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The Year Ahead

OIL&GAS JOURNAL®

Jan. 7, 2008
Volume 106.1

THE YEAR AHEAD

REGULAR FEATURES

COVER

From politics to markets to operations, 2008 will present the oil and gas industry with changes on many fronts. As in every year, the changes will include more than a few surprises. In The Year Ahead, the special report beginning on p. 20, Oil & Gas Journal's supervising editors write about changes—including a few surprises—they expect in the new year.

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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Jan. 7, 2008

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General Interest — Quick Takes

MMS proposes OCS royalty relief amendments

The US Minerals Management Service proposed changes to its Outer Continental Shelf deepwater royalty relief regulations on Dec. 21 to conform to a 2004 federal court decision.

A US Court of Appeals for the Fifth Circuit in a case involving Santa Fe Snyder Corp. found provisions of the US Department of the Interior agency's interpreting Section 304 of the 1995 Deepwater Royalty Relief Act were contrary to the statute's requirements, MMS said.

MMS said that the court found that a lease issued under that section could not be excluded from royalty relief if it was part of a field that already was in production before the deepwater royalty relief legislation became law.

The court also found that royalty suspension volumes prescribed in Section 304 should apply to each lease and not jointly to all leases in a particular field, MMS said.

It issued an information bulletin on Aug. 8, 2005, to alert affected lessees that MMS would respect the court decision and would revise its regulations accordingly.

MMS announced a proposal on Dec. 21, and the agency will accept comments on the proposal for 60 days following publication by the federal government.

Cosco Busan faces $61 million in bay cleanup

The cost of cleaning up the San Francisco Bay oil spill is expected to reach $61 million and may rise even higher, according to Admiral Thad Allen, Commander of the US Coast Guard.

Allen told Congress that figure is significant because it's what the owner of the Cosco Busan is required to pay under federal law for spilling 58,000 gal of fuel after striking the Bay Bridge Nov. 7. However he said the costs likely will rise beyond that amount to cover costs of completing cleanup and restoring coastal areas hit by the spillage.

Those liability limits can be increased if the US Justice Department determines a spill was caused by gross negligence. Allen said the USCG is discussing an increase of those limits with the companies involved in the spill.

The Coast Guard said $54.7 million had been spent on cleanup as of Dec. 14, an average of about $770,000/day.

To recover their costs, federal, state, and local authorities have filed civil suits against the ship's owner, Regal Stone Ltd.; its insurer, Shipowners' Insurance & Guaranty; and the bar pilot who was at the helm, Capt. John Cota.

A spokesman for the Hong Kong-based Regal Stone said the company is already paying for private cleanup crews who have been skimming oil and cleaning beaches.

He said the firm will meet its legal responsibility, but declined to say if it would pay any bill exceeding the $61.8 million.

The Cosco Busan was allowed to leave San Francisco to sail to South Korea for repairs after its owners agreed to post a $79 million bond as a guarantee the firm would pay its share of the cleanup costs.

PTT privatization OK'd; pipeline assets ceded

A top Thai court has ruled against a Thai consumer group's petition to nullify the 2001 partial privatization of the former Petroleum Authority of Thailand (PTT), now PTT PLC.

However, the Supreme Administrative Court also ordered PTT to cede back to the state its 3,000-km of natural gas pipelines and the land appropriated to build it, which are valued at about 100 billion baht ($2.94 billion).

The verdict saved the Thai state-controlled energy giant from delisting from the Thai stock market, which prevented a blow to the country's economy.

However, the court on Dec. 14 ruled that, while the privatization of PTT was lawful, PTT had no right to transfer its (state-owned) assets to a privatized entity and would need to return them to the state.

Had the court ruled against PTT, which accounts for 15% of total capitalization on the Stock Exchange of Thailand, it would have been forced to remove the listing of its stock shares from the Thai capital market.

PTT has a market capitalization of about 800 billion baht. The court recognized that forced removal from the Thai stock market would jeopardize the country's financial and social state, and even its security.

Analysts said the transfer of PTT's pipeline assets could have a negative impact on the firm and the broader stock market, depending on how it is handled.

But PTT MDNM Pres. Prasert Bunsumpun downplayed the impact, saying the pipeline assets represent just over 10% of PTT's combined group assets and generated around 20 billion baht/year in revenue, a small portion of the estimated 1.4 trillion baht in revenues projected by the energy conglomerate this year.

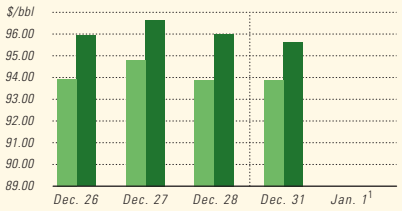
Furthermore, Prasert said, PTT is expected to be compensated for the transfer and will remain the pipelines' operator.

PTT's 2001 initial public offering was marred by complaints about the allocation of shares to those with strong political connections to the administration of Thaksin Shinawatra, the ousted former prime minister.

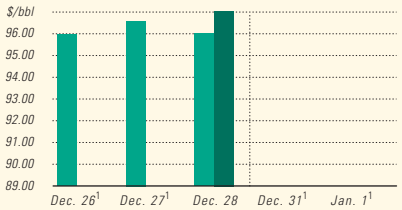
Thai consumer groups filed a legal challenge in August 2006 after successfully derailing the partial privatization of the Electricity Generating Authority of Thailand, the state power utility, in March 2006 on legal grounds similar to those filed against PTT.

Industry Scoreboard

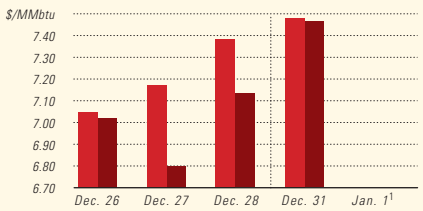
IPE BRENT / NYMEX LIGHT SWEET CRUDE



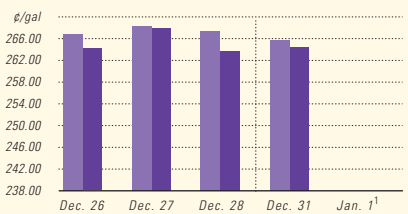
WTI CUSHING / BRENT SPOT



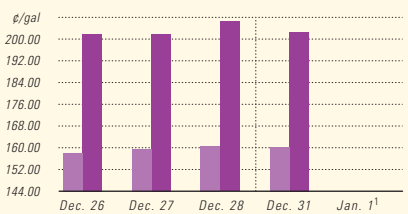
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



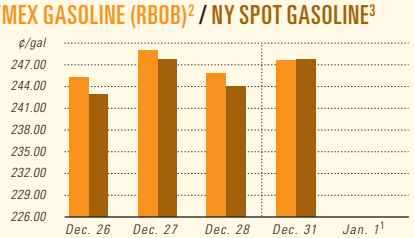
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



NYMEX GASOLINE (RBOB)[2] / NY SPOT GASOLINE[3]



[1]Data not available, [2]Reformulated gasoline blendstock for oxygen blending, [3]Nonoxygenated regular unleaded.

US INDUSTRY SCOREBOARD — 1/7

Latest week 12/21	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	9,377	9,311	0.3	9,305	9,250	0.6
Distillate	4,484	4,243	5.7	4,251	4,166	2.0
Jet fuel	1,595	1,626	–1.9	1,623	1,633	–0.6
Residual	721	673	7.1	738	688	7.3
Other products	4,952	4,906	0.9	4,814	4,878	–1.3
TOTAL DEMAND	21,089	20,759	1.6	20,731	20,684	0.2
Supply, 1,000 b/d						
Crude production	5,119	5,149	–0.6	5,119	5,100	0.4
NGL production[2]	2,393	2,434	–1.7	2,387	2,235	6.8
Crude imports	9,588	9,650	–0.6	10,003	10,127	–1.2
Product imports	3,462	3,151	9.9	3,506	3,602	–2.7
Other supply[3]	960	776	23.7	966	1,029	–6.1
TOTAL SUPPLY	21,522	21,160	1.7	21,981	22,093	–0.5
Refining, 1,000 b/d						
Crude runs to stills	14,939	15,542	–3.9	15,236	15,240	—
Input to crude stills	15,139	15,632	–3.2	15,466	15,598	–0.8
% utilization	86.8	89.9	—	88.7	89.7	—

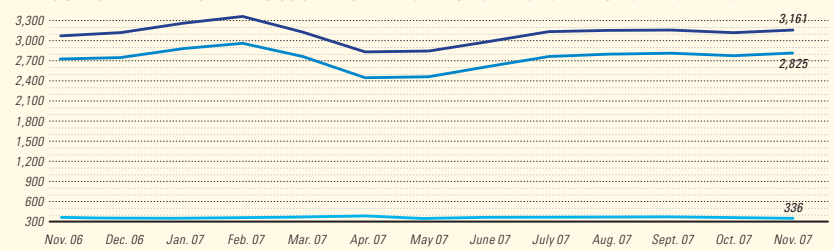
Latest week 12/21	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	293,633	296,932	–3,299	329,107	–35,474	–10.8
Motor gasoline	205,857	205,221	636	200,915	4,942	2.5
Distillate	126,608	129,376	–2,768	133,120	–6,512	–4.9
Jet fuel-kerosine	39,245	39,331	–86	38,263	982	2.6
Residual	40,991	42,215	–1,224	43,038	–2,047	–4.8
Stock cover (days)[4]			Change, %		Change, %	
Crude	19.2	19.3	–0.5	21.4	–10.3	
Motor gasoline	22.0	22.0	—	21.3	3.3	
Distillate	28.2	29.4	–4.1	31.1	–9.3	
Propane	37.3	40.7	–8.4	43.5	–14.3	

Futures prices[5] 12/28			Change		Change	%
Light sweet crude, $/bbl	95.68	91.35	4.33	62.99	32.69	51.9
Natural gas, $/MMbtu	7.16	7.14	0.02	6.87	0.29	4.2

[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.

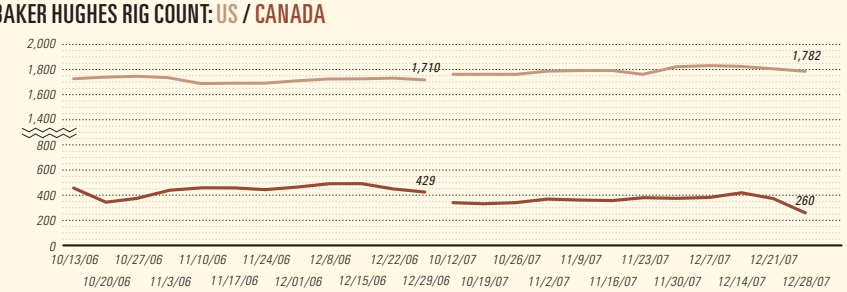
Sources: Energy Information Administration, Wall Street Journal

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



Note: Monthly average count

BAKER HUGHES RIG COUNT: US / CANADA

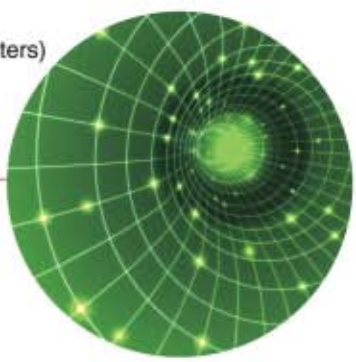


Note: End of week average count

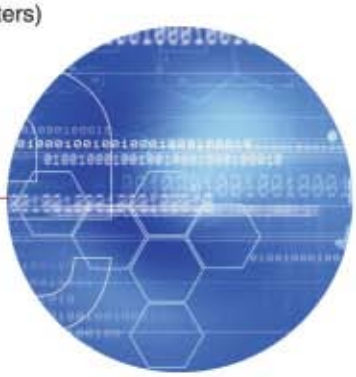
Highest pressure:
30,440 psi (210 MPa)
LWD world record
Gulf of Mexico, 2006

Highest temperature:
379°F (193°C)
LWD world record
North Sea, 2005

Highest dogleg:
61° per 100 feet (33 meters)
LWD world record
Middle East, 2007



Deepest offshore:
34,189 feet (10,421 meters)
Including deepest
LWD data transmission
Gulf of Mexico, 2005



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Indonesia to cut taxes to boost production

Indonesian government, in an effort to boost the country's oil output, said it will abolish import duty, value added tax, and income tax on imports of capital goods used for oil, natural gas, and geothermal exploration and development.

Vice-President Jusuf Kalla said the incentives are expected to boost the country's oil production to 1.4 million b/d in 2009. He said Indonesia needs to regain the productivity it had in 1985 when production averaged 1.7 million b/d.

"We had a very large surplus at the time. We could have become a large oil producer. But why were we not able? Therefore, we will increase the target further," Kalla said.

Indonesia's upstream oil and gas regulator BP Migas said the country's daily oil production would continue to fall unless new fields were developed. Currently, oil production stands at 1.1 million b/d, while demand is at 1.3 million b/d.

BP Migas Deputy Head Trijana Kartoatmodjo said the country's oil production is falling by 1.2% a year, while domestic oil demand is rising by 1.5%.

He said oil production is expected to fall to 982,000 b/d in 2008 and to 971,000 b/d in 2009 from 995,000 b/d in 2007, while domestic consumption is projected at 1.365 million b/d in 2007, 1.443 million b/d in 2008, and 1.505 million b/d in 2009. The Economic Research Center of the Indonesian Science Institute (LIPI) expressed pessimism about the government's oil output target of 1.034 million b/d for 2008.

The target on which the government calculated the 2008 state budget is overly optimistic, said Latif Adam, coordinator of the center's research team. LIPI's estimate puts output at 950,000 b/d.

Adam described the government's crude oil production target, and the oil price assumption of $60/bbl used for the 2008 state budget, as "unrealistic." ✦

Exploration & Development — *Quick Takes*

Iceland to license Atlantic area in 2009

Iceland has approved its industry minister's proposal to offer in January 2009 oil and gas exploration and production licenses in the Dreki area northeast of Iceland on the Jan Mayen Ridge.

The area lies between Iceland and Norway's Jan Mayen Island. Norway's InSeis shot seismic in a 42,000 sq-km-area in Iceland waters south of Jan Mayen Island in 2001. Industry has expressed interest in the area, the ministry said Dec. 18.

The area lies 400 miles northwest of Norwegian continental shelf oil fields and north of the Faroe Islands, where several fields have been discovered (see map, OGJ, Aug. 20, 2007, p. 38).

The government said exploratory drilling is necessary to verify whether oil and gas exist in the Dreki area and that its approval is based on the findings of a detailed strategic environmental assessment.

Saying considerable discoveries could have a "vigorous impact" on Iceland's economy, it promised to place stringent requirements on work safety and environmental protection.

Discovery of producible quantities of oil and gas at Dreki would be a major addition to the hydropower and geothermal energy already produced in Iceland, the government said.

Kazakhstan nonstate gas field flow starts

Tethys Petroleum Ltd., Guernsey, Channel Islands, UK, started gas production on Dec. 19 from Kyzyloi gas field in Kazakhstan northwest of the Aral Sea.

Average contract quantity for the first two months is 21.2 MMcfd from six wells in what Tethys called the country's first nonstate, dedicated dry gas development. Gas flows via a 35-mile pipeline to the Bukhara-Urals export trunk line. Gas buyer is Kazakhstani petrochemical firm Kemikal LLP.

Meanwhile, Tethys has discovered more gas in the Akkulka exploration area that surrounds Kyzyloi field, having flow-tested more than 40 MMcfd from seven shallow exploration wells. Incorporating these wells into the greater Kyzyloi development could boost production to more than 44 MMcfd by late 2008.

The AKK13 exploration well is drilling, AKK14 is to evaluate two shallow stratigraphic gas intervals on a separate prospect, and deep Triassic and Jurassic targets have been identified in the Akkulka and Kul-Bas areas that might be reached by reentering old wells.

EnCore to appraise Cobra gas find in early 2008

Operator EnCore Oil PLC will drill an appraisal well using the Ensco 80 rig on the Cobra discovery in the UK North Sea in first-quarter 2008.

Cobra, on Block 48/2c, tested gas at a flow rate of 2.7 MMcfd in 1984 when Amoco initially drilled it.

The company will team with Challenger Minerals (North Sea) Ltd. in a farmin agreement under which Challenger will receive a 5% share from EnCore in southern North Sea Blocks 48/1b and 48/2c where Cobra is located.

Under terms of the farmout agreement, together with the previously announced farmout agreement with Tata Petrodyne and Bharat Petroleum, EnCore will pay for 3% of the appraisal well cost (subject to an overall well cost cap) and will retain a 20% interest in the license, EnCore said. EnCore also will remain the license operator.

Alan Booth, chief executive officer of EnCore, said Cobra would represent its first operated well. "Cobra lies close to existing infrastructure and offers a relatively low risk appraisal project some 300 ft updip from the existing discovery well, with significant upside potential."

Sonatrach, QP to farm into Mauritania blocks

Sonatrach and Qatar Petroleum International are about to farm into Total SA's two blocks in Mauritania, according to Total Chief Executive Christophe de Margerie.

Total acquired the onshore blocks in January 2005 under two production-sharing contracts. The blocks, which lie at Taoudenni in southeastern Mauritania, cover a total 58,000 sq km. At the time, three exploration phases were planned, each for 3 years.

Total acquired seismic data last year and is planning to drill a well in the area in 2009. Sonatrach and QP will take part in the exploration as they are on the point of acquiring a 20% stake each

in the PSC. Negotiations are currently being finalized, de Margerie said.

Huntington Forties delineation completed

Oilexco Inc., Calgary, completed appraisal of the Paleocene Forties reservoir at its mid-2007 Huntington two-zone oil and gas discovery on Block 22/14b in the UK North Sea.

Having drilled nine penetrations of the Forties reservoir, the company on Dec. 20 spudded a single appraisal wellbore to target the oil/water contact in the Jurassic Fulmar sands. The Fulmar appraisal wellbore is on the flank of the structure 250-350 ft below the elevation tested by the discovery well, which did not observe an oil/water contact.

The last Forties appraisal well, near the structure's crest, was drillstem tested at 9,982-10,002 ft and 9,870-9,945 ft measured depth. The combined rate was 7,940 b/d, compared with the 6,143 b/d rate from Forties in the vertical discovery well (OGJ Online, June 6, 2007).

The Huntington 22/14b-5 discovery well went to TD 13,325 ft. Fulmar sand at 12,750 ft flowed at a maximum 4,624 b/d of 39° gravity oil and 1.6 MMcfd of gas, restricted by equipment capacity. Forties sand flowed at a top rate of 5,577 b/d of 41° gravity oil and an estimated 3.4 MMcfd of gas, severely restricted by test equipment capacity.

The appraisal drilling is designed to define reservoir properties in preparation to apply for the 2009 field development.

Oilexco has 40% interest in Huntington, E.On Ruhrgas UK Exploration & Production Ltd. has 25%, and Altinex Oil (UK) Ltd. has 20%. Carrizo Oil & Gas Inc., Houston, which generated the prospect, has a 15% cost-bearing share and 17% beneficial interest in all depths.

Oilexco, which set a $707 million budget for 2008, is participating in the drilling of the Mallory prospect on Block 22/14a, northeast of Huntington. Mallory is either on an analogous structure on trend with, or an extension to, the Huntington Fulmar oil discovery. ✦

Drilling & Production — *Quick Takes*

BP lets Skarv FPSO installation to Aker Kvaerner

BP Norway has let a 300 million kroner contract to Aker Kvaerner to tow and install a floating production, storage, and offloading system (FPSO) at Skarv field in the Norwegian Sea.

Aker Marine Contractors, a subsidiary, will use the offshore construction vessel BOA SUB C for 2010 preinstallation of the 15-leg mooring system in water as deep as 3,000 m. "The vessel is equipped with diesel-electric propulsion, dynamic positioning class, 3,400 tonnes active heave compensated crane, and 600 tonnes anchor handling winch," Aker Kvaerner said. Planning and engineering will start in January, and transportation and installation of the complete FPSO will be executed in 2011. BP wants to develop Skarv and nearby Idun gas field simultaneously, using the FPSO, which will lie in the Norwegian Sea 200 km west of Sandnessjoen, Norway. It will be installed between Norne field, 35 km to the north, and Heidrun, 45 km to the south (OGJ Online, Sept. 21, 2007).

Joint venture to supply nitrogen to Mexico

Air Products said a joint venture company with its Grupo Infra partner will supply 90 MMscfd of nitrogen to Petroleos Mexicanos Exploracion y Produccion (PEP).

Nitrogen from the gas turbine and steam-driven facility is supplied for injection and enhanced oil and gas recovery from PEP's Jujo-Tecominoacan oil fields near Villahermosa in Tabasco, Mexico. The nitrogen plant project, announced in 2006, began its supply of nitrogen during November as scheduled.

In 2006, state-owned Petroleos Mexicanos said it planned to invest 13 billion pesos during 2007-21 in Jujo-Tecominoacan oil field, its second-largest hydrocarbon reservoir in southern Mexico. The investment is to include completing 11 development wells and repairing 34 wells as well as the construction of 6 km of oil-gas pipelines, 25 km of oil pipelines, and 15 km of gas pipelines.

The announcement concerning nitrogen injection coincides with a report issued by Mexico's ministry of energy detailing the country's oil outlook for 2006-16, as well as key recommendations for the development of Pemex (OGJ Online, Dec. 14, 2007).

Broom field production to start in first quarter

Operator Lundin Petroleum AB expects to start oil production in first-quarter 2008 from its development well 2/5-25 in Broom field on Block 2/5 on the UK continental shelf.

Lundin is using the GSF Arctic II semisubmersible rig to drill the well under the field development's Phase 3. Drilling is under way on the sidetrack to one of three production wells on the West Heather structure. It will be tied-back to the existing Heather platform. "The well will receive pressure support from the existing injection wells," Lundin said.

Broom field has 30.9 million boe of proved plus probable gross reserves remaining, with gross total recoverables of 54.7 million boe. Formerly called West Heather and discovered in 1977, Broom has oil in Middle and Upper Jurassic reservoirs (OGJ Online, Aug. 7, 2005). Lundin Petroleum holds a 55% interest, and it is working with Challenger Minerals (North Sea) Ltd., Palace Exploration Co. (E&P Ltd.), and Dyas UK Ltd. ✦

Transportation — *Quick Takes*

Russia, others sign Caspian gas pipeline deal

Russia, Kazakhstan, and Turkmenistan signed an agreement to build a natural gas pipeline along the Caspian Sea coast. The line would have an initial capacity of 20 billion cu m/year.

Russian President Vladimir Putin said the pipeline will ensure long-term gas deliveries to Russia's foreign partners, adding that it would be a "major contribution by our countries to the energy security of Eurasia and the world at large."

Russian Minister of Industry and Energy Viktor Khristenko said

the new pipeline, which will carry gas from Turkmenistan for delivery to Russia's gas transportation system, will be built before yearend 2010.

The pipeline deal will likely disappoint the US and the European Union, which have been lobbying for a rival pipeline to be built under the Caspian Sea, bypassing Russia.

In September, Turkmenistan President Gurbanguli Berdymukhamedov said his country was ready to bypass Russia and begin selling some of its gas directly to Europe (OGJ Online, Sept. 21, 2007).

In December, however, Russia and Turkmenistan agreed to accelerate development of the proposed Caspian Gas Pipeline project following talks between OAO Gazprom Chief Executive Officer Alexei Miller, President Berdymukhamedov, and Deputy Prime Minister Tachberdy Tagyyev.

FERC issues EIS for High Plains line expansion

Colorado Interstate Gas Co.'s proposed High Plains natural gas pipeline expansion project would have minimal environmental impact under recommended mitigation measures, the US Federal Energy Regulatory Commission reported.

CIG, a subsidiary of El Paso Corp., Houston, is developing the $196 million project as a joint venture with Xcel Energy to supply an additional 899 MMcfd of gas to Colorado's Front Range system. It will link Public Service Co. of Colorado's intrastate system with the Rockies Express, Wyoming Interstate, and Young Gas Storage Co. interstate systems.

The project would expand CIG's existing gas pipeline system by nearly 164 miles in four separate segments of 24-in. and 30-in. pipeline and 10 measurement facilities, FERC's staff said in a final environmental impact statement issued on Dec. 28.

CIG plans to use existing rights-of-way for nearly 84 miles, or about 51%, of the proposed route. The company plans to use project-specific erosion control, revegetation, and maintenance programs; wetland and water body construction and mitigation procedures, and hydrostatic testing, reclamation, and invasive species control plans.

FERC said it will consider the staff's recommendation and final EIS before issuing a final decision on the project.

Petrobras funded for Amazonas pipelines

The Brazilian National Social and Economic Development Bank (BNDES) has awarded state-owned Petroleo Brasileiro SA (Petrobras) 2.49 billion reais for the construction of pipelines in Amazonas state.

The funds will be designated for use by Transportadora Urucu-Manaus SA, which will construct a 383-km, 20-in. natural gas pipeline connecting Coari and Manaus, where it will have two delivery points.

Additionally, TUM SA also will build distribution branches to supply seven municipalities located along the pipeline route and a 279-km, 10-in. LPG pipeline connecting the Arara Pole in Urucu to the Solimoes Terminal in Coari.

The gas will be used initially for thermoelectric power generation in Manaus, replacing fuel oil generators now in use. Gas will later be used to supply the region's industrial, vehicle, commercial, and residential sectors.

The project also includes the readaptation of an existing 18-in. pipeline between Urucu and Coari, which will be interconnected to the 20-in. line, allowing for gas production outflow.

South Korea offshore oil spill investigated

South Korean authorities said the Hong Kong-based oil tanker, Hebei Spirit, spilled 12,547 kl of crude oil into the sea west of the Korean Peninsula, an increase of 19.5%, or 2,047 kl, over the earlier estimate of 10,500 kl.

The Marine Accidents Inquiry Agency said the tanker was carrying 302,641 kl of crude oil and began losing oil after it was hit Dec. 7 by a barge in the sea about 15 km off western T'aean, South Chungcheong province, South Korea.

An MAIA official said it was difficult to correctly calculate the amount of crude left in the tanker because the ship was tilted at 6-7° after the accident.

The tanker sailed to Daesan Port in Seosan.

The Hebei Spirit spill is considered South Korea's worst. Officials have described it as being about one third of the size of the Exxon Valdez disaster, which cost a reported $9.5 billion to clean up and settle.

The Hebei Spirit tanker is registered to the Hebei Spirit Shipping Co., of Hong Kong. The firm's manager is Hosco, (Hebei Ocean Shipping Co.), of Haigang Qu, Qinhuangdao Hebei.

Shell unit enters prepaid utility gas market

Public Energy Authority of Kentucky Inc. and Societe Generale Energie (USA) Corp. signed a 20-year, $456 million prepaid natural gas contract.

Coral Energy Resources LP, a unit of Shell Energy North America (US) LP, will supply SGE with 88.6 bcf of gas required for the transaction, which marks the Shell subsidiary's entry into the municipal natural gas prepayment market.

SGE will deliver the gas to PEAK, a municipal joint action agency organized by the cities of Carrollton and Henderson in northern Kentucky.

PEAK will use the supply to serve base load gas requirements of its municipal members and participants in Kentucky, South Carolina, New Mexico, and Alabama.

PEAK, which financed the prepayment with the proceeds of revenue bonds, concluded two earlier prepayment deals in 1998 and 2006.

The deals secure long-term, reliable gas supplies in volatile energy markets. ✦

Correction

An OGJ article incorrectly referred to KBR as "the engineering and construction unit of Halliburton, Houston (OGJ, Dec. 10, 2007, p. 9)." KBR has been a stand-alone company since April 2007.

Letters

Molecular sieves

Knowing the plants of Saudi Aramco well and being in charge of product management of CECA SILIPORITE molecular sieves, I would like to comment on the article by Ahmed Ghazal ("Common errors can cause mol-sieve desiccant deterioration"; OGJ, Nov. 26, 2007, p. 62) to prevent misunderstanding.

Molecular sieves remove dissolved water (speaking about liquids) but should not be in contact with entrained water, as the article relates. Entrained water will saturate them quite fast, given the likely huge amount of water entrained, may lead to local temperature peaks leading to faster aging, and may bring all kind of "aggressive" molecules (e.g., amines) with it, destroying either the binder or the zeolite (active material of the molecular sieve) or both.

In our more than 40 years' experience, we cannot confirm the fact of ion leaching due to use of molecular sieves of different suppliers. Different suppliers would mean different types of zeolite and different binders. Indeed a single supplier may have to supply molecular sieves for natural sweetening (mercaptan removal), which would include different types (4A, 5A, 13X sieves) fabricated with different binders. No problems of ion leaching due to the composition would be noticed.

Moreover, the problems observed in YGP might be due to liquid carryover, causing chemical attack or simply hydrothermal damaging due to a poor regeneration procedure. Poor regeneration procedure means in this case heating too fast (no intermediate heating ramp) and causing water desorption from the layers at the inlet of heating gas and condensation of water at the still-cold layers at the opposite site of the bed.

This liquid water together with the high regeneration temperature will lead to boiling of the sieves in the liquid water, causing hydrothermal damaging. Hydrothermal damaging means attack of the binder, destruction of the crystal structure of the zeolite, or pore closure of the zeolite.

I agree with the author that it is better to use only fresh molecular sieve in

order to get the process guarantee from the supplier, ensure the life time of the sieves (the costs of some days of production loss due to premature shutdown of the plant is huge compared with the price of a load of sieves), and start with low pressure drop as unloading and screening of the used sieves will decrease the average particle size leading to higher pressure drop.

It is strange, however, to see large beads (⅛-in. equivalent or 2.5-5 mm beads or 3.2 mm pellets) in a liquid dryer. Usually small particle size—1/16 in. equivalent—is recommended as the mass transfer is much shorter. For ⅛-in. particle, easily half of the vessel might be used for the mass-transfer zone. The mass-transfer zone is used to meet the specifications of the product—in this case 10 ppm (wt)—but does not adsorb a lot of water.

Using large particles in this case shows that the initial design is poor and short. This could be the case if fluidization should be prevented. This poor design might also be the origin of molecular sieve failure.

Peter Meyer
Business Manager Dynamic Applications
Molecular Sieves CECA SA

Ghazal replies

The occurrence of ion leaching at the mentioned site was verified by Aramco's Research and Development Center through internal research and a series of lab tests.

Data obtained from subject study revealed a clear relationship between the instigation of ion leaching and presence of dissimilar desiccant materials, in the same vessel, that are supplied by different vendors and consist of different binder additives. Chemical attacks, poor regeneration procedures, and application of inaccurate loading configurations are all typical causes of desiccant failure and widely known among operating facilities.

The fact of the matter is that all troubleshooting attempts start by investigating the more obvious factors stated by Mr. Meyer and a rather vigorous study is initiated once the aforementioned bases are covered.

The highlighted desiccant particle sizes do not represent existing setup at Yanbu gas plant; the information was merely mentioned in my article to describe proper loading configuration for different layers within typical dehydration beds that serve sweet liquid hydrocarbon streams (propane and butane). I also might add that reflected desiccant size was obtained from engineering standards and manufacturer loading guidelines.

Although the mixture of different desiccant in the same dehydrator is no longer permitted at Saudi Aramco sites, we still allow use of different brands for adjacent vessels, meaning that Bed A could possibly be loaded with a different material than Bed B.

Ahmed S. Ghazal
Saudi Aramco
Dhahran

Calendar

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

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2008

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World Future Energy Summit, Abu Dhabi, +971 2 444 6011, +971 2 444 3987 (fax), website: www.wfes08.com. 21-23.

API Exploration & Production Winter Standards Meeting, Ft. Worth, Tex., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 21-25.

API/AGA Oil & Gas Pipeline Welding Practices Meeting, Ft. Worth, Tex., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-25.

International Forum Process Analytical Technology (IFPAC), Baltimore, (847) 543-6800, (847) 548-1811 (fax), e-mail: info@ifpacnet.org, website: www.ifpac.com. 27-30.

SPE/IADC Managed Pressure Drilling & Underbalanced Operations Conference & Exhibition, Abu Dhabi, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-29.

Offshore West Africa Conference & Exhibition, Abuja, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.offshorewestafrica.com. 29-31.

Petroleum Exploration Society of Great Britain Geophysical Seminar, London, +44 (0)20 7408 2000, +44 (0)20 7408 2050 (fax), e-mail: pesgb@pesgb.org.co.uk, website: www.pesgb.org.uk. 30-31.

SIHGAZ International Hydrocarbon and Gas Fair, Hassi Messaoud, Algeria, website: www.sihgaz2008.com. Jan. 30-Feb. 3.

FEBRUARY

Middle East Corrosion Conference, Bahrain, + 973

Calendar

17 729819, + 973 17 7299819 (fax), e-mail: bseng@batelco.com.bh, website: www.mohandis.org. 3-6.

IADC Health, Safety, Environment & Training Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 5-6.

SPE Unconventional Reservoirs Conference, Keystone, Colo., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 10-12.

International Pipeline Pigging & Integrity Management Conference & Exhibition, Houston, (713) 521-5929, (713) 521-9255 (fax), e-mail: clarion@clarion.org, website: www.clarion.org. 12-14.

Deep Offshore Technology International Conference & Exhibition, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.dotinternational.net. 12-14.

SPE International Formation Damage Control Symposium & Exhibition, Lafayette, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 13-15.

Alternative Fuels Technology Conference, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 18.

IP Week, London, +44 (0)20 7467 7100, +44 (0)20 8561 0131 (fax), e-mail: events@energyinst.org.uk, website: www.ipweek.co.uk. 18-21.

International Catalyst Technology Conference, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 19-20.

Pipe Line Contractors Association Annual Conference (PLCA), Maui, (214) 969-2700, (214) 969-2705 (fax), e-mail: plca@plca.org, website: www.plca.org. 20-24.

International Petrochemicals & Gas Technology Conference & Exhibition, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 21-22.

AAPG Southwest Section Meeting, Abilene, Tex., (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 24-27.

Laurance Reid Gas Conditioning Conference, Norman, Okla., (405) 325-3136, (405) 325-7329 (fax), e-mail: bettyk@ou.edu, website: www.lrgcc.org. 24-27.

Middle East Refining Conference & Annual Meeting, Abu Dhabi, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 25-26.

CERI Natural Gas Conference, Calgary, Alta., (403) 220-2380, (403) 284-4181 (fax), e-mail: jstaple@ceri.ca, website: www.ceri.ca. 25-26.

SPE Intelligent Energy Conference & Exhibition, Amsterdam, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 25-27.

IADC Drilling HSE Asia Pacific Conference & Exhibition, Kuala Lumpur, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 26-27.

Middle East Fuels Symposium, Abu Dhabi, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 27-28.

MARCH

GPA Annual Convention, Grapevine, Tex., (918) 493-3872, (918) 493-3875 (fax), e-mail:

pmirkin@gasprocessors.com, website: www.gasprocessors.com. 2-5.

GEO Middle East Geosciences Conference & Exhibition, Bahrain, +44 20 7840 2139, +44 20 7840 2119 (fax), (fax), e-mail: geo@oesallworld.com, website: www.allworldexhibitions.com. 3-5.

Subsea Tieback Forum & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.subseatiebackforum.com. 3-5.

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Annual Middle East Gas Summit, Doha, +971 4 336 2992, +971 4 336 0116 (fax), e-mail: sarita.singh@ibc-gulf.com, website: www.ibcgulfconferences.com. 5-6.

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.

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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.

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Down under, out yonder

Nina M. Rach
Drilling Editor

Educators have been taking "giant strides" off the M/V Fling to investigate marine communities at two High Island platforms, just within the boundaries of the Flower Garden Banks National Marine Sanctuary.

Every summer since 1996, a group of 18 teachers participates in an introductory 5-day, hands-on "Down Under, Out Yonder" (DUOY) program. Sponsored by the Gulf of Mexico Foundation and hosted by the National Marine Sanctuaries program of the National Oceanic & Atmospheric Administration, the educators take 2 days of classroom instruction and apply it during 3 days of SCUBA diving on East, West, and Stetson Banks. Some years, alumni are invited back for an advanced session.

Kelly Drinnen joined the Flower Garden Banks National Marine Sanctuary as education specialist in 2004, after serving as director of education at Moody Gardens in Galveston, Tex. She participated in DUOY in 2000 and 2001 and now organizes the annual program.

Reefs

Drinnen told OGJ that the educators learn about coral reef biology, ecology, and conservation issues, and are also introduced to commercial perspectives. They learn to identify 80 species of reef fish and participate in a full-day fish survey on the natural reefs, before spending a day at one of the platforms.

According to the International Coral Reef Initiative, 2008 is the international year of the reef: "A worldwide campaign to raise awareness about the value and importance of coral reefs and threats to their sustainability." It's sponsored by the US Department of State, Department of Commerce, which manages NOAA, and Japan's Ministry of the Environment (www.iyor.org).

IYOR 2008 is the second designated campaign; more than 225 organizations in 50 countries and territories participated in the first IYOR, in 1997, which generated more than 700 articles.

Platforms

Sharon Cain at Gulf Diving LLC told OGJ that the High Island platforms (A389 and A376) are adjacent to the original marine sanctuary blocks and operators usually grant permission for boats to dive when radioed in advance. Capt. Ken W. Bush, a retired school principal, has run the M/V Fling for the educator workshops. Boats are only refused permission when a supply vessel is in the area or platform maintenance is under way, Cain said.

Diving on a platform is very different from diving on the natural reefs of Flower Garden Banks, Drinnen told OGJ. Currents are less predictable and divers must stay within the platform legs. After following lines set from the dive vessel to a platform leg, they may descend to only 70-80 ft, although the water depth surpasses 300 ft. There are a great many encrusting organisms colonizing the platform steel, including marine algae, sponges, and corals. They frequently see loggerhead turtles, large jacks, Red Hind (a spotted grouper), and sharks. Drinnen was particularly pleased to find the elusive Tessellated Blenny (Hypsoblennius invemar), a small fish with vivid blue-red spotting, that ducks into barnacles and sponges.

Orange cup coral has colonized many platforms and is particularly photogenic, but Drinnen points out that it's an invasive species, native to the Pacific, and is believed to have migrated in ship ballast via the Panama Canal. It was first spotted off Curacao in the 1940s, and prefers shaded environments provided by the truss structure of platforms.

Lloyd Hetrick, a well integrity engineer with BP PLC in Houston, with a degree in ocean engineering from Texas A&M University, has taught at the DUOY educator workshops for 10 years. He explains to the participants how operators bid, explore, and extract oil and gas, discusses the types of rigs and platforms and their lifecycle through abandonment.

Hetrick told OGJ that he tries to clear up misconceptions about the technical complexities of working offshore and puts the industry's activities in perspective.

Even facility ownership can be complex. The High Island A389 platform, a favorite dive spot for DUOY, was originally controlled by Mobil Oil, passed to ExxonMobil, then Vastar, BP, and is now operated by W&T Offshore.

Diving at the Flower Garden Banks and on the platforms is more akin to recreational diving than to commercial diving, Hetrick told OGJ, though it still carries some risk.

The educators ask a lot of questions, and throughout the Q&A, Hetrick tried to point out that the industry works hard to put people's safety first, prevent harm to the environment, and protect property and facilities from damage. When demand for petroleum changes, he tells them, industry will scale back. No one rode bicycles to class, he noted. ✦

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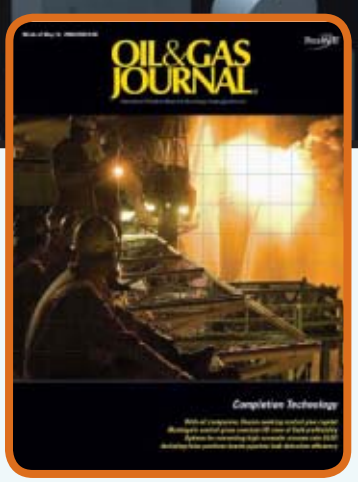

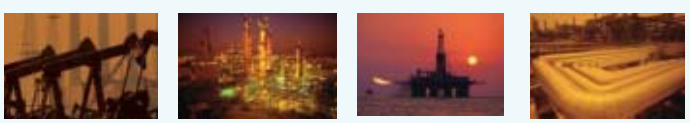

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[1] *Signet Readership Survey (February 2007)*

Editorial

A new energy agenda

In an intensely political year, the US oil and gas industry should seek opportunities to reconcile energy politics with consumer interests. Politicians and consumers now travel contradictory paths.

The current political agenda on energy emerges from an undisciplined legislature taking its cues from environmental extremists, fuel suppliers seeking favors, and a president eager to distance himself from oil and gas. The product is a regulatory system certain to collapse under the burden it is creating for consumers. Its centerpiece is an ethanol mandate that makes no energy or environmental sense, that saps the federal treasury, and that drives up food costs.

Yet Congress just quintupled the ethanol requirement to make corn growers and distillers happy. It acted even though costs of the original mandate have come into clear focus. It acted when no politician of either party dared anger the farm business: just weeks before fateful presidential caucuses in Iowa. And it acted in a way that makes the political agenda look not only confused but also corrupt.

The agenda now

Ethanol draws specious intellectual support from a political agenda obsessed with conservation and alternatives to oil, gas, and coal. In an energy market that the Energy Information Administration expects, under reference case assumptions, to grow by 24% during 2006-30, conservation and alternative energy forms are surely necessary. They just aren't sufficient. The US can't conserve away expected market growth without requiring economic sacrifice Americans won't and shouldn't be forced to accept. And alternative sources, important as they are as supplements, can't fill the supply void.

If it is to sustain standards of living and grow, the US needs not only more conservation and more alternative energy but also more oil, gas, coal, and nuclear power. Focused as it is on conservation and alternative energy, however, the US political agenda ignores and in many ways disparages traditional energy forms, the forms with commanding shares of the market and therefore those best able to address US supply problems promptly and economically.

The agenda must change. The US needs a political agenda on energy that's centered on the interests not of environmental extremists, fuel suppliers, and politicians but of energy consumers. Those interests are easy to identify. Consumers need reliable supply of affordable energy; mitigation of the health, safety, and environmental risks of energy production and use; and freedom of economic choice.

An agenda that includes those elements of consumer interest doesn't exclude conservation and alternative energy. It simply makes room for essentials such as currently dominant energy forms, which will not disappear under any circumstances, and market freedom.

The oil and gas industry must find a way to advance a political agenda on energy that's broader than the one now in place. It won't change the agenda in Washington, DC, where it has limited credibility. It has to start with energy consumers, the interests of whom any replacement agenda must have at its core.

Focus on consumers

A consumer-centered agenda works. One of the most hopeful developments in energy politics in recent years was the discussion in 2005-06 of federal oil and gas leasing—or at least gas leasing—off the East Coast. The effort stalled when Democrats won control of Congress and exploited rising energy prices for political theater instead citing them as the reason they are to act meaningfully on supply. What remains important is that the push for East Coast leasing came less from oil and gas producers than from consumers—industries and states hurt by rising prices of natural gas and recognizing how new supply would solve their problem.

Under the current political agenda, an agenda that forces conservation and the use of nonhydrocarbon energy to the exclusion of cheaper and larger sources of supply, consumers face a future of too little energy and too much cost. As those costs become clear, they'll listen to suggestions for something better. The oil and gas industry should be ready to offer a superior agenda—not to politicians but to the consumers the agenda must serve. ✦

Oil market heading for surprises in '08

Marilyn Radler
Senior Editor-Economics

This year the oil market will see a few surprises. Commodity price volatility will continue, but it will moderate, and prices will move lower.

The US economy will grow at a much slower pace than during 2007, and there is still some risk of entering a recession this year. That risk is abated, though, by the strength of US exports. The weak dollar relative to other major currencies will drive strong export demand this year.

As motor gasoline prices decline, gasoline consumption will strengthen again following 2 years of flat demand. Demand growth will be muted, though, as inflation across consumer spending dents personal spending power.

Earnings

US company earnings this year will be less robust than last year. This eventually will hurt oil production, primarily US output. It also could further weaken chances for new refinery construction in the US.

Profits will continue to moderate for producers due to higher costs for exploration and field development. During 2007, US-based producers saw their quarterly earnings start to decline following a long string of gains.

Service and supply companies will also see earnings growth slow. As recently as the third quarter of 2007, these firms continued to enjoy strong growth in net income compared with year-earlier results. Revenues soared on high day rates for rigs.

This year, service and supply companies will also feel a downward shift in earnings growth as their supplies of equipment are pinched and due to leaner capital budgets set by producers.

Capital budgets

Oil prices will moderate this year from their run at $100/bbl on the futures exchanges in the fourth quarter of 2007.

Leaner profits from oil and gas producing companies will result in less cash being allocated to capital and exploration expenditures. Outside the US and Canada, capital budgets will climb at least 16% this year, according to the most recent exploration and production (E&P) spending survey from Lehman Bros.

But upstream capital spending will be nearly flat in the US and down in Canada this year. Deepwater operations will still command much of the available resources, but onshore activity will lessen. Uncertainty surrounding natural

About this report

In this special report, Oil & Gas Journal's supervising editors write about important developments they expect in 2008. They'll discuss their observations and answer questions in a live webcast Feb. 14, 2008. Watch Oil & Gas Journal Online, www.ogjonline.com, for time and registration details.

gas prices is the reason that Lehman forecasts only moderate US spending growth.

The combination of these factors will continue the decline in US oil output. The last year that US crude and condensate production climbed more than negligibly was 1984.

Consolidation

The climate looks conducive to more consolidation among oil and gas companies during 2008. Merger and acquisition activity slowed in the past couple of years but could spike this year.

OGJ's annual look at oil and gas producers' results, the OGJ200, shows a recent decline in consolidation among the US-based, publicly traded firms with reserves in the US. During 2006, only six of these firms were acquisition and merger targets, the same as in 2005 and down from seven in 2004. Recent mergers among the companies in this special report peaked at 12 in 2000 and 2001.

The number of respondents in the Lehman Bros. survey that indicated a preference for acquiring reserves through the drillbit rather than by purchasing reserves declined in 2007.

While the proportion viewing drilling as economically favorable has declined in the US and Canada, the reverse has been true internationally, according to the survey. In the US, the economics of drilling are viewed as preferable to purchasing by 83% of respondents, down from 90% last year; in Canada by 66%, down from 97% a year ago; and internationally by 86% vs. 79% last year. ✦

LNG questions loom amid wave of project completions

Warren R. True
Chief Technology Editor-LNG/Gas Processing

Each recent year has brought global LNG capacities to levels only dreamed of 10 years ago. That will be no less true for 2008.

The difference this year, however, will be that many of the projects set in motion 3-5 years ago will be coming on line or nearing completion as the wave of projects from the first half of this decade crests.

But closely following that wave are clouds of problems that have begun to obscure the future, ultimate success of LNG in transforming natural gas trade into a fully global enterprise.

Capacities, projects

The accompanying table summarizes global LNG production and regasification capacities added in 2007-09.

Most of the liquefaction capacity in those 3 years will come online in 2008, mostly in the Middle East as several projects in Qatar—at least 39 million tonnes/year (tpy)—are finally completed. Qatar Petroleum Co. announced in early 2007 that it was freezing plans to finish current projects and to evaluate reservoir conditions in and production from its North field, the world's largest nonassociated gas field.

Long-awaited production will start from Russia's Sakhalin, Indonesia, and Nigeria as well as from Australia and Yemen.

By the same token, most of the new regasification capacity in 2007-09 will come on this year. In the US, more than 65 million tpy of import capacity is set to open—all but 3 million tpy on the Gulf Coast—with additional North American capacity set to open in Mexico and Canada pushing that continental capacity to nearly 90 million tpy.

Europe will add nearly 26 million tpy of import capacity, mostly in the UK but also in France and Italy, if current construction meets targets.

Asia will similarly add 26 million tpy in 2008—spread among India, China, and Korea—with another nearly 19 million tpy due online in 2009.

Last year saw a dearth of announcements for new liquefaction capacity but ended with a minor flourish in December as Chevron Corp. announced investors in Angola LNG had agreed to move the project to construction.

Cabinda Gulf Oil Co. Ltd., a wholly owned subsidiary of Chevron, holds a 36.4% interest in Angola LNG Ltd., which has entered into an investment contract with the Angolan government and the country's state oil company Sonangol to develop the project. Other Angola LNG shareholders are Sonangol (36.4%) and BP PLC and Total (13.6% each).

The project plans to move offshore Angolan gas to a liquefaction plant to be built in the Soyo region, Zaire Province. The plant will be able to handle 1 bcfd of associated gas and produce 5.2 million tpy of LNG and related gas liquids. The project will also supply up to 125 MMcfd of gas to Sonangol for domestic use in Angola.

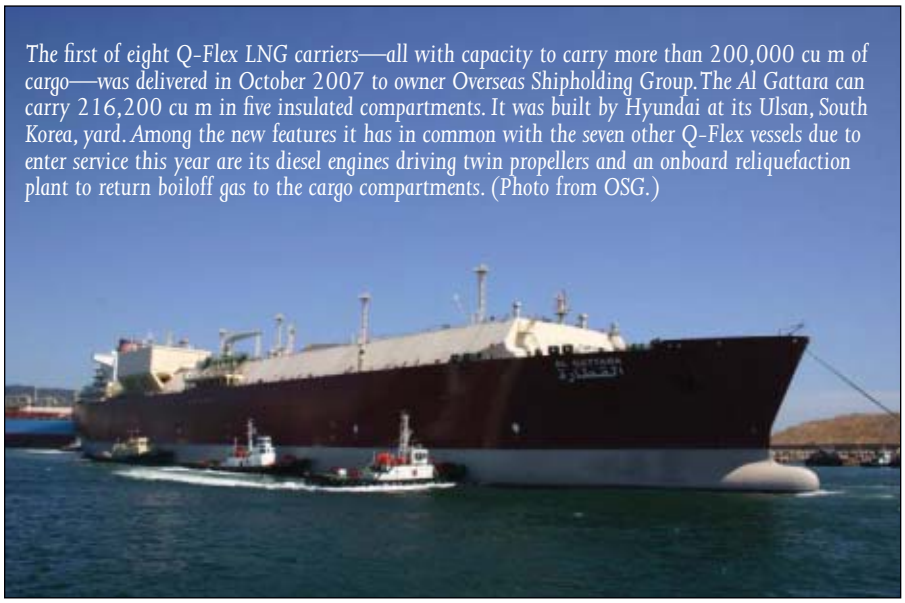
First LNG from the project is set for early 2012 and will be delivered to Gulf LNG's Clean Energy regas terminal, planned for Mississippi's Gulf Coast.

Also receiving the green light last year, after considerable delays and doubts, and starting construction was Woodside Energy Ltd.'s Pluto

GLOBAL LNG CAPACITIES ADDED 2007-09

	Liquefaction, million tpy	Regasification, million tpy
2007	8.8	17.1
2008	49.5	144.2
2009	23.4	71.0
Total	**81.7**	**232.3**

*As of Jan. 1, 2008.
Sources: OGJ; World LNG Source Book, GTI, Chicago; International Energy Agency; industry reports.



The first of eight Q-Flex LNG carriers—all with capacity to carry more than 200,000 cu m of cargo—was delivered in October 2007 to owner Overseas Shipholding Group. The Al Gattara can carry 216,200 cu m in five insulated compartments. It was built by Hyundai at its Ulsan, South Korea, yard. Among the new features it has in common with the seven other Q-Flex vessels due to enter service this year are its diesel engines driving twin propellers and an onboard reliquefaction plant to return boiloff gas to the cargo compartments. (Photo from OSG.)

LNG project, involving an investment of more than $5 billion (Aus).

The project includes development of Pluto gas field, off northwest Western Australia, and construction of an onshore LNG plant in the Pilbara region of Western Australia.

Pluto field, discovered in 2007 with early reserves estimated at 3.5 tcf, lies about 100 km off northwest Western Australia and about 180 km from the Burrup Peninsula. The gas, according to Woodside, is relatively dry with small amounts of condensate and low levels of carbon dioxide.

Pluto's first target for its 5-7 million tpy of LNG is Asia with possible eventual supplies aimed at North America, especially if any locale on the US West Coast ever approves a terminal.

The first phase will build a 4.8 million tpy train with first gas expected in 2010. Woodside Energy said feasibility work has begun on the second train.

Industry issues

These two projects made headlines last year in part because of longstanding industry concerns about the slow pace of growth in global liquefaction capacity. The table makes clear the growing gap between liquefaction and regasification capacity.

By far the largest factor in the slow growth of production capacity has been the explosive increase in materials costs and the shortage of skilled and trained labor to build and manage projects.

Cambridge Energy Research Associates has estimated that, since 2002, upstream capital costs as part of an LNG project have risen by 80%. That reflects industry observations that capital costs of annual capacity in an LNG project rose to more than $600/tonne in 2006 from $200/tonne in 2002.

Fueling this growth has been surging Chinese demand for all industrial raw materials, pushed by double-digit annual gross domestic product growth over the last 5 years. The effect has had every major industrial project in the world, especially energy projects, scrambling for sufficient materials and skilled labor.

Aggravating these shortages in materials and people, in the view of some observers, is the double-edged sword of natural gas prices.

Elevated gas prices since the mid-1990s have in part spawned the resurgence of LNG as a transportation mode. But in markets where prices have hit particularly high levels, they have driven energy demand towards competing fuels, especially coal, even with expensive cleanup technologies.

Some project developers, therefore, have been reluctant to invest massive capital and extensive time if natural gas demand is not more certain.

Complicating this dilemma are the differing behaviors of the world's three major LNG markets: Asia, the historical leader, broadly indexes LNG prices to crude oil; the US pegs them to the Henry Hub gas price; and Western Europe has several pricing centers with little uniformity—and therefore predictability—among the several nations.

Finally, an unexpected consequence of the flow of wealth to formerly developing nations is that their domestic gas demand is rising and threatens to siphon off gas initially intended for international trade, thus tightening global supplies.

By yearend 2008, some of these issues may be sorted out as growth of industry's capacities crests and leads to several years of consolidation before the next wave begins in 2013-14. ✦

Personnel and access constraints to test the worldwide E&D industry

Alan Petzet
Chief Editor-Exploration

Worldwide exploration and development, stimulated by high prices of oil and natural gas, should have a positive but challenging year in 2008.

Activity remains constrained by limits on access to reserves and exploration acreage and by a shortage of skilled personnel.

The human factor is the most urgent constraint. Large percentages of oil company staffs become eligible to retire in the next 5-10 years.

Worker shortages, for example, have been cited as a factor in the delayed production start of supergiant Kashagan oil field in the Caspian Sea off Kazakh-

stan, one of the world's largest fields.

Lack of new talent is one of the most dangerous threats to the long-term health of ConocoPhillips, Chief Executive Officer James Mulva told Business Week in late December.

Reserves access

Another threat looms in the form of access to reserves. National oil companies, led by those of Saudi Arabia and Iran, control the great majority of the world's proved oil and gas reserves. Another group of countries controls the next tier. International oil companies hold about 6% of the reserves, said John McDonald, vice-president of strategic planning, Chevron Corp.

"Access to oil and gas reserves is not a given," McDonald said, "particularly as we're encountering a new wave of resource nationalism in some large producing countries and entrenched barriers in resource countries like Mexico, where the constitution continues to prohibit foreign investment in the oil sector."

To do its job, the E&D industry has big spending plans again in 2008. The planned capital and exploration outlay tops $354 billion, according to a mid-December 2007 survey by Citi Investment Research. For the 247 companies surveyed, that is a 9.3% increase from estimated 2007 expenditures.

The survey reflects the expectation of a modest increase in the US, a modest decline in Canada, and solid growth in operating areas outside North America. The outlays are directed 8% to Canada, 24% to the US, and 68% outside North America.

The 10 largest spenders for 2008 account for 44% of total spending compared with more than 51% in 2007. In late 2006, the International Energy Agency projected that the industry needed to invest more than $200 billion/year through 2030 to meet demand.

Top company spending plans indicate that this is occurring. A few budgets: Chevron $23 billion, up 15% on the year, and ConocoPhillips $11 billion, up 8%. BP PLC plans to average $6 billion/year over the next decade. Saudi Arabia is investing $30 billion over the next 5 years.

Most of the expenditures are geared toward drilling and equipping wells and bringing new fields on production. Worldwide, OGJ counted 90 major upstream projects whose oil or gas output is scheduled to start or peak in 2008, compared with only 68 in 2007 (OGJ, July 23, 2007, p. 43).

BP CEO Tony Hayward noted that untold billions of barrels could be produced by improving the recovery factor, as his company has done with enhanced oil recovery on the Alaska North Slope.

"The worldwide recovery factor for conventional oil reservoirs is around 35% of oil in place—if we can raise that by just 5%, it would add around 170 billion bbl to world reserves.

"In Alaska, we and our partners are raising our recovery rate to around 60% by applying new technologies such as horizontal drilling, miscible gas injection, and gas cap water injection."

Of the eight megaprojects OGJ counted as peaking in 2008 in the US, seven are in the Gulf of Mexico.

ExxonMobil Chairman and Chief Executive Officer Rex W. Tillerson said the US can still boost its oil production.

"The US was endowed with the second largest oil and gas resource base in the world, and even after more than a century of development and production is still ranked No. 5 in remaining oil and gas," he said.

US resources meet 50% of domestic demand but "could supply more if more of it were opened to exploration, development, and production," Tillerson said. "Federal and state governments…have ruled off-limits an estimated 31 billion bbl of recoverable oil and 105 tcf of natural gas." The majority is in the Rockies and offshore, not in the Arctic National Wildlife Refuge, and industry has the technology and experience to produce safely and with minimal environmental footprint.

Industry size

Besides having access to reserves, the E&D industry must be immense to supply the needs of a huge market. The scale of the global energy industry is difficult to grasp, said Tillerson.

Daily consumption equates to 230 million bbl of oil equivalent, including 40,000 gal/sec of oil.

"ExxonMobil is the largest nongovernment energy company and has the largest market capitalization of any corporation in the world. Yet we produce no more than 2% of the world's total energy," Tillerson said.

Meanwhile, operator responses to the study by Citi Investment found that seismic and computer-aided exploration (CAEX) technology has taken second place behind horizontal and directional drilling as the technology or trend that has the greatest impact on E&P spending plans. Nevertheless, more than half of the respondents still voted seismic/CAEX the most important. ✦

Offsetting demand gains will limit ethanol's ability to cut oil imports

Bob Tippee
Editor

Ethanol will fail this year to fulfill promises made on its behalf about lowering US dependence on imported oil. It won't be the first time—or the last.

The failure will result from the energy required to grow and process corn and to transport corn to ethanol plants and ethanol to blending facilities.

Ethanol's supporters argue that modern processing technology endows their favorite fuel additive with a positive energy balance, that energy content of ethanol exceeds energy consumed in its

manufacture. They're right.

But their optimistic assessments of ethanol's energy balance underestimate the energy used outside processing plants for essentials like its transportation and the production of fertilizer. As corn takes over land once dedicated to crops such as soybeans and wheat, which require less fertilization than corn, and as the industry spreads geographically, those energy needs grow.

And grow they surely will. The energy bill passed and signed into law in December greatly expands the ethanol mandate, beginning this year.

Expanding mandate

The original mandate for ethanol and other renewable fuels, set by the Energy Policy Act of 2005, increased in annual steps to 7.5 billion gal/year by 2012. But production has increased ahead of schedule. Ethanol production in 2007 was expected to exceed 6 billion gal, above not only that year's mandate but this year's as well.

In fact, the supply surge has suppressed the ethanol price while demand for raw material has zoomed, driving up the price of corn. Ethanol plant operators are caught in the squeeze.

So the new energy bill, the Energy Independence and Security Act, lifts this year's production requirement to 9 billion gal (from the original mandate of 5.4 billion gal) and raises the threshold in steps to 36 billion gal in 2022. Beginning in 2016, a rising share of each year's total, reaching 21 billion gal in 2022, must be "advanced" renewable fuel such as cellulosic ethanol.

Meeting the targets will be neither easy nor cheap. That ethanol production at current levels strains crop supplies is evident in rising prices for corn and the food crops it increasingly replaces. Escalation of the mandate will increase the stress. And a 51¢/gal tax credit costs the US Treasury, after adjustments for energy content and tax not paid by displaced gasoline, 45¢/gal. Federal subsidies for corn add more cost.

The stated reason for the imposition of these burdens is the replacement by fuel made from domestic crops of oil imported from unstable if not hostile countries. So a test should be possible: Do imports fall in step with the increase in ethanol production?

Imports dip

Imports indeed declined in 2007, according to December projections by the US Energy Information Administration. But the amount of the decrease was less than the rate of ethanol output and attributable to other factors.

EIA expected net crude and product imports to be down by an average of 170,000 b/d for 2007 in a market that expanded by 70,000 b/d. Ethanol production in the first 9 months averaged 406,000 b/d, the energy equivalent of 264,000 b/d of gasoline.

If other elements of the import equation hadn't changed, ethanol thus would seem nearly to have lived up to its billing as a replacement for foreign oil. But those other elements moved in directions that suppressed imports.

Total US production of crude oil and gas liquids, for example, rose by an average 20,000 b/d, according to EIA. And a 120,000 b/d draw on stocks further enhanced supply.

Other variables affect imports, of course. But it's clear that ethanol last year didn't reduce imports barrel-per-barrel or anywhere near that much. A big part of the reason is energy use stimulated by increased corn cultivation and ethanol-industry logistics.

To some important extent, gasoline consumption reduced by the use of ethanol is offset by gains in ethanol-related demand for transport fuels, especially diesel because so much corn and ethanol moves by rail and truck. Last year, according to EIA, demand for distillate oils, the category that includes diesel, increased by an estimated 70,000 b/d—coincidentally, the same amount by which total US demand is estimated to have grown.

The promise implied by the wildly successful politics of ethanol is that reliance on imported oil will decline as a direct function of increased use of ethanol.

It didn't happen in 2007. It won't happen in 2008. ✦

US presidential politics to brighten spotlight on energy security issue

Steven Poruban
Senior Editor

What should make 2008 an interesting year for writing about the oil and gas industry is the developing news about "energy security" in the US and its relationship to the presidential election.

Energy security has become—and will remain—a key platform topic for presidential candidates as November draws closer. While always bright, the spotlight on energy and energy security in the US has been intensified especially after President George W. Bush on Dec. 19 signed into law an energy bill designed to increase vehicle fuel efficiency and reduce US dependence on foreign oil.

The Energy Independence and Security Act mandates the first increase in vehicle fuel economy since 1975 while increasing ethanol production in the US. While called historic by many Democratic members of Congress, the act was opposed by some Republican lawmakers. Dropped from the act were portions that would have raised taxes on oil companies and set renewable fuel standards for electric power generation.

Defining 'security'

While on the campaign trail, presidential candidates—Democrats and

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Republicans alike—will have to believably reinforce their own definitions of "energy security" and "energy independence" and how they would uphold these definitions in office.

In a speech at the Brookings Institution on Dec. 18, US Sen. Dick Lugar (R-Ind.) said, "I would state unequivocally that energy security and the economic and environmental issues closely associated with it should be the most important topics of the 2008 presidential election (OGJ, Dec. 24, 2007, p. 32)." Lugar asserted that advancements in American energy security have been "painfully slow" over the last 2 years and that political leaders have been "defensive, rather than proactive" on the issue.

The senator said the issue of energy security has never been more crucial, particularly after the release of the International Energy Agency's annual World Energy Outlook, which projected that global demand for energy would increase by 50% by 2030—with global demand for oil expected to rise from 85 million b/d to 116 million b/d by 2030.

Three reasons

Lugar cited three reasons why energy has assumed such importance in the election:

- Energy is the issue with the widest gulf between what is required to make the US secure and what is likely to be achieved given the inertia of existing programs and congressional proposals.
- Transformational energy policies are likely to be required for achieving economic and social aspirations in the US.
- Energy exacerbates almost every major foreign policy issue.

"Whoever is sworn in as president in 2009 must elevate energy security to the status of a core national goal and must directly engage all the American people in the solution," Lugar said. "If the next president addresses energy through a familiar ideological prism, the chance to strengthen US national security and economic prosperity will be lost."

To this end, Lugar said, the next president will have to be "relentless" in his or her pursuit of energy concerns.

It remains to be seen, however, whether a political campaign focused around energy security will entice enough American voters to get a candidate to that level. ✦

Khelil says Sonatrach seeking major player status

Uchenna Izundu
International Editor

Chakib Khelil, Algeria's energy minister and the current president of the Organization of Petroleum Exporting Countries, spoke to OGJ about his plans to position Sonatrach as a major international player and to restore the credibility of OPEC in a rapidly changing and complex energy environment.

OGJ: When is Algeria's next licensing round?

Chakib Khelil: It will be in January. We will be offering 10-15 blocks. There will be prequalification of companies and only the qualified companies that can deal with the problems in those blocks will be selected. Those companies that can do swaps of assets elsewhere and are willing to discuss the partnership of Sonatrach in projects other than Algeria will be selected. I can't say where the blocks will be in Algeria.

Sonatrach and the state will propose areas. Some are controlled by Sonatrach, and there are areas which are not. There will be two types of blocks that will be offered but the same process will be applied to both. In terms of qualifications, we will wait until the bids will be announced and the companies will be informed of where those blocks will be.

OGJ: It would seem that Algeria is demanding a lot more from companies that are coming to invest.

Khelil: Algeria doesn't need money; Sonatrach has money, the know-how, and the technology. We need companies at first to increase the effort in particular areas, and we don't have the level of resources to do all these things at the same time. We need also technology and so that's what we are going to be looking for. We want Sonatrach to become a more important international player. We're going to use this opportunity to achieve that objective also.

OGJ: What is the position now with Gassi Touil? Is Sonatrach saying it doesn't want any international partners, or are they going to hold another bidding round?

Khelil: Sonatrach has taken over. It will not offer another bidding round with Gassi Touil. Our interest was to accelerate the development, and since that didn't happen we have decided to do it on our own. It poses too many problems to try and find a partner and start from scratch. The easy way to do it on time is to do it on our own.

OGJ: And when do you expect production to start from Gassi Touil?

Khelil: That will be in 2012, and we will have 4 million tonnes of LNG. We are building another LNG plant in Skikda, and the contract was awarded to KBR so that will also be ready in 2011. That one is 4.5 million tonnes. In terms of exports, we are also building Medgaz, which will add 8 billion cu m in 2009.

OGJ: What is the status of the price dispute with Medgaz?

Khelil: There is no price dispute. Price disputes deal with the gas that is signed through the Hassi R'Mel gas pipeline in Morocco. When we were dealing with Medgaz, which goes from Algeria to Spain, the Spanish authorities made certain decisions and went back on them. And we have arbitration on Gassi Touil with Repsol and Gas Natural.

There are two contracts with Morocco and Gas Natural. We have the right to increase the price. The contract was signed in 1995 and now we are in 2008; at that time oil was $15/bbl, now it's $90/bbl. So, definitely there has to be an increase in price.

The third issue is that Sonatrach cancelled the contract with Gas Natural and Repsol. We are under arbitration because we are seeking reparation for the fact that they didn't comply with the contract's terms. Gassi Touil was supposed to come on stream in 2009, and they came out saying it will come on stream in 2012. That's 3 years' delay, and that's not complying with the contract. That's why it was cancelled.

OGJ: How does Algeria regard the restructuring of the European gas sector?

Khelil: We are always in favor because we have restructured our gas and oil sector. We probably have the most open gas sector; we have distribution companies and transportation companies and, of course, producing companies. We have regulatory authorities, so we are maybe better than some of the European countries in terms of reforms.

Now, in Europe, the problem is that every country has a different view on what they mean by a liberalized sector. The view of the European Commission is that the gas sector should be run by independent companies that don't have a conflict of interest in marketing the gas. But that's not the view necessarily of some European countries; they feel that their companies should have a major role in controlling some of those pipelines. So, in that respect it doesn't affect us because we're not interested in gas pipelines and trunk lines in Europe.

Second, we are going to be selling gas—whether it's [to] an independent company or an operator, the only impact is going to be [on] the consumer. If it's an independent, probably the consumer would enjoy the benefits of competition. If it's someone with a monopoly, then of course there is a price to pay by the consumer.

The other thing is the issue of reciprocity, which is mentioned by the European Commission's directive. It doesn't affect Algeria; we are open, and companies are operating there. In the upstream and in petrochemicals we do bidding, so it's open. We would like reciprocity ourselves; we did not have reciprocity with Medgaz. We were curtailed and of course we protested. [Spain's national energy commission], the CNE, decided that we could only distribute 1 billion cu m out of 3 billion cu m, so the question was, 'What do I do with the 2 billion cu m?' At the same time they made a decision to interfere with the Medgaz company and all of that was really very bad. It left a really bad feeling for producing countries that play the game and make investments.

We talk about security of demand; you hear about security of supply, but our concern is security of demand. The first problem we had was trying to export gas to the US in 1970. We had a long-term contract, and suddenly from one day to another, after doing huge investments, the market wasn't there. We had to renegotiate the whole thing and find other uses for our gas.

OGJ: How do you see cooperation with Gazprom evolving?

Khelil: It's not developing: we don't have any cooperation. We signed a [memorandum of understanding] with them; we signed one with Shell and Statoil. We are not in any discussions with them [Gazprom] at all about projects.

OGJ: How is Sonatrach's international investment program going?

Khelil: Over the long term we are planning to have at least 30% of our production coming from outside [Algeria] by 2015. Part of it is the Algerian licensing round and we are being aggressive ourselves by bidding in other countries as well. Whenever we offer blocks in Algeria we'd like to use this to leverage our participation outside because most of these companies have that.

OGJ: There has been a lot of criticism of Algeria on resource nationalism. What is your response to that?

Khelil: Resource nationalism is not particular to Algeria. It's also with the US: there was the Unocal affair, which was not an Algerian affair. Spain not letting a German company take over a Spanish one is not Algerian. French companies not letting non-French companies take over their companies is not Algerian. I don't see what they call resource nationalism.

We imposed tax on exceptional profits, which is not considered to be resource nationalism. It just takes into account that when the contracts were signed in the 80's the oil price was $15/bbl, now the oil price is $90/bbl. Some of these contracts didn't include the mechanism by which the state would receive a fair share when the oil price would go that high. The state of Algeria has taken the decision that it would get a fair share, and that is not specific to Algeria. Even Alberta has put tax on royalties, and the US has put taxes on offshore assets in the Gulf of Mexico.

It's just a matter of tremendous changes in the market and to avoid upheavals. Our demands are based on logic: If you sign a contract based on $15/bbl you expect a certain return. But if you get $90/bbl you are getting more than what you expected. In any case it is the same company that is making very good returns. They have a choice not to come to Algeria: We are not forcing them. They are free to go to Libya and to any other country that offers them better conditions.

OGJ: But Gassi Touil has been given as an example where Algeria has seized back a project that was meant to have international partners.

Khelil: That's not the issue. It doesn't have anything to do with resource nationalism. If the companies had met their contract commitments I don't think that anything would have happened. They wanted to renegotiate, but we are in arbitration and that will determine if we did the right or the wrong thing. We are asking for reparations because we lost a lot in this process. This project was done by bidding; it was not negotiated. You can't go back to

the second bidder; it's too late.

OGJ: Can you tell me how much you're seeking and how much you've lost?

Khelil: I can't tell you. That's part of the arbitration. The minister of Spain's foreign affairs said that this is a commercial issue. It's not about politics.

OGJ: Can Sonatrach still make money in refining when oil is being sold at $90/bbl?

Khelil: Sonatrach is an integrated company and it has to look at it long term. We are going to build a new refinery. We have finished a small refinery of 16,000 b/d in the south with the Chinese, and they have 70%. It started operations earlier this year. We are finishing a 100,000 b/d condensate refinery in Skikda, built by the Chinese, which will be finished next year. We are building a new 300,000 b/d refinery south of Algiers, and that is still under bidding for the EPC. It will probably be ready by 2013.

OGJ: Have you started discussions with Brazil about joining OPEC?

Khelil: No, we haven't and their president said that they might become members of OPEC. I don't know whether it's true or not, but it's been reported by the press. Apparently Petroleo Brasileiro SA (Petrobras) has discovered large reserves, and by the time they are able to develop those reserves and by the time they can increase production to the level of being exporters, instead of net importers, that will be at least 4 or 5 years. What I'm saying is that we will welcome any country for that and we have Sudan as one observer status and Equatorial Guinea as another as it's a net oil exporter.

OGJ: What kind of initiatives do you want to implement to turn around the credibility of OPEC?

Khelil: Credibility is what we did in 2001 when I was president: whatever we say, we do and not to say something and do something else. We want to have credibility with the consuming countries, and I think the other thing we mentioned was to improve the dialogue with consuming nations, the International Energy Agency, with whom we have good relations. We are working on an information databank to make all the data about the oil market transparent.

But we need to work more on the financial markets because financial markets have a tremendous impact on the oil markets through the speculation of operators. We need to work with the consuming nations to see how the financial markets could be improved, either through regulations or more transparency of various operations so as to have less impact on the oil market. As you know speculation has tremendous impact on the market.

OGJ: Do you have an oil price forecast?

Khelil: No, but all I can say is that oil prices will remain at this level. It will maybe strengthen in the first quarter of 2008 because some people say there will be some bad weather. But in the second quarter I think there will be some relaxation on the oil price because of lower demand. ✦

DOI budget takes bite from states' revenue shares

Nick Snow
Washington Editor

US oil and gas producing states will lose nearly $43 million of their shares of revenues from federal oil and gas production within their borders under a provision of the Department of Interior's fiscal 2008 budget. President George W. Bush signed DOI's budget into law on Dec. 26 as part of the omnibus budget bill approved by Congress earlier that week.

Known as net receipts sharing, the provision attempts to charge states for part of the federal government's oil and gas royalties program's administrative costs. It effectively will reduce each state's share of federal oil and gas revenues to 48% from 50%.

Then-Rep. Sidney R. Yates (D-Ill.) first proposed the assessment in 1991 when he chaired the US House's Interior Appropriations Subcommittee. Congress included it in DOI's annual budget until 2000 when producing states, through the Interstate Oil & Gas Compact Commission and their governors and congressional delegations, convinced federal lawmakers to repeal it.

The Bush administration brought it back as part of its fiscal 2008 DOI budget request early in 2007 but it escaped producing states' attention until late in the year, according to Kevin Bliss, IOGCC's Washington representative. He said that federal lawmakers including Sens. Jeff Bingaman (D-NM), Pete V. Domenici (R-NM) and Ken Salazar (D-Colo.) and Rep. Tom Udall (D-NM) protested but to no avail.

"The IOGCC has long advocated for a 50-50 split on revenue and was in fact instrumental in achieving that goal several years ago. We believe that the federal government has not made a case for this action. Previous studies have shown that states can administer the revenue distribution at a much lower cost than the federal government," IOGCC Acting Executive Director Gerry Baker said on Dec. 21.

States see role

Producing states believe they are better equipped to assume at least part of the responsibility, Bliss told OGJ on Dec. 28. He said that then-Vice President Al Gore's Reinventing Government program embraced that concept in the 1990s but DOI did not adopt the idea.

"We certainly regulate more efficiently" than the US Bureau of Land Management, Don J. Likwartz, supervisor of the Wyoming Oil & Gas Conser-

vation Commission, said by telephone from his Casper office on Dec. 28. "We issue six permits for every one of theirs in Wyoming. We have six staff members compared to their 80, although they have to look at more aspects when issuing permits than we do."

Western states will be hit hardest now that net receipts sharing has been revived. Wyoming represents more than half, nearly $21.5 million, of the estimated $42.6 million that producing states will have to pay based on the nearly $2.13 billion they received during fiscal 2006. Estimated costs for other producing states include $11.5 million for New Mexico, $3.5 million for Utah, $2.9 million for Colorado, and $1 million for California.

"Revenue from oil and gas production on federal land is an important source of income for New Mexico. This new provision would hit the state hard," Mark E. Fesmire, chairman of the New Mexico Oil Conservation Commission, said on Dec. 21 before DOI's budget became law.

Producing states want to make certain that the provision is not part of the department's 2009 budget. "We fought this battle back in 1999 and got it turned around once, and we'll try to do it again through the states' governors, congressional delegations, and the IOGCC. We don't see why BLM needs to take approximately $43 million out to administer these royalties," Likwartz said. ✦

Colorado state, federal officials discuss future of Roan Plateau

Nick Snow
Washington Editor

The US Department of the Interior and Colorado state officials have begun discussing the Roan Plateau's future and will continue talks over coming weeks, Colorado Gov. Bill Ritter said on Dec. 20.

The federally and privately owned northwestern Colorado plateau became a prominent resource access symbol during 2007 when two US House Democrats from the state, John T. Salazar and Mark Udall, tried to delay further federal oil and gas leasing there with amendments to various bills.

"The Roan Plateau is a very special place, and we have only one chance to get it right. The state and federal governments owe it to present and future

WATCHING GOVERNMENT

Nick Snow, Washington Editor

Moments to savor in 2007

This year promises to be an exciting and challenging year in Washington, DC, for the oil and gas business. But before it gets too far under way, let's revisit some of 2007's more entertaining moments and properly recognize their instigators. Yes, it's time for the "Watchies," this column's annual salute to the past year's most amusing moments in government.

As in previous years, most of the winners are members of Congress. Roger W. Sant, who chairs the Smithsonian Institution's board of regents, is not. He still receives this year's "Good Will and Enlightenment" Watchy for questioning the museum's acceptance of $5 million from the American Petroleum Institute to help underwrite a major oceans exhibit. API, which senior Smithsonian staffers had approached earlier in the year, quietly withdrew the gift before it could come to a vote before the regents.

Sant reportedly felt that ocean life preservation and petroleum industry activity are incompatible. In addition to being a former chairman of the World Wildlife Fund, he also founded and chaired AES Corp., which is encountering opposition to its planned LNG terminals near Baltimore and Boston.

On to Congress

We move now to the 110th Congress, where members railed against alleged price gouging amid the oil and gas industry's supposedly obscene profits. While many contended, the "Let's Not Mince Words" Watchy goes to Senate Majority Whip Richard J. Durbin (D-Ill.) for declaring on Dec. 13 that "the oil companies are celebrating in their boardrooms" after a cloture motion failed by one vote, dooming the 2007 energy bill's punitive tax provisions.

The many runners up in the House and Senate were merely tuning up their rhetoric for the 2008 elections. There's not enough space to discuss what's at various presidential candidates' web sites. Let's just say that competition will be fierce for this Watchy this year.

Committee hearings also were entertaining. Rep. Jay Inslee (D-Wash.) wins a "Deja Vu" Watchy for his May testimony before the House Natural Resources Committee urging incentives to stimulate marine renewable energy development. It was reminiscent of calls in the early 1990s to suspend royalties for initial deepwater oil production in the Gulf of Mexico.

Cultural relevance

Finally, Rep. Stevan Pearce (R-NM) wins the first "Cultural Relevance" Watchy for his maneuver during a May 23 Natural Resources Committee hearing. It's not certain whether he was aware that singer-composer Paul Simon was in town to receive the first George and Ira Gershwin Prize for Popular Song from the Library of Congress.

Pearce nevertheless asked a panel of five federal resource managers which provisions in HR 2337 would lead to increases in domestic oil and gas production. Then he sat back and awaited their responses.

That's right. It was the Sound of Silence. ✦

generations to do everything we can to accomplish our goals," Ritter said in Denver.

C. Stephen Allred, assistant US Interior secretary for land and minerals, said he welcomed Ritter's views. Allred added that he and BLM Director Jim Caswell will continue to work with BLM Colorado State Director Sally Wisely and the state government.

Udall said he would have preferred that Congress adopt statutory provisions to protect the area, "but in the absence of action by Congress I believe the governor's approach represents our best opportunity to achieve that goal."

Meg Collins, president of the Colorado Oil and Gas Association, said COGA was pleased with Ritter's announcement "and the fact that he recognizes the vast resource potential within the Roan Plateau and the potential for substantial revenue for the state. Most importantly, we're pleased that Gov. Ritter acknowledges the important role technology plays in extracting natural gas from environmentally sensitive places."

COGA recognizes that discussions regarding future Roan Plateau leasing are ongoing and looks forward to meeting with the governor and other stakeholders, she continued.

One of Ritter's main goals would be to expand four wildlife protection zones, designated Areas of Critical Environmental Concern by BLM, which currently total 21,032 acres. Udall said that if the Bush administration accepted Ritter's suggestions, about 80% of the top of the Roan Plateau would fall under that designation.

Ritter also would like BLM to explore phased or incremental leasing to increase state revenues, reduce environmental impacts, and "properly pace future development." He also suggested possibly amending the 1997 federal land transfer law to ensure that the state receives bonus payments from future leasing on the plateau.

The law moved ownership of Naval Oil Shale Reserves 1 and 3 on the plateau from the US Department of Energy to BLM. It also instructed the DOI agen-

cy to develop a multiple-use resource management plan for the area and issue oil and gas leases "as soon as practicable," according to BLM. Its current management plan would allow 91% recovery of the estimated 8.9 tcf of natural gas while protecting 51% of the plateau.

Ritter said he also would like any future leasing there to incorporate state-of-the-art technology to minimize environmental disturbance and to provide sustained economic benefits to local communities and businesses.

The federal government owns 73,620 acres, or 58% of the surface, within the Roan Plateau Planning Area, while energy companies, ranchers and other private entities hold the remaining 42%, according to information at the governor's web site. It said that BLM's current plan is to lease all available acreage at once, resulting in up to 1,560 wells on 193 well pads being developed over 20 years. Surface disturbances would be limited to 350 acres at a time, and wells would be clustered on multiwell pads, it said. ✦

BLM publishes draft program EIS for commercial oil shale development

Nick Snow
Washington Editor

The US Bureau of Land Management published a draft programmatic environmental impact statement on Dec. 21 to guide future management of 1.9 million acres in Utah, Colorado, and Wyoming for potential commercial oil shale development.

A federally published draft complies with Section 369(d) of the 2005 Energy Policy Act, which declares oil shale and other unconventional fuels to be strategically important domestic energy sources which should be developed to reduce US reliance on imported oil, the Department of the Interior agency said.

"The potential of America's oil shale resources to meet future US demand for fuel is significant. Oil shale deposits on public lands hold the equivalent of 1.23 trillion bbl of oil. The lands we are proposing to make available are estimated to hold, at a minimum, the equivalent of 61 billion bbl," BLM Director Jim Caswell said on Dec. 20.

Rep. Mark Udall (D-Colo.) and other politicians expressed concern following EPACT's passage that the law did not adequately consider possible economic, social, and environmental impacts of oil shale resource development on nearby communities.

Caswell said BLM is taking a thoughtful, deliberate approach to completing the program's EIS because there is no federal program for leasing these resources. BLM cooperated with 14 federal, state and local government agencies as it developed the draft over nearly 2 years, he said.

The draft programmatic EIS would not authorize any commercial development projects, provide for any leases to be issued, or commit BLM to any particular course of action, Caswell emphasized.

He said that its alternatives would exclude between 305,000 and 1.5 million acres from leasing. No leasing would be allowed in wilderness areas, wilderness study areas, other units of BLM's National Landscape Conservation System or critical environmental concern areas that are closed to mineral development.

The draft proposes that oil shale resources on identified lands would be leased as a solid mineral and additional site-specific analysis under the National Environmental Impact Act would be completed on each application before any lease could be issued, according to BLM.

BLM will accept comments on the proposal for 60 days following federal publication. The complete draft is available online and from BLM state and field offices in Colorado, Utah, and Wyoming. ✦

Independent panel completes DOI mineral royalty review

Nick Snow
Washington Editor

An independent panel completed its review of the US Department of Interior's mineral royalty collection program on Dec. 18 and forwarded its findings and recommendations to the department's royalty policy committee. The committee will review and discuss the panel's findings at a Jan. 17 public meeting.

Secretary Dirk A. Kempthorne formed the panel 9 months earlier to assess DOI's mineral revenue collections system. "The panel was given a free hand to scrutinize all key processes, from production accountability and royalty collections to audits, compliance and enforcement," he said.

US House Natural Resources Committee Chairman Nick J. Rahall (D-W. Va.) has been one of the DOI royalties collection system's harshest critics, saying it is plagued with problems, particularly in its royalty-in-kind (RIK) program.

The panel's cochairmen, former US Sens. Bob Kerrey (D-Neb.) and Jake Garn (R-Utah), acknowledged in a joint statement that there has been controversy over federal mineral resources management for several years, and that Congress has expressed concern about mineral leasing and revenue collection processes.

They said that within DOI, the inspector general has investigated allegations of ethical lapses by RIK program employees. "We believe the RIK program is an extremely important component of the royalty management program and the recommendations in this report are geared toward ensuring its survival," Kerrey and Garn said.

They said the panel's report makes more than 100 recommendations to improve the federal mineral resource management program, which provided more than $11 billion of revenue in 2007. "Most of these recommendations can be implemented administratively. Many can be done quickly. Some will require long-term effort and continued vigilance. A few of the recommendations depend on legislative action," they said.

In addition to Kerrey and Garn, the seven-member panel, which functioned as a subcommittee of the royalty policy committee, included David Deal, who was vice-chairman, and members Cynthia Lummis, Perry Shirley, Robert Wenzel, and Mario Reyes. The full committee will review the report at its Jan. 17 meeting before transmitting it to Kempthorne. ✦

California suing EPA over greenhouse gas rules

Paula Dittrick
Senior Staff Writer

California has filed a lawsuit against the US Environmental Protection Agency. The anticipated action comes after the EPA last month denied California a waiver that the state requested under the US Clean Air Act.

The requested waiver would have allowed California to impose tougher standards on motor vehicles' emissions than federal regulations require (OGJ, June 25, 2007, p. 31).

More than 12 other states are expected to join California's suit against EPA. These states have adopted the California emissions standards for GHG emissions from new cars and trucks.

California Atty. Gen. Jerry Brown called a news conference, saying the lawsuit was filed on Jan. 2 in the 9th US Circuit Court of Appeals in San Francisco. He expects that the federal government will try to have the case transferred to an appeals court in Washington, DC.

Brown suggested EPA's decision was made after "White House pressure, automobile influence, or some other lobbying pressure."

The vehicle regulations are part of California's global warming law that seeks to reduce GHG emissions statewide by 25%, or to 1990 levels, by 2020.

"We understand this is a long fight

that may go to the Supreme Court," Brown said. "We feel this is going to be a struggle."

EPA Administrator Stephen L. Johnson denied the waiver for California, saying the US government is working on a national standard. ✦

Ecuador lifts emergency decree; will probe abuses

Eric Watkins
Senior Correspondent

Ecuador has reached an agreement with human rights organizations and regional leaders and has lifted the state of emergency it decreed on Nov. 29 in the province of Orellana.

The agreement calls for the creation of a commission to investigate charges of human rights abuses connected with the emergency decree, which came after protests shut down a key oil-production facility operated by Ecuadoran State Petroleum Enterprise.

President Rafael Correa decreed the state of emergency in the Dayuma region in order to control protests by local residents who were demanding public works projects.

At the time, Correa said, "What we have are organized mafias under the orders of political bosses who live for conflict and are the last ones who want things to be resolved."

Authorities arrested a score of people under charges of sedition, but Interior Minister Fernando Bustamante has said that authorities would determine if the army committed excesses at the time.

"If there has been any abuse of authority, evidence will be gathered," he said. "The commission will ensure that disciplinary measures are taken and compensation is made."

Justice Minister Gustavo Jalk nonetheless said he will act quickly to identify the people who were responsible for acts of sabotage performed around the Dayuma facility. ✦

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Khodorkovsky's new year

Whatever the new year may hold for most of us in the oil and gas industry, it will likely resemble nothing close to what's in store for jailed Yukos founder Mikhail Khodorkovsky and his business partner Platon Lebedev.

Remember them? If not, recent reports say that a court in the city of Chita, where the men are jailed, has extended custody for them until Feb. 8, pending a new investigation into their activities.

The new charges against Khodorkovsky and Lebedev, who were convicted of fraud and tax evasion in 2005, include stealing government shares, expropriating oil, and laundering $25 billion earned from oil sales in 1998-2004.

The new investigation was upheld by the Moscow City Court on Sept. 19, 2007, while Russia's Supreme Court ruled on Dec. 25 that the investigation was legal. How's that for a Christmas present?

Khodorkovsky, who acquired oil assets through privatization deals in the 1990s, insists that his prosecution was orchestrated by the authorities to silence his criticism of President Vladimir Putin, and as part of a campaign to bring oil and gas assets under the Kremlin's control.

State control

Once Russia's largest oil producer, Yukos collapsed after claims of tax evasion, which led to the company being broken up and sold off to meet debts. State-owned Rosneft bought most of Yukos's assets.

Lawyers for Khodorkovsky and Lebedev plan to appeal the Supreme Court's ruling at the European Court of Human Rights.

"Everything that has taken place in connection with this case has already been translated into the official languages of the European Court," the former oil tycoon's lawyer, Yury Shmidt, said.

But don't hope for much—especially given the experience of former Yukos Vice-Pres. Vasily Aleksanyan, who is currently in custody, and insisting on the need for hospitalization due to his grave illness.

"Russia must comply with already the third instruction from the European Court of Human Rights about my urgent hospitalization to a specialized civilian clinic from the prison where I am now," Aleksanyan wrote in a letter from the pretrial detention facility.

No pity

The letter said that more than a year ago, following a forensic examination, Aleksanyan was diagnosed with a terminal illness.

"Already at that time my condition required intensive chemotherapy to ease symptoms and to prolong life. Experts said in their report that my staying in prison directly depends on how soon the chemotherapy will start," the letter said.

"By October this year, my condition has become life-threatening. And from Oct. 16, 2007, the prison's medical staff started recording a daily fever of over 38° C.," Aleksanyan said.

"Even prison doctors had to acknowledge that in such condition I cannot participate at trial and investigation procedures," he said.

Neither Russian authorities nor the Federal Prison Service were immediately available for comment on this matter. If you are awaiting a comment, don't hold your breath. ✦

Sequence stratigraphic control on prolific HC reservoir development, Southwest Iran

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The Lowermost Cretaceous Fahliyan formation is an important carbonate reservoir in the Persian Gulf and the onshore oil fields of Southwest Iran (Fig. 1).

The Fahliyan formation in Darkhowain field consists of unconformity-bounded depositional sequences (Figs. 2 and 3) containing prolific hydrocarbon reservoirs of contrasting origin.

The most prolific reservoir occurs in the highstand systems tract (HST) of the lower sequence encompassing over 200 m of oil column (Fig. 3) at 4,350-4,500 m in depth. Porosity in this sequence is the result of a paleokarst event that occurred over the platform during a late Berriasian sea level lowstand and the subsequent dissolution of the originally impermeable late highstand lagoonal facies (Figs. 2 to 4).

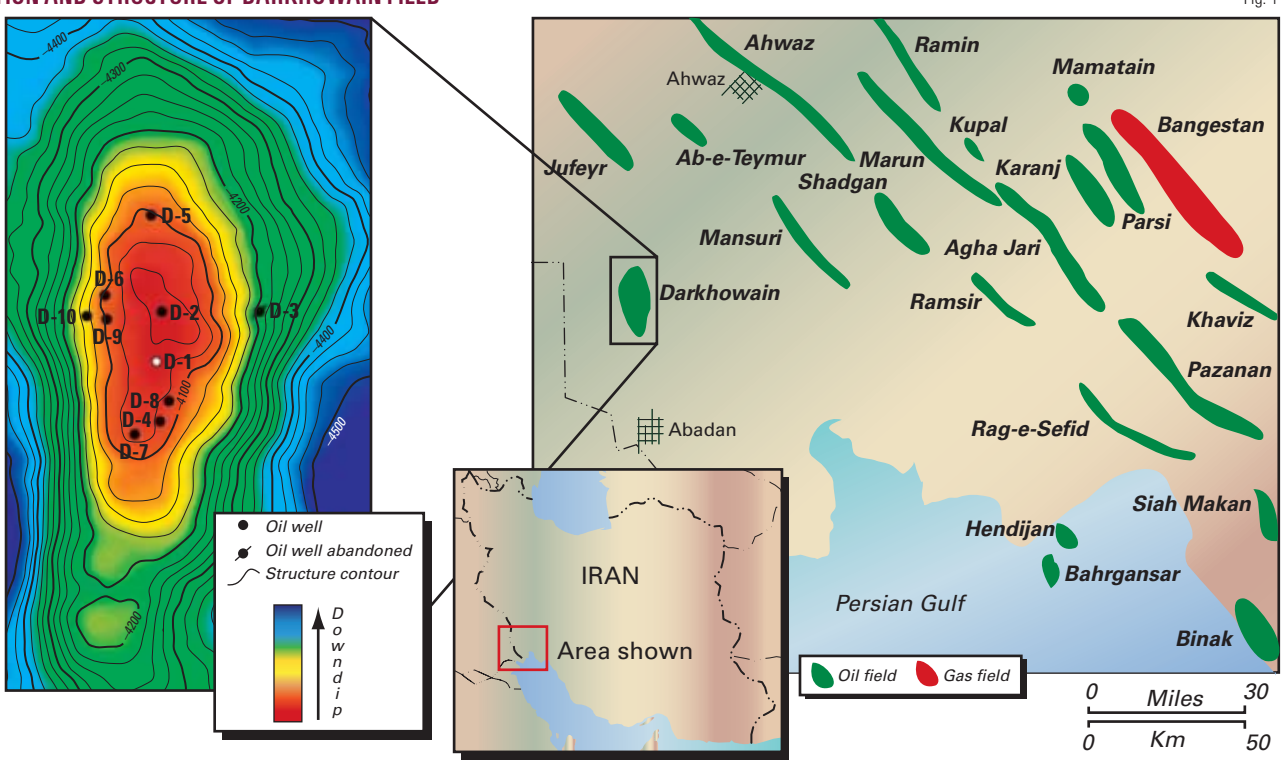
The next significant reservoir is over 80 m thick and occurs at depths of 4,260-4,340 m. It consists of shallowing-upward cycles that are best developed within the transgressive systems tract (TST) of the upper sequence (Figs. 2 and 3).

The cycles consist of a Lithocodium-dominated reef facies or a grainstone shoal facies capped by Lithocodium boundstone that developed in the high energy setting of the platform margin (Fig. 3). The porosity in the upper reservoir is mostly primary, but it was enhanced by partial dissolution during short term subaerial exposure of the platform (Fig. 5).

The Darkhowain structure is a combination trap in which the impermeable quiet water carbonates of the TST of the upper sequence have sealed the reservoirs of the Fahliyan formation, which was draped over a structure that was

LOCATION AND STRUCTURE OF DARKHOWAIN FIELD

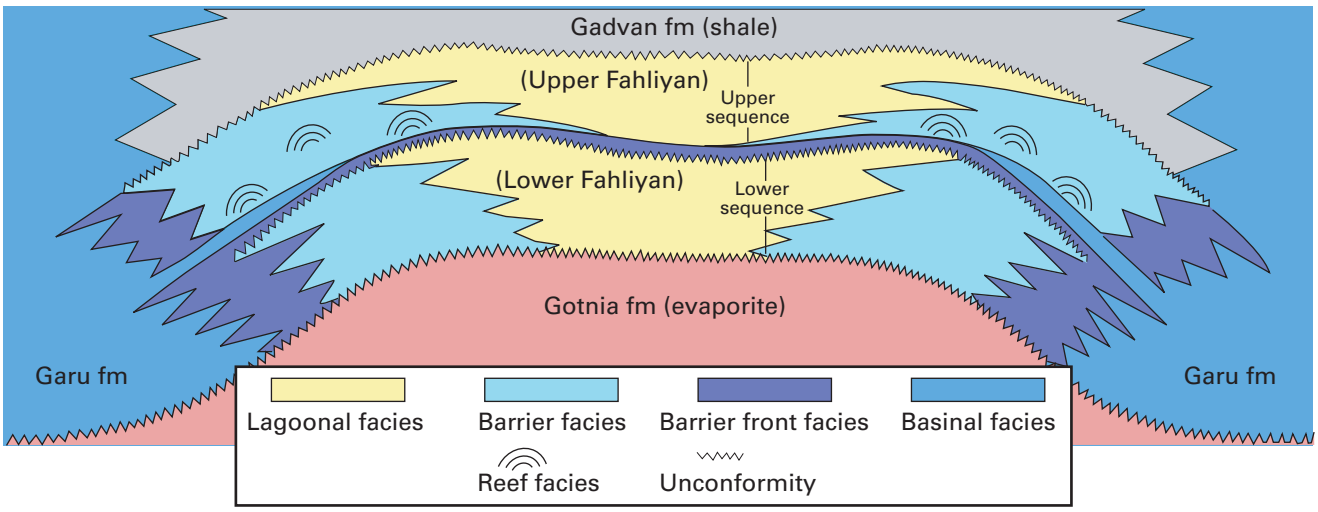
Fig. 1



Structure contour map on top of the Fahliyan formation shows the steep-sided Darkhowain structure. The Darkhowain-1 well was not deep enough to reach the Fahliyan reservoirs.
Source: Agip-Iran Oil Co.

FACIES AND SEQUENCE STRATIGRAPHIC MODEL

Fig. 2



active during the deposition.

The widespread development of reservoirs in the platform facies and the proximity to the organic-rich, deepwater Garu formation and other important source rocks have made the Fahliyan formation one of the important exploration targets in the Persian Gulf region of Southwest Iran. The rocks with the greatest hydrocarbon reservoir potential occur within the shallow marine carbonates of the isolated platforms surrounded by the deepwater Garu intrashelf basin (Fig. 2).

The results of this study indicate that high-resolution sequence stratigraphic analysis could significantly aid exploration and enhance production, development, and secondary recovery in the Persian Gulf and other petroleum provinces.

Overview

The Lowermost Cretaceous Fahliyan formation[1] is a chiefly shallow marine carbonate succession over 500 m thick that was deposited on the Persian Plate, the northeast passive margin of Gondwana. It is an important carbonate reservoir in the Persian Gulf region and the onshore areas of Southwest Iran.

In Darkhowain field, the Fahliyan formation overlies the evaporites of the Upper Jurassic Gotnia formation and underlies the Lower Cretaceous Gadvan shale with unconformable contacts (Fig. 2).

Previous stratigraphic workers[1-3] considered the Fahliyan formation as a single shallow marine unit of Early Cretaceous age. Recent facies analysis and high resolution sequence stratigraphic studies, however, have revealed that the Fahliyan formation consists of two unconformity-bounded sequences of Berriasian-Valanginian age containing both shallow (restricted marine, barrier, and open marine) and deep marine (pelagic and calciturbidite) facies.[4-6]

The first well on the Darkhowain structure (D-1) was drilled in 1964 on a north-south trending closure near Abadan in Southwest Iran (Fig. 1). It reached the upper few meters of the Fahliyan formation with some oil shows in the Upper Cretaceous carbonates.

In 1978, a second well was drilled about 3 km north of Darkhowain No. 1 encountering two productive zones in the Fahliyan formation, but the operation was suspended due to the Iranian revolution.

The first phase of development of the field started in late 1997. The field is currently producing 55,000 b/d of oil from eight wells. The production is kept low due to limited surface facilities. Production per well from the lower reservoir is 16,000 b/d, while the maximum production from the upper reservoir is 4,000 b/d.

The second phase of development that is currently under way is expected to increase the production of Darkhowain field to 160,000 b/d. The reservoirs in Darkhowain-3 are poorly developed because it is located off the platform, where deeper-water facies were deposited and exposure to freshwater was limited.

Field structure

In a sharp contrast to the northwest-southeast trending structures of the Zagros Mountain front, Darkhowain field is a north-south trending drapeover anticline (Fig. 1) surrounded by a N-S trending, deepwater intrashelf basin.

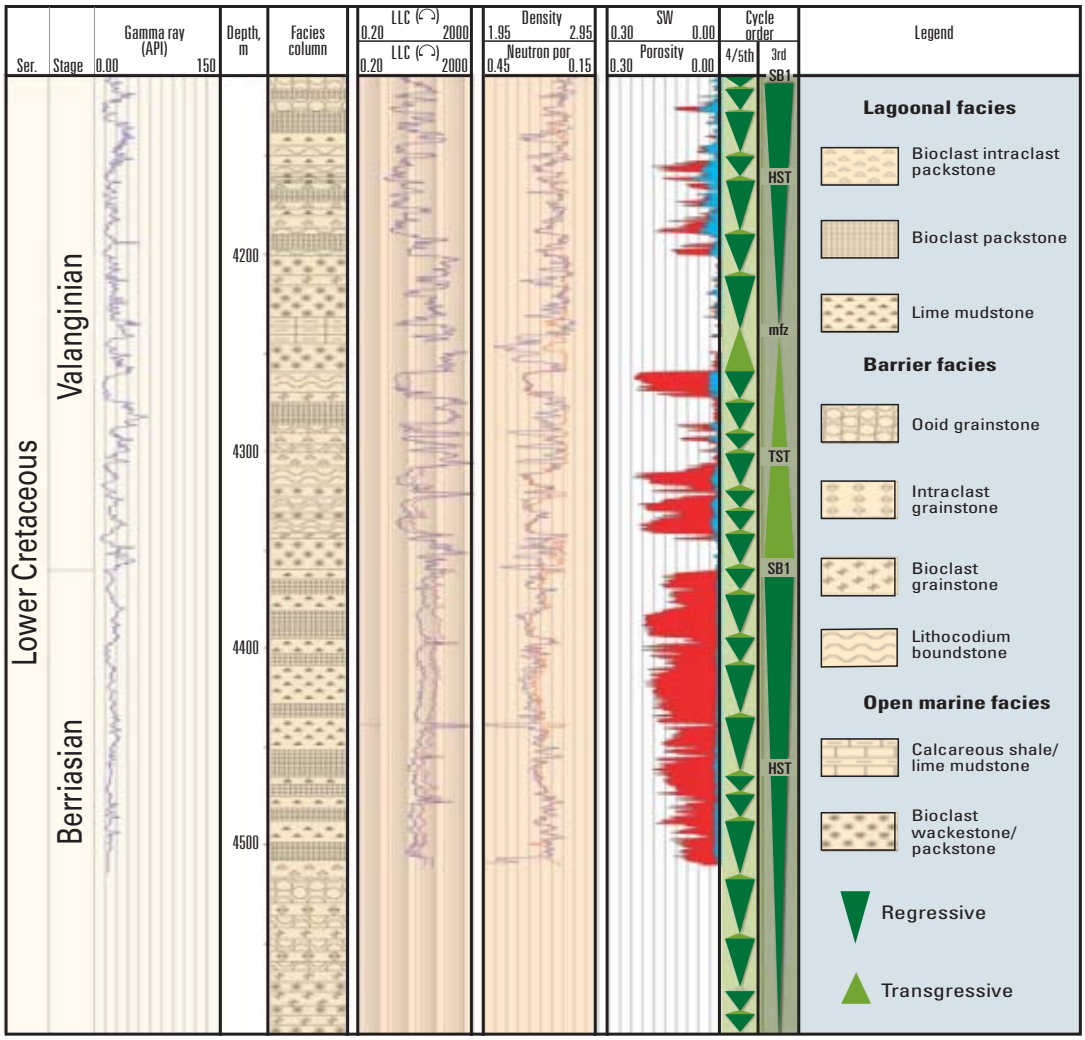
The structure was formed during the Cretaceous prior to or during the deposition of the Fahliyan formation probably as a result of reactivation of north-south trending normal faults[3 6 7] associated with the Carboniferous to Early Permian rifting of the Neotethys in Northeast Gondwana.[8]

The platform-to-basin facies distribution indicates that the Darkhowain structure was an isolated carbonate platform within the deepwater Garu Intrashelf basin during the entire Cretaceous.

This basin[9] was the site of deposition of several thousand meters of Lower-Upper Cretaceous dark gray organic shale containing thin pelagic limestone

RESERVOIRS OF THE FAHLIYAN FORMATION

Fig. 3



A typical well (D-6) showing geophysical logs, facies column, oil saturated reservoirs, and sequences of the Fahliyan formation. Note the downward decrease of porosity as well as oil saturation (the far right column) in the karstified lagoonal facies of the lower reservoir (red is for oil saturation and blue for water saturation).

beds and platform-derived calciturbidite layers. The Garu basinal facies changes laterally to shallow marine carbonates in the adjacent shelves and the Darkhowain isolated platform (Fig. 2).

A combination of structure and stratigraphic traps controlled the petroleum entrapment of Darkhowain field. The reservoirs in the Fahliyan formation are sealed by the transgressive quiet-water lime mudstone to packstone facies higher in the upper sequence.

Depositional setting

The Fahliyan formation mainly consists of platform carbonates composed of restricted bioclastic lime mudstone to packstone of the platform interior, Lithocodium boundstone or ooid-intraclast-bioclast grainstone of the high energy platform margin, and the bioclast packstone to lime mudstone related to the off-platform setting.

Seaward, the platform facies of the Fahliyan formation grades into the Garu formation, a dark gray organic-rich shale containing thin pelagic limestone beds and platform derived calciturbidite layers (Fig. 2). These facies reflect proximal to distal subenvironments of a carbonate shelf or an isolated carbonate platform.[10,11]

Together, the subsurface structure map (Fig. 1), the facies distribution, and the high resolution sequence stratigraphy show that during deposition of the Fahliyan formation, Darkhowain oil field was an isolated carbonate platform (similar to the present day Bahamas) that was surrounded by the north-south trending, deepwater Garu intrashelf basin (Figs. 1 and 2).

Sequence stratigraphic model

The sequence stratigraphic model (Fig. 2) shows facies development and lateral growth and shifting of depositional settings on the platform during Early Cretaceous sea level fluctuations.

The integration of vertical facies distribution and their paleobathymetry (using cores and well samples) and geophysical log signatures of the Fahliyan formation in the Darkhowain platform reveal the presence of two unconformity-bounded depositional sequences (third-order cycles) in the sense of Vail et al.,[12] Van Wagoner et al.,[13] and Sarg.[14] The sequences consist of TST and HST packages composed of several short-term shallowing upward cycles (Fig. 3) and are correlated with other surface and subsurface sections in the Persian Gulf region (e.g., Lasemi et al.;[4] Mohamadkhani;[15] Khazaei;[16] Lasemi and Nourafkan;[5] and Feizi.[6]

The most prolific reservoir of the

Fahliyan formation occurs in the HST tract of the lower sequence below the sequence boundary. A basinward progradation of the lagoonal and barrier facies during the sea-level highstand was followed by a subaerial exposure to fresh water during a late Valanginian sea level lowstand. Extensive karstification created widespread cavernous and channel porosity by diagenetic dissolution of carbonate grains and the interstitial matrix of the originally impermeable late highstand lagoonal facies (Figs. 2-4).

The most productive wells (over 16,000 b/d) are associated with this oil-saturated reservoir (over 200 m thick) at depths of 4,350-4,500 m.

In contrast to the lower sequence, the reservoir in the upper sequence is best developed within the TST (Figs. 2 and 3). The reservoir rock is a reef facies dominated by Lithocodium or ooid/bioclast or intraclast grainstone shoal facies capped by Lithocodium boundstone (Fig. 5).

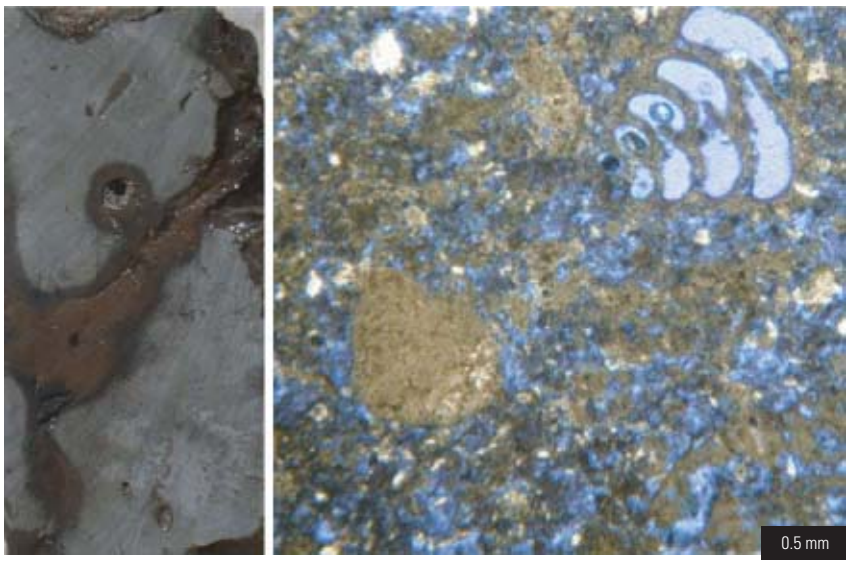
Lithocodium is a calcareous alga with irregular fenestral structure (Fig. 5) that was an important reef builder during Valanginian-Aptian time.[17] The upper reservoir is over 80 m thick and occurs at depths of 4,260-4,340 m.

Porosity development in the upper sequence was controlled by reef growth and the high energy setting of the shelf margin that generated primary porosity which was later enhanced by freshwater dissolution during short term sea level falls. A tight, open-marine facies capped the reservoirs forming the trap.

The highstand tract of the upper sequence is less productive or even nonproductive due to the well-cemented grainstone shoal facies and thin Lithocodium patch reefs of the lagoonal setting.

KARST RELATED RESERVOIR OF THE LOWER SEQUENCE

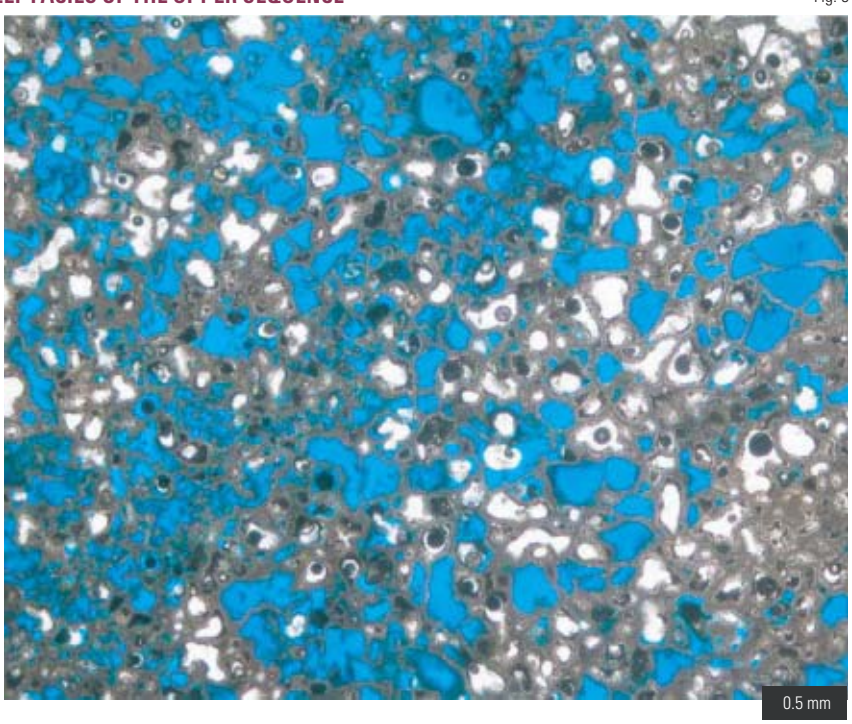
Fig. 4



Core and blue dye impregnated photomicrograph of the lower reservoir facies showing the dissolution of the grains and the interstitial matrix of the lagoonal facies and the secondary porosity development. On the left is a core sample (core diameter is 8 cm) of Darkhowain-5 from depth of 4,460 m showing the cavernous and channel porosity that was developed by freshwater diagenetic dissolution.

REEF FACIES OF THE UPPER SEQUENCE

Fig. 5



Blue dye impregnated photomicrograph of the porous Lithocodium reef facies showing the fenestral pattern of the algae and porosity enhancement due to partial dissolution during short term platform exposure.

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geology team leader (Lorenzo Osculati), and technical staff (Dario Sartorio, Sandro Reali, and Jalil Nasseri). ✦

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Khalil Nourafkan Kondroud is a PhD student in Tarbiat Moallem University. He is employed by Agip Kazakhstan North Caspian Operating Co. (Agip KCO) as a reservoir geologist. He has worked as a reservoir geologist for Agip Iran on Darkhowain oil field and South Pars gas field since 2002 as he worked on his PhD in geology. He has an MS in sedimentology from Tarbiat Moallem University and a BS in geology from Tabriz University.

Louisiana

Neumin Production Co., Point Comfort, Tex., has completed a gas-condensate discovery in St. Mary Parish, La.

The Shadyside-1 stabilized at 3 MMcfd and 200 b/d on a 7/64-in. choke with 8,900 psi FTP from an unstimulated Miocene reservoir, said interest owner Century Petroleum Corp., Houston. Index Oil & Gas Inc., Houston, also has an interest.

Texas

Comstock Resources Inc., Frisco, Tex., plans to drill seven operated horizontal Cotton Valley wells in 2008 in its East Texas-North Louisiana region, including five more in Waskom field.

The company's first horizontal Cotton Valley well, Bell 11A-H, in Waskom field, Harrison County, Tex., went to 9,490 ft TVD with a 2,548-ft horizontal leg through the upper and lower Taylor Cotton Valley sands. After a seven-stage frac, it tested at 8.4 MMcfd of gas with 950 psi flowing casing pressure.

Shell VP Sharpe sees safer operations, continued success

Nina M. Rach
Drilling Editor

POINT OF VIEW

Supermajor Shell is spending record sums, said Peter J. Sharpe, allocating more than $20 billion/year in capital for new projects and more than $2 billion/year for exploration. Shell's well engineering and well services budget was $7 billion in 2007 and will continue at the same level until the end of the decade.

As vice-president of the Wells function and chief well engineer for Shell International Exploration & Production BV, Sharpe oversees the activities of 2,300 company staff, more than 160 actively drilling rigs, and hundreds of operations in more than 30 countries. Wells activity in Shell has increased by about 50% since 2003, obliging the company to recruit more than 650 new engineers over the last 4 years.

Shell's overall priority is safety and Sharpe says he will never consider himself successful in his job until all operations under the Wells function are incident-free. He believes that this is achievable, while at the same time achieving his second goal of beating the competition in operational performance.

Business environment

Sharpe noted that cost inflation across the industry has been significant over the last few years. "We're writing bigger checks for almost everything we do." While the service sector has struggled to maintain standards, "it is certainly easier to build new hardware than it is to develop experienced people."

A leader in deep water, Shell anticipated the market and made a series of long-term commitments for rigs in 2005. This has resulted in Shell's deepwater fleet costs being about 30% below the current market average. Sharpe said that Shell had good coverage on deepwater drilling capacity through 2010-11, at which time he believes the market for deepwater rigs will soften.

Shell's first new "Bully" rig, now under construction in a 50-50 joint venture with Frontier Drilling ASA, will be completed in early 2010 (OGJ, Nov. 26, 2007, p. 39). The two companies have also committed to build a second Bully rig, which is also expected to be ready in 2010. The sister ships will have artic hulls and carry 8,200 ft of riser, although capable of operating in conventional mode (subsurface BOP) in 10,000 ft of water and capable of operating with a surface BOP in more than 12,000 ft of water.

Looking at the overall market situation, Sharpe commented that higher operating costs require greater innovation, an increased focus on technology,

"We spend significant amounts of management time and effort on the smallest of recordable incidents while often ignoring near misses which, but for luck, could have been fatalities....If you cannot find the person responsible for safety failures then you have a leadership problem."

—Peter J. Sharpe, vice-president of Wells and chief well engineer, Shell International Exploration & Production BV

Career highlights

Peter J. Sharpe is vice-president of Wells and chief well engineer for Shell International Exploration & Production BV, based in The Hague.

Since joining Shell in 1990, Sharpe worked in the Netherlands as a senior drilling engineer, in Albania and China as operations manager, in Brunei as head of well delivery and later, as an asset manager. He was appointed regional wells manager for Shell's Asia-Pacific region in 2003 and was promoted to his current position on Jan. 1, 2007.

Employment

Sharpe began his career in exploration logging in Southeast Asia. He went on to work as a consultant for numerous operators in Thailand, Indonesia, Philippines, Sri Lanka, Pakistan, and Denmark before ending up as consultant for Shell in Syria and deciding to join them when he realized "that they had the best-trained people in the business."

Education

Sharpe holds a BSc in geology (1980) from Hull University, Kingston upon Hull, England. He has since attended myriad training courses, classes, workshops, symposia, and meetings within Shell.

and improved "technical prowess," which he defined as staff capability to successfully integrate and implement the complex technical solutions required to develop an increasingly demanding range of projects.

A key focus area for Shell through this period of intense business growth has been people. Sharpe believes that Shell's industry recognized proprietary "Round I/II" staff development program gives them a real competitive edge in this critical area. Shell recently expanded the curriculum to cover all areas of completion and well intervention. Every year, the company starts more than 100 graduates from around the world in this multiyear program. Upon completing the program, the work can be credited as a MSc. with a leading UK university.

The Wells function in Shell also has a well developed "technical ladder" which ensures that people who want technical careers can progress through positions such as principal technical expert and chief scientist to reach the most senior job grades without having to move into general management positions.

Technology

Sharpe said that Shell classifies technologies as either evolutionary or revolutionary. "If the technology is key to what we're working on, we'll take it on ourselves," he said.

Shell has invested heavily in research, development, and deployment of new technologies. It took directional drilling along a new path, successfully drilling snake and dragon wells in Southeast Asia. Sharpe is confident that surface BOP systems, as planned for the BC-10 development in Brazil, and monodiameter expandables, as recently trialed in the Gulf of Mexico, together with the new Bully rig design will all play a part in Shell's plans for efficient deepwater drilling.

Another deepwater technology enabler that Shell recently worked on with Noble Corp. was the aluminum riser on the Noble Clyde Boudreaux semisubmersible, now on the Perdido project in the Gulf of Mexico. Sharpe told OGJ that Charlie Williams, one of Shell's chief scientists, had been instrumental in troubleshooting welding procedures. The new riser was successfully deployed in early December 2007.

Performance

Shell's revitalized "Drilling the Limit" program (rDTL), is based on Ferrari's approach to optimizing performance and using the technical limit methodology has significantly improved drilling performance in several key projects in 2007, such as Pinedale (OGJ, Oct. 15, 2007, p. 52). The rDTL program is currently being implemented across all of Shells major drilling projects. Sharpe said that Shell's target is to have 75% of its wells benchmarked in the top quartile by the end of the decade.

About 20% of the E&P industry's capital expenditure on drilling is lost to nonproductive time. Shell uses its system of worldwide real-time operations centers (RTOCs) for well planning and optimized drilling. This also leads to improved safety and efficiency because it depopulates offshore facilities and allows scarce expertise to cover multiple projects. For example, vibration-related problems on an operation in Inner Mongolia were addressed in real time by experts in Shells research center.

Contractor performance

Shell has been collecting key performance data on drilling contractors for more than 5 years, using a series of KPIs to construct contractor performance league tables that it can use in rig tender evaluation. Sharpe said the data show that the performance of most contractors has been deteriorating over the last 2 years, as they have struggled to cope with business growth, but are now starting to show signs of improvement.

The company also collects performance statistics on key services such as directional drilling, logging services, drilling fluids, and cementing.

Sharpe said he wants to see greater value alignment and value transparency in the contracting relationships with service companies.

Well control, integrity

Well control and well integrity have been key focus areas for Shell in 2007, with global multi-year programs "to ensure that these critical area of the business are being controlled to the highest standards."

Sharpe told OGJ that well control, in

particular, worries him because of "falling experience levels in the industry due to business growth."

Safety—'Goal Zero'

"Looking back on my career, the only things I'll truly remember, other than my colleagues and the friends made, are the accidents that have occurred on my watch," Sharpe said. He stressed that they want no one to get hurt, and expect all vendors to meet the company's ambitious safety standards.

The Wells group aspires to reach "Goal Zero" and Sharpe wants to "integrate safety into everything we do" by focusing on the risk, listening carefully to contractors, and simplifying standards. Sharpe believes "simpler is always better but is usually more difficult" and that people want to do the right thing but need clear rules so that they can comply. He felt that most people know that rules and compliance save lives but that in many cases the rules have become so complex that they are impossible to follow.

Sharpe stressed the importance of investigating near-miss incidents the same way serious injuries are investigated in order to share what is learned. Reviewing the company's high-potential near-miss incidents, his team found that dropped objects were "far and away the highest area of risk" in 2007.

Sharpe has spent 2007 ensuring that his teams distill the key learning and action and then tailor the communication so that the right people get the right information in a way that they can understand. He explained that giving the same incident investigation report to an HSE professional, a manager, and an OIM was hardly the best way to ensure that they all got the information that they needed to take action and make a difference.

Improving the cascade of key learning from incidents is still an area that Sharpe feels can be improved in Shell. He questions whether the same level of intensity and urgency goes into the follow up and verification of action close-out as went into the initial investigation. "Leaders who set clear safety expectations, but then don't ensure that they are met, are poor leaders."

"Looking back on my career, the only things I'll truly remember, other than my colleagues and the friends made, are the accidents that have occurred on my watch."

Sharpe makes at least one HSE trip/month and recently visited an operation that had experienced several high potential, near miss incidents. He wanted to understand what needed to change and what could be learned. Among other things, an overload of distractions during start up, a new crew, and new operation had reduced the focus on safety. Rig start-up is a high-risk activity, he said, and we must do a better job in ensuring that we have the right level of supervision and sufficient time to ensure we do it incident free. Another trip highlighted the difficulty of communicating incident learning. Sharpe discovered that the crew believed the key learning from an incident was around hardware while management was convinced that communication failure was the root cause. Sharpe believed that nobody was completely clear on the key action to prevent reoccurrence, which in his own view was that during lock out and tag out "the person or people at risk must also be in control of the lock out."

Visiting a rig in Qatar with no incidents, Sharpe attributed its success to "committed leadership and an experienced long serving crew with a strong intervention culture."

Keeping operations safe requires discipline and clear consequences; if you cannot find the responsible person for safety failures, you have a leadership problem.

In Q3 2007, 46% of the rigs working globally for Shell had been free of recordable cases for more than 12 months, i.e., had achieved "Goal Zero."

Sharpe believes "we need a fundamental change with regard to visibility of leading HSE indicators—total recordable case frequency is a horrible way to talk about people being hurt and it does nothing to stop the next accident. Why isn't training plan compliance a key HSE metric made visible on a rig?"

Program focus

Under the "Goal Zero" program, Sharpe said Shell will be simplifying HSE standards, making safety an even more important factor in contractor selection and ensuring that safety leadership is key in the staff appraisal and promotion process. The Goal Zero message is to elevate safety from a priority to a core value and to convince everyone that harm is avoidable and continued safety demands urgent action. Sharpe explained that Goal Zero also contained specific plans for high risk focus areas such as road transport, contractor HSE management, process safety, and worksite hazard recognition.

Sharpe believes that Shell can work with anyone, anywhere, and achieve Goal Zero. He cited the company's work in China on the Changbai project in Inner Mongolia, where Shell is drilling 6-km multilaterals for tight gas with three rigs from local contractors. The operation has been running for 5 years with only two people hurt and with nobody hurt for the last year. Sharpe attributed the success to extensive training; highly experienced supervisors, and the time spent building a strong safety culture with the local companies prior to the start of operations.

Shell International E&P recognized KCA Deutag for their safety performance in 2007. KCA Deutag operates 15 land rigs for Shell in Brunei, Siberia, Oman, Saudi Arabia, and Nigeria, and 10 of them were free of recordable cases in 2007. Sharpe said, "KCA Deutag's focus on safety is excellent, as demonstrated by this achievement with a rig fleet spread across many different countries and operating environments. The company's continuous nurturing of a safety culture among all its crews, combined with a robust set of safety tools and systems have resulted in significant progress towards Goal Zero."

"We need a fundamental change with regard to visibility of leading HSE indicators—RCF is a horrible way to talk about people being hurt and it does nothing to stop the next accident."

Looking ahead

Sharpe feels that Shell has led the industry in many new technologies and deepwater project developments and considers the company a global leader in deploying new technologies, citing managed pressure drilling and highlighting the recent use of this technology on an Algerian tight gas exploration venture for reservoir characterization.

Sharpe believes that while finding technical solutions, working with key stakeholders and with service providers are key factors for Shell, ultimately it is "people that make it happen." He's therefore focused on seeing that Shell staff are the best trained in the industry. This is, in his view, what will put Shell Wells in the best position to address the future energy challenges of the E&P business. ✦

Waterflood boosts oil production from field in Egypt

Mahmoud Abu El Ela
Cairo University
Giza, Egypt

Ismail Mahgoub
Agiba Petroleum Co.
Cairo

A cost-effective waterflooding plan allowed Khalda Petroleum Co. (an international joint-venture company) to improve oil recovery from the Tut field in Egypt's western desert. With waterflooding, producing rates from the field increased to 4,000 bo/d up from 500 bo/d with primary recovery methods.

Considerations that the company took into account when planning a waterflood included:[1]

- Availability of low-cost water.
- Relative ease of injecting water.
- Horizontal and vertical sweep efficiency of the injected water.
- Oil-to-water mobility ratio.
- Displacement efficiency of the water.
- Cost of injecting water above the hydraulic head.

Waterflooding is a reliable and economic oil-recovery technique and operators have considered implementing waterflooding in almost all major oil fields in the world that do not have a natural water drive.[2]

Waterflood design

Fig. 1 shows the main steps for a waterflood design.

Reservoir factors to consider for waterflooding or pressure maintenance are:[2]

- Reservoir geometry.
- Lithology.
- Fluid properties and relative permeability relationships.
- Pressure performance.

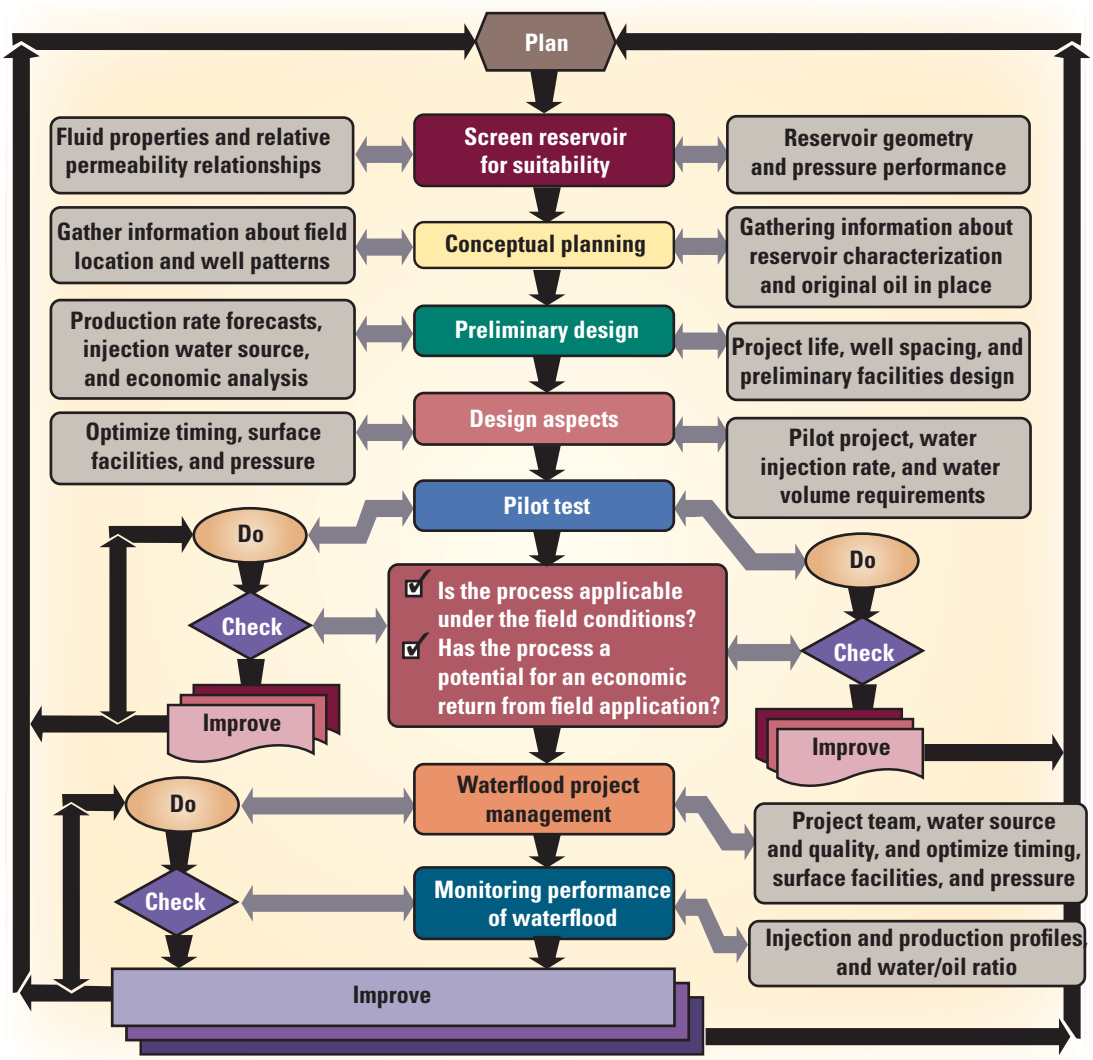
Reservoir geometry (structure and stratigraphy) controls the location of the wells and, to a large extent, dictates the methods for producing a reservoir. Lithology influences the efficiency of the water injection. Lithological factors that affect floodability include porosity, permeability, and clay content.

Porosity directly relates to the total oil recovery from a reservoir.

Reservoir rock permeablity controls, to a large degree, the water injection

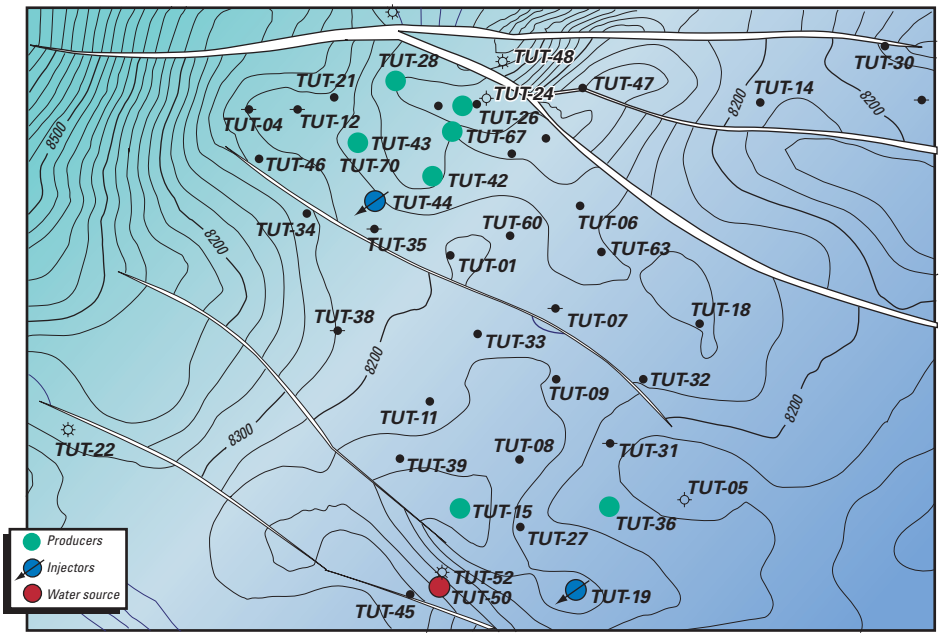
WATERFLOOD PROJECT DESIGN

Fig. 1



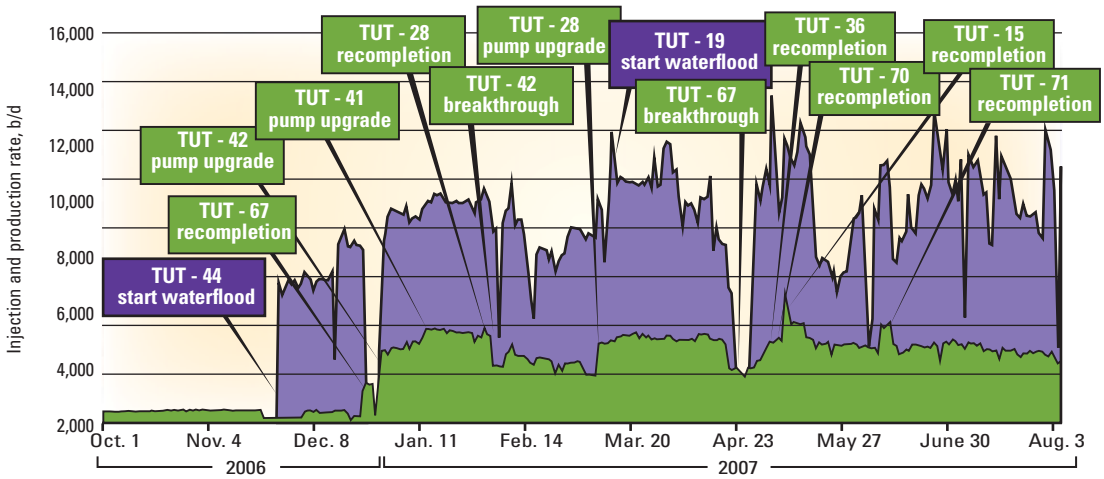
TUT WATERFLOOD

Fig. 2



AEB-3D PERFORMANCE

Fig. 3



that can be sustained for a specific sandface pressure. In determining the reservoir's suitability for waterflooding, therefore, the design should determine the maximum permissible injection pressure for the depth. The evaluation requires extensive laboratory work and a comprehensive reservoir study. A pilot injection operation also can supplement the experimental data.

Physical properties of reservoir fluids also affect the waterflood design. Of major importance is oil viscosity that affects the mobility ratio. Another factor that affects the mobility ratio is the relative permeability of the reservoir rock to the displacing and displaced fluids.

The mobility ratio, M, is the ratio of the mobility of the displacing fluid to that of the displaced fluid. M should be less than one. The larger the mobility ratio, the lower will be the oil recovery at breakthrough; hence, more water must be produced to recover a fixed amount of oil. This is caused from a smaller area being swept at breakthrough and the larger stratification effects.

The reservoir pressure history is one of the most important factors to consider. The reservoir pressure in the waterflood should be held higher than the saturation pressure to maintain the pressure close to the initial pressure.

Other factors influencing the design are oil price, marketing conditions, operating expenses, water availability, legal considerations such as minimum spacing and adjacent leases, pattern selection, and process considerations such as injection rate, response time, production rate, flood life, and injector-to-producer ratio.

Waterflood patterns should provide sufficient water injection rates to:

- Yield the desired oil production rate.
- Maximize oil recovery with the least water production.
- Be compatible with existing well patterns and require few new wells.

Factors to consider in the conceptual planning are field location, reservoir shape, oil in-place, fluid saturations and distributions, reservoir characterization, zonal continuity, fractures and faults,

formation dip, directional permeability, gas cap and aquifer size, previous reservoir development, gathering and separation facilities, production methods, production history, previous problems, and previous development studies.

The preliminary design provides such information as phase or full development, project life, initial oil rate, production rate forecasts, water injection rate, waterflood layout and well spacing, injection water source, produced water disposal plan, preliminary facilities design, capital and expense cost estimates, economic analysis, risk and mitigation plans, reservoir and well monitoring programs, and logistics and infrastructure considerations.

The design aspects include the determination of injection water source (quality, compatibility, and recycling produced water), water injection rate, optimum timing, optimum pressure level, fluid saturation at start of waterflooding, residual oil saturation at end of waterflooding, optimum well pattern, injection philosophy, injection well requirement, pilot project, and surface facilities.

A pilot test will determine if a process is applicable under the field conditions and if the process has a potential for an economic return from a field application.

The pilot test helps determine the recovery efficiency and provides a better understanding of the process mechanism as well as operational information on injection and production rates.

Waterflood management

Effective waterflood management requires a multidisciplinary team approach that includes reservoir, drilling, and production engineers, as well as chemists, accounting, legal, and others.

Guidelines for waterflood management include information on water source and quality. During most of the flood life, an oil reservoir will require about 0.5-1.0 b/d of injection water for each 1 acre-ft of reservoir volume. The ultimate volume of water required for many floods is about 1.5-2 times the reservoir pore volume.[3,4]

The water injected should be inexpensive and free from bacteria, suspended solids, and oxygen. It should also be nonreactive with any clays in the reservoir and compatible with the reservoir rock and formation water as well as not being corrosive in the injection and production facilities.

Injected water can include produced, surface, or subsurface water.[4,5] The injection rate requirement to support the desired production rate depends on inflow performance relationship considerations, well injection pressure and rate, rules of thumb, local experience, and availability of compatible water.

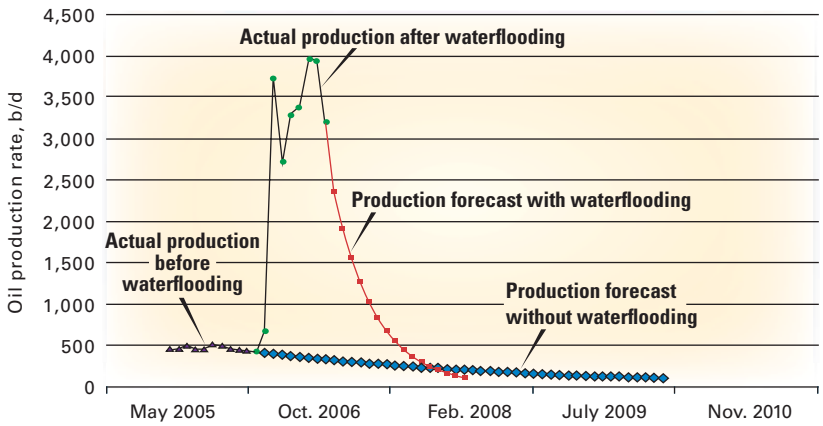
Controllable parameters in a waterflood are the injection and production rates. Economic success depends on the additional recovery obtained and the cost of the water, injection wells, and surface treatment facilities.

Waterfloods require a regular analysis of the produced water to detect injected water breakthrough by such means as a change in chlorides if the injected and produced water have different salinities.

Other parameters to monitor are the presence of corrosive dissolved gases (CO_2, H_2S, O_2); minerals, bacterial growth; dissolved solids; suspended solids, concentration and compositions; ion analysis; and pH. This data is gathered at the water source wells, water injection wells, and points in the injection system.

Production forecast

Fig. 4



Tut field

The Tut field has proved to be a successful waterflood. The field is in southeast part of the Khalda concession in the north part of Egypt's western desert. Discovered in 1986, the field currently has 21 oil producing wells and 3 water injection wells.

The field produces from the Alam El Bueib (AEB), Kharita, and Bahariya formations. The AEB-3D interval has two main sand bodies: upper and lower.

The interval is perforated and produces in most of the wells. Currently, AEB-3D has seven oil producing wells and two water injection wells. The zone produced under depletion drive until the recompletion of wells Tut-44 and Tut-19 as water injection wells in November 2006 and May 2007 (Fig. 2).

Volumetric estimates indicated that the zone had 13.6 million stock-tank bbl of original oil in place. As of November 2006, cumulative production from the zone was 2.5 million bbl, or 18% of the oil in place.

The operator expects the waterflooding of AEB-3D to increase the recovery factor to 35%, resulting in an ultimate oil recovery of 4.8 million bbl, or an incremental increased recovery of 2.3 million bbl from existing wells.

Until November 2006, the zone was producing 500 bo/d from two wells: Tut-41 and Tut-42. In addition, the field had several wells shut in because of low productivity caused by a lack of

TUT WATERFLOOD PROJECT Table 1

Reservoir rock properties	
Porosity, %	16
Permeability, md	150
Irreducible water saturation, %	20
Reservoir characteristics	
Average net pay, ft	25
Original oil in place, million bbl	13.6
Recovery factor, %	35
Ultimate oil reserves, million bbl	4.8
Cumulative production to November 2006, million bbl	2.5
Remaining oil as of November 2006, million bbl	2.3
Reservoir conditions	
Original reservoir temperature, °F.	238
Original reservoir pressure, psig	3,500
Original recovery mechanism	Solution gas drive
Reservoir pressure before implementing waterflooding, psig	1,000
Current reservoir pressure, psig	1,300
Reservoir fluid characteristics	
Oil gravity at 60° F.	40
Solution GOR, cu ft/bbl	401
B_o at original reservoir pressure, reservoir bbl/bbl	1.3940
Bubblepoint pressure, psig	687
B_o at bubblepoint pressure, reservoir bbl/bbl	1.281
Oil viscosity at initial reservoir conditions, cp	0.44
Oil viscosity at current reservoir conditions, cp	0.37
Production-injection data	
Number of the injectors	2
Number of the producers	7
Water source wells	1
Mobility ratio	0.3
Average water injection, b/d	6,000
Cumulative water injection, million bbl	1.36
Average oil production, b/d	3,000
Cumulative oil production, million bbl	0.71

Note: The bbl units refer to stock-tank bbl.

pressure support. On October 2006, estimated reservoir pressure of AEB-3D was 1,000 psig compared with 3,500 psig initially.

Table 1 shows the fluid and rock properties of AEB-3D.

Waterflooding in the AEB-3D zone of the nearby Qasr field had increased oil production from Well QSR-07 to 2,000 bo/d from 100 bo/d previously. Subsequently, Tut field well, Tut-44 in the AEB-3D, was recompleted as a AEB-3D water injection well. Injection in the well started on Nov. 27, 2006 at 5,000 b/d with zero wellhead pressure.

The injection led to production increasing to 4,000 bo/d from 500 bo/d previously (Fig. 3). The project involved recompleting wells Tut-70, Tut-67, and Tut-28 as well as upgrading the pumps in Tut-41, Tut-42, and Tut-28.

Less than 1 month after implementing water injection, the AEB-3D pressure recorded in Well Tut-67 was 1,300-1,500 psi in the lower sand compared with the initial 3,500-psi reservoir pressure.

Pressure data from well Tut-44 in the AEB-3D formation proved the well was in communication with the current producers Tut-41, Tut-42, Tut-70, Tut-76, and Tut-28. Therefore, Tut-44 was recompleted as water injection well and Tut-41, Tut-42, Tut-70, Tut-76, and Tut-28 were recompleted as oil producers to increase the recoverable reserves in the northwest area of the field.

The success in the northwest area led to the south area in the field being developed by recompleting Well Tut-19 as a water injection well, and Tut-15 and Tut-36 as oil producers. Figs. 3 and 4 show the production performance.

The selection of the injectors and producers in the northwest and south areas of the field was based on lower development costs through the use of less injection wells and for keeping the produced water to a minimum.

This waterflooding system is a closed system because the shut-in well, Tut-53, was converted into a water source well from AEB-3E. This well supplies injection water for the AEB-3D injectors: Tut-44, and Tut-19. A good practice is to use a closed system to reduce or eliminate water treatment. Well Tut-53 was good candidate for the water source from AEB-3E formation because the well has no other pay zone.

Tut-53 openhole logs showed a few feet of pay with low quality sand in AEB-3D formation and 25 ft of pay with good quality sand in Lower Baharia (LBAH) formation. Offset well Tut-45, 120 m away from Tut-53, had already drained the LBAH reserve in this area.

Acknowledgment

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Method calculates crude cut properties

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An investigation of 28 crude samples from Russia, FSU countries, the Middle East, North Africa, and Bulgaria showed that the crude true boiling point (TBP), or ASTM D-86 distillation, density, and sulfur content, along with the Riazi's property distribution model and known correlations, can determine the physical and chemical properties of each 1% narrow cut of the crude. The samples have densities (d_4^{20}) of 0.792-0.938 and sulfur contents of 0.04-3.90%.

Crude costs, which account for about 80% of refinery expenditures, is the single most important determinant for the profitability of an oil company.[1] The quality and value of a crude oil depends on its TBP curve—which consists of white oil fractions boiling up to 360° C., the 360-540° C. fraction, and the bottom of the barrel (540+° C.)—and the level of impurities like sulfur, nitrogen, metals, etc.

The TBP curve, however, does not reflect the chemical structure of petroleum fractions that in turn affects the yield and properties of refinery upgrading and conversion unit products. Knowledge of the TBP curve and the chemical nature of fractions of a crude is therefore of great importance for improving refinery economics. Unfortunately, obtaining this information requires laboratory analyses, which are costly and time consuming.

Riazi developed a two-parameter distribution model for the absolute boiling point, molecular weight, density, and refractive index parameter.[2,3] Using that model and appropriate correlations allows one to determine the chemical nature of narrow crude oil fractions.

The research laboratory of Lukoil Neftochim Bourgas, Bulgaria, investigated 28 crudes with the intent to develop a tool for quick crude fraction characterization. This article discusses the results of that study.

We found that the distribution property parameter, B, in Riazi's property distribution model was crude and property specific and not a constant for a given property, as Riazi reported. The data of crude oil TBP, or ASTM D-86 distillation, density, and sulfur content along with the Riazi's property distribution model can be used for physical and chemical characterization of each 1% narrow cut of a crude oil.

Experimental

The TBP distillation of all 28 investigated crudes was carried out in an Autodest 800 Fisher column according to ASTM D-2892 for atmospheric pressures and according to ASTM D-5236 for vacuum pressures. The TBP distillation was performed in the Autodest 800 Fisher column at a pressure drop from 760 mmHg down to 2 mmHg and in the Autodest 860 Fisher column from 1 mmHg down to 0.2 mmHg.

The density at 20° C. was analyzed ac-

TBP YIELDS

Table 1

Crude	Crude oil fraction, % — Boiling range, °C. — IBP-180	180-240	240-360	360-540	Sulfur, %	Density at 20° C., g/cc
AMCO	17	10	22	26	2.71	0.8710
Buzachi (Western Siberia)	10	8	22	37	1.45	0.8910
Gulf of Suez	16	9	22	32	1.83	0.8720
Heavy Iranian	20	9	16	28	2.35	0.8630
Bouri (Libya)	29	11	20	24	0.69	0.8150
Heavy Ural	14	9	20	32	2.90	0.8927
Iraqi	25	12	20	26	1.93	0.8402
Kumkol (Kazakhstan)	29	12	22	24	0.18	0.8207
Kuwaitian	18	9	19	24	2.73	0.8680
Light Arabian	18	12	23	31	1.83	0.8560
Light Azeri (Caspian Sea)	24	13	23	24	0.46	0.8428
Light Iranian	20	13	17	29	1.54	0.8510
Sirtica (Libya)	29	11	20	24	0.69	0.8150
Light Siberian	23	11	22	29	0.49	0.8435
Light Syrian	19	12	27	32	0.89	0.8400
REBCO 1	16	9	22	28	1.70	0.8700
Syrian	15	8	15	30	3.90	0.9070
Tengiz (Caspian Sea)	37	17	23	17	0.29	0.7930
Port of Tuapce (Black Sea)	21	12	21	30	0.69	0.8490
Tunisian	15	9	22	34	0.04	0.8360
Ural	17	11	22	27	1.32	0.8550
Ural+ atmospheric residue	13	9	19	33	1.40	0.8724
Zaikinski	35	15	23	19	0.91	0.7920
Azeri (Caspian Sea)	17	8	28	30	0.46	0.8453
REBCO 2	17	10	21	28	1.45	0.8707
AvCO March 2003	22	9	21	28	1.21	0.8545
Samgori (Georgia)	28	13	26	22	0.31	0.8368
Tulen (Bulgaria)	3	6	17	49	0.75	0.9380

Equations

$$P^* = [A/B \ln (1/(1-x_i))]^{1/B} \quad (1)$$

$$P^* = (P_i - P_0)/P_0 \quad (2)$$

$$I = (n^2-1)/(n^2+1) \quad (3)$$

$$Y = C_1 + C_2 X \quad (4)$$

$$Y = \ln P^* \quad (5)$$

$$X = \ln (\ln(1/x^*)) \quad (6)$$

$$B = 1/C_2 \quad (7)$$

$$A = B \exp (C1B) \quad (8)$$

$$MW = 0.01077 (TBP)^{[1.52869+0.06486 \ln(TBP/(1078-TBP))]}/d \quad (9)$$

For light fractions with $M_W \leq 300$:

$$I = 2.3435 \times 10^{-2} \exp(7.029 \times 10^{-4} T_b + 2.468S - 10.267 \times 10^{-4} T_b S) \times T_b^{0.0572} S^{-0.72} \quad (10)$$

For heavy fractions with $M_W > 300$:

$$I = 1.8422 \times 10^{-2} \exp(11.6352 \times 10^{-4} Tb + 5.144S - 5.92 \times 10^{-4} T_b S) \times T_b^{-0.4077} S^{-3.333} \quad (11)$$

For light fractions with $M_W < 200$:

$$P\% = 257 - 287.7S + 2.876CH \quad (12)$$

$$N\% = 52.641 - 0.7494(P\%) - 2.1811m \quad (13)$$

$$A\% = 100 - (P\% + N\%) \quad (14)$$

For heavy fractions with $M_W > 200$:

$$P\% = 198.42 - 27.722RI - 15.643CH \quad (15)$$

$$N\% = 59.77 - 76.174RI + 6.8048 \quad (16)$$

$$A\% = 100 - (P\% + N\%) \quad (17)$$

$$RI = n - d/2 \quad (18)$$

$$m = M_W(n - 1.475) \quad (19)$$

$$H = 30.346 - 65.341n/d + 82.952/d - 306/M_W \quad (20)$$

Fractions boiling at <300° C.:

$$\% \text{ sulfur} = (0.2993\exp(0.0186T_{avg})) S_{CO}/100 \quad (21)$$

Fractions boiling at 300-400° C.:

$$\% \text{ sulfur} = (-0.0033T_{avg}^2 + 2.8956T_{avg} - 511.7) S_{CO}/100 \quad (22)$$

Fractions boiling at 400-540° C.:

$$\% \text{ sulfur} = (28.72\exp(0.0031T_{avg})) S_{CO}/100 \quad (23)$$

Fractions boiling at >540° C.:

$$\% \text{ sulfur} = 2 S_{CO} \quad (24)$$

$$A_T = 2{,}612{,}977.01 - 15{,}734{,}706.15d + 37{,}894{,}253.56d^2 - 45{,}595{,}074.07d^3 + 27{,}410{,}167.21d^4 - 6{,}586{,}609.792d^5 - 171.6322505D_{300} + 6.682667662D_{300}^2 - 0.129420997D_{300}^3 + 0.001242386D_{300}^4 - 4.71428D_{300}^5 10^{-6} \quad (25)$$

$$B_T = 2{,}612{,}977.01 - 15{,}734{,}706.15D_{300} + 37{,}894{,}253.56D_{300}^2 - 45{,}595{,}074.07D_{300}^3 + 27{,}410{,}167.21D_{300}^4 - 6{,}586{,}609.792D_{300}^5 - 171.6322505d + 6.682667662d^2 - 0.129420997d^3 + 0.001242386d^4 - 4.71428d^5 10^{-6} \quad (26)$$

Nomenclature

CH	=	Carbon–to–hydrogen ratio
d	=	Liquid density at 20° C., g/cc
D_{300}	=	Amount evaporated up to 300° C. according to ASTM D-86 distillation, vol %
I	=	Refractive index parameter
n	=	Refractive index at 20° C.
P	=	Property such as absolute boiling point (T_b), molecular weight (M_W), specific gravity (S), density (d), or refractive index parameter (I)
RI	=	Refractive intercept
S	=	Specific gravity at 60° F.
S_{CO}	=	Crude oil sulfur, %
T_{avg}	=	Fraction average boiling point, K
T_b	=	Pseudocomponent's true boiling point, K
TBP	=	Pseudocomponent's or fraction's average normal true boiling point, K
x_i	=	Cumulative volume or weight fraction for specific gravity (S), density (d), or refractive index parameter (I), or the cumulative mole fraction for molecular weight (M_W)

cording to ASTM D-1298. The oil sulfur level was analyzed according to ASTM D-4294.

Table 1 summarizes the density, sulfur, and composition of various cuts: naphtha (initial boiling point, IBP to 180° C.), kerosine (180-240° C.), diesel (240-360° C.), vacuum gas oil (360-540° C.). The 540+° C. fraction is defined as 100%-naphtha-kerosine-vacuum gas oil.

Correlations

According to Riazi, Equation 1 (see equation box) describes the distribution of various properties of a hydrocarbon C_{7+} fraction.[2]

In Equation 1, x is the cumulative volume or weight fraction for specific gravity (S), density (d), and refractive index parameter (I); for molecular weight (M_W), x is the cumulative mole fraction. P refers to a property such as absolute boiling point (T_b), molecular weight (M_W), specific gravity (S), density (d), or refractive index parameter (I).

Equation 3 relates I to the refractive index (n) at 20° C.

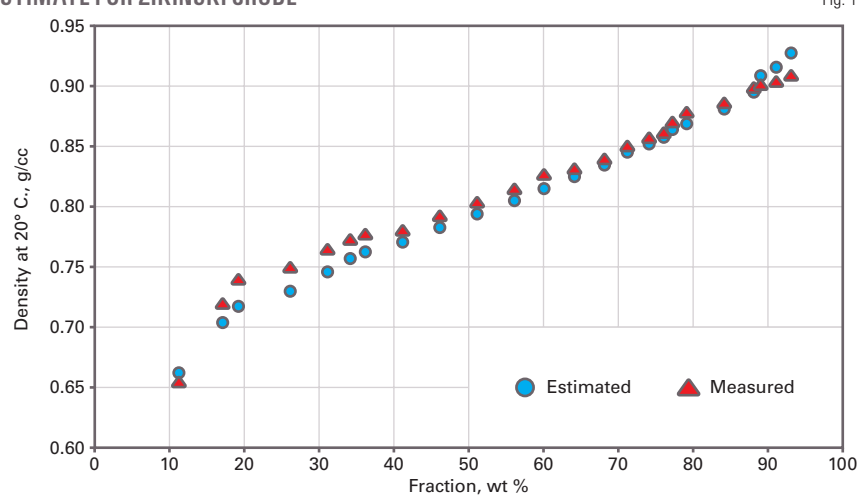
P_0 is the parameter specific for each property (T_0, M_0, S_0, I_0) and each sample. A is also a parameter specific for each property (A_T, A_M, A_S, A_I) and each sample.

B is a parameter specific for each property (B_T, B_M, B_S, B_I); Riazi discovered that B is the same for all investigated samples. He determined that $B_S = B_I = 3$, $B_M = 1$, and $B_T = 1.5$. With values of B_T known for different properties, Equation 1 becomes a two-parameter distribution model in which P_0 and A should be determined.[3]

Equation 1 can be converted into a linear form (Equation 4).

Estimate for Zikinski crude

Fig. 1



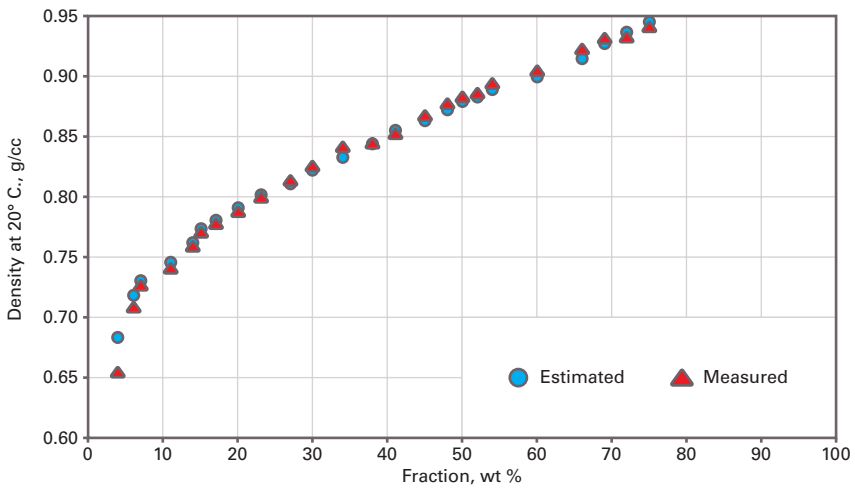
TBP OF THE STUDIED SAMPLES

Table 2

Crude	Fraction, % 5	10	30	50	70	90	95	98	A_T	B_T	R^2
AMCO	85	130	257	370	498	707	813	938	5.59	1.90	0.9991
Buzachi (Western Siberia)	134	182	305	401	504	657	731	815	11.24	2.49	0.9990
Gulf of Suez	97	142	264	368	483	664	755	860	6.51	2.08	0.9981
Heavy Iranian	67	111	249	382	542	814	960	1,134	4.52	1.62	0.9983
Bouri (Libya)	111	161	295	407	532	726	824	936	8.30	2.12	0.9977
Heavy Ural	104	151	281	390	511	701	797	907	7.39	2.09	0.9987
Iraq	53	89	202	311	442	666	786	929	3.27	1.62	0.9999
Kumkol (Kazakhstan)	44	76	180	281	405	620	735	875	2.68	1.56	0.9998
Kuwait	75	121	259	387	540	794	929	1,088	5.07	1.71	1.0000
Light Arabian	89	130	243	338	444	610	694	790	5.51	2.09	0.9990
Light Azeri (Caspian Sea)	56	92	202	305	427	633	741	870	3.36	1.69	0.9997
Light Iranian	68	110	235	351	487	715	835	977	4.36	1.72	0.9984
Sirtica (Libya)	47	81	188	292	419	636	753	894	2.90	1.58	0.9981
Light Siberian	61	97	204	303	417	607	706	822	3.54	1.77	0.9954
Light Syrian	93	132	234	318	409	548	617	696	5.50	2.26	0.9985
REBCO 1	92	138	266	377	503	703	806	924	6.23	1.97	0.9997
Syrian	102	153	298	425	570	801	920	1,058	7.52	1.93	0.9938
Tengiz (Caspian Sea)	39	65	146	222	311	462	541	635	2.02	1.70	0.9999
Port of Tuapce (Black Sea)	76	115	228	327	440	621	714	822	4.55	1.92	0.9974
Tunisian	102	147	267	368	480	652	739	838	6.93	2.15	0.9934
Ural	86	130	254	362	484	680	780	896	5.61	1.95	0.9997
Ural + atmospheric residue	109	158	289	399	520	709	804	913	8.02	2.13	0.9981
Zaikinski	40	68	155	236	334	498	585	689	2.20	1.67	0.9992
Azeri (Caspian Sea)	99	142	255	349	452	610	689	779	6.44	2.20	0.9972
REBCO 2	86	131	258	370	498	704	809	932	5.70	1.91	0.9998
AvCO March 2003	69	110	230	340	469	682	793	923	4.32	1.77	0.9979
Samgori (Georgia)	58	91	190	280	383	553	641	745	3.18	1.81	0.9994
Tulen (Bulgaria)	202	250	370	470	530	650	705	764	33.04	3.36	0.9916

ESTIMATE FOR REBCO2 SAMPLE

Fig. 2



One can readily calculate the parameters A and B using Equation 4 given the boiling point, density, molecular weight, and refractive index parameter at different cumulative weight, mole, or volume fractions.

In this article, we computed the parameters A and B for the properties mentioned and for all studied crude samples by using the cumulative weight fraction.

Table 2 shows the TBP distribution of all studied crude samples. Using that TBP distribution along with Equation 4 and the assumption that T_0 is the boiling point of isobutane (–11.6° C.), the lowest-boiling component in the crude, the parameters A_T and B_T were calculated.

The right hand column in Table 2 shows that the R^2 correlation coefficient for all investigated crude oil samples was higher than 0.90, which shows that all crude samples boiling points obeyed the Riazi's distribution model (Equation 1). The parameter B_T for this data set, however, varied 1.56-3.36, instead of being constant value of 1.5 as Riazi reported.[2]

The TBP distillation of all samples was stopped at 540° C., and the higher boiling points were estimated using Equation 1. For 99% of these crudes, the end boiling point could be more than 1,093° C. (2,000° F.).[4]

We analyzed narrow 20° C. cuts from four crude samples (Zaikinski, REBCO-2, AvCO March 2003, and Kumkol) for density. We assumed a constant Kw factor for the entire crude and estimated the densities for the fractions: IBP-180° C., 180-240° C., 240-360° C., 360-540° C., and 540+° C. These estimated densities obeyed Equation 4 and parameters A_D and B_D were calculated assuming d_0 to be the density of isobutane ($d_4^{20} = 0.56$).

Figs. 1-4 show the density curves calculated based on estimated A_D and B_D, using Equation 1, and narrow 20° C. cuts. The average relative deviation was an acceptable 0.6-1.6%.

The density distribution for all studied crude samples assumed constant Kw and application of Equation 4 for computing A_D and B_D. The R^2 correlation coefficient for all investigated crude samples was higher than 0.99, proving

the validity of Equation 1 for density distribution.

The estimated parameter B_D, however, varied in the range 2.88-5.65, which is different from Riazi's stated constant value for $B_D = 3$.[2]

There are several correlations that calculate molecular weight from the boiling point and density (OGJ, Dec. 28, 1987, p. 110).[5-11] In this study, the Goosens correlation was used to calculate the molecular weight of fractions in the studied crude samples because it has shown better accuracy in predicting molecular weight in the entire crude oil boiling range.[11] The Goosens molecular weight correlation is in Equation 9.

Equation 1 represents well the molecular weight distribution of fractions of all studied crude samples—the R^2 correlation coefficient was higher than 0.99 except the value for the Buzachi crude oil (0.9873). The parameters A_M and B_M were calculated by Equation 4 assuming that M_0 equals 58 (the isobutane molecular weight). It is evident that the estimated parameter B_M varied in the range 0.98-2.87 instead of $B_M = 1$ as reported by Riazi.[2]

The refractive index parameter, I, was estimated using the general relation for the prediction of that parameter in Equations 10 and 11.[12]

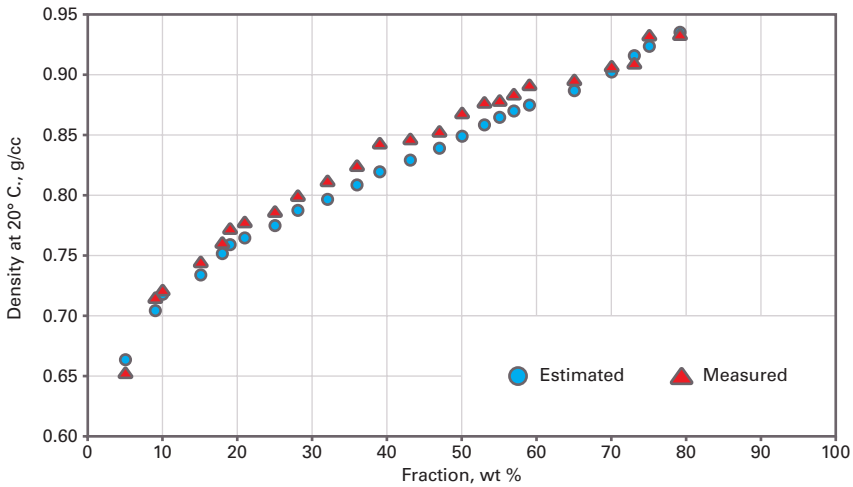
As was observed with the other crude fraction properties, the parameter I also obeys Riazi's model distribution; R^2 correlation coefficient was 0.9714-0.9991. The estimated parameter B_I, however, varied in the range 2.94-7.94 instead of $B_I = 3$ as reported by Riazi.[2]

The refractive index was calculated on the basis of the refractive index parameter I and Equation 2.

Having readily available information about the distribution of the crude fraction refractive index, molecular weight, and density, the chemical structure of crude fractions can be calculated using published correlations.[13-20] In this study, the prediction of molecular analysis by Riazi and Daubert was used to estimate paraffinic, naphthenic, and aromatic portions in the investigated crudes.[20]

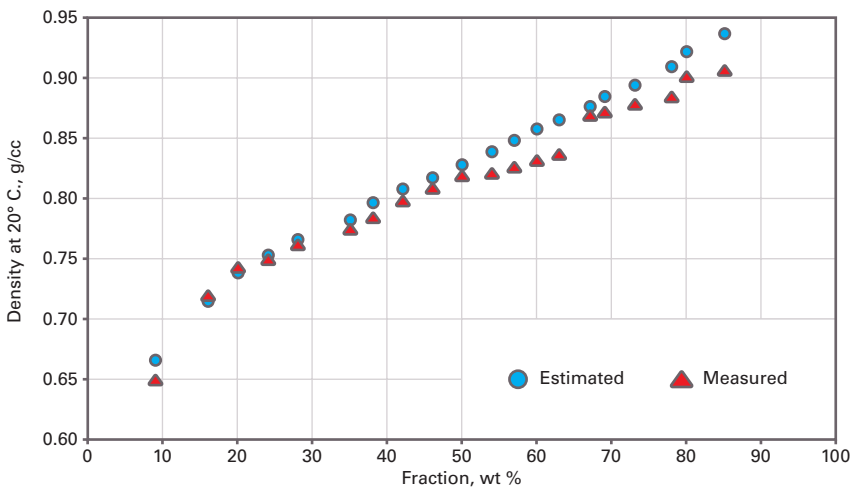
Estimate for AVCO sample

Fig. 3



Estimate for Kumkol crude

Fig. 4



The correlations we used are Equations 12-17.[20] The hydrogen content was estimated by the Goosens correlation, shown in Equation 20.[21]

We found that the sulfur content can be estimated using Equations 21-24.

The carbon content was calculated as C = 100 – % hydrogen – % sulfur. The nitrogen content was neglected, because it is mainly concentrated in the bottoms (540+° C.).

We studied the chemical structure in terms of paraffinic, naphthenic, and aromatic portions for the different fractions for all the crude samples. Data show that for all crude samples, the aromatics in naphtha and kerosine are higher than that of diesel and vacuum gas oil. Naphthenic content is almost the same and the paraffinic portions in the diesel and vacuum gas oil are higher than that of the kerosine and naphtha.

These data suggest that the higher-molecular-weight crude fractions contain more paraffinic portions and less aromatic ones regardless of the fact that it is well known that heavier crude fractions contain more aromatic hydrocarbons. This may be explained by the suggestion that in heavier fractions, the aromatic hydrocarbons contain more paraffinic side chains.

In this data set, the highest paraffinic portion in all fractions was the Tunisian crude and the most aromatic was the Syrian crude. The Tunisian crude oil is not the lightest, nor is the Syrian the heaviest, which suggests that crude density is not a good enough indicator about the chemical composition of crude fractions.

This work demonstrates that the TBP, density, and sulfur content of a crude along with Riazi's property distribution model can be used for physical and chemical characterization of each 1% narrow cut of that crude. If the TBP analyses are not available, one can estimate it by computing Riazi's boiling temperature distribution parameters A_T and B_T using the correlations in Equations 25 and 26.

These correlations were developed via multiple nonlinear regressions of the data for the investigated 28 crude samples.

The chemical characterization of crude fractions can be used as an input to estimate refinery unit product yields and, therefore, to examine the economic benefit of processing a given crude. An earlier work showed that the vacuum gas oil chemical composition can be applied for evaluation of fluid catalytic cracking yield distribution.[22] ✦

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NELSON-FARRAR COST INDEXES

Refinery construction (1946 Basis)

(Explained on p.145 of the Dec. 30, 1985, issue)

	1962	1980	2004	2005	2006	Sept. 2006	Aug. 2007	Sept. 2007
Pumps, compressors, etc.	222.5	777.3	1,581.5	1,685.5	1,758.2	1,777.5	1,850.3	1,853.1
Electrical machinery	189.5	394.7	516.9	513.6	520.2	530.5	514.6	514.1
Internal-comb. engines	183.4	512.6	919.4	931.1	959.7	965.7	980.8	980.8
Instruments	214.8	587.3	1,087.6	1,108.0	1,166.0	1,199.4	1,272.4	1,282.4
Heat exchangers	183.6	618.7	863.8	1,072.3	1,162.7	1,179.4	1,374.7	1,374.7
Misc. equip. average	198.8	578.1	993.8	1,062.1	1,113.3	1,130.5	1,198.6	1,201.0
Materials component	205.9	629.2	1,112.7	1,179.8	1,273.5	1,321.4	1,356.9	1,357.7
Labor component	258.8	951.9	2,314.2	2,411.6	2,497.8	2,497.2	2,615.7	2,628.7
Refinery (Inflation) Index	237.6	822.8	1,833.6	1,918.8	2,008.1	2,026.9	2,112.2	2,120.3

Refinery operating (1956 Basis)

(Explained on p.145 of the Dec. 30, 1985, issue)

	1962	1980	2004	2005	2006	Sept. 2006	Aug. 2007	Sept. 2007
Fuel cost	100.9	810.5	971.9	1,360.2	1,569.0	1,491.5	1,381.5	1,264.3
Labor cost	93.9	200.5	191.8	201.9	204.2	206.8	203.8	220.5
Wages	123.9	439.9	984.0	1,007.4	1,015.4	1,046.1	1,006.5	1,061.4
Productivity	131.8	226.3	513.3	501.1	497.5	505.8	493.9	481.3
Invest., maint., etc.	121.7	324.8	686.7	716.0	743.7	750.7	779.4	782.4
Chemical costs	96.7	229.2	268.2	310.5	365.4	371.5	381.6	388.7
Operating indexes								
Refinery	103.7	312.7	486.7	542.1	579.0	576.6	579.1	576.8
*Process units**	103.6	457.5	638.1	787.2	870.7	846.8	817.5	782.5

**Add separate index(es) for chemicals, if any are used. See current Quarterly Costimating, first issue, months of January, April, July, and October.*

These indexes are published in the first issue of each month. They are compiled by Gary Farrar, Journal Contributing Editor.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

Yearly refinery construction indexes listed for 80 years

Gary Farrar
Contributing Editor

Here are yearly values for the Nelson-Farrar refinery inflation cost index since 1926.

They are based on 1946 as 100, since that was the date of index inception. Values from 1926 to 1945 were back-calculated. ✦

INDEXES FOR SELECTED EQUIPMENT ITEMS

Date	Materials component	Labor component	Misc. equipment	Nelson-Farrar inflation index	Date	Materials component	Labor component	Misc. equipment	Nelson-Farrar inflation index
1926	87.7	61.5	94.0	72.0	1967	219.7	331.3	226.1	266.7
1928	93.2	64.5	89.0	71.0	1968	224.1	357.4	228.8	304.1
1929	83.2	64.5	87.0	72.0	1969	234.9	391.8	239.3	329.0
1930	76.0	66.5	84.0	70.3	1970	250.5	441.1	254.3	364.9
1931	72.2	60.0	82.0	64.9	1971	265.2	499.9	268.7	406.0
1932	68.0	49.0	79.0	56.6	1972	277.8	545.6	278.0	438.5
1933	68.3	49.0	76.0	56.7	1973	292.3	585.2	291.4	468.0
1934	73.5	55.5	74.0	62.7	1974	373.3	623.6	361.8	522.7
1935	74.3	55.0	76.0	62.7	1975	421.0	678.5	415.9	575.5
1936	78.2	60.0	77.0	67.3	1976	445.2	729.4	423.8	615.7
1937	86.7	66.5	80.0	74.6	1977	471.3	774.1	438.2	653.0
1938	84.7	71.5	81.0	76.8	1978	516.7	824.1	474.1	701.1
1939	82.0	73.0	82.0	76.6	1979	573.1	879.0	515.4	756.6
1940	82.2	74.5	83.0	77.6	1980	629.2	951.9	578.1	822.8
1941	84.5	77.0	84.0	80.0	1981	693.2	1,044.2	647.9	903.8
1942	86.2	82.0	85.0	83.7	1982	707.6	1,154.2	662.8	976.9
1943	86.7	86.5	86.0	86.6	1983	712.4	1,234.8	656.8	1,025.8
1944	87.6	88.5	88.0	88.1	1984	735.3	1,278.1	665.6	1,061.0
1945	89.7	90.0	90.0	89.9	1985	739.6	1,297.6	673.4	1,074.4
1946	100.0	100.0	100.0	100.0	1986	730.0	1,330.0	684.4	1,089.9
1947	122.4	113.5	114.2	117.0	1987	748.9	1,370.0	703.1	1,121.5
1948	139.5	128.0	122.1	132.5	1988	802.8	1,405.6	732.5	1,164.5
1949	143.6	137.1	121.6	139.7	1989	829.2	1,440.4	769.9	1,195.9
1950	149.5	144.0	126.2	146.2	1990	832.8	1,487.7	797.5	1,225.7
1951	164.0	152.5	145.0	157.2	1991	832.3	1,533.3	827.5	1,252.9
1952	164.3	163.1	153.1	163.6	1992	824.6	1,579.2	837.6	1,277.3
1953	172.4	174.2	158.8	173.5	1993	846.7	1,620.2	842.8	1,310.8
1954	174.6	183.3	160.7	179.8	1994	877.2	1,664.7	851.1	1,349.7
1955	176.1	189.6	161.5	184.2	1995	918.0	1,708.1	879.5	1,392.1
1956	190.4	198.2	180.5	195.3	1996	917.1	1,753.5	903.5	1,418.9
1957	201.9	208.6	192.1	205.9	1997	923.9	1,799.5	910.5	1,449.2
1958	204.1	220.4	192.4	213.9	1998	917.5	1,851.0	933.2	1,477.6
1959	207.8	231.6	196.1	222.1	1999	883.5	1,906.3	920.3	1,497.2
1960	207.6	241.9	200.0	228.1	2000	896.1	1,973.7	917.8	1,542.7
1961	207.7	249.4	199.5	232.7	2001	877.7	2,047.7	939.3	1,579.7
1962	205.9	258.8	198.8	237.6	2002	899.7	2,137.2	951.3	1,642.2
1963	206.3	268.4	201.4	243.6	2003	933.8	2,228.1	956.7	1,710.4
1964	209.6	280.5	206.8	252.1	2004	1,112.7	2,314.2	993.8	1,833.6
1965	212.0	294.4	211.6	261.4	2005	1,179.8	2,411.6	1,062.1	1,918.8
1966	216.2	310.9	220.9	273.0	2006	1,273.5	2,497.8	1,113.3	2,008.1

ITEMIZED REFINING COST INDEXES

The cost indexes may be used to convert prices at any date to prices at other dates by ratios to the cost indexes of the same date. Item indexes are published each quarter (first week issue of January, April, July, and October). In addition the Nelson Construction and Operating Cost Indexes are published in the first issue of each month of Oil and Gas Journal.

Operating cost (based on 1956 = 100.0):	1954	1972	2004	2005	2006	Aug. 2007	*References	Index for earlier year in Costimating and Questions on Technology issues
Power, industrial electrical	98.5	131.2	727.9	771.3	850.2	928.7	Code 0543	No. 13, May 19, 1958
Fuel, refinery price	85.5	152.0	944.5	1,288.9	1,523.6	1,314.8	OGJ	No. 4, Mar. 17, 1958
Gulf cargoes	85.0	130.4	1,250.7	1,635.4	2,023.9	2,192.2	OGJ	No. 4, Mar. 17, 1958
NY barges	82.6	169.6	1,130.7	1,539.6	1,837.5	2,124.3	OGJ	No. 4, Mar. 17, 1958
Chicago low sulfur	—	—	1,478.4	1,478.4	1,765.8	2,093.6	OGJ	July 7, 1975
Western US	84.3	168.1	1,427.7	1,941.5	2,358.1	2,774.7	OGJ	No. 4, Mar. 17, 1958
Central US	60.2	128.1	953.8	1,274.0	1,765.9	1,638.6	OGJ	No. 4, Mar. 17, 1958
Natural gas at wellhead	83.5	190.3	5,322.0	7,010.6	6,306.5	5,203.1	Code 531-10-1	No. 4, Mar. 17, 1958
Inorganic chemicals	96.0	123.1	504.9	562.9	686.8	759.7	Code 613	Oct. 5, 1964
Acid, hydrofluoric	95.5	144.4	414.9	414.9	414.9	414.9	Code 613-0222	Apr. 3, 1963
Acid, sulfuric	100.0	140.7	397.4	397.4	397.4	397.4	Code 613-0281	No. 94, May 15, 1961
Platinum	92.9	121.1	762.1	819.3	1,344.5	1,577.7	Code 1022-02-73	July 5, 1965, p. 117
Sodium carbonate	90.9	119.4	310.3	357.3	452.4	500.5	Code 613-01-03	No. 58, Oct. 12, 1959
Sodium hydroxide	95.5	136.2	529.6	529.6	620.1	685.5	Code 613-01-04	No. 94, May 15, 1961
Sodium phosphate	97.4	107.0	733.7	733.7	733.7	733.7	Code 613-0267	No. 58, Oct. 12, 1959
Organic chemicals	100.0	87.4	587.9	666.5	764.5	780.9	Code 614	Oct. 5, 1964
Furfural	94.5	137.5	848.1	961.9	1,103.1	1,205.5	Chemical Marketing Reporter	No. 58, Oct. 12, 1959
MEK, tank-car lots	82.6	87.5	408.3	625.0	625.0	625.0	Reporter	
Phenol	90.4	47.1	339.1	411.3	374.9	416.9	Code 614-0241	No. 58, Oct. 12, 1959

ITEMIZED REFINING COST INDEXES

Operating cost (based on 1956 = 100.0):	1954	1972	2004	2005	2006	Aug. 2007	*References	Index for earlier year in Costimating and Questions on Technology issues
Operating labor cost (1956 = 100)								
Wages & benefits	88.7	210.0	984.0	1,007.0	1,015.4	1,006.5	Employ & Earn	No. 41, Feb. 16, 1969
Productivity	97.2	197.0	513.3	501.1	497.5	493.9	Employ & Earn	No. 41, Feb. 16, 1969
Construction labor cost (1946 = 100)								
Skilled const.	174.6	499.9	2,077.2	2,170.8	2,240.7	2,357.2	Eng. News Record	No. 55, Nov. 3, 1949
Common labor	192.1	630.6	2,747.1	2,863.5	2,971.7	3,095.8	Eng. News Record	No. 55, Nov. 3, 1949
Refinery cost	183.3	545.9	2,314.2	2,411.6	2,497.8	2,615.7	OGJ	May 15, 1967
Equipment or materials (1946 = 100):								
Bubble tray	161.4	324.4	1,329.6	1,409.4	1,484.0	1,558.0	Computed	July 8, 1962, p. 113
Building materials (nonmetallic)	143.6	212.4	825.9	886.4	969.6	1,005.9	Code 13	No. 61, Dec. 15, 1949
Brick—building	144.7	252.5	1,215.8	1,301.7	1,408.6	1,431.8	Code 1342	No. 20, Mar. 3, 1949
Brick—fireclay	193.1	322.8	1,358.6	1,441.1	1,540.5	1,619.1	Code 135	May 30, 1955
Castings, iron	188.1	274.9	1,192.5	1,290.0	1,351.3	1,427.1	Code 1015	Apr. 1, 1963
Clay products (structural, etc.)	159.1	342.0	843.9	893.8	951.6	969.5	Code 134	No. 20, Mar. 3, 1949
Concrete ingredients	141.1	218.4	908.3	985.5	1,092.0	1,178.8	Code 132	No. 22, March 17, 1949
Concrete products	138.5	199.6	761.9	841.3	921.1	963.6	Code 133	Oct. 2, 1967, p. 112
Electrical machinery	159.9	216.3	516.9	513.6	520.2	514.6	Code 117	May 2, 1955
Motors and generators	157.7	211.0	796.8	839.2	880.3	927.6	Code 1173	May 2, 1955
Switchgear	171.2	271.0	1,045.9	1,090.0	1,147.3	1,205.8	Code 1175	May 2, 1955
Transformers	161.9	149.3	486.0	537.1	612.5	705.1	Code 1174	No. 31, May 19, 1949
Engines (combustion)	150.5	233.3	919.4	931.1	959.7	980.8	Code 1194	No. 36, June 23, 1949
Exchangers (composite)	171.7	274.3	863.8	1,072.3	1,162.7	1,374.7	Manufacturer	Mar. 16, 1964
Copper base	190.7	266.7	816.2	992.1	1,059.4	1,241.9	Manufacturer	Mar. 16, 1964
Carbon steel	156.8	281.9	866.1	1,080.2	1,162.1	1,396.5	Manufacturer	Mar. 16, 1964
Stainless steel (304)	—	—	914.3	1,119.3	1,174.8	1,365.0	Manufacturer	July 1, 1991
Fractionating towers	151.0	278.5	1,065.1	1,157.2	1,207.2	1,281.7	Computed	June 8, 1963, p. 133
Hand tools	173.8	346.5	1,651.7	1,722.1	1,792.5	1,831.3	Code 1042	June 27, 1955
Instruments (composite)	154.6	328.4	1,087.6	1,108.0	1,166.0	1,272.4	Computed	No. 34, June 9, 1949
Insulation (composite)	198.5	272.4	2,230.4	2,228.6	2,257.4	2,248.5	Manufacturer	July 4, 1988, p. 193
Lumber (composite):	197.8	353.4	1,417.9	1,359.6	1,309.8	1,226.4	Code 81	No. 7, Dec. 2, 1948
Southern pine	181.2	303.9	1,040.7	998.6	984.3	868.8	Code 81102	No. 7, Dec. 2, 1948
Redwood, all heart	238.0	310.6	2,145.1	2,057.9	1,948.1	1,790.4	Code 811-0332	July 5, 1965, p. 117
Machinery								
General purpose	159.9	278.5	1,106.7	1,163.6	1,213.7	1,281.5	Code 114	Feb. 17, 1949
Construction	165.9	324.4	1,407.3	1,499.2	1,559.7	1,597.7	Code 112	Apr. 1, 1968, p. 184
Oil field	161.9	269.1	1,333.0	1,454.8	1,599.1	1,724.9	Code 1191	Oct. 10, 1955
Paints—prepared	159.0	231.8	907.4	975.3	1,040.8	1,081.3	Code 621	May 16, 1955
Pipe								
Gray iron pressure	195.0	346.9	2,301.2	2,580.2	2,687.9	2,754.7	Code 1015-0239	Jan. 3, 1983
Standard carbon	182.7	319.9	1,900.0	2,217.3	2,306.9	2,306.1	Code 1017-0611	Jan. 3, 1983
Pumps, compressors, etc.	166.5	337.5	1,581.5	1,685.5	1,758.2	1,850.3	Code 1141	No. 29, May 5, 1949
Steel-mill products	187.1	330.6	1,300.6	1,409.1	1,527.5	1,599.0	Code 1017	Jan. 3, 1983
Alloy bars	198.7	349.4	1,050.1	1,146.8	1,311.8	1,233.9	Code 1017-0831	Apr. 1, 1963
Cold-rolled sheets	187.0	365.5	1,278.4	1,462.5	1,658.4	1,731.7	Code 1017-0711	Jan. 3, 1983
Alloy sheets	177.0	225.9	665.0	760.3	862.4	900.5	Code 1017-0733	Jan. 3, 1983
Stainless strip	169.0	221.2	710.0	811.6	920.7	961.6	Code 1017-0755	Jan. 3, 1983
Structural carbon, plates	193.4	386.7	1,493.7	1,654.5	1,766.6	1,986.0	Code 1017-0400	Jan. 3, 1983
Welded carbon tubing	180.0	265.5	1,925.0	2,246.8	2,337.3	2,336.5	Code 1017-0622	Jan. 3, 1983
Tanks and pressure vessels	147.3	246.4	868.7	974.4	1,014.3	1,088.6	Code 1072	No. 5, Nov. 18, 1949
Tube stills	123.0	125.3	503.5	540.5	579.9	607.3	Computed	Oct. 1, 1962
Valves and fittings	197.0	350.9	1,660.6	1,738.2	1,839.6	1,967.2	Code 1149	No. 46, Sept. 1, 1940
Nelson-Farrar Refinery (Inflation Index)								
(1946)	179.8	438.5	1,833.6	1,918.8	2,008.1	2,112.2	OGJ	May 15, 1969
Nelson-Farrar Refinery Operation								
(1956)	88.7	118.5	486.7	542.1	579.0	579.1	OGJ	No. 2, Mar. 3, 1958
Nelson-Farrar Refinery Process								
(1956)	88.4	147.0	638.1	787.2	870.7	817.5	OGJ	No. 2, Mar. 3, 1958

*Code refers to the index number of the Bureau of Statistics, US Department of Labor, "Wholesale Prices" Itemized Cost Indexes, Oil & Gas Journal.

DNV pipeline standard sharpens integrity focus

Christopher E. Smith
Pipeline Editor

DNV released a new revision of Submarine Pipeline Standard—DNV OS F101, effective Nov. 13, 2007, harmonizing the existing standard with ISO, increasing its focus on integrity management, and improving the document's structure.

The revised Submarine Pipeline Standard complies with the new ISO 3183 on line pipe material, with additional and modified requirements that make it the only pipeline standard in compliance with ISO 13623 on pipeline design. The DNV standard also increased its focus on the integrity of operational pipelines.

ISO harmonization

Newly revised ISO 3183, the material standard for C-Mn steel line pipe, triggered revisions to DNV-OS-F101. DNV wants to harmonize its standards with the ISO codes, with DNV-OS-F101 focusing on both ISO 3183 (material) and ISO 13623 (design). The new revision of ISO 3183, a merger between the old revision and API 5L, sought to bring US and global standards into conformity.

DNV chose to provide a self-contained standard instead of providing additional requirements to ISO. ISO requirements are repeated, with any additional or modified requirements clearly marked, including revision of the welding and nondestructive testing requirements. The component section also now reflects new ISO standards. DNV intends this document to stipulate most of the additional requirements purchasers normally specify regarding ISO-API.

The update also improves requirements regarding in-service pipelines, introducing new integrity-management system requirements and adding a separate section on documentation.

The document now subdivides the pipeline life cycle into concept and business development, design, construction, operation, and abandonment. All the standard's sections now refer directly to one of these phases, and some of the contents have been moved to fit the new structure.

DNV introduced a new section, "Design—materials engineering," that includes design-phase requirements relating to material selection, corrosion, sour service, hydrogen induced stress cracking, and other topics.

Modifications made regarding pipeline design were minor. Most changes constitute fuller interpretations of already existing guidelines and do not alter requirements. Pressure definitions, however, did change and the slightly modified criteria clarify requirements regarding the pressure protection system.

DNV course

DNV offers a course covering modifications to pressure and design criteria and introducing the structure of the line pipe section, including ISO 3183 requirements.

The course also includes modifications to components and referenced ISO standards and installation and operational requirements, and addresses the latest updates to welding and NDT requirements. The course targets engineers who have already been using DNV-OS-F101, 2000.

Software

DNV also offers software for checking code compliance. The code-compliance software is programmed in Excel-Visual Basic and includes the following checks:

- Burst (pressure containment) related to system test condition and operation.
- Collapse.
- Propagation buckling.
- Load-controlled load interaction (moment, axial force, and overpressure).
- Displacement-controlled load interaction (axial strain and overpressure).

The program calculates minimum required wall thickness for given conditions and use based on a wall thickness given by the user. The program also includes report sheets meant for paper printout and inclusion in reports, containing all relevant input, some intermediate data, and results from the check.

RP updates

DNV issued updates to recommended practices RP F109, On-Bottom Stability Design of Submarine Pipelines and RP F110, Global Buckling of Submarine Pipelines in October 2007.

Updates to these publications followed DNV's call earlier in the year for two joint industry projects addressing integrity management of subsea pipelines. The first JIP, managed by DNV Høvik, invites oil and gas companies, survey companies, and other interested parties to participate in developing DNV Recommended Practice RP-F116, Subsea Pipeline System Integrity Management.

DNV Houston is managing the second JIP, developing a "Guideline for the development of a Subsea Pipeline Integrity Management Program for the Gulf of Mexico." Pipeline owners and operators in the Gulf of Mexico are funding this JIP. Current industry practices, a significant percentage of unpiggable pipelines, local regulatory requirements, and Gulf of Mexico reporting requirements require establishment of a local guideline for pipelines in this area.

The results of this JIP will be referenced or incorporated into DNV RP-F116. Preliminary input from both JIPs informed the integrity-management content of the updated DNV OS-F101.

Operators currently apply onshore standards, such as API1160 "Managing System Integrity for Hazardous Liquid Pipelines" and ASME B31.8S "Managing System Integrity of Gas Pipelines," and their own integrity-management systems to offshore pipelines, according to DNV.

DNV introduced the JIPs in response to the pipeline industry's recognition of:

- An aging pipeline system.
- The lifetime extension and requalification of existing pipelines.
- Optimized design, which implies a stricter need for monitoring.
- Novel designs producing new challenges.
- The introduction of pipeline integrity-management standards for onshore pipelines (API1160, ASME31.8S).

The output from both JIPs will address in-service issues of concern, from early design through operation. The development and use of DNV RP-F116 and the guideline for the Gulf of Mexico will increase focus on the operational phase from the early design phase, allowing a better inspection and maintenance regime and reducing operational costs, says DNV. Operators can also use the RP to document compliance.

The Gulf of Mexico guideline will identify the components of a subsea pipeline integrity-management program and provide a detailed framework that producers or pipeline operators can use when preparing integrity-management programs for their own pipeline systems.

The guideline will also include a detailed framework for a direct-assessment methodology, which would be applicable to unpiggable subsea pipelines and will be submitted to the National Association of Corrosion Engineers, International (NACE) for review and approval.

Both DNV RP-F116 and the Gulf of Mexico guideline are intended to apply to subsea pipelines, both piggable and unpiggable, which transport natural gas or hydrocarbon liquids, and will address integrity management relating to both internal and external corrosion as well as other relevant threats to the system, such as free spans and third-party damage. ✦

Imports of crude and products

	Districts 1-4 12-14 2007	Districts 1-4 12-7 2007	District 5 12-14 2007	District 5 12-7 2007	Total US 12-14 2007	Total US 12-7 2007	Total US *12-15 2006
	1,000 b/d						
Total motor gasoline	1,089	888	19	97	1,108	985	843
Mo. gas. blending comp.	685	505	19	59	704	564	502
Distillate	248	176	1	—	249	176	541
Residual	597	336	13	—	610	336	255
Jet fuel-kerosine	131	87	59	59	190	146	107
Propane-propylene	136	230	14	11	150	241	154
Other	429	1,001	67	–11	496	990	460
Total products	**3,315**	**3,223**	**192**	**215**	**3,507**	**3,438**	**2,862**
Total crude	**8,196**	**8,694**	**915**	**1,369**	**9,111**	**10,063**	**8,902**
Total imports	**11,511**	**11,917**	**1,107**	**1,584**	**12,618**	**13,501**	**11,764**

*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.

OIL&GAS JOURNAL online research center

OGJ crack spread

	*12-21-07	*12-22-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	101.55	72.46	29.10	40.2
Brent crude	92.42	62.39	30.03	48.1
Crack spread	9.13	10.07	–0.94	–9.3
FUTURES MARKET PRICES				
One month				
Product value	102.37	70.87	31.51	44.5
Light sweet crude	91.35	62.83	28.52	45.4
Crack spread	11.03	8.04	2.99	37.2
Six month				
Product value	104.89	77.67	27.22	35.0
Light sweet crude	90.21	66.11	24.10	36.5
Crack spread	14.67	11.55	3.12	27.0

*Average for week ending.
Source: Oil & Gas Journal
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—Dec. 21, 2007

Receiving terminal	Liquefaction plant: Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	7.73	5.52	6.85	5.40	6.15	6.76
Everett	5.62	3.50	5.23	3.58	4.03	5.93
Isle of Grain	9.62	7.23	9.06	7.11	7.88	8.92
Lake Charles	4.38	2.44	4.16	2.62	2.90	5.04
Sodegaura	5.53	7.88	5.78	7.56	6.81	4.81
Zeebrugge	7.21	5.11	6.53	5.02	5.62	6.54

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: Total	Motor gasoline: Blending comp.[1]	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual	Propane-propylene
	1,000 bbl						
PADD 1	13,410	52,989	25,293	9,537	54,583	15,631	5,049
PADD 2	62,222	49,396	17,488	7,412	27,796	1,334	20,752
PADD 3	152,811	66,824	29,919	12,075	30,773	18,675	29,592
PADD 4	14,648	5,878	1,804	528	3,048	369	[1]2,834
PADD 5	53,841	30,134	23,933	9,779	13,176	6,206	—
Dec. 14, 2007	**296,932**	**205,221**	**98,437**	**39,331**	**129,376**	**42,215**	**58,227**
Dec. 7, 2007	**304,518**	**202,241**	**96.154**	**39,864**	**131,534**	**39,522**	**59,578**
Dec. 15, 2006[2]	**329,107**	**200,915**	**89,852**	**38,263**	**133,120**	**43,038**	**64,024**

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Refinery report—Dec. 14, 2007

District	Refinery operations: Gross inputs	Refinery operations: Crude oil inputs	Refinery output: Total motor gasoline	Refinery output: Jet fuel, kerosine	Refinery output: Fuel oils: Distillate	Refinery output: Fuel oils: Residual	Refinery output: Propane-propylene
	1,000 b/d						
PADD 1	1,523	1,539	1,744	98	505	139	76
PADD 2	3,251	3,220	2,079	181	983	69	198
PADD 3	7,251	7,272	3,525	654	2,108	245	686
PADD 4	546	542	296	29	155	18	[1]145
PADD 5	2,745	2,667	1,468	421	564	145	—
Dec. 14, 2007	**15,316**	**15,240**	**9,112**	**1,383**	**4,315**	**616**	**1,105**
Dec. 7, 2007	**15,476**	**15,278**	**9,155**	**1,552**	**4,234**	**689**	**1,219**
Dec. 15, 2006[2]	**15,772**	**15,543**	**9,341**	**1,424**	**4,223**	**637**	**1,070**
	17,436 operable capacity		**87.8% utilization rate**				

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

OGJ GASOLINE PRICES

	Price ex tax 12-19-07	Pump price* 12-19-07	Pump price 12-20-06
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	263.3	303.0	221.0
Baltimore	256.7	298.6	221.5
Boston	254.7	296.6	221.6
Buffalo	252.3	312.4	244.7
Miami	261.4	311.7	243.6
Newark	253.7	286.6	216.1
New York	239.5	299.6	235.6
Norfolk	254.0	291.6	215.9
Philadelphia	249.6	300.3	238.6
Pittsburgh	251.3	302.0	227.6
Wash., DC	262.4	300.8	231.1
PAD I avg.	254.4	300.3	228.9
Chicago	268.2	319.1	274.5
Cleveland	249.8	296.2	223.8
Des Moines	248.2	288.6	218.6
Detroit	249.5	298.7	229.8
Indianapolis	250.9	295.9	227.8
Kansas City	245.9	281.9	210.8
Louisville	252.8	298.7	221.8
Memphis	250.7	290.5	213.8
Milwaukee	238.7	290.0	237.8
Minn.-St. Paul	249.3	289.7	222.9
Oklahoma City	243.9	279.3	209.8
Omaha	239.7	286.1	223.9
St. Louis	253.6	289.6	217.8
Tulsa	240.0	275.4	208.8
Wichita	238.7	282.1	219.8
PAD II avg.	248.0	290.2	224.2
Albuquerque	255.4	291.8	224.7
Birmingham	249.2	287.9	226.6
Dallas-Fort Worth	243.8	282.2	218.8
Houston	243.7	282.1	213.7
Little Rock	250.4	290.6	223.5
New Orleans	253.3	291.7	220.6
San Antonio	239.3	277.7	217.6
PAD III avg.	247.9	286.3	220.8
Cheyenne	255.1	287.5	217.8
Denver	258.5	298.9	212.8
Salt Lake City	257.3	300.2	227.9
PAD IV avg.	257.0	295.6	219.5
Los Angeles	269.1	327.6	244.9
Phoenix	253.9	291.3	224.8
Portland	269.2	312.5	242.9
San Diego	277.2	335.7	249.9
San Francisco	292.4	350.9	267.9
Seattle	266.8	319.2	263.8
PAD V avg.	271.4	322.9	249.0
Week's avg.	**253.7**	**297.2**	**228.1**
Nov. avg.	**264.0**	**307.6**	**223.7**
Oct. avg.	**237.3**	**280.9**	**228.0**
2007 to date	**234.7**	**278.2**	—
2006 to date	**212.7**	**256.3**	—

*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

	12-14-07 ¢/gal		12-14-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	232.02	New York Harbor	260.65
Gulf Coast	226.27	Gulf Coast	256.02
Los Angeles	240.65	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	228.61	ARA	263.06
Singapore	245.24	Singapore	258.21
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	232.02	New York Harbor	173.14
Gulf Coast	226.65	Gulf Coast	165.48
Los Angeles	242.65	Los Angeles	205.42
		ARA	191.04
		Singapore	178.41

Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

BAKER HUGHES RIG COUNT

	12-21-07	12-22-06
Alabama	5	4
Alaska	9	8
Arkansas	43	34
California	37	33
Land	35	30
Offshore	2	3
Colorado	104	94
Florida	0	0
Illinois	0	0
Indiana	2	0
Kansas	15	13
Kentucky	8	7
Louisiana	159	192
N. Land	57	62
S. Inland waters	27	20
S. Land	27	43
Offshore	48	67
Maryland	1	0
Michigan	1	2
Mississippi	11	19
Montana	10	21
Nebraska	0	0
New Mexico	72	88
New York	5	10
North Dakota	52	37
Ohio	13	10
Oklahoma	196	180
Pennsylvania	20	18
South Dakota	0	1
Texas	894	782
Offshore	12	12
Inland waters	2	2
Dist. 1	18	17
Dist. 2	35	26
Dist. 3	76	64
Dist. 4	86	96
Dist. 5	186	139
Dist. 6	123	122
Dist. 7B	40	38
Dist. 7C	58	49
Dist. 8	119	97
Dist. 8A	28	26
Dist. 9	48	37
Dist. 10	63	57
Utah	38	45
West Virginia	36	32
Wyoming	65	84
Others—NV-3; TN-6; VA-4	13	9
Total US	**1,809**	**1,723**
Total Canada	**372**	**450**
Grand total	**2,181**	**2,173**
Oil rigs	343	279
Gas rigs	1,461	1,438
Total offshore	62	84
Total cum. avg. YTD	**1,767**	**1,648**

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	12-21-07 Percent footage*	Rig count	12-22-06 Percent footage*
0-2,500	63	6.3	45	—
2,501-5,000	115	60.8	114	52.6
5,001-7,500	218	24.7	217	19.8
7,501-10,000	456	1.5	437	3.2
10,001-12,500	427	4.4	409	2.4
12,501-15,000	277	—	262	0.3
15,001-17,500	121	—	124	0.8
17,501-20,000	67	—	78	—
20,001-over	32	—	37	—
Total	**1,776**	**8.6**	**1,723**	**7.4**
INLAND	34		32	
LAND	1,689		1,634	
OFFSHORE	53		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]12-21-07	[2]12-22-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	15	20
Alaska	663	759
California	650	681
Colorado	50	58
Florida	5	5
Illinois	29	27
Kansas	95	92
Louisiana	1,390	1,299
Michigan	15	14
Mississippi	49	48
Montana	95	99
New Mexico	176	164
North Dakota	108	114
Oklahoma	165	177
Texas	1,370	1,340
Utah	44	49
Wyoming	143	147
All others	60	69
Total	**5,122**	**5,162**

[1]OGJ estimate. [2]Revised.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

$/bbl*	12-21-07
Alaska-North Slope 27°	78.19
South Louisiana Sweet	93.75
California-Kern River 13°	80.80
Lost Hills 30°	89.30
Southwest Wyoming Sweet	84.81
East Texas Sweet	89.25
West Texas Sour 34°	82.25
West Texas Intermediate	89.75
Oklahoma Sweet	89.75
Texas Upper Gulf Coast	86.25
Michigan Sour	82.75
Kansas Common	88.75
North Dakota Sweet	81.50

*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

$/bbl[1]	12-14-07
United Kingdom-Brent 38°	91.43
Russia-Urals 32°	86.41
Saudi Light 34°	88.23
Dubai Fateh 32°	84.53
Algeria Saharan 44°	91.95
Nigeria-Bonny Light 37°	92.62
Indonesia-Minas 34°	93.45
Venezuela-Tia Juana Light 31°	86.41
Mexico-Isthmus 33°	86.30
OPEC basket	89.07
Total OPEC[2]	88.08
Total non-OPEC[2]	85.22
Total world[2]	86.79
US imports[3]	82.44

[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]

	12-14-07	12-7-07	12-14-06	Change, %
	bcf			
Producing region	985	1,010	943	4.5
Consuming region east	1,757	1,831	1,808	–2.8
Consuming region west	431	453	426	1.2
Total US	**3,173**	**3,294**	**3,177**	**–0.1**
	Sept. 07	**Sept. 06**	**Change, %**	
Total US[2]	**3,316**	**3,323**	**–0.2**	

[1]Working gas. [2]At end of period.
Source: Energy Information Administration.
Data available in OGJ Online Research Center.

Imports of crude and products

	Districts 1-4 12-21 2007	Districts 1-4 12-14 2007	District 5 12-21 2007	District 5 12-14 2007	Total US 12-21 2007	Total US 12-14 2007	Total US *12-22 2006
	1,000 b/d						
Total motor gasoline	993	1,089	22	19	1,015	1,108	968
Mo. gas. blending comp.	578	685	22	19	600	704	527
Distillate	145	248	0	1	145	249	431
Residual	269	597	0	13	269	610	190
Jet fuel-kerosine	105	131	48	59	153	190	163
Propane-propylene	122	136	13	14	135	150	209
Other	794	429	–9	67	785	496	489
Total products	**3,006**	**3,315**	**96**	**192**	**3,102**	**3,507**	**2,977**
Total crude	**8,635**	**8,196**	**1,170**	**915**	**9,805**	**9,111**	**9,129**
Total imports	**11,641**	**11,511**	**1,266**	**1,107**	**12,907**	**12,618**	**12,106**

*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.

OIL&GAS JOURNAL online research center

OGJ crack spread

	*12-28-07	*12-29-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	105.72	67.21	38.50	57.3
Brent crude	97.08	62.42	34.66	55.5
Crack spread	8.64	4.79	3.84	80.1
FUTURES MARKET PRICES				
One month				
Product value	106.02	67.18	38.84	57.8
Light sweet crude	95.68	60.76	34.92	57.5
Crack spread	10.34	6.42	3.92	61.0
Six month				
Product value	107.83	75.69	32.14	42.5
Light sweet crude	92.86	64.55	28.31	43.9
Crack spread	14.97	11.14	3.83	34.4

*Average for week ending.
Source: Oil & Gas Journal
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—Dec. 28, 2007

Receiving terminal	Liquefaction plant: Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMBtu					
Barcelona	7.73	4.99	6.85	4.88	6.16	6.77
Everett	5.58	3.49	5.19	3.57	4.10	5.89
Isle of Grain	9.62	7.24	9.07	7.12	7.89	8.93
Lake Charles	4.41	2.43	4.19	2.61	2.90	5.02
Sodegaura	5.99	7.88	6.24	8.03	7.28	5.26
Zeebrugge	7.21	5.18	6.62	5.07	5.77	6.61

Definitions, see OGJ Apr. 9, 2007, p. 57.
Source: Purvin & Gertz Inc.
Data available in OGJ Online Research Center.

Crude and product stocks

	Crude oil	Motor gasoline: Total	Motor gasoline: Blending comp.[1]	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual	Propane-propylene
	1,000 bbl						
PADD 1	13,104	53,905	27,046	9,345	52,335	15,339	4,764
PADD 2	62,716	48,421	16,787	7,563	27,927	1,227	20,623
PADD 3	149,459	66,620	30,058	11,921	30,630	18,506	28,350
PADD 4	14,254	6,134	1,891	567	2,990	367	[1]2,759
PADD 5	54,100	30,777	24,380	9,849	12,726	5,552	—
Dec. 21, 2007	**293,633**	**205,857**	**100,162**	**39,245**	**126,608**	**40,991**	**56,496**
Dec. 14, 2007	**296,932**	**205,221**	**98,437**	**39,331**	**129,376**	**41,215**	**57,942**
Dec. 22, 2006[2]	**320,975**	**203,853**	**89,763**	**37,560**	**133,592**	**42,911**	**63,513**

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Refinery report—Dec. 21, 2007

District	Refinery operations: Gross inputs	Refinery operations: Crude oil inputs	Refinery output: Total motor gasoline	Refinery output: Jet fuel, kerosine	Refinery output: Fuel oils: Distillate	Refinery output: Fuel oils: Residual	Refinery output: Propane-propylene
	1,000 b/d						
PADD 1	1,515	1,536	1,695	88	509	113	72
PADD 2	3,274	3,248	2,078	182	1,012	58	212
PADD 3	7,301	7,249	3,470	725	2,077	328	715
PADD 4	536	524	274	31	149	16	[1]146
PADD 5	2,733	2,661	1,487	426	547	227	—
Dec. 21, 2007	**15,359**	**15,218**	**9,004**	**1,452**	**4,294**	**742**	**1,145**
Dec. 14, 2007	**15,316**	**15,240**	**9,112**	**1,383**	**4,315**	**616**	**1,105**
Dec. 22, 2006[2]	**15,813**	**15,625**	**9,369**	**1,567**	**4,254**	**687**	**1,085**
	17,436 operable capacity		**88.1% utilization rate**				

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

OGJ GASOLINE PRICES

	Price ex tax 12-26-07	Pump price* 12-26-07	Pump price 12-27-06
		¢/gal	
(Approx. prices for self-service unleaded gasoline)			
Atlanta	262.6	302.3	226.9
Baltimore	256.2	298.1	227.1
Boston	254.2	296.1	230.5
Buffalo	251.3	311.4	249.5
Miami	260.2	310.5	245.8
Newark	253.2	286.1	223.3
New York	239.0	299.1	242.5
Norfolk	253.5	291.1	220.6
Philadelphia	248.7	299.4	246.8
Pittsburgh	250.6	301.3	235.1
Wash., DC	261.8	300.2	235.0
PAD I avg.	253.8	299.6	234.8
Chicago	266.1	317.0	265.7
Cleveland	248.3	294.7	227.2
Des Moines	247.1	287.5	221.5
Detroit	247.6	296.8	226.5
Indianapolis	249.9	294.9	228.5
Kansas City	245.2	281.2	211.5
Louisville	251.6	288.5	224.5
Memphis	249.6	289.4	219.2
Milwaukee	236.6	287.9	233.9
Minn.-St. Paul	248.1	288.5	222.2
Oklahoma City	242.3	277.7	210.5
Omaha	239.6	286.0	224.6
St. Louis	252.5	288.5	218.5
Tulsa	238.3	273.7	210.2
Wichita	237.2	280.6	217.9
PAD II avg.	246.7	288.9	224.2
Albuquerque	254.1	290.5	220.2
Birmingham	247.9	286.6	223.5
Dallas-Fort Worth	242.3	280.7	223.5
Houston	242.9	281.3	218.5
Little Rock	249.3	289.5	221.8
New Orleans	252.8	291.2	221.5
San Antonio	238.1	276.5	219.1
PAD III avg.	246.8	285.2	221.1
Cheyenne	254.0	286.4	213.2
Denver	257.8	298.2	212.9
Salt Lake City	257.1	300.0	226.6
PAD IV avg.	256.3	294.9	217.5
Los Angeles	268.6	327.1	257.8
Phoenix	253.6	291.0	233.5
Portland	268.8	312.1	262.2
San Diego	276.7	335.2	264.6
San Francisco	291.7	350.2	279.2
Seattle	265.9	318.3	275.2
PAD V avg.	270.9	322.3	262.1
Week's avg.	**252.7**	**296.3**	**231.4**
Dec. avg.	**257.0**	**300.6**	**228.5**
Nov. avg.	**264.0**	**307.6**	**223.7**
2007 to date	**235.0**	**278.6**	—
2006 to date	**212.3**	**255.9**	—

*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

	12-21-07 ¢/gal		12-21-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	236.28	New York Harbor	260.48
Gulf Coast	233.03	Gulf Coast	257.08
Los Angeles	247.53	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	227.19	ARA	260.42
Singapore	234.52	Singapore	257.02
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	236.65	New York Harbor	176.50
Gulf Coast	230.15	Gulf Coast	173.81
Los Angeles	250.53	Los Angeles	193.17
		ARA	189.16
		Singapore	177.60

Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

BAKER HUGHES RIG COUNT

	12-28-07	12-29-06
Alabama	5	4
Alaska	7	8
Arkansas	42	36
California	35	34
Land	33	31
Offshore	2	3
Colorado	102	94
Florida	0	0
Illinois	0	0
Indiana	2	0
Kansas	15	12
Kentucky	8	7
Louisiana	158	189
N. Land	55	60
S. Inland waters	27	20
S. Land	27	42
Offshore	49	67
Maryland	1	0
Michigan	0	2
Mississippi	10	21
Montana	10	21
Nebraska	0	0
New Mexico	68	91
New York	5	10
North Dakota	47	34
Ohio	11	10
Oklahoma	198	174
Pennsylvania	20	17
South Dakota	0	1
Texas	885	784
Offshore	12	12
Inland waters	2	2
Dist. 1	17	19
Dist. 2	34	27
Dist. 3	74	64
Dist. 4	92	93
Dist. 5	183	146
Dist. 6	118	125
Dist. 7B	36	35
Dist. 7C	59	49
Dist. 8	116	98
Dist. 8A	27	25
Dist. 9	50	36
Dist. 10	65	53
Utah	35	44
West Virginia	36	24
Wyoming	69	85
Others—NV-3; TN-6; VA-4	13	8
Total US	**1,782**	**1,710**
Total Canada	**260**	**429**
Grand total	**2,042**	**2,139**
Oil rigs	325	278
Gas rigs	1,452	1,425
Total offshore	63	84
Total cum. avg. YTD	**1,768**	**1,649**

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	12-28-07 Percent footage*	Rig count	12-29-06 Percent footage*
0-2,500	57	3.5	45	—
2,501-5,000	100	53.0	114	52.6
5,001-7,500	201	20.8	217	20.2
7,501-10,000	450	1.5	436	2.7
10,001-12,500	429	4.4	409	2.2
12,501-15,000	277	—	261	0.3
15,001-17,500	120	—	120	0.8
17,501-20,000	66	—	79	—
20,001-over	32	—	38	—
Total	**1,732**	**7.1**	**1,719**	**7.3**
INLAND	36		33	
LAND	1,643		1,629	
OFFSHORE	53		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]12-28-07	[2]12-29-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	15	20
Alaska	660	785
California	649	681
Colorado	50	57
Florida	5	5
Illinois	29	27
Kansas	95	90
Louisiana	1,393	1,281
Michigan	15	14
Mississippi	49	48
Montana	96	99
New Mexico	176	164
North Dakota	109	114
Oklahoma	165	178
Texas	1,365	1,338
Utah	44	49
Wyoming	144	147
All others	60	69
Total	**5,119**	**5,166**

[1]OGJ estimate. [2]Revised.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

$/bbl*	12-28-07
Alaska-North Slope 27°	78.19
South Louisiana Sweet	96.50
California-Kern River 13°	83.30
Lost Hills 30°	92.00
Southwest Wyoming Sweet	87.50
East Texas Sweet	92.00
West Texas Sour 34°	85.00
West Texas Intermediate	92.50
Oklahoma Sweet	92.50
Texas Upper Gulf Coast	89.00
Michigan Sour	85.50
Kansas Common	91.50
North Dakota Sweet	84.25

*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

$/bbl[1]	12-21-07
United Kingdom-Brent 38°	92.49
Russia-Urals 32°	87.92
Saudi Light 34°	89.31
Dubai Fateh 32°	86.49
Algeria Saharan 44°	92.77
Nigeria-Bonny Light 37°	92.80
Indonesia-Minas 34°	95.14
Venezuela-Tia Juana Light 31°	87.36
Mexico-Isthmus 33°	87.25
OPEC basket	90.16
Total OPEC[2]	89.16
Total non-OPEC[2]	86.63
Total world[2]	88.02
US imports[3]	83.41

[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]

	12-21-07	12-14-07	12-21-06	Change, %
	bcf			
Producing region	938	985	946	–0.8
Consuming region east	1,657	1,757	1,777	–6.8
Consuming region west	413	431	404	2.2
Total US	**3,008**	**3,173**	**3,127**	**–3.8**
	Sept. 07	**Sept. 06**	**Change, %**	
Total US[2]	**3,316**	**3,323**	**–0.2**	

[1]Working gas. [2]At end of period.
Source: Energy Information Administration.
Data available in OGJ Online Research Center.

PACE REFINING MARGINS

	Oct. 2007	Nov. 2007	Dec. 2007	Dec. 2006	2007 vs. 2006 Change	2007 vs. 2006 Change, %
	$/bbl					
US Gulf Coast						
West Texas Sour	11.27	13.13	8.15	9.57	–1.42	–14.8
Composite US Gulf Refinery	10.44	13.17	12.66	10.06	2.60	25.9
Arabian Light	7.68	10.91	14.92	10.14	4.78	47.2
Bonny Light	5.04	5.88	2.53	1.95	0.58	29.7
US PADD II						
Chicago (WTI)	9.26	9.82	6.53	7.64	–1.11	–14.6
US East Coast						
NY Harbor (Arab Med)	4.62	7.18	11.93	9.73	2.20	22.6
East Coast Comp-RFG	8.15	9.72	10.29	12.18	–1.90	–15.6
US West Coast						
Los Angeles (ANS)	12.48	12.71	12.05	17.25	–5.21	–30.2
NW Europe						
Rotterdam (Brent)	3.04	6.21	4.57	0.05	4.52	8,602.4
Mediterranean						
Italy (Urals)	8.95	10.83	8.82	7.36	1.46	19.3
Far East						
Singapore (Dubai)	6.30	7.44	7.52	4.18	3.34	79.8

Source: Jacobs Consultancy Inc.
Data available in OGJ Online Research Center.

US NATURAL GAS BALANCE DEMAND/SUPPLY SCOREBOARD

	Oct. 2007	Sept. 2007	Oct. 2006	Oct. 2007-2006 change	Total YTD 2007	Total YTD 2006	YTD 2007-2006 change
	bcf						
DEMAND							
Consumption	1,559	1,587	1,640	–41	18,793	17,776	1,017
Addition to storage	334	372	246	88	2,934	2,668	266
Exports	59	61	58	1	614	582	32
Canada	27	29	30	–3	334	249	85
Mexico	28	28	25	3	240	281	–41
LNG	4	4	3	1	40	52	–12
Total demand	**1,992**	**2,020**	**1,944**	**48**	**22,341**	**21,026**	**1,315**
SUPPLY							
Production (dry gas)	1,633	1,580	1,587	46	15,764	15,372	392
Supplemental gas	4	5	6	–2	52	54	–2
Storage withdrawal	76	73	115	–39	2,433	2,668	–235
Imports	352	358	333	19	3,837	3,463	374
Canada	320	314	296	24	3,096	2,971	125
Mexico	NA	2	1	–1	18	7	11
LNG	32	42	36	–4	723	485	238
Total supply	**2,065**	**2,016**	**2,041**	**24**	**22,086**	**21,557**	**529**

NATURAL GAS IN UNDERGROUND STORAGE

	Oct. 2007	Sept. 2007	Aug. 2007	Oct. 2006	Change
	bcf				
Base gas	4,236	4,232	4,226	4,217	19
Working gas	3,567	3,316	3,017	3,452	115
Total gas	**7,803**	**7,548**	**7,243**	**7,669**	**134**

Source: DOE Monthly Energy Review.
Data available in OGJ Online Research Center.

WORLDWIDE NGL PRODUCTION

	Sept. 2007	Aug. 2007	9 month average Production 2007	9 month average Production 2006	Change vs. previous year Volume,	Change vs. previous year %
	1,000 b/d					
Brazil	86	88	84	86	–2	–2.5
Canada	638	697	696	674	22	3.3
Mexico	372	378	404	438	–35	–7.9
United States	1,795	1,755	1,754	1,731	22	1.3
Venezuela	200	200	200	200	—	—
Other Western Hemisphere	199	199	204	216	–12	–5.5
Western Hemisphere	**3,290**	**3,316**	**3,341**	**3,345**	**–4**	**–0.1**
Norway	297	270	288	281	7	2.5
United Kingdom	99	87	137	150	–13	–8.4
Other Western Europe	11	11	10	11	–	–1.2
Western Europe	**406**	**368**	**436**	**441**	**–6**	**–1.3**
Russia	428	428	426	414	12	2.8
Other FSU	160	160	160	160	—	—
Other Eastern Europe	12	15	15	17	–3	–14.9
Eastern Europe	**600**	**603**	**601**	**592**	**9**	**1.6**
Algeria	340	340	340	304	36	11.7
Egypt	70	70	70	73	–3	–4.1
Libya	80	80	80	86	–6	–7.0
Other Africa	187	189	186	190	–4	–2.0
Africa	**677**	**679**	**676**	**654**	**23**	**3.5**
Saudi Arabia	1,427	1,427	1,427	1,427	—	—
United Arab Emirates	250	250	250	250	—	—
Other Middle East	871	871	870	903	–33	–3.7
Middle East	**2,548**	**2,548**	**2,547**	**2,580**	**–33**	**–1.3**
Australia	77	79	75	82	–7	–8.0
China	180	180	180	180	—	—
India	—	—	4	42	–38	–89.9
Other Asia-Pacific	172	173	177	186	–9	–4.6
Asia-Pacific	**429**	**432**	**437**	**489**	**–53**	**–10.8**
TOTAL WORLD	**7,950**	**7,945**	**8,038**	**8,101**	**–63**	**–0.8**

Totals may not add due to rounding.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

OXYGENATES

	Oct. 2007	Sept. 2007	Change	YTD 2007	YTD 2006	Change
	1,000 bbl					
Fuel ethanol						
Production	14,018	13,222	796	124,899	94,302	30,597
Stocks	11,423	11,509	–86	11,423	9,814	1,609
MTBE						
Production	1,632	2,034	–402	19,290	27,713	–8,423
Stocks	1,454	1,742	–288	1,454	1,197	257

Source: DOE Petroleum Supply Monthly.
Data available in OGJ Online Research Center.

US HEATING DEGREE-DAYS

	Nov. 2007	Nov. 2006	Normal	2007 % change from normal	Total degree-days July 1 through Nov. 30 2007	2006	Normal	% change from normal
New England	775	584	727	6.6	1,246	1,250	1,384	–10.0
Middle Atlantic	694	525	667	4.0	965	1,022	1,193	–19.1
East North Central	763	668	757	0.8	1,145	1,347	1,337	–14.4
West North Central	788	742	840	–6.2	1,248	1,453	1,447	–13.8
South Atlantic	350	326	339	3.2	447	542	528	–15.3
East South Central	450	448	449	0.2	597	742	695	–14.1
West South Central	253	249	293	–13.7	336	355	385	–12.7
Mountain	545	583	676	–19.4	951	1,120	1,219	–22.0
Pacific	326	342	396	–17.7	607	579	690	–12.0
US average*	**521**	**469**	**539**	**–3.3**	**782**	**872**	**922**	**–15.2**

*Excludes Alaska and Hawaii.
Source: DOE Monthly Energy Review.
Data available in OGJ Online Research Center.

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Report redraws global warming caricatures

The Editor's Perspective

by Bob Tippee, Editor

The global-warming discussion long ago fell victim to a style of politics in which one side turns the opposition into a self-debunking caricature.

Former President Bill Clinton was and remains a master at this. He manages to make serious people who disagree with him look like goons of the "vast right-wing conspiracy" his wife invented.

So goes global warming politics. Scorn falls to anyone who doubts that governments must restructure the world economy to keep the planet from overheating.

That's a shame. The issue deserves serious attention. Instead, it gets former US Vice-President Al Gore and his moralistic hallucinations of doom.

Gore and his cowinner of the Nobel Peace Prize, Intergovernmental Panel on Climate Change (IPCC) Chairman Rajendra Pachauri, both have likened doubters of the need for urgent warming responses to people who believe the world is flat.

There's sophisticated discourse for you.

A consistent ploy of the Gore-Pachauri axis and its media lemmings has been to caricaturize opposition as the work of a tiny cabal of crackpots supported financially by ExxonMobil. That maneuver hit a snag on Dec. 20 with publication of a report documenting widespread scientific opposition to the alarmists' view.

The report comes from the office of the ranking member of the US Senate Committee on Environment and Public Works, James M. Inhofe (R-Okla.). It cites challenges from more than 400 scientists to the ballyhooed "consensus" view on global warming. Some of the scientists participate in the IPCC or have done so.

Many of the quotes are classic. Here's just one sample, by Dr. George Kukla, a research scientist with the Lamont-Doherty Earth Observatory at Columbia University, from the Apr. 24, 2007 issue of Gelf Magazine: "The only thing to worry about is the damage that can be done by worrying. Why are some scientists worried? Perhaps because they feel that to stop worrying may mean to stop being paid."

The report appears at http://epw.senate.gov/public/index.cfm?FuseAction=Minority.Blogs&ContentRecord_id=f80a6386-802a-23ad-40c8-3c63dc2d02cb. According to the Washington Times, a Gore spokeswoman scanned the document and observed that 25-30 of the scientists might have received funding from Exxon Mobil.

See how it works?

(Online Dec. 21, 2007; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

A December run for $100/bbl oil

With many observers convinced they had seen the last major run up in oil prices for 2007, the market mounted another run at $100/bbl crude in late December.

The January contract for benchmark US light, sweet crudes dropped $9.47/bbl during the last five trading sessions of November, finishing the month at $88.71/bbl on the New York Mercantile Exchange. It fluctuated at $87-90/bbl until Dec. 12 when it jumped $4.37 to $94.39/bbl, the biggest one-day gain since Jan. 30 and then the highest closing since Nov. 27 on NYMEX, after the US Federal Reserve offered to $24 billion to the European Central Bank and Swiss National Bank to spur economic growth.

However, that price gain was followed by a losing streak over the next four NYMEX sessions that reduced the January crude contract to $90.49/bbl by Dec. 18. Then it escalated to $91.24/bbl Dec. 19 as the Energy Information Administration reported US crude inventories fell to the lowest level since February 2005, down 7.6 million bbl to 296.9 million bbl in the week ended Dec. 14 vs. a consensus among Wall Street analysts of a smaller drop of 1.4 million bbl.

On Dec. 20, the NYMEX price slipped to $91.06/bbl. But that was followed by consecutive increases over the four sessions on Dec. 21, Dec. 24, and Dec. 26-27 to $93.31/bbl for the new front-month February contract. That contract soared as high as $97.92/bbl in electronic premarket trading Dec. 28 before profit taking dropped it to a closing price of $96/bbl.

Still, Paul Horsnell at Barclays Capital Inc., London, said, "The most relevant question about $100/bbl [price for crude] is when and not if."

Crude prices climbed in late December in the New York market with the escalation of geopolitical tensions as the Turkish military said it would continue attacks against Kurdish rebels across the boarder into northern Iraq. Even more distressful was the assassination of former Pakistani Prime Minister Benazir Bhutto and at least 20 other people by a suicide bomber at a political rally in Pakistan. Pakistan is not a major oil producer, but it does have nuclear weapons and ties to radical Muslims, which could be a factor in a Middle East dispute.

Crude stocks tighten

At the same time, EIA reported another major drop in commercial US crude inventories, down 3.3 million bbl to 293.6 million bbl in the week ended Dec. 21. US gasoline stocks increased by 700,000 bbl to 205.9 bbl in the same period, while distillate fuel fell 2.8 million bbl to 126.6 million bbl. "US crude oil inventories have fallen further below their 5-year average, having now fallen in absolute terms by more than 60 million bbl since the end of June," Horsnell said. US crude stocks "are still falling relative to normal seasonal patterns despite the continuation of low refinery utilization rates," he said.

"What was, as recently as July, a 40 million bbl build in total US oil inventories above their 5-year average has now disappeared completely. Crude inventories at Cushing, Okla., have not managed to achieve the usual scale of end-year seasonal build, and they are ending 2007 at a level some 33% lower than that at which they ended 2006," Horsnell said.

The latest implied gasoline demand is 9.446 million b/d—"the highest figure since the seasonal peaks in August and enough to turn what had been a year-over-year decline for December-to-date into a year-over-year increase," Horsnell said. "Despite a 25% rise in retail prices and gathering economic pessimism, US gasoline demand now looks set to record the 26th straight month of year-over-year increases. Distillate demand for December-to-date is running close to the all-time high for any month, with a very strong 7.1% year-over-year increase."

The latest EIA petroleum data "showed an overall decline to refined product inventories, which is not typical for this time of year. The inventory drawdown was driven by the highest weekly demand level since February 2007, which is most likely a one time event due to holiday travel," said Soleil-Back Bay Research analyst Jacques H. Rousseau.

Gasoline supply remains below average, "which could be the result of some refiners operating below capacity due to weak margins and because of lower imports due to a narrow US East Coast vs. Europe arbitrage spread," said Rousseau. "We remain cautious on the near-term outlook for the sector and believe that consensus earnings expectations for the fourth quarter of 2007 are too high, but we expect refining margins to rebound heading into the 2008 driving season."

(Online Dec. 31, 2007; author's e-mail: samf@ogjonline.com)

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