Opportunity Crudes?

TOPGUARD
Overhead Corrosion Control

Be Prepared

When processing opportunity crudes increases your overhead corrosion risk, Baker Petrolite brings proven technology and experience to help you reach the top safely. The Baker Petrolite team works with you, using TOPGUARD Overhead Corrosion Control to:

- Increase feedstock flexibility
- Manage increased overhead corrosion potential
- Define the optimum operating envelope for any feedstock
- Quickly respond to changing unit conditions
- Ensure integrity and safety of your operations

Processing opportunity crudes successfully takes a team effort. Match our specialized technology, expertise and responsive service with your next opportunity.

Contact *www.bakerpetrolite.com* today.

BAKER HUGHES Baker Petrolite

Best-in-Class

CONDENSATE EAST OF SUEZ: NGL and its Naphtha Impacts in Asia Pacific and Mideast Gulf

Condensate and the Light-End Products Squeeze

By Asia Pacific Energy Consulting

- **This is the "definitive" report on condensate in the fastest growing, critical regions of the world, Asia Pacific and the Mideast Gulf.**
- **The study provides a complete guide to optimizing value in future condensate production, utilization, and trade.**

For additional information:
E-mail: orcinfo@pennwell.com
Phone: 1.918.831.9488

To Order:
Online Order Form:
www.ogjresearch.com
Phone: 1.800.752.9764 or
1.918.831.9421

PRODUCT NO: CNDENSATE

$5,000 US—Single User
$1,000 US—(per additional copy)
$7,000 US—Multi user Corporate License

Condensate coming into its own

Condensate, one of the two groups defined as Natural Gas Liquids (NGLs), is finally coming of age in world trade, marketing, refining and petrochemicals. Condensate sales are moving from a niche marketing specialty to a mainstream segment of crude and products trade, and nowhere is this more evident than in the Mideast Gulf and Asia Pacific.

This report explains how the protean nature of condensate allows it to be used in a wide range of sectors: as a refinery slate component; in specialized distillation towers called condensate splitters; in direct feed to ethylene crackers; in gasoline blending and as a substitute for gas in turbine power generation. It can be defined as a base material, a blending component, a feedstock or a boiler feed.

See website for Table of Contents and sample tables, charts and graphs.

OIL&GAS JOURNAL online research center

www.ogjresearch.com

Week of Mar. 10, 2008/US$10.00

PennWell®

OIL&GAS JOURNAL®

International Petroleum News and Technology / www.ogjonline.com

Refining Report

Nile Delta Oligocene find boosts Egypt's gas outlook
Feed-gas molecular weight affects compressor efficiency
Shuttle tankers offer competitive deep US gulf transport

OIL&GAS JOURNAL®

Mar. 10, 2008
Volume 106.10

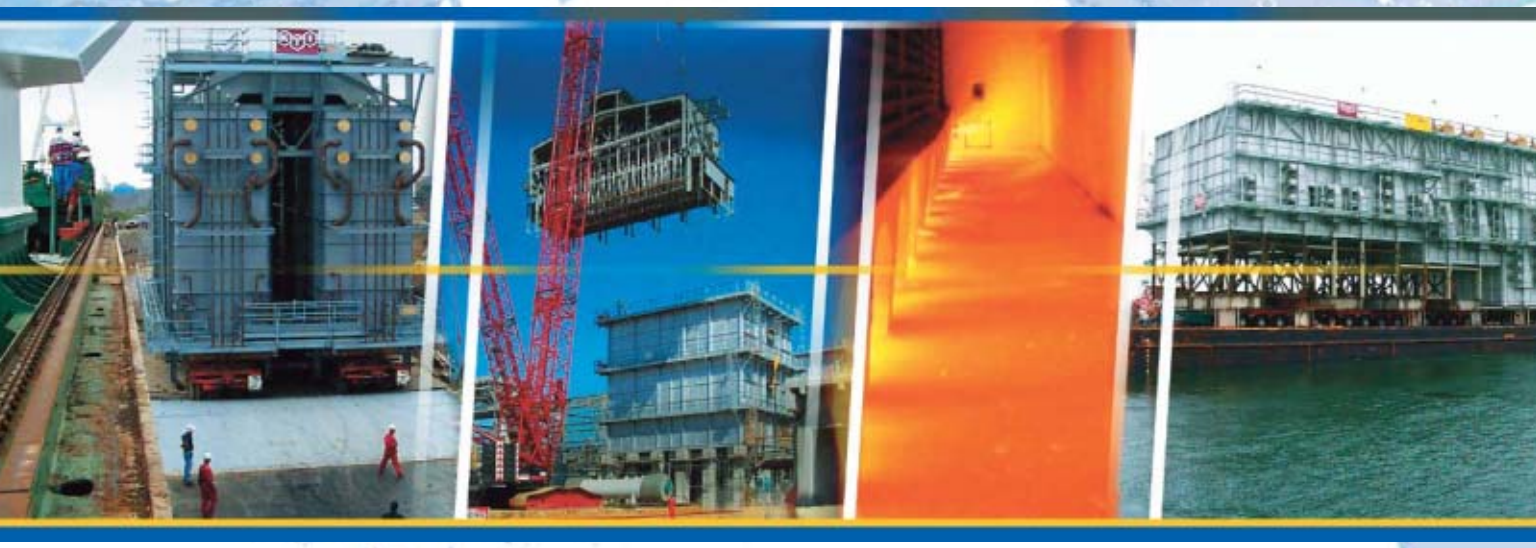
REFINING REPORT

REGULAR FEATURES

COVER

Changing specifications for refined products throughout the world are affecting the way refiners produce and trade these fuels. Boutique fuels, such as those produced in Tesoro Corp.'s 166,000-b/d Golden Eagle refinery in Martinez, Calif., represent added complexity for worldwide refiners. The first article in this week's special report, starting on p. 22, evaluates the potential of Iran's latest efforts to resolve its gasoline shortage problems. The second article, p. 54, provides a forecast of the global refining industry to 2012. Photo from Tesoro.

KINETICS TECHNOLOGY INTERNATIONAL



THE WORLD LEADER
ENGINEERING – FABRICATION
CONSTRUCTION – NOx REDUCTION

FIRED HEATERS

- Refinery Applications
- Steam Reformers
- Petrochemical Applications
- OTSGs

NOx/CO REDUCTION

- Gas Turbines
- Heaters
- Boilers
- FCC Units
- other fired sources

Please visit www.kticorp.com for a complete list of our products, services, and contacts.

KTI CORPORATION
1990 Post Oak Blvd., Suite 200, Houston, TX 77056
Tel: (281) 249-2400 Fax: (281) 249-2328
E-mail: sales@kticorp.com

KTI - KOREA
#612, Kolon Science Valley II, 811, Guro-dong,
Guro-gu, Seoul, 152-050, Korea
Tel: 82-2-850-7800 Fax: 82-2-850-7828
E-mail: BSKim@kti-korea.com

Technip

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

 Oil & Gas Journal (ISSN 0030-1388) is published 50 times per year by PennWell Corporation, 1421 S. Sheridan Rd., Tulsa, Okla., Box 1260, 74101. Periodicals postage paid at Tulsa, Okla., and at additional mailing offices. Oil & Gas Journal and OGJ are registered trademarks of PennWell Corporation. **POSTMASTER:** send address changes, letters about subscription service, or subscription orders to P.O. Box 3497, Northbrook, IL 60065, or telephone (800) 633-1656. Change of address notices should be sent promptly with old as well as new address and with ZIP code or postal zone. Allow 30 days for change of address. Oil & Gas Journal is available for electronic retrieval on Oil & Gas Journal Online (www.ogjonline.com) or the NEXIS® Service, Box 933, Dayton, Ohio 45401, (937) 865-6800. **SUBSCRIPTION RATES** in the US: 1 yr. $89; Latin America and Canada: 1 yr. $94; Russia and republics of the former USSR, 1 yr. 1,500 rubles; all other countries: 1 yr. $129, 1 yr. premium digital $59 worldwide. These rates apply only to individuals holding responsible positions in the petroleum industry. Single copies are $10 each except for 100th Anniversary issue which is $20. Publisher reserves the right to refuse non-qualified subscriptions. Oil & Gas Journal is available on the Internet at http://www.ogjonline.com. (Vol. 106, No. 10) Printed in the US. GST No. 126813153. Publications Mail Agreement Number 602914. Return Undeliverable Canadian Addresses to: P.O. Box 1632, Windsor, ON N9A 7C9. Standard Mail A enclosed in version P2

PennWell, Houston office
1455 West Loop South, Suite 400, Houston, TX 77027
Telephone 713.621.9720/Fax 713.963.6285/Web site www.ogjonline.com
Editor Bob Tippee, bobt@ogjonline.com
Chief Editor-Exploration G. Alan Petzet, alanp@ogjonline.com
Chief Technology Editor-LNG/Gas Processing Warren R. True, warrent@ogjonline.com
Production Editor Guntis Moritis, guntism@ogjonline.com
Drilling Editor Nina M. Rach, ninar@ogjonline.com
Refining/Petrochemical Editor David N. Nakamura, davidn@ogjonline.com
Pipeline Editor Christopher E. Smith, chriss@ogjonline.com
Senior Editor-Economics Marilyn Radler, marilynr@ogjonline.com
Senior Editor Steven Poruban, stevenp@ogjonline.com
Senior Associate Editor Judy R. Clark, judyrc@ogjonline.com
Senior Writer Sam Fletcher, samf@ogjonline.com
Senior Staff Writer Paula Dittrick, paulad@ogjonline.com
Survey Editor Leena Koottungal, lkoottungal@ogjonline.com
Editorial Assistant Linda Barzar, lbarzar@pennwell.com

Petroleum Group President Michael Silber, msilber@pennwell.com
Vice-President/Group Publisher Bill Wageneck, billw@pennwell.com
Vice-President/Custom Publishing Roy Markum, roym@pennwell.com

PennWell, Tulsa office
1421 S. Sheridan Rd., Tulsa, OK 74112
PO Box 1260, Tulsa, OK 74101
Telephone 918.835.3161 / Fax 918.832.9290
Presentation/Equipment Editor Jim Stilwell, jims@ogjonline.com
Associate Presentation Editor Michelle Gourd, michelleg@pennwell.com
Statistics Editor Laura Bell, laurab@ogjonline.com
Illustrators Alana Herron, Kermit Mulkins, Mike Reeder, Kay Wayne
Editorial Assistant Donna Barnett, donnab@ogjonline.com
Production Director Charlie Cole

London
Tel +44 (0)208.880.0800
International Editor Uchenna Izundu, uchennai@pennwell.com

Washington
Tel 703.533.1552
Washington Editor Nick Snow, nicks@pennwell.com

Los Angeles
Tel 310.595.5657
Senior Correspondent Eric Watkins, hippalus@yahoo.com

OGJ News
Please submit press releases via e-mail to: news@ogjonline.com

Subscriber Service
P.O. Box 2002, Tulsa OK 74101
Tel 1.800.633.1656 / 918.831.9423 / Fax 918.831.9482
E-mail ogjsub@pennwell.com
Circulation Manager Tommie Grigg, tommieg@pennwell.com

PennWell Corporate Headquarters
1421 S. Sheridan Rd., Tulsa, OK 74112
P.C. Lauinger, 1900-1988
Chairman Frank T. Lauinger
President/Chief Executive Officer Robert F. Biolchini

Member Audit Bureau of Circulations & American Business Media

The GENESIS™ Catalyst System

Maximize yield with Grace Davison's GENESIS FCC catalyst.

Most refiners need flexible catalyst systems that allow them to take advantage of changing economic scenarios. Grace Davison delivers this flexibility with the GENESIS catalyst system. GENESIS catalysts provide a means to maximize yield potential through optimization of discrete cracking catalyst functionality. GENESIS catalysts are a blend of two catalyst types. The key component is MIDAS, which maximizes conversion of bottoms and improves coke selectivity by eliminating coke precursors. The other GENESIS component is most often an IMPACT catalyst. The inclusion of IMPACT provides critical zeolite surface area and activity as well as superior coke and gas selectivity in a broad range of applications, from severely hydrotreated gasoils to heavy resid feeds.

GENESIS catalysts demonstrate a true yield synergy with a superior coke to bottoms relationship than either component alone. The synergy exists because each component cracks specific feed species.

GENESIS catalyst provides the ultimate in formulation and FCC operational flexibility.

GRACE

For more information, contact your Grace Davison Technical Sales Manager

www.grace.com 7500 Grace Drive • Columbia, MD 21044 USA

OGJ Newsletter

Mar. 10, 2008
International news for oil and gas professionals
For up-to-the-minute news, visit www.ogjonline.com

General Interest — Quick Takes

Senate Republicans pressed to support bill

Democratic leaders in both houses of the US Congress used record-high crude oil prices to press Senate Republicans to back a House-approved bill that would shift $18 billion in tax breaks from major oil companies to alternative and renewable energy projects.

Responding to news Mar. 3 that crude oil prices reached $103.95/bbl, breaking a record set in 1980 when adjusted for inflation, Senate Majority Leader Harry M. Reid (D-Nev.) said: "As oil prices reach record highs in a weakening economy, Democrats remain committed to repealing Big Oil's tax breaks and instead use that money to expand incentives for investing in energy-efficient vehicles and renewable energy.

"Bush Republicans blocked our efforts to do so last year, but we will soon give them another chance to help lower prices at the pump and reduce our reliance on oil," he continued.

In the House, which passed H.R. 5351 by 236 to 182 votes largely along party lines Feb. 27, Speaker Nancy Pelosi (D-Calif.) said that Americans are paying the price for years of a failed energy policy that has resulted in heavy reliance on imported oil and a growing threat from global warming in addition to record energy costs.

After Democrats assumed control of Congress in January 2007, she said, federal lawmakers enacted the first motor fuel economy increase in 32 years; dramatically boosted efficiency standards for buildings, lighting, and appliances; and invested in domestic biofuels. "This year, we again seek to repeal billions of dollars in unnecessary subsidies given to Big Oil at a time of record profits and invest these savings in clean, renewable energy initiatives that will create good-paying green jobs," Pelosi said.

She and Reid urged President George W. Bush to drop his opposition to the measure, which he has said he would veto because it is aimed at increasing taxes in a single industry.

Chavez warns of war plans with Colombia

Oil production in Venezuela and Ecuador are not under any threat despite rising tensions with their neighbor Columbia, according to oil ministers from both countries.

Venezuelan Energy and Mines Minister Rafael Ramirez said his country's oil industry infrastructure "has been protected for some time now" and that the country is "ready to protect" itself.

Ecuador's Oil Minister Galo Chiriboga said his country's oil output would not be affected by recent military movements in the region.

Both Venezuela and Ecuador have sent troops to their respective borders with Colombia in response to Colombia's killing of a top rebel leader on Ecuadorian soil on Mar. 1.

Earlier, Venezuelan President Hugo Chavez warned that his country and Ecuador could go to war with Colombia over the military incursion into Ecuador by Colombian forces that killed Raul Reyes, the second most senior rebel commander for the Revolutionary Armed Forces of Colombia (FARC).

Colombian authorities said Reyes and 16 other guerrillas were killed in a raid on a FARC camp 1.8 km inside Ecuador's border with Colombia. Documents recovered from Reyes' captured laptop computer showed Chavez's administration recently paid $300 million to the rebels, while high-level meetings had been held between rebels and Ecuadorian officials, Colombian officials said.

"We don't want a war... (but) if we have to give (a war), we will, and it will be in Colombia," said Chavez during a nationally broadcast radio and television show.

Ecuador "will always count on Venezuela for anything under any circumstance," said Chavez, who ordered Venezuelan troops to his country's border with Colombia.

Columbia justified the raid on grounds that the Colombian rebels were using Ecuador as a base to attack their homeland and that Venezuela had provided financial and military support.

"We cannot allow terrorists who seek refuge in other countries to spill the blood of our countrymen," said Columbian President Alvaro Uribe, who added: "We are not warmongers, but we are not weak."

US President George W. Bush backed Colombia, accusing Chavez of provocative maneuvers and warning he opposed any act of aggression in the region. For his part, Chavez says Uribe is a pawn in a US plot to invade Venezuela, the No. 4 oil supplier to the US.

European unbundling discussed at EU meeting

At a meeting of European Union Energy Ministers in Brussels Feb. 28, the Slovene presidency accepted an unbundling option proposed by Germany, France, and six other EU members. The unbundling initiative had been introduced as an alternative to the Energy Commission's two options to separate energy production from distribution networks in order to obtain a truly competitive European integrated energy market.

There will be further discussions on the matter before the end of June. France assumes the presidency of the EU July 1.

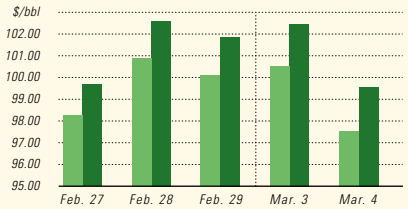
The Commission wanted the total breakup of fully vertically integrated gas and electricity utilities but proposed a complicated alternative that eight opponents rejected. It posed that ownership of production and transport networks be retained but that the assets be managed by a fully independent body.

Their third option was to set up the conditions for an "effective and efficient" dissociation between energy producers and transporters while maintaining ownership.

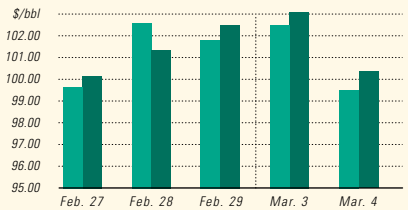
While France's Energy Minister Jean-Louis Borloo was celebrating "a psychological victory" because the third option had been

Industry Scoreboard

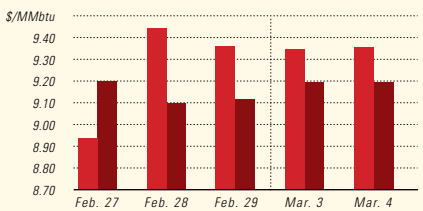
IPE BRENT / NYMEX LIGHT SWEET CRUDE



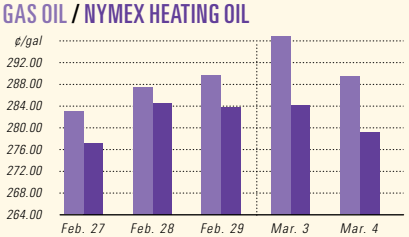
WTI CUSHING / BRENT SPOT



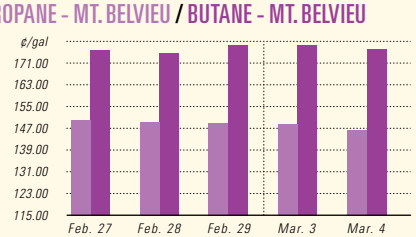
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



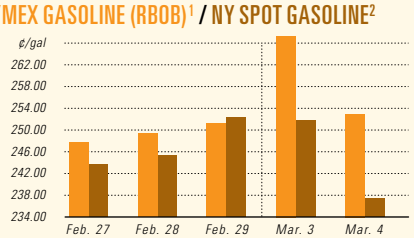
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



NYMEX GASOLINE (RBOB)[1] / NY SPOT GASOLINE[2]



[1]Reformulated gasoline blendstock for oxygen blending.
[2]Non-oxygenated regular unleaded.

US INDUSTRY SCOREBOARD — 3/10

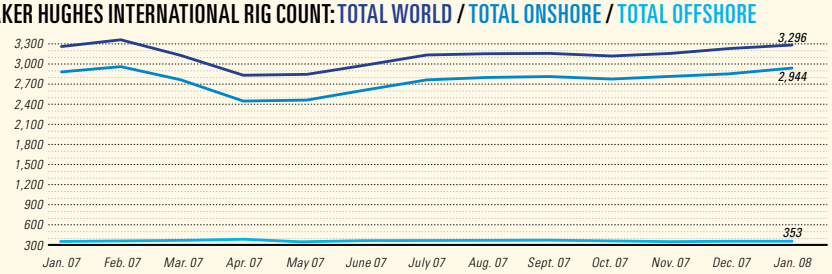
Latest week 2/22	4 wk. average	4 wk. avg. year ago[1]	Change, %	YTD average[1]	YTD avg. year ago[1]	Change, %
Demand, 1,000 b/d						
Motor gasoline	9,027	8,992	0.4	9,054	8,958	1.1
Distillate	4,360	4,518	–3.5	4,304	4,434	–2.9
Jet fuel	1,571	1,631	–3.7	1,555	1,626	–4.3
Residual	581	896	–35.2	710	848	–16.3
Other products	5,043	5,056	–0.3	5,079	5,049	—
TOTAL DEMAND	20,582	21,093	–2.4	20,702	20,915	–1.0
Supply, 1,000 b/d						
Crude production	5,034	5,159	–2.4	5,030	5,172	–2.7
NGL production[2]	2,657	2,227	19.3	2,470	2,235	10.5
Crude imports	10,078	9,335	8.0	10,090	9,650	4.6
Product imports	3,673	3,197	14.9	3,484	3,283	6.1
Other supply[3]	833	1,026	–18.8	1,016	1,046	–2.9
TOTAL SUPPLY	22,275	20,944	6.4	22,090	21,386	3.3
Refining, 1,000 b/d						
Crude runs to stills	14,808	15,271	–3.0	14,808	14,712	0.7
Input to crude stills	14,984	15,528	–3.5	14,984	15,087	–0.7
% utilization	85.9	89.2	—	85.9	86.4	—

Latest week 2/22	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	308,505	305,274	3,231	329,004	–20,499	–6.2
Motor gasoline	232,619	230,264	2,355	220,175	12,444	5.7
Distillate	119,952	122,527	–2,575	124,503	–4,551	–3.7
Jet fuel-kerosine	40,083	39,803	280	40,210	–127	–0.3
Residual	36,672	36,915	–243	35,998	674	1.9
Stock cover (days)[4]			Change, %		Change, %	
Crude	21.2	21.0	1.0	22.4	–5.4	
Motor gasoline	25.8	25.6	—	24.1	7.1	
Distillate	27.5	28.2	–2.5	26.5	3.8	
Propane	19.3	20.5	–5.9	17.1	12.9	

Futures prices[5] 2/29			Change		Change	%
Light sweet crude, $/bbl	100.84	99.45	1.39	60.06	40.78	67.9
Natural gas, $/MMbtu	9.23	9.00	0.23	7.68	1.55	20.2

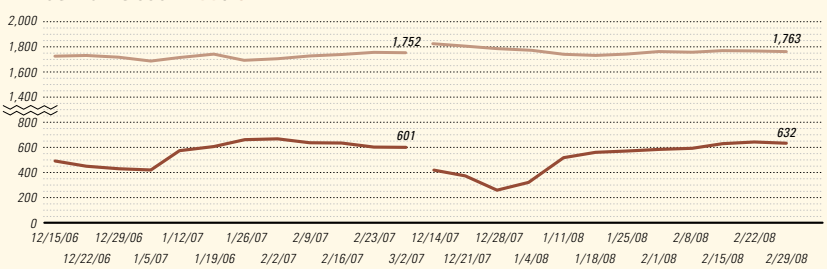
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average of daily closing futures prices.
Sources: Energy Information Administration, Wall Street Journal

BAKER HUGHES INTERNATIONAL RIG COUNT: TOTAL WORLD / TOTAL ONSHORE / TOTAL OFFSHORE



Note: Monthly average count

BAKER HUGHES RIG COUNT: US / CANADA



Note: End of week average count

retained for discussion, Germany's E.On AG was pulling the carpet from under the discussions by setting up a precedent for full unbundling: It was offering to sell its electricity grid to a fully independent buyer, a move rejected by German Chancellor Angela Merkel as likely to weaken the position of Germany and France.

A number of observers noted that, while it was possible to give up ownership of electricity networks, giving up ownership of gaslines would destroy the value of a company such as Gaz de France and involve questions of national security, as a company such as Gazprom is known to be ready to acquire networks that would appear on an open market.

Sakhalin-2 partners seek swifter financing

Sakhalin Energy, operator of the Sakhalin-2 gas and oil project, reported it is no longer seeking loans from the US Export-Import Bank or the UK's Export Credits Guarantee Department due to possible delays on loan decisions.

A Sakhalin Energy spokesman said Ex-Im Bank might require lengthy consultations over the loans, but that the project's tight start-up and operating schedule dictated the need to seek a swifter financing decision, not environmental or political concerns.

Sakhalin Energy, which needs a reported $5 billion for project financing, will continue to hold discussions with other potential creditors such as the Japanese Bank for International Cooperation and major commercial banks.

Phase 2 construction of the Sakhalin-2 project is nearing completion with some 90% of work already accomplished. The company hopes to finish the second phase by yearend and start production of LNG shortly after.

The company's work plan this year includes starting of drilling at platform Piltun-Astokhskoye-B and start-up of the Molikpaq tie-in modules to establish year-round production of oil.

Also in the plan for this year are continued drilling at gas platform Lunskoye-A; commissioning the OPF to receive hydrocarbons from all three offshore platforms; completion of the onshore pipelines and booster Station 2 construction; and the commissioning of Trains 1 and 2 of the LNG gasification plant. ✦

Exploration & Development — *Quick Takes*

ExxonMobil to explore block off Libya

ExxonMobil Corp. will shoot seismic surveys and drill an exploration well under a production-sharing agreement with National Oil Corp. (NOC) of Libya covering offshore Area 21.

NOC said ExxonMobil agreed to acquire 4,000 line-km of 2D seismic data and 2,000 sq km of 3D data under a $97 million work commitment. It also will fund training or scholarships during the exploration period and improve schools in Libya.

Area 21 encompasses four blocks covering a total of 2.5 million acres in the Sirte basin 110 miles offshore. It is adjacent to the east of Area 20, for which ExxonMobil also holds a production-sharing agreement (OGJ, Feb. 12, 2007, Newsletter).

USGS reports Permian basin oil, gas estimates

There is roughly 40.58 tcf of undiscovered natural gas, 1.02 billion bbl of natural gas liquids, and 1.26 billion bbl of oil in the Permian basin, the US Geological Survey said.

Most of the gas (about 35.38 tcf) and gas liquids (about 785 million bbl) is in unconventional formations in the Delaware and Midland basins, USGS said in a publication released on Mar. 1. "Given that few wells have produced from these assessment units, there is significant geological uncertainty in these estimates," the agency said.

The remaining crude is more evenly divided between an estimated 747 million bbl of conventional resources and 510 million bbl from unconventional deposits, the report said.

The primary estimates were means of assessments using the total petroleum system concept which range from 5% to 95% probability. The study assessed the potential for technically recoverable resources in new field discoveries only and did not include field or reserve growth in conventional fields, USGS said.

Total to invest $2 billion on Anguille redevelopment

Total Gabon reported it will drill a dozen wells in Anguille field in Gabon under its redevelopment program and expects oil recovery to improve to 23% from 13%.

The redevelopment will cost $2 billion for additional proved and probable reserves of about 150 million bbl, with production peaking at more than 30,000 b/d in 2013-14.

The Total unit said production is expected to increase in 2008, with operating costs falling by refocusing operations onshore.

Under the first phase of redevelopment, associated surface facilities will be debottlenecked, and Total will increase the number of drainage points, in particular in the northern part of the field, and boost well productivity by hydraulic fracturing and massive waterfloods.

"Running from 2009 to 2011, Phase 2 entails installing new offshore infrastructure and decommissioning obsolete process units, building an onshore plant (power generation, fluid treatment, gas compression) and drilling an additional 30 or so wells," Total added.

The Anguille redevelopment is an important project to eliminate wasteful gas flaring in the country by 2011, as well as coastal discharges of production water.

Anguille lies 20 km off Port-Gentil in 30 m of water in the Grand Anguille Marine concession, which is wholly owned by Total Gabon.

Discovered in 1962, Anguille came on stream in 1966 and produced 7,500 b/d in 2007 prior to redevelopment.

Eni, PDVSA to develop Orinoco belt block

Eni SPA will develop Junin Block 5 in Venezuela's Orinoco oil belt under a strategic agreement with Venezuela's energy ministry, and Petroleos de Venezuela SA.

The companies will form a joint venture to assess reserves and draw up a development program to initially produce 30,000 b/d and reach a long-term production plateau of 300,000 b/d. The 670 sq km block is in the state of Anzoategui, 550 km southeast of

Caracas, with a resource estimated at over 2.5 billion boe.

Eni will make available to the venture proprietary slurry technology to convert heavy oils, bitumens, and asphaltenes into high-quality light products. It says the technology eliminates production of liquid and solid refinery residues.

PDVSA will have a 60% stake in the joint venture and Eni, 40%.

EOG makes Barnett shale oil discovery

EOG Resources Inc. announced an oil discovery in the Barnett shale region near Fort Worth, Tex., where EOG has drilled for natural gas since 2004.

During a Feb. 28 conference call, EOG executives told analysts they drilled and tested eight horizontal crude oil wells. EOG plans to develop its Barnett shale oil play north of gas-prolific Johnson County.

EOG is still delineating its oil discovery, and executives estimate possible crude oil reserve potential at 225-460 million boe net on its 250,000 net acres in Montague, Clay, and Archer counties.

Oil production from EOG's holdings in the Barnett shale is forecast for 2009. ✦

Drilling & Production — *Quick Takes*

Pemex to boost output in Cantarell field

Average output at Mexico's Cantarell oil field will decline by as much as 20% this year as the field matures, a Petroleos Mexicanos executive reported.

Carlos Morales Gil, Pemex exploration and production director, said the state firm will reverse the decline when the company installs new production equipment at the field. The energy ministry has said investment in Cantarell would reach $5 billion this year.

Morales said output at Cantarell will range from 1.2-1.3 million b/d this year, compared with an average of 1.5 million in 2007.

According to figures published by the energy ministry, Cantarell's output had already slipped to 1.27 million b/d in January, down some 230,000 b/d from the 1.6 million b/d in January 2007.

In fourth-quarter 2007 Pemex drilled five new development wells at Cantarell and repaired nine major wells and 10 smaller wells. During first-quarter 2008, the company plans to complete a nitrogen recovery unit in the field.

Despite Cantarell's decline, Morales said the company will produce an average 3.1 million b/d this year, the same as in 2007, as other fields compensate for declines at Cantarell.

Morales acknowledged that the decline in Cantarell's production is forcing Pemex to move into more difficult production zones on land and in deeper waters in the Gulf of Mexico.

Much of the company's new drilling is at the Tertiary Gulf Oil project in the northern states of Veracruz and Puebla, where output rose to 41,000 b/d by yearend 2007. By 2015, Pemex hopes production in the region will rise to nearly 600,000 b/d following investments now pegged at $1.7 billion.

Pemex also hopes to boost output at Ku-Maloob-Zaap offshore field, in which seven new wells were completed and a new production platform installed by yearend 2007. Pemex also plans to begin construction of the Maloob C drilling platform in early 2008.

Yemen to raise oil production by 2010

Yemen plans to increase its oil production to 500,000 b/d by 2010 from the current 317,000 b/d, according to the country's oil minister, Khaled Bahah.

"The current oil production decreased from 438,000 b/d in 2002 to 317,000 b/d in 2007," he said, adding that his country is looking to increase production by selling new licenses as well as by improving output at existing sites.

According to the US Energy Information Administration, Yemen's total oil production in 2006 was about 380,000 b/d, down from 400,000 b/d in 2005.

Citing Yemen's Petroleum Exploration and Production Authority (PEPA), EIA said the decrease is due to declining production in Masila and Marib, the country's two largest basins.

EIA's Short-Term Energy Outlook currently projects oil production of 360,000 b/d for 2007 and 350,000 b/d in 2008.

Minister Bahah's upbeat remarks coincided with statements by Austria's OMV AG that it plans to drill new 40 oil wells by 2010 in Yemen's S2 block (Al Uqlah) in the Armah district of Shabwa governorate.

OMV aims to increase its production to more than 30,000 b/d, said the firm's in-country director during a meeting with Shabwa Gov. Mohammed Shamlan.

Last year, OMV AG announced that it began production of 1,000 b/d of oil from its Kharwah-1 well on Block S2 and that it plans to deliver 11,000 b/d of oil by 2008 (OGJ, Jan. 8, 2007, Newsletter).

Interest holders in Block S2 are OMV (Yemen Block S2) Exploration GMBH 44%, Sinopec International Petroleum Exploration & Production Corp. 37.5%, Yemen General Corp. for Oil & Gas 12.5%, and Yemen Resources Ltd. 6%.

EOG to start Horn River gas production

EOG Resources Inc. expects to begin natural gas production in June from British Columbia's Horn River basin.

The Houston independent estimates initial production potential from the basin to be 3.5-5 MMcfd.

EOG has accumulated leaseholds on 140,000 net acres near British Columbia's northern boundary. Production is expected to be ramped up significantly starting in 2010, EOG executives told analysts during a Feb. 27 conference call.

US drilling slips 8 units

US drilling activity slipped to 1,763 rotary rigs the week ended Feb. 29, 8 less than the previous week but up from 1,752 during the same period last year, said Baker Hughes Inc.

All of the latest loss was in land operations, down 13 units to 1,681 working. US offshore drilling increased by 4 to 59, including 58 in the Gulf of Mexico. Inland waters gained 1 rotary rig to 23.

Texas lost 7 rigs this week, down to 859 drilling. Alaska's rig count dipped by 3 to 8. Colorado and Wyoming were down 2 rigs each to respective counts of 110 and 72. Oklahoma declined by 1 rig to 200, and Louisiana was unchanged with 144 rigs drilling. California's rig count increased by 2 to 35 units. New Mexico was up 3 to 68. ✦

Transportation — *Quick Takes*

Mexico's CFE gets LNG bids for new terminal

Mexico's Comision Federal de Electricidad said it has received bids from three consortia to receive, store, and regasify LNG at the new terminal at the Port of Manzanillo on the country's Pacific Coast.

One bid was tendered by Energia Occidente de Mexico, a consortium of Canada's TransCanada, Argentina's Techint, and Belgium's Tractebel.

The second bid was tendered by Terminal KMS de GNL, a consortium of Japan's Mitsui and South Korea's Samsung and Korea Gas Corp.

The third bid was filed by the consortium Controladora LNG Manzanillo, formed by Spain's Iberdrola, Mexico's ICA, and Japan's Tokyo Gas and IHI.

After starting at 90 Mcfd in 2011, supply will be scaled up to 500 Mcfd by 2015 at increments of 180 Mcfd, 360 Mcfd, and 400 Mcfd. The gas from Manzanillo will feed the new 3 Gw capacity CFE intends to install in the region.

CFE, which will announce its decision on Mar. 10, awarded Repsol Comercializadora de Gas a 15-year, $15 billion contract in September 2007 to supply the Manzanillo terminal with Peruvian gas.

Inpex considers Darwin LNG landfall

Japanese company Inpex Australia is considering Darwin as an optional site for its proposed LNG plant, which will use gas feedstock from its Ichthys field in the Browse basin off Western Australia (OGJ Online, Feb. 2, 2007).

Inpex also is considering a larger plant for a Darwin operation, although it has not specified the precise size.

The company and partner Total SA have a preferred site on the Maret Islands off the Kimberley coast of Western Australia that calls for a two-train LNG plant for a total 7.6 million tonne/year output.

However, that site is facing increasing opposition from green groups and a drawn-out approvals process from Western Australian authorities.

In addition, Australia's federal and state (Western Australia) governments are considering the sanction of just one common-user LNG hub on the Kimberley coast for all Browse basin gas fields.

Inpex said its original schedule to produce its first LNG shipments by 2012 will be delayed as the company reviews its project budget and development program.

The company recently signed a project facilitation agreement with Northern Territory under which the joint venture will take a considered look at the Middle Arm Peninsula near Darwin as a potential LNG site.

The NT government is keen to have the project and says the agreement ensures that a whole-of-government approach is taken to the development of Ichthys. This includes facilitating necessary environmental and planning approvals, provision of land at Middle Arm, and port access.

The company is now undertaking a range of technical and engineering studies to fully assess the Darwin option to compare it with the Maret proposal.

One difficulty is the length of pipeline required for a Northern Territory landfall.

An Ichthys-to-Darwin pipeline would be 850 km compared with an Ichthys-to-Maret line of 190 km.

Inpex has a 76% interest, and Total holds the remaining 24%.

Consultant forecasts tighter 2008 tanker market

McQuilling Services LLC expects a rebound in both tanker spot rates and time-charter revenues during 2008, with demand outpacing supply in most sectors. McQuilling's annual Tanker Market Outlook doesn't anticipate much growth in demand, but instead sees the market tightening due to accelerated exits from the fleet for conversion.

Beyond 2008, McQuilling expects the tanker market to weaken as surplus tonnage grows. Strength once anticipated post-2010, driven by the scheduled phase-out of single-hull vessels by that year, has disappeared on a combination of asset owners' converting these vessels early and a 600,000 b/d softening in global oil demand growth for 2010 compared with last year's projections.

McQuilling also anticipates double-digit tonnage supply increases in 2009.

For 2008, however, McQuilling expects demand for crude and dirty products tonnage to grow 1.2-4.1%, depending on the vessel sector, with 3.3% demand growth expected for very large crude carriers (VLCCs) in 2008 vs. no growth in 2007. VLCCs (265,000 dwt) operating on AG-Far East routes drew world-scale spot rates of 72 in 2007. McQuilling expects this level to continue on average through 2012, but with a 2008 spike up to WS 85. Other tanker segments will follow a similar spot-rate pattern, according to McQuilling.

For time-charter equivalent daily revenue, McQuilling expects VLCC's, which earned $39,800/day in 2007, to peak this year at $51,400/day before slipping to an average of $38,300 through 2012. This stands in contrast, however, to McQuilling's revenue forecast for the balance of the tanker market, which calls for a steady decline from 2007 through the end of the forecast period in 2012.

Suezmax (130,000 dwt) vessels operating between West Africa and the US Atlantic Coast, for example, earned $39,100/day in 2007 but are expected to earn $37,700/day this year and $31,000/day through 2012. ✦

Letters

AnthropLetterEthanol

The Energy Independence and Security Act requires 15 billion gal of corn ethanol in 2016. Using an average corn yield of 147 bushels/acre (the average over the 6-year period 2002-07), we find 41 million acres would have to be devoted to corn production for fuel ethanol. These 15 billion gal of ethanol would displace just 245 million bbl of reformulated gasoline—just 7.2% of year 2007 gasoline consumption. This hardly qualifies as ending our dependence on foreign oil.

Ethanol production is currently much above the previous legislative mandate. Energy Information Administration data show that year 2007 fuel ethanol production should total about 6.5 billion gal. The new energy bill will therefore require 8.5 billion gal of additional ethanol by 2016. This production will necessitate converting 23 million additional acres to corn production. The table summarizes acreage data for corn, soybeans, and wheat for the period 2003-07.

Between 2006 and 2007, corn acreage increased about 15 million acres. This clearly came at the expense of soybean acreage, which decreased by 12 million acres. Not surprisingly, the price of soybeans closed at $12.10/bushel on Jan. 29, compared to $6.85/bushel a year ago. In her TV commercials in California, Hillary Clinton is telling people they should not have to pay $3/gal for gasoline. Thanks to Congress and the ethanol mandate, the price of eggs has increased from $1.10/dozen a year ago to $1.43/dozen today. She has been strangely silent on the increase in food prices.

Average per-capita gasoline consumption over the 6-year period 2001–06 is 11.24 bbl/year. The new energy bill raises the corporate average fuel economy standards in 2012. In my judgment, it is far from clear what effect this will have on US gasoline consumption, but I suspect it is going to be considerably less than its supporters hope. In any event, it will have very little effect by 2016. Let's assume per-capita consumption remains constant

at 11.24 bbl/year. Estimating the US population in 2016 is difficult because we don't know what the level of immigration will be.

My estimate is 327.6 million. (The resident population on July 1, 2007, was 301.6 million). The Census Bureau's projection for 2016 is 324.8 million. However, this was made in March 2004 before the recent surge in immigration. If per-capita gasoline consumption remains constant, US gasoline consumption in 2016 will be 3.682 billion bbl, compared to 3.394 billion bbl in 2007. Thus, gasoline consumption will increase by 288 million bbl. The 8.5 billion gal of new ethanol production between 2007 and 2016 will displace only 139 million bbl of gasoline. So the increased gasoline demand between 2007 and 2016 is just about double the energy supplied by the 8.5 billion gal of additional ethanol. And these idiots call this the Energy Security and Independence Act.

A quick calculation indicates that if the 21 billion gal of "advanced" biofuels mandated for 2022 consists of ethanol derived from switchgrass, some 42 million additional acres of cropland would have to be converted to switchgrass production. An accurate assessment of this is not possible today because we really don't know the efficiency of converting switchgrass to ethanol.

Donald F. Anthrop
San Jose State University

HARVESTED ACREAGE

Year	Corn for grain	Soybeans	Wheat	Total
	Million acres			
2003	70.944	72.476	53.063	196.483
2004	73.631	73.958	49.999	197.588
2005	75.117	71.251	50.119	196.487
2006	70.648	74.602	46.810	192.060
2007	86.071	62.818	51.011	199.900

Calendar

✦ Denotes new listing or a change in previously published information.

OIL&GAS JOURNAL online

Additional information on upcoming seminars and conferences is available through OGJ Online, Oil & Gas Journal's Internet-based electronic information source at http://www.ogjonline.com.

2008

MARCH

NPRA Annual Meeting, San Diego, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 9-11.

World Heavy Oil Congress, Edmonton, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 10-12.

New Zealand Petroleum Conference, Auckland, +64 3 962 6179, +64 4 471 0187 (fax), e-mail: crown.minerals@med.govt.nz, website: www.crownminerals.govt.nz. 10-12.

Gastech International Conference & Exhibition, Bangkok, +44 (0) 1737 855005, +44 (0) 1737 855482 (fax), e-mail: tonystephenson@dmgworldmedia.com, website: www.gastech.co.uk. 10-13.

API Spring Petroleum Measurement Standards Meeting, Dallas, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 10-14.

European Fuels Conference & Annual Meeting, Paris, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 11-12.

IADC International Deepwater Drilling Conference & Exhibition, Rio de Janeiro, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 11-12.

SPE North Africa Technical Conference & Exhibition, Marrakech, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 12-14.

NACE International Conference & Expo, New Orleans, (281) 228-6200, (281) 228-6300 (fax), website: www.nace.org. 16-20.

Offshore Asia Conference & Exhibition, Kuala Lumpur, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.offshoreasiaevent.com. 17-19.

Sub-Saharan Oil, Gas & Petrochemical Exhibition & Conference, Cape Town, +27 21 713 3360, +27 21 713 3366 (fax), e-mail: expo@fairconsultants.com, website: www.fairconsultants.com. 17-19.

Turoge and Black Sea Oil & Gas Exhibition & Conference, Ankara, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 18-20.

AAPG Prospect & Property Expo (APPEX), London, (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 24-26.

AAPG Pacific Section Meeting, Bakersfield, Calif., (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. Mar. 29-Apr. 2.

NPRA International Petrochemical Conference, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. Mar. 30-Apr. 1.

SPE Middle East Petroleum Engineering Colloquium, Dubai, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. Mar. 30-Apr. 2.

Calendar

PIRA Understanding Global Oil Markets Conference, Tokyo, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. Mar. 31-Apr. 1.

ERTC Sustainable Refining Conference, Brussels, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. Mar. 31–Apr. 2.

APRIL

SPE/ICoTA Coiled Tubing & Well Intervention Conference & Exhibition, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 1-2.

ERTC Biofuels+ Conference, Brussels, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 2-4.

GIOGIE Georgian International Oil & Gas Conference & Showcase, Tbilisi, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 3-4.

Middle East Petroleum & Gas Conference, Doha, +65 6222 0230, +65 6222 0121 (fax), e-mail: mpgc@cconnection.org, website: www.cconnection.org. 6-8.

Australian Petroleum Production & Exploration Association (APPEA) Conference & Exhibition, Perth, +61 2 9553 1260, +61 2 9553 4830 (fax), e-mail: appea2008@saneevent.com.au, website: www.appea2008.com.au. 6-9

ACS National Meeting & Exposition, New Orleans, 1 (800) 227-5558, e-mail: natlmtgs@acs.org, website: www.acs.org. 6-10.

American Institute of Chemical Engineers (AIChE) Spring National Meeting, New Orleans, (212) 591-8100, (212) 591-8888 (fax), website: www.aiche.org. 6-10.

CIOGE China International Oil & Gas Conference, Beijing, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 7-8.

API Pipeline Conference & Cybernetics Symposium, Orlando, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 7-10.

EAGE Saint Petersburg International Conference & Exhibition, Saint Petersburg, +7 495 9308452, +7 495 9308452 (fax), e-mail: eage@eage.ru, website: www.eage.nl. 7-10.

IADC Well Control Europe Conference & Exhibition, Amsterdam, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 9-10.

ENTELEC Annual Conference & Expo, Houston, (888) 503-8700, website: www.entelec.org. 9-11.

North Caspian Regional Atyrau Oil & Gas Exhibition & Petroleum Technology Conference, Atyrau, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 9-11.

API Spring Refining & Equipment Standards Meeting, New Orleans, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 14-16.

API/NPRA Spring Operating Practices Symposium, New Orleans, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 15.

SPE Gas Technology Symposium, Calgary, Alta., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 15-17.

SPE International Health, Safety & Environment Conference, Nice, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 15-17.

Base Oils & Lubricants in Russia and the CIS Conference, Moscow, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: e.polovinkina@theenergyexchange.co.uk, website: www.wraconferences.com/Overview.html. 16-17.

GPA Midcontinent Annual Meeting, Okla. City, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 17.

AAPG Annual Convention & Exhibition, San Antonio, 1 (888) 945 2274, ext. 617, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org/sanantonio. 20-23.

SPE Improved Oil Recovery Symposium, Tulsa, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-23.

ERTC Coking & Gasification Conference, Rome, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 21-23.

WestAsia Oil, Gas, Refining, & Petrochemicals Exhibition & Conference, Oman, +968 24790333, +968 24706276 (fax), e-mail: clemento@omanexpo.com, website: www.ogwaexpo.com. 21-23.

International Pump Users Symposium, Houston, (979) 845-7417, (979) 847-9500 (fax), website: http://turbolab.tamu.edu. 21-24.

SPE Progressing Cavity Pumps Conference, Houston, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 27-29.

MAY

IOGCC Midyear Meeting, Calgary, Alta., (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.state.ok.us, website: www.iogcc.state.ok.us. 4-6.

PIRA Canadian Energy Conference, Calgary, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 5.

API International Oil Spill Conference, Savannah, Ga., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 5-8.

Offshore Technology Conference (OTC), Houston, (972) 952-9494, (972) 952-9435 (fax), e-mail: service@otcnet.org, website: www.otcnet.org. 5-8.

GPA Permian Basin Annual Meeting, Odessa, Tex., , (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 6.

PIRA Understanding Global Oil Markets Conference Calgary, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 6-7.

ERTC Asset Maximization Conference, Lisbon, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 12-14.

Oil and Gas Pipelines in the Middle East Conference, Abu Dhabi, +44 (0) 1242 529 090, e-mail: c.pallen@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk/mepipes8/mepipes8register.html. 12-14.

International School of Hydrocarbon Measurement, Oklahoma City, (405) 325-1217, (405) 325-1388 (fax), e-mail: lcrowley@ou.edu, website: www.ishm.info. 13-15.

Uzbekistan International Oil & Gas Exhibition & Conference, Tashkent, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 13-15.

NPRA National Safety Conference, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 14-15.

IADC Drilling Onshore America Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 15.

SPE Digital Energy Conference, Houston, (972) 952-9393, (972) 952-9435 (fax), e-mail: service@spe.org, website: www.spe.org. 20-21.

Mediterranean Offshore Conference & Exhibition (MOC), Alexandria, Egypt, + 39 0761 527976, + 39 0761 527945 (fax), e-mail: st@ies.co.it, website: www.moc2008.com. 20-22.

NPRA Reliability & Maintenance Conference & Exhibition, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 20-23.

Society of Professional Well Log Analysts (SPWLA) Annual Symposium, Edinburgh, (713) 947-8727, (713) 947-7181 (fax), website: www.spwla.org. 25-28.

Middle East Refining and Petrochemicals Conference & Exhibition, Bahrain, +973 1755 0033. +973 1755 3288 (fax), e-mail: mep@oesallworld.com, website: www.allworldexhibitions.com. 26-28.

SPE International Oilfield Corrosion Conference, Aberdeen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 27.

SPE International Oilfield Scale Conference, Aberdeen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-29.

The CIS Oil and Gas Summit, Paris, +44 (0) 207 067 1800, +44 207 430 0552 (fax), e-mail: l.hannant@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk/summit8/summit8register.html. 28-30.

JUNE

ERTC Management Forum, Copenhagen, +44 1737 365100, +44 1737

365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 2-4.

Caspian Oil & Gas Exhibition & Conference, Baku, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 3-6.

Oklahoma Independent Petroleum Association (OIPA) Annual Meeting, Dallas, (405) 942-2334, (405) 942-4636 (fax), website: www.oipa.com. 6-10.

SPEE Society of Petroleum Evaluation Engineers Annual Meeting, Hot Springs,Va., (713) 651-1639, (713) 951-9659 (fax), e-mail: bkspee@aol.com, website: www.spee.org. 7-10

PIRA Scenario Planning Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 9.

Asian Geosciences Conference & Exhibition, Kuala Lumpur, +44 (0) 20 7862 2136. +44 (0) 20 7862 2119, e-mail: geoasia@oesallworld.com, website: www.geo-asia.com. 9-11.

Independent Liquid Terminals Association (ILTA) Annual Operating Conference & Trade Show, Houston, (202) 842-9200, (202) 326-8660 (fax), e-mail: info@ilta.org, website: www.ilta.org. 9-11.

SPE Tight Gas Completions Conference, San Antonio, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 9-11.

EAGE/SPE EUROPEC Conference & Exhibition, Rome, +31 30 6354055, +31 30 6343524 (fax), e-mail: eage@eage.org, website: www.eage.nl. 9-12.

ASME Turbo Expo, Berlin, (973) 882-1170, (973) 882-1717 (fax), e-mail: infocentral@asme.org, website: www.asme.org. 9-13.

PIRA London Energy Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 10.

Asian Oil, Gas & Petrochemical Engineering Exhibition, Kuala Lumpur, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: oga@oesallworld.com, website: www.allworldexhibitions.com. 10-12.

Global Petroleum Show, Calgary, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 10-12.

IADC World Drilling Conference & Exhibition, Berlin, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 11-12.

PIRA Understanding Global Oil Markets Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 11-12.

Asia's Subsea Conference & Exhibition, Kuala Lumpur, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: subsea@oesallworld.com, website: www.subseaasia.org. 11-13.

CIPC/SPE GTS Joint Conference, Calgary, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 16-19.

American Association of Professional Landmen (AAPL) Annual Meeting, Chicago, (817) 847-7700, (817) 847-7704(fax), e-mail: aapl@landman.org, website: www.landman.org. 18-21.

LNG North America Summit, Houston, (416) 214-3400, (416) 214-3403 (fax), website: www.lngevent.com. 19-20.

IPAA Midyear Meeting, Colorado Springs, Colo., (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org. 19-21.

PIRA Scenario Planning Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 23.

Calendar

API Tanker Conference, San Diego, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-24.

API Exploration & Production Standards on Oilfield Equipment & Materials Conference, Calgary, Alta., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-27.

PIRA Understanding Global Oil Markets Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 24-25.

Russian Petroleum & Gas Congress, Moscow, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 24-26.

NEFTEGAZ Exhibition, Moscow, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 24-26.

PIRA's Globalization of Gas Study Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 25.

PIRA Understanding Natural Gas Markets Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 26-27.

World Petroleum Congress, Madrid, +34 91 745 3008, +34 91 563 8496 (fax), e-mail: info@19wpc.com, website: www.19wpc.com. June 29- July 3.

JULY

International Offshore & Polar Engineering Conference, Vancouver, (650) 254 2038, (650) 254 1871 (fax), e-mail: meetings@isope.org, website: www.isope.org. 6-11.

✦Annual Rocky Mountain Natural Gas Strategy Conference & Investment Forum, Denver, (303) 861-0362, (303) 861-0373 (fax), e-mail: conference@coga.org, website: www.coga.org. 9-11.

IADC Lifting & Mechanical Handling Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 15-16.

Oil Sands and Heavy Oil Technology Conference & Exhibition, Calgary, Alta., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilsandstechnologies.com. 15-17.

AUGUST

ACS National Meeting & Exposition, Philadelphia, 1 (800) 227-5558, e-mail: natlmtgs@acs.org, website: www.acs.org. 17-21.

IADC/SPE Asia Pacific Drilling Technology Conference, Jakarta, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 25-28.

Offshore Northern Seas Exhibition & Conference, Stavanger, +47 51 59 81 00, +47 51 55 10 15 (fax), e-mail: info@ons.no, website: www.ons.no. 26-29.

Summer NAPE Expo, Houston, (817) 306-7171, (817) 847-7703 (fax), e-mail: info@napeexpo.com, website: www.napeonline.com. 27-28.

SEPTEMBER

China Power, Oil & Gas Conference & Exhibition, Guangzhou, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.chinasenergyfuture.com. 2-4.

ECMOR XI-European Mathematics of Oil Recovery Conference, Bergen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 8-11.

IADC Drilling HSE Europe Conference & Exhibition, Amsterdam, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 9-10.

Rocky Mountain GPA Annual Meeting, Denver, (918) 493-3872, (918) 493-3875 (fax), email: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 10.

API Fall Refining & Equipment Standards Meeting, Los Angeles, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 15-17.

Rio Oil & Gas Conference & Expo, Rio de Janeiro, 55 21 2112 9078, 55 21 2220 1596 (fax), e-mail: riooil2008@ibp.org.br, website: www.riooilegas.com.br. 15-18.

API/NPRA Fall Operating Practices Symposium, Los Angeles, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 16.

GEO India South Asia's Geosciences Conference & Exhibition, New Delhi, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: geo@oesallworld.com, website: www.geo-india.com. 17-19.

SPE Annual Technical Conference & Exhibition, Denver, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 21-24.

ERTC Petrochemical Conference, Cannes, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. Sept. 29-Oct. 1.

International Pipeline Exposition, Calgary, Alta., 403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. Sept. 30-Oct. 2.

Unconventional Gas International Conference & Exhibition, Ft.Worth, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.unconventionalgas.net. Sept. 30-Oct. 2.

OCTOBER

NPRA Q&A Forum, Orlando, Fla., (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 5-8.

GPA Houston Annual Meeting, Kingwood, Tex., (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessor.com. 7.

KIOGE Kazakhstan International Oil & Gas Exhibition & Conference, Almaty, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 7-10.

IADC Drilling West Africa Conference & Exhibition, Lisbon, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 8-9.

International Gas Union Research Conference, Paris, +31 50 521 30 78, +31 50 521 19 46 (fax), e-mail: igrc2008@gasunie.nl, website: www.igrc2008.com. 8-10.

ERTC Lubes and Additives Conference, Berlin, +44 1737 365100, +44 1737 365101 (fax), e-mail:

events@gtforum.com, website: www.gtforum.com. 13-15.

Middle East Plant Maintenance Conference, Abu Dhabi, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: d.michalski@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 13-15.

API Fall Petroleum Measurement Standards Meeting, Long Beach, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 13-17.

Central and Eastern European Refining & Petrochemicals Roundtable, Warsaw, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: c.taylor@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 14-16.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 14-16.

Oil & Gas Transportation in the CIS & Caspian Region Conference, Moscow, +44 (0) 207 067 1800, +44 207 430 0552 (fax), e-mail: j.golodnikova@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk/cispipes10register.html. 14-16.

PIRA New York Annual Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 16-17.

Petchem Arabia Conference, Abu Dhabi, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: c.verma@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 20-22.

Emission cost-effectiveness

David N. Nakamura
Refining/Petrochemical Editor

Lately there has been a preponderance of company ads claiming that they are "going green" or reducing their carbon "footprint." But what does this really mean? What are the best ways for these companies to be more environmentally friendly and reduce greenhouse gas (GHG) emissions?

In December, McKinsey & Co. published a report, "Reducing US Greenhouse Gas Emissions: How Much at What Cost?" The report was produced in association with Royal Dutch Shell PLC, Honeywell, PG&E, DTE Energy, National Grid, Natural Resources Defense Council, and Environmental Defense.

The central conclusion of the study is that the US could reduce GHG emissions in 2030 by 3-4.5 gigatons of carbon dioxide equivalents (CO_2e) using tested approaches and high-potential emerging technologies. The reductions would be those that cost less than $50/ton of CO_2.

Some of the more interesting conclusions of the study were specifically which technologies had a positive payout and which were not cost-effective.

Future GHG emissions

Based on an analysis of US government forecasts, the study estimated that GHG emissions in the US will rise to 9.7 gigatons/year CO_2e in 2030 from 7.2 gigatons/year CO_2e in 2005—an increase of 35%. These increases will be due to continued expansion of the US economy, growth in buildings-and-appliances and the transportation sectors, and greater use of carbon-based power without the use of carbon capture and storage technology.

This growth in GHG emissions will be accompanied by a gradual decrease in the absorption of carbon by US forests and agricultural lands, the study said. Carbon absorption will decrease to 1 gigaton/year in 2030 from 1.1 gigatons/year in 2005.

Interestingly, carbon absorption from forests and US lands had been rising for 50 years, in contrast to some developing countries. According to the study, net annual carbon absorption has risen by 25% since 1990, primarily due to greater accumulation of carbon in existing forests and some forestation.

The net effect is that US emissions in 2030 will exceed GHG reduction targets outlined in climate change bills currently before Congress by 3.5-5.2 gigatons.

Solutions

According to the study, the US could reduce GHG emissions by as much as 3 gigatons/year in a midrange case to 4.5 gigatons/year in a high-range case by 2030.

Of the more than 250 abatement options, the study found that almost 40% of them could be achieved at "negative" marginal costs, meaning that investing in these options would generate positive economic returns over their lifecycle. The study also found that the abatement potential and costs varied across geographical regions.

The GHG reductions could come about most effectively if the US used five "clusters" of initiatives:

- Improving energy efficiency in buildings and appliances would reduce GHG emissions by 710 megatons in the mid-range case to 870 megatons in the high-range case.
- Increasing fuel efficiency in vehicles and reducing carbon intensity of transportation fuels would save 340-660 megatons/year. Improved fuel efficiency could provide 240-290 megatons/year of abatement, most of it from automobile advancements and increased use of diesel for light-duty vehicles.

In this cluster, it was interesting that cellulosic biofuels had only a slightly advantageous average cost. The study stated that achieving large-scale production of cellulosic biofuels depends on many critical, and uncertain, developments. Much more effective technologies, from a cost and technology point of view, are improving fuel efficiency of vehicles and increasing the use of diesel fuel in light-duty cars and trucks.

One of the most expensive options in this cluster is the adoption of hybrid electric vehicles.

- Improvements in the energy-intensive portions of the industrial sector would reduce emissions by 620-770 megatons/year.
- Expanding and enhancing carbon sinks would reduce emissions by 440-590 megatons/year.
- Reducing the carbon intensity of electric power production would reduce GHG emissions by 800-1,570 megatons/year.

Without a coordinated set of actions, however, it is unlikely that the most economically beneficial options would materialize at the magnitude and costs estimated in the study.

The study found that these abatement opportunities are highly fragmented and widely spread across the economy. And it remains to be seen if the politicos will use common sense and heed the recommendations in the report.

But, as many in our industry know, common sense and politics rarely go hand-in-hand. ✦

Editorial

The EISA effect

A champion of last year's energy bill reads too much into a revision by the Energy Information Administration of its long-term outlook for US energy. The Energy Independence and Security Act of 2007 (EISA) is still a bad law.

Whatever benefits EISA might achieve by toughening fuel-economy standards for new vehicles it will more than offset by hiking the renewable fuel standard to high, possibly unfeasible levels. Expanding the costly mandate for ethanol and biodiesel was a mistake for which Americans who don't grow or distill corn for a living will pay for many years. Maybe that's why lawmakers feel compelled to cheer anything that seems to make EISA look otherwise.

Celebratory statement

Sen. Jeff Bingaman (D-NM), chairman of the Senate Energy and Natural Resources Committee, issued a celebratory statement Mar. 4 after hearing EIA's revision to the "early-release" Annual Energy Outlook it published in December, just as Congress was passing EISA. The revision accounts for EISA's provisions not requiring appropriations. It also accounts for changes other than the new law, including, according to EIA Administrator Guy Caruso, "a more current economic outlook."

By themselves, new economic assumptions explain some of the moderation in projected demand growth. Economic expectations have deteriorated since December, while oil prices have zoomed. In testimony to Bingaman's committee, Caruso did credit EISA for influencing market indicators. But the effects are mostly adjustments to rates of change in trends under way when EISA was passed. They're not attributable solely to the new law.

"The increased use of biofuels resulting from EISA2007, much of which is domestically produced, and the reduction in transportation fuel demand due to the new fuel economy standards both serve to moderate growth in energy imports," Caruso said in prepared testimony. But he added: "Higher fuel prices over the projection period also spur increased domestic energy production and moderate energy demand growth, also tempering growth in imports."

Bingaman ignored the market influences mentioned by the EIA chief, among which, it might be argued, higher fuel prices result partly from inefficiencies introduced by the new law. "Caruso noted," Bingaman's statement says, "that because of EISA: Net imports of crude oil and refined petroleum products are expected to decline from 60% in 2006 to 51% in 2022; inflation-adjusted prices for oil, natural gas, and coal are expected to be lower in 2030 than they are today...total domestic energy demand is expected to increase by about 24% through 2030, but the pre-EISA figure was closer to 31%; and energy-related emissions of CO_2 are forecast to grow by 25% from 2006 to 2030, down from pre-EISA's prediction of a 35% increase."

The statement implies that EISA by itself accounts for the drop in the net import share of something it doesn't specify, which a check of Caruso's testimony shows to be net liquids use. Not so. EIA's December early-release projection, which didn't reflect EISA, indicated a drop, too, but to 55% in 2010-20 rather than 51%. As Caruso points out, the lower demand and higher domestic production that come with elevated prices account for some of that change.

Similarly, inflation-adjusted prices for oil and gas aren't expected to be lower in 2030 than they are now "because of EISA," as Bingaman suggests. The December (pre-EISA) outlook projected a 2030 crude price of $72/bbl. The revision trims that to $70/bbl.

Emissions growth

And, to keep the record straight: EIA's new projection puts growth in total energy use at 19% during 2006-30, not the 21% asserted by Bingaman's statement. That figure comes from EIA's December projection. The 31% growth figure in Bingaman's statement appeared in the long-term outlook EIA made early last year. The senator's statement makes a similar mistake with CO_2 emissions: the revised number for 2006-30 growth is 16%.

Expectations for emissions, of course, will abate further if projected growth in energy use slows even more, which it will if Congress keeps imposing costs such as those of mandates for taxpayer-subsidized fuels. But lawmakers eager to take credit for that part of the EISA effect will be hard to find. ✦

Iran's gasoline woes persist despite rationing, price hikes

Cyrus H. Tahmassebi
Independent consultant
Bethesda, Md.

Iran's gasoline shortage and its growing dependency on imports have been the subject of discussion and debate, both in and outside Iran. The problem, which began after the 1980-88 Iran-Iraq war, has worsened. Its resolution has become more difficult because successive postwar administrations have failed to address the issue boldly and decisively.

Today, the gasoline shortage and the estimated $40 billion/year subsidy that the government pays for this and other fuels is a huge economic burden to the state. Because of Iran's controversial stance on certain international political issues, it also has become an important national security concern.

Recognizing the gravity of the situation, President Mahmoud Ahmadinejad recently launched an initiative that raised the price of gasoline and, for the first time, introduced an elaborate rationing system.

This article will describe the background of the problem, the deterioration in Iran's gasoline prices relative to international prices of gasoline and crude oil, the huge losses borne by the National Iranian Oil Co. (NIOC) in its downstream operations, and the persistent public expectations for the government to provide cheap fuel despite these heavy losses.

The article also evaluates the recently adopted rationing scheme, its efficacy and chances of success as a long-term policy measure to resolve current problems and pave the way for the eventual privatization of NIOC's downstream operations.

In addition to decreasing demand, Iran also is intensifying efforts to boost its own output of gasoline and other fuels through a major refinery expansion and modification program.

This article is a modified version of an editorial the author wrote for the Middle East Economic Survey, Vol. L, No. 50, Dec. 10, 2007.

Iran's gasoline problem

Iran's refining capacity has not kept pace with rapidly growing demand, and this imbalance has necessitated a rapid surge in gasoline imports (Table 1). This has created a huge financial burden on the state and jeopardizes the national security of the country by making it vulnerable to import disruptions. Ahmadinejad's initiative aims to address these concerns.

Ahmadinejad has acted much more boldly than his predecessors. His rationing plan has provided a demand-management apparatus and has put into place a scheme that might be fine-tuned if needed and used more vigorously to mitigate adverse impacts of a major interruption in gasoline imports. However, it falls short of being a long-term solution to a perennial problem that has dogged every administration since the 1980-88 Iran-Iraq war.

The key factors contributing to Iran's gasoline problem are the government's ownership of downstream assets and its intervention in a process that should function through free market mechanisms rather than by state controls and government fiat.

Iran is not unique in this respect. In almost all OPEC countries, government ownership of energy-related assets and intervention in markets are prevalent,

and for the same reason most of them face similar issues. However, owing to its large industrial base, rapid growth, large population, unique demographic profile, and controversial stance on international political issues, Iran's case is much more complicated.

Iran's population has more than doubled to about 70 million today from about 34 million in 1979, nearly half 30 years old or younger. The vehicle fleet—now as many as 7 million—and industrial activities have grown rapidly. Improvements in fuel efficiency in almost all sectors, particularly transportation, have been lackluster.

Meanwhile, the prices of gasoline and other fuels have been kept artificially low, resulting in astronomical growth in consumption of these products and even their smuggling to neighboring countries.

Rebuilding capacity

In addition to slowing gasoline consumption, Iran is attempting to lessen its reliance on imported gasoline by increasing its own production.

Its ability to produce crude oil and petroleum products was severely undermined by the 1980-88 war and by a series of trade constraints and economic sanctions imposed on the country since the 1979 revolution. The war with Iraq heavily damaged oil fields and refineries, resulting in considerable declines in the country's ability to produce and refine crude oil.

The post-1979 trade restrictions and economic sanctions imposed by the US and others made it much more challenging to restore or expand refining and oil production capacity. Whereas the decline in oil production led to lower exports and revenues, the damage to refineries forced the country to meet its rising fuel consumption with costly imports.

Despite numerous constraints and economic sanctions, however, the country has managed to restore oil production to about 4 million b/d, and refining capacity is rising, although production output remains insufficient (Table 2).

IRAN'S PRODUCTS PRODUCTION VS. CONSUMPTION

Table 1

Product	1980	1985	1990	1995	2000	2005	2006
				1,000 b/d			
NIOC output of refined products							
Gasoline	74.9	74.9	122.4	149.1	182.6	208	274
Kerosine	101.3	70.5	86.2	124.5	156.9	178	133
Distillates	126	225.7	229.2	287.2	357.3	403	506
Residuals	243.1	201.2	230.9	255.8	397.6	436	483
Others	37	75	82	125.5	222	215	52
Total	**582.3**	**647.3**	**750.7**	**942.1**	**1,316.4**	**1,440**	**1,448**
				1,000 b/d			
Products consumption in Iran							
Gasoline	82.6	105.7	129	182.2	225	421	463.1
Kerosine	124.8	163.8	167.3	169.2	193.9	133.4	122.5
Distillates	169.4	281.7	393.1	398.8	404	473.8	533.3
Residuals	141.3	200.7	240.9	263.6	232	213.1	226.3
Others	44.4	60.4	71.8	127	134	217.8	233.4
Total	**562.5**	**812.3**	**1,002.1**	**1,140.8**	**1,189.1**	**1,459.2**	**1,578.6**

Source: OPEC Annual Statistical Bulletin, 2007

In a major 3-4-year refinery expansion program, National Iranian Oil Engineering & Construction Co. (NIOEC) plans to increase capacity to more than 3 million b/sd from about 1.7 million with the construction of seven grassroots refineries and the upgrading or modification of five existing refineries to produce more gasoline (Table 3). NIOEC reported that gasoline production capability will rise to 140 million l./day, up from 40 million l./day, to become 35% of the total products output, compared with the current 16% of the total.

Tempering consumption

Until these facilities are on stream, however, a successful means must be found to temper consumption. Past responses to the imbalance in gasoline supply and demand were lethargic, inadequate, and ill-conceived.

In a market-based economy, a circumstance of this nature would have led to rapid increases in petroleum product prices, thereby discouraging consumption and generating cash for investments in refineries. But in Iran, the nominal prices of products—particularly gasoline—either remained unchanged or rose slowly and with considerable lag.

Even in a state-run enterprise such as a national oil company, one would expect a government to raise petroleum product prices, at least in tandem with inflation or with the increase in the opportunity cost of crude oil, i.e., what it could fetch if exported. But for numerous reasons, some clearly political, no post-Iraq-war administration until recently has taken the initiative to address this problem boldly. Consequently, rather than generating revenue and income for NIOC and the government, all refineries in the country have operated perennially with huge losses and consumed a considerable portion of the funds generated from oil exports.

Frustrated by this state of affairs a few years ago, former Oil Minister Gholamreza Aghazadeh was quoted in the press as lamenting that he would be happy to deliver gasoline free to any entity at the refinery gates if it accepted the sales and distribution responsibilities.

Some believe the country's hesitation to raise gasoline prices goes back to an event in the early 1960s. There was an attempt in 1964 to raise the price of gasoline to 10 rials/l. from 5 rials/l.—a 100% increase. According to those in decision-making positions at the time, the purpose of this price hike was to generate additional revenue rather than to discourage consumption. The initiative was short-lived. Due to public opposition and the assassination of the prime minister at the time, the price of

NIOC REFINERY CAPACITIES

Table 2

Location	1980	1981	1982	1985	1989	1991	1994	1997	2000	2003	2006
	1,000 b/d										
Abadan	635	635	0	0	117	297	297	297	400	400	460
Arak	0	0	0	0	0	0	135	135	150	150	170
Tehran	220	220	220	220	220	220	220	220	225	225	230
Esfahan	240	240	240	240	254	254	254	254	265	265	270
Tabriz	80	80	80	80	99	99	99	99	112	112	112
Shiraz	40	40	40	40	40	40	40	40	40	40	42
Kermanshah	15	15	NA	15	27	27	27	27	30	30	30
Lavan	20	20	20	20	20	20	20	20	20	20	20
Masjid-i-Suleiman	70	70	70	0	0	0	0	0	0	0	0
Bandar Abbas								116	232	232	232
Total	**1,320**	**1,320**	**670**	**615**	**777**	**957**	**1,092**	**1,208**	**1,474**	**1,474**	**1,566**

Source: OPEC Annual Statistical Bulletin, 2007

gasoline was lowered to 6 rials. Although there is no convincing evidence that the assassination was in any way related to the gasoline price increase, some believe it has contributed to the succeeding governments' hesitation to raise gasoline prices adequately.

'Cheap' gasoline?

Although a large percentage of the driving population in Iran is of the post-revolutionary period, the "cheap" gasoline era of the 1960s and 1970s still evokes nostalgia in the minds of many.

The "cheap" gasoline price of that era is often mentioned in discussions criticizing the government's energy policy. However, gasoline at 6 rials/l. or at 10 rials/l. for a subsequently introduced higher octane grade called "Super"—about 23 rials/gal in the 1960s—was not really cheap, being either close to or surpassing international prices. At the then-prevailing 70 rials-to-$1 exchange rate, 23 rials/gal translated to $0.33/gal.

The average retail gasoline price in the US at the time was about $0.25-0.30/gal—substantially lower than in Iran.

Today, gasoline prices in the US are the lowest among all industrial countries, including Canada, which is a major oil exporter, and yet the current 1,000 rials/l. in Iran is only a small fraction of the current US prices.

In the 1960s, crude was around $1.60/bbl. At about $0.33/gal or $13.86/bbl, the retail gasoline price in Iran in the 1960s was about nine times the price of crude oil.

At today's exchange rate of about 9,300 rials to $1 and the crude oil price at $85/bbl, a retail gasoline price at even 4,900 rials/l. (five times the 1,000 rial price that has been in effect since April 2007) would cover only the opportunity cost of the crude, still leaving NIOC to absorb refining, distribution, and sales costs. Iran's domestic gasoline prices could easily top 10,000 rials/l. if parity with international prices were the real objective.

Failed economics

Although there are no consistent and reliable figures for the amount of subsidy provided to consumers of gasoline and other fuels in Iran, it is obvious that it is huge by any standard. Iran now consumes some 1.5-1.7 million b/d of petroleum products. Thus the annual subsidy, even at the artificially inflated exchange rate, could easily top $40 billion.

The weight of these subsidies is not only on the shoulders of the government but also on NIOC's downstream operations. Iran has had the luxury of continuing to operate these money-losing refineries only because of huge cash flows generated from crude oil exports.

The multifold increase in crude oil prices over the last few years has provided the government with the financial wherewithal not only to continue operating these refineries at great losses but also to add to capacity and upgrade some of them.

Obviously, this subsidy trend is not sustainable. Most observers believe the government will be forced to follow a free market model in pricing its gasoline and other petroleum products and gradually phase out its subsidy program. Procrastination—as has happened in the past—would only make the task of tackling this problem progressively more difficult.

Ahmadinejad's program

Over the last year or so, Iran's high degree of dependency on imported gasoline has been the subject of numerous analyses in the West and has been identified as Iran's Achilles' heel. Accordingly, it has been asserted that the economic damage and hardship resulting from a successful attempt by the West to halt gasoline exports to Iran could cause enough unrest to undermine Ahmadinejad's presidency.

In reaction to these potential threats and the damaging impact of the highly subsidized gasoline prices on the overall economy and on NIOC, Ahmadinejad last May launched a plan that included both a price increase and a rationing program. The gasoline price was raised by 25% to 1,000 rials/l.—a tepid amount compared with what was needed to effectively address the problem.

The plan also includes a rationing scheme through the use of a ration card called "Houshmand" or "smart card."

The scheme consists of different

WHAT SHOULD YOU GET OUT OF YOUR CAREER? EVERYTHING YOU PUT IN, AND MORE.

Whatever you do in life, you give it your all. You know the rewards of a job well done, and your work is a reflection of your values. You're a perfect fit for Marathon. Based both in the U. S. and abroad, Marathon is a fully integrated oil and gas company. We're in this business for the long haul, and built to last through bumps in the road. It's time to join a company where your hard work, honesty and integrity matter. It's time to make it your Marathon.

MARATHON®

IT'S YOUR MARATHON

www.marathon.com

Equal Opportunity Employer

IRAN'S PLANNED REFINING CAPACITY INCREASES

Table 3

Refinery	Existing capacity (2006), 1,000 b/cd	2011 capacity, 1,000 b/cd	Cost, €	Expected completion	Status
Modifications, upgrades planned at existing refineries					
Esfahan (stabilize capacity)	375	370	2.5 billion		Basic design. Two of five construction contracts awarded
Arak	180	250	2.5 billion	45 months	EPC, detailed design under way
Bandar Abbas capacity expansion	265	320	38 million	3 years	Under construction IGC and Oil Design & Construction Co.
Bandar Abbas Gasoline production increase			400 million	3 years fast track	Basic engineering, site prep., civil works under way. PIDEC is EPC contractor.
Bandar Abbas-Esfahan pipeline	540 km of 20-in. pipeline, 3 pump stations, expand terminal capacity		140 million	27 months	Rafsanjan-Esfahan section complete
Tabriz	110	110			
Tehran	250	250	230 million	3 years	Feasibility study complete. Feed change. Refining from heavy products to light.
Shiraz	55	55			
Kermanshah	25	25			
Levan	30	45			
Grassroots refineries planned					
Persian Gulf Star gas condensate	0	360	1.7 billion	3 years	Basic design complete by ODCC and Indian Oil Co. EPC contractor selected.
Abadan	385	360	1.5 billion	3 years	New 180,000 b/sd train. Modify processes.
Hormoz extra-heavy crude	0	300	3 billion	42 months	Feasibility study complete. Basic design and EPC tenders issued to contractors.
Khoozestan extra-heavy crude	0	180	1.5 billion	3 years	Snamprogetti completed feasibility study. Preparations to start basic design.
Shiraz	0	120			
Kermanshah	—	150	1.3 billion	3 years	Feasibility study complete. Preparations to start basic design. Engineering bid out.
Tabriz Shahriar	0	110	1.2 billion	42 months	Combine new refinery with older one.
Total	**1,675**	**3,005**			

Source: National Iranian Oil Engineering & Construction Co.

ration allowances for varied types of vehicles and uses—ranging from 100 l./month for private cars to 800 l./month for taxis.

By adding the rationing system to the price increase, the government in effect seemed to concede that it doesn't have confidence in the demand-reduction impact of the price increase alone, and its hope of reducing demand rests largely on the rationing scheme.

The initiative triggered unrest on a small scale initially and resulted in some gas stations being set on fire, but it seems now to be firmly in place and fully implemented.

The goal of the combined price increase and rationing is to reduce gasoline consumption to about 39 million l./day from 75 million l./day—a 47% reduction. According to some sources, gasoline demand has declined nearly 20%, resulting in a decline in imports of 50% and an almost complete halt to smuggling to neighboring countries.

There is a degree of skepticism among analysts and other observers as to the plan's long-term prospects for success, however. Most believe the issues surrounding fuels such as gasoline, heating oil, and natural gas, which enjoy huge subsidies, are not resolved. Rather than opting for large, systematic price increases that would reduce consumption and bring the domestic price of gasoline closer to international levels and that would prepare the country for the eventual privatization of downstream operations, the government opted primarily for a rationing method that has been tried many times in other parts of the world and has almost always failed to achieve a long-lasting, tangible result.

Ahmadinejad, however, reportedly favors a combination of a relatively small price increase—small compared to what is needed—and adoption of a strict rationing scheme for two reasons. First, he believes that too large an increase in price would be not only inflationary but also unfair to the low-income and middle classes. Second, he considers rationing a "catch-all" device that distributes the pain and hardship equally and fairly to all consumers.

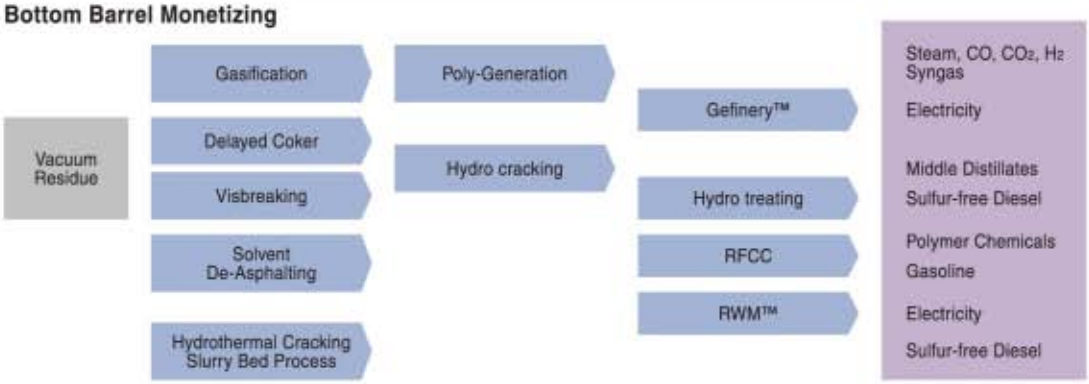
Many experts, however, argue that rationing is a form of "command and control," which requires a huge bureaucracy. Rationing, they say, almost always

To truly enjoy the fruits of heavy crude oil, choose JGC for engineering and construction.

As one of the world's top engineering contractors, JGC has the skills to ensure the most effective use of heavy crude oil. We have a deep knowledge of processing methods to accommodate a wide range of oil characteristics, and are deeply involved in the manufacture of catalysts that are essential in upgrading heavy oils. Plants constructed by JGC account for about 12% of the world's oil refining capacity over the past 20 years. This outstanding track record is evidence of our expertise and reliability.

Look to JGC as your best partner for creating greater value in heavy crude oil operations.

Bottom Barrel Monetizing



JGC CORPORATION

Engineering for the Quality of Human Life

2-3-1 Minato Mirai, Nishi-ku, Yokohama 220-6001, Japan Phone 81.45.682.1111 Fax 81.45.682.1112 www.jgc.co.jp

Why not pursue an exciting opportunity with JGC?! Please see the following URL for current openings.

CAREER OPPORTUNITIES: http://www.jgc.co.jp/en/

fails to achieve its goals, including those of fairness and benign inflation. Even if it initially succeeds on a limited basis, success will be short-lived. Moreover, rationing, by its nature, carries a huge stigma because its adoption signifies the failure of or lack of trust in market-based measures. Free markets provide competitive prices, which in turn signal to the decision-makers how to utilize their resources in the most efficient and optimal manner. Interventions and rationings, on the other hand, result in distortion of these signals and thus in wasteful decisions.

Critics also expect the rationing plan to fail because it is prone to manipulation, cheating, and the emergence of black markets, despite its high administrative cost. In fact anecdotal evidence suggests that black markets have already emerged, and cheating and abuses of the system are abundant. Whether the government will be able to prevent these abuses by adding new features to its smart cards is not yet clear. But it is obvious that if the rationing system is not followed up by rapid price increases and a gradual phasing out of the subsidy system, abuses are certain to continue or even worsen.

Ironically the flaw in the rationing system that allows smart-card holders to cheat and sell part of their ration in the black markets has inadvertently produced a positive result and indirectly helped to enhance the scheme's effectiveness. Paradoxically, this occurs because the cheating by smart-card holders introduces some elements of the free market incentives to the rationing scheme.

Even though the 25% increase in price may not generate enough incentives for conservation, the opportunity to sell part of the ration at much higher prices (reportedly at 6,000-11,000 rials/l.) on the black markets not only raises the overall average price of gasoline but also gives the card holder incentive to conserve and sell the unused portion of his ration in the black market. Forgoing the opportunity to make that additional income is tantamount to paying that high black market price for the quantity not offered. The same incentive also discourages the smuggling of gasoline to neighboring countries because domestic black markets offer a better opportunity for profit.

Pragmatic approach

Despite repeated calls for action from different circles within the country, no one seems to suggest that either a huge price increase—i.e., to raise fuel prices to international levels in a very short period—or complete privatization of downstream operations is feasible at this time. Such initiatives are considered radical, impractical, and extreme. Yet suggestions abound for galvanizing the rationing scheme or making it more effective. Some have suggested replacing the single price in the rationing scheme with a new progressive pricing mechanism where the price would rise with the level of each vehicle owner's consumption.

Others have suggested a combination of rationing and a semifree-market approach. In this approach, reportedly discussed in Majlis (the parliament), the present rationing system would continue, but consumers would also have the choice of purchasing unlimited quantities of gasoline at the quasi free-market price.

Initially one or two pumps in each gas station would be set aside to sell gasoline at a much higher price with no limitations on the quantity. The price in these pumps that target affluent consumers would rise much faster until it approached parity (or near parity) with international prices. Meanwhile, the price in other pumps would also rise, but at a much slower pace to allow other consumers to adjust more gradually to the higher prices. Within a few years, the prices for the rationed and nonrationed gasoline would converge. This would gradually prepare the public for much higher prices and pave the way for the eventual privatization of all downstream activities.

Inflation and fairness

Inflation, fairness, and affordability are issues frequently raised with regard to the need to increase fuel prices in Iran. Having been accustomed to unrealistically cheap fuel prices for so long, the public reacts negatively to any proposal to reduce or eliminate the subsidies. Rather than being assertive and educating the public on the dire consequences of continuing the status quo, past governments have succumbed to public opposition. Every administration in the past 2-3 decades has failed to face the issues head-on, instead adopting half-hearted measures. This has exacerbated the problem almost beyond remedy.

Most experts argue that the issues of inflation, fairness, and affordability merit close examination and analysis. However, their adverse impact seems to have been grossly exaggerated. Inflation is a monetary phenomenon, and with a proper monetary policy, the spillover from higher fuel prices can be small and manageable. Moreover, the resulting inflation cannot be long-lasting if it is not fueled by an unnecessary expansion in money supply. Interestingly, countries that keep fuel prices low through huge subsidies are almost invariably among those with very high inflation rates.

And the reverse often is true. For example, as a result of rising crude oil prices in recent years, gasoline prices in the US have more than doubled, and EU countries have seen their fuel prices rise sharply. Yet inflation has remained in check because of their measured monetary policies. On the other hand, inflation in Venezuela—one of the two

countries with gasoline prices below those in Iran—averaged 39.3% during 1990-2004.

The argument for fairness and affordability also collapses under close examination. Fuels of all kinds are used much more by affluent citizens than by the poor or middle class. Therefore, rich people are the biggest beneficiaries of the fuel subsidies. In an efficient economy, the problems of fairness and affordability are not tackled by market interference; they are remedied by such measures as income subsidies or tax relief. Thus markets are allowed to function with minimum distortion and government interference.

Finally, national ownership of an industry's production and operation is almost certain to result in unrealistic public expectations. For example, sharp increases in crude oil prices over the last few years have actually raised the amount of subsidies on gasoline and other fuels because of higher opportunity costs of the crude oil used in domestic refineries. Yet the public's expectations for subsidies have become even more extensive. They seem to believe that when the government's revenue goes up as a result of higher oil prices, so should the subsidies. Here again, one can clearly see the disadvantages of a government being involved in a business activity that should be owned and operated by the private sector.

Prospects for success

If history is a guide, one must be skeptical about the prospects of success for Ahmadinejad's plan. His approach is bolder than others, which makes it appear to have a better chance. But if rationing fails in implementation, as many observers and experts expect, Ahmadinejad's initiative will not significantly differ from those of previous administrations.

Those who believe rationing is a panacea would argue that the previous administrations failed because they resorted only to price increases. But in reality, their plans failed because their price increases were insufficient, as is the case with Ahmadinejad's initiative.

Iran's gasoline problem is deeply entrenched in all aspects of its economy and the life of its people. Left unchecked for decades, the problem of cheap gasoline and other fuels has become institutionalized. As a result, any initiative by the government to truly stem the problem will be extremely painful to the consumer, unsettling for the general economy, and risky for the government.

Some observes say Ahmadinejad would have a greater chance of success if he treated his rationing plan as a temporary measure, lowered his expectations for its success, completely precluded it from his long-term planning, and pursued his demand-reduction goals by resorting to price increases and improvements in fuel efficiency. These observers also believe his chances of success would improve considerably if he coupled his price increases with a well planned and executed financial assistance program to mitigate the financial hardship of higher fuel prices on low-income consumers.

Resolving the gasoline problem is a major challenge that has defied the will and wit of previous administrations. Only time will tell if Ahmadinejad is the man to succeed. ✦

The author

Cyrus Tahmassebi is an independent consultant who formerly was the chief economist and director of market research for Ashland Inc. During his 15-year tenure with Ashland, Tahmassebi gained international recognition for his oil market forecasts and views on energy-related issues. Before joining Ashland in 1981, he was a visiting fellow at Harvard University. Tahmassebi has long, broad-based experience in international oil and natural gas markets. He worked for National Iranian Oil Co. and National Iranian Gas Co. (NIGC) in senior management positions for over 16 years. During his years with NIGC, Tahmassebi was responsible for the economic-feasibility study of major LNG and pipeline gas export projects and participated in negotiations concerning these projects. He also represented Iran on OPEC's gas committee. He received a BS and MS from Brigham Young University in Provo, Utah, and his PhD from Indiana University in Bloomington, Ind. He has written extensively on oil, gas, and energy markets and has given talks at various seminars and workshops worldwide.

US House passes latest oil-tax-for-alternatives bill

Nick Snow
Washington Editor

The US House of Representatives passed a bill Feb. 27 that proponents said would shift $18 billion in tax breaks from major oil companies to alternative and renewable energy projects and conservation and energy efficiency programs.

HR 5351, which passed by 236 to 182 votes, was approved largely along party lines. Many Democrats tried to emphasize the potential benefits of alternative projects that might be cancelled if funding is not extended. Others in the party said crude oil prices, which closed at $101/b/d earlier, showed that oil companies don't need tax incentives.

'Energy policy lite'

HR 5351 opponents, who were largely Republicans, said the bill actually hurts some alternative energy programs it intends to help while discriminating against a single industry by excluding it from a tax break that other US manufacturers receive.

"This bill is not a serious solution. It is 'energy policy lite,' and it is clearly intended to appeal more to the blogosphere than to market forces," said Rep. Phil English (R-Pa.), a Ways and Means Committee member who led the opposition during debate leading up to

the vote. "The Democrats' solution to America's energy crisis is to single out what they claim are the five largest oil and gas producers for a tax increase."

"This legislation is not likely to impact oil producers' profits in any way.... It is also not limited to the five largest producers, as they claim," English continued. "The one thing you can be sure of is that this bill will raise prices at the pump for American consumers and create a looming sense of uncertainty, which will compound the forces increasing prices today in the marketplace."

'We have an obligation'

Ways and Means Committee Chairman Charles B. Rangel (D-NY), who led supporters, said H.R. 5351's passage was essential because it would extend tax credits that otherwise would expire at the end of 2008 for alternative sources, including wind, solar, geothermal, cellulosic ethanol, and other biofuels. "If we are to end our dangerous reliance on foreign oil and create the green-collar jobs of tomorrow, we have an obligation to find renewable energy sources," he maintained.

Other Democrats argued it was time to move tax incentives to future technologies from an industry which essentially doesn't need them because it is making record profits. "We want to take the $18 billion in tax subsidies that the Bush administration and previous Congresses gave oil companies and reinvest the money in alternative energy technologies," said Chris Van Hollen, a Ways and Means Committee member from Maryland.

But English said the bill would substantially modify the wind energy tax credit in a way that would dramatically reduce its effectiveness for some of its most successful consumers. H.R. 5351 also excludes Citgo Petroleum Corp., the US subsidiary of Petroleos de Venezuela SA, from removal of tax incentives for other large oil refiners, he charged. Finally, the bill repeals the domestic manufacturing tax deduction for US producers but allows all others to continue receiving it, including some foreign companies, he said.

"H.R. 5351 is simply not the answer. It wasn't in any of its three previous incarnations, and it isn't today. This legislation threatens America's investment, threatens Americans' jobs, threatens the American economy and puts the consumer at a disadvantage," English said.

Rep. Sander M. Levin (D-Mich.), another Ways and Means Committee member, said none of English's arguments could bear the weight of observation. "It is absolutely mysterious why, in a time of global warming, what they do on the minority side is come here with a cold shoulder . . . I stand here today wondering where you have been all of these years when you controlled this institution and the White House," he asserted.

'Shooting at Big Oil'

Ways and Means Committee member Kevin Brady (R-Tex.) said many of the bill's supporters were launching unwarranted attacks. "Make no mistake: Politicians are shooting at Big Oil, but they are hitting American energy workers and they are hitting families in the pocketbook. Whenever there is no argument left, you will hear this: ExxonMobil is making record profits. You will hear it over and over again," he said.

"Well, politicians in Washington ought to hold a mirror up to why there are record profits. We have locked off reserves [in the Gulf of Mexico and Arctic National Wildlife Refuge]. We have locked off oil shale. We are killing coal. We are chasing American energy deeper and deeper into costly offshore areas," Brady declared.

Another Ways and Means Committee Democrat, Jim McDermott of Washington, said, "Big Oil has America over the proverbial barrel. Not only are we paying $100/bbl for oil and over $3.30/gal at the pump, and it will soon be $4. Not only are oil companies piling up record profits at $10 billion a quarter, but the American people are sending truckloads of taxpayer money to fatten Big Oil's wallet every month," he said.

"The legislation before us today will keep America on course to a sustainable renewable energy future. We can dramatically reduce the energy consumption by dramatically increasing energy efficiency. This bill does that, using tax credits and interest-free financing to partner with the American people to enable them to renovate their homes, to reduce consumption and to install efficient appliances," McDermott stated.

The bill's prospects for becoming law are not certain. The US Senate has rejected similar measures previously, and President Bush has said he will veto any bill that raises taxes or singles out an individual industry. But its chances in 2009 could improve significantly if Democrats successfully use votes this year in November elections to help increase their majorities in both the House and Senate. ✦

Supreme Court hears Exxon Valdez punitive damages arguments

Nick Snow
Washington Editor

The US Supreme Court heard arguments Feb. 27 over whether ExxonMobil Corp. should pay punitive damages arising from the 1989 crude oil spill into Alaska's Prince William Sound from its tanker, the Exxon Valdez.

The company already has paid a $25 million criminal penalty and earlier agreed to pay $900 million over 10 years for environmental restoration. The punitive damages case before the high court arose from a separate action in 1994 in which more than 32,000 plaintiffs, including commercial fishermen, private landowners, Alaskan

NFS-BlackSeal™

Prevention is the Greatest Cure for Losses

* Prevents and controls seepage loss
* Provides lubricity
* Easy mixing through the mud hopper
* Single sack blend
* Water and oil dispersible; can be used in a broad range of fluid applications
* Total resiliency
* Environmentally compliant (meets LC_{50} requirements)
* Broad PSD range

New Fluid Solutions, Inc. is also offering other exciting new technologies to the oil and gas drilling industry.

Please visit our website at www.newfluid.com

NFS New Fluid Solutions, Inc.™

The Fluid Specialists SM

6161 Savoy Dr., Suite 248 • Houston, TX 77036

713.780-3600 • Fax 713.780.3611 • 1.877 NEWFLUID (877.639.3584) • www.newfluid.com

WATCHING GOVERNMENT

Nick Snow, Washington Editor

Domenici's call for reason

US Sen. Pete V. Domenici (R-NM) could see a storm coming. The US House had just passed its latest bill to deny financial incentives to major oil companies and use the money to fund alternative energy programs. Crude prices were days away from breaking their inflation-adjusted record as the overall economy continued to slow down.

So the Energy and Natural Resources Committee's chief minority member sought time to make Senate floor speeches on Feb. 28-29 to address a problem that has grown increasingly political: the economic consequences of allowing oil imports to keep growing.

Domenici noted that experts estimate that foreign oil will cost the US $400 billion this year. He cited National Defense Council Foundation estimates that importing oil deprives the US economy of more than 2.2 million jobs/year and creates another $825 billion of hidden costs including oil-related defense outlays, lost government revenues, and reduced domestic investment.

"Nearly all of us, and nearly all of our constituents, can agree that America's dependence on foreign oil must end," Domenici said.

Key element ignored

Domenici suggested that a strong US energy policy would rely on increasing domestic oil and gas production responsibly; accelerating research and development of alternative energy sources, and significantly enhancing conservation.

There is broad agreement on the last two elements, but the first is generally ignored, he said, adding that increasing US oil and gas production won't solve problems by itself. "But with proven reserves of more than 21 billion bbl of oil, and undiscovered reserves of more than 100 billion bbl, it is simply unacceptable that America fail to meet a greater share of our own needs with domestic energy resources," he said.

Counterproductive action

Raising US production involves more than issuing leases in the Arctic National Wildlife Refuge and on more of the Outer Continental Shelf, he said. It also means ending counterproductive maneuvers such as inserting drilling permit application fees and an oil shale moratorium into the omnibus appropriations bill late last year.

In addition to the House's latest energy bill, Domenici said, "Some in the majority seek to make it more difficult for our military to purchase unconventional fuels from our allies in Canada...and to undo lease agreements that American companies have to produce energy in the Gulf of Mexico. This makes no sense."

Instead, he said, it's time to take action on an aggressive agenda of old and new energy ideas. "We must recognize that reasonable policies to reduce our dependence on foreign oil are American ideas, not partisan agendas. We must affirm that these policies are worth pursuing because additional steps can and should be taken to reduce the amount of energy this nation imports," Domenici said. ✦

Natives, and associated individuals and businesses, sued the vessel's captain, Joseph J. Hazelwood, and ExxonMobil, the ship's owner and Hazelwood's employer.

At that time a jury awarded the plaintiffs $287 million in compensatory damages. It also assessed punitive damages of $5,000 against Hazelwood and $5 billion against ExxonMobil, saying that these awards were "necessary in this case to achieve punishment and deterrence." The US Ninth Circuit Court of Appeals affirmed the compensatory damage award and the jury's determination to award punitive damages but reduced the punitive damages award to $2.5 billion. ExxonMobil appealed to the Supreme Court, which on Oct. 29, 2007, agreed to hear the case.

More than 300 people lined up outside the court Feb. 27, hoping to be admitted to watch the arguments. Many were Alaskans who said damages from the spill continue and are substantial. Arguments before the court centered on whether punitive damages are allowed under federal maritime law or are preempted by the Clean Water Act. They also discussed whether ExxonMobil could be held liable for continuing to employ Hazelwood as a tanker captain when management had received reports that his drinking problems had returned.

'Problem ran deeper'

Jeffrey L. Fisher, a partner in Davis Wright Tremaine LLP's Seattle office, argued on behalf of the suit's plaintiffs: "The same district judge who heard the criminal case sat on our trial. He saw in that first case that the environment was damaged and ruled that the limit should be $25 million. He also found that the captain and third mate were negligent. It wasn't until our trial that it was shown the problem ran much deeper, and the judge found that the company was liable."

But Walter Dellinger, a partner in O'Melveny & Myers LLP's Washington office who spoke on ExxonMobil's behalf, said other federal laws preempt

assessing the company for punitive damages. "The one thing that Congress has done, whether in the Trans-Alaska Pipeline Authorization Act of 1973, the Clean Water Act in 1977, or the Oil Pollution Act of 1990, was to provide specific instead of open-ended remedies," he told the justices.

Dellinger maintained that the $3.4 billion that ExxonMobil has already paid in fines, damage awards, and cleanup and environmental restoration costs addresses deterrence. There clearly was no malicious intent by the company since the spill cost it so much money and harmed its public image, Dellinger said. "When you look to punishment, it can't be a black hole where limits to damages disappear," he said.

Fisher responded that Exxon did not enforce its policy banning work aboard its tankers by intoxicated employees. "We showed 33 instances where other employees drank with Hazelwood. For 3 years, Exxon received reports that this was happening," he said.

Dellinger said reckless hiring could lead to corporate punitive damages if management clearly knew an employee was incompetent. "The jury could have found this was the case. It also could have found that Hazelwood had a problem with alcohol and was getting treatment," he said.

Justices' questions

Chief Justice John G. Roberts Jr. asked at what level an employee's actions make a corporation liable. Fisher said that Hazelwood qualified in this instance because he had charge of substantial property. Dellinger disputed this because operating policies were established farther up in the organization and Hazelwood simply was responsible for carrying them out.

"It seems to me this captain was managerial for some purposes and not for others. But he was not authorized to set aside the company's policy not to operate a vessel while intoxicated," Associate Justice Anthony M. Kennedy said.

Associate Justice Stephen G. Breyer asked if there were examples where federal laws regarding managerial liability had changed. "When you deal with multinational corporations which have hundreds of divisions, you need to be able to assign liability below the very top management," Fisher replied. Dellinger said it still is difficult to decide what level of employee can implicate a company.

Roberts said: "This was a very dramatic accident. But accidents happen every day. If it has not been normal to assign liability for an employee's conduct under maritime law before now, what basis exists to require it now?"

Fisher said that without a punitive damage award, each plaintiff would receive only $15,000 in compensatory damages. Dellinger said that a punitive damage total for billions of dollars was the relevant issue.

Eight of the Supreme Court's nine members heard the arguments. Associate Justice Samuel A. Alito Jr. recused himself because he owns ExxonMobil stock worth several hundred thousand dollars. ✦

Transneft to start ESPO export terminal this month

Eric Watkins
Senior Correspondent

Russia's state-owned pipeline concern OAO Transneft will begin construction for the export terminal of the East Siberia Pacific Ocean oil pipeline this month, according to company officials.

"In March we are beginning the practical stage of the project," said Transneft chief Nikolai Tokarev, referring to the oil export terminal that is to be located at Kozmino on Russia's Pacific Coast.

"Currently, the feasibility study for the construction of the terminal is ready," he said, adding, "It has successfully gone through examination by governmental experts."

The Kozmino export terminal will have two berths for tankers, first one for 80,000 dwt ships and eventually another for 150,000 dwt ships. Plans call for an initial 300 visits/year, rising to 800 when the second berth is completed.

Plans also call for a railway oil discharge jetty and an oil handling terminal with an oil storage tank farm, along with other associated onshore and offshore facilities.

Meanwhile, Surgutneftegas—aiming to partly supply the ESPO line with crude oil—is preparing to begin commercial development of the Talakan oil field, which has reserves estimated at 124 million tonnes of oil and 47 billion cu m of natural gas.

The Surgutneftgas announcement followed a meeting of Tokarev, Surgutneftegas Gen. Director Vladimir Bogdanov and Vyacheslav Shtyrov, President of the republic of Yakutia, where Talakna field is located.

"We have purchased a pumping station and will deliver it to the field and install it," said Bogdanov. "In July we will be ready to start filling the pipeline. This will enable commercial pumping to begin with the launch of the Talakan-Taishet section of the pipeline, which is planned for the fall."

Bogdanov said the volume of production will depend on the launch date of the pipeline, but that "by 2009 we can ensure production of 1 million tonnes with subsequent increases in accordance with the field development project."

The Surgutneftgas announcement coincided with a statement by Rosneft president Sergey Bogdanchikov that his company will undertake development of Vankor oil fields as a priority project in connection with the ESPO.

Bogdanchikov said that the fields, located in the Krasnoyarsk Territory, will

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Venezuela's deadly gambit

Venezuelan President Hugo Chavez is pulling out all stops in his effort to undermine the US, even calling on the Organization of Petroleum Exporting Countries to back his country against ExxonMobil Corp.

This is just the latest ploy in the Venezuelan leader's heavy-handed efforts at oil diplomacy. Chavez has been using his country's oil to secure allies in his war against the US, and Ecuador—which Venezuela recently helped return to OPEC—is clearly one of them.

But Chavez's OPEC gambit failed as Sec. Gen. Abdalla Salem el-Badri said the organization would not take sides in the dispute between Venezuela and the US firm.

"We will not side with Venezuela against Exxon nor with Exxon against Venezuela," he said, adding that OPEC would try to respect the entitlements of both parties. Their fight concerns assets nationalized by the Chavez administration last year in the oil-rich Orinoco River basin.

Proxy wars

Chavez attempted to enlist the world's premier oil organization in his own personal proxy wars against the US. Could anything be more likely to fail? OPEC is highly unlikely to do anything to undermine the world's largest buyer of oil.

The decision of the OPEC secretary-general is hardly surprising as, time and again, the organization has insisted it will not be politicized by Chavez or anyone else. OPEC has an economic mission, but some people just don't listen.

Failing in that bid, Chavez has turned on Colombia, calling its president a "pawn" in a supposed US plot to invade Venezuela. Last week, along with fellow OPEC member Ecuador, now an ally in his causes, Chavez said he would take war to Columbia, if necessary.

"We are not going to permit the North American empire, which is the ruler, to allow his lapdog, President Uribe and the Colombian oligarchy, to divide or weaken us. We will not permit it," said Chavez, referring to the supposed alliance between the US and Colombia.

Going after FARC

Chavez was responding to a Mar. 1 incursion of Colombian military forces into Ecuador, where they killed a Columbian rebel leader named Raul Reyes, considered the second most senior commander of the Revolutionary Armed Forces of Colombia (FARC).

Ecuador was not slow to join the rhetorical attack, nor was Nicaraguan president Daniel Ortega—whose country plans to import and refine Venezuelan crude oil. Ortega accused Colombia of defying a recent World Court decision on his country's maritime dispute with Colombia.

Using what is clearly a pretext for war, Ortega warned that Nicaragua will use any means available to defend its own sovereignty—along with help from Venezuela. "We are strong and they [Columbians] must respect us," Ortega said.

Respect? It is hard to generate any respect for the likes of Chavez and his cronies around the world. Respect comes from developing the oil and gas industry for peaceful purposes, not using it as an instrument of war. ✦

receive special attention because they are expected to supply the ESPO line with most of its crude oil.

He said commercial oil production at Vankor is expected to commence in August, and construction of the 19-20 million tonnes/year Vankor-Purpe pipeline will be completed in September.

The Vankor-Purpe line will connect area fields to the ESPO oil trunk pipeline system. Rosneft plans call for Vanko to produce 1.9 million tonnes of oil in 2008, 9.8 million tonnes in 2009, 15.6 in 2010 and 18.7 million in 2011.

The ESPO pipeline system is being built in two stages. The first is comprised of the pipeline from Taishet to Skovorodino and the oil terminal in Kozmino, while the second stage consists of a pipeline from Skovorodino to Kozmino. Under the first stage, as much as 30 million tonnes of oil will be delivered to Skovorodino, with onward transmission by rail to Kozmino. In the second stage, an additional 50 million tonnes will be delivered through the line directly to Kozmino.

Russian officials have yet to state clearly when construction of the ESPO will be completed and the line ready to be commissioned. In early February, the government said it would hold a meeting to discuss postponement of the line's commissioning date (OGJ Online, Feb. 15, 2008). ✦

Shell Oil executive outlines 12-point energy plan

Paula Dittrick
Senior Staff Writer

Shell Oil Co. Pres. John D. Hofmeister said his company proposes a 12-point energy plan, noting that he believes World War II was the last time the US had a "coherent, comprehensive" energy policy.

Hofmeister, speaking Feb. 27 to Business and Climate Change conference cosponsored by the British Consulate-General of Houston, Shell, and others, advocated a US energy policy to address short-term, medium-term, and long-term issues.

Calling upon the US government to approach energy security in a bipartisan manner, Hofmeister said lawmakers need to give energy security the same attention that they already give homeland security and economic security.

Although every presidential candidate has made energy speeches, Hofmeister said, "We must beware of superficial promises of easy solutions." He foresees "hard choices ahead of us" that will require "a broad understanding of the basic issues of energy security."

For instance, the US needs more investment and public acceptance of efforts to update its electric transmission system, its oil and gas pipeline systems, and expand its liquefied natural gas facilities, he said.

"We face enormous difficulty in siting LNG regasification terminals, especially on the East and West Coasts, Hofmeister said. "It will take ongoing education and forward-looking policymakers to make this clean energy source accessible."

For example, Shell US Gas & Power and TransCanada Corp. continue working to receive all necessary clearances for the Broadwater Energy's proposed offshore LNG project in Long Island Sound.

The project, if authorized, would be developed in New York state waters about 9 miles from Long Island's nearest shoreline and about 10 miles from Connecticut's closest shore. The terminal would be a floating storage and regasification unit attached to a yoke mooring system that would include a mooring tower embedded in the sea floor.

While Broadwater has been in the planning and authorization stages, Shell reports the construction of two LNG

plants outside the US in which it has an equity interest. One is in India and one is in Mexico.

12-point plan

Hofmeister said energy strategy progress requires "national political will, technological and human energy, and major financial investments." He said "a national climate change policy makes much better sense than dozens of regional policies or 50 state policies."

States can be helpful in pointing federal government in the right direction, but the atmosphere does not recognize state boundaries, he said.

Shell's 12-point plan addresses energy supply, energy demand, and environment. It was compiled after Shell executives visited 50 US cities in 18 months in what the company called "A National Dialogue on Energy Security."

Hofmeister is meeting individually with US presidential candidates to discuss the plan, which calls for:

- Greater access to conventional oil and gas in and off the US.
- Development of unconventional oil and gas resources, particularly oil shale in Colorado, Wyoming, and Utah.
- Greater emphasis on clean coal technology, particularly coal gasification or integrated gas combined cycle technology, can allow the US to use coal to generate electricity while capturing and sequestering carbon dioxide.
- Supplementing US natural gas supply with imported LNG.
- Moving biofuels beyond the food parts of grain to biofuels like cellulosic ethanol made from the stalks and other nonfood parts of grain.
- Creating wind energy distribution systems.
- Pushing solar research to make solar energy commercially viable.
- Developing a hydrogen fleet and fueling infrastructure. Hydrogen as an automotive fuel is in the pilot stages with only a few demonstration projects in the US.
- Improving energy-efficient designs of various energy products including light bulbs and automobile engines. This includes more energy efficiency in urban planning.
- Developing a federal framework for measuring and controlling greenhouse gases. Shell advocates an effective US climate change policy including a cap-and-trade program.
- Educating citizens on energy issues, starting with programs in the schools.
- Staying open to other viable energy alternatives, including as-yet-undiscovered options along with nuclear power, geothermal energy and hydropower. ✦

ExxonMobil offers latest development plan for Alaska

Paula Dittrick
Senior Staff Writer

ExxonMobil Production Co. submitted the latest in a series of development plans for the Point Thomson Unit (PTU) gas-condensate lease on Alaska's North Slope.

Development of the 106,200-acre PTU, east of Prudhoe Bay, is linked with construction of the proposed Alaska natural gas pipeline from ANS to the Lower 48.

ExxonMobil, PTU operator, estimates the high-pressure reservoir has reserves of more than 8 tcf of gas and 200 million bbl of condensate (OGJ, Nov. 26, 2001, Newsletter).

Alaska state documents indicate 25 lessees hold working interest in PTU, covering 45 state oil and gas leases. Lessees include BP Exploration (Alaska) Inc., Chevron USA Inc., and ConocoPhillips Alaska Inc.

PTU has no production yet. Lessees have said production hinges upon an Alaska gas pipeline, and the pipeline's future remains uncertain.

PTU development

The PTU development has been under discussion for years. ExxonMobil has submitted numerous plans and modified plans. The latest plan calls for PTU production by yearend 2014.

In 2001 the Alaska Department of Natural Resources approved a development plan calling for PTU production by 2008.

But in October 2005 the DNR Division of Oil and Gas rejected that development plan, placing ExxonMobil in default of its earlier agreement with the state (OGJ, Nov. 6, 2006, p. 32).

The latest plan for the proposed $1.3 billion project would involve a development and delineation drilling program in 2008-09 followed by construction of production facilities and pipelines.

An initial phase calls for production of 200 MMcfd of PTU gas from which 10,000 bbl of liquid condensate would be separated and delivered through oil pipelines. Remaining gas would be reinjected into the reservoir.

ExxonMobil plans to ship produced fluids west through the Badami sales pipeline and then into the Trans-Alaska Pipeline System.

Craig Haymes, ExxonMobil Alaska production manager, said, "A phased development is a prudent approach to maximize the benefits to the state of Alaska and the Point Thomson owners, especially since a gas pipeline is more than a decade away."

Meanwhile, ExxonMobil representatives plan to meet with DNR officials on Mar. 3 in a meeting ordered by an Alaska state Superior Court.

Previously, ExxonMobil offered to pay the state of Alaska $20 million and to relinquish 20,000 acres to resolve unmet PTU development obligations. ✦

Subsea market to remain strong, study says

The global subsea oil and gas market will remain strong for the foreseeable future and is forecast to total $218 billion over 2008-12, reports Scottish Enterprise in a study to be released shortly. This is despite a market growth of nearly 90% during the past 5 years.

"The Subsea Market Report 2008-2012," is one of a series of reports commissioned by Scottish Enterprise's Energy Team from energy business analyst firm Douglas-Westwood.

"We expect that increasing global energy demand coupled with high oil price and the move to deeper waters will drive subsea activity to new levels in the years ahead," said lead study analyst Thom Payne from Douglas-Westwood's Aberdeen office. "Key regions within the market are Africa, Latin America, North America, and the North Sea. Together these regions accounted for over 70% of the global subsea market in 2007.

"Further discoveries and developments in Brazilian deepwater plays will continue to drive growth in the Latin American market" over 2008-12, Payne said. "Currently we expect that the vast majority of Latin American spend will be focused in this area, but uncertainties over future developments in Mexico, such as Ku Mallob Zaap field, could result in increased spend in this area over the forecast period."

Payne said the African subsea market is growing at a faster rate than all other regions, with expenditures expected to increase by 16% during 2008-12 "when spend will equal just over $11 billion." Other major growth markets will be Latin American and Asia.

"The Asian subsea market was valued at $4.2 billion in 2007, and we expect it to exceed $6 billion in 2012," driven by rising energy demand, Payne said.

The subsea market of regions such as the Middle East and Russia will be characterized primarily by export and trunk lines linking them with consumer markets in Asia and Europe. "We expect that these developments will result in the 'rest of the world' accounting for 14% of the 2008-12 market," Payne said. After 2012, he expects important development in the Russian Arctic and South Pars field off Iran to drive subsea spend in those regions.

"The only thing that is stopping the market [from] growing at a faster rate is a global shortage of resources ranging from deepwater drilling rigs to experienced engineers," Payne said. ✦

Nile Delta Oligocene find boosts Egypt's gas outlook

Egypt's gas production and exports are building with the recent opening of several pipelines, and BP PLC is sizing up its first discovery of deep Oligocene nonassociated gas offshore in the Nile Delta.

The country's mid-2007 internal estimate of gas reserves is 72 tcf, up 36% from 2001, said Egyptian Natural Gas Holding Co. (EGAS). Almost four-fifths of the gas is in the Mediterranean Sea.

In terms of gas production, capacity approaching 6 bcfd would put Egypt in the league with Qatar. Before the 1990s, Egypt's entire gas production was associated gas.

Gas discoveries

Oil discoveries far outnumbered gas finds in Egypt in 2007, but BP reported the Mediterranean Oligocene discovery scarcely a month into 2008.

The Satis-1 well, in 295 ft of water 31 miles north of Damietta, was drilled to a Nile Delta record TD of more than 21,325 ft, BP said.

Without giving test information, BP said the high-pressure, high-temperature discovery well represents "a major technical achievement that demonstrates the great potential of the deeper reservoirs within the Nile Delta and will require further appraisal."

The company said the discovery "will underscore our position as a major producer in the growing Egyptian gas market for many years to come."

Nile Delta Oligocene rocks include the Ghazalat, Qatrani, and Abu Zaabal formations, but BP did not identify the producing zone at Satis-1.

It called Satis, on the North El Burg concession, the company's third deep gas discovery in the Nile Delta, but the earlier Raven discovery in 2003 and Taurus Deep find in 2007, both on the North Alexandria concession, were in rocks of Pliocene age.

North El Burg partners are BP operator with 60% interest and RWE Dea 40%. North El Burg lies between the BP-operated Ras El Barr development concession and the International Egyptian Oil Co.-operated Offshore Baltim development concession. EGAS has an entitlement under North El Burg's production sharing arrangements.

Another early 2008 discovery came in Egypt's western desert, where Apache Corp., Houston, gauged the Hydra-1X gas-condensate find in the Jurassic Lower Safa formation (OGJ, Feb. 4, 2008, Newsletter).

The well's 178 ft of net pay was one of the thickest Lower Safa pay zones identified since Apache's 2003 discovery 25 miles away at Qasr, at 2.3 tcf of gas and 80.4 million bbl of condensate the company's largest find ever. Hydra also had 45 ft of probable gas-condensate pay in the Jurassic Alam El Bueib Unit 6 sand and 30 ft of probable oil pay in the Lower Cretaceous AEB Unit 3.

Apache, which averaged 240 MMcfd of gas production in Egypt in 2007, plans to drill 282 wells in 2008, including 40 exploration wells.

The company's exploratory drilling will target Jurassic formations with gas-condensate potential near the recent Hydra, Qasr, and Jade discoveries; oil potential farther southwest near Apache's Neith, Heqet, and Buchis development leases; new Bahariya and Abu Roash oil fields in the Abu Gharadig basin; and Apache's newest acreage in Egypt, a 50% interest in a 10.5-million-acre farmout from Tharwa Petroleum.

Gas pipeline outlets

While supplying more remote reaches of its own country, Egypt is shipping gas to other countries in the Middle East and exporting LNG.

Both Egyptian and foreign companies are participating in the projects, and overall it is estimated that about 29% of the gas produced in Egypt is exported.

Gas began flowing in February through a 62-mile subsea pipeline from El Arish in eastern Egypt to Ashkelon,

Israel. Capacity is 165 MMcfd.

The Arab Gas Pipeline, which began transporting gas in 2003 from El Arish to Aqaba and was extended from Aqaba to El Rehab in 2005, is to begin moving gas to Deir Ali in Syria and to Lebanon later in 2008. Ultimate capacity is 950 MMcfd. ✦

McMoRan reenters Blackbeard gas prospect in gulf

McMoRan Oil & Gas Corp. LLC, New Orleans, has entered into a multiwell drilling contract with Rowan Cos. Inc. that includes its reentering the ultradeep Blackbeard gas prospect on the Gulf of Mexico shelf.

The Rowan Gorilla IV jack up will reenter and deepen Blackbeard No. 1 ultradeep exploratory well, already one of the deepest wells in the Gulf of Mexico. It lies in 70 ft of water on South Timbalier Block 168.

ExxonMobil Corp. initially drilled Blackbeard No. 1 to 30,067 ft in August 2006, using Rowan's Tarzan-class Scooter Yeargain jack up, but temporarily abandoned it prior to reaching its 32,000-ft primary target because of higher-than-expected pressure. The well had encountered a thin gas-bearing sand below 30,000 ft.

Gorilla IV, committed for at least 90 days at a day rate in the mid-$190,000s, was on location in late February.

McMoRan acquired the rights to the project from Newfield Exploration Co. in an August 2007 acquisition of Gulf of Mexico shelf oil and gas properties for $1.08 billion in cash and certain exploration rights. McMoRan will now operate the well and holds a 26.8% working interest in the Blackbeard prospect, which is part of the Treasure Island ultradeep play.

"Other partnership arrangements will be disclosed after plans are finalized," a McMoRan spokesman told OGJ.

McMoRan owns 450,000 gross acres associated with the ultradeep play in the Gulf of Mexico. ✦

EOG pursuing Colorado North Park Niobrara oil

EOG Resources Inc., Houston, plans to drill seven wells in 2008 and is shooting a 36 sq mile 3D seismic survey in a horizontal play for oil in Cretaceous Niobrara in Colorado's remote North Park basin.

EOG, which has amassed 100,000 net acres and drilled one well in Jackson County, estimated the Niobrara has a reserve potential of 10 to 80 million bbl of oil equivalent at an implied recovery efficiency of 1-5%. Nevertheless, the company said Feb. 29, the first well is very encouraging. Estimated oil in place is 10-40 million bbl/sq mile.

The company drilled the Buffalo Ditch 1-32H, in 32-7n-80w, 15 miles south-southwest of Walden, to 7,500 ft true vertical depth plus a 4,000-ft single lateral and applied a multistage frac in the fourth quarter of 2007.

Initial rate was 550 b/d of 38° gravity sweet crude with a GOR of 600 scf/bbl, and the well averaged 320 b/d in its first 30 days on production.

Preliminary estimated ultimate recovery is 250 million boe/well, compared with two vertical wells drilled by others within 3 miles that produced more than 100,000 bbl/well. Coalmont oil field lies just to the southwest.

On its acreage, which represents the majority of the play concept, EOG estimates the reservoir to be 90-450 ft thick with 3.5 to 6% average porosity, initial reservoir pressure of 3,700 psi, and temperature 210° F.

The company sees costs at $6 million/well on 640-acre spacing and plans to use a single rig. The basin has no oil pipeline, and the company sees no production impact until 2009.✦

Partners move to develop Usan field off Nigeria

Partners in Usan oil field off Nigeria are moving to develop the 2002 discovery, which lies in 750-850 m of water on Oil Mining License 138, about 100 km off the eastern Niger Delta coast.

Development plans for Usan include a floating production, storage, and offloading vessel with a storage capacity of 2 million bbl of oil. First production is expected in late 2011 with peak production reaching 180,000 b/d of oil. Associated gas will be reinjected.

Coventurers in Usan field deepwater development are operator Elf Petroleum Nigeria Ltd. 20%, Chevron Nigeria Deepwater Ltd. 30%, Esso Exploration & Production Nigeria (Offshore East) Ltd. 30%, and Nexen Petroleum Nigeria Ltd. 20%.

Nexen estimated its capital investment at $1.6 billion to $2 billion, implying a total project price tag to the group of $8-10 billion.

Nexen also said the government approved conversion of Oil Prospecting License 222 into Oil Mining Leases 138 and 139, each of which covers half the original area of OPL 222. The field is covered by the original production sharing contract issued in 1993, with Nigerian National Petroleum Corp. (NNPC) as concessionaire, and conveys the right to develop and produce crude oil and continue with exploration. ✦

Argentina

Argenta Oil & Gas Inc., Toronto, said the first well on its 100% owned Loma El Divisadero Block in Argentina's Neuquen basin found 19° gravity oil in the Chorreado member of the Cretaceous Huitrin formation.

The well flowed at undisclosed rates without treatment.

The LEDO x-2 exploration well went to TD 5,294 ft and cut 197 ft of gross thickness in three packages of fine to very fine sandstone and log porosities averaging 18% with resistivities that suggest high oil saturation, the company said.

The company is reviewing recent 3D seismic data to determine the size of the hydrocarbon pool and examining options to improve production rates, including a sand frac.

The company's geologist and geophysicist said velocity log interpretation indicates that the hydrocarbon accumulation goes beyond the previously interpreted structural play and may be part of a larger stratigraphic play.

Argenta is completing three other exploration wells that were cased.

New Zealand

Maari, at 50 million bbl recoverable New Zealand's largest undeveloped offshore field, has a further 37 million bbl of potential in the general area, said a participant in the field.

Maari field, operated by OMV AG in the Taranaki basin, could have 12 million bbl recoverable in the M2A sands above the main Miocene Moki sands structure in Maari field and 25 million bbl recoverable in the Manaia structure 10 km southwest of Maari, said Horizon Oil Ltd., Sydney.

Manaia could work as a subsea tieback to Maari.

The Maari partners plan to appraise Manaia and the M2A zone in mid-2008.

Maari field is expected to go on production in this year's third quarter and reach full output in 2009.

Philippines

Galoc Production Co. pronounced the Galoc-3 development well ready to connect to the field's FPSO after it flow-tested at a constrained, stabilized 5,200 b/d of oil.

Commercial oil production is to start in April 2008 at a higher flow rate based on analysis of the pressure data during the cleanup flow period, said 18.28% interest owner Otto Energy Ltd., Perth.

The rig is being moved to Galoc-4 to ready it for production. The FPSO is to arrive in March. A gross production rate of more than 15,000 b/d is expected.

Thailand

GFI Oil & Gas Corp., Houston, has drilled and logged two development wells at Bualuang oil field in the western subbasin of the Gulf of Thailand.

The first development well, Bualuang 05, cut 21 m of net pay with porosity averaging 29% and 809 md average permeability as indicated by preliminary core analysis.

The pay interval is at 3,700 ft in 150 ft of water.

Bualuang 01 went to 1,270 m TVD and cut 20 m of net pay. Logs indicate average porosity of 27%. The well was not cored.

The Rubicon Vantage FPSO is expected on location by late March, and development drilling will continue until mid-April. Sun Oil Co. discovered the field in 1992.

GFI's interest is 60%, and SOCO International Inc. has 40%.

Ukraine

The Kashtan Petroleum Joint Venture plans to spud a second development well in Lelyaki oil field in east-central Ukraine in the second quarter of 2008.

The directional No. 307 well is to go to 1,960 m to further develop the P1 and 2 and K1 reservoirs. Recently drilled offsets came on at more than 240 b/d of 42° gravity oil, said Shelton Canada Ltd., Calgary. Shelton and Ukraine's state Ukrnafta make up the Kashtan venture.

Kashtan, which is using infill wells to exploit Lelyaki's remaining reserves, also plans to reenter and sidetrack four other suspended wells in the field this year. The first well has averaged 185 b/d since coming on production in December 2007 (OGJ, Sept. 4, 1995, p. 42).

Arizona

Enhanced Oil Resources Inc., Houston, said the 10-2-30 well in St. Johns helium-carbon dioxide field in Apache County stabilized at 3.1 MMcfd of CO_2, with 390 psi flowing tubing pressure, the highest flow rate achieved in the field to date.

The well, which made the flow from the Granite Wash and fractured basement, was air drilled with a larger hole size, and test equipment restricted the flow rate.

A larger test unit was moved in. The well also had 120 ft of potential gas pay in the Amos Wash zone.

The 12-34-29 well near the northwest edge of the field was being redrilled after encountering a high-pressure gas zone above the regional seal. The significance of the new potential pay zone is uncertain, the company said.

A third rig has spud the 12-31-30 well 3 miles east of the 12-34-29 well.

Pennsylvania

Range Resources Corp., Fort Worth, said its leasehold in southwestern Pennsylvania's Devonian Marcellus shale gas play totals 1.1 million net acres, 650,000 acres of which could be prospective, and leasing continues.

Resource potential on the prospective acreage totals 10 to 15 tcf equivalent.

The company's 2008 program calls for drilling 60 shale wells in Pennsylvania, 40 of which will be horizontal. The company has drilled 15 horizontal wells to date, 11 of which have been completed with initial producing rates of previously announced horizontal wells ranging from 1.4 to 4.7 MMcfd of gas equivalent. Two 2008 horizontal completions flowed 4.7 and 4 MMcfd.

Mahmood Moshfeghian
Mark E. Bothamley
Larry L. Lilly
John M. Campbell & Co.
Norman, Okla.

A study has shown how relative density (molecular weight) affects the performance and efficiency of two centrifugal compressors.

Scenarios simulated included:

- Compressor speed as a function of molecular weight, while maintaining the same suction and discharge pressure and mass flow rate.
- Polytropic head and efficiencies as a function of gas molecular weight for a given compression ratio, and compressor speed.
- Effects of thermodynamic properties.

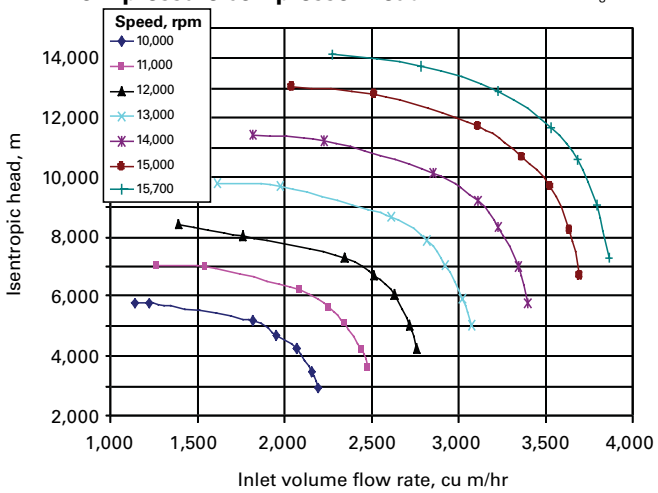
Feed-gas molecular weight affects centrifugal compressor efficiency

Based on a presentation to the Compressor & Turbines Optimization & Troubleshooting Conference, Aberdeen, Jan. 29-30, 2008.

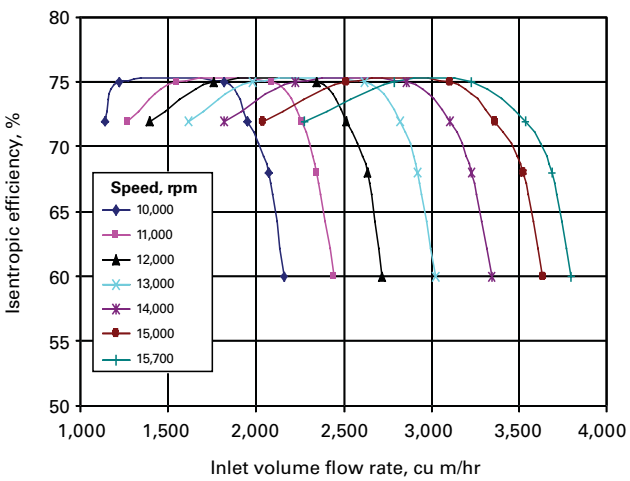
Compressor characteristics

Fig. 1

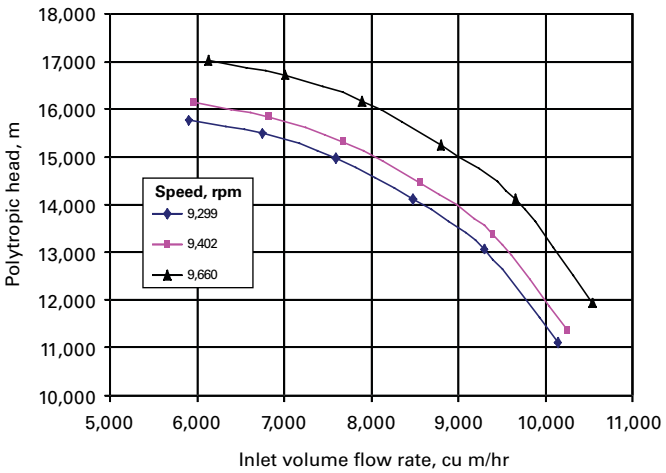
Low-pressure compressor head Fig. 1a



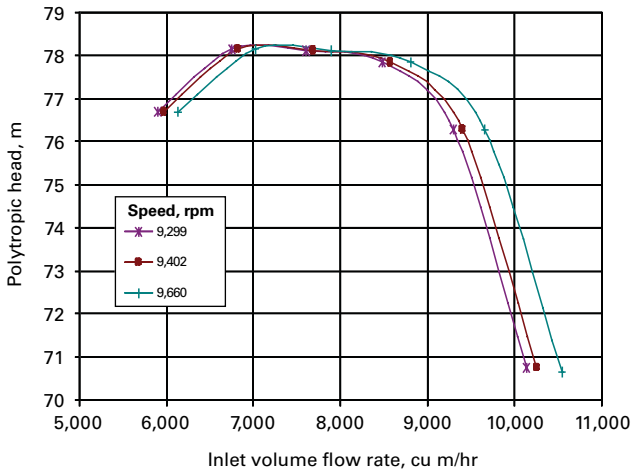
Low-pressure compressor efficiency Fig. 1b



Intermediate-pressure compressor head Fig. 1c



Intermediate-pressure compressor efficiency Fig. 1d

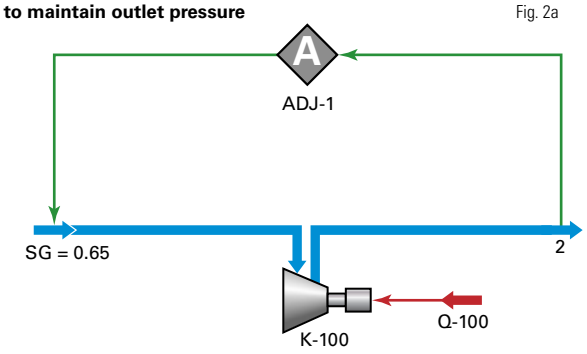


PROCESS FLOW

Fig. 2

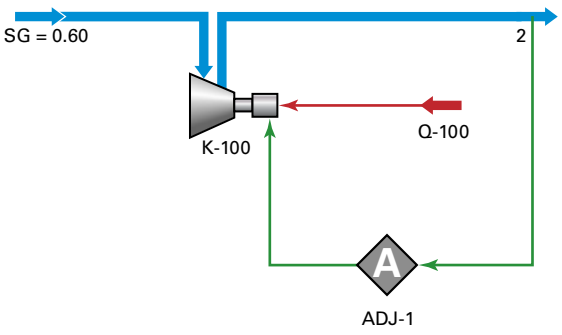
Feed-gas flow rate adjustment to maintain outlet pressure

Fig. 2a



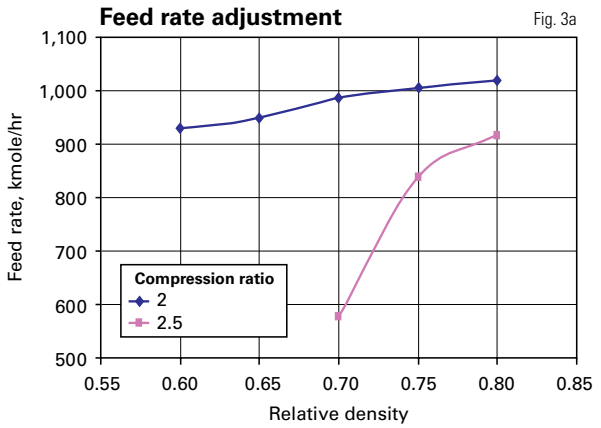
Compressor speed adjustment to maintain outlet pressure

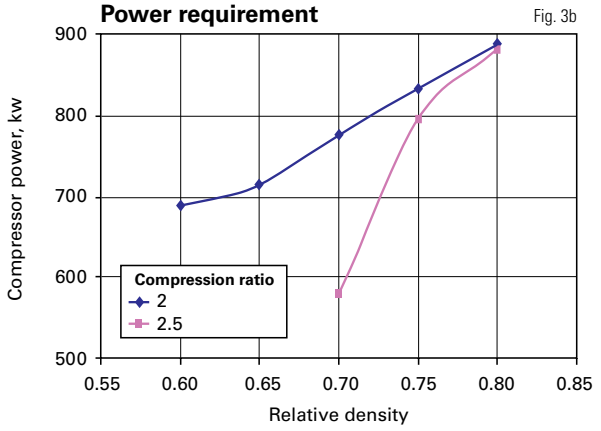
Fig. 2b

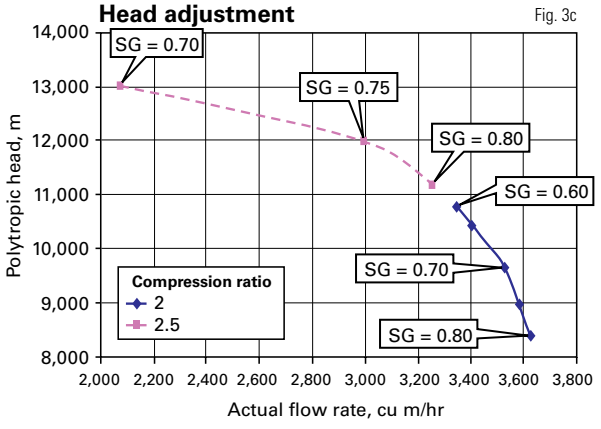


CASE 1

Fig. 3







Note: Speed = 15,000 rpm, T_1 = 35° C., P_1 = 700 kPa, EOS = PR

Compressors

Compressors generally fit into two categories:

1. Positive displacement compressors that include reciprocating, rotary screw, sliding vane, liquid ring, and rotary lobe. The compression principle is volumetric displacement, in which reducing the gas volume increases pressure.

2. Kinetic or dynamic compressors that include centrifugal and axial. The compression principle is acceleration and deceleration of gas, in which kinetic energy is converted to pressure increase. Reciprocating and centrifugal units are the most popular compressors used in oil and gas field production applications.

Rotary screw compressors have gained popularity for low to moderate-pressure gas boosting, refrigeration systems, and fuel-gas compression for gas turbines.

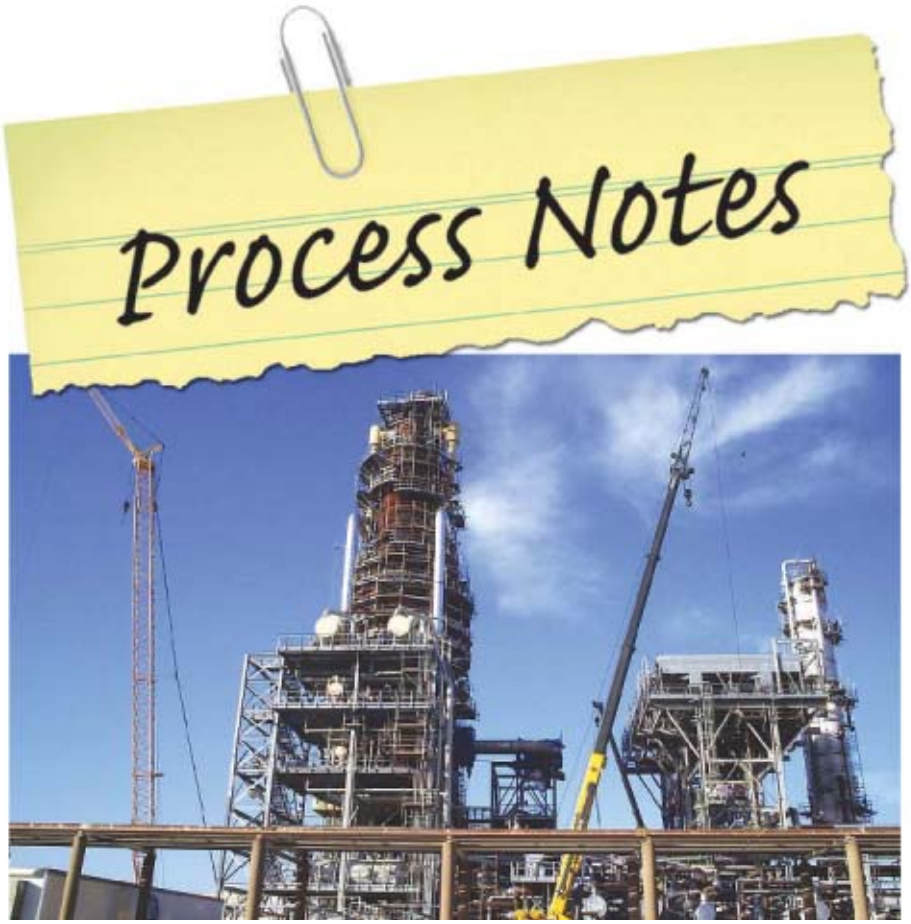
Power calculations

Theoretical power requirements are independent of compressor type, and actual power requirements vary with compressor efficiency. In general, Equations 1 and 2 in the equation box calculate power.

These two equations are equally correct theoretically. The practical choice depends on available data, although they are somewhat arbitrary. The power calculation should be made per stage of compression and then summed for all stages connected to a single driver. For general planning purposes, the graphical solutions in Reference 1 produce results comparable to these equations.

From a calculation viewpoint alone, the power calculation is sensitive to flow rate, inlet temperature and pressure, and outlet pressure. Gas composition is important but a small error in it is less important as long as it does not exclude corrosive components.

A compressor will operate under changing variables that affect its perfor-



The Myth of the 1000°F Vacuum Unit Cutpoint

Canadian Synbit and Dilbit crudes will come to make-up a substantial fraction of feedstocks to North American refineries. Today, however, for the most part refiners both north and south of the 40° parallel seem to be unaware of the extreme challenges this change will present. To run an oil sands crude in a vacuum unit designed for conventional heavy feedstocks and to expect a 1000°F cutpoint for a 5-6 year run is like believing in the Tooth Fairy. Bitumen based crudes are ultra-heavy, fouling, hard to desalt, corrosive, thermally unstable and tough to vaporize in the vacuum column flash zone even at elevated temperatures. Can any crude oils be nastier to cope with?

First and foremost, heater outlet temperature can be no higher than 725°F and possibly lower to avoid extremely high cracked gas rates and rapid coke laydown. Even at these reduced temperatures the heater tubes must be double-fired, coil steam rates high, coil layout correct, oil mass velocity high and heater outlet pressure selected properly. But won't lower heater outlet temperature increase the coker charge rate by 25% or more? Yes …with current unrealistic vacuum column design! The proper design is one which can provide minimum coker charge with design features that incorporate efficient residue stripping and low column operating pressure.

If you design your vacuum unit correctly you can indeed expect to achieve a 975°F VGO cutpoint and a 5-6 year run length. But it won't come from conventional cheap unit designs. If the wrong designs are used it could mean replacing the heater, having to add residue stripping and new ejector systems. The revamp can cost 40% of a new unit. The choice is yours. Pay now or pay through the nose later.

A last word: Because process and equipment design is critical when processing oils sands crudes, know-how and actual experience designing units to process these feedstocks can make the difference between success or possibly disastrous reliability and yields.

For a more thorough discussion of cutpoint ask for Technical Papers 236 and 237.

PROCESS CONSULTING SERVICES, INC.

3400 Bissonnet
Suite 130
Houston, Texas 77005
USA

Ph: [1] (713) 665-7046
Fx: [1] (713) 665-7246
info@revamps.com
www.revamps.com

CASE 2

Fig. 4

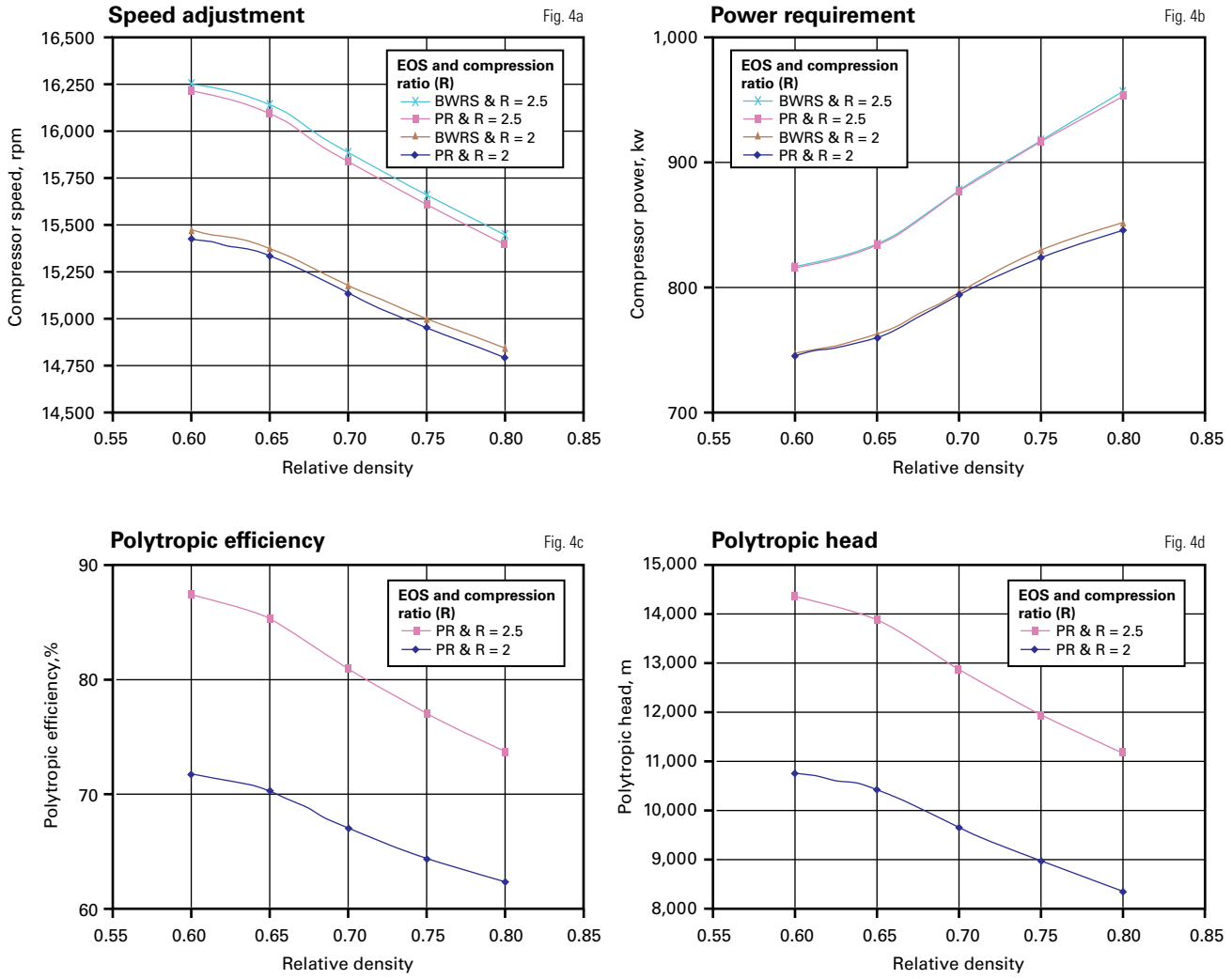


Fig. 4a Fig. 4b Fig. 4c Fig. 4d

Note: Variable speed, T_1 = 35° C., P_1 = 700 kPa, mass rate - 1,000 kmole/hr

EQUATIONS

$$\frac{\text{Power}}{\text{Stage}} = \frac{(\dot{m})(\Delta h)}{\eta} \quad (1)$$

$$\frac{\text{Power}}{\text{Stage}} = \left(\frac{1}{\eta}\right)\left(\frac{k}{k-1}\right)(q)\left(\frac{P_s}{T_s}\right)(T_1)\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{k-1}{k}\right)} - 1\right](Z_a) \quad (2)$$

Nomenclature

η	-	Efficiency
$\dot{m}$	-	Mass flow rate
h	-	Specific enthalpy
P_1	-	Suction pressure
P_2	-	Discharge pressure
T_1	-	Suction temperature
q	-	Gas volume flow rate at standard conditions
P_s	-	Standard presssure
T_s	-	Standard temperature
Z_a	-	Average gas compressibility factor
k	-	Heat capacity ratio

mance. The most difficult part of a compressor calculation, therefore, is to specify a reasonable range for each variable and not the calculation itself.

Maddox and Lilly emphasize that use of a single value for each variable is incorrect when evaluating a compression system.[2]

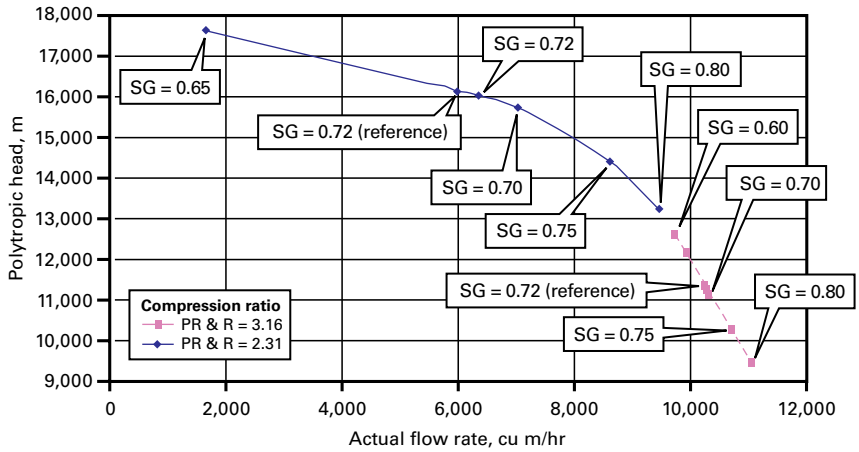
Normally, an evaluator will make thermodynamic calculations on an ideal (reversible) process and then adapt them to the real world by including an efficiency term.

A compression process has three ideal processes: isothermal, isentropic, a polytropic. Any of these processes can serve as a basis for evaluating compression power requirements by either hand or computer calculations. The isothermal process, however, seldom is the basis because the normal industrial compression process is not at constant temperature, even approximately.

The compression ratio has a limited practical range of between 2 and 6. The

Case 3 head adjustment

Fig. 5



Note: Speed = 9,402 rpm, T_1 = 31.1° C., P_1 = 2,137 kPa, EOS = PR

choice of the interstage pressure is an economic decision. One can estimate the pressure by equal compression ratios for each section and then adjust it to minimize total power requirement.

Equation of state

Any commercial process-flow simulation software contains an equation of state (EOS). Normally, these simulators use a cubic EOS such as Soave-Redlich-Kowng (SRK)[3] or Peng-Robinson (PR)[4] because of their simplicity and relative accuracy.

With proper binary interaction coefficients, these two equations give practically the same process simulation results.

Computer solution

For a known gas rate, pressure (P_1), temperature (T_1), and composition at the inlet condition and discharge pressure (P_2), the calculation with a computer of the compressor power requirement based on an EOS involves two steps:

1. Determine the ideal or isentropic (reversible and adiabatic) enthalpy change of the compression process. The ideal work requirement equals mass rate multiplied by the isentropic enthalpy change.

2. Adjust the ideal work requirement for compressor efficiency with the calculations based on an EOS as shown in the box.

Compressor efficiency, and hence, the compression process depends on the method used to evaluate the work requirement. Isentropic efficiency ranges from 0.60 to 0.90.

Adjusting ideal work for compressor efficiency

1. Assume steady state, for example. $\dot{m}_1 = \dot{m}_2 = \dot{m}$, and the feed composition remaining unchanged.
2. Assume isentropic process, for example adiabatic and reversible.
3. Calculate enthalpy $h_1 = f(P_1, T_1,$ and composition) and $s_1 = f(P_1, T_1,$ and composition) at the suction condition with an EOS.
4. For the isentropic process s_2^* (P_2, T_2^*, composition) = $s_1(P_1, T_1,$ composition). Note the superscript * denotes ideal or isentropic value.
5. Calculate the ideal enthalpy (h_2^*) at outlet condition for known composition, P_2 and s_2^*.
6. Ideal work is $W^* = (\dot{m})(h_2^* - h_1)$.
7. Actual work is ideal work divided by efficiency or $W = W^*/\eta$.
8. Actual enthalpy at the outlet condition is $h_2 = W/\dot{m} + h_1$.
9. Calculate the actual outlet temperature with an EOS for a known h_2, P_2, and composition.

Computer simulations

This study used several HYSYS[5] software simulations to show the effect of feed-gas molecular weight on centrifugal compressor performance.

Table 1 lists the gas mixture compositions used in the simulations. The mixtures have molecular weights ranging from 17.38 to 23.17 kg/kmol (lb_m/lb_{mole}), corresponding to 0.60-0.80 relative densities.

The simulations investigated two centrifugal compressors with compressor characteristics curves shown in Fig. 1. These curves were supplied to the simulation software.

Three cases were simulated:

1. Low-pressure compressor with variable feed rate.
2. Low-pressure compressor with variable speed.
3. Intermediate-pressure compressor with variable feed.

Case 1

The low-pressure compressor with variable feed rate simulation used a 700-kPa fixed inlet pressure, 35° C. temperature, and 15,000-rpm speed and varied the feed-gas relative density from 0.60 to 0.80 in 0.05 increments.

To maintain the outlet pressure, the simulation needed to vary the feed flow rate.

Fig. 2a shows the process flow diagram and Fig. 3 shows the simulation results for 2.0 and 2.5 compression ratios. The case used the PR EOS for calculating the thermodynamic properties.

Fig. 3a indicates that as the relative density decreases, the flow rate must decrease. Note, for the 2.5 compression ratio case, the simulation could not obtain convergence for 0.65 and 0.60 relative densities because the simulation had

Gas mixture composition

Table 1

Component	Relative density/Mole fractions Gas 1	Gas 2	Gas 3	Gas 4	Gas 5
Methane	0.9291	0.8900	0.8320	0.7800	0.7490
Ethane	0.0256	0.0515	0.0880	0.1050	0.1010
Propane	0.0197	0.0365	0.0420	0.0650	0.0720
i-Butane	0.0049	0.0070	0.0110	0.0150	0.0240
n-Butane	0.0049	0.0070	0.0110	0.0150	0.0240
i-Pentane	0.0079	0.0040	0.0080	0.0100	0.0150
n-Pentane	0.0079	0.0040	0.0080	0.0100	0.0150
Relative density	0.60	0.65	0.70	0.75	0.80

reached the surge limit.

For the same case, Fig. 3b shows the required power as a function of relative density. Because the flow rate decreases with decreasing relative density, the required power also decreases. This is consistent with Equations 1 and 2 because power is directly proportional to flow rate.

Fig. 3c shows the variation of polytropic head as a function of inlet actual volumetric flow rate. Note that this figure indicates the influence of relative densities on compressor performance.

Case 2

In the low-pressure compressor, variable-speed case, as in Case 1, for a fixed 700-kPa inlet pressure, 35° C., and mass flow rate of 1,000 kmol/hr, the simulation varied feed-gas relative density from 0.60 to 0.80 in 0.05 increments.

To maintain the outlet pressure, the simulation needed to vary compressor speed. Fig. 2b shows the process flow.

Figs. 4a-4b shows the simulation results for 2.0 and 2.5 compression ratios. In addition to the results with the PR EOS, the diagram also shows the results obtained with the Benedict-Webb-Rubin-Starling (BWRS) EOS.[6]

The difference in the results of these two EOS methods is negligible.

As shown in Fig. 4a, as the relative density increases, the compressor speed decreases. As relative density or molecular weight increased, however, the required power increased (Fig. 4b). This is also consistent with Equation 2 in which power is directly proportional to the average compressibility factor, and the compressibility factor, in turn, is proportional to the gas molecular weight. Figs. 4c and 4d show that polytropic efficiency and head decrease with relative density.

Case 3

In the intermediate-pressure compressor, variable-feed rate case, as in Case 1, for a fixed 2,137-kPa inlet pressure, 31.1 C. , and 9,402 rpm, the simulation varied feed-gas relative density from 0.60 to 0.80 in 0.05 increments. To maintain the outlet pressure, the simulation varied the feed flow rate. Fig. 2a shows the process flow.

Fig. 5 shows the simulation results for 2.31 and 3.16 compression ratios. Note that for the 3.16 compression ratio and 0.60 relative density, the simulation could not converge because flow approached the surge limit. The reference point at 0.72 relative density in Fig 5 is from the compressor manufacturer's actual test data. Note that the computer simulated results matched closely with the actual test data.

Results

A summary of the results is as follows:

- For the same feed condition, compression ratio, compressor speed, flow rates must be decreased as the relative density decreases.
- For the same feed condition, compression ratio, compressor speed, as the relative density increases, flow rates can be increased which results in more power consumption.
- For the same feed condition, compression ratio, compressor speed, as relative density decreases, flow rates must be decreased and will approach the surge limit.
- For the same feed condition and rate, and compression ratio, compressor speed decreases with molecular weight but as expected, the power requirement increases.

The PR EOS and BWRS EOS produced the same simulation results. ✦

References

1. Campbell, J.M., Gas Conditioning and Processing, Vol. 2, the Equipment Modules, 8th Edition; Norman, Okla.: Campbell Petroleum Series, 2001.

2. Maddox, R.N., and Lilly, L.L., Gas Conditioning and Processing, Vol. 3: Advanced Techniques and Applications, 2nd Edition, Norman, Okla.: John M. Campbell & Co., 1990.

3. Soave, G., "Equilibrium Constants from a Modified Redlich-Kwong Equation of State," Chemical Engineering Science, Vol. 27, 1972, p. 1,197.

4. Peng, Y.D., and Robinson, D.B., "A New Two-Constant Equation of State," Ind. Eng. Chem. Fund., Vol. 15, No. 59, 1976.

5. ASPENone, Engineering Suite, HYSYS Version 2006, Cambridge, Mass.: Aspen Technology Inc., 2006.

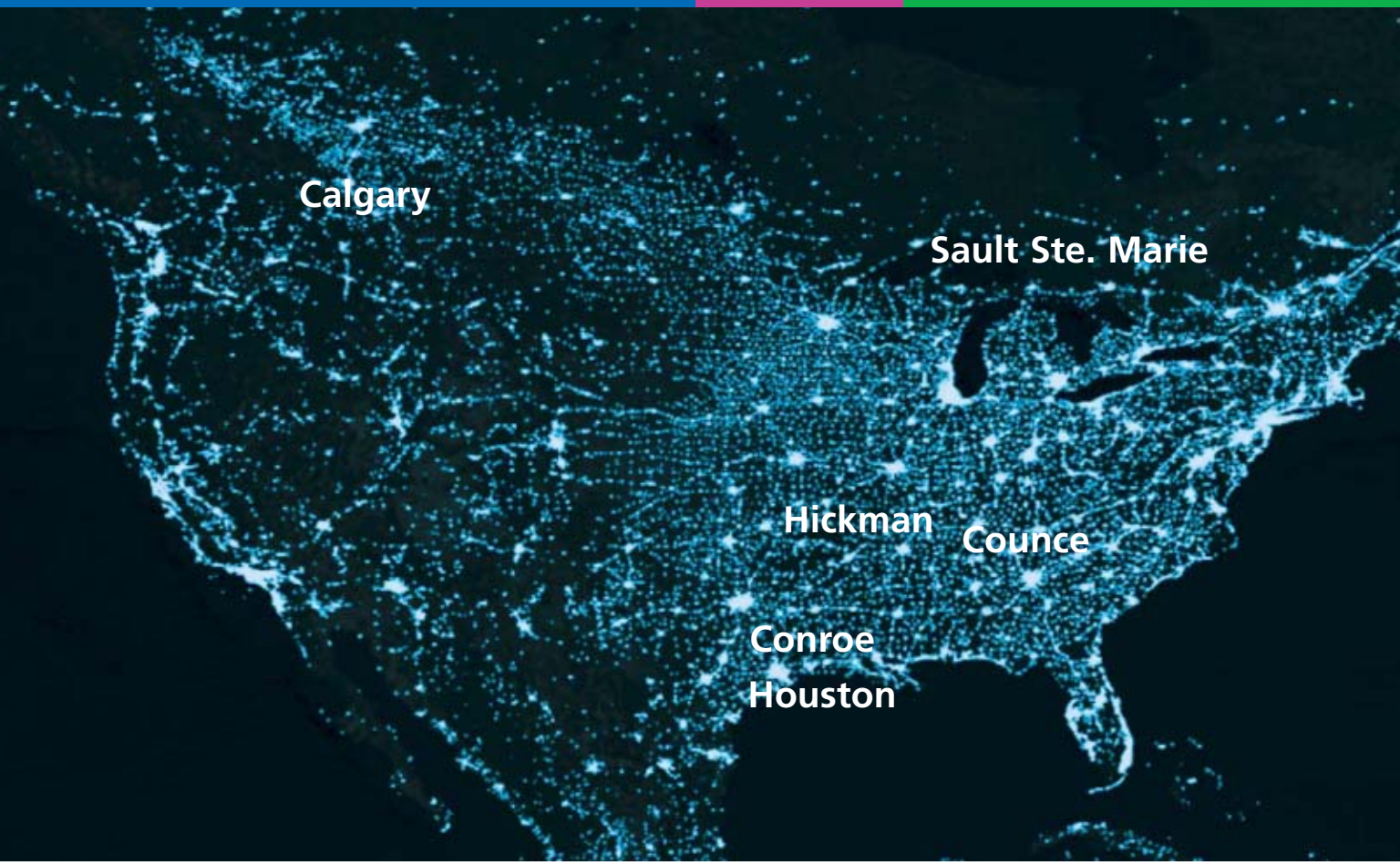
6. Starling, K.E., and Powers, J.E., "Enthalpy of mixtures by modified BWR equation," Ind. Eng. Chem. Fundam., Vol. 9, No. 4, 1970, p. 531.

The authors

Mahmood Moshfeghian (mahmoodm@jmcampbell.com) is a consultant and instructor at John M. Campbell & Co., Norman, Okla. Before joining JMC, he was professor of chemical engineering at Shiraz University, Iran, where he served as department head and associate dean of research in the college of engineering. He was previously professor of chemical engineering at the University of Qatar and a senior research scientist at the Kuwait Institute for Scientific Research. Moshfeghian holds BS, MS, and PhD degrees in chemical engineering from Oklahoma State University. He is a member of AIChE.

Larry L. Lilly (larry@jmcampbell.com) is past chairman of John M. Campbell & Co. He has more than 30 years' experience with engineering and consulting companies including design, commissioning, and start-up. Lilly holds BS, MS, and PhD degrees in chemical engineering from Oklahoma State University. He is a member of AIChE, GPSA, GPA Europe, and numerous local technical societies.

Mark Bothamley (markb@jmcampbell.com) is chief engineer with John M. Campbell & Co. His experience covers design, operation, troubleshooting, and optimization of offshore and onshore oil and gas production and treating facilities. Before joining JMC, he was with BP PLC (Amoco) for 24 years in several locations worldwide. Bothamley holds a BS in chemical engineering from Lakehead University, Thunder Bay, Ont., and a diploma in natural gas and petroleum technology from the British Columbia Institute of Technology, Vancouver.



Made in the USA and Canada.
From the oil sands to the deepwater Gulf of Mexico, Tenaris is serving the North American energy industry.

At our mills in North America, we produce a broad range of OCTG, line pipe and coiled tubing products. And now, with Hydril, we have a range of premium connections to cover the widest array of demanding applications. We're investing to streamline production processes and set new standards in product quality. We're building an integrated supply chain to make our products and services readily available with the support of a distributor network. Combined with our global strengths, Tenaris can serve better than ever all your needs, from shallow wells to the most complex offshore environments.

Tubular technologies. Innovative services.

www.tenaris.com

Tenaris

CLASSIC BIT KINEMATICS—
Conclusion

Kinematics-improved bit drills 1,000 m in hard formations

Yuri A. Palashchenko
Consultant
Moscow

The calculation method proposed in this series, using actual gear ratio for the cones, allows the designer to determine and optimize kinematic parameters of drill bits. The analysis is applicable to both steel tooth and tungsten carbide insert bits.[1 2 3 4]

This final part of this four-part series will discuss the performance of a modified roller cone bit in the Tatneft OSC oil fields as compared with other bits.

Earlier parts of this series covered roller cone bit design analysis with teeth of equal and varied pitch, and the interaction of bits with the well bottom during pure rolling.

Slip value

It is possible to increase the cone cutters' slip value for soft-formation bits and to decrease this value to a minimum for hard, abrasive formation bits, and even to create a true rolling rock bit, in which cone cutter elements interact with the hole bottom without any slip.

The results of the work presented in this series can be used to design and optimize roller cone bits and analyze their performance under different drilling conditions.

This article reviews the performance of one of the jet roller cone bit models tested in Russia. The Challenger-type, 8½-in. CH55MRS bit (IADC code 637Y), with sealed oil-filled bearings, was designed to drill hard, abrasive formations. Tatneft Open Stock Co. (OSC) tested the bit (Fig. 1) widely in several different oil fields.[5]

Bit design

The 8½-in. CH55MRS bit cutting structure consists of hard-alloy hemispherical heel teeth combined with tapered teeth of the second rows. The outer end of the cones is reinforced with two rows of hard-alloy hemispherical teeth. The bit legs are protected by hard-facing on shirttail and the leading edges and by rows of hemispherical tungsten carbide inserts that act as roller gaugers. The sealed oil-filled journal bearing of the bit comprises silver-plated floating elements. The recommended WOB is in the range of 13-23 tonnes at 50-250 rpm.

The design of the 8½-in. CH55MRS bit was motivated by test results from an 8½-in. ETD55-type bit (IADC code 637Y) conducted in 2002 by the Almetyevskoye drilling department of Tatneft OSC. Although test results were positive (715 m in 65.1 hr at ROP 11 m/hr), engineers observed premature wear of the cone heel rows while the bit bearing remained in operable condition (Fig. 2).

This wear pattern during drilling of hard abrasive formations such as experienced in Tatarstan is common among roller cone bits. Fig. 3 shows a dull bit from another manufacturer after drilling 539 m in 48.7 hr at ROP 11.1 m/hr in the Berezovskoye field by Tatneft's Almetyevskoye drilling department.

Having reinforced the cone gauge part of the bit, according to Equation 53 cited earlier in Part 3 (OGJ, Feb. 25, 2008, p. 40), a US-based drill bit manufacturer developed the 8½-in. CH55MRS type bit design, which was tested by Tatneft's Almetyevskoye and Aznakayevskoye drilling departments in June-December 2003.

Bit performance

Bit no.	Bit serial no.	Well no.	Area	Depth, m	Meterage, m	Time, hr	ROP, m/hr
1	191084	30005	V.Suleyevskaya	1,042-1,350	308	32.5	9.5
	-*-	-*-	-*-	1,430-1,643	213	20.0	10.6
	-*-	24594	Aznakayevskaya	1,096-1,350	254	30.0	8.4
	-*-	-*-	-*-	1,350-1,651	301	25.0	12.0
	-*-		Total		1,076	107.5	10.0
2	191104	34015	Chishminskaya	1,300-1,767	467	46.5	10.0
	-*-	30419	Alkeyevskaya	1,022-1,558	536	53.0	10.8
	-*-		Total		1,003	99.5	10.0
3	191102	24744	Aznakayevskaya	1,262-1,719	457	46.0	9.9
	-*-	24832	Aznakayevskaya	1,187-1,684	497	55.0	9.0
	-*-		Total		954	101.0	9.4
4	191103	12024	Sarmanovskaya	1,295-1,371	436	42.0	10.4
	-*-	40100	Tumutukskaya	1,193-1,611	418	75.0	5.6
	-*-		Total		854	117.0	7.3
5	191083	11367	Onbiyskaya	310-1,000	690	59.5	11.6
	-*-	-*-	-*-	1,509-1,743	234	22.5	10.4
	-*-	-*-	Total		924	82.0	11.2

This Challenger-type, 8½-in. CH55MRS (IADC code 637Y) jet roller cone bit has sealed oil-filled bearings and is used for drilling hard abrasive formations (Fig. 1).

The cone heel rows exhibited premature wear while the bit bearing remained in operable condition (Fig. 2).

A bit from another manufacturer was dull after drilling 539 m in 48.7 hr at ROP 11.1 m/hr in the Berezovskoye field, Tatarstan (Fig. 3).

This 8½-in. CH55MRS bit, No. 191084, made 521 m of hole in 52.5 hr in Well No. 30005 in the Vostochno-Suleyevskaya area (Fig. 4).

Test sites, horizons

Fifteen 8½-in. CH55MRS bits were used to drill directional wells in a Devonian section (from Upper Carbon to the Pashiysky horizon) in 13 Russian fields: Abdrakhmanovskoye, Onbiyskoye, Zay-Karatayskoye, Minibayevskoye, Novo-Yelkhovskoye, T-Kandizskoye, Aznakayevskoye, Sarmanovskoye, Alkeyevskoye, Chishminskoye, Leninogorskoye, Vostochno-Suleyevskoye, and Tumutukskoye.

The bits were tested while drilling the 310-2,030-m thick section in all stratigraphic horizons ranging from the surface casing to total depth. The stratigraphic horizons included the Upper Carbon, Myachkovsky, Podolsky, Kashirsky, Vereysky, Bashkirsky, Namyursky, Serpukhovsko-Oksky, Tulsky, Carboniferous, Turneysky, Verkhnefamensky, Nizhnefamensky, Verkhnefransky, Mendimsky, Domanikovy, Shugurovsky, Kinovsky, and Pashiysky.

For the most part, the geological profile includes tight and hard, abrasive limestones and dolomites, except for the Vereysky, Carboniferous, Kynovsky, and Pashiysky horizons that include argillites, siltstones, and sandstones.

Equipment

Tatneft drilled 24 wells using the

The same bit as shown in Fig. 4, after its second run in Well No. 24594 in the Aznakayevskaya area, after drilling an additional 555 m in 55 hr. In total, this bit penetrated 1,076 m in 107.5 hr at an average ROP of 10 m/hr (Fig. 5).

This 8½-in. CH55MRS bit, No. 191103, made 436 m of hole in 42 hr in Well No. 12024 in the Sarmanovskaya area (Fig. 6).

The same bit as shown in Fig. 6, after its second run in exploratory Well No. 40100 in the Tumutukskaya area, after making an extra 418 m of hole in 75 hr. In total, the bit penetrated 854 m of hole in 117 hr in two runs at an average ROP of 7.3 m/hr (Fig. 7).

The 8½-in. CH55MRS bit No. 191103 is shown at left after making 854 m of hole in 117 hr. A corresponding bit, produced by another manufacturer, is shown with diamond inserts at the outer end of the cones (right) after drilling 868 m in 82.2 hr in the Aznakayevskoye drilling department area at the average ROP of 10.5 m/hr (Fig. 8).

БУ-75-БрЭ drilling rig, БРН-1 mud pumps, and four downhole motors:

- Д5-172М (100-110 rpm).
- Д2-195 (100-110 rpm).
- ДВ-172 (200-240 rpm).
- ДВ-176 (200-240 rpm).

Process water was used for the drilling fluid and rotary drilling with clay mud system was used in four wells.

The bottomhole assembly (BHA) included:

- 8½-in. CH55MRS bit with three 12.7-mm jet nozzles.
- Positive-displacement motor (PDM).
- Float collar and 165 mm × 100 m drill collars.
- 127 × 9.3 mm ТБПК drill pipes.

The drilling parameters included:

- WOB = 12-17 tonnes.
- Circulation rate when drilling with PDM = 30 l./sec. (1,000 l./min.), when drilling in rotary mode = 15 l./sec. (900 l./min).
- Rotary speed when drilling with PDM = 100-240 rpm, when drilling in rotary mode = 65 rpm.
- Manifold pressure = 8-10 MPa, when drilling in rotary mode = 4-5 MPa.

Operations

One advantage of drilling with the 8½-in. CH55MRS-type bits was the opportunity to reuse. Among the 15 used bits, only four were worn out in a single run in one of the wells. In two successive wells, ten 8½-in. CH55MRS bits were run twice. Also, bit No. 191083 was used twice in well No. 11367 in the Onbiyskaya area to drill the depth intervals 310-1,000 m and 1,509-1,743 m. In total, the bit drilled 924 m in 82 hr, at an ROP of 11.3 m/hr.

As a rule, after the first bit run (drilling about 400-600 m in 30-60 hr), the 8½-in. CH55MRS-type bits remained practically unworn and were reused, achieving 800-1,000 m per bit.

Fig. 4 shows the 8½-in. CH55MRS bit No. 191084 after making 521 m of hole in 52.5 hr in well No 30005 in the Vostochno-Suleyevskaya area. Fig. 5 shows the same bit after its second run in the well No. 24594 in the Aznakayevskaya area where it drilled 555 m in 55 hr. In total, this bit penetrated 1,076 m in 107.5 hr at an average ROP of 10 m/hr.

Fig. 6 shows the 8½-in. CH55MRS bit, No. 191103 after it drilled 436 m of hole in 42 hr in well No. 12024 in the Sarmanovskaya area. The same bit appears in Fig. 7 after its second run in exploratory well No. 40100 in the Tumutukskaya area, where it made an extra 418 m of hole in 75 hr.

In total, the bit penetrated 854 m of hole in 117 hr in two runs at an average ROP 7.3 m/hr. It should be taken into account that during the second run of the bit in well No. 40100, the drilling fluid was a natural water suspension that contained formation fluids including hydrogen sulfide.

The test results show that the average depth drilled by each 8½-in. CH55MRS-type bit was 757 m during an average drilling period of 95.8 hr. The average ROP was 7.9 m/hr.

The 8½-in. CH55MRS-type bits performed well when drilling both with low and high-speed downhole motors.

Also, it is important to note that drilling with the 8½-in. CH55MRS bits was preceded by first drilling out the 70-120-m thick cement plug in each well. During reuse of the bit, the total thickness of the drilled-out cement was 300 m.

The 8½-in. CH55MRS bit No. 191083 is shown at right after making 690 m of hole in 59.5 hr at ROP 11.6 m/hr using the high-speed (240 rpm) positive-displacement downhole motor in the Almetyevskaya drilling department area. A corresponding bit, produced by another manufacturer (left), drilled 592 m in 52 hr in the same area at ROP 11.4 m/hr using the low-speed (100 rpm) downhole motor (Fig. 9).

The wear on the cutting structure (bit gauge loss) of the 8½-in. CH55MRS bit No. 196982 was about 1 mm (Fig. 10).

Wear performance

Examination of the used bits confirmed that three of them had failed due to bearing wear and the other 12 bits failed due to cutting structure wear. This suggests that in order to improve the performance of the 8½-in. CH55MRS bits it would be necessary to optimize the BHA and the drilling fluid's circulation rate. This would adjust the energy characteristics of the downhole motors to the operational resource of the bit.

Table 1 shows the typical performance data of five 8½-in. CH55MRS bits.

Tatneft's Aznakayevskoye drilling department ran the first four bits using the ДЛ5-172 downhole motor at 100-110 rpm. The first bit, No. 191084, was run through the last depth interval, 1,350-1,651 m, using the ДЛВ-172 high-speed positive displacement downhole motor at speeds reaching 240 rpm.

The fifth bit, No. 191083, was run in the Almetyevskoye drilling department area with the ДЛВ-176 high-speed positive displacement downhole motor at speeds reaching 240 rpm.

The bearings of all five bits remained fully operable.

The gauge loss of the tested bits was as follows:

- No. 191084—3 mm after making 1,076 m of hole and 800,000 revolutions.

• No. 191104—0.5 mm after 1,003 m of hole and 600,000 revolutions.

• No. 191102—1 mm after 954 m of hole and 600,000 revolutions.

• No. 191103—1 mm after 854 m of hole and 700,000 revolutions.

• No. 191083—2 mm after 924 m of hole and 1,100,000 revolutions.

Comparisons

Fig. 8 shows two bits used to drill in the Aznakayevskoye drilling department area. At left, the 8½-in. CH55MRS bit No. 191103 after making 854 m of hole in 117 hr and a corresponding bit produced by a different manufacturer, with diamond inserts at the outer end of the cones, at right, after drilling 868 m in 82.2 at an average ROP of 10.5 m/hr.

Despite the diamond protection of the bit cone gauge, the gauge loss of the bit shown at right was 7 mm while that of bit No. 191103 (at left) was only 1 mm.

Another comparison in Fig. 9 shows two bits used the Almetyevskaya drilling department area. The 8½-in. CH55MRS bit No. 191083 is shown at right after making 690 m of hole in 59.5 hr at ROP 11.6 m/hr using a high-speed positive displacement downhole motor (240 rpm). The bit at left, produced by another manufacturer, drilled 592 m in 52 hr in the same area at ROP 11.4 m/hr using a low-speed downhole motor (100 rpm).

Note that bit No. 191083 was used to make additional hole with a high-speed positive displacement downhole motor (240 rpm) and drilled, in total, 924 m in 82 hr at an average ROP 11.2 m/hr.

Successful test results with the 8½-in. CH55MRS bits in the Almetyevskaya and Aznakayevskaya drilling department areas contributed to Tatneft's decision to use these bits across a wide number of fields.[5]

Currently, Tatneft uses these bits to drill directional and horizontal wells with positive-displacement downhole motors and geared turbodrills (type ТРШ-195).

The 8½-in. CH55MRS bit No. 196982 is an example of drilling consecutive wells with a high-speed downhole motor (ДВ-172) and a geared turbodrill (ТРШ-195). This bit was used in three runs in well No. 2410 in the Iskrinskaya area of the Aznakayevskoye drilling department and drilled 1,017 m in 142 hr at an average ROP 7.2 m/hr:

• Hole section 387-646 m; 259 m in 31.5 hr at ROP 8.2 m/hr; ТРШ-195.

• Hole section 646-687 m; 41 m in 8 hr at ROP 5.1 m/hr; ДВ-172.

• Hole section 687-1,404 m; 717 m in 102.5 hr at ROP 7 m/hr; ТРШ-195.

Fig. 10 shows the wear of the cutting structure of the 8½-in. CH55MRS bit No. 196982. The bit gauge loss was in the range of 1 mm. The bearing remained in operable condition.

Based on the successful tests and high performance, Tatneft OSC bought 500 8½-in. CH55MRS-type bits in 2004. To date, these roller cone bits have been successfully used in the Russian Republics of Bashkortostan, Komi, Udmurtia, Karelia and in the Orenburg region.

Kinematic design results

1. Analytical and experimental studies confirm that the actual gear ratio i_a for the three-cone bit cones with equally-pitched heel rows may have values shown in Equations 1-5.

2. Analytical and experimental studies confirm that the actual gear ratio i_{ak} for the three-cone bit cones with varying pitch of the heel rows is determined by the relationships shown in Equations 6 and 7.

3. The cones of the 21B-151T bit with equal pitch of the heel teeth

Equations

$i_a = i$: pure rolling of cones (1)

$i_a = i - \frac{\Delta}{Z}$: slowed-down cone rotation (2)

$i_a = i - \frac{1+\Delta}{Z}$: slowed-down cone rotation (3)

$i_a = i - \frac{2+\Delta}{Z}$: slowed-down cone rotation (4)

$i_a = i - \frac{1-\Delta}{Z}$: accelerated cone rotation (5)

where $i = \frac{D}{d}$: the gear ratio for the cones at pure rolling

D : the bit diameter, mm

d : the gauge tip diameter of the cone, mm

Z : the number of the heel teeth on each cone

Δ : the fractional part of the ratio $\frac{\pi D}{t}$, i.e., the fractional part of the rack "teeth" number

t : the pitch of each cone's heel teeth, mm

$i_{ak} = i - \frac{\Delta'_k}{Z_k} - \frac{\Delta'_{k\text{-}m}}{Z_k} - \frac{\Delta'_{k\text{-}n}}{Z_k}$; (6)

$i_{ak} = i + \frac{1-\Delta'_k}{Z_k} - \frac{\Delta_{k\text{-}m}}{Z_k} - \frac{\Delta_{k\text{-}n}}{Z_k}$ (7)

where Z_k : the number of the heel teeth for the given cone

$\Delta'_k = \frac{\Delta_k}{3}$; Δ_k : fractional part of the calculated number of "teeth" of the rack that can be rolled by the given cone on the well bottom per revolution of the bit.

$\Delta_{k\text{-}m} = Z_{rk} - Z_{am}$;

$\Delta_{k\text{-}n} = Z_{rk} - Z_{an}$;

Z_{rk} : the calculated number of the "teeth" of the rack that can be rolled by the given cone on the well bottom per 1/3 of the bit revolution.

Z_{am} and Z_{an} : the actual number of the "teeth" on the rack in the sectors rolled by the other two cones.

$Z_{am} = Z_{rm} - \Delta_m$;

$Z_{an} = Z_{rn} - \Delta_n$.

Z_{rm} and Z_{rn} : the calculated number of "teeth" on the rack that can be rolled on the well bottom by each of the other two cones per 1/3 of the bit revolution.

$Z_{rk} = \frac{\pi D}{3t_k}$; $Z_{rm} = \frac{\pi D}{3t_m}$; $Z_{rn} = \frac{\pi D}{3t_n}$;

t_k, t_m, t_n : the pitch of the heel teeth for the corresponding cone.

$\Delta'_m = \frac{\Delta_m}{3}$; $\Delta'_n = \frac{\Delta_n}{3}$;

Δ_m and Δ_n : the fractional parts of the calculated number of the "teeth" on the rack that can be rolled by each of the other two cones per revolution of the bit on the well bottom.

which is determined by the relationship iZ/k = N (where N – the integer, k – the number of bit cones) destroy the well bottom when drilling hard abrasive rock in the mode of pure rolling of their heel rows and provide a two-fold increase in depth drilled as compared to the base commercial bit.

4. The 8½-in. CH55MRS-type roller cone bits (IADC code 637Y) are highly efficient in drilling hard abrasive formations when used with low and high-speed positive-displacement downhole motors and geared turbodrills.

5. The average depth drilled by each 8½-in. CH55MRS bit in the Tatneft OSC drilling areas was 757 m. Some 8½-in. CH55MRS bits achieved meterage in excess of 1,000 m, suggesting that the analysis used to optimize this bit design was successful. ✦

References

1. Palashchenko, Y.A., "Technique of calculation of kinematic parameters for combined roller cone bit," Proceedings of Conference on Dynamics and Durability of Oil Equipment, Baku, AZINEFTECHIM, 1974.

2. Palashchenko, Y.A., "Technique of calculation of kinematic parameters for rock drill bits without offset of cones," News of Universities, Geology and Exploration, Moscow, VINITI, 1981.

3. Palaschenko, Yuri, "Rock bits with the optimal kinematics," Sixth International Symposium on the Observation of the Continental Crust Through Drilling, International Lithosphere program,, Continental Scientific Drilling Program, Paris, Apr. 7-10, 1992.

4. Palaschenko, Y.A., "Influence of rock bit kinematics on the bottom hole destruction process," poster session abstracts, First North American Rock Mechanics Symposium, the University of Texas at Austin, June 2, 1994.

5. Vakula, A., Bikchurin, T., Bikbulatov, R., Schreiber, L., and Palashchenko, Y., "1,000 m of hole and more drilled with a single Varel roller cone bit in the Tatneft OSC oil fields," Drilling and Oil magazine, June 2004, pp. 12-14.

Global crude capacity will rise nearly 11 million b/d by 2012

Global crude distillation capacity will increase 10.6 million b/d during 2007-12—9.1 million b/d of new capacity and 1.5 million b/d of capacity creep—according to a report from the International Energy Agency (IEA) entitled "Medium-Term Oil Market Report." The expansion in refining capacity will be in response to an increase in oil demand of 9.6 million b/d by 2012.

IEA feels that investment in sophisticated refinery capacity is continuing and it foresees significant improvement in refinery flexibility despite project inflation and slippage similar to that seen in the upstream sector.

Current refinery investment should increase refiners' ability to process heavy, sour OPEC spare capacity that was of little interest to them during the past few years, IEA feels. Refiners will be able to upgrade more fuel oil into lighter transportation fuels, which should improve their ability to meet demand growth in gasoline and diesel. But this will affect prices and price differentials.

If refiners can more easily meet gasoline and diesel demand, then the high differentials to crude oil are likely to decrease, the report said. Similarly, refiners' ability to upgrade the heavy end of the barrel means that large discounts needed to clear surplus fuel oil production will disappear. Differentials between light, sweet and heavy, sour crude should narrow, IEA said.

The potential for distillate markets to ease during the next 5 years would be insignificant compared to marine bunker fuels switching from fuel oil to distillate. This change would necessitate additional investment in upgrading capacity of more than that currently forecast in the study.

IEA believes that recent imbalances in product markets had a significant effect on oil market volatility and outright prices. An easing of these imbalances should therefore reduce one of the price pressures that have existed for the past few years. But it may be short-lived.

IEA's product supply forecast depends on the assumption that many large refining projects in the US will be approved in the short term and that high-cost projects slated to start up closer to 2012 are not delayed. If refining margins dip, projects with lead times of 18 months to 3 years could be delayed. These market dynamics suggest that it is unlikely that the refining industry will return to a long-term era of low refinery margins, according to IEA.

Demand

Global oil product demand will increase 1.9 million b/d/year or 2.2%/year on average, reaching 95.8 million b/d by 2012, according to IEA. Growth is due to stronger demand growth in non-Organization for Economic Co-operation and Development (OECD) countries, particularly in Asia and the Middle East, where demand will grow more than three times faster than OECD countries.

IEA expects OECD oil product demand to increase 1.0%/year on average (Fig. 1a) rising to 52.1 million b/d in 2012 from 49.6 million b/d in 2007 due to transportation fuel demand growth in North America, where consumption will grow twice as fast as in Europe or the Pacific. North America will grow at 1.3%/year on average vs. 0.7%/year for Europe and 0.6%/year for the Pacific. Consumption growth will have different regional trends (gasoline in North America, diesel in Europe, and the Pacific more evenly balanced).

North America will represent 52.7%

of total OECD demand in 2012, and 67.8% of the OECD's average volumetric annual increase. OECD North America will account for 28.7% of global oil product demand, which is modestly lower compared with 2007 (29.9%), according to IEA. By 2012, transportation fuels should account for about 65.3% of total regional demand, increasing an average of 1.4%/year.

Europe will account for 30.6% of total OECD demand in 2012, and for 21.6% of the OECD's annual average volume increase. The share of OECD Europe will lower slightly to 16.6% of global product demand in 2012, compared with 17.9% in 2007, according to IEA.

The Pacific will account for 16.7% of total OECD demand in 2012, and for 10.6% of the OECD's average annual volumetric increase. By 2012, OECD Pacific demand will correspond to 9.1% of the world's total, almost one percentage point down from 2007.

IEA expects non-OECD oil product demand to increase by an average of 1.4 million b/d/year (Fig. 1b) to 43.7 million b/d from 36.6 million b/d, or 3.6%/year during 2007-12. It will nearly surpass total oil consumption in the OECD.

Data uncertainties pose upside risks to the forecast, particularly for China, India, and the FSU. Within non-OECD countries, two regions will be major consumers in the forecast period: Asia, which will represent about half of average non-OECD incremental demand growth, and the Middle East, accounting for almost a quarter, according to IEA.

Average growth will be particularly strong in China (+5.6%/year) and the Middle East (+4.6%/year), with other non-OECD countries growing between 2%/year and 3%/year on average.

Transportation fuels will account for the bulk of demand growth worldwide, IEA reports. These fuels will represent roughly 67% of the increase in OECD consumption to 2012, and about 60% of the rise in non-OECD demand.

Demand growth

Fig. 1

Refining, product supply

IEA expects global crude distillation capacity to increase 10.6 million b/d during 2007-12, which includes 9.1 million b/d of new capacity and 1.5 million b/d of capacity creep.

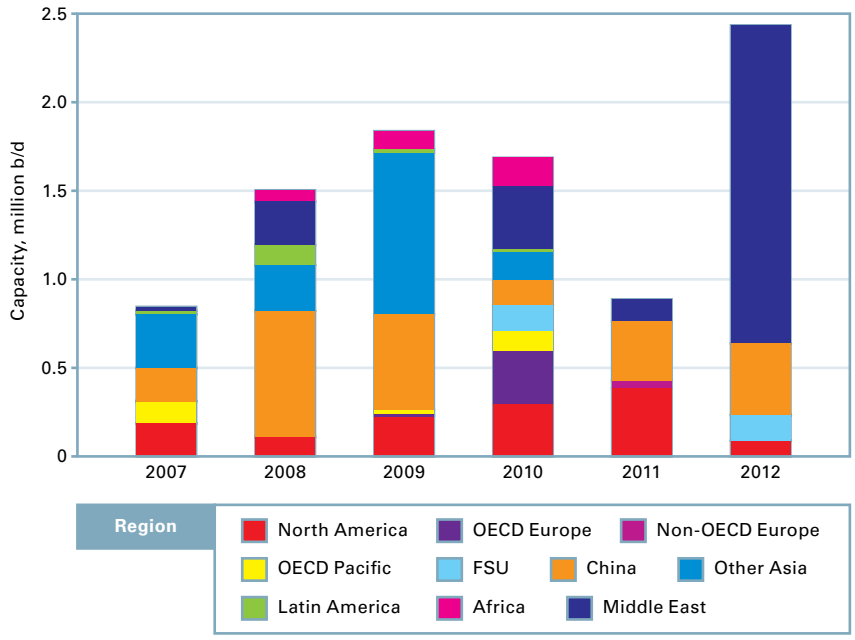
Fig. 2 shows IEA forecasts for additions of crude distillation capacity by region. The Middle East and Asia accounts for 6.7 million b/d of the expansions; refining capacity growth in these regions will exceed regional product demand. The additional capacity increases the flexibility of refiners to process existing and future crude slates, particularly the tranche of heavy, sour crude spare capacity OPEC currently holds.

IEA's projections for refining are subject to uncertainties for projects due for completion near the end of the forecast period—3.3 million b/d from a handful of large projects during 2011-12. These could experience additional delays if refinery economics deteriorate or contractor-related bottlenecks increase, or if investors believe all the biofuels targets will be achieved.

If these investments go ahead, IEA believes that the ability of refiners to expand gasoline supplies should improve significantly during the next few years, and that the potential to both process heavy sour crudes and convert fuel oil into lighter products will increase. With fuel oil discounts of $15-30/bbl

CRUDE DISTILLATION ADDITIONS

Fig. 2



relative to crude in the past few years, IEA believes there is the potential for upgrading capacity additions to tighten fuel oil and ease gasoline differentials to benchmark crudes.

The Middle East and Asia will account for 6.7 million b/d of new crude distillation capacity, according to IEA. This exceeds expected regional demand growth, and India and Saudi Arabia will develop significant export-orientated refining capacity. The Middle East will supply the marginal barrel of product to importing regions as well as the marginal barrel of crude, according to IEA.

New refineries and upgrading capacity additions (Fig. 3) will boost product supply flexibility in the medium term. IEA predicts a substantial increase in refining complexity during the next 5 years. Refiners will therefore be better positioned to meet transportation fuel demand growth, although at the expense of fuel oil.

Gasoline market tightness should ease, possibly by 2008, followed by gas oil and diesel in 2010. Jet fuel market tightness is likely to persist until 2010 unless further unwinding in the other transportation fuel appears. Fuel oil markets could tighten significantly, unless there is a shift in behavior by consumers or refiners, according to IEA.

Refinery expansion plans

IEA forecasts global crude distillation capacity to increase 10.6 million b/d by 2012, of which (Fig. 2):

- 4.0 million b/d is due to the expansion of existing refineries, mainly in Asia-Pacific and North America.
- 5.1 million b/d of growth comes from newbuild distillation capacity, largely in the Middle East, China, and other Asia (primarily India).
- 1.5 million b/d comes from capacity creep at existing refineries in OECD North America, Europe, and Asia-Pacific.

IEA's report excluded projects accounting for 6.3 million b/d of crude distillation capacity that are unlikely to materialize by 2012. Where appropriate, IEA factored in some delays to those projects in which it saw a risk of contracts being re-tendered. IEA is also concerned about the solidity of 2.4 million b/d of distillation capacity that is currently forecast to commence operations in 2012.

Large-scale upgrading capacity additions include 7.2 million b/d during the next 5 years (including coking, catalytic cracking, hydrocracking, and visbreaking). Refiners are also continuing to invest heavily in hydrotreating capacity to remove sulfur from refined products. IEA expects hydrotreating capacity to increase 8.1 million b/d through 2012. More than half of this total is to meet global lower-sulfur specifications in diesel.

IEA also expects atmospheric residue (fuel oil) hydrotreating to experience a similarly strong increase, although around 40% of the growth comes from Kuwait's al Zour project, which is slated to start up in 2012.

In OECD regions, IEA expects no new refineries, although several of the larger planned expansions are equivalent to world-class refineries. Investment aims at improving product quality, either through upgrading or hydrotreating additions, or adapting operations to handle an increasingly heavy, sour crude slate.

North American refineries constitute most of the forecast 1.8 million b/d increase in OECD crude distillation capacity and also most of the upgrading capacity (Fig. 4). Most of the expansions are in Northern US to process increasing amounts of heavy, sour Canadian crude.

In Europe, investment will focus on improving middle distillate production through the installation of upgrading capacity to convert atmospheric residue into middle distillates. Pacific growth similarly aims at improving light product yields.

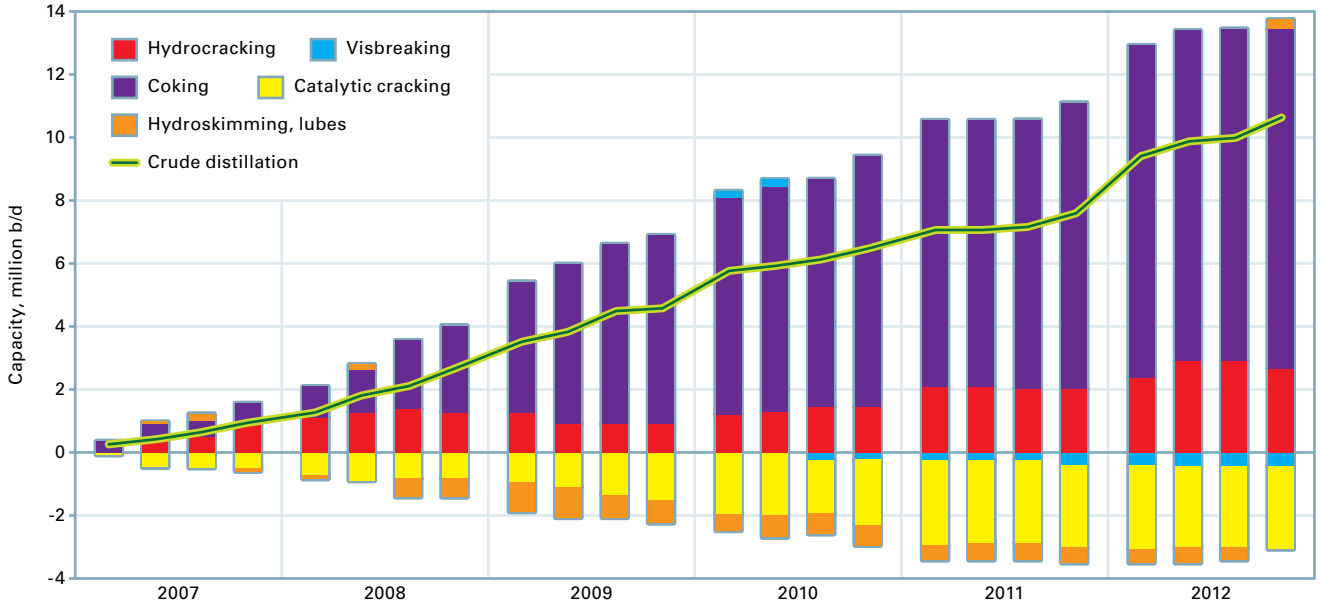
IEA's forecasts show that 51% of world refining capacity will lie in non-OECD regions by 2012, up from 48% currently. Product trade should increase, and a growing proportion of that trade will likely come from OPEC member states, particularly in the Middle East, which will leave the region to supply not only the marginal crude barrel but also the marginal product barrel.

Product quality

IEA expects that the next 5 years will

GLOBAL CUMULATIVE CAPACITY ADDITIONS*

Fig. 3



* Includes reclassification of refineries to more complex, following installation of upgrading capacity.

see a further significant tightening of product specifications in many regions. Europe will enforce 10-ppm sulfur, from the current limit of 50 ppm, in gasoline and diesel in 2009. Further tightening of the distillate market may result from the adoption of 10-ppm sulfur limit in 2010 for off-road diesel, a reduction of 99% from the 1,000-ppm limit that is in effect starting this year.

In North America, the US aims to limit benzene in gasoline to 0.6% by 2011, from 1% currently. In addition, there is a federally mandated ethanol blend for gasoline. The distillate market is adjusting to the recent introduction of a 500-ppm sulfur limit in off-road diesel, including locomotive and marine use. Further tightening of distillate-quality specifications are planned with the adoption of ultralow-sulfur diesel (ULSD) for all on-road (up from 80% currently) and off-road diesel in 2010 and locomotive and marine sectors in 2012.

Fuel oil, which has high sulfur levels (1.0-3.5% sulfur), will also face tighter specifications as a result of the International Maritime Organization's Sulfur Emission Control Area taking effect in the English Channel and North Sea in 2007. IEA feels that there is the possibility of their introduction to the Mediterranean and US West Coast, possibly as early as 2010. Overall, the proposed fuel-quality changes will necessitate further refinery investment.

North America

Despite the removal of some forecast capacity additions, North America remains a significant source of capacity growth. IEA forecasts that refiners will add 1.3 million b/d of crude distillation capacity through new projects during 2007-12. This forecast includes many large-scale expansion projects that IEA assumes will be approved in the next year.

The most notable expansion is the Motiva Enterprises LLC (a Shell-Saudi Aramco joint venture) 325,000 b/d expansion of its Port Arthur, Tex., refinery. IEA did not include Chevron Corp.'s 200,000 b/d expansion of its Pascagoula, La., refinery because a final investment decision has not been made, suggesting it may not start operations before 2013.

US crude distillation capacity will grow 1.1 million b/d between 2007 and 2012, according to IEA. The four largest projects, all due to start up in 2010-12, contribute 700,000 b/d. Of these projects IEA was only able to confirm that Marathon Oil Corp.'s 180,000 b/d Garyville, Ind., expansion received final investment approval, which indicates that the remaining 500,000 b/d of capacity may be delayed. Rising project costs have forced several refiners to defer, or scale back, expansion plans to meet capital budgets.

IEA is also forecasting substantial investment in North American upgrading capacity (Fig. 4), mostly in new coking and hydrocracking units. North American refiners will continue to invest in substantial amounts of diesel, gasoline, and kerosine hydrotreating capacity through 2012. IEA expects more than 500,000 b/d of new coking capacity centered on refineries in Northern US states and Canada.

Europe

European refinery investment plans focus on improving distillate and reducing fuel-oil production due to regional production-demand imbalances. IEA forecasts net crude capacity additions of

300,000 b/d, as well as new upgrading capacity, particularly for coking and hydrocracking. Due to slow demand growth, IEA feels that large-scale expansion of European crude distillation capacity is unlikely in the medium term.

Hydrocracking investment in Europe will increase capacity by 360,000 b/d through 2012, with a further 60,000 b/d of residue hydrocracking. Most capacity additions are in the Mediterranean post-2009.

Similarly, the addition of 200,000 b/d of coking capacity is largely due to projects in Spain, plus the planned expansion of MOL Group's Szazhalombatta, Hungary, refinery and the upgrade to Hellenic Petroleum's Elefsis, Greece, refinery. IEA also included the likely installation of a coker at ConocoPhillips' Wilhelmshaven, Germany, refinery in 2012.

OECD Pacific

IEA is forecasting crude capacity to increase 284,000 b/d through 2012. The balance of the increase is in Japan, with 124,000 b/d of additional distillation capacity, of which 94,000 b/d is from new condensate splitters. The rest of the growth comes from expansion of the New Zealand Refining Co.'s Marsden Point Refinery by 35,000 b/d, and a 50,000 b/d condensate splitter in Australia, both due to commence operations in 2010.

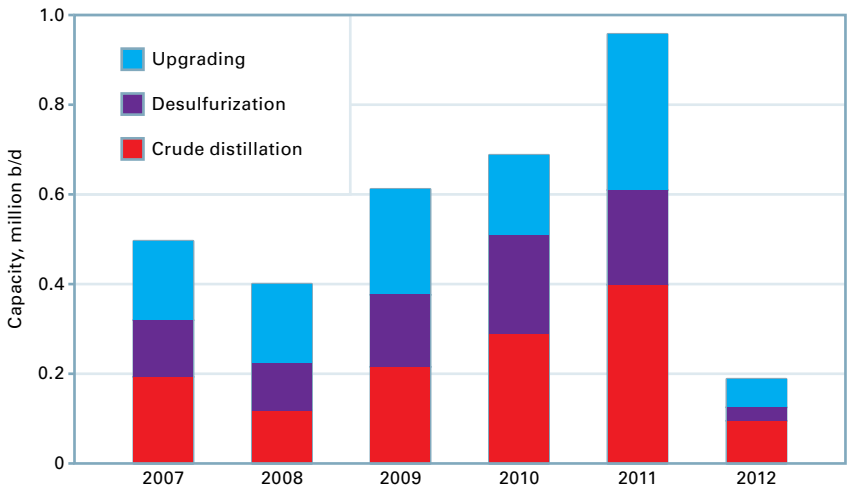
China

China contributes more than any other country to refinery growth. IEA predicts that grassroots refineries and the expansion of existing plants will contribute 2.3 million b/d of additional crude capacity before yearend 2012 (Fig. 5).

Sinopec dominates growth with 1.3 million b/d capacity in new projects, including up to 360,000 b/d in joint ventures, according to IEA. Chinese refineries, which already boast some of the highest upgrading-to-distillation ratios in the world, will continue to invest in coking and hydrocracking capacity, adding more than 500,000 b/d of

North America capacity additions

Fig. 4



both, as they seek to maximize distillate production for transportation and naphtha for petrochemical feedstock.

IEA similarly expects hydrotreating capacity to increase by more than 2 million b/d, 60% of which is aimed at diesel production, ahead of tighter product specifications coming into effect in 2008 and 2010.

In 2008, refining capacity growth will increase, with Sinopec's new 200,000 b/d Quindao and China National Offshore Oil Corp.'s 240,000 b/d Huizhou refineries starting up. Additionally, expansions at five other refineries will add 260,000 b/d of complex refining capacity.

Growth in 2009 will result from:

- Petrochina Co. Ltd.'s 200,000-b/d Quinzhou refinery in the Guangxi region.
- The 130,000-b/d expansion of Sinopec's Maoming refinery.
- The 160,000-b/d expansion of the Fujian refinery for Sinopec, ExxonMobil Corp., and Saudi Aramco.
- The 46,000-b/d expansion of Petrochina's Fushun refinery.

IEA expects that growth will slow to 150,000 b/d in 2010, with the expansion of Sinopec's 100,000 b/d Tianjin refinery. In 2011-12, China will have 740,000 b/d of new refining capacity, in four or five additional projects, but actual capacity additions will depend on China's demand growth in the intervening period and its consequential product supply requirements. Any slowdown in demand growth will likely result in lower capacity additions than forecast.

Other Asia

IEA predicts that other Asian countries will contribute about 1.6 million b/d of new crude distillation capacity by 2012. Indian projects account for 1.4 million b/d of new crude distillation of the region's capacity increase.

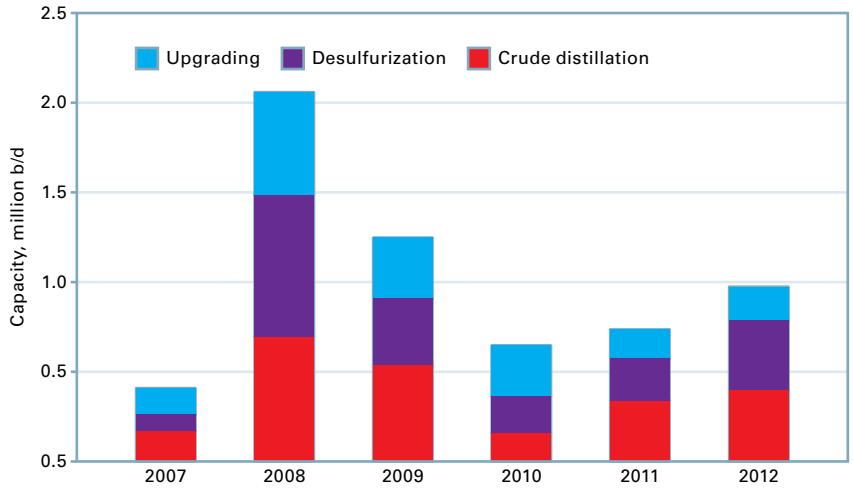
Malaysia, Thailand, and Vietnam will start up 270,000 b/d of new crude capacity by 2012.

Reliance Petroleum Ltd.'s 580,000-b/d Jamnagar refinery is the largest addition in the region and will commence operations in 2008. IEA consequently included it in forecasts from 2009. The reported size of upgrading capacity suggests this refinery will run heavy, sour crude, and IEA expects the refinery to be capable of making 10-ppm sulfur diesel and gasoline for markets in Europe and North America. Additional projects in India will add another 800,000 b/d of crude capacity during 2007-12.

IEA included Bharat Petroleum's 120,000 b/d Bina refinery in 2010, and new crude distillation due to upgrading capacity expansions at Indian Oil Corp.'s Haldia, Mumbai, and Chennai refiner-

CHINA CAPACITY ADDITIONS

Fig. 5



ies. Oil and Natural Gas Corp.'s Mangalore refinery expansion to 300,000 b/d in 2009 and the second phase of Essar's Vadinar expansion in late 2008 are included in IEA's forecast.

Middle East

The Middle East first appears to be the largest single region of refining capacity growth, according to IEA. The forecast, however, now relies on a significant portion of the region's capacity coming on stream in 2012.

The majority of the 2.0 million b/d of capacity will come on stream in 2012. Any further delays could result in a significant shortfall, even on a global basis, of newbuild refinery capacity before 2012.

IEA expects Saudi Arabian refinery additions of 975,000 b/d through 2012. Of this total, IEA expects 800,000 b/d to start up in 2012. This includes Total's 400,000 b/d Jubail refinery and the 400,000 b/d ConocoPhillips Ras Tanura refinery, which is more likely to start in 2013 than 2012.

For Iran, IEA expects the phased expansion of 360,000 b/d of condensate splitters to start up between summer 2010 and summer 2011. Furthermore, IEA expects 190,000 b/d of expansions at the Arak, Lavan, and Isfahan refineries, tied into significant increases in refinery complexity, during 2009-12.

IEA expects Kuwait's 615,000-b/d refinery at al-Zour to start up in fourth-quarter 2012. The report also expects a delayed start-up of the planned expansion of the Mina Abdullah refinery, to 2013, because it is a more complex and time-consuming undertaking.

Africa

The study sees crude distillation expansions of 313,000 b/d in Africa, largely from projects in the northern and eastern countries. Investment in upgrading capacity remains limited and new hydrotreating capacity is similarly sparse. IEA says that South African refiners have recently completed some investments, but prospects of more stringent national quality specifications early next decade may generate more investment projects.

FSU

The expansion of existing Russian refineries dominates the region's growth. Planned investments will increase light product yields and improve product quality. Significant additions to catalytic cracking and hydrocracking capacity, plus more limited investment in coking and visbreaking capacity should reduce fuel-oil production and boost gasoline and distillate production through to 2012, according to IEA.

Tatneft's $4.8 billion plan for a new 140,000 b/d full-conversion refinery at Nizhnehamsk in 2010-11 represents the only grassroots investment. Rosneft's 140,000-b/d expansion of the Tuapse refinery is the only large-scale refinery expansion project included in IEA's forecasts.

Latin America

Petrobras is planning to upgrade seven of its refineries, which will increase the ability to handle its domestic heavy, sour crude production. Some incremental crude distillation is expected to accompany the addition of 130,000 b/d of new coking capacity through 2012. Despite the progress evident at many of Petrobras's projects, IEA remains skeptical that the planned 200,000-b/d Abreu e Lima refinery in Pernambuco state, a joint venture with PDVSA, will be completed before 2012, with some reports suggesting a 2014 start date.

Product supply

New refineries starting up in the next 5 years are more complex than existing refineries, on average, according to the study. They will therefore produce a higher percentage of light products and less fuel oil. Significant upgrading capacity additions will increase demand for heavy, sour crudes that are currently priced at a significant discount to light, sweet crudes.

Gasoline

IEA expects the recently tight gasoline market to start to ease soon, with increased flexibility to expand supplies (including ethanol) increasing during 2007-12. The increased supply potential is most significant in the Atlantic Basin, where the structural surplus in European gasoline supply will persist; improving the region's potential to meet US import requirements through 2009. By 2012, US refiners will start to close some of the gap in domestic supplies.

IEA expects the Middle East to remain a net importer of gasoline until 2012. In the meantime, much depends on the outcome of Iran's plans to invest

in FCC and condensate splitting capacity while implementing demand restraint measures. Saudi Arabia and Kuwait's capacity expansions in 2012 will rebalance regional gasoline production to demand.

In Latin America, Brazilian refining investments in upgrading capacity will increase capacity for heavy domestic Marlim crude. The net impact of these coking additions to the gasoline pool is limited because the refining of heavier crude will cut naphtha yields from crude distillation, but boost supplies of FCC and coker naphtha, according to IEA.

Other Asian countries will become significant exporters of gasoline, mainly due to India's planned refining additions. The increase in potential supplies will possibly increase exports to North America, the Middle East, or Africa, given that IEA expects the OECD Pacific to also become more balanced by 2012.

Gas oil, diesel

The gas oil-diesel market should remain tight in the short-term due to strong demand growth, but could ease from 2009 as higher global crude distillation capacity and investment in hydrocracking capacity come on line, according to the report. Some regions, however, particularly Europe, will remain importers.

The European refining system is, according to IEA's analysis, maximizing diesel and gas oil production from distillation and upgrading units to meet transport and heating oil demand. Consequently, IEA forecasts diesel production to increase due to additional hydrocracking and coking capacity, but a more significant increase in production will not be achieved unless crude runs rise significantly.

North American demand growth will accelerate during 2007-12 and, despite recent improvements in distillate yields, the region will likely become a net importer of gas oil and diesel if yields do not improve. There is some flexibility within the US refining system, however, to bolster distillate supplies at the expense of gasoline (particularly given the growth in ethanol supplies), implying that price differentials between gasoline and diesel will be closely linked, according to IEA.

Overall, hydrocracking additions and increased runs will cover the growth in gas oil and diesel demand, but tightening sulfur limits and increasing cetane requirements in diesel could further fragment the distillate market, reducing potential trade and supporting product cracks if insufficient desulfurization capacity additions occur.

The impact of marine bunker fuels switching from fuel oil to distillate dwarf the potential for distillate markets to ease until 2012, according to the study. ✦

Shuttle tankers offer competitive deep US gulf transport choice

Julie Wilson
Wood Mackenzie Ltd.
Houston

Petrobras' development of Cascade and Chinook fields in the US Gulf of Mexico will use a floating, production, storage, and offloading vessel in the initial phase.

The use of shuttle tankers will provide a competitive alternative to pipeline transport of crude production, even if shuttle tanker use remains generally limited. The development of Cascade and Chinook via FPSO and shuttle tanker is an important first step in establishing this type of facility in the remote, ultradeep waters of the US gulf.

This article analyzes the transportation options of a hypothetical oil discovery in a remote part of the Lower Tertiary play, comparing the costs of shuttle tanker use to paying tariffs through new and existing pipelines.

Background

Petrobras' Lower Tertiary Cascade and Chinook fields are the first US gulf fields to be developed by FPSO. FPSOs are used globally in other deepwater provinces but until recently were prohibited in the US gulf. Their use in frontier environments is sensible, especially from a transportation standpoint. Pipeline costs rise disproportionately as water depths increase, while shuttle tanker costs are insensitive to water depth and—to a certain extent—distance.

The shuttle tanker holds a cost advantage vs. pipeline when the full life of the field is considered. The advantage, however, is concentrated in the first half of a field's life. As production declines, the dedicated status of the shuttle tanker causes unit costs to increase sharply. Sharing the shuttle tanker with another FPSO-developed field would help defray these high late-life costs.

Shuttle tankers hold several other benefits vs. pipelines, not least the lower risk incurred in a frontier area since both the shuttles and the FPSO itself can be redeployed if the development proves disappointing. Other advantages include avoidance of hurricane damage and flow assurance issues, flexibility of destination, and easier maintenance and repair.

Certain barriers, however, exist to the spread of shuttle tanker use in the US gulf. The US Jones Act inflates costs and complicates operations. Stringent rules on gas use also mean gas from remote discoveries might need to be transported by gas pipeline regardless of other factors.

It remains to be seen whether other operators will follow Petrobras in FPSO and shuttle tanker deployment in the US gulf or whether pipeline companies will be convinced to keep building out the pipeline network to the new frontiers.

In 2001, the US Minerals Management Service issued an environmental impact statement approving the concept of FPSO development. This laid the regulatory foundation for its use, after which the MMS announced it would review FPSO-based development plans on a case-by-case basis. Despite this, the first application didn't occur until 2006, when Petrobras submitted it as the development concept for Cascade and Chinook, using two dedicated shuttle tankers provided by OSG.

There is still, however, no shuttle tanker fleet in the US, meaning initial FPSO developments will need to use dedicated vessels such as these, and taking advantage of the extensive existing pipeline infrastructure in the US gulf will remain an appealing development option.

Ultradeep waters

Discoveries in the Lower Tertiary play and progress toward development in the region have spurred increased drilling in the remote, ultradeep waters of Walker Ridge, Keathley Canyon, and Alaminos Canyon protraction areas. Williams plans to spend $480 million

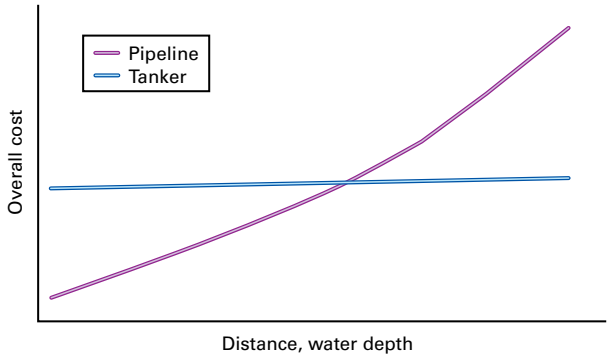
to build oil and gas pipelines to connect the Alaminos Canyon's Perdido Regional Hub to existing networks in the western gulf. No such plans currently exist for transportation infrastructure in the central gulf from the Lower Tertiary play.

Laying pipelines to discoveries in ultradeep waters (greater than 1,600 m), remote from existing infrastructure, disproportionately increases their cost. Pressure rises and temperatures drop as water depths increase, requiring thicker pipelines that use more steel and potentially more technology to insulate them. The limited number of vessels capable of installing in such water depths increases installation costs.

The cost of a shuttle tanker, by contrast, is largely insensitive to increasing water depth and distance to infrastructure, unless the distances are so great they require two shuttle tankers. Fig. 1 shows the effect of increasing water depth and distance on overall capital and operating costs for pipelines and shuttle tankers. It, however, reflects only the basic cost. It does not reflect fees or returns on investment; nor does it consider the cost differences between an FPSO and any other facility design such as a spar.

In addition to cost considerations, upstream risk remains an important consideration in remote areas of the US gulf as the Lower Tertiary remains a frontier play. A great deal of uncertainty surrounds reservoirs in Lower Tertiary discoveries, both in terms of size and long-term production performance. This uncertainty has undoubtedly played a part in Petrobras' decision to take a phased approach to developing Cascade and Chinook, with an FPSO and shuttle tankers used in the initial phase. If the reservoir proves disappointing, the FPSO and tankers can be redeployed elsewhere, keeping sunk costs to a minimum.

TRANSPORTATION COST, OFFSHORE FIELD Fig. 1



Cost comparison

Wood Mackenzie analyzed transportation options of a hypothetical oil discovery in a remote part of the Walker Ridge protraction area. The hypothetical discovery contained 200 million bbl at least 60 miles from the nearest deepwater infrastructure and more than 170 miles from shore. Analysis focused on five different pipeline options at a range of payable fees. Each option uses existing infrastructure, whether tying in to an existing deepwater pipeline or laying pipe to a continental shelf-based platform. Analysis used an assumed cost of building the pipeline(s), and the fees required to earn the pipeline builder a minimal rate of return from the fields feeding the pipeline.

Analysis compared the results of the pipeline options to the estimated cost of a shuttle tanker; basing estimates on one dedicated shuttle tanker for which the field operator paid a set day rate, plus expenses such as fuel, port charges, etc. Day-rate calculation used a range of current global shuttle tanker rates, with an additional 50-100% applied to account for the cost effects of the Jones Act. Analysis disregarded cost differences between an FPSO and any other types of facility design, as well as the possible limit on peak production and deferring of oil revenues made possible as a result of use of only one shuttle tanker.

FIELD PARAMETERS Table 1

Size	200 million bbl
Life	18 years
Peak annual average production	75,000 b/d
FPSO capacity	1 million bbl
Shuttle tanker capacity	350,000 bbl
Distance to existing infrastructure	60-120 miles

The shuttle tanker holds a clear cost advantage for the full life of the field, but the advantage changes during the field's production lifetime. Fig. 2 outlines the fee charged to the operator each year of field life, using the basis of barrels produced. The study assumes the fees charged by the pipeline operator do not change (on a real basis) and the shuttle tanker is assumed to be a dedicated vessel, with the day rate time-charter fee assumed fixed (on a real basis) for the lifetime of the field and paid every day, regardless of whether the vessel is idle or working. The operator would hope, in reality, to share the shuttle tanker with another FPSO development, thereby avoiding this late-life unit cost increase.

At the most likely fee rate, the shuttle tanker maintains its annual cost advantage vs. the pipeline until year 11 of the field's life, when declining production causes a rapid increase in unit costs. This cost profile depends highly on the field's production profile. The capacity of the FPSO and shuttle tanker would tend to flatten and extend peak production.

The cost profile described by Fig. 2 would likely render late-life production uneconomic, leading to early abandonment, an act it is unclear whether the MMS would sanction. Writing the shuttle tanker contract with higher day rates early in field life or sharing the shuttle tanker with another FPSO might mitigate this possibility.

Analysis assumed only one shuttle tanker would be employed for a single field. Given assumptions of field size, FPSO and shuttle tanker capacity, and time taken to load, unload, and travel between FPSO and port, one tanker would be sufficient. But Petrobras has

contracted two tankers, eroding some of the cost benefit compared to pipelines. Two shuttle tankers, however, would still result in a lower unit cost during the hypothetical field's first 8 years.

Given Petrobras' contract for the FPSO is only 5 years long (with a 3-year extension option), it is likely Petrobras' two shuttle tankers are a lower-cost option than a pipeline. Such a short-lived first development phase also allows the operator to avoid much of the problems of late-life, increasing unit costs.

Tanker advantages

A shuttle tanker operation enjoys a number of advantages compared to a pipeline beyond overall cost benefit in ultradeep water. The specifics of the US gulf, however, change some of the dynamics of this comparison.

- *Hurricane.* A shuttle tanker, like the FPSO itself, can move out of harm's way in the event of a hurricane or major storm. Pipeline and facility damage during the 2005 hurricane season led to long production shutdowns, expenditure running into the hundreds of millions of dollars, and some production being lost forever due to destruction of platforms.
- *Maintenance.* Repairing an ultradeepwater pipeline would be extremely costly in terms of both money and time. The limited number of vessels available that can perform repairs in extreme water depths would leave any repair subject to vessel availability. This could also slow progress on whatever project the vessel is pulled from to perform repair work. Repair or maintenance of a shuttle tanker, by contrast, simply requires dock space.
- *Ocean floor.* Hills and canyons hundreds of feet high and deep lie on the ocean floor in Walker Ridge, Keathley Canyon, and Alaminos Canyon. Navigating this terrain adds to the cost and complexity of a pipeline.
- *Flow assurance.* Falling seabed water temperature with increasing distance and water depth force field operators to consider flow assurance issues that might need additional technology to be properly addressed. Solutions might be mechanical (e.g., insulation) or chemical (e.g., hydrate inhibitor). A shuttle tanker does not have any of these issues.
- *Flexibility.* A shuttle tanker can, in theory, deliver directly to a number of destinations, allowing the operator to take advantage of price differentials or arbitrage opportunities. On the Gulf Coast, however, the shuttle tanker's draft may limit the number of ports available to it for cargo discharge. The US gulf pipeline network is also so well developed that it offers a number of different delivery options. Most US gulf crude is commingled into a recognized blend (such as Mars or Poseidon) that offers a pricing precedence, while a small cargo from a shuttle tanker of a relatively unknown crude might suffer a price disadvantage in the Gulf Coast market.
- *Frontier risk.* Building a pipeline to remote, ultradeep waters requires an investment of hundreds of millions of dollars, which is then physically static. Pipeline builders typically commit to build a pipeline based on guaranteed throughput from one or more anchor fields that will fill their pipeline until decline sets in and spare capacity opens up. The income from the anchor field usually provides a minimal return, and might only cover the cost of capital.

Incremental returns for the pipeline operator are based on the development of a production hub with a pipeline connection stimulating exploration activity and reducing the economic threshold of other prospects and discoveries in the region. In a frontier play such as the Lower Tertiary, relying on the success of future exploration is very risky. The high cost of construction, however, acts as a barrier to entry for other pipelines, creating suitably high potential rewards in a situation where there may be very few competitive alternatives to a pipeline.

A shuttle tanker-FPSO development carries much lower initial risk, since the shuttle tanker and FPSO can be redeployed elsewhere if the field's performance is disappointing. They are, however, unlikely to encourage and capture new business from other discoveries, unless these are also FPSO-based developments allowing the shuttle tanker market to reach sufficient critical mass to be run on a fleet basis.

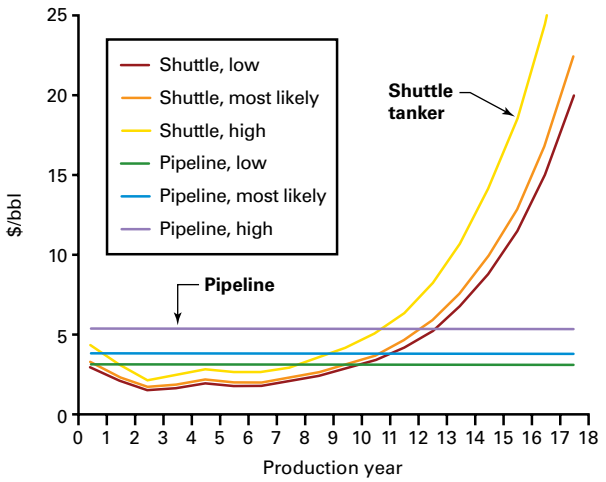
No shuttles

FPSO and shuttle tankers are long-standing development tools in many regions—both deepwater areas with little infrastructure, such as West Africa and Brazil, and relatively mature areas with existing pipelines, such as the North Sea—but have so far not been embraced by US gulf operators.

The US ban on FPSO was founded on

ANNUAL TRANSPORTATION FEES

Fig. 2



AVERAGE LIFE-OF-FIELD COST

Table 2

	Low	Most likely	High
	$/bbl		
Shuttle tanker	2.55	2.80	3.80
Pipeline	3.00	3.75	5.30

environmental concerns. But even the ruling by the MMS to begin considering FPSO applications on a case-by-case basis did not produce a rush of FPSO development plans, largely because the extent of existing infrastructure gave pipelines a cost advantage. An FPSO application will also likely face a large amount of red tape, and possibly the opposition of the general public, making it no coincidence a Brazilian company is the first to develop an FPSO plan.

The Jones Act also continues to act as a barrier to FPSO-based field developments. This legislation dates back to 1920 and was designed to protect American jobs and industry at a time of economic depression. It stipulates any ships plying their trade between US ports must be built in the US, owned and crewed by US nationals and be flagged in the US. An FPSO would qualify as a US port (although the FPSO itself would not be subject to Jones Act regulations).

The Act requires any newbuild shuttle tankers be built in one of a handful of remaining suitable American shipyards, raising implications for both the cost of the tanker and the timescale. Advances in efficiency by Asian shipyards allow them to build a ship for an estimated half the cost of an American yard and in a third of the time.

Conversion of existing Jones Act vessels might be a more cost-effective solution. They, however, are limited in number and their market is already very active. The cost savings in terms of contract day rate (time charter) may not be large, but carrying out a conversion would still be much quicker. Petrobras has chartered from OSG two conversions of newbuild product tankers, which OSG already had on order from the Aker Philadelphia shipyard. Delivery of the first is expected in the first quarter of 2010, with the second following a year later.

Progress on a number of FPSO developments in the US gulf might prompt development of a shuttle tanker fleet such as works in the North Sea, keeping costs low as specialist, third-party tanker operators manage a fleet of vessels for a number of projects and fields.

Natural gas

The economic, environmentally sound, and efficient disposal of any produced natural gas is another key issue surrounding FPSO use. Flaring is not allowed in the US gulf and gas injection is not common since reservoir pressures are high and the gas is too valuable in the US market to reinject into the reservoir. The FPSO can burn some gas as fuel, but this will likely not use up all the gas.

Petrobras plans to install a small gas export line for its Cascade-Chinook development. The economics of this line remain unclear, but it is likely its small size will reduce cost and installation issues. Gas lines also have fewer flow assurance issues than oil lines, again keeping costs down.

The use of compressed natural gas tankers might also be possible inn the future, if the technology can be commercially proven. Since FPSOs do not traditionally have space or technology for gas storage, two CNG tankers might need to alternate, allowing one to always be connected to the FPSO. ✦

The author

Julie Wilson (julie.wilson@woodmac.com), lead analyst, Gulf of Mexico research, Wood Mackenzie (Houston), leads the research team producing field-by-field analysis of the US Gulf of Mexico deep water, focused on forward-looking project and field economics. Wilson joined Wood Mackenzie in April 1999 as an analyst covering Latin America. She moved to Houston in November 2000 in an upstream consulting role. She then worked in and managed a wide variety of international consulting roles, including gas supply and market analysis, corporate strategies, country entry strategies, and competitor analysis. In August 2006 she rejoined Wood Mackenzie's research team to focus on the US Gulf of Mexico deep water. Prior to joining Wood Mackenzie, she worked for BP for 8 years in London and Aberdeen in a variety of political, commercial, and financial analysis roles focused on upstream assets. Wilson graduated from Heriot-Watt University with an honors BA in Spanish and French and from University of Strathclyde with an MSc in marketing.

Equipment/Software/Literature

New vacuum powered vessel lifter

This new high-capacity, custom battery powered vacuum lifter is designed for handling large vessels in a plant with cranes or outdoors using a forklift and boom.

The BA1-RV custom vacuum lifter features three articulated rubber suction pads that adapt to different diameters from 85 in. to 110 in. and can lift as much as 4,500 lb. It's designed for use with a crane or forklift and boom. The unit eliminates the need to weld on lifting eyes.

Incorporating a 2.2 cfm piston pump driven by a ⅓ hp motor, the lifter has a battery powered vacuum station with front mounted controls, an ergonomic handlebar, and a remote pendant control. Standard features include a vacuum check valve, vacuum pump control system, reservoir, gauges, an alarm, and indicator lights.

Source: **Anver Corp.,** 36 Parmenter Rd., Hudson, MA 01749.

Services/Suppliers

Wood Group Pressure Control,

Houston, has named Will Denyko US service director and Loren Boisvert US operations manager. Denyko's responsibilities will include working with the US operations management team, branch managers, and customer contacts to identify areas of improvement and share best practices needed to advance the level of service delivered to customers. Prior to his 4 years at Pressure Control, he worked for FMC, training service technicians in wellhead installation on offshore platforms. Boisvert will be responsible for overseeing the operations of 27 facilities in 10 states. He has 14 years of industry experience in a variety of engineering and management roles, including his most recent role as vice-president and general manager for Wood Group Pressure Control (Canada). Boisvert has a BS in mechanical engineering and is a registered professional engineer with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

Denyko

Boisvert

Wood Group Pressure Control, part of international energy services company John Wood Group PLC, designs, manufactures, and services wellhead systems, gate valves, chokes, and actuators. John Wood Group is an international energy services company that provides a range of engineering, production support, maintenance management, and industrial gas turbine overhaul and repair services to the oil and gas and power generation industries worldwide.

KBR

Houston, has made four key appointments in its Operations organization led by Executive Vice-Pres. Dennis Calton. Bill Kallmeyer, a 29-year KBR employee, was named senior vice-president and will lead the Project Oversight and Control group. Kallmeyer and his team will be responsible for ensuring compliance with procedures, policies, and work processes governing project controls and project management across KBR. Chris Rhine, who has been with KBR for 39 years, was appointed senior vice-president and will lead KBR's Resource Management functions in Arlington, Tex., Leatherhead, UK, Houston, Singapore, Moscow, Jakarta, Lagos, Johannesburg, Cairo, and Baku and at KBR's MWKL offices in Greenford, UK. Bert Aragon, a 24-year KBR employee, was named a vice-president and will oversee the responsibilities of KBR's Monterrey, Mexico, office. Keith Ackley, a 21-year KBR employee, was appointed vice-president, engineering. Ackley will oversee KBR's engineering operations and ensure all processes and procedures of this department will be aligned with KBR's overall business strategy.

KBR is a global engineering, construction, and services company supporting the energy, petrochemicals, government services, and civil infrastructure sectors.

OFFSHORE ASIA™

17 - 19 March 2008
Kuala Lumpur
Convention Centre,
Kuala Lumpur, Malaysia
www.offshoreasiaevent.com

NEW GROWTH, TECHNOLOGY & MARKET CHANGES

REGISTER NOW ONLINE
WWW.OFFSHOREASIAEVENT.COM

WHY ATTEND OFFSHORE ASIA?

- Choose from various tracks offering inside expertise in the offshore industry, including Multiphase Pumping and Technologies
- Match your information and learning needs, and help you tackle everyday challenges
- Gain global and regional perspective through keynote addresses on the state of the industry as well as emerging trends
- Extend your personal knowledge of offshore technology and trends
- Benefit from networking by sharing information
- Discover and evaluate products and services
- Examine the latest products, meet with the manufacturers to learn the benefits you will get from their use
- Take advantage of the knowledge transfer with the best and brightest in the offshore industry
- Become an integral part of the region's fastest growing Conference and Exhibition

Incorporating:

Multiphase™ Pumping and Technologies

Flagship Media Sponsors:

Offshore
OIL&GAS JOURNAL

Owned & Managed by:

PennWell

For Event Information and Registration Visit:
www.offshoreasiaevent.com

E&P ISSUES • CHALLENGES • SOLUTIONS

Imports of crude and products

	Districts 1-4		District 5		Total US		
	2-22 2008	2-15 2008	2-22 2008	2-15 2008	2-22 2008	2-15 2008	*2-23 2007
	1,000 b/d						
Total motor gasoline	1,281	827	73	—	1,354	827	889
Mo. gas. blending comp.	820	394	23	—	843	394	480
Distillate	194	381	—	—	194	381	381
Residual	181	404	—	—	181	404	513
Jet fuel-kerosine	79	71	53	—	132	71	286
Propane-propylene	254	174	27	26	281	200	203
Other	526	1,233	33	60	559	1,293	677
Total products	**3,335**	**3,484**	**209**	**86**	**3,544**	**3,570**	**3,429**
Total crude	**8,938**	**9,034**	**1,020**	**1,068**	**9,958**	**10,102**	**9,522**
Total imports	**12,273**	**12,518**	**1,229**	**1,154**	**13,502**	**13,672**	**12,951**

*Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—Feb. 29, 2008

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	7.76	6.26	6.88	6.15	6.19	6.80
Everett	8.92	6.52	8.50	6.58	7.16	9.25
Isle of Grain	8.71	5.98	8.04	5.87	6.62	7.85
Lake Charles	6.69	4.53	6.42	4.72	5.03	7.43
Sodegaura	6.74	8.42	6.63	8.43	7.68	5.64
Zeebrugge	7.75	5.60	7.20	5.55	6.29	7.20

Definitions, see OGJ Apr. 9, 2007, p. 57.
Source: Purvin & Gertz Inc.
Data available in OGJ Online Research Center.

Crude and product stocks

District	Crude oil	Motor gasoline		Jet fuel, kerosine	Fuel oils		Propane-propylene
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD 1	15,162	68,873	33,614	9,163	43,702	14,584	4,052
PADD 2	62,707	57,040	19,166	8,093	30,363	1,346	9,663
PADD 3	162,304	72,040	34,851	12,736	29,747	14,868	17,060
PADD 4	12,661	6,786	2,153	555	3,113	394	[1]1,013
PADD 5	55,671	32,880	26,290	9,536	13,027	5,480	—
Feb. 22, 2008	**308,505**	**232,619**	**116,074**	**40,083**	**119,952**	**36,672**	**31,788**
Feb. 15, 2008	**305,274**	**230,264**	**114,486**	**39,803**	**122,527**	**36,915**	**33,987**
Feb. 23, 2007[2]	**329,004**	**220,175**	**98,219**	**40,210**	**124,503**	**35,998**	**31,894**

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Refinery report—Feb. 22, 2008

District	Refinery operations		Refinery output				
	Gross inputs	Crude oil inputs	Total motor gasoline	Jet fuel, kerosine	Fuel oils		Propane-propylene
					Distillate	Residual	
	1,000 b/d						
PADD 1	1,347	1,365	1,724	59	385	101	58
PADD 2	3,210	3,178	2,240	208	951	63	213
PADD 3	7,091	7,040	3,059	801	1,908	296	657
PADD 4	536	535	286	23	157	15	[1]133
PADD 5	2,581	2,506	1,469	405	487	153	—
Feb. 22, 2008	**14,765**	**14,624**	**8,778**	**1,496**	**3,888**	**628**	**1,061**
Feb. 15, 2008	**14,562**	**14,464**	**8,840**	**1,448**	**4,010**	**610**	**1,080**
Feb. 23, 2007[2]	**14,960**	**14,616**	**8,668**	**1,441**	**3,947**	**664**	**988**
	17,436 operable capacity		**84.7% utilization rate**				

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Additional analysis of market trends is available through **OGJ Online**, *Oil & Gas Journal's* electronic information source, at http://www.ogjonline.com.

OGJ crack spread

	*2-29-08	*3-2-07	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	109.29	74.55	34.74	46.6
Brent crude	100.11	60.93	39.18	64.3
Crack spread	9.18	13.62	–4.44	–32.6
FUTURES MARKET PRICES				
One month				
Product value	110.62	76.41	34.22	44.8
Light sweet crude	100.84	61.66	39.18	63.5
Crack spread	9.79	14.75	–4.96	–33.6
Six month				
Product value	112.92	77.86	35.07	45.0
Light sweet crude	99.23	65.51	33.72	51.5
Crack spread	13.69	12.35	1.35	10.9

*Average for week ending.
Source: Oil & Gas Journal
Data available in OGJ Online Research Center.

OGJ GASOLINE PRICES

	Price ex tax 2-27-08	Pump price* 2-27-08	Pump price 2-28-07
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	282.7	322.4	223.3
Baltimore	269.2	311.1	224.0
Boston	269.1	311.0	223.4
Buffalo	273.9	334.0	245.3
Miami	285.7	336.0	243.2
Newark	263.9	296.8	222.8
New York	252.3	312.4	232.5
Norfolk	268.9	306.5	220.5
Philadelphia	267.6	318.3	246.0
Pittsburgh	265.2	315.9	227.2
Wash., DC	280.0	318.4	232.9
PAD I avg.	270.8	316.8	231.0
Chicago	291.0	341.9	258.3
Cleveland	257.6	304.0	236.3
Des Moines	265.9	306.3	225.3
Detroit	258.1	307.3	235.3
Indianapolis	265.4	310.4	241.0
Kansas City	264.3	300.3	225.8
Louisville	283.4	320.3	236.2
Memphis	263.6	303.4	221.6
Milwaukee	253.5	304.8	236.2
Minn.-St. Paul	260.0	300.4	232.5
Oklahoma City	264.5	299.9	222.9
Omaha	263.5	309.9	241.4
St. Louis	253.3	289.3	233.0
Tulsa	261.8	297.2	220.6
Wichita	253.5	296.9	227.4
PAD II avg.	264.0	306.2	232.9
Albuquerque	269.5	305.9	224.9
Birmingham	273.6	312.3	220.2
Dallas-Fort Worth	267.5	305.9	223.1
Houston	267.9	306.3	218.1
Little Rock	267.7	307.9	222.1
New Orleans	268.0	306.4	230.4
San Antonio	262.1	300.5	215.8
PAD III avg.	268.0	306.5	222.1
Cheyenne	256.6	289.0	216.2
Denver	259.5	299.9	230.6
Salt Lake City	260.8	303.7	223.1
PAD IV avg.	259.0	297.5	223.3
Los Angeles	276.3	334.8	277.7
Phoenix	260.3	297.7	237.1
Portland	285.5	328.8	253.9
San Diego	286.6	345.1	278.1
San Francisco	303.0	361.5	295.2
Seattle	286.1	338.5	264.0
PAD V avg.	283.0	334.4	267.7
Week's avg.	**268.8**	**312.4**	**234.9**
Feb. avg.	**259.5**	**303.1**	**228.0**
Jan. avg.	**260.9**	**304.5**	**225.3**
2008 to date	**260.3**	**303.9**	—
2007 to date	**182.9**	**226.5**	—

*Includes state and federal motor fuel taxes and state sales tax. Local governments may impose additional taxes.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

REFINED PRODUCT PRICES

	2-22-08 ¢/gal		2-22-08 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	250.48	New York Harbor	276.82
Gulf Coast	252.02	Gulf Coast	272.50
Los Angeles	274.02	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	236.54	ARA	288.58
Singapore	255.86	Singapore	273.81
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	248.23	New York Harbor	170.17
Gulf Coast	255.02	Gulf Coast	169.95
Los Angeles	279.02	Los Angeles	180.92
		ARA	184.29
		Singapore	179.33

Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

BAKER HUGHES RIG COUNT

	2-29-08	3-2-07
Alabama	3	2
Alaska	8	14
Arkansas	39	41
California	35	31
Land	34	27
Offshore	1	4
Colorado	110	93
Florida	0	1
Illinois	0	0
Indiana	1	1
Kansas	9	14
Kentucky	11	10
Louisiana	144	209
N. Land	45	57
S. Inland waters	19	30
S. Land	29	44
Offshore	51	78
Maryland	0	0
Michigan	1	2
Mississippi	10	18
Montana	10	22
Nebraska	1	0
New Mexico	68	75
New York	7	8
North Dakota	57	32
Ohio	12	13
Oklahoma	200	182
Pennsylvania	19	15
South Dakota	1	0
Texas	859	810
Offshore	7	11
Inland waters	4	1
Dist. 1	22	24
Dist. 2	33	35
Dist. 3	57	49
Dist. 4	94	90
Dist. 5	177	158
Dist. 6	119	121
Dist. 7B	31	44
Dist. 7C	47	54
Dist. 8	127	108
Dist. 8A	18	29
Dist. 9	45	33
Dist. 10	78	53
Utah	44	44
West Virginia	28	29
Wyoming	72	78
Others—NV-5; TN-6; VA-3	14	8
Total US	**1,763**	**1,752**
Total Canada	**632**	**601**
Grand total	**2,395**	**2,353**
Oil rigs	337	290
Gas rigs	1,418	1,458
Total offshore	59	94
Total cum. avg. YTD	**1,758**	**1,728**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 42.

Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

SMITH RIG COUNT

Proposed depth, ft	Rig count	2-29-08 Percent footage*	Rig count	3-2-07 Percent footage*
0-2,500	66	4.5	57	—
2,501-5,000	107	52.3	100	59.0
5,001-7,500	199	22.1	210	20.0
7,501-10,000	458	3.4	427	3.5
10,001-12,500	421	4.7	409	3.9
12,501-15,000	313	0.3	276	1.0
15,001-17,500	98	—	112	1.7
17,501-20,000	76	—	79	—
20,001-over	38	—	34	—
Total	**1,776**	**7.8**	**1,704**	**8.0**
INLAND	33		41	
LAND	1,692		1,606	
OFFSHORE	51		57	

*Rigs employed under footage contracts.
Definitions, see OGJ, Sept. 18, 2006, p. 42.

Source: Smith International Inc.
Data available in OGJ Online Research Center.

OGJ PRODUCTION REPORT

	[1]2-29-08	[2]3-2-07
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	15	19
Alaska	699	752
California	653	667
Colorado	44	38
Florida	5	6
Illinois	26	24
Kansas	98	96
Louisiana	1,329	1,314
Michigan	15	16
Mississippi	51	56
Montana	92	94
New Mexico	163	161
North Dakota	114	116
Oklahoma	171	172
Texas	1,342	1,335
Utah	44	52
Wyoming	144	144
All others	63	67
Total	**5,068**	**5,129**

[1]OGJ estimate. [2]Revised.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

	2-29-08 $/bbl*
Alaska-North Slope 27°	80.63
South Louisiana Sweet	104.75
California-Kern River 13°	89.20
Lost Hills 30°	97.25
Southwest Wyoming Sweet	93.34
East Texas Sweet	97.75
West Texas Sour 34°	90.75
West Texas Intermediate	98.25
Oklahoma Sweet	98.25
Texas Upper Gulf Coast	94.75
Michigan Sour	91.25
Kansas Common	97.25
North Dakota Sweet	90.00

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

WORLD CRUDE PRICES

	2-22-08 $/bbl[1]
United Kingdom-Brent 38°	98.83
Russia-Urals 32°	93.99
Saudi Light 34°	93.21
Dubai Fateh 32°	91.46
Algeria Saharan 44°	98.44
Nigeria-Bonny Light 37°	99.52
Indonesia-Minas 34°	97.31
Venezuela-Tia Juana Light 31°	92.74
Mexico-Isthmus 33°	92.63
OPEC basket	95.04
Total OPEC[2]	93.71
Total non-OPEC[2]	93.27
Total world[2]	93.51
US imports[3]	89.61

[1]Estimated contract prices. [2]Average price (FOB) weighted by estimated export volume. [3]Average price (FOB) weighted by estimated import volume. Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

US NATURAL GAS STORAGE[1]

	2-22-08	2-15-08	2-22-07	Change, %
	bcf			
Producing region	571	952	595	–4.0
Consuming region east	852	212	912	–6.6
Consuming region west	196	606	244	–19.7
Total US	**1,619**	**1,770**	**1,751**	**–7.5**
	Dec. 07	**Dec. 06**	**Change, %**	
Total US[2]	**2,879**	**3,070**	**–6.2**	

[1]Working gas. [2]At end of period.
Source: Energy Information Administration.
Data available in OGJ Online Research Center.

Statistics

WORLDWIDE CRUDE OIL AND GAS PRODUCTION

	Dec. 2007	Nov. 2007	12 month average production 2007	12 month average production 2006	Change vs. previous year Volume	Change vs. previous year %	Dec. 2007	Nov. 2007	Cum. 2007
	Crude, 1,000 b/d						Gas, bcf		
Argentina	620	591	625	638	–13	–2.1	125.3	118.0	1,517.74
Bolivia	42	42	44	45	–1	–2.8	42.0	41.0	498.83
Brazil	1,806	1,711	1,748	1,722	25	1.5	31.0	30.0	347.60
Canada	2,463	2,671	2,621	2,513	108	4.3	521.7	476.1	5,934.83
Colombia	559	556	531	527	4	0.7	22.0	21.0	233.50
Ecuador	500	490	499	535	–35	–6.6	1.0	1.0	12.00
Mexico	2,954	2,901	3,083	3,256	–174	–5.3	198.7	182.6	2,211.24
Peru	118	114	114	116	–2	–1.6	9.0	9.0	93.69
Trinidad	114	112	120	143	–23	–15.9	130.0	120.0	1,409.87
United States	5,098	5,006	5,105	5,102	3	0.1	1,766.0	1,696.0	19,951.00
Venezuela[1]	2,430	2,430	2,398	2,562	–164	–6.4	75.0	70.0	867.00
Other Latin America	79	80	80	79	—	0.6	5.5	5.2	64.92
Western Hemisphere	**16,783**	**16,705**	**16,965**	**17,237**	**–272**	**–1.6**	**2,927.2**	**2,769.9**	**33,142.22**
Austria	18	17	17	17	—	—	5.5	4.9	63.90
Denmark	308	308	312	334	–22	–6.6	32.4	33.1	303.16
France	20	20	20	21	–2	–8.8	2.9	2.7	36.06
Germany	65	64	67	69	–2	–2.8	52.1	51.6	603.12
Italy	110	109	108	110	–2	–1.8	28.0	26.0	340.80
Netherlands	40	39	40	26	14	52.2	320.0	300.0	2,705.00
Norway	2,235	2,287	2,271	2,491	–220	–8.8	315.0	308.5	3,161.80
Turkey	40	40	41	41	–1	–1.9	—	—	8.50
United Kingdom	1,561	1,475	1,524	1,518	6	0.4	271.0	253.9	2,696.48
Other Western Europe	5	5	4	5	—	–4.5	1.7	1.4	16.77
Western Europe	**4,401**	**4,364**	**4,405**	**4,634**	**–229**	**–4.9**	**1,028.5**	**982.0**	**9,935.59**
Azerbaijan	850	870	827	643	185	28.7	31.0	30.0	330.00
Croatia	15	16	16	17	–1	–4.9	5.4	6.0	72.21
Hungary	14	15	16	16	–1	–4.1	8.3	7.6	88.70
Kazakhstan	1,150	1,100	1,088	1,064	23	2.2	50.0	70.0	940.00
Romania	90	95	98	98	–1	–0.6	17.5	17.0	210.90
Russia	9,780	9,800	9,723	9,498	224	2.4	2,100.0	2,000.0	22,550.00
Other FSU	450	500	461	500	–39	–7.8	550.0	500.0	5,390.00
Other Eastern Europe	50	50	48	48	—	0.8	20.2	18.9	226.46
Eastern Europe and FSU	**12,400**	**12,446**	**12,275**	**11,884**	**391**	**3.3**	**2,782.4**	**2,649.6**	**29,808.26**
Algeria[1]	1,400	1,390	1,358	1,348	11	0.8	285.0	275.0	3,310.00
Angola[1]	1,789	1,808	1,697	1,395	302	21.7	4.5	4.5	40.90
Cameroon	85	85	84	87	–3	–3.4	—	—	—
Congo (former Zaire)	20	20	20	20	—	—	—	—	—
Congo (Brazzaville)	240	240	240	240	—	—	—	—	—
Egypt	630	630	638	670	–33	–4.9	42.0	40.0	492.60
Equatorial Guinea	320	320	320	320	—	—	0.1	0.1	0.72
Gabon	230	230	230	235	–5	–2.1	0.3	0.3	3.65
Libya[1]	1,750	1,750	1,708	1,708	—	—	23.0	22.0	265.90
Nigeria[1]	2,160	2,180	2,166	2,219	–53	–2.4	72.0	70.0	860.00
Sudan	480	480	473	414	58	14.1	—	—	—
Tunisia	83	87	95	68	26	38.6	6.4	5.8	77.48
Other Africa	232	232	232	239	–7	–2.7	10.2	9.7	119.52
Africa	**9,420**	**9,453**	**9,260**	**8,963**	**297**	**3.3**	**443.4**	**427.3**	**5,170.77**
Bahrain	170	170	172	172	—	–0.1	29.0	28.0	317.68
Iran[1]	3,930	4,010	3,932	3,891	41	1.0	245.0	240.0	2,970.00
Iraq[1]	2,350	2,400	2,093	1,900	193	10.2	4.5	5.0	58.50
Kuwait[1,2]	2,550	2,535	2,444	2,501	–57	–2.3	33.0	32.0	371.00
Oman	700	700	710	740	–30	–4.1	58.0	55.0	677.00
Qatar[1]	800	800	799	823	–23	–2.8	165.0	160.0	1,825.00
Saudi Arabia[1,2]	8,960	8,915	8,625	9,098	–473	–5.2	175.0	170.0	1,955.00
Syria	380	380	389	423	–33	–7.9	18.0	17.0	203.30
United Arab Emirates[1]	2,540	2,150	2,532	2,625	–93	–3.6	135.0	120.0	1,577.00
Yemen	320	320	338	349	–12	–3.3	—	—	—
Other Middle East	—	—	—	—	—	–36.8	10.1	8.6	105.85
Middle East	**22,700**	**22,380**	**22,033**	**22,521**	**–488**	**–2.2**	**872.6**	**835.6**	**10,060.33**
Australia	382	429	444	424	21	4.9	116.6	115.7	1,407.61
Brunei	177	170	179	203	–24	–11.8	34.9	35.4	421.23
China	3,616	3,737	3,739	3,683	56	1.5	210.2	210.2	2,432.98
India	683	710	687	680	7	1.0	88.6	87.9	995.66
Indonesia[1]	840	830	839	893	–53	–6.0	200.0	190.0	2,350.00
Japan	17	18	17	15	1	6.9	11.0	10.8	126.09
Malaysia	800	780	759	751	8	1.1	150.0	145.0	1,713.00
New Zealand	65	62	37	15	23	153.4	10.0	10.0	154.10
Pakistan	66	70	68	65	4	5.5	123.7	117.1	1,413.94
Papua New Guinea	5	15	8	49	–41	–83.8	0.5	0.5	5.95
Thailand	219	218	212	210	3	1.2	42.0	42.0	520.00
Vietnam	300	300	310	345	–35	–10.0	13.0	12.0	153.50
Other Asia-Pacific	31	31	34	33	—	1.3	95.4	94.8	1,126.31
Asia-Pacific	**7,201**	**7,369**	**7,334**	**7,365**	**–31**	**–0.4**	**1,095.9**	**1,071.3**	**12,820.37**
TOTAL WORLD	**72,904**	**72,717**	**72,273**	**72,605**	**–331**	**–0.5**	**9,150.1**	**8,735.8**	**100,937.54**
OPEC	31,499	31,198	30,590	29,567	1,024	3.5	1,412.5	1,354.0	16,409.40
North Sea	4,120	4,090	4,126	4,359	–234	–5.4	714.3	685.1	6,969.28

[1]OPEC member. [2]Kuwait and Saudi Arabia production each include half of Neutral Zone. Totals may not add due to rounding.
Source: Oil & Gas Journal. Data available in OGJ Online Research Center.

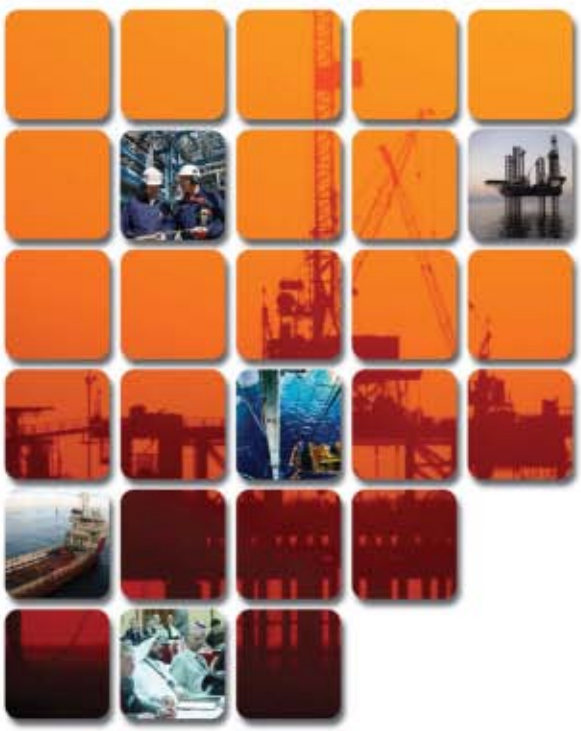
Qatar International Exhibition Centre
Doha, Qatar
28-30 October 2008

www.offshoremiddleeast.com

Under the Patronage of
H.E.Abdullah bin Hamad Al Attiyah
Deputy Premier & Minister for Energy and Industry

OFFSHORE MIDDLE EAST
معرض ومؤتمر الشرق الأوسط لشركات الأوفشور

Exploration and **Development** of Offshore Resources



For further information on exhibit and sponsorship opportunities contact:

Peter Cantu
The Americas
T: +1 713 963-6213
E: peterc@pennwell.com

Jane Bailey
Rest Of World
T: +44 (0) 1992 656 651
E: janeb@pennwell.com

Jonathan Franklin
NOC/Sponsorship Sales
T: +44 (0) 1992 656 658
E: jfranklin@pennwell.com

Offshore Middle East is an exciting new conference and exhibition for the oil and gas industry of the Gulf region, delivering new opportunities and unique information and learning for offshore oil and gas exploration and production.

CALL FOR PAPERS

We invite you to submit an abstract for Offshore Middle East 2008 and share your knowledge, experience and ideas with technical and strategic decision-makers and strategists.

Abstract Submittal Deadline: 15th April 2008

Conference Topics include:

- Field Development
- Management
- Risers & Riser Technology
- Subsea Technology
- Mobile Offshore: Drilling Units
- Data Collection/Communication
- Flow Assurance
- Flowlines & Pipelines
- Mooring & Station-keeping
- Drilling Operations
- Completions
- Well Construction
- Tubulars

For further information about participation as a speaker, or for a full list of conference topics, please contact:
Frances Webb, Event Director
T: +44 1628 810 562
E: francesw@pennwell.com

Hosted by: Qatar Petroleum

Flagship Media Sponsors: Offshore | OIL&GAS JOURNAL | Oil, Gas & Petrochem EQUIPMENT

Owned and Produced by: PennWell

Classified Advertising

Your marketplace for the oil and gas industry

DEADLINE for CLASSIFIED ADVERTISING is 10 A.M. Tuesday preceding date of publication. Address advertising inquiries to CLASSIFIED SALES, 1-800-331-4463 ext. 6301, 918-832-9301, fax 918-831-9776, email: glendah@pennwell.com.

- *DISPLAY CLASSIFIED: $375 per column inch, one issue. 10% discount three or more CONSECUTIVE issues. No extra charge for blind box in care. Subject to agency commission. No 2% cash discount.*
- *UNDISPLAYED CLASSIFIED: $4.00 per word per issue. 10% discount for three or more CONSECUTIVE issues. $80.00 minimum charge per insertion. Charge for blind box service is $54.00 No agency commission, no 2% cash discount. Centered/Bold heading, $9.00 extra.*
- *COMPANY LOGO: Available with undisplayed ad for $80.00. Logo will be centered above copy with a maximum height of 3/8 inch.*
- *NO SPECIAL POSITION AVAILABLE IN CLASSIFIED SECTION.*
- *PAYMENT MUST ACCOMPANY ORDER FOR CLASSIFIED AD.*

EMPLOYMENT

SENIOR SCIENTIST

Gas Technology Institute (GTI), the leading research, development and training organization serving energy and environmental markets, has the following opportunity for a Senior Scientist. Acquire and organize geological, reservoir engineering, and drilling data from the producing and service companies and the public sector. Supervise logging, coring, and other field data acquisitions. Perform petrophysical laboratory experiments and integrate lab and field data toward geological and petrophysical analysis relative to gas production from unconventional natural gas resources. Prepare reports and technical papers for presentation at technical conferences and workshops.

PhD degree or MS in geology or reservoir engineering required. Must have a minimum of 5 years experience working with exploration and production or service companies. Hands-on experience in geological, well log, and petrophysical data analyses required.

Must have authorization to work permanently in the U.S. Please visit our website at: **www.gastechnology.org** and apply online. Only accepting online applicants. EOE

gti®

Weatherford in Fort Worth, TX seeks Field Geophysicist (4 positions) to coordinate seismic data acquisition, processing & QC of borehole seismic surveys. Req's.: Master's in Geophysics or Petroleum Engineering & 2 yrs in job or as Open/Cased Hole Engineer &/or Borehole Seismic Engineer involved in seismic data acquisition. Please submit resume to HR via fax at 281-260-5669 or e-mail at Kathi.Campbell@weatherford.com

OGJ Classifieds Get Results

EMPLOYMENT

PETROLEUM ENGINEER – WICHITA, KS

Independent Oil & Gas Co seeks Operations Engineer for headquarters. Prefer 5+ years operations & engineering experience. Competitive salary & benefits. Fax resume to 316-681-4728 or mail to Berexco Inc., P O Box 20380, Wichita, KS 67208 Attn: Diana. Or e-mail Diana@Berexco.com

EQUIPMENT FOR SALE

FOR SALE / RENT

5.2 MW MOBILE GEN SETS
CALL: 800-704-2002

SOLAR TAURUS 60

- GAS - LOW NOx (OIL)
- 60 Hz - 13.8KV or 50 Hz - 11KV
- LOW HOUR - SOLAR SERVICED

DIESELS • TURBINES • BOILERS

24/7 EMERGENCY SERVICE
IMMEDIATE DELIVERY

www.wabashpower.com | info@wabashpower.com
Phone: 847-541-5600 Fax: 847-541-1279

wabash POWER EQUIPMENT CO.
444 Carpenter Avenue, Wheeling, IL 60090

REFRIGERATION AND J.T. PLANTS

7.5 MMSCFD, 1000 PSI, NATCO

4.0 MMSCFD, 1000 PSI, NATCO

6.5 MMSCFD, 1250 PSI X 400 PSI, H&H J.T.

2.0 MMSCFD, 1000 PSI, PROCESS EQPT.

OTHERS AVAILABLE

PLEASE CALL 318-425-2533, 318-458-1874

regardres@aol.com

EQUIPMENT FOR SALE

Solar Taurus 60

5.2 MW • Mobile Gen Sets
FOR SALE

- Solar Maintained - Low Time
- 13 Units (Gen 1) & (Gen 2)
- 8 Natural Gas - 5 Dual Fuel
- Low Nox 25 ppm
- Complete Packages
- Mobile PCR U.G. Switchgear
- 60 Hz ○ 13.8 kV
- 50 Hz Conversion Available

Mid America Engine, Inc.
662-895-8444 · Fax: 662-895-8228
Keith: keith@maegen.com
Art: art@maegen.com

Process Units

Condensate Stabilizer
6,500 BPSD

200 T/D Methanol Plant

FCCU UOP
17,000 – 22,000 BPSD

BASIC Engineering, Inc.
Please Call: 713-674-7171
Tommy Balke
tbalkebasic1@aol.com
www.basicengineeringinc.com

EDUCATION

Introduction to Petroleum Refining Economics: This course will present an introduction to the economics of a modern petroleum refinery, including discussion of crude oil and petroleum products. Case study to illustrate refinery project economics -calculation of capital cost, operating costs, refinery economics. Colorado School of Mines, April 3-4 and October 23-24, 2008 Contact: 303/273-3321, fax: 303/273-3314, e-mail: space@mines.edu, http://www.mines.edu/outreach/cont_ed/prep.html

EQUIPMENT FOR SALE

SURPLUS GAS PROCESSING/REFINING

EQUIPMENT

NGL/LPG PLANTS: 10 - 600 MMCFD
AMINE PLANTS: 120 – 1,000 GPM
SULFUR PLANTS: 10 - 180 TPD
FRACTIONATION: 1000 – 25,000 BPD
HELIUM RECOVERY: 75 & 80 MMCFD
NITROGEN REJECTION: 25 – 80 MMCFD
ALSO OTHER REFINING UNITS
We offer engineered surplus equipment solutions.

Bexar Energy Holdings, Inc.
Phone 210 342-7106
Fax 210 223-0018
www.bexarenergy.com

Email: info@bexarenergy.com

REAL ESTATE

Stable Income Stream
Medical office projects throughout the Southwest and Southeast available for cash investment or 1031 Exchange. Developer with 24 years experience. Portfolio or single property investment available.
Contact Jim 847-824-6650 or jtwalesa@core.com

190,000 ACRE BACKYARD
Retreat to what few ever find, 35 acres of Colorado Mountain splendor power/phone, year round access, borders National Forest. 1½ hrs to major airport, a recreational outdoor paradise $175,000 - Jim 888 346 9127 jlivllc@aol.com
Colorado Land Store

DRILLING PROSPECTS

WANTED
Oil Drilling prospects. Less than 3,000 ft.
Southwest Minerals, Inc.
Harvey Estes, Pres.
813-376-4075
Harveylv@aol.com

EPA PROPOSAL

Shell Air Quality Permit Proposed
EPA Invites Your Comments
EPA is proposing to issue an air quality permit to Shell Offshore, Inc. The permit would regulate air emissions from the Kulluk floating drilling platform. The Kulluk would be used by the company to explore for oil and gas beneath the Outer Continental Shelf (OCS) of the Beaufort Sea. Comments are due by April 1, 2008. EPA will host public meetings in March. For details, visit http://Yosemite.epa.gov/R10/AIRPAGE.NSF/Permits/OCS. Or, contact Dan Mahar, EPA, at 206-553-7079 or toll-free 800-424-4372, or email mahar.dan@epa.gov.

BUSINESS OPPORTUNITIES

Want to purchase minerals and other oil/gas interests. Send details to: P.O. Box 13557, Denver, CO 80201.

LEASES FOR SALE

R & R Exploration desires to place Barnett Shale leases with companies that have the ability to react and to make decisions quickly. Contact Don Richards, phone (940) 381-0846.

CONSULTANTS

Brazil: EXPETRO can be your guide into this new investment frontier.
Effective strategic analysis, quality technical services, compelling economic/regulatory advice, and realistic approach regarding Brazilian business environment-120 specialists upstream, downstream gas and biofuels.
Email: contato@expetro.com.br
Web: www.expetro.com.br-Rio de Janeiro, Brazil

Hiring?

Selling Equipment?

Need Equipment?

New Business

Opportunity?

Contact:

Glenda Harp

+1-918-832-9301 or

1-800-331-4463,

ext. 6301

Fax: +1-918-831-9776

Advertising Sales / Advertisers Index

Houston
Regional Sales Managers. Marlene Breedlove; Tel: (713) 963-6293, Fax: (713) 963-6228, E-mail: marleneb@pennwell.com. Charlene Burman; Tel: (713) 963-6274, Fax: (713) 963-6228; E-mail: cburman@pennwell.com. Renee Rubens-Muhammad; Tel: (713) 499-6334, Fax: (713) 963-6228: E-mail: reneerm@pennwell.com. PennWell - Houston, 1455 West Loop South, Suite 400, Houston, TX 77027.

Southwest / South Texas/Western States/ Gulf States/Mid-Atlantic
Marlene Breedlove, 1455 West Loop South, Suite 400, Houston, TX 77027; P.O. Box 1941 Houston, TX 77251; Tel: (713) 963-6293, Fax: (713) 963-6228; E-mail: marleneb@pennwell.com.

Northeast/New England/Midwest/North Texas/ Oklahoma/Alaska/Canada
Charlene Burman, 1455 West Loop South, Suite 400, Houston, TX 77027; Tel: (713) 963-6274, Fax: (713) 963-6228; E-mail: cburman@pennwell.com.

Scandinavia/The Netherlands/Middle East/Africa
David Betham-Rogers, 11 Avenue du Marechal Leclerc, 61320 Carrouges, France; Tel: 33 2 33 282584, Fax: 33 2 33 274491; E-mail: davidbr@pennwell.com.

United Kingdom
Linda Fransson, Warlies Park House, Horseshoe Hill Upshire, Essex EN9 3SR, UNITED KINGDOM Tel: +44 (0) 1992 656 665; Fax: +44 (0) 1992 656 700; E-mail: lindaf@pennwell.com.

France/Belgium/Spain/Portugal/Southern Switzerland/Monaco
Daniel Bernard, 8 allee des Herons, 78400 Chatou, France; Tel: 33 (0)1 3071 1224, Fax: 33 (0)1 3071 1119; E-mail: danielb@pennwell.com, France, Belgium, Spain, Portugal, Southern Switzerland, Monaco.

Germany/Austria/Denmark/Northern Switzerland/Eastern Europe/Russia
Verlagsburo Sicking, Emmastrasse 44, 45130, Essen, Germany. Tel: 49 0201 77 98 61, Fax: 49 0201 781 741; E-mail: wilhelms@pennwell.com. Wilhelm F. Sicking, Germany, Austria, Denmark, Northern Switzerland, Eastern Europe, Russia, Former Soviet Union.

Japan
e. x. press Co., Ltd., Hirakawacho TEC Building, 2-11-11, Hirakawa-cho, Chiyoda-ku, Tokyo 102-0093, Japan, Tel: 81 3 3556 1575, Fax: 81 3 3556 1576; E-mail: manami.konishi@ex-press.jp; Manami Konishi.

Brazil
Grupo Expetro/Smartpetro, Att: Jean-Paul Prates and Bernardo Grunewald, Directors, Ave. Erasmo Braga 22710th and 11th floors Rio de Janeiro RJ 20024-900 BRAZIL; Tel: (55-21) 3084 5384, Fax: (55-21) 2533 4593; E-mail: jpprates@pennwell.com.br and bernardo@pennwell.com.br.

Singapore/Australia/Asia-Pacific
Michael Yee, 19 Tanglin Road #09-07, Tanglin Shopping Center, Singapore 247909, Republic of Singapore; Tel: (65) 6 737-2356, Fax: (65) 6 734-0655; E-mail: yfyee@singnet.com.sg. Singapore, Australia, Asia Pacific.

India
Rajan Sharma, Interads Limited, 2, Padmini Enclave, Hauz Khas, New Delhi-110 016, India; Tel: +91-11-6283018/19, Fax: +91-11-6228928; E-mail: rajan@interadsindia.com.

Italy
Vittorio Rossi Prudente, UNIWORLD MARKETING, Via Sorio 47, 35141 PADOVA - Italy; Tel:+39049723548, Fax: +390498560792; E-mail: vrossiprudente@hotmail.com.

House energy bill an exercise in childishness

Kicking oil companies in the shins is not energy policy. It's childishness.

The US House took a foot-swipe at oil companies on Feb. 27 when it passed the Renewable Energy and Energy Conservation Tax Act of 2008.

The bill would extend and enlarge tax subsidies for electricity generated from renewable energy and for renewable fuels such as ethanol and biodiesel.

The Editor's Perspective

by Bob Tippee, Editor

It supposedly would pay for the tax breaks with a jab of the congressional heel into the US oil industry's tibia: a tax hike estimated at $18 billion over 10 years.

"We want to take the $18 billion in tax subsidies that the Bush administration and previous Congresses gave oil companies and reinvest the money in alternative energy technologies," said Chris Van Hollen (D-Md.; OGJ Online, Feb. 28, 2008).

This is rubbish. Of that sum, $13.57 billion would come from curtailing the oil industry's use of a tax deduction enacted in 2004 to help all US manufacturers compete internationally.

The rest would come from tightening limits on foreign tax credits associated with oil and gas income.

Neither of those original tax measures was enacted specifically for oil and gas companies. And neither represents a "subsidy" on the order of the 50¢-$1/gal tax gifts that the bill extends or creates for renewable fuels.

To pretend otherwise is deceitful.

And to pretend that the tax bill would somehow "end our dangerous reliance on foreign oil," as Ways and Means Committee Chairman Charles B. Rangel (D-NY) proclaimed, is foolish.

The tax bill would steer money away from investment in commercial energy sources that fill more than 60% of US needs and spend it on noncommercial forms that together account for less than 5% of total supply.

Subsidizing renewable energy to displace rather than supplement oil and gas will come nowhere close to ending oil imports. It will just waste money.

The Democratic Congress seems not to care how much it harms energy consumers and taxpayers as long as it can claim to be hurting oil companies.

Grownups should know better.

(Online Feb. 29, 2008; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

Crude topped $100/bbl in February

Traders pushed crude prices well above $100/bbl in late February, turning from equities to commodities as a haven for investments as fear of a US recession sent the US dollar plummeting to record lows against the euro and other key currencies.

On Feb. 29, crude touched a record high of $103.05/bbl in overnight electronic trading before finishing the week at $101.84/bbl, down from a record closing of $102.59/bbl Feb. 28 on the New York Mercantile Exchange. Despite an end-of-the-week decline in most energy prices, Olivier Jakob at Petromatrix, Zug, Switzerland, noted West Texas Intermediate increased a total $3.03/bbl from the start of the week, marking the fourth consecutive week for gains of $3-4/bbl. North Sea Brent gained about the same, up $3.09/bbl for the week. The April contract for heating oil "managed to more or less follow with an increase of $2.71/bbl, but RBOB gasoline was stalling and made a loss of 27¢/bbl," Jakob said. Natural gas for April increased 1.9%, and WTI was up $40.20/bbl from a year ago," he said.

Dollar declines

On Feb. 28, the dollar was at its lowest exchange rate against the euro since the European currency began trading in January 1999. The value of the US dollar had dropped 40% against the euro and 20% against a basket of other currencies over the last 6 years, sparking worries that it eventually could lose its place among world currencies.

"The commodity markets are clearly under a dollar overdrive, making the call of the top [price] a difficult task," Jakob said Feb. 28. "We do not know where the bottom is for the dollar index, but we know that the fall in the gasoline crack cannot continue at the current pace. We will very soon come to a point where complex refiners will either move back to voluntarily cutting runs or keep their systems on maintenance for a longer period, which in turn will accelerate the building of crude oil stocks as the backwardation on crude oil is relatively shallow."

US inventories

The front-month crude contract climbed to an intraday record above $102/bbl in early trading Feb. 27 on the New York market but then retreated after US officials reported larger-than-expected builds in crude and gasoline inventories. The Energy Information Administration said commercial US inventories of crude increased for the seventh consecutive week, up 3.2 million bbl to 308.5 million bbl during the week ended Feb. 22. That surpassed Wall Street's expectations of a 2.4 million bbl build. Gasoline stocks jumped to their highest level in 14 years, up 2.3 million bbl to 232.6 million bbl vs. a market consensus of a 400,000 bbl increase. Distillate fuel inventories fell 2.5 million bbl to 120 million bbl during the same period, surpassing expectations of a 2 million bbl decline (OGJ Online, Feb. 27, 2008).

"The high gasoline stocks (and that is before ethanol stocks are even considered) and imports reported by [EIA] will be no supportive item. Crude oil stocks are also steadily rebuilding with imports on the 4-week average higher by 480,000 b/d from last year," Jakob said. "Overall US stocks have gone from a yearly deficit at the start of the year of 65 million bbl to 20 million bbl [through Feb. 22]. With the subsequent week last year showing a 16 million bbl draw, the overall yearly stock deficit should have mostly disappeared by the next report."

Jakob said at the time the world petroleum markets faced "a test to see if market participants are currently able to focus on fundamentals for more than a few hours." The front-month crude contract had gained $5/bbl since mid-February on the New York Mercantile Exchange, but the crack for the April gasoline contract "has lost the same amount, and the backwardation continues to gently erode in crude oil," he said.

Paul Horsnell at Barclays Capital Inc., London, said, "The global gasoline market does look extremely weak at the moment, primarily because of how very little of the incremental demand barrel is gasoline. However, the reverse of that is that global distillate markets look like raging bull markets, given the extent to which the incremental global demand barrel is dominated by distillates. [Organization for Economic Cooperation and Development] demand looks weak (as it has been for 3 years), but non-OECD demand looks robust, and Chinese demand is improving."

Meanwhile, Ecuador declared force majeure Feb. 29 on oil exports after a mudslide ruptured 80 m of the 390,000 b/d Trans-Ecuadorian Oil Pipeline System. Officials said it would take 3-6 days to repair the pipeline.

(Online Mar. 3, 2008; author's e-mail: samf@ogjonline.com)

The world is growing by more than 70 million people a year.

So is that a problem, or a solution?

With our planet's population continuing to increase, and the quality of life for millions in the developing world improving daily, our demand for energy is also growing. And to meet everyone's needs 25 years from now may take 50% more energy than we use today.

Finding and developing all the fuel and power we need for our homes, businesses and vehicles, while protecting the environment, could be one of the greatest challenges our generation will face.

The key to ensuring success is found in the same place that created this need: humanity itself. When the unique spirit we all possess is allowed to flourish, mankind has proven its ability to take on, and overcome, any issue. It's a spirit of hard work, ingenuity, drive, courage and no small measure of commitment. To success, to each other, to the planet.

The problem...becomes the solution.

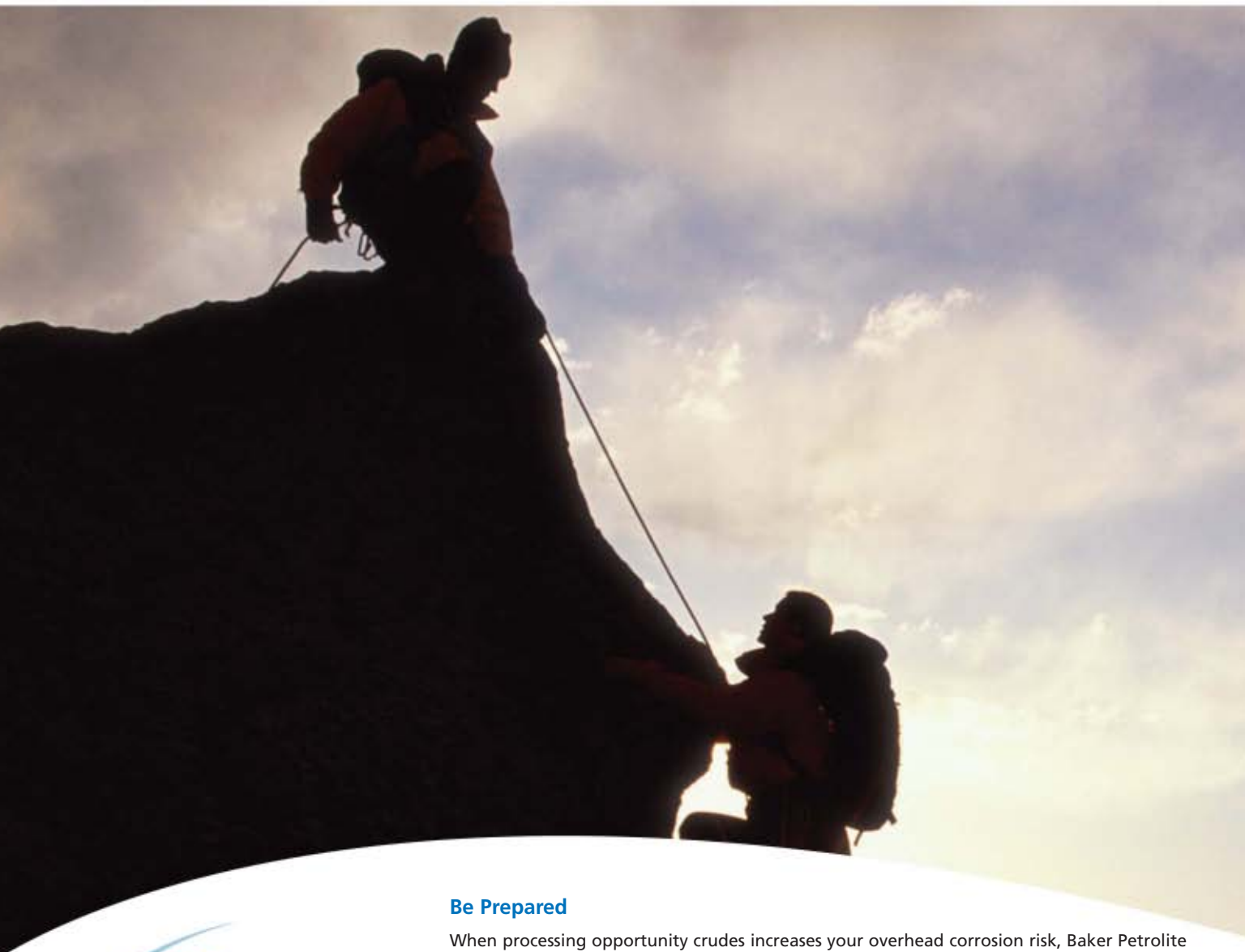
This human energy that drives us to succeed has been there every day since the beginning. And it will be with us to shape many tomorrows to come.

So join us in tapping the most powerful source of energy in the world. Ourselves.

And watch what the human race can do.

Chevron Human Energy™

Opportunity Crudes?



TOPGUARD
Overhead Corrosion Control

Be Prepared

When processing opportunity crudes increases your overhead corrosion risk, Baker Petrolite brings proven technology and experience to help you reach the top safely. The Baker Petrolite team works with you, using TOPGUARD Overhead Corrosion Control to:

- Increase feedstock flexibility
- Manage increased overhead corrosion potential
- Define the optimum operating envelope for any feedstock
- Quickly respond to changing unit conditions
- Ensure integrity and safety of your operations

Processing opportunity crudes successfully takes a team effort. Match our specialized technology, expertise and responsive service with your next opportunity.

Contact *www.bakerpetrolite.com* today.

BAKER HUGHES Baker Petrolite

Best-in-Class

PennWell

PennEnergyJOBS™

Energy Workforce

For the industry's career-minded professionals • Spring 2008

Women in Energy: A Forum

A supplement to PennWell publications • www.PennEnergyJOBS.com

PennWell

PennEnergyJOBS Energy Workforce

www.PennEnergyJOBS.com

Dear Reader,

Welcome to our first issue of the newly revamped PennEnergyJOBS career guide. We are very excited with the many changes that have been introduced with this issue.

To start with, we have merged our Petroleum Career Guide with our Power Career Guide in order to better address the cross-functional needs and subjects of the global energy industry's professional workforce. We have found that the two mainstays of global energy, the petroleum and power industries, often recruit from each other. And while there may be differences in how the two industries operate—even as they are often essential to each other's well-being—many of the career development and staffing issues are the same.

We have found that the two mainstays of global energy, the petroleum and power industries, often recruit from each other. And while there may be differences in how the two industries operate—even as they are often essential to each other's well-being—many of the career development and staffing issues are the same.

Those similarities are on display in this issue's cover feature, a Women in Energy Forum. In this forum, leading executives from petroleum, power, and integrated energy companies share their views on career development issues for women in the energy industry.

We will continue to offer regular departments such as Job Profile, which takes a look at the day-to-day activities and the qualifications for success in certain industry-specific lines of work. And we soon will introduce a new feature, HR Insights, which will glean career development advice from key human resources managers in the energy industry.

With that said, in an effort to continue catering to industry-specific topics and allow you to quickly find the articles that interest you most, we have color-coded the magazine: Energy Interest (green), Petroleum (taupe), and Power (blue).

By combining the two career guides, we have instantly increased our circulation to over 150,000 recipients worldwide.

As for the look and feel, we have effectively changed everything from the actual dimensions of the magazine to the font and the layout.

And finally, to better represent the overall focus of the career guide and all of the changes mentioned above, we gave the magazine a new name, *EnergyWorkforce: For the Industry's Career-Minded Professional*

What has not changed is our mission to deliver the highest quality articles and cover the most important topics for our industry's career-minded professionals. We also decided to keep our editor in place, Bob Williams, who in my opinion is among our industry's top thought leaders.

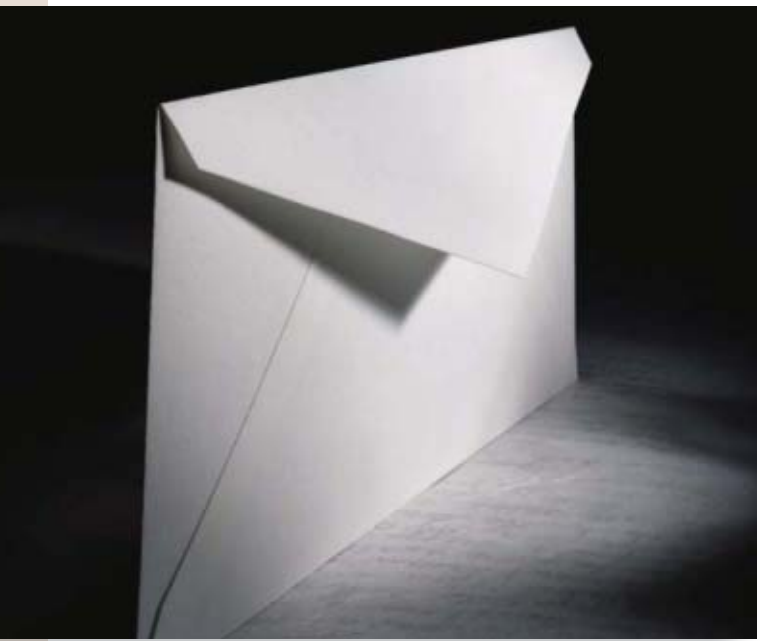
In this issue, Bob debuts another new regular department, Editor's Corner, in which he makes a strong case for collaboration between the power and petroleum industries for tackling the dominant environmental issue of our time: climate change.

I hope you enjoy the changes we have made and continue to find career benefits in reading our publication. Our focus is and always will be to serve you, the reader.

Sincerely,

Jamie Matlin,
Publisher & Director of Recruitment Advertising

Increase engineering salaries — A response



Regarding the letter to the editor titled "Increase Engineering Salaries" (PennEnergyJOBS Petroleum Career Guide, Vol. 3, 2007), I think this letter was written to start controversy, and it seems to be misdirected. By stating that engineers are not well paid compared with other professions is not comparing apples to apples. Being a doctor, lawyer, or CEO that makes more than an engineer also has the burden of risk—diagnoses that could kill someone, trial record of winning, or running a company rather than being an employee. With the risk of the job the pay increases or decreases. Being an eangineer and finding a position within one's self-risk level is the key:

- Would you like to make bottom pay scale? (Go to a job, do your work, and go home: Average Worker—No Risk).
- Would you like to make middle pay scale? (Go to a job, be the best in the office: Great Worker—No Risk).
- Would you like to make high pay scale? (Manage a work flow that increases return on investment: Manager, Responsible for Self and Others—Medium Risk).
- Would you like to make killer pay? (Own the successful business; you could lose investment, income, and be held liable—High Risk).

The statements above are the exact same if I replace engineer in the first line with either doctor or lawyer. However, the only position in that list that is different is the CEO: someone who has taken the risk to start a company, bought a company, or has been entrusted with the position of CEO, which holds the high risk as the successful business owner. Looking at the future for engineers, with engineering graduates decreasing (in some fields) and baby boomers in the market (US) retiring, I personally feel that supply and demand for engineers will increase engineers' salaries.

— Joseph Coym
Performance measurement analyst
Transocean
Houston

We encourage your feedback on this or any PennEnergyJOBS EnergyWorkforce article. Please send your comments to feedback@PennEnergyJOBS.com

PennEnergyJOBS PennWell

Jamie Matlin, PennEnergyJOBS Recruitment Advertising/ EnergyWorkforce Publisher
jamiem@pennwell.com

Michael Silber, Power Group President
msilber@pennwell.com

Bob Williams, Managing Editor
bobw@pennwell.com
918.831.9535

Alana J. Herron, Art Director
alanah@pennwell.com
918.831.9429

Dorothy Davis, Production Manager
dorothyd@pennwell.com
918.831.9493

Tommie Grigg, Circulation Manager
tommieg@pennwell.com
918.832.9207

PennWell Corporate Headquarters
1421 S. Sheridan Rd.Tulsa, OK 74112
918.835.3161

P.C. Lauinger, 1900–1988
Chairman, Frank T. Lauinger
President/CEO, Robert F. Biolchini

A convenient marriage?

Energy Workforce Publisher Jamie Matlin on page 2 discusses the rationale for consolidating the PennEnergyJOBS Petroleum and Power career guides into a single publication.

Apart from the compelling reasons he cites, there is a broader rationale for promoting synergies between these two most vital of industries: Working together, they may be able to devise a cost-effective solution to the challenge of addressing global climate change.

Whatever your views on the issue, no one can dispute that it has taken on juggernaut proportions. The jury may still be out for some of us on the science regarding the inevitability of catastrophic anthropogenic climate change. But the verdict has been rendered on the inevitability of the world responding to the perceived threat through actions that target fossil fuel industries.

Most energy analysts contend that oil, natural gas, and coal will continue to provide the vast majority of the world's energy supply for decades to come. Without steps to curb them, that means more GHG emissions. Annual carbon dioxide (CO_2) emissions from US coal plants alone are expected to rise to 3.3 billion metric tons, or gigatonnes (Gt), by 2050 from about 2 Gt/year in 2006.

Some have suggested that a crash program in building nuclear power capacity would be a solution, but the reality is that no US utility has ordered a nuclear power plant since 1978 because of public opposition to them.

Drastically cutting greenhouse gas (GHG) emissions from the use of fossil fuels will cause energy costs to soar, perhaps to the point of economic devastation and its concomitant human misery. No credible energy forecast points to any alternative fuels taking away a significant chunk of market share from fossil fuels for another generation or two. Energy costs today already are high; what would a world look like with them doubled or tripled—or worse?

What if there were a way to "eat our cake and have it too?" Perhaps there is: a marriage of power plant carbon capture and storage (CCS) with enhanced oil recovery (EOR).

In a paper presented at the Sixth Annual Conference on Carbon Capture & Sequestration in Pittsburgh in May 2007, Vello Kuuskraa and Phil Dipietro posited that notion and put numbers to the potential benefits offered by such a marriage. (Kuuskraa is president of Advanced Resources International, Washington, DC, and Dipietro is with the US Department of Energy's National Energy Technology Laboratory [NETL].)

While CCS is hugely expensive ($35–40/tonne of CO_2), power producers could make it cost-effective by selling the waste CO_2 to oil producers, who in turn would sequester the CO_2 by injecting it into oil reservoirs to recover more oil. In the US, this represents no small number. NETL estimates that of the bypassed discovered oil in US oil fields shallower than 5,000 ft, about 218 billion bbl is technically recoverable. US conventional proved oil reserves today total about 21 billion bbl.

What if there were a way to "eat our cake and have it too?" Perhaps there is: a marriage of power plant carbon capture and storage (CCS) with enhanced oil recovery (EOR).

NETL also has shown that most of the thousands of aging oil fields in the US are amenable to CO_2 EOR. The process currently accounts for about 4% of US oil production. The main reason it isn't applied much more widely is that oil producers have long lamented the lack of CO_2 supply within a reasonable distance. The Permian basin of West Texas and New Mexico is percolating with CO_2 EOR projects because large natural reservoirs of CO_2 are close by in Colorado and New Mexico.

It has been estimated that it would take the application of CCS to 275 gigawatts of coal-fired power in the US to meet the cuts required to help the world stabilize the atmosphere's CO_2 load. Kuuskraa and Dipietro estimated that such a program could make available 8–12 Gt of CO_2 to sell to US oil producers for EOR during 2020–2050, enabling power producers to avoid $10/tonne of CO_2 sequestration cost and net $300 billion in incremental revenue during the period. US oil producers, in turn, could recover an additional 24–47 billion bbl of oil. The direct economic benefits to the US could total trillions of dollars.

This will be neither cheap nor easy. But the oil industry already is using industrial waste CO_2 for enhanced oil and gas recovery—at Weyburn, Sask., and off Norway. It just might work on a much broader scale. And it keeps vital parts of our energy infrastructure intact.

For those who demonize the fossil fuels that underpin our way of life, this may prove to be an "inconvenient truth" they don't want to hear. But it may prove to be a "convenient marriage" for the rest of us.

Bob Williams,
Managing Editor

Forum: Career prospects for women in energy better than ever

Bob Williams, Managing Editor

The energy industry's daunting challenge to sustain a viable workforce has created the best environment to date for women to develop and advance their careers in businesses that traditionally have been heavily male-dominated.

EnergyWorkforce has invited three leading female executives in the energy industry to participate in a forum on the current climate and outlook for women seeking to enter or advance their careers in the energy business.

The forum participants represent a wide range of disciplines across disparate types of business:

Dr. Eve Sprunt is manager of university partnership and recruitment for Chevron Corp., one of the world's largest integrated oil and natural gas companies.

Holly Koeppel is executive vice-president and chief financial officer of American Electric Power, one of the largest electric utilities and power producers in the US.

Dr. Schuyler Gordon is manager of school relations for Entergy Services Inc., an integrated energy services company with power generation and transmission and natural gas distribution business units.

Glass ceiling

Q: Is there still a glass ceiling for women in the energy industry? If so, why do you think that is the case, and how pervasive is it (especially in comparison with other industries)?

SPRUNT: Across the industry we are starting to see more and more examples of women rising to true executive levels. While women are still underrepresented at the top levels, tremendous progress has been made. When I started in the industry almost 30 years ago with a company that has since been acquired, there were few female professionals, and I didn't encounter a female manager for many years. It was novel to just hire a woman. I remember when I was a project leader, and my company was very uncomfortable with having a woman manage older men. Attrition was relatively high because some women became frustrated with the limited opportunities, lack of advancement, and challenges of achieving an acceptable work/life balance. But now, the environment has changed, and there are more opportunities for women to advance, and in an environment that supports them.

GORDON: If a glass ceiling currently exists within some organizations within the energy industry, one reason for its existence may be the result of years of low attrition and voluntary termination of energy industry employees. Traditionally, the vast majority of employees within the energy industry may have been that of male employees; thus in a traditional seniority-based system these individuals ascended higher into the organization than others, resulting in a glass ceiling. Certainly, this is not the only explanation for a glass ceiling potentially existing within the industry, but it may be one that will soon be eliminated. As attrition and voluntary termination slowed, so did the movement of these individuals throughout the organization, thereby resulting in very few positions being available for women within the industry. As we currently expect—and are seeing—a large exiting of these individuals from the energy industry, I anticipate that this glass ceiling may begin to dissipate somewhat as the pool of available and qualified candidates reflect a larger number of women available. It is my hope that any glass ceilings that currently exists within the energy industry will be identified and actively eliminated to ensure that women within this industry are given an equal playing field in terms of the opportunities available to them, as well as career development options.

KOEPPEL: I don't think there was or is a glass ceiling, but I do think that it was difficult for a woman to map out a career path that allowed her to achieve most senior

positions. I don't think managers or employees set out to limit opportunities, but opportunity is often a function of career path management and support from peers and colleagues. I've been fortunate in over 25 years of working in this industry to have had tremendous support, both from coworkers and from industry colleagues. I think the issue of a glass ceiling can be best tackled through training and career path management. There are tremendous opportunities for women with a financial background, not only at AEP, but throughout the industry. There is a much smaller pool of women with operational backgrounds in our industry. I encourage all women to seek out a diverse array of operational and line management roles. That is the type of experience that is necessary to move up, and it expands your potential career opportunities. I'm very fortunate to have experienced a broad array of line management roles and wouldn't be as effective in my current job without that experience.

Prospects for advancement

Q: How would you characterize prospects for career advancement for women in general in the energy industry?

"Prospects for employment in the industry are probably better than they have ever been. The world's energy needs are growing, and we will be very dependent on hydrocarbons for many years to come, which brings lots of opportunities for both women and men, but we all need to make tough choices on our priorities."
— Eve Sprunt, Chevron

SPRUNT: Prospects for employment in the industry are probably better than they have ever been. The world's energy needs are growing, and we will be very dependent on hydrocarbons for many years to come, which brings lots of opportunities for both women and men, but we all need to

make tough choices on our priorities. Given the increase of female representation in the industry, many things that are considered women's issues are actually dual-career-couple issues. Dual-career couples are increasingly common among young professionals, and challenges arise whether the partners work for the same company and/or the same industry. At some point in their careers, the couples are forced to decide whose career takes precedence. In the past, men usually had better opportunities, so it was the man's career that dominated. Now, we see more instances where the women's career takes the lead. Since it is a waste of a company's investment to truncate either partner's career, a challenge for business is to figure out how to enable both partners to enjoy satisfying careers. With the huge number of job opportunities we have now, flexible and creative management should be able to enable couples to work for many years—if not their entire careers—without forcing one partner to seriously limit his or her potential. This is a business issue that is in the company's best interest to pay attention to.

"The power industry is slowly becoming one of the most lucrative industries within the labor market, due to the anticipated increase in construction as well as the necessity of the product we produce. With a large percentage of the energy industry's workforce approaching the life milestone of retirement, there is a critical need within the industry for all types of disciplines. As women begin to enter into these disciplines, as well as actively choose the energy industry as a place to advance their careers, they will find that the opportunities are vast."

— Schuyler Gordon, Entergy

GORDON: The power industry is slowly becoming one of the most lucrative industries within the labor market, due to the anticipated increase in construction as well as the necessity of the product we produce. With a large percentage of the energy industry's workforce approaching the life milestone of retirement, there is a critical need within the industry for all types of disciplines. As women begin to enter into these disciplines, as well as actively choose the energy industry as a place to advance their careers, they will find that the opportunities are vast. When the need is coupled with additional initiatives that organizations are creating to ensure a pipeline of diverse talent, one can only fathom the limits they will have within the energy industry. Some of the things that are now being focused on to increase the pipeline within the energy industry include expanded recruitment activities, vast relationship-building opportunities with targeted women organizations, targeted scholarships/internships/apprenticeships, increased advertisement within majority-female publications, increased focus on the leadership development activities and programs of women, and more formalized mentorship opportunities being available, as well as dedicated cross-functional discussions of women talent to ensure targeted career development options. When all of these things are integrated into a well-thought-out performance management process, the prospects for career advancement for women within the energy industry is even more pronounced.

KOEPPEL: I truly believe that your future is what you make it. If you find this to be an interesting industry, if you are excited about the challenges and opportunities we are facing, and if you are energized by working with others to address these challenges, there is no limit to your potential opportunities. If you map out the broadest possible career path and take as many diverse assignments as possible, you will succeed. My philosophy and advice to others has always been: Ask questions, forge relationships, learn continuously, and have fun. If you love what you do, you can succeed faster than you ever thought possible.

Leveling the playing field

Q: What has your company done—or is doing—to level the playing field for women in terms of a career path toward the executive suites?

KOEPPEL: AEP has been recognized nationally for our efforts to support workforce diversity and a better work/life balance for all of our employees, including women. We've put in place programs specifically to help support women, like a monthly meeting of nearly 100 women in leadership roles in the company, but also programs that support work/life balance, including things such as flexible work schedules, backup child and elder care support, adoption assistance, and expanded paid parental leave programs that support all of our employees.

We've also made career development a priority and focused on diversity. All of the programs we've put in place are helping us attract new talent representing all demographics, not just women. The challenge for us will be to continue that focus and to keep AEP a challenging, fulfilling, and fun place to work.

GORDON: Entergy has always actively promoted the career growth and advancement of all employees, not just its women employees. However, we do recognize that sometimes it takes additional action to ensure women's career paths are adequately aligned toward the executive suites. With this in mind, we have instituted many programs that seek to develop our women employees as well as ensure that valuable discussions are being held that identify those areas that are needed in their respective development. Specifically, our organization has a mentoring program, as well as many development options for current and future leaders. Our employee development group has actively been working on a curriculum that seeks to immediately begin developing our future leaders as well as targeting areas that have been identified as critical areas needed for higher-level positions within the organization. In addition, we have various affinity groups within the organization that have also begun active mentoring with their participants to ensure that they are leveraging the knowledge, skills, and competencies of their organization's respective leadership teams.

SPRUNT: After 21 years in the industry, I joined Chevron in 2000, because I was given the opportunity to do things I had never done before. Chevron has continued to provide me the opportunity to take on roles that were new to me. In the 8 years I have been with Chevron, I've had four distinctly different assignments: managing global climate change policy, venture capital investments, alternative energy research, and university relationships. Chevron is giving women the chance to learn and grow on the job. Unlike the women of 30 years ago, who didn't expect to find female role models, the current generation judges employers by whether there are role models and mentors to whom they can relate. Chevron has a very strong culture of mentoring and network building, and this culture is led from the top level of management where the most senior female executives make themselves available to mentor rising women. We have a women's network run by employees that also helps to build relationships and provide mentoring opportunities. I have found these opportunities very valuable both in meeting the women more senior to myself as well as interacting with those for whom I am a role model.

Initiatives for women

Q: What initiatives should the energy industry undertake to improve prospects for women to advance their careers?

GORDON: Many within the energy industry have already realized some of the key processes and programs they should institute for further advancement of women within their careers, but the most important ones that I've found is that of mentoring and active succession and career planning discussions. All three of these programs are tied together in that a thorough discussion of one's career will thereby lead to more formal discussions regarding the women's careers within the organization. When thoughtful discussions around career paths and possible replacements are held, valuable information regarding areas of growth and opportunity are discussed so that aggressive action can be taken to develop these women in the areas that are needed to advance their careers. We've found that active participation in the company's mentoring program has been a wonderful way for women to network as well as engage in continuous learning by partnering with individuals whose perspective and experience can enhance their knowledge and understanding of business, cultural, or technical issues.

While participation in our program is voluntary and is not intended to replace informal mentoring relationships that also exists, we've found that the mentoring program promotes and enhances professional development and personal growth for both the mentee and the mentor. When these things happen, the prospects for career advancement significantly increase.

KOEPPEL: I think the same types of initiatives apply to all demographic groups, including women and minorities. We need to look at not just development plans for individuals, but at a programmatic approach for rotation programs, cross training, and developmental moves. It's important at all levels that we focus on broadening the skills and experience base of the organization.

SPRUNT: Companies need to be flexible and recognize that not everyone's career must take the same path and that priorities for employees change. Chevron is a family-friendly company in that it recognizes and works to accommodate many different personal situations through flexible working practices such as alternate work locations, alternate work schedules, telecommuting, and support for those caring for dependents.

Our company culture recognizes that women—and men—have lives outside of work and that employees are more effective at work if they are able to attend to their home lives. One of the luxuries of modern communications is that we don't have to work 9 to 5 and be in the office to be effective. Women also need more examples of how they can combine a rewarding career with raising a family. Providing for mentoring opportunities and industry networks for women to tap into at every stage of their career provides a framework for knowledge transfer and support that is critical to career development.

New landscape for women

Q: Is the overall shortage of qualified personnel in the energy industry changing the landscape for women in energy?

GORDON: Absolutely. As a result of the shortage of personnel within the energy industry, we are having to become even more creative than prior years to target women within core disciplines. Where we normally would have used traditional recruitment and sourcing activities such as career fairs, cold calling, and job postings, we're now having to become even more innovative in the recruitment activities we use. One example is that of active relationship building. We are now broadening and

"We are responsible, at a very basic level, for our customers' quality of life. At the same time, we are operating in a very challenging global business environment with competing demands for capital investment and talented employees. What this means is our industry attracts and retains great people who truly care about the needs of society and are energized by the challenges we face in meeting those needs. To me, that's very exciting."

— Holly Koeppel, AEP

IEEE-PES 2008 governing board led by women

Five women have been elected to the governing board of the IEEE Power Engineering Society (IEEE-PES) for 2008.

The fact that IEEE-PES is now led by women is evidence that females are making significant strides in the power industry, says Wanda Reder, IEEE-PES president.

Reder, vice-president, power systems for S&C Electric, is the first female president of IEEE-PES.

Women also were elected IEEE-PES secretary and treasurer. The society's 2008 secretary is Cheryl Warren, vice-president, asset strategy and investment planning, National Grid USA; its treasurer for 2008 is Dr. Noel Schultz, associate professor, electrical and computer engineering, Mississippi State University.

"IEEE and PES will be celebrating its 125th year anniversary in 2009," said Reder. "We believe this is the first time in the history of IEEE that any society has had females in all three of these positions.

"It is especially significant because these governing board positions are elected by the membership."

In addition, of the seven vice-president positions on the IEEE-PES governing board, two slots are occupied by women. Paula Traynor, an account executive with Electric Power Research Institute, is the 2008 IEEE-PES vice-president for technical activities. Edina Bajrektarevic, an operations engineer with American Transmission Co., is the 2008 IEEE-PES vice-president for membership and image.

About IEEE and PES

IEEE (originally the Institute of Electrical and Electronics Engineers) describes itself as "the world's leading professional association for the advancement of technology."

Through its global membership, IEEE is a leading authority on areas ranging from aerospace systems, computers, and telecommunications to biomedical engineering, electric power, and consumer electronics, among others. It has more than 370,000 members in more than 160 countries and includes 39 societies.

IEEE-PES membership encompasses more than 21,000 individuals engaged in electric power engineering.


Reder


Warren


Schultz


Bajrektarevic


Traynor

strengthening our relationships with sources that can directly feed women candidates, within our targeted disciplines, directly to our organization. By continually strengthening these relationships, we've found that they have become one of our primary sources for actively recruiting women in energy. In addition, we've found that our relationships have yielded stronger candidates that are even better fits for our organization. When you invest the time and resources into actively building your relationships, as well as continually feeding them through ongoing communication, the reward is an increase in successful women candidates.

SPRUNT: Yes. Throughout history there have been examples of women getting new opportunities when there were insufficient men for the "traditional" roles. The shortage of qualified personnel creates opportunities for everyone, and right now companies like ours are scouring the world for the best talent. At Chevron, we are actively looking for bright,

motivated women engineers and scientists to fill the ranks—and offering an environment where they can excel and build a career. Around the world we are seeing migrations of people to fill well-compensated jobs. For example, many Indonesians have moved to the Middle East to fill better-compensated jobs. There is now a large section of IATMI (Society of Indonesian Petroleum Engineers) in the Middle East, and the president of the section is a woman. As 2006 president of the Society of Petroleum Engineers, I was very pleased to meet women in leadership positions in SPE and in their companies all around the world. In March 2007, I was thrilled to be a keynote speaker at a meeting on women in science and technology in Bahrain that included very impressive women from Kuwait, Bahrain, Oman, Yemen, and Saudi Arabia. In Libya, I visited a university with a young woman who had just been elected as the representative for the young professionals on the SPE Libya Section board. This anecdotal evidence suggests to me that the landscape has shifted, and we are approaching a critical mass of women in leadership positions in the energy industry.

KOEPPEL: There are certainly significant opportunities for women in the workforce; the question is: How can we make a career in the energy industry exciting and challenging for the workforce of the future, including women? My own view is that we have to ensure that we have as much access and engagement at all levels so that even the newest members of the team feel the pulse of the business. We need to develop multiple career path options—to ensure that folks throughout the organization continue to grow and learn, not necessarily just progress up the ladder. If we broaden the skill base of our workforce, we'll have a pool of candidates for every position that is much richer and deeper than it was when I was moving up through the industry. Electricity providers have a public service obligation and ethic that is fairly unique to our industry. We are responsible, at a very basic level, for our customers' quality of life. At the same time, we are operating in a very challenging global business environment with competing demands for capital investment and talented employees. What this means is our industry attracts and retains great people who truly care about the needs of society and are energized by the challenges we face in meeting those needs. To me, that's very exciting. —EW

We encourage your feedback on this or any PennEnergyJOBS EnergyWorkforce article. Please send your comments to feedback@PennEnergyJOBS.com

Humility seen as key trait for energy futures trader's success

Bob Williams, Managing Editor

Energy commodity futures trading is a risky business; succeeding at it calls for boldness, stamina, resilience, aptitude with numbers, a keenly analytic mind—and humility.

Energy futures trader and risk hedging advisor Steve Mosley, principal and president of Steven A. Mosley Inc., Maumelle, Ark., actually names humility the number one characteristic he deems necessary for charting a successful career as an energy futures trader.

"I really do think that people that trade for themselves or trade for others, deep down they're very humble people," Mosley said. "Because somewhere along the way you've had your head handed to you. I've had my head handed to me. The cockier [some traders] are, the less experienced they are."

"I really do think that people that trade for themselves or trade for others, deep down they're very humble people. Because somewhere along the way you've had your head handed to you. I've had my head handed to me. The cockier [some traders] are, the less experienced they are."

— Steven A. Mosley, natural gas futures trader, risking hedging consultant

With high and extremely volatile oil and natural gas prices the norm today, more and more companies—from oil and gas producers to other commodity producing industries—are hedging oil and gas price risk in the energy futures markets. It's a dynamic business itself fraught with risk. Some oil and gas producers have seen financial results turn sour in a given quarter—even while cash flow is already robust from high commodity prices—because of ill-fated hedges. Alternatively, some industrial and agricultural firms have bolstered their bottom lines with smart hedges that helped them weather oil and gas price spikes that otherwise would have taken huge bites out of profits. So the services of a seasoned futures trader and risk hedging advisor such as Mosley are increasingly in demand. But it's a difficult business to get into, hard to navigate around, and even tougher to succeed at.

Mosley, who specializes in natural gas contracts, is registered with the Commodity Futures Trading Commission (CFTC) as a Commodity Trading Advisor (CTA) and is a member of the National Futures Association (NFA). While he still conducts limited speculative trading services for some clients, the main focus of his business today is providing risk hedging advice for oil and gas producers and industrial firms that include the steel, metals, paper, fertilizer, petrochemical, and agricultural sectors.

"Essentially, I became a commodity futures trader in 1991 while managing risk for the gas marketing joint venture that I founded in 1988.," he said. "I used swaps to hedge price for our gas marketing deals and used proprietary funds to trade natural gas futures contracts speculatively from 1991 through 2002. The speculative activity was successful in that an initial investment was multiplied by 22 over that 11-year period."

Mosley began winding down personal trading in 2002 and became registered as a CTA with the CFTC so that he could properly manage outside funds and provide advice on futures trading and hedging. He has profitably managed outside funds in natural gas futures since becoming a CTA. He also began providing hedging advice in 2003 and currently has a number of oil and gas and industrial clients that he provides with a standard written products as well as other add-on services.

Background

Mosley attended Oklahoma State University at Stillwater, Okla., and graduated in the mid-1970s, getting an accounting degree.

"We were in a recession, and the only ones getting jobs were chemical engineers and accountants," he recalled. "I worked for Phillips Petroleum [Co.] for about 2 years as a computer programmer. And then with that accounting degree, I ended up getting to go to work for a Big Eight accounting firm [Ernst & Whinney] for about 5 years. After that period of time, I went back into oil and gas, and I did revenue accounting and then special projects for Samson Resources [Co., Tulsa]. We kept track of well payouts and that sort of thing. We handled a little bit of acquisitions."

> *"I had a real good run of about 10 years just speculating on futures, making my living that way and had a couple of years where I made a lot of money. Probably the worst year was when I lost about $100,000. It was a rollercoaster, and it kind of became stressful over time."*
>
> *— Steve Mosley*

Mosley's desire to get more into the business side of the oil and gas industry at first focused on contracts between pipelines and the producers trying to sell them gas—at a time when natural gas was still regulated by the federal government. That led to a job with Northern Natural Gas Co. in the firm's contracts group, where he was employed for several years.

"Then [Northern Natural] went through the merger where they became Enron [Corp.]. And I took a severance with them and went to work for Arkla Energy Resources over in Little Rock."

At the time, Arkla was in the early throes of gas deregulation and in the process of setting up a sales and marketing group to sell deregulated gas and gas transportation services.

"I signed up for that really quick because that sounded like the place to be," Mosley recounted. "After a couple of years, our boss lost a political struggle, and I wasn't sure if I still had a job, so I thought if I was ever going to start my own

business, then this was why I needed to do it—because I knew more about the Arkla transportation business and the markets and the industrials than anybody over there and anybody outside the company."

"I've been known to set an alarm clock and check it periodically in the night if I am particularly nervous about a position. That's one of the exhaustive things about trading—sometimes you don't go back to sleep. You end up getting mentally and physically exhausted."

— Steve Mosley

That decision led to a 50-50 joint venture Mosley with a small firm, Panda Resources Inc., Tulsa, that handled marketing and transportation services for Arkla for 5 years.

"I built up more industrial customers on Arkla than anybody else had. They tended to be the smaller and medium-sized customers, and we took good care of them, had some real loyal customers."

Once the natural gas supply bubble of the late 1980s dissipated, prices rose, producers demanded letters of credit, Panda changed its business model, and the Mosley-Panda joint venture sold the marketing side of the business to Tulsa-based Vesta Natural Gas Co. Around the same time, the natural gas futures market had started up.

"The hardest part of what we were doing then was risk management, because we would buy gas at market and sell it at a fixed price," Mosley said. "We had real good fortune for the first 2 or 3 years because we would do a fixed-price deal and the market would fall during the year, and we would make more money than we thought we were going to.

"And then when it turned, we needed to start hedging. So we figured out how to do swaps. We were one of the first gas marketers doing swaps; we were doing swaps with Williams [Cos.,] and we did one with Enron. I researched all this and figured out how to do it."

About then Mosley started dabbling with speculation in the futures market.

"There was one time where we couldn't afford a letter of credit for some swaps, so I ended up just buying a whole lot of futures contracts just right as the market started running up," he said. "We managed to hedge and stay in business. My half of the venture could have been in dire straits if I hadn't done that. When we sold out, I worked for a year for Vesta to keep all those contracts with them and made sure that all of those industrials stayed with them—and I actually added a few more."

After completing a 1-year commitment to Vesta, Mosley struck out on his own playing the futures market.

"I had a real good run of about 10 years just speculating on futures, making my living that way and had a couple of years where I made a lot of money. Probably the worst year was when I lost about $100,000. It was a rollercoaster, and it kind of became stressful over time."

Subsequent concerns over financial security for his family spurred Mosley to make the decision to phase out his personal trading and start a consulting and trading business, first getting registered as a CTA.

"I started trying to offer my services either trading gas or writing reports for people and sharing my perspective on the market—basically what I'd developed as a system for identifying highs and lows in the market. I was having trouble finding people to trade with me, but the reports caught on fast. Oil and gas companies started buying them, and some very large industrials—paper mills, fertilizer plants, steel companies, agricultural and aluminum companies—started buying the reports. So I turned it into a standardized report. I'd do a monthly report, then weekly reports, then I'd do midweek updates whenever the market started doing something that we were not expecting."

Although Mosley had quit trying to offer his trading services, some of his reports also brought him a few trading prospects.

"It's kind of hard to bring on new clients when you're trading a lot, because that's really a full-time thing too."

As the trading service opportunities diminished, Mosley expanded his consulting business.

How a trader works

In speculative trading of energy futures commodities, activities tend to extend from Sunday night until late Friday afternoon, Mosley said.

"The most difficult aspect of trading involves the 24-hour/day trading that takes place in the energy markets," he said. "When I have a position on or am looking to establish one, it is important to keep a sharp eye on everything a good portion of the day and as much as possible at night. I have a screen that I can watch at home as well as in the office, and I tend to check it several times in the evening as well as in the middle of the night when I wake up. I've been known to set an alarm clock and check it periodically in the night if I am particularly nervous about a position."

Mosley acknowledges that such a work style can take its toll.

"That's one of the exhaustive things about trading—sometimes you don't go back to sleep," he said. "You end up getting mentally and physically exhausted. That was the worst thing that happened to energy markets, in my opinion, to go to all-night trading. It made it very, very difficult."

Before all-night trading, "you could look at what happened during the day and envision what you thought the market would open at the next day and either get in or get out. It was closed for the night, and there wasn't anything you could do about it. You went home. At 9 o'clock the next morning, the market opened again, and you watched it open based on the fundamentals, and that was it."

Nowadays, there are some big players on energy futures market who will move large contract volumes at night, "and a lot of times the biggest moves come at 5 o'clock in the morning."

Fortunately, a trader is able to set triggers to get in or out of the market if it should hit certain points, which helps to reduce the amount of time otherwise spent watching live trading. Such triggers, or "stops," allow a trader to reduce much of the emotion and stress of the trading function and helps to keep the mind clear and objective in the decisionmaking process.

"I have greatly reduced and almost eliminated my trading in proprietary funds after 2002," Mosley noted. "Essentially, I believe it helps me stay fresher and a little more objective if I'm not trading my own funds. I have never traded my own funds while trading speculatively for others. Professionally and ethically, a CTA has to take care of his clients first."

A typical week of personal trading for Mosley would entail undertaking two or three transactions, including adding to a position as well as taking from a position. The same amount applied to trading for clients.

"My goal is to know what is moving the market and to be able to anticipate market trends in order to provide clients with timely conclusions and recommendations that are proactive as opposed to reactive. The idea is to incorporate history and experience and, as accurately as possible, project short and long-term movement before it happens."
— Steve Mosley

"There are some folks who trade in and out a lot, catch the daily moves. I try to maintain the big picture and then just trade from one side of the market. If I think the market is moving up, then I'll trade from the long side. If I think it's moving down, I'll trade from the short side."

How a hedging advisor works

A hedging advisor also faces a 6-day work week, although the sleep patterns are better.

"I don't tune into the market real early in the morning," Mosley said. "Energy markets are open 24 hours a day, and you get some strange trades at night and first thing in the morning. I usually wait until the floor trading starts, when there's a high volume, and then I plug into the market, and I check weather.

"Weather is one of the first things I check every day—in fact I check weather several times a day. You're always looking, especially this time of year, for anything new that might be moving the market, such as weather forecasts. With natural gas you're looking at what's going on in North America, especially east of the Rockies..."

Mosley's clients receive standardized reports that include a monthly report, weekly reports, and occasional midweek updates.

"I basically need to be well plugged into what is going on in the futures market and what is happening with the fundamental and technical factors that affect its movement," he noted. "Much of my time is spent checking and analyzing various weather forecasts, storage data, cash pricing, and other markets that affect natural gas, such as oil and the factors that affect oil's movement.

"My goal is to know what is moving the market and to be able to anticipate market trends in order to provide clients with timely conclusions and recommendations that are proactive as opposed to reactive. The idea is to incorporate history and experience and, as accurately as possible, project short and long-term movement before it happens."

In addition, some of Mosley's clients—who for a variety of reasons are active in making daily adjustments to their hedging positions—prefer services beyond written reports and updates.

"With these clients, I provide anywhere from one to four e-mail or phone updates per day and will comment on changes in weather forecasts and other intraday changes in fundamental or technical factors."

In his monthly report, Mosley tries to lay out a "big picture" perspective of a coming movement and then uses the weekly and daily updates to adjust projections based on how fundamentals and technicals are varying from expectations.

"I probably spend more time writing and fine-tuning my reports than my clients realize," he said. "The act of writing helps to focus sharply on the subject matter, and the editing process provides the assurance that what I've said makes sense and is still consistent with my thoughts on the day the report is issued."

Monthly reports are composed and adjusted from Tuesday through Friday, and weekly reports are done on Thursday and Friday. In both cases, Mosley does the final edit on Saturday and generally sends it to clients via e-mail by early Saturday afternoon. "I then use the remainder of Saturday and Sunday for R&R and clear my mind for the coming week," he said. "I do check in on weather forecasts and the market when it opens again on Sunday evening. I spend spare time during the day making prospective client contacts and taking care of administrative functions and related paperwork."

Basically a typical day for Mosley involves research, monitoring, and "getting your head in the game as to what's going on.

"You want to make sure that you understand why the market is doing what it's doing that day or that week or during that month, then be able to anticipate what's going to happen next."

> *"There's a tremendous amount of advice that goes out in the market from brokerages and the like. And it's written by people who have no trading experience themselves. As far as I know, I'm probably the only advisor that has a successful trading record to back up my advice."*
>
> *— Steve Mosley*

What moves the market

Energy traders don't have time to do a lot of research, Mosley noted, and thus tend to react viscerally to market movements.

"The commodities markets move on two things—anxiety and comfort. Anxiety tends to create upward moves, and comfort tends to create lower moves. High storage creates comfort; mild weather creates comfort. Anxiety is created when you're moving toward a seasonal period, like moving toward winter because you have anxiety over what the winter might bring.

"So the whole idea is to get an overall feel for the market as to whether you've got anxiety building or some comfort and whether you've reached a peak in anxiety or you've reached the lowest part of the comfortable.

"You see a day where you say, 'Things couldn't get any more bearish than this—storage is up, and the forecasts just came out for mild weather'—a lot of times that will be your low in the market. If it stops moving downward for a time, a lot of times you've reached your low.

"There's a lot of just experience to go by—you recognize things from what you've seen in the past. History repeats itself. There have been times when I've looked at what the fundamentals were at a certain point in time, and I'll see what the fundamentals are now and go back and look at when they

were similar and when highs and lows came and why. Then what I'd do is project when a high or low is going to occur."

Then there are times when something out of the ordinary occurs in the futures markets, Mosley point out: "Maybe oil is moving to one of its all-time highs, and sometimes that will take natural gas with it. You have to know from experience how long and much it's going to affect gas. There are certain times of the year that oil does affect gas very directly, like in spring and early summer. You pay close attention to oil at those times."

Seasonal umbrella

Mosley's overview of the gas futures market is that of a seasonal "umbrella," in which he has divided the year into four components: a winter season, a summer season, and two seasons that lead up to those—the shoulder months.

"There are seasonal tendencies in each of those periods to have highs and lows," he said. "There are usually one or two significant highs and one or two significant lows in each of those periods. So I try to get my industrial clients to hedge at the lows, and I try to get the producers in a position to hedge at the highs. Based on what the fundamentals are and what the seasonal aspects are, I kind of marry those together. You look within the season and see what the tendencies are, and then you look at the fundamentals—and if certain fundamentals skew, you have to suspect your timing is not going to be like normal."

"Once you get in, if you get upside down a certain amount, you get out because you weren't anticipating that. Sometimes you'd stay in a day, maybe 2 days, and if [the market] isn't doing what you thought it was going to do, you just get out and take your loss. Those little losses are so much easier to recoup than a big, bad loss. You can get really down on yourself when you make a mistake—you think: 'I should have seen that coming.' But when you do make money, and you have a good run, it's the best feeling in the world."

— Steve Mosley

Mosley noted that the extremely high gas storage levels of the past 2 years have put the market off its normal timing for the seasonal highs.

"It's been very tough for some of my producer clients to put down some good hedges during some of the high points, because what highs we've gotten have come at odd times, and the times when we usually get them, we haven't had them," he said. "It's been tough on them and tough on me too."

Research and data

A hedging consultant must invest a great deal of time in researching daily happenings and current statistics.

"I read newswires to see what's happening. The newswires tend to be overly dramatic about what's going on in the market, but it's interesting to see what they're talking about. Reuters is a really good newswire.

"I do research on the EIA [US Energy Information Administration] website just to see what's going on with oil markets. I've got daily charts of all the oil, the gasoline, the natural gas prices, and I watch those charts during the day just to get a feel for how they're reacting to various weather forecasts and the things that are going on.

"You spend a lot of time in front of the tube. And you make a lot of phone calls. You call people whose judgment you value—other traders, other folks like yourself.

"The whole idea is to lay out expectations in a monthly report for how the market is going to react for that month—and actually for a whole season. At the beginning of the season, I'll say: 'Here's when I expect the highs and lows to occur, and here's the general price I expect, based on fundamentals.'"

Once the period is under way, Mosley monitors those fundamentals, noting his original expectations and advising clients to make needed adjustments.

"I lay out recommendations at the back of my reports as to when they ought to hedge and when they ought to watching for hedges, and sometimes during the middle of the week I'll send out a report saying, 'This is when you ought to be hedging now' (an example of one of Mosley's midweek reports is shown in the accompanying sidebar)."

Hedging advice

Mosley has little use for the energy commodity risk hedging advice touted by giant Wall Street financial

services firms. "There's a tremendous amount of advice that goes out in the market from brokerages and the like. And it's written by people who have no trading experience themselves. As far as I know, I'm probably the only advisor that has a successful trading record to back up my advice.

"[The big brokerage houses] tend to hire some MBAs and put them in a room and say, 'Here, make some economic analysis.' I've never talked to one of those guys that writes that stuff that has ever traded a contract for his own account.

"Some are good with storage statistics, but I don't pay any attention to their thoughts on market movement."

Mosley contends a background in the oil and gas industry itself and experience as an energy futures contract trader are an imperative for someone to provide good energy risk hedging advice. In order to be a credible hedging advisor or speculative funds manager, he contends, it is essential to have successfully managed proprietary or outside funds in speculative futures. He also thinks it is important to thoroughly understand the commodity involved and to have worked as a player in the related industry.

> *"The discretionary traders, when they do well, they tend to do very well. The technical traders tend to be some of the big boys in the East, and they're happy to knock down 7% [return on investment] a year. A good discretionary trader can knock down maybe 50% in a year, but he might lose 5% the next year."*
>
> *— Steve Mosley*

"You almost have to trade [to be adept at giving risk hedging advice]; it sharpens your senses when it's your own money on the line. Trading is a very emotional, stressful thing to do. A lot of times after a big trade, you've been in the market for several days, you're just physically worn out; I'd take a week off. I don't know whether trading other people's money or trading your own is more stressful. I hate to lose money for

other people, and I hate to lose my own money. Fortunately, I've always made money for myself and for others."

When his own money was on the line, Mosley always sought a comfort zone in deciding whether to go long or short.

"Once you get in, if you get upside down a certain amount, you get out because you weren't anticipating that. Sometimes you'd stay in a day, maybe 2 days, and if [the market] isn't doing what you thought it was going to do, you just get out and take your loss. Those little losses are so much easier to recoup than a big bad loss.

"You can get really down on yourself when you make a mistake—you think: 'I should have seen that coming.'

"But when you do make money, and you have a good run, it's the best feeling in the world."

"It's better to occasionally settle for a flat trading year as opposed to taking a low-probability risk that varies from a proven system. As a result of this type of discipline, I have only had 1 year with a material loss in over 13 years of speculative trading."

— Steve Mosley

Different systems

Mosley acknowledged the wide range of systems that energy commodity traders use to hedge price risk.

"It's a very strange business. Everybody has his own system. Some people trade only on technical factors, others trade only on fundamentals. My system involves both technicals and fundamentals.

"The people that trade only on technical factors often have absolutely no idea about the markets that they trade—it's just all these technical things, like when certain waves happen, they get in. They've discovered over time that they can be right more often than they're wrong by using that system. I really need to know the market; I need to know when the market's about to blow or fall apart and to get in and ride that."

It's also critical to pay attention to the seasonal aspects of trading, Mosley said. "Seasonally, there is a tendency for a high at the end of October, and you've got be very careful about sticking with a long position, because it's likely to turn very sharply on you."

Mosley generally divides traders into two camps: discretionary and technical—the former ruled more by experience and instinct, the latter more by elaborate statistical models

"The discretionary traders, when they do well, they tend to do very well. The technical traders tend to be some of the big boys in the East, and they're happy to knock down 7% [return on investment] a year. A good discretionary trader can knock down maybe 50% in a year, but he might lose 5% the next year."

Mosley contends that the less time spent watching the market during an active trade, the better for the trader's peace of mind.

"You can make assumptions about what it's going to do and either trade or don't trade based on those assumptions," he said. "Sometimes, you walk away from it for an hour or two during the day, but you've put in some safety stops. If you're in the market, you always have a protective stop. It something unexpected happens while you're not watching the market, it gets you out automatically. If a terrorist act happens when you're not watching it, you don't want the market to move on you 2 bucks without getting out."

Understanding the business

Mosley contends that it's difficult to understand how the commodities futures trading industry works because there's not much information on it.

Essentially, a person or corporate entity is generally required by law to have a registration with the CFTC and membership in the NFA if they are soliciting funds for management in commodity futures, Mosley noted: "My registration is such that I can only solicit funds management services with qualified eligible participants. These are normally considered to be wealthy individuals, corporate entities, or other members of the NFA.

"As far as the advisory work, I can generally provide advice to anyone, but as a CTA, I think I have an ethical obligation to

A natural gas futures risk hedging consultant's advice to clients

Steven A. Mosley's risk hedging consulting incorporates monthly and weekly advisory reports—both too lengthy to replicate here—to clients seeking to hedge their price risk in the natural gas futures market. He also provides midweek market analysis updates to clients, including this Jan. 16, 2008, sample:

"Clients,
"In our last weekly report, we continued to note the progress of our anticipated late December/early January rally and continued to think that the window for this rally would close by around the 15th of the month. As such, we thought the highest point would occur sometime between Friday (1/11/08) and Wednesday (1/16/08).

"The high point of our rally appears to have come on Monday (1/14/08) at $8.482, as early week forecasts stayed very bullish. Since Monday, however, private weather forecasts have been hinting that the arctic cold that is moving into the US will end in late January and that a Pacific flow will resume. We think these forecasts have correctly facilitated the pullback to the low $8's. The National Weather Service forecast this afternoon appears to have picked up on the same indicators as the private forecasters, and the market has dropped closer to $8 in today's late afternoon electronic trading. Even if forecasters eventually decide that the cold will stay around a little while longer into February, we don't think the market will be able to mount a recovery that will exceed the $8.482 high-water mark from Monday.

"If the weather pattern hints are right, and the pattern does change back to the Pacific flow, we think there is still a good chance that the year-on-year storage deficit can be eliminated by early March. As such, we continue to target mid-to-late February for a winter seasonal low and continue to think prompt month market pricing should have the potential to fall back below $7, somewhat as expected. If cold lingers on materially, we will be much less apt to see the deficit eliminated and may not accumulate the necessary market comfort to get pricing back to $7.

"We anticipate that cash pricing will rise tomorrow and Friday as the coldest air approaches, and this may open the door to a late-week recovery in natural gas futures. However, we are not anticipating that any recovery this week or next will exceed $8.482 and that this high will stand as our late December/early January significant high."

NYMEX natural gas futures prices

Source: New York Mercantile Exchange

know my clients and to understand that my advisory services are appropriate for their needs."

Companies or individuals looking for funds management services in commodity futures need to be careful that they are dealing with appropriate entities registered with the CFTC and members of the NFA, said Mosley. Those looking for only advisory services are also better off looking for a CTA.

"While the right of free speech allows anyone the ability to state opinions on market movement, the chances that you will be getting advice from someone with experience and a successful track record are much better if they are a CTA.

"CTAs usually charge for their advisory services. A good saying to remember in looking for advisory services is that 'you get what you pay for.'"

Mosley has found that the most difficult thing about conducting business as a CTA is being found by entities that can benefit from one's knowledge and advice.

"While the NFA will provide a name and address list of all registered entities, they are not willing to produces a directory that would make it easier to locate a person or company with certain specialties…I hope this is something that can be changed at some point.

"Essentially, those who have completed the requirements for registration are, in effect, the 'good guys' in the commodity futures business, and I think it would be in the best interest of investors and those looking for advice is for the NFA to make information on such entities more readily available and easy to decipher.

"It's a tough industry, even when you're in it, to find people to do business with. When you're trading your own money, you don't have to be registered, you just do it yourself. When you're trading other people's money…it's just hard to find those folks that will want you to trade their money."

The NFA's policy of not making it easier to find commodities traders for fear of helping them "promote" themselves is "a frustration of being a little guy," said Mosley. "It tends to favor the big guys who have the names,—the Goldman Sachs, the Smith Barneys—and they generally make their money off of trades. They have research folks who write reports whose purpose it is to generate trades and to boost their image."

The most difficult thing about managing outside funds is convincing a client of the importance of sticking to a disciplined trading approach, according to Mosley: "It's better to occasionally settle for a flat trading year as opposed to taking a low-probability risk that varies from a proven system. As a result of this type of discipline, I have only had 1 year with a material loss in over 13 years of speculative trading."

Hedging strategies

Even after providing his advice on hedging, Mosley often doesn't know what the strategies or outcomes are for his clients. "The folks that I give advice to I don't trade for; I just give them advice as to when to pull the trigger on a long or a short sale. A lot of times you don't know what they're doing. They may make only one or two hedges a year.

"The whole idea is that when they're trying to lock in 6 months or a year of gas prices, they're reading my stuff to see what I think is one of the market lows.

"These industrials, there's a lot of reasons why they would lock in. Maybe they've beaten last year's budget and looked at all the futures prices for the entire year, and they're lower than what they paid last year. They may say, 'Maybe we ought to hedge here. Let's see what Mosley says, if he thinks the market is going to go lower or expects to turn and go back up.'"

One client will contact him via e-mail several times during the day because they're constantly putting on hedges and taking them off.

"They don't reveal their strategy to me, and I won't know whether they're in or out. I'm sort of a third head for them."

Personal characteristics

Being a futures trader is not something ones sets out to do, Mosley has discovered: "It's something you pick up sometimes out of necessity. It's a dangerous thing to do. I had a friend that basically lost about everything he had. You have to be very, very careful."

His advice to a young person interested in commodities futures trading:

"You have to be humble. You need a very analytical background. My accounting, programming, and math abilities have given me the ability to dissect the market, looking for patterns. I was always good at that, looking for patterns in tests and the like.

"You have to be bold and have some determination to get back up off the ground and go at it again. You have to be resilient. You have to have mental and physical stamina. It will wear you down. You occasionally have a year where you don't make any money, where you're right only 50% of the time.

"While I don't know a recipe for a successful trader, I credit my math abilities and my analytical background in computer programming and public accounting in providing me with the necessary thought processes and discipline that I think it took for me to experience a degree of success in this field." —EW

We encourage your feedback on this or any PennEnergyJOBS EnergyWorkforce article. Please send your comments to feedback@PennEnergyJOBS.com

Rejuvenating the workforce supply chain

Brad Kamph, Interliance Consulting Inc.

This is the first of three articles analyzing the bottom-line approach to knowledge retention in the energy industry.

Everybody's talking about the workforce these days. Unfortunately, it can mean different things to different people.

Some consider it a human resources (HR) matter, while others think the term applies to the "brain drain" resulting from a constant stream of retirees or is all about training and knowledge management.

So who is right? Each one is correct—at least in part.

To comprehend the serious personnel situation the utility industry faces, it is vital to grasp the entirety of what could be termed the workforce supply chain. This article discusses the workforce supply chain and lays out a way to analyze it in each company in order to determine priorities and set effective strategy. The goal is to halt the steady loss of skills through attrition and set the organization on the right footing for the future.

Most current strategies, though, are either incomplete or flawed. Despite serious effort at improvement, these companies continue to struggle in the battle against attrition. It takes a cold, hard look at the situation and a realization that if personnel, efficiency, and profitability continue to be problematic, it is a sure sign that the strategy needs to be retooled.

One common error in strategy, for example, is an overemphasis on the aging workforce. While this may be correct for a few companies, statistics disprove that this is the most pressing challenge overall.

According to the US Department of Labor, estimated retirements for 2006 were 4.4%. Measured "quits" in the utilities industries, on the other hand, totaled 19.4% for the year. Clearly, retirement is a problem. But these numbers highlight the fact that retirement represents only about one-fifth of the overall attritional situation. Yet only one out of every eight companies has a goal of addressing nonretirement attrition.

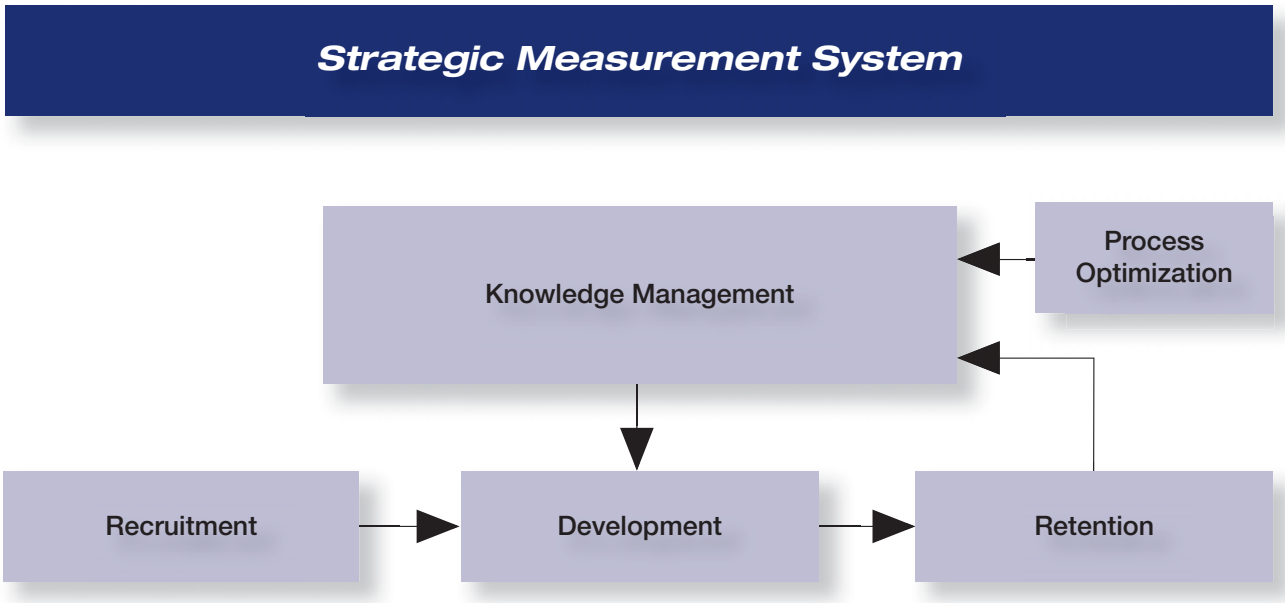
Reading these data, some utilities might be tempted to immediately reverse course, abandon aging workforce actions, and tackle other forms of attrition. However, that might not be the best approach. Some companies desperately need to address retirement, while others don't. And some need to address both in equal measure. The point is that each organization is uniquely different and has specific and individual needs.

Workforce supply chain elements

Without an understanding of the workforce supply chain, the utility industry is beset with a host of problems. Most are attempting to combat the loss of organizational knowledge through retirement and headhunting. Those that fail to stem the tide then have to come up with new, qualified resources. And that leads to another dilemma—to pay a premium for experienced staff

According to the US Department of Labor, estimated retirements for 2006 were 4.4%. Measured "quits" in the utilities industries, on the other hand, totaled 19.4% for the year. Clearly, retirement is a problem. But these numbers highlight the fact that retirement represents only about one-fifth of the overall attritional situation. Yet only one out of every eight companies has a goal of addressing nonretirement attrition.

— Brad Kamph



The workforce supply chain comprises elements such as recruitment, development, and retention. While knowledge capture is vital to development, it is not actually a part of the development process. It sits above the development box and feeds vital know-how into the development process. Similarly, process optimization sits about the supply chain, as it impacts all facets.

or to recruit industry rookies and hope they can be trained into competence in a reasonable period of time.

Meanwhile, any workforce programs drawn up invariably demand change—and that may not sit well with local unions. So how do you manage that union relationship in order to implement a workforce strategy that significantly changes the culture of the organization?

Let's look at things another way. Those with workforce programs ongoing are surely familiar with the difficulties inherent in measuring their success. But how do you demonstrate results to top management and convince them to continue investment in something that is hard to state in return on investment (ROI) terms?

Fortunately, it is possible to transform a workforce strategy from a cost into an investment with measurable ROI. But first, it takes an understanding of each element of the workforce supply chain, the dynamic interrelationships between each element, and how each ties into overall operations. By isolating these relationships and the continuous shifts in their relative importance, management is empowered to develop the right workforce strategies: those that map a steady path towards heightened efficiency and profitability.

Let's take a brief look at the various aspects of the supply chain.

Fortunately, it is possible to transform a workforce strategy from a cost into an investment with measurable ROI. But first, it takes an understanding of each element of the workforce supply chain, the dynamic interrelationships between each element, and how each ties into overall operations. By isolating these relationships and the continuous shifts in their relative importance, management is empowered to develop the right workforce strategies: those that map a steady path towards heightened efficiency and profitability.
— Brad Kamph

Recruitment

Recruitment is self-explanatory. It encompasses actions on college campuses, high schools, and job fairs. It includes an online presence,

compensation policy, a resume database, headhunting, and a whole lot more.

But done on its own without the right strategic guidance, recruitment efforts can go astray. Companies end up with too many green employees while the situation is dire at a critical installation that is about to lose several valuable staff.

Alternatively, the HR budget can be placed under severe stress when too much emphasis is placed on hiring top talent.

It's all a case of finding the right balance between experience and cost. A workforce analysis goes a long way towards locating that sweet spot in any organization.

Development

Hired personnel immediately move into the development category. Similarly, all existing personnel correctly come under the province of development—the more their skills are honed and new skills learned, the greater their value to the organization.

The development phase consists of two principal aspects, knowledge transfer and personnel qualification. The goal is to transform raw and existing talent into competent resources.

Training certainly plays a major role in this—and it is a weak point in many outfits. The organizations that deliver the best quality training provide basic training on the company itself, as well as the technological fundamentals of specific positions.

Retention

Retention is all about keeping people employed despite the lure of retirement or headhunters or being lost through inadequate opportunity.

If your organization excels at bringing in top talent, but cannot retain them, there is an enormous cost that can be avoided. After all, it is hard to replace the experience or know-how of a 30-year veteran. Thus it is important to target retention efforts at specific skill sets and age groups.

Knowledge capture

Not all veterans are created equally, however. It turns out

that some veterans' knowledge is far more valuable than others. But how can you tell the difference?

A workforce analysis relates existing skill sets to organizational efficiency. If one impending retiree worked in an area that had performed consistently badly for a decade, why capture that knowledge?

Instead, find those veterans who operate in highly effective portions of the organization and tap their brains for the benefit of future generations.

Process optimization

Process optimization is an area that invades the other zones such as recruitment, development, and retention.

By optimizing the organizational processes, each element of the workforce supply chain is made to function correctly.

If processes are flawed, after all, knowledge capture will be ineffective and recruitment resources will be squandered. Thus process optimization plays a fundamental role.

Strategic role

The value of achieving an end-to-end understanding of the different facets of the workforce supply chain is evident once you inspect each one within a given company.

It will be found that one or more elements are neglected or omitted entirely by companies suffering from personnel stress. This will prove illuminating when engaged in the setting of workforce strategy.

In order to determine the best course, then, a company's efforts are best served by conducting an in-depth analysis of the workforce as a whole. By carrying out a workforce analysis, it becomes possible to set the right priorities and plan out the most appropriate remedial actions.

When it comes to nonretirement attrition, for instance, it isn't enough to tackle it generally. A hit-or-miss approach might end up consuming time and resources without results. A workforce analysis determines exactly which workers are most at risk. In one company, for example, research data revealed that most personnel tended to leave after 2–7 years of service. Armed with a specific breakdown of personnel most at risk, it is possible to initiate the correct program.

Such a workforce analysis goes far beyond the scope of a traditional training needs analysis. It spans the entire spectrum of the workforce supply chain—from recruitment through retention, knowledge capture, and process optimization. It correlates the relationship between business needs and workforce requirements, as well as attrition risk to organizational skill levels. In addition, it helps to identify which knowledge it is most important to capture, as well as specific skill development and process improvement priorities for the organization. Instead of viewing the workforce in intangible terms, a workforce analysis presents the entire picture in a workable framework and in terms of ROI.

Without this in-depth analysis, the likelihood is high that the company will engage upon a direction that may not bring about a long-term resolution. Companies in the industry, after all, have adopted all manner of programs over the past decade or so. While some worked, many weren't appropriate to the situation.

Utility example

Take downsizing in the utility sector. Major turbine maintenance used to be conducted by large in-house crews. A 1,000-MW plant, for example, might have had 75 to 100 full timers in maintenance alone, and many of these were 20-year veterans. They were typically supported by another crew of about 30 people for day-to-day maintenance duties. This brought stability, and what came with it was a climate of long lead times and slow budgeting.

That's all changed over the past decade or so. The internal crews have all but disappeared. In their place are a couple of supervisory staff whose job it is to keep an eye on outsourced engineering teams. Financing and scheduling have become more frantic. It's no wonder that short-term planning tends to dominate and longer-term projects, such as regional transmission upgrades, rarely get the attention they merit.

Workforce analysis benefits

The remedy is to have an accurate estimate of the current business environment. The key to correctly solving any organizational problem is to fully and comprehensively understand where the workforce currently stands. This helps companies to zero in on the knowledge gaps that will exist when employees retire and how well that

knowledge is being trapped before it walks out the door for the final time.

A workforce analysis also helps companies to accurately measure the capability of its workforce, determine if internal processes are capable of supporting company expansion, and ensure that training provides the exact skills needed to impact business performance. And it answers that all-important question: Who do we really need to hire?

A workforce analysis, then, is of material assistance in quantifying workforce challenges, forecasting future capabilities, and identifying the relationship of the workforce to actual business needs. It is both a strategic and tactical tool set that is designed to isolate the specific organizational skills and the depth of knowledge that currently exist and to relate specific skills to the business reasons for each performance requirement of the job position. It determines strengths and weaknesses of the workforce; key areas of required training, process improvement, and knowledge capture; the current depth of knowledge within each job class and the organizational learning rate; and a strategic focus on the skills and knowledge gaps that are most important to the successful operation of the organization.

The resulting analysis provides a specific action plan for closing present skill gaps and preventing future gaps before they occur. The process has been utilized in union as well as nonunion environments and for technical, professional, and other fields.

Further, it must be realized that a workforce analysis should not take an eternity. The entire process can be done competently and conclusively in about 6 weeks.

And management is armed with exactly what it needs to act with precision. In one company, for example, the analysis uncovered worker uncertainty as the underlying issue. Operations or maintenance employees on average were found to have less than 50% of full certainty for all skills within their job position. The workforce analysis homed in on this area, breaking skill level certainty down further in terms of position.

Thus management received a report outlining the relative levels of certainty for each section of the plant and every position, how those certainty levels would vary over time, which skills were most in danger, and the areas of the plant in most need of attention. The findings were then correlated with statistics of problem frequency to determine knowledge capture, skill development, and process improvement priorities.

Conclusion

By understanding every facet of the workforce supply chain, management has it in its power to transform a workforce strategy from a cost into an investment with measurable ROI.

Only by knowing each element of the supply chain, as well as their dynamic interrelationships, is it possible to develop laser-precise workforce strategies that improve efficiency, productivity, and profitability.

A good starting point is a workforce analysis. It offers immediate direction on how to rapidly bring about a substantial reduction in the turnover. As well as serving as a launching pad for strategic planning, it is a proven way to save millions of dollars on workforce development costs.

Subsequent articles in this series will delve further into the development of a workforce analysis for energy companies, as well as demonstrate its effectiveness with case studies taken from the energy industry. —EW

The Author

Brad Kamph (bkamph@interliance.com) is president of Interliance Consulting Inc. and a 20-year veteran in the development of workforce, knowledge management, process optimization, and performance measurement strategies for energy companies. For more information about a workforce analysis, please contact Interliance Consulting at 714-540-8889, or visit the web at http://www.interliance-knowledge.com

We encourage your feedback on this or any PennEnergyJOBS EnergyWorkforce article. Please send your comments to feedback@PennEnergyJOBS.com

Building & Construction

Capital Projects — Construction Manager
Chevron
Houston, TX
Job Id: 7363176

Construction Engineer
Chevron
Escravos, Nigeria
Job Id: 7363229

Construction Manager
G.A.S. Unlimited, Inc
Monrovia, CA
Job Id: 4317529

Construction Specialists
G.A.S. Unlimited, Inc
Monrovia, CA
Job Id: 4317541

Facilities Engineers
G.A.S. Unlimited, Inc
Multiple Locations
Job Id: 6757454

Senior Civil/Structural Designer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6874057

Structural Substation Engineer
G.A.S. Unlimited, Inc
Wilmington, DE
Job Id: 7268921

Business Operations

Business Analyst
Chevron
Multiple Locations
Job Id: 7363332

Business Analyst
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7040906

Claims Adjuster — Offshore Drilling
Pride International
Houston, Texas
Job Id: 6881529

Contract Class Compliance Specialist
Pride International
Galveston, Texas
Job Id: 6811484

Contracts Advisor
Chevron
Multiple Locations
Job Id: 7363122

Lead Contract Specialist
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011138

Maintenance Analyst
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011093

Performance Analysts
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011133

Power Industy Contracts Manager
Granite
Schenectady, New York
Job Id: 6641826

Power Systems Analyst
Florida Power & Light
Miami, Florida
Job Id: 6136572

Regulatory Compliance Coordinator
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6076426

Regulatory Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011044

Regulatory Specialist
Chevron
Grand Junction, CO
Job Id: 7363293

Regulatory Specialist
Chevron
Houston, TX
Job Id: 7363020

Civil Engineering

Civil / Structural Engineering
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011059

Civil Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7094923

Civil Engineers — Transmission & Distribution
Stantec Consulting, Ltd.
Multiple Locations
Job Id: 2949760

Engineer — Civil/Structual
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011108

Drilling Engineer

Subsurface Consultants & Associates, LLC
Houston, TX
Job Id: 6641759

Drilling Systems Engineer
Pride International
Houston, Texas
Job Id: 6811414

Engineer, Piping and Valves
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6019590

Engineer/Reservoir
Subsurface Consultants & Associates, LLC
Multiple Locations
Job Id: 6641747

Environmental Engineer
Chevron
Bakersfield, CA
Job Id: 7363046

Flow Assurance Engineer
INTEC Engineering
Houston, Texas
Job Id: 6569026

Geotechnical Engineers
G.A.S. Unlimited, Inc
Chicago, IL
Job Id: 7268913

Intermediate Engineer/ Hydrogeologist
Conestoga-Rovers & Associates
Plymouth, Michigan
Job Id: 6241152

Large Steam Turbine Project Engineer
Granite
Rocherville, Gauteng, South Africa
Job Id: 7197434

Lead Engineer (Transmission)
Progress Energy
Lake Mary, Florida
Job Id: 7218001

Lead Pipeline Engineer
Chevron
Houston, TX
Job Id: 7363258

Lead Structural Analysis
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757444

Maintenance Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011078

Marine Electrical Systems Engineer/Designer
Siemens
Alpharetta, Georgia
Job Id: 6880460

Offshore Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7211202

Petroleum Engineer
Chevron
Multiple Locations
Job Id: 7363039

Pipeline Engineer
Chevron
Multiple Locations
Job Id: 7363355

Piping Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7040890

[For full job descriptions and to apply for these opportunities, visit www.PennEnergyJOBS.com and search for the specific listing by job listing number, job title, or company name.]

Plant Engineer
Xcel Energy
Minneapolis, Minnesota
Job Id: 6083076

Principal Engineer
BP
Naperville, IL
Job Id: 6788070

Process Engineers
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757403

Production Engineer
Chevron
Multiple Locations
Job Id: 7363149

Reservoir Engineer
Chevron
Multiple Locations
Job Id: 7363243

Reservoir Engineer
Subsurface Consultants
& Associates, LLC
Houston, TX
Job Id: 6641778

Riser Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6968289

Risk Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6967867

Rotating Equipment Engineers
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757493

Seismic and Dynamic Analysis Engineer
Granite
Sunol, California
Job Id: 6641852

Senior Engineer — Underground Mining
Rio Tinto
Salt Lake City, UT
Job Id: 6983171

Senior Engineer (Fossil)
Entergy
Willis, Texas
Job Id: 6236183

Senior Engineer Nuclear I&C
Mitsubishi Electric
Power Products, Inc.
Warrendale, Pennsylvania
Job Id: 7237673

Senior Naval Architect
Pride International
Houston, Texas
Job Id: 6811419

Senior Process Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7352344

Sr. Pipe Stress
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7094928

Sr. Piping Designer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7268901

Structural Designer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7211201

Structural Engineer
Chevron
Houston, TX
Job Id: 7363114

Structural Engineer
G.A.S. Unlimited, Inc
Multiple Locations
Job Id: 6757410

Subsea Survey Engineer
Chevron
Houston, TX
Job Id: 7268851

Supervisor — Substation Design
Mid American Energy
Davenport, Iowa
Job Id: 6723833

Transmission Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 3260839

Transmission Line Senior Engineer
HDR, Inc.
Billings, Montana
Job Id: 6980123

Pipe Stress Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757491

Senior Structural Designer/Checker
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757449

Electrical Engineering

Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757413

Electrical Engineer
Chevron
Houston, TX
Job Id: 7363146

Electrical Engineer Transmission & Distribution
Stantec Consulting, Ltd.
Multiple Locations
Job Id: 2888590

Electrical Power Engineer
National Security Agency
Fort Meade, Maryland
Job Id: 6106331

Principal Electrical Design Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757484

Senior Electrical Engineer
Pride International
Houston, Texas
Job Id: 6880142

Sr. Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6686348

Engineering & Design

Advanced Control and Instruments Engineering Technology Consultant
BP
Naperville, IL
Job Id: 6788071

Chief Pipeline Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757492

Completions Engineer
Chevron
Houston, TX
Job Id: 7363140

Construction Manager
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011043

Corrosion Engineer
Chevron
Houston, TX
Job Id: 7363100

Cost Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011064

Design Engineer I (Piping)
G.A.S. Unlimited, Inc
Sugar Land, TX
Job Id: 6757458

Drilling Engineer
Chevron
Multiple Locations
Job Id: 7363199

Engineer/Completion
Subsurface Consultants
& Associates, LLC
Houston, TX
Job Id: 7110114

Heat Transfer Engineer
G.A.S. Unlimited, Inc
Monrovia, CA
Job Id: 4317545

Lead Process Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011008

[For full job descriptions and to apply for these opportunities, visit www.PennEnergyJOBS.com and search for the specific listing by job listing number, job title, or company name.]

Reservoir Engineer Sr.
Subsurface Consultants
& Associates, LLC
Job Id: 6641735

Senior Planning Engineer
NOVEC
Gainesville, Virginia
Job Id: 6156124

Senior System Studies Engineer
Mitsubishi Electric
Power Products, Inc.
Warrendale, Pennsylvania
Job Id: 6936933

Specialist Shutdown Piping
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011039

Supervisor, Distribution Engineering
NOVEC
Gainesville, Virginia
Job Id: 6170950

Field Operations

Control Systems Specialist
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011132

Drill Site Manager
Chevron
Multiple Locations
Job Id: 7363178

Environmental Specialist Air Quality
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011140

Facilities Engineer
Chevron
Malongo, Angola
Job Id: 7363119

Facilities Engineer
Marathon Oil
Houston, Texas
Job Id: 6918285

Field Engineer
Southern California Edison
San Bernardino, California
Job Id: 6859386

Field Operator
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6010994

Generator Technician — Winder
AGTServices Inc
Amsterdam, New York
Job Id: 6440589

GIS and Project Site Specialist
OwnEnergy, Inc.
Brooklyn, New York
Job Id: 6710981

Land Surveyor
G.A.S. Unlimited, Inc
Santa Rosa, CA
Job Id: 4896525

Operations Engineer
Chevron
Houston, TX
Job Id: 7363017

Quality Assurance Inspector(s)
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011047

Plant Engineer
Southern California Edison
Redlands, California
Job Id: 7322011

Plant Supervisor — Mechanical
Mid American Energy
Council Bluffs, Iowa
Job Id: 6455398

Power Plant Operations Supervisor
City of Roseville
Roseville, California
Job Id: 6913925

Production Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011006

Senior Estimator
INTEC Engineering
Houston, Texas
Job Id: 6686367

Senior Piping Technician
Chevron
Richmond, CA
Job Id: 7363021

Well Completion Supervisor
Subsurface Consultants
& Associates, LLC
Job Id: 6641743

Wellsite Manager
Chevron
Multiple Locations
Job Id: 6755302

Wireman
Snohomish County PUD
Everett, Washington
Job Id: 7404172

Health & Safety

Emergency Response Specialist
Chevron
Houston, TX
Job Id: 7363403

Fire Fighter
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6244836

Health, Environment and Safety (HES) Trainer
Chevron
Multiple Locations
Job Id: 7363170

Process Safety Engineer/Consultant
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7040896

QA/HSE Supervisor
Pride International
Houston, Texas
Job Id: 6882933

Safety Manager
Chevron
Berry, AL
Job Id: 7363071

Specialist — Safety Training
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6244841

I&C Engineering
Instrument & Controls Engineer
G.A.S. Unlimited, Inc
Multiple Locations
Job Id: 6757439

Instrument Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6934558

Mechanical Engineer

Mechanical — Rotating Engineer
Chevron
Malongo, Angola
Job Id: 7363379

Mechanical Design Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6934561

Mechanical Engineer
Chevron
Multiple Locations
Job Id: 7363167

Mechanical Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 7040893

Mechanical Engineer — Upgrading
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011036

Mechanical Integrity Consultant
Siemens
Houston
Job Id: 6880222

Senior Mechanical Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6328695

Project Management

Lead Project Engineer
Chevron
Multiple Locations
Job Id: 7363390

Project Control Specialist
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011098

Project Controls Manager
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 2595768

[For full job descriptions and to apply for these opportunities, visit www.PennEnergyJOBS.com and search for the specific listing by job listing number, job title, or company name.]

Project Engineer
Chevron
Lagos, Nigeria
Job Id: 7363014

Project Engineer
G.A.S. Unlimited, Inc
Houston, TX
Job Id: 6757422

Project Engineer — Upstream Projects
Siemens
Houston, Texas
Job Id: 6880589

Project Engineer — Utilities Area
Georgia-Pacific Toledo LLC
Toledo, Oregon
Job Id: 6094932

Project manager
Affinity Management Group
Houston, Texas
Job Id: 7403885

Project Manager or Project Engineer
Degremont Technologies — Infilco
Elmwood Park, New Jersey
Job Id: 7211241

Sr. Project Manager
Siemens
Houston, Texas
Job Id: 6877094

Sr. Project Manager — Power & Energy
HDR, Inc.
Omaha, Nebraska
Job Id: 6980130

Sales & Marketing

Global Marketing Manager
Chevron
San Ramon, CA
Job Id: 7363111

Product Marketing Manager
Megger
Dallas, Texas
Job Id: 7029420

Regional Sales Manager
Megger
Dallas, Texas
Job Id: 7029532

Sales Engineer
Siemens
Houston, Texas
Job Id: 6880327

Science

Development Earth Scientist
Chevron
Bangkok, Thailand
Job Id: 7363321

Development Geologist
Chevron
Multiple Locations
Job Id: 7363329

Earth Modeler
Chevron
Houston, TX
Job Id: 7363259

Exploration Geologist/ Geophysicist
Chevron
Multiple Locations
Job Id: 7363262

Geologist
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6011117

Geologist Sr./Carbonate
Subsurface Consultants & Associates, LLC
Houston West
Job Id: 7393094

Geologist Sr./Reservoir
Subsurface Consultants & Associates, LLC
Houston, TX
Job Id: 6890793

Geologist/Production
Subsurface Consultants & Associates, LLC
Multiple Locations
Job Id: 6641765

Geophysicist
Subsurface Consultants & Associates, LLC
Houston West
Job Id: 6641733

Geophysicist/Exploration
Subsurface Consultants & Associates, LLC
Calgary, AB, Canada
Job Id: 6641776

Geoscientist
Chevron
Houston, TX
Job Id: 7363324

Geoscientist
Subsurface Consultants & Associates, LLC
Houston, TX
Job Id: 6641748

Geotechnical Technologist
Canadian Natural Resources Limited
Fort Mcmurray, AB, Canada
Job Id: 6686234

Petrochemical Process Safety Coordinator
Siemens
Houston, Texas
Job Id: 6880240

Petrophysicist
Subsurface Consultants & Associates, LLC
Houston West
Job Id: 7393092

Petrophysicist — Formation Evaluation Services
Chevron
Houston, TX
Job Id: 7363261

Research Scientist — Nuclear Logging
Chevron
Houston, TX
Job Id: 7363337

Senior Geophysicist/ Field Geologist
Rock Investment Group, Inc.
Wheatridge, Colorado
Job Id: 7243384

Staff Geologist Sr.
Subsurface Consultants & Associates, LLC
Multiple Locations
Job Id: 6641769

Western Geophysical Advisor
Subsurface Consultants & Associates, LLC
Job Id: 6641763

Ad Index

Sales Index

CALENDAR OF EVENTS

March 3 – 5, 2008
Subsea Tieback
Galveston, TX

March 16 – 20, 2008
NACE Expo
New Orleans, LA

March 18 – 20, 2008
OffShore Asia
Kuala Lampur

March 27, 2008
PennEnergyJOBS Petroleum Virtual Job Fair
www.PennEnergyJOBS/VCF

April 3 – 5, 2008
POWER-GEN India & Central Asia
New Delhi, India

April 20 – 23, 2008
American Association of Petroleum Geologists (AAPG)
San Antonio, TX

May 5 – 8, 2008
OffShore Technology Conference (OTC)
Houston, TX

June 3 – 5, 2008
POWER-GEN Europe
Milan, Italy

June 3 – 5, 2008
POWERGRID Europe
Milan, Italy

June 3 – 5, 2008
Renewable Energy Europe
Milan, Italy

June 26, 2008
PennEnergyJOBS Petroleum Virtual Job Fair
www.PennEnergyJOBS/VCF

June 30 – July 2, 2008
COAL-GEN Europe
Warsaw, Poland

Opportunity. Alberta.

Be part of Alberta, Canada's, growing oil and gas industry while enjoying a high standard of living, spectacular scenery, and recreational opportunities right on your doorstep. Alberta's unprecedented prosperity provides numerous career opportunities for you to consider.

Occupations in demand include:

- Energy Professionals
- Engineers (Petroleum, Chemical, Civil)
- Geological and Geophysical Technologists
- Heavy Duty Equipment Mechanics
- Mechanical Engineering Technologists and Technicians
- Oil and Gas Operators, Drilling and Servicing
- Steamfitters and Pipefitters

Find out more! Visit our website at:
www.albertacanada.com/energycommodities
www.albertacanada.com/immigration

Alberta
Canada