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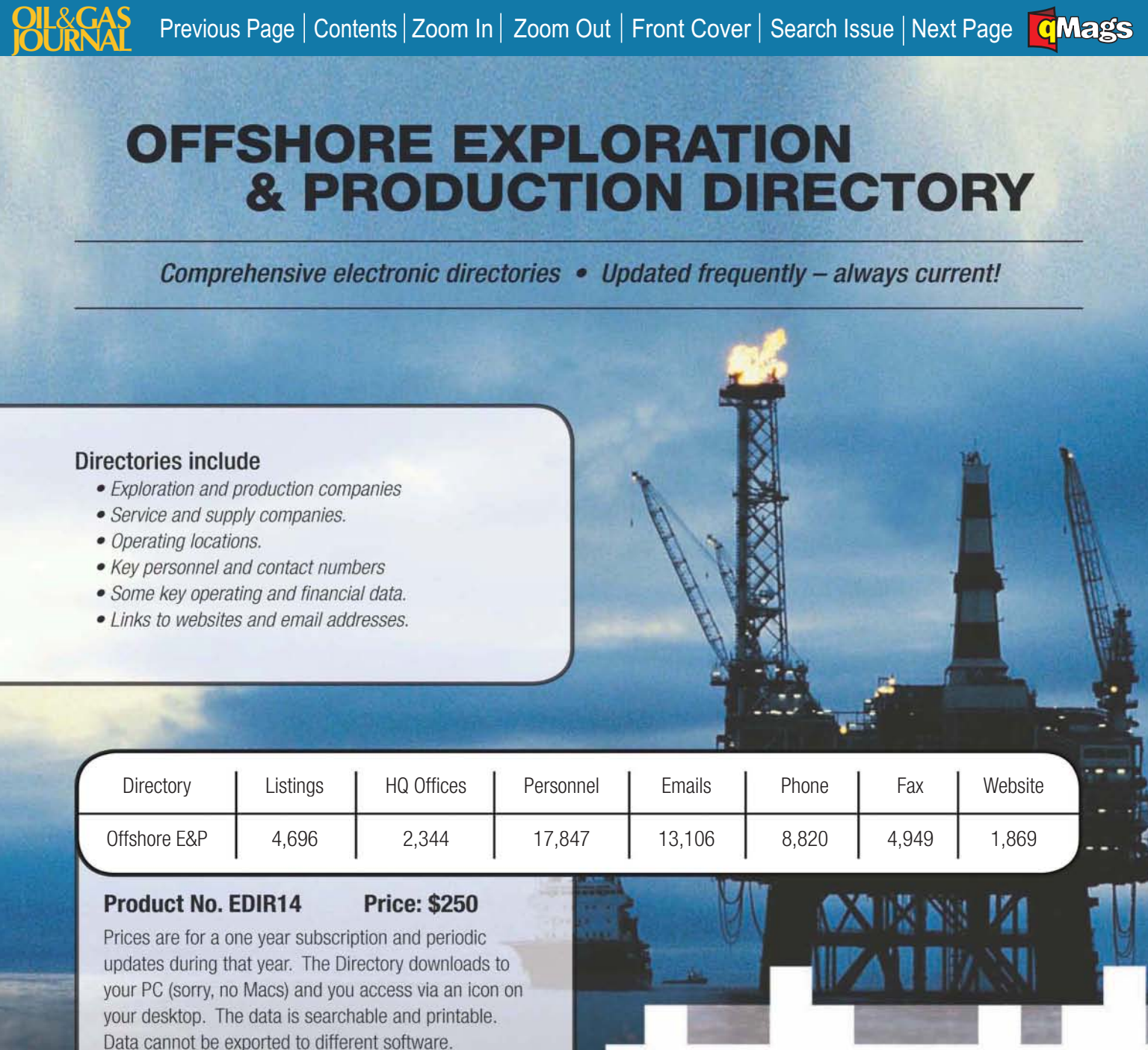

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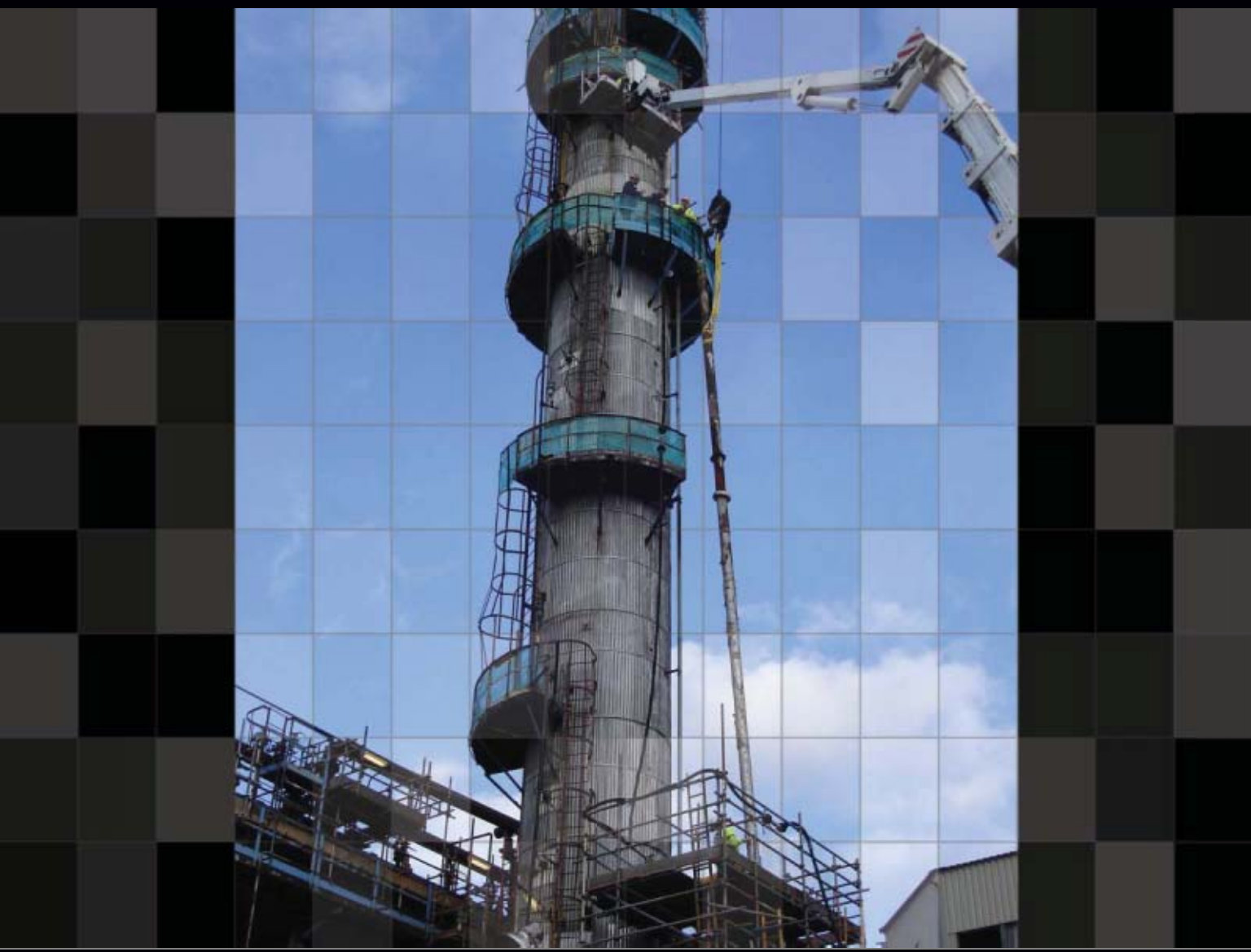


Process Plant Maintenance And Turnaround

US can learn from European experience with cap and trade
Alternative to soil gas detects seepage anomalies
New fluids prevent formation damage to Tarim sandstones
Shallow-water gas network navigates multiple problems

OIL&GAS JOURNAL®

May 19, 2008
Volume 106.19

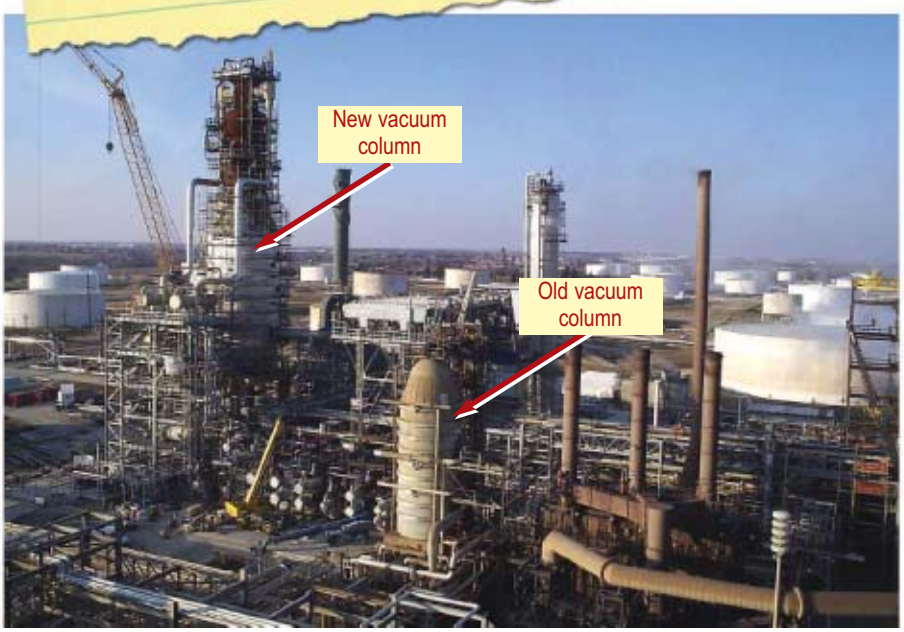
PROCESS PLANT MAINTENANCE AND TURNAROUND

REGULAR FEATURES

COVER

Maintenance workers from ThyssenKrupp Xervon GMBH install equipment at ExxonMobil Corp.'s 326,000-b/cd refinery, Fawley, UK. Avoiding unplanned delays and optimizing unit turnarounds allow plant owners to maintain product supply and maximize profitability. The first article in this week's special report, starting on p. 50, discusses computerized maintenance management systems and how they mesh with plant operators' maintenance requirements. The second article, p. 55, discusses how to extend the life of molecular sieves by understanding how liquids form. Photos from ThyssenKrupp Xervon.

Process Notes



Why Produce Diesel from the Vacuum Unit?

Look ahead five years. The economy is likely to keep tightening and the rush to control pollution will inevitably be accompanied by demands for greater energy conservation. Consequence? A growing market for diesel which yields more energy per unit volume. Yet many continue to believe that producing diesel from the vacuum unit is poor design—that it should be produced only from the atmospheric column. Hence many refiners feed 20-30% diesel boiling range material to their FCCs or hydrocrackers. But where most motor fuel is diesel, refiners have long known that producing vacuum unit diesel can increase production up to 5 volume percent on whole crude.

Maximum diesel production is simply not possible in the atmospheric column because flash zone temperature would need to be 760°F or higher. Moreover, the inherent reflux rate below the diesel draw results in molar L/V ratio less than 0.15. But in vacuum columns it can be 0.4 or higher. And distillation is driven by L/V!

Also: eliminating diesel from vacuum unit feed cuts vacuum gas oil (VGO) yield because it is more difficult to vaporize the feed in the vacuum column flash zone. If atmospheric diesel recovery is very high, VGO yield is low. As crudes get heavier it is essential to leave some diesel in the vacuum column feed to achieve reasonable VGO cutpoints.

Lastly, if you process Canadian oils sands Dilbit and Synbit, you can't run the atmospheric heater hotter than 680°F resulting in very high diesel boiling range material in the vacuum feed. To obtain reasonable diesel recovery from the whole crude you *must* produce it in the vacuum unit.

For a more involved discussion please request Technical Papers #255 and 261.

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May 19, 2008

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General Interest — Quick Takes

OPEC: Refinery mismatch strains crude price

Refinery construction oriented to gasoline in a market needing distillate is lifting the premium for light crude and contributing to market instability, says the Organization of Petroleum Exporting Countries.

In its May Monthly Oil Market Report, OPEC says global refinery construction during 2000-07 favored conversion capacity associated with gasoline while demand growth for the product was less than half that of distillate.

During this period, demand for distillate increased by 5.2 million b/d while that for gasoline rose by 2 million b/d and use of fuel oil declined.

At the same time, refiners added 1.2 million b/d of fluid catalytic cracking and coking capacity, associated with gasoline, but only 700,000 b/d of hydrocracking capacity, related to distillate.

Recently, demand for distillate has surged because of economic resilience in developing countries and the increased use of diesel generators, OPEC says. With insufficient distillate-oriented conversion capacity in place, refiners must rely on increased runs of light crude.

The result, OPEC says, is a widening price differential between light and heavy crude grades. The difference in price between heavy Maya crude and West Texas Intermediate, for example, has grown from about $8/bbl in June 2007 to more than $20/bbl at the beginning of May.

"The persistent mismatch between the product demand pattern and the refinery configuration has focused further upward pressure on light crude prices," OPEC says. "Downstream constraints are continuing to contribute to the high risk premium for these grades, leaving the market increasingly sensitive to any disruption in light crude supplies."

Aussie budget closes condensate tax loophole

Australia's federal budget has closed a tax loophole, ending an excise exemption worth more than $500,000 on the production of condensate.

Biggest losers are the North West Shelf joint venture partners, which have been producing the gas fields off Western Australia for the past 25 years. Condensate has been a lucrative byproduct obtained with little effort.

However the new Labor Party government reported that it will remove the oil excise exemption for condensate. The move is expected to add $564 million (Aus.) to federal government revenue during the next financial year (2008-09) and about $2.5 billion over the next 4 years.

Condensate production from NWS fields and those onshore will be subject to the same excise rates as those applicable to all petroleum fields discovered since Sept. 18, 1975.

Under previous arrangements the first 30 million bbl of oil produced from a field was exempt from excise duty. Past production of condensate will now contribute to reaching that threshold.

Western Australia also is a loser as two thirds of the excise went to the state government under the old scheme. However the federal government said it will compensate the state for lost revenue, beginning with an initial $80 million this financial year and building to a total of $406 million over 4 years.

Not surprisingly, industry is unhappy with the change. Belinda Robinson, chief executive officer of the Australian Petroleum Production & Exploration Association, said industry was surprised by the government's move and concerned at the absence of any prior consultation.

"Given the magnitude of the investments involved and the important contribution of the petroleum industry to the Australian economy, a strong partnership between industry and government is critical," Robinson said. "Investment decisions are made on the basis of certainty that fiscal frameworks agreed with governments will underpin the long-term economic viability of projects."

Sudan rebels vow more attacks on Khartoum

Risks to energy installations and their personnel in Sudan will increase in the next few months, particularly for Chinese oil companies operating in the southwest region of the African country, said Tahir Elfaki, head of the legislative council of Sudan's rebel group Justice and Equality Movement.

JEM rebels attacked the nation's capital Khartoum on May 10 and plan to continue launching new attacks on the city, aiming to destabilize the government until it falls, Elfaki said.

He also said JEM is planning operations against oil fields operated by state-owned China National Petroleum Corp. in the central province of Kordofan. Last December, JEM rebels said they attacked the Defra oil facility in south Kordofan (OGJ Online, Dec. 21, 2007).

In London, risk analyst Exclusive Analysis (EA) confirmed that additional attacks by the rebels on Khartoum as well as on energy assets in Kordofan "are likely in the next couple of months."

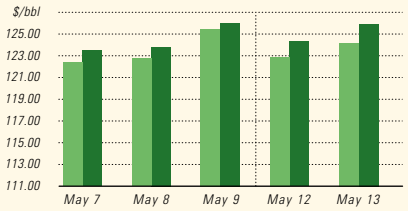
Confirming the May 10 attack on Khartoum, EA said a rebel column of 50-100 vehicles left JEM's stronghold in Jebel Moun, near the Chadian border in West Darfur, and advanced on the capital, picking up reinforcements along the way.

"After a day of heavy fighting in Omdurman—a suburb across the Nile to the west of the city center—they were repelled by the army," it said.

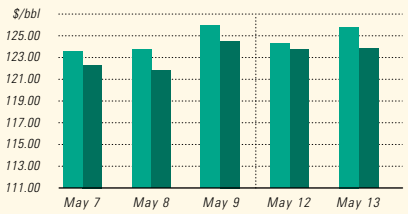
The analyst also commented on JEM's threats to increase attacks on energy and economically viable assets, especially in south Kordofan.

Industry Scoreboard

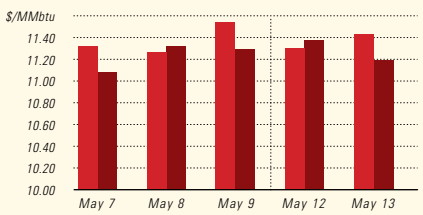
IPE BRENT / NYMEX LIGHT SWEET CRUDE



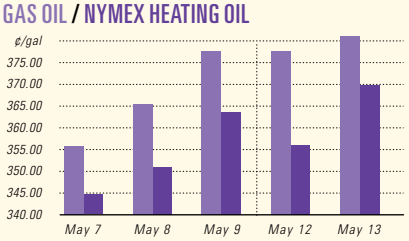
WTI CUSHING / BRENT SPOT



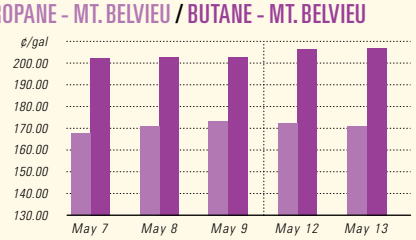
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



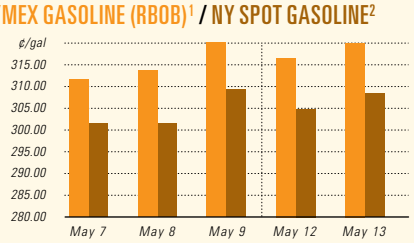
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



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



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

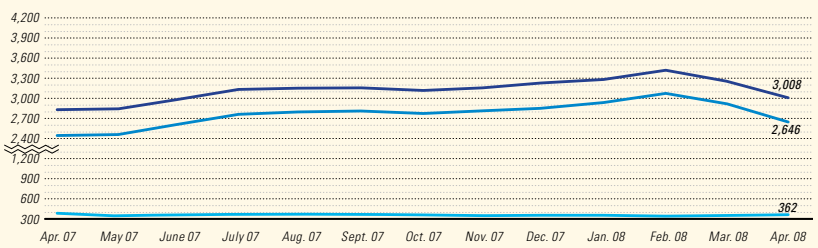
US INDUSTRY SCOREBOARD — 5/19

Latest week 5/2	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	9,263	9,239	0.3	9,028	9,082	–0.6
Distillate	4,188	4,207	–0.5	4,229	4,345	–2.7
Jet fuel	1,554	1,650	–5.8	1,558	1,613	–3.4
Residual	812	718	13.1	666	791	–15.8
Other products	4,794	4,767	0.6	4,895	4,872	0.5
TOTAL DEMAND	20,611	20,581	0.1	20,226	20,722	–2.4
Supply, 1,000 b/d						
Crude production	5,099	5,219	–2.3	5,100	5,186	–1.7
NGL production[2]	2,448	2,399	2.0	2,312	2,327	–0.6
Crude imports	9,941	10,185	–2.4	9,780	9,961	–1.8
Product imports	3,485	3,721	–6.3	3,296	3,462	–4.8
Other supply[3]	1,299	693	87.4	1,312	837	56.8
TOTAL SUPPLY	22,272	22,217	0.2	21,800	21,773	0.1
Refining, 1,000 b/d						
Crude runs to stills	14,641	14,651	–0.1	14,641	14,939	–2.0
Input to crude stills	14,829	15,401	–3.7	14,829	15,279	–2.9
% utilization	84.8	88.3	—	84.8	87.5	—

Latest week 5/2	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	325,583	319,929	5,654	341,159	–15,576	–4.6
Motor gasoline	211,883	211,089	794	193,471	18,412	9.5
Distillate	105,724	105,831	–107	118,764	–13,040	–11.0
Jet fuel-kerosine	38,792	38,738	54	40,043	–1,251	–3.1
Residual	39,597	39,522	–925	38,773	–176	–0.5
Stock cover (days)[4]			Change, %		Change, %	
Crude	22.3	22.0	1.4	22.4	–0.4	
Motor gasoline	22.9	22.8	0.4	20.9	9.6	
Distillate	25.2	24.9	1.2	27.8	–9.4	
Propane	30.0	27.5	9.1	27.1	10.7	
Futures prices[5] **5/9**			**Change**		**Change**	**%**
Light sweet crude, $/bbl	123.00	115.34	7.66	63.30	59.70	94.3
Natural gas, $/MMbtu	11.29	10.86	0.43	7.84	3.45	44.0

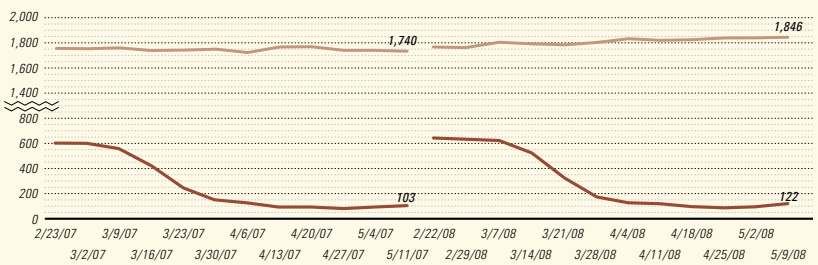
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average 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

"Although a large-scale attack on an oil installation would be costly to JEM in terms of loss of lives, the attack on Khartoum shows a willingness to take such losses if the operation is thought to further their strategic aims," EA said.

It said members of JEM are "particularly well placed" to stage attacks in Kordofan, where they have experience operating and where the state presence is more limited, but they are likely to reach beyond this area as well to show their capability.

OTC: Deepwater systems offer new life in gulf

The ultradeep waters of the Gulf of Mexico will be an area of significant oil production in the future, according to Steve Thurston, vice-president of Chevron North America Exploration & Production Co.

At least four projects are expected to come on stream within the next 5 years, including Royal Dutch Shell PLC's Perdido, Petroleo Brasileiro SA's (Petrobras) Cascada, Chevron's St. Malo and Jack, and BP PLC's Kaskida. The gulf has produced about 1 million b/d from its shelf for the past 30 years, but these reserves are now in decline, Thurston noted May 8 at a luncheon during the Offshore Technology Conference in Houston.

Jack holds 3 billion bbl in place and Chevron has tested 6,000 b/d of oil. It will carry out further appraisal after gathering 350 ft of net pay. So far several companies have made 14 discoveries in the Lower Tertiary system, or a 58% success rate.

Thurston said this trend would require breakthrough technology to produce hydrocarbons in an efficient and cost effective manner. "The reservoirs are very large and spread out. We need to aggregate the fluid into one host so flow assurance is a big issue. Other challenges are long distance subsea tiebacks, life cycle water management and small fields will need to get in earlier rather than later."

Operators are completing wells at 1,200 ft and want to reduce the cost and number of days needed. The trend is challenging as operators must overcome from top to bottom during drilling hurricanes, currents, unstable mud, thick salt layers, and high pressures and temperatures. "Other than that, it's pretty easy," Thurston said. Wilcox alone, in 5,000-10,000 ft of water, has a 10,000-ft salt layer.

Chevron plans to drill 13 wells on Wilcox over the coming years. It is looking at different technologies to cut investment costs, increase production rates, and reduce key uncertainties. ✦

Exploration & Development — *Quick Takes*

Nine E&P permits awarded off W. Australia

Australia has awarded nine new offshore leases, receiving a total of $425 million (Aus.) in its most recent exploration acreage release. The permits cover a range of prospects, water depths, and play types. Five are in the Bonaparte basin, three in the Browse basin, and one in the Carnarvon basin.

France's Total SA won 22% of the acreage with a substantial $94 million work program over 3 years plus $6 million in secondary work commitments for newly awarded Browse basin permit WA-408-P off northwest Western Australia.

Total beat three other bidders to win WA-408-P. Its program guarantees 1,300 sq km of new 3D seismic work, three exploration wells, and geotechnical studies in the first 3 permit years. The secondary program consists of further geotechnical studies.

Chinese company Sinopec won NT/P76 in the Troubador Terrace area of the Bonaparte with a guaranteed initial work program of $35.65 consisting of geotechnical studies, 500 km of 2D seismic reprocessing, 2,000 km of new 2D work, and 1,000 sq km of 3D. The company also bid $38.5 million on a secondary work program comprising one well and geotechnical studies.

Apache and Total won Bonaparte Block AC/P42, with a $18.9 million primary program and $30.2 million secondary work, and AC/P43 with a $32.95 million program and $300,000 worth of secondary work.

Finder Exploration Pty. Ltd., Perth, won AC/P44 and AC/P45 with more modest bids.

Of the other two Browse permits, a partnership of Santos, Chevron, and Inpex won WA-410-P with a low $760,000 bid for some 3D seismic and geotechnical studies followed by a secondary program of one well and geotechnical and marketing studies valued at $30.5 million.

Santos, Inpex, and Beach Petroleum combined to win WA-411-P with an initial program worth $1.46 million followed by a secondary program, including a $30.5 million program of one well and geotechnical and marketing studies.

Carnarvon basin permit WA-409-P went to Australian independent Cue Exploration and Gascorp Australia for an initial $3 million program of seismic work and a secondary $25.5 million program to drill one well and conduct geotechnical studies.

Norway invites bids for mature offshore acreage

Norway has invited operators to bid for mature acreage in the Norwegian North Sea, Norwegian Sea, and the Barents Sea under its Awards in Predefined Areas (APA) 2008 round.

This year operators can apply for all or part of 18 blocks, 11 of which are in the North Sea, 3 in the Norwegian Sea, and 4 in the Barents Sea. The APA initiative is important in attracting new and smaller companies to the Norwegian Continental Shelf.

"The area announced in APA 2008 consists mainly of returned blocks where petroleum activities have previously taken place," the Norwegian Petroleum Ministry said. "The purpose of the APA-rounds is to enhance exploration activities in mature areas, where expectations are [for] smaller discoveries that cannot justify an independent development. It is therefore good resource management to discover and develop these resources before existing infrastructure in connection to other fields are shut down."

The deadline for applications is midday on Oct. 3, and the Norwegian Petroleum Ministry will award the blocks by late 2008 or early 2009.

StatoilHydro finds oil, gas in Oseberg area

StatoilHydro discovered commercial quantities of oil and gas in exploration well 30/9-21 S in the Norwegian North Sea.

Oil and gas were found in the upper parts of the Brent Group of

production license PL104, 7 km west of the Oseberg Sor platform. The well was drilled using the floating rig Transocean Winner and was concluded in Middle Jurassic rocks.

StatoilHydro said the discovery held an estimated 16 million recoverable bbl of oil equivalent and could be tied to the nearby Delta template within a few years. Continued exploration success in the area may trigger new development solutions, it added.

StatoilHydro also found oil in the Theta structure via its long-reach exploration well from the Oseberg C platform, targeting the Cook formation. It has designed the well to be turned into a producer within 45 days after the discovery.

Prospect mapping and well planning was a collaborative effort between the Oseberg Petech team and the North Sea exploration team, with the former unit being responsible for the drilling operation. ✦

Drilling & Production — *Quick Takes*

Eni delays Kashagan oil field production further

Kazakhstan, learning of additional delays in the development of its Kashagan oil field, may impose new fines on the Eni SPA-led consortium in charge of the project.

Eni notified the government of the delays, and officials are evaluating possible sanctions, but have not made a final decision, according to a senior official of the Kazakh oil ministry.

The consortium proposed postponing the production start to 2012-13 from 2011, according to Kazakh Energy Minister Sauat Mynbayev, who said the two sides were trying to "come to an agreement again."

Industry analysts say the field's development poses unusual challenges, including temperatures that range from 40° C. in the summer to–40° C. in the winter.

Kashagan's crude also has high hydrogen-sulfide content, making it potentially deadly for workers on site and raising unusually difficult environmental problems.

Owing to the challenges, in January Eni set a new date of 2011 for first production of Kashagan oil, following two earlier delays. At the time, the consortium agreed to compensate the Kazakh government for the cost overruns and production delays occasioned by 6 months of talks.

The government claimed that the delays in the Kashagan project were undermining the nation's financial plans and preventing it from implementing other developments in the country.

Under the agreement reached in January, Eni will no longer be sole operator once production begins but will share that role with partners ExxonMobil Corp., Royal Dutch Shell PLC, and Total SA (OGJ Online, Feb. 3, 2008).

Also in January, the partners agreed to sell part of their Kashagan stakes to KazMunaiGas, giving the Kazakh state oil company a 16.81% stake in the project and to make additional payments to the Kazakh government based on the price of oil.

At the end of April, Eni Chief Executive Officer Paolo Scaroni said the consortium was talking with the Kazakh government about an updated plan for Kashagan, and it had hoped to reach an agreement by then. Scarloni said discussion had focused on the need to agree to a date specifying when field production would begin.

Eni expects Kashagan's output to reach 370,000 b/d when it eventually comes online and to reach peak production of 1.5 million b/d by 2019.

Shell starts gas production from Shamrock

Shell UK Ltd. reported production start-up May 12 from Shamrock field in the North Sea, the third new Shell-operated North Sea field to begin production this year. Shell operates the field and holds 100% interest.

Shamrock field was developed using Shell's proprietary Monotower platform powered by wind and solar energy, which costs much less to build than a traditional offshore platform. John Gallagher, technical vice-president for Shell Exploration & Production, Europe, said Shamrock was brought on stream shortly after Starling and Caravel fields earlier this year. "Our ability to use latest generation technology has enabled Shell to develop a field that would once have been uneconomic," Gallagher said.

Starling, a subsea tieback to the Shearwater platform in the Central North Sea, came on stream in January, and Caravel—also a Monotower platform development—produced initial gas Apr. 30.

Production capacity through the Shamrock monotower will average 120 MMscfd, Shell said. Gas is transported by pipeline to the Shell-operated Bacton gas plant about 120 km to the southwest.

Shell UK operates fields in the UK sector of the North Sea on behalf of itself, Esso, and other partners.

Shell, Repsol drop Iranian development plans

Royal Dutch Shell PLC and Repsol-YPF SA have suspended plans to develop Phase 13 of South Pars gas field in Iran as relations between the US and Iran deteriorate and development costs rise.

US sanctions against Iran have made it increasingly difficult for foreign investors to develop the proposed $10 billion LNG export plant, but the companies have signalled an intention to look at other types of involvement in Iran at a later date. The US Congress is worried about Iran's nuclear program.

A Shell spokesperson said that the company agreed to swap the development for "alternative suitable phases."

According to media reports, a Repsol-YPF source was quoted saying that the companies want to exchange their participation in Block 13 for a role in Blocks 20 or 21 due to rising development costs.

Other replacement candidates for the partners could be OAO Gazprom and certain Asian companies. As Iran has huge gas potential holding the second largest proven natural gas reserves in the world, the majors have been reluctant to shun it completely despite pressure from Iran to commit to a development date. The country has published proven natural gas in-place of more than 27.57 trillion cu m.

Respol-YPF and Shell had planned to develop Persian LNG on Tombak Island in partnership with National Iranian Oil Co. to

export 16 million tonnes/year of LNG to Europe, Asia, and the Far East. The plant was to use two 8-million tonne/year trains and start operations in 2007 and then 2011 (OGJ Online, June 1, 2007). Other products included 1.5 million tonnes/year of LPG, 4.5 million bbl/year of condensate, and 200,000 tonnes/year of sulfur, using 2.8 bcfd of natural gas. ✦

Processing — *Quick Takes*

Construction begins on Nghi Son refinery in Vietnam

Construction has begun on Vietnam's $6 billion Nghi Son refinery and petrochemical project in Thanh Hoa province, following directives issued by the country's prime minister Nguyen Tan Dung.

At groundbreaking, Nguyen said the Nghi Son complex and the Dung Quat refinery, also under construction, will jointly meet some 60% of the country's demand for petroleum products.

Output from the Nghi Son refinery complex is expected to reach 200,000 b/d, with products to include gasoline A92, A95, A98, diesel, kerosine, fuel for reaction engines, and paraxylene.

The Dung Quat refinery, the first of its kind in Vietnam, is slated to begin operating in February 2009, according to Truong Van Tuyen, head of the refinery's management board.

Authorities plan to begin trial runs at the Dung Quat refinery later this month, with all tests due to be completed by August, according to a report in the Saigon Liberation newspaper.

Venezuela, Ecuador to seek bids for refinery

Venezuelan and Ecuadoran state-owned oil and gas companies Petroleos de Venezuela SA and Petroecuador plan to form a joint venture company to build and operate a 300,000 b/d refinery on Ecuador's Pacific Coast.

Petroecuador said the planned Pacific Refinery-CEM, to be owned 51% by Ecuador and 49% by Venezuela, will ask foreign companies to bid on constructing the refinery, requiring them to finance 70% of its construction.

Petroecuador, which did not set a date for bidding to start, said the winner would be compensated after construction, possibly with a fee-for-service payment or a temporary share of the refinery's earnings.

Last year, Ecuadorean President Rafael Correa said the proposed Pacific refinery, to be built in the coastal province of Manabi, would cost around $5 billion, increasing to $10 billion if the partners decided to add a petrochemical plant on the site. ✦

Transportation — *Quick Takes*

Odessa-Brody oil line reversal nears completion

The Odessa-Brody oil pipeline will start carrying light crude oil in its originally-planned direction from the Caspian Sea toward Europe this summer, according to a senior Ukrainian official.

Oleh Dubyna, chairman of state oil and gas company Naftohaz Ukrayiny, expects the pipeline to carry Caspian crude by July, saying that state oil pipeline operator Ukrtransnafta already is purchasing 485,000 tonnes of light oil to facilitate the pipeline's reversal.

The Odessa-Brody pipeline was originally built to transport light Caspian crude oil to Europe, but it has never operated as planned. Instead, it has worked in the reverse direction, carrying Russian oil to Odessa.

The planned reversal is part of a larger project aimed at extending the Odessa-Brody pipeline and using it to supply Europe with oil from the Caspian Sea region.

Last October, five former members of the Russia-dominated former Union of Soviet Socialist Republics—Azerbaijan, Georgia, Lithuania, Poland, and Ukraine—agreed to set up the so-called "Samartia" consortium (OGJ Online, Oct. 12, 2007).

Its goal is to enable transportation of oil from the Caspian Sea region, particularly Azerbaijan and possibly Kazakhstan, through Poland to markets in western Europe.

The countries in the Samartia consortium want to diversify Europe's sources of oil. Most European countries rely heavily on supplies from Russia, but they fear that Russia could leverage its near-monopoly status for political advantage.

In April, oil company officials from Ukraine and Poland signed an agreement authorizing a feasibility study for a new oil network that would extend the Odessa-Brody pipeline from Ukraine to Poland.

The plan calls for the extension of the pipeline to the central Polish city of Plock, site of the country's largest refinery, allowing new supplies to be shipped onward to Poland's Baltic Sea port of Gdansk.

OTC: US must pay more to attract gas storage

US natural gas markets will have to compete in price in global gas markets if they expect to attract sufficient supplies into storage before the country's gas withdrawal season traditionally begins on Nov. 1.

That was the main message of David Thames, president of Cheniere Marketing, as he spoke to a luncheon audience May 8, the final day of the Offshore Technology Conference in Houston. And he believes historically high prices for this time of the year suggest US markets will respond.

Arguing the primacy of LNG as the fuel most likely to fill the import demand, Thames cited the flat growth in domestic natural gas production despite rising gas rig counts and prospects for falling gas imports from Canada. The result, he said, will be a 5-8 bcfd deficit the US will face.

New shale plays will not be as productive as the Barnett has been, Thames said. Many are requiring years to reach modest levels of a few hundred million cubic feet/day.

LNG, on the other hand, as exemplified by Cheniere's newly opened Sabine Pass terminal stands ready to send out large amounts of gas into storage or electric power market. Again, price is the key, Thames said.

Recent US prices have hit more than $11/Mcf, compared with contracts in Asia-Pacific nearing $20/MMbtu, as US markets respond to growing demand for gas. ✦

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Letters

Biofuels and food

I believe that blaming biofuels for high feedstuff prices is simplistic.

Much has been written recently about the negative societal impact of developed nations' adoption of biofuels and its direct impact on food prices. Making ethanol from corn is inefficient compared to Brazilian sugar cane. US energy policy, including import duties on ethanol, has increased corn and soy prices, but it is not the only culprit.

Spring 2007's flooding in Kansas and Oklahoma and Australia's summer drought were natural events which impacted wheat prices. And so are the rising needs of a growing global population and Southeast China's January floods. What has received little attention to date is the inflow of highly speculative capital from new, non-commodity-related, investors. This disturbing trend is facilitated by the newfound correlation between energy values and corn/soybeans. The higher return currently provided to farmers will more than likely lead to a precipitous reversal when overextended participants finally liquidate positions.

I believe fund dollars have caused more damage than biofuels use. Wheat prices have soared to unnecessary levels due to being swept into fund speculation.

And I know that global grain stocks were on a downward trend long before the biofuels push. Despite discussions among, and warnings from, entities worried about this condition and its long-term implications, markets did not react appropriately—partially due to US farm programs—to increase output.

The advent of biofuels woke up the financial community to the prospects of hedging corn and soy against escalating hydrocarbon values. That development brought in far more capital that needed which, driven by the declining dollar, escalating US dollar-denominated energy costs, and an inflationary mindset, led to escalating corn/soy/palm oil prices and drug nonenergy grains along.

Is there a parallel to the formerly escalating housing market? Yes. Hedging over 70% of the US soybean crop is not a healthy financial condition.

Gerard d'Aquin
President, Con-Sul Inc.
Bigfork, Mont.

Calendar

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

OIL&GAS JOURNAL online

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

2008

MAY

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

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

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

✦Middle East Refining and Petrochemicals Conference & Exhibition, Bahrain, +973 1755 0033. +973 1755 3288 (fax), e-mail: mep@oesallworld.com, website: www.allworldexhibitions.com. 25-28.

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

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

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

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

JUNE

ERTC Management Forum, Copenhagen, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 2-4.

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

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

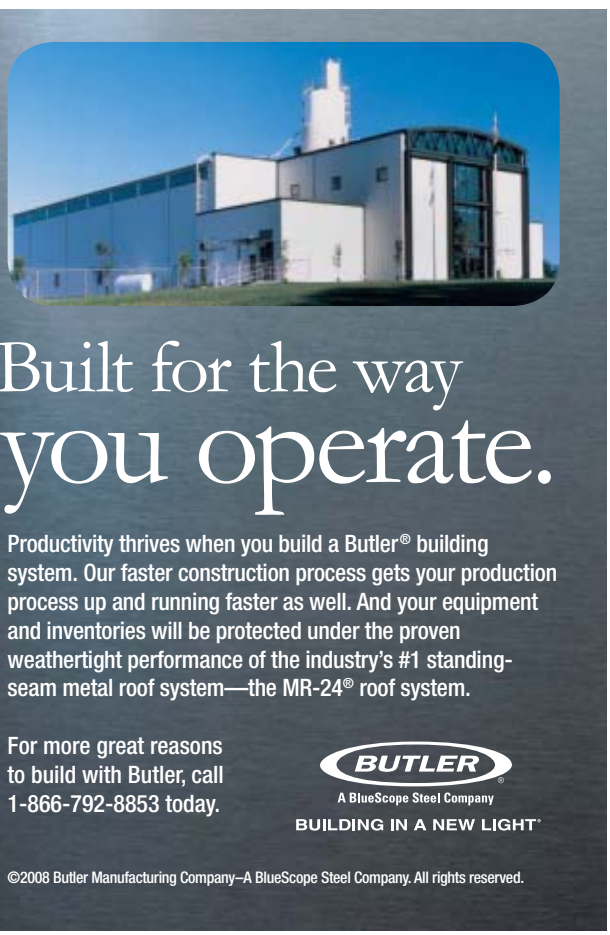
SPEE Society of Petroleum Evaluation Engineers Annual Meeting, Hot Springs, Va., (713) 651-1639, (713) 951-9659 (fax), e-mail: bkspee@aol.com, website: www.spee.org. 7-10

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

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

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

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



Calendar

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

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

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

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

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

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

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

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

Russia and CIS Oil & Gas Investment and Finance Forum, London, +44 (0)20 7878 6888, website: www.C5-Online.com/OilGasFinance. 16-17.

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

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

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

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

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

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

✦Purvin & Gertz Annual Asia LPG Seminar, Singapore, (713) 331-4000, (713) 236-8490 (fax), e-mail: glrodriguez@purvingertz.com, website: www.purvingertz.com. 23-26.

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

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

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

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

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

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

Russian Oil and Gas Exports International Forum, Amsterdam, +44 (0)20 7878 6888, website: www.C5-Online.com/OilGasExport. 26-27.

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

JULY

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

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

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

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

AUGUST

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

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

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

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

SEPTEMBER

✦Annual India Oil & Gas Review Symposium & International Exhibition, Mumbai, (0091-22) 40504900, ext. 225, (0091-22) 26367676 (fax), e-mail: oilasia@vsnl.com, website: www.oilasia.com. 1-2.

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

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

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

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

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

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

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

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

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

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

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

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

OCTOBER

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

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

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

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

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

ERTC Lubes and Additives Conference, Berlin, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 13-15.

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

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

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

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

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

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

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

SPE Asia Pacific Oil & Gas Conference & Exhibition, Perth, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-22.

SPE International Thermal Operations & Heavy Oil Symposium, Calgary, Alta., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-23.

Permian Basin International Oil Show, Odessa, Tex., (432) 367-1112, (432) 367-1113 (fax), e-mail: pbioilshow@pbioilshow.org, website: www.pbioilshow.org. 21-23.

AAPG International Conference & Exhibition, Cape Town, (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 26-29.

Biofuels Conference, Berlin, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: c.taylor@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 28-30.

SPE Russian Oil & Gas Technical Conference & Exhibition, Moscow, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-30.

Arab Oil & Gas Show, Dubai, +971 4 3355001, +971 4 3355141 (fax), e-mail: info@icedxb.com, website: www.oqsonline.com. 28-30.

IADC Contracts & Risk Management Conference, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 29-30.

NOVEMBER

ASME International Mechanical Congress & Exposition, Boston, (973) 882-1170, (973) 882-1717 (fax), e-mail: infocentral@asme.org, website: www.asme.org. 2-6.

Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC), Abu Dhabi, website: www.adipec.com. 3-6.

Deepwater Operations Conference & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepwateroperations.com. 4-6.

North African Oil and Gas Summit, Vienna, +44 (0) 207 067 1800, +44 207 430 0552 (fax), e-mail: c.brown@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk/nas3register.html. 4-6.

Mangystau International Oil & Gas Exhibition, Aktau, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 5-7.

GPA North Texas Annual Meeting, Dallas, (918) 493-3872, (918) 493-3875 (fax), email: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 6.

IADC Annual Meeting, Paradise Valley, Ariz., (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 6-7.

SEG International Exposition and Annual Meeting, Las Vegas, (918) 497-5542, (918) 497-5558 (fax), e-mail: register@seg.org, website: www.seg.org. 9-14.

IPAA Annual Meeting, Houston, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org. 10-12.

Houston Energy Financial Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.accessanalyst.net. 11-13.

American Institute of Chemical Engineers (AIChE) Annual Meeting, Philadelphia, (212) 591-8100, (212) 591-8888 (fax), website: www.aiche.org. 16-21.

ERTC Annual Meeting, Vienna, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 17-19.

IADC Well Control Middle East Conference & Exhibition, Muscat, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 24-25.

Annual European Autumn Gas Conference (EAGC), Cernob-

bio, Italy, +44 (0) 1737 855281, +44 (0) 1737 855482 (fax), e-mail: vanessahurrell@dmgworldmedia.com, website: www.theeagc.com. 25-26.

DECEMBER

Annual Refining & Petrochemicals in Russia and the CIS Countries Roundtable, Prague, +44 207 067 1800, +44 207 430 0552 (fax), e-mail: e.polovinkina@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 2-4.

Downstream Asia Refining & Petrochemicals Conference, Singapore, +44 (0) 207 067 1800, +44 207 430 0552 (fax), e-mail: a.ward@theenergyexchange.co.uk, website: www.wraconferences.com/FS1/dalregister.html. 3-4.

IADC Drilling Gulf of Mexico Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 3-4.

Deep Offshore Technology International Conference & Exhibition, Perth, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepoffshoretechnology.com. 3-5.

International Petroleum Technology Conference (IPTC), Kuala Lumpur, +971 (0)4 390 3540, +971 (0)4 366 4648 (fax), e-mail: iptc@iptcnet.org, website: www.iptcnet.org. 3-5.

PIRA Natural Gas Markets Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 8-9.

PIRA Understanding Global Oil Markets Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 10-11.

Seatrade Middle East Maritime Conference & Exhibition, Dubai, +44 1206 545121, +44 1206 545190 (fax), e-mail: events@seatrade-global.com, website: www.seatrade-middleeast.com. 14-16.

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

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

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

2009

JANUARY

Oil & Gas Maintenance Technology Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 19-21.

Pipeline Rehabilitation & Maintenance Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.piipeline-rehab.com. 19-21.

SPE Hydraulic Fracturing Technology Conference, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 19-21.

FEBRUARY

✦Deep Offshore Technology International Conference & Exhibition (DOT), New Orleans, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.dotinternational.net. 3-5.

ASEG International Conference & Exhibition, Adelaide, +61 8 8352 7099, +61 8 8352 7088 (fax), e-mail: ASEG2009@sapro.com.au. 22-26.

MARCH

GPA Annual Convention, San Antonio, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 8-11.

Middle East Oil & Gas Show & Conference (MEOS), Manama, +973 17 550033, +973 17 553288 (fax), e-mail: aeminfo@batelco.com.bh, website: www.allworldexhibitions.com/oil. 15-18.

Asian Biofuels Roundtable, Kuala Lumpur, +44 (0) 207 067 1800, +44 207 430 0552 (fax), e-mail: a.ward@theenergyexchange.co.uk, website: www.wraconferences.com/FS1/AB1register.html. 24-25.

MAY

ACHEMA International Exhibition Congress, Frankfurt, +1 5 168690220, +1 5 168690325 (fax), e-mail: amorris77@optonline.net, website: http://achemaworldwide.dechema.de. 11-15.

Gastech International Conference & Exhibition, Abu Dhabi, +44 (0) 1737 855000, +44 (0) 1737 855482 (fax), website: www.gastech.co.uk. 25-28.

JUNE

Oil and Gas Asia Exhibition (OGA), Kuala Lumpur, +60 (0) 3 4041 0311, +60 (0) 3 4043 7241 (fax), e-mail: oga@oesallworld.com, website: www.allworldexhibitions.com/oil. 10-12.

OCTOBER

International Oil & Gas Exploration, Production & Refining Exhibition, Jakarta, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: ogti@oesallworld.com, website: www.allworldexhibitions.com. 14-17.

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US gasoline perceptions

David N. Nakamura
Refining/Petrochemical Editor

With the official start of the summer driving season just a week away, US drivers are faced with the most expensive gasoline in history. Recent price trends have changed the behavior of the typical US driver. The typical driver also expects the high prices to continue or even worsen.

Two Gallup Inc. polls conducted during the past month quantify the thinking of US gasoline consumers. Many are reducing consumption of gasoline in various ways, spending less on other goods, and using mass transit. And most think high gasoline prices are here to stay and will continue to increase.

Gallup poll

In a USA Today/Gallup poll conducted May 2-4, 78% of the 1,017 adult respondents said they think that the rise in gasoline prices is a permanent change. In August 2003, only 33% of poll respondents felt this way.

When asked if rising prices are causing financial hardships for them or their families, 71% responded yes, nearly as high as the 72% affirmative rate in a similar September 2005 post-Hurricane Katrina poll. Of the 71% positive responders, about 35% (equivalent to 25% of the entire population) said that the hardship has been severe.

Due to these hardships, drivers are either changing their driving and spending habits, or increasing the efficiency of the cars they drive:

- 60% of those polled said they were "cutting back significantly on household spending," a rise from 34% in a 2004 poll.
- 84% were consolidating trips or otherwise cutting back on daily driving.
- 74% said they tried harder to find less-expensive gas.
- 81% reported driving the most fuel-efficient car when given a choice.
- 76% had taken steps to increase mileage of the cars they own, including driving slower, tuning up their cars, or using air conditioning less.
- 71% were considering more fuel-efficient cars for their next vehicle purchase.
- 62% had shared rides with friends or neighbors.
- 51% decided to forgo a trip taken regularly in the past.
- 34% switched to a lower, and less-expensive, grade of gasoline.
- Only 31% were using mass transit or other alternative transportation modes.

Gallup reported that "the prevalence of finding creative ways…to compensate for the higher price of gas is inversely correlated with income." High-income US drivers, however, are more likely than lower-income drivers to consider a more fuel-efficient vehicle in the future.

Gasoline, crude prices

Latest data (May 12) from the US Department of Energy's Energy Information Administration show an average gasoline price of $3.72/gal paid by US consumers. Prices have risen more than 21% from a year-ago average of $3.10/gal (May 14, 2007) and more than 72% from an average of $2.16/gal in May 2005.

During the same time period, crude prices have risen even more dramatically. West Texas Intermediate closed at $124.24/bbl on May 12; $62.55/bbl on May 14, 2007; and $48.64/bbl on May 16, 2005.

A quick calculation shows that the ratio of gasoline-to-WTI prices has fallen to about 1.25:1 from year-ago levels of nearly 2.1:1. Applying the year-ago ratio to current WTI prices leads to an equivalent gasoline price of about $6.16/gal.

And the latest refining margins show this price divergence—US margins are down 30-50% from year-ago levels (OGJ, May 5, 2008, p. 93).

This all means that gasoline prices are more likely to get worse before they get better because refiners are less willing to operate less-profitable units, especially if crude prices stay on their current trend.

The May Gallup poll reported that 54% of those polled thought that gasoline would reach $6/gal in the next 5 years. And 19% of those polled thought gasoline would reach $10/gal sometime during the next 5 years.

Another Gallup poll, conducted Apr. 25-27, reported that 89% of respondents think gasoline prices in their local area will reach $4/gal this summer, 22% expect prices of $5/gal, and 5% expect that prices will reach $6/gal.

Time will tell if public perceptions in this case are prophetic. ✦

Editorial

Subsidizing oil use

What better symbolizes the modern oil market than the American sport utility vehicle? The outsize crowd carrier embodies the unbridled gasoline consumption and disregard for cost that receive widespread blame for fuel prices now pressing hard on consumers and economies. By those parameters, however, the taxi cab in Jakarta and cooking stove in Kuala Lumpur deserve comparable scorn.

Indonesia and Malaysia belong to the large group of countries whose governments cap prices of oil products and natural gas or otherwise subsidize consumption. Where prices are controlled, fuel consumers don't feel the same compulsion to conserve that their counterparts elsewhere do. It is partly because of this muted price signal that oil consumption continues to rise in the subsidized world as it falls elsewhere. The effect is strong enough to keep global oil demand rising, which will keep prices heading upward until supply catches up.

Developing world

Subsidization of oil and other energy consumption occurs mostly in the developing world. Elsewhere, oil use is falling.

In its May Oil Market Report, the International Energy Agency predicts oil consumption will decline for the third consecutive year during 2008 in all of the industrialized countries represented by the Organization for Economic Cooperation and Development (OECD). The projected annual decline is small—0.7%—in part because of downward adjustments to IEA's estimates for OECD demand in 2007. Comparisons between oil use in March 2008 with that of March 2007 show more clearly what's happening: down 2.8% in the OECD American and Pacific regions and down 2.3% in Europe.

In contrast with the OECD declines comes IEA's projection for a 3.7% increase in non-OECD oil use this year. Some of that jump relates to strong economic performance in Asia and the Middle East. But some also reflects protection of consumers from the sting of rising oil-product prices in many developing countries. This increase in the market segment representing 44% of worldwide oil consumption is enough to offset the OECD decline and leave a net projected gain in global oil consumption, according to IEA, of 1.2%. A question worth asking is whether oil demand still would be rising in the absence of developing-world price ceilings.

Consumption subsidies are as difficult to sustain as they are painful to repeal, especially in poor countries. Governments must compensate for the difference between prices at locally controlled levels and higher, free-market levels. Difficulty grows as market prices rise. Indeed, the new IEA report documents the strain.

China, for example, has begun compensating Sinopec and PetroChina for the downstream losses they incur by selling oil products at capped prices. The government worries that product shortages will develop during the Olympic Games next August in Beijing. For now, the Chinese government can afford the payments. Other Asian governments aren't so lucky.

IEA reports that the incoming administration in Taiwan might lift price controls imposed last November and cites reports that, if it doesn't, the state oil company might be bankrupt in 2 years. In Thailand, the government has reintroduced diesel subsidies, letting refiners offset the costs by suspending contributions to national oil and conservation funds. Indonesia is grappling with the financial pressure created by gasoline, diesel, and kerosene subsidies estimated to cost $12 billion this year. Malaysia recently decided to maintain fuel-price caps despite the costs but, says IEA, "hopes to target subsidies more effectively." Vietnam, meanwhile, has frozen oil product prices until June and will suspend import taxes and help importers of gas oil, kerosine, and fuel oil. Although gasoline in Vietnam was supposedly deregulated last year, importers still must have government approval to change retail prices.

Other distortions

Asia isn't the only region where governments subsidize consumption. IEA also reports distortions caused by market controls in Iran and India. And subsidizing consumption isn't the only way governments manipulate markets. European governments punish consumption with high taxes on oil products, for example. And the US limits future supply by restricting access to federal land.

Consumption subsidies nevertheless help explain why worldwide oil demand keeps rising despite record-setting price increases. SUVs aren't the only reason. ✦

COMMENT

US can learn from European experience with cap and trade

Carlo Stagnaro
Istituto Bruno Leoni
Torino, Italy

Cap-and-trade responses to climate change are in place in Europe and are in prospect in the US. All US presidential candidates believe climate change is a man-made problem that can be solved by reducing emissions of greenhouse gases (GHG). Before adopting a cap-and-trade system, the US should look closely at the European experience.

Under a federal cap and trade, the government sets a limit or cap on GHG emissions as a lower percentage of current emissions, and allowances are distributed—either for free or through an auction—to emitting parties. They report all emissions, and at the end of a compliance period—say, 3 or 5 years—they surrender allowances equivalent to their actual emissions during the period. Any party failing to do so will be fined and required to achieve reductions in the next period.

The rationale is that, under such a system, any emitting party has an incentive to cut emissions to the level where the marginal price of reductions is equal to, or higher than, the cost of allowances on the market. As a result, emissions would be cut most where it is cheapest to do so and the lower the cap, the higher the price of emissions quotas.

Cap and trade systems have been applied successfully several times in the past, including in the US under the Environmental Protection Agency's acid rain program aimed at reducing sulfur dioxide (SO_2) emissions.

There is, however, some evidence that containing GHGs would differ from controlling SO_2 because, among other reasons, virtually every industrial plant and living being emits CO_2. Controlling emissions implies either a transaction cost so high that the whole system would be unsustainable or a wide degree of political arbitrariness.

The EU trading system

In 2005, the last year for which official data are available, emissions from the first 15 members of the European Union (EU15) were lower than those of 1990 by 1.5%, at the same levels as 1992, and higher than those of 2000. The year 2005 was also the first year Europe's cap and trade mechanism, the Emissions Trading Scheme (ETS), became effective. The EU was targeting the Kyoto Protocol's goal of cutting emissions by 8% below those of the baseline year at least since 2003, when a directive established the ETS.

Before 2005, no Europe-wide policy had been established, but individual member states were aware of the targets and had implemented various policies uncoordinated with other EU states, with the goal of getting closer to their emission-reduction goals. Moreover, at least since 2004, a secondary market for emissions arose, with a small but growing trading of emissions futures.

The table reports the yearly variations declared by the European Environment Agency (EEA) together with explanations the agency has supplied in its annual communiqués to explain the changes. Except for 1999, the variation is never attributed to specific policies. In 5 years out of 7, a significant role is attributed to climate conditions—that is, to a factor completely exogenous and which cannot be politically controlled. Then, on and off, the greater or lesser use of coal in the mix is noted, and that mix depends both on industrial choices or long-term policies, and on demand, which in turn depends primarily on the temperature and on economic growth (or lack thereof).

It is therefore not an exaggeration to state that if Europe gets more or less close to the Kyoto target, it will depend largely on variables that are independent from climate policies; indeed the single most important variable will be... the weather: the warmer it is, especially

in winter, the lower the emissions will be.

The very analyses of the agency therefore show that regardless of the cost, European policies are ineffective, thus inefficient. In fact, while emissions data are made available with a 2-year delay, verified emissions data related to the ETS sectors are more quickly available, so it is already possible to draw preliminary conclusions.

Phased emissions rights

Before the failure of European policies is assessed, a closer look at the European market for emissions rights is needed.

The ETS was created with a directive in 2003, and enforcement began on Jan. 1, 2005. The ETS identifies two phases of application: a first pilot phase during 2005-07 followed by a second momentum phase in 2008-12 that will coincide with the Kyoto Protocol applications period during which companies and countries are called upon to meet the objective of reducing emissions by 8% below 1990 levels.

At the beginning of each phase, a certain number of emissions permits is gratuitously assigned to firms covered by the ETS. Distribution of the permits takes place according to a national allocation plan by which each member state declares the total amount of the emission quotas that it intends to distribute within its state. On Apr. 30 of each year, the plant will have to return a number of permits equal to its emissions. If it is unable to do so, or if it did not have a way to buy the extra needed quotas on the market, it must pay a fine of €40/tonne of CO_2 equivalent emitted above its allotted permit amount in the first phase and €100/tonne for unpermitted overage in the second phase.

The first phase covers only CO_2, while in the second, the other greenhouse gases identified by the Kyoto Protocol come into play.[1] Once the fine has been paid, the company is not exempted from cutting its emissions, so the €40 and €100 fines respectively do not work as a cap on carbon price.

ANNUAL VARIATIONS IN EU15 GREENHOUSE EMISSIONS

	Emissions[8] variation, % change	Main reasons for variation	Economic growth, % change
[1]1999	–2	• Measured against NO_2 in France and the UK. • Measured against HFC[9] emissions in UK. • Shift to gas from coal (Germany, the UK). • Mild winter in Germany, UK, France, and the Netherlands.	+3
[2]2000	+0.3	• Increase in electric power-related emissions. • Increase of coal use in UK. • Continuous growth of emissions in Greece, Spain, Ireland, Italy, Belgium.	+3.8
[3]2001	+1	• Cold winter. • Increase in transportation emissions. • Greater use of fossil fuels for heating and electricity generation.	+1.9
[4]2002	-0.5	• Mild temperatures. • Slower economic growth. • Shift to gas from coal.	+1.1
[5]2003	+1.3	• Increase of the carbon share in electrical generation. • Cold winter.	+1.2
[6]2004	+0.3	• Road transport emissions increase. • Increase in industrial emissions (iron, steel, refrigeration, air conditioning).	+2.3
[7]2005	–0.8	• Road transport emissions decrease. • Reduction in the use of coal. • Mild temperatures. • Increased use of diesel over gasoline (Germany).	+1.7

[1](http://www.eea.europa.eu/pressroom/newsreleases/newsrelease20010423). [2](http://www.eea.europa.eu/pressroom/newsreleases/greenhouse_gas_emission). [3](http://www.eea.europa.eu/pressroom/newsreleases/ghg-2003-en). [4](http://www.eea.europa.eu/pressroom/newsreleases/tec2-2004-en). [5](http://www.eea.europa.eu/pressroom/newsreleases/ghg_inventory_report-en). [6](http://www.eea.europa.eu/pressroom/newsreleases/GHG2006-en). [7](http://www.eea.europa.eu/pressroom/newsreleases/eu-greenhouse-gas-emissions-decrease-in-2005). [8]Combined emissions of the six greenhouse gases covered by the Kyoto Protocol on climate change. It does not consider the impact of land use and forestry, which can either produce or absorb emissions as no internationally accepted methodologies exist yet. [9]Hydrofluorocarbons.

Source: European Environment Agency, Economic growth (1999-2005), Eurostat

Finally, the directive does not allow the banking of allowances and their transfer from one phase to another. If the enterprise that holds excess emission quotas cannot sell them in useful time, their value crumbles to zero.

From this summary description, the three main elements of political arbitrariness of the ETS project emerge: the inclusion of some industries and not others, the prohibition against banking the permits, and their gratuitous distribution at the beginning of each phase on the basis of the historical emission record in a reference period—the so-called grandfathering.[2]

Furthermore, the albeit small experience accumulated by ETS gives rise to perplexities about how well it is operating, with particular regard to the high volatility of the carbon allowance price. The price of the allowances, which at the beginning of the market increased from the initial €7/tonne to settle at around €20-25/tonne, suddenly crashed. The crash coincided with the publication of the data on emissions by the ETS industries. The price then shot up again to more than €20/tonne at the beginning of 2008 and the beginning of the second phase, and as this article is written, a tonne of CO^2 is traded at or above €25. The immediate growth reflects the prohibition against banking excess permits, which couldn't be transferred to 2008-12.

What caused the price volatility, which has effectively nullified the predictable cost of the quota system? According to a Bologna University Working Paper by Stefano Clô, a phenomenon of "over-allocation" in favor of the ETS industries has taken place. The national allocation plans approved by the Commission for 2008-12 reflect a sensitivity to these issues. For example, Brussels issued 1,439 permits vs. the 1,570 requested. But this—and, in junction the prices of quotas, which went back to pre-2006 levels—allows one to predict that the second phase will have tangible costs for the enter-

prises and consequently for consumers.

The observation about the system's high level of inefficiency as a whole must be added to the need for equity and the need to set up a system of rules that is certain and stable—a need made cogent by the size of the objectives and by the short time span in which they should be reached. Verified emissions data reveal that emissions from ETS industries in 2007 were higher than those in 2006 by more than 1%.

The new directive

The European Commission is aware of all these criticisms, but it finds itself locked in by commitments made perhaps too lightly. So in recent months, it has been working intensely, rewriting former decisions. This has culminated in the change of the objective of renewable resources from 20% of primary energy consumption to 20% of final consumption—although the Orwellian effort to rewrite past decisions prevented the European Commission from stating it openly.

The new directive introduces substantial changes, some of which are questionable. Its greatest flaw is in the zone of uncertainty, which the directive says it wants to eliminate but which is instead amplified.

Beyond the statements of principle, which change nothing, the directive immediately sets fair general objectives, such as harmonizing the emission market and creating maximum predictability and stability of choices.[3]

Furthermore, it is honestly recognized that "the environmental outcome of the first phase of the EU ETS could have been more significant but was limited due to excessive allocation of allowances in some member states and some sectors."[4]

The new directive foresees the extension of the ETS to other emitting plants or industries for which it is possible to monitor emissions.[5] The directive proposal suggests superseding multiple national allocation plans with the adoption of a single unified, communitarian cap to reach within a time period longer than the 5 years of the first two phases.

The other fundamental choice concerning the third phase is about passage from grandfathering to auctioning in the allocation of quotas to guarantee the "efficiency of the ETS, transparency and simplicity of the system, and [avoidance of] undesirable distributional effects."[6]

Thus, starting from 2013, all quotas for the thermoelectric industry will be allocated through auctions. This choice seems in line with the preferences of most economists, who recognize two advantages in allocation through quota auctioning: less exposure to political whim and the ability to generate tax income.[7]

This last point is open to interpretation; it is not certain that a larger flow of resources to public finances can be considered advantageous, from both the environmental perspective and that of proper market operation—in fact, the opposite is more likely.

The first argument about the greater neutrality of auctioning seems to have better foundations, but further reading of the European directive on emission trading indicates that exceptions seem far more numerous than the cases to which the presumed rule applies.

One line after stating that allocation for the thermoelectric industry is to be performed through auctioning from 2013 on, the report adds that, "in order to encourage a more efficient generation of electricity, electricity generators could, however, receive free allowances for heat delivered to district heating or industrial installations."[8]

For all other industries, several factors will influence the passage from free distribution to auctioning, which will take place gradually.

Enterprises are then told that a variable allowances quota will be distributed free of charge. The quota will differ from industry to industry and from year to year, and within the same industry in a given year, it will change from case to case.

And there is more: if the other industrialized countries do not commit to reducing emissions, and if this creates a competitive disadvantage for some European enterprises, these will be able to enjoy special free-of-charge quota assignments.

To the political uncertainties over distribution of free emission quotas is therefore added the possibility that further free quotas are assigned to the most energy-hungry enterprises according to the choices of other sovereign nations. This generates a number of questions: From whom will these further free quotas be subtracted? Or are they to delay the reduction objectives? Which energy-hungry enterprises will receive them—and in which industries?

The definition of "certainty," so much in vogue in Brussels, apparently includes as a variable the political choices of an undefined number of foreign countries over the next 12 years.

The lesser evil

If one must choose between two unnecessary evils, it is wiser to pick the lesser one. Thinking about the costs of climate strategies means thinking about their benefits as well, and therefore the opportunity of imposing binding domestic targets.

This is particularly important in light of the substantial scientific uncertainties that remain concerning the global warming phenomenon and on the high probability that the benefit question will remain politically isolated in the short term in the effort to reduce emissions.

From this stems the substantial practical uselessness of the European policies, even if they were justified, effective, and efficient, because Europe represents an important but nevertheless minor and relatively decreasing fraction of global emissions.

Strictly connected to these questions is the issue of the political feasibility of climate policies. There is virtual unanimity among experts that from the political point of view, a cap and trade system is easier to launch than a carbon tax—the direct alternative to cap and trade—as the tax regulates

prices instead of emission quantities. The European story provides evidence of that. However, the price of having a cap and trade system—the option with less political resistance—is having a system that is volatile, opaque, and arbitrary.

A carbon tax, on the other hand, at least can provide a more predictable environment to businesses while creating fewer occasions for rent-seeking or corruption, because the degree of political arbitrariness is lower with a carbon tax. From a certain point of view, therefore, the option with less political desirability due to the difficulty of garnering consensus on a tax and the need to substantially reformulate the fiscal system actually has an advantage over cap and trade. This is because the politically less-feasible option guarantees that the measure will be taken only when a truly large portion of the population is willing to pay more to obtain a certain environmental goal.

For the same reason, it will be easier to abrogate the tax—a move politically less difficult than cancelling regulations as encrusted with lobby activities as they are obscure to most people—when and if it becomes evident that the European strategy is not sustainable or that global warming is a problem less severe than what is believed today.

Before following the European example, the next US president might want to further examine this state of affairs, visit Europe, and personally see that a failing policy in Europe can hardly lead to a healthy one in America. ✦

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Bodman criticizes gasoline tax suspension pitch

Curtis Williams
OGJ Correspondent

US Secretary of Energy Samuel W. Bodman has criticized a call by both Republic Party presumptive nominee Sen. John McCain (R-Ariz.) and Sen. Hillary Clinton (D-NY) for a suspension of the 18.4¢/gal federal gasoline tax during the US summer driving season.

With record oil prices underpinning soaring gasoline prices, the two Senators have been calling for a tax waiver, but on May 13 Bodman called their suggestion nothing short of "pandering to the electorate."

Speaking to OGJ during his recent trip to Trinidad and Tobago, Bodman said of the call: "My view is that is a terrible idea. I am not running for president, and I am not pandering to the electorate, and I think that is what that is."

The energy secretary told Trinidad and Tobago's chapter of the American Chamber of Commerce that the world will remain dependent on hydrocarbons, but clearly new energy options in the form of alternative fuels and clean energy technologies are required.

He said, "In particular I would highlight the development of commercially competitive cellulosic biofuels, advanced vehicle technologies like plug-in electric hybrids, hydrogen fuel cells, solar energy (including an acceleration of the development of solar photovoltaics), high-efficiency wind power, and carbon sequestration and clean-coal technologies."

Bodman told the Chamber that the US has been aggressively funding both basic science and applied research and development to hasten the type of breakthroughs "that truly change the nature of our thinking and fundamentally alter how we produce, deliver, and use energy."

He said efforts already are bearing fruit, and he believes the effort may be his most important contribution during his 4 years as energy secretary.

"My view is that [the proposed suspension of the federal gasoline tax during the summer driving season] is a terrible idea. I am not running for president, and I am not pandering to the electorate, and I think that is what that is."
—US Secretary of Energy Samuel W. Bodman

LNG and terrorism

With Trinidad and Tobago being the largest exporter of LNG, ammonia, methanol, and urea to the US, Bodman said, the two countries must ensure that the Caribbean island nation's energy sector is protected from terrorism.

Bodman said, with this in mind, the US energy department led an interagency effort to assist Trinidad and Tobago with an LNG sector safety assessment.

"We look forward to working with the government of Trinidad and Tobago—and, as importantly, with the private sector—to develop action plans to implement the recommendations contained in the assessment," he added.

Bodman said he was embarrassed that political gridlock has led to the inability to unlock crude resources in the Arctic National Wildlife Refuge, but he does not see an end to the problem as neither side is likely to budge even though he hopes a new president and a new administration can lead to some compromise on the issue.

Bodman said he is more hopeful that there will be an increase in the construction of new LNG import terminals in the US. He said there already are more terminals being built, but he hopes they will not be limited to the Gulf Coast region.

On the question of Trinidad and Tobago's neighbor Venezuela, Bodman said President Hugo Chavez's use of energy as a political and diplomatic tool creates "a slippery slope."

"Any time you use energy or the presence of energy or the cost of energy as a diplomatic tool, I think that tends to be a slippery slope, and you tend to move in the wrong direction," he said.

While in Trinidad and Tobago, Bodman also met with Prime Minister Patrick Manning and Energy Minister Conrad Enill. ✦

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WATCHING GOVERNMENT

Nick Snow, Washington Editor

Wyoming Range leasing resisted

When the US Senate Energy and Natural Resources Committee sent 45 public land, forest, park, and water bills to the floor on May 7, the measures included closure of 1.2 million federal acres in Wyoming to future oil and gas leasing.

"Natural gas prices are up 48% over this time last year, and consumers could pay as much as $85.9 billion more for gas in 2008 vs. 2007," said Paul N. Cicio, president of the Industrial Energy Consumers of America. "At a time when every homeowner, farmer, and manufacturer is suffering from high energy costs, this is not the time for Congress to withdraw access to large amounts of natural gas."

But S. 2229 has the support of the Cowboy State's two US senators, Republicans John Barrasso and Mike Enzi; its governor, Democrat Dave Freudenthal; and many others because it involves a mountain range that is 100 miles long, 12,000 ft high, and named for the state.

It also is a bill that Barrasso's predecessor, Craig L. Thomas, was spearheading before he died on June 4, 2007. "This legislation, [which] Craig Thomas was ready to introduce the week he passed, goes to the very heart and soul of Wyoming," Barrasso said when he introduced the measure on Oct. 25.

'Simply too special'

After the bill passed the committee on May 7, Barrasso said he promised voters that he would continue Thomas's work to preserve the Wyoming Range. "I strongly support oil and gas development in our state, but I also believe that some places are simply too special to develop," he said.

Barrasso said that S. 2229 respects current leaseholders' property rights in the Wyoming Range and Bridger-Teton National Forest by allowing other parties, presumably conservation groups, to buy the leases and retire them. It does not prevent future production from current leases.

About 4,300 producing oil and gas wells in the three counties covered by the legislation and 4,399 proposed wells would not be affected, Barrasso added.

Independent Petroleum Association of Mountain States Executive Director Marc W. Smith often reminds me that IPAMS members are avid fishermen and sportsmen. So I asked for his reaction to the bill.

Abundant in energy

"IPAMS recognizes the sensitivity of the Wyoming Range and the special place it holds for the people of Wyoming. In addition to being abundant in beauty, it also is prospectively abundant in critical energy resources," he responded.

IPAMS is very concerned about removing areas from future production, he continued. It also recognizes that Barrasso made important changes in response to industry concerns. "The bill provides voluntary, not mandatory, options for leaseholders and allows for continued activity and potential growth in existing producing fields," Smith said.

The next step is to identify areas appropriate for energy development and places most critical to protect in the Wyoming Range, he said. ✦

Senate, House approve bills to suspend SPR crude oil purchases

Nick Snow
Washington Editor

The US Senate and House overwhelmingly approved bills on May 13 to suspend crude oil purchases for the Strategic Petroleum Reserve through the end of 2008 unless prices fall below $75/bbl for 90 days.

It was not clear what would happen next since the bills might need to be reconciled in a joint conference. But the margins of approval (97 votes to 1 in the Senate, 385 to 25 in the House) showed that there was more than enough support to override an anticipated presidential veto.

Discussion in both chambers emphasized that each measure was a small, but immediate, effort to reduce exceptionally high crude oil prices. "When the American consumer is being burned at the stake, his government should not be carrying wood for the fire," said Byron L. Dorgan (D-ND), who introduced the Senate bill on Feb. 6.

Republicans in the House and Senate said efforts by Democrats to put less crude in storage and more onto the open market belatedly acknowledged that supplies are important. "I want to thank the majority for bringing this bill to the floor and saying we should bring on more supplies. But we shouldn't stop at 70,000 b/d. Let's support coal-to-liquids research and opening more of the Outer Continental Shelf," said Rep. John M. Shimkus (R-Ill.).

But the Senate rejected a bill which would have done just that, as well as authorizing leasing on the Arctic National Wildlife Refuge's (ANWR's) coastal plain, by a vote of 56-to-42 immediately before it began to debate Dorgan's bill. Mary L. Landrieu (D-La.) was the single Democrat to support the measure, which Pete V. Domenici (R-NM),

the Energy and Natural Resources Committee's ranking minority member, introduced on May 1.

A gathering storm

During floor debate on his own bill, Domenici said that suspending SPR purchases while prices are so high was a good first step but hardly constituted an energy policy. "Make no mistake: A growing and gathering storm is swirling around this nation. It's centered around our dependence on foreign oil," he warned.

Democrats questioned the need to open more domestic federal tracts to the oil and gas industry when many tracts that have been leased already have not been developed. Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM) said it may be necessary to begin charging leaseholders who don't move promptly to begin drilling. "We need to get more of this domestic oil and gas out of the reserves column and into the production column," he said on May 12.

Bingaman also responded to Republican charges that Democrats have made energy a fiercely partisan issue. "The president set the tone for the debate 2 weeks ago in his Rose Garden press conference with his remarks about high oil and food prices. Unfortunately, in the time since, he has not been willing to sit down and try to develop a bipartisan strategy on either of these issues," he said.

But Majority Whip Carl M. Levin (D-Mich.) said that Congress also should be prepared to curb rampant oil market speculation, regulate energy commodity trades more closely, and tax major oil companies' windfall profits as outlined in the Senate Democrats' bill. "We can fight back against excessively high energy prices, but it will take all of our energy to do it," he said.

Republicans maintained that efforts will be futile unless domestic oil and gas production climbs. "Congress has turned a blind eye to affecting supply. All it talks about is a windfall profits tax. Let's not talk about things that won't work. Let's talk about things that will, such as increasing our domestic supplies," said Kay Bailey Hutchison (Tex.).

Pursue all options

Dorgan suggested that all options need to be pursued. "Yes, we need additional production. We need renewables. We need more energy efficiency. At least, we should increase the margin requirements for energy commodities. The fact is we have hedge funds, investment banks, and other speculators in the markets like never before," he said.

"If we keep cool heads and try to find common-sense solutions, we'll

do what needs to be done. This bill is a quick first step toward addressing higher energy prices," said Rep. Nick Lampson (D-Tex.), an early cosponsor of the House bill that Rep. Peter Welch (D-Vt.) introduced.

But Rep. Joe Barton (R-Tex.), the Energy and Commerce Committee's ranking minority member, led opposition to the measure not so much because he disagreed with its concept but because it came to the floor without going through a hearing and markup in the committee and that it arrived under suspension, which prevented its being amended.

Barton said that he also thought Welch's bill was vague because it did not specify what would happen to royalties-in-kind, which represent most of the current SPR purchases, if the measure became law. He also said that the bill would bring only enough oil onto the market to reduce gasoline prices by about 2¢/gal at the most.

Supporters responded that Congress needed to start somewhere. "The question before us today is whether taking a small step that this president, his father, and President [Bill] Clinton each took will help bring prices down. History tells us that when we've used the SPR and suspended purchases, it actually has," Welch said.

"It astonishes me to hear so many of my colleagues say it is the president's fault. Clearly, this is something we need to work on together. I've voted against opening ANWR to leasing, but I also realize that conservation and alternatives won't be enough and we'll need to produce more oil and gas elsewhere," said Rep. Christopher Shays (R-Conn.).

"There is plenty of blame to go around. This is a short-term alleviation that will give us time to take more decisive actions. This administration denied the benefits of conservation and alternatives for years, and we're paying the price now," said House Democratic Caucus Chairman Rahm Emanuel (Ill.). ✦

OTC: Dialogue with consumer groups can influence policy

Judy R. Clark
Senior Associate Editor

The oil and gas industry is headed for an energy policy "train wreck" unless it can successfully communicate with and engage the public in a way that will influence governmental actions favorable to the realistic provision of energy, said Consumer Energy Alliance Vice-Pres. Michael Whatley at the Offshore Technology Conference in Houston May 8.

"Since 1980 US demand has increased by 30%, but supply has grown by only 15%. Yet over 80% of the Outer Continental Shelf remains off-limits to oil and gas exploration and production. Even worse, only 3% of onshore federal land is available for oil and gas leasing, and more than 51% is totally off-limits for conventional leasing," he said.

America currently imports 60% of all its oil and gasoline—more than 10 million b/d of total imported petroleum and products, according to the US Energy Information Administration, with half of those imports coming from Organization of Petroleum Exporting Countries member countries.

Whatley said over the last 20 years, US imports from the Persian Gulf area alone have increased 550%. But many areas of domestic potential remain off-limits to exploration and production.

Rising costs

At the same time, "rising energy costs are the top concern among US entrepreneurs," Whatley said. The national average price of gasoline is $3.68/gal and is projected to rise to $4/gal or more this summer.

US energy demand is projected to increase over 30% in the next 20 years, he said—47% for oil and 54% for gas.

To offset the projected energy shortfall, he said, the US must develop every possible form of alternative energy, but even that won't be enough under proposed legislation.

"Even if we displace oil and gas with all the alternative forms being proposed, it would only meet 5% of all US energy demand," he said.

That means fossil fuels must continue to meet the majority of US energy needs, a fact that both the public and Congress need to better understand. The industry needs to do a better job of educating them, Whatley said.

When groups ask why prices are so high, he replies that the fault lies with "Congress, India, and China," with an emphasis on "Congress."

In the last 18 months, he said, Congress has enacted laws in a number of arenas that can and likely will adversely affect the energy industry and create obstacles to more domestic oil and gas production. There are more laws planned that can do even more harm to the industry.

Saying these actions "didn't just start" but are the product of an "extremely effective campaign by environmental groups over many years," Whatley insisted that the oil and gas industry must follow the same game plan being implemented by these groups if it is to avoid legislative policy that will damage the industry and inadvertently endanger the energy security of the US and its people.

The game plan

Tactics environmentalists employ to protect clean water, air, and endangered species, Whatley said, include

"developing consistent policy objectives and playing offense." He added, "They know what they want and they ask for it." That is important, he said. "Highly organized, they also recruit strong allies, reward 'good' behavior and punish 'bad' behavior; they lobby Congress and push the president. They give campaign donations." They don't care about blasting Democrats and Republicans alike, he said, and they also "play outside the Beltway."

Whatley said the industry must form consumer-energy alliances with powerful and influential groups such as labor unions, manufacturers, farmers, and trucker coalitions to pressure Congress for policies that will ensure the energy the country needs. This includes legislation that will help the industry provide more energy, not hinder it from finding and producing oil and gas.

Working with these groups, industry principals should strive to make sure farmers and truckers have enough energy and at reasonable cost. Having such groups say, "Our gasoline prices are too high and are affecting our livelihood and the whole economy, so you must give us access to domestic supplies" can be effective in influencing Congress, he said.

At stake is access to onshore and offshore domestic oil and gas resources, and a national energy policy that encourages use of domestic resources and decreases imports of oil and gas over the long term. ✦

Refiners' storm plans greatly improved, NPRA says

Nick Snow
Washington Editor

Refiners have greatly enhanced their storm preparation procedures in the wake of Hurricanes Katrina and Rita, reported National Petrochemical & Refiners Association Pres. Charles T. Drevna to a US Senate committee May 13.

"Almost every refinery on the Gulf Coast has performed process analyses of the time it takes to enact a full shutdown procedure, which tells how long it takes to drain the tanks of inventory to prevent leakage or fill them with water to ensure buoyancy and minimize damage to the tanks and surrounding equipment," he said in written testimony submitted to the Senate Energy and Natural Resources Committee.

Facilities monitor the projected path of each storm during hurricane season and react accordingly, with different levels of reaction depending on how far the storm is out to sea, he continued. "The process is based on the idea of a trip wire: If it takes a plant 36 hours to empty its tanks of inventory and fill them with water, and if the plant is in the storm arc 36.5 hours out, shutdown procedures are enacted," he said.

Drevna testified at a hearing to examine climate-change impacts on the reliability, security, economics, and design of critical energy infrastructure in coastal regions. "A significant portion of our nation's critical energy infrastructure is concentrated in coastal areas that are vulnerable to natural hazards and changes in climate. This infrastructure forms the heart of a nationally and globally interdependent energy system," committee chairman Jeff Bingaman (D-NM), said in his opening statement.

'Absolutely appropriate'

While meteorologists have questioned whether storm intensity and global climate change are related, it's "absolutely appropriate" to discuss refiners' efforts to protect infrastructure from the elements, Drevna said. "Katrina and Rita severely damaged the region's infrastructure and economy, to say nothing of the tragic loss of life and displacement of residents. The refining industry was not spared the effects, yet we responded quickly and effectively to the dangers and challenges posed by these storms," he told the committee.

No major, long-lived transportation fuel shortage occurred despite serious damage because the federal government temporarily waived regulatory requirements and released oil from the Strategic Petroleum Reserve, and because oil producers, pipelines, and refiners and their employees worked hard to bring important assets back into service quickly, he continued.

Refiners first determined that employees and their families were safe, he said. Many provided shelter, supplemented housing allowances, and loans. "Indeed, many plants that were 'shut-in' had employees live on site for several weeks," Drevna said, noting that Valero Energy Corp.'s plant in Port Arthur, Tex., housed more than 1,000 of its workers while it was being brought back on-line.

Refiners also temporarily expanded their workforces at affected installations by bringing in employees from other plants as well as contractors, he said. "Restarting a plant is more complex and potentially dangerous than normal operations because it involves increased heat and pressure. Consequently, restarting a refinery requires additional workers to monitor and perform necessary procedures," he explained.

In addition to restoring operations at damaged plants, to meet demand, refiners also worked to increase production at installations that had not been damaged, Drevna said in his written testimony. "For many plants, this meant delaying planned maintenance in order to continue production. Refineries typically perform scheduled maintenance throughout the year in order to maintain and repair equipment, but in the wake of Hurricanes Katrina and Rita many delayed this so they could supplement reduced refining capacity," he said. ✦

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

A shamrock or shillelagh?

Believe it or not, in Ireland's County Mayo they're still arguing over the route of the pipeline Shell E&P Ireland wants to construct from offshore Corrib gas field (OGJ, Nov. 20, 2006, p. 30).

Shell E&P Ireland has applied for direct planning permission to build a rerouted pipeline for the Corrib gas project in north Mayo. But Shell's application has stirred bitter opposition from some sections of the local community.

According to local reports, Shell has sought planning permission for the construction of a 92.6 km gas pipeline, of which 9.2 km will be onshore. The gas field is 3,500 m below sea level. This follows a 12-month public consultation process, which led to a new route being proposed.

The original route was designed in 2000. The application was made directly to An Bord Pleanala, or National Planning Board, as the project is thought to involve strategic infrastructure. That means Shell E&P Ireland has bypassed the local authority.

Rossport Five again

While the new proposed route is similar, in parts, to the original route, the main differences are that it now passes through an area of commonage—of which two of the previously jailed Rossport Five protesters are shareholders (OGJ Jan. 15, 2007, p. 40).

The proposed pipeline also will raise the eyebrows of environmentalists as it crosses under the seabed of Broadhaven Bay, an area of conservation under European Union law.

Local resident and Shell to Sea activist John Monaghan said residents in the area still have major concerns about the new route.

Monaghan said Shell's contractors are planning to drill at the foot of Dooncarton—a site of recent landslides which required evacuation of villagers—and they want to route it under special areas of conservation that are habitats for protected species.

He also said the pipeline is being built to withstand a pressure of 144 bar—three times what an average Gas Board pipeline is built for—and it crosses under public roads in three places near Rossport.

Concerns rejected

A Shell spokeswoman rejected the concerns voiced by the Shell to Sea group about the proposed pipeline, saying that it is twice the distance to dwellings and is half the pressure of the previous line.

A week or so ago, Shell rejected a plan by seven Rossport residents—and three local priests who helped mediate between the two sides—to move the current gas terminal at Bellanaboy, north Mayo, to the more rural area of Glinsk, near Belderrig, north Mayo.

So far, Shell E&P Ireland has spent more than €200 million on the project, and one third of its gas processing terminal is already built. According to Shell, about 600 people are employed on the site, and 40% of these are from the surrounding areas.

About the only thing Shell E&P Ireland needs now is a shamrock or, maybe, a shillelagh. ✦

OTC: Natural gas hydrates research active, promising

Paula Dittrick
Senior Staff Writer

Methane hydrates research has made unexpected strides since 2000, but technical and economic obstacles have to be resolved before hydrates production can be proved feasible, a speaker told the Offshore Technology Conference in Houston on May 8.

Brad Tomer, director for the Strategic Center for Natural Gas and Oil within the US Department of Energy, credited recent successful research to what he called "aggressive" international collaboration research and development efforts.

"We haven't done long-term productivity tests yet," Tomer said during his luncheon speech. "This is very young research and development...we've got a lot to learn." Hydrates also were discussed at separate technical sessions at OTC.

The US Geological Survey's Energy Resources Program has said the world's gas hydrates accumulations exceed the volume of known conventional gas resources.

Tomer said the question remains as to whether industry can economically produce those resources. It's estimated the US gas hydrates resources could total 200,000 tcf of gas in place and that world hydrates resources could total about 700,000 tcf of gas in place.

Tomer said he is optimistic that hydrates production can be demonstrated on a commercial scale by 2020, and that commercial production possibility could get under way by 2025.

Japan might have the most active hydrates research program, Tomer said, adding that other countries with research programs are India, China, South Korea, Canada, and the US. ✦

COMPANY NEWS

EnCana plans split into separate oil, gas companies

The board of Canadian oil and natural gas company EnCana Corp. has approved a proposal to split along distinct business lines—oil and gas—to create two Calgary-based energy firms.

In other recent company news:

• In what could be the biggest takeover in Australian resources history, UK-based BG Group has made a $13 billion (Aus.) bid for major oil, gas, and electric power group Origin Energy Ltd., Sydney.

• Perth-based Arc Energy Ltd. is to merge with Australian Worldwide Exploration, Sydney, to form an entity with a market capitalization exceeding $2 billion (Aus). The new company will have a portfolio of interests on and offshore holding proved and probable reserves of more than 78 million boe.

• Stone Energy Corp. will acquire and then merge with Bois d'Arc Energy Inc. of Houston, in a cash and stock deal valued at $1.65 billion, the Lafayette, La.-based independent reported. Including debt, the companies value the deal at $1.8 billion.

• Total SA will pay $480 million (Can.) for Synenco Energy Inc. to acquire a 60% stake in and operatorship of the Northern Lights Canadian heavy oil project in Alberta's Athabasca region.

EnCana forms IOCo, GasCo

EnCana's split will create a publicly traded, fully integrated oil company, with a working name of IntegratedOilCo (IOCo), which will focus on EnCana's Canadian oil sands assets and refinery interests in the US, underpinned by an established gas and oil production base in Alberta and Saskatchewan, the company said. IOCo assets, which will encompass EnCana's Integrated Oil Division and Canadian Plains Division, represent about one third of EnCana's current production and proved reserves. The permanent name of IOCo will be determined before the transaction closes.

The other company, with a working name of GasCo, will encompass EnCana's Canadian Foothills Division, USA Division, Offshore and International Division, and midstream assets "to form a pure-play gas company aimed at growing existing high-potential resource plays in Canada and the US," the company said. GasCo will represent about two thirds of EnCana's current production and proved reserves.

It is expected that GasCo will retain the EnCana Corp. moniker.

"This transaction is designed to enhance long-term value for EnCana shareholders by creating two highly sustainable, independent entities, each with an ability to pursue and achieve greater success by employing operational strategies best suited to its unique assets and business plans," the company said.

EnCana shareholders are to receive one share in each of IOCo and GasCo for each share of EnCana held. The split is expected to be completed in early 2009.

IOCo's assets

IOCo's asset base will include EnCana's two producing upstream Alberta oil sands areas—Foster Creek and Christina Lake—and two refineries at Wood River, Ill., and Borger, Tex.

Upstream, construction is under way to increase production capacity more than 200% to an estimated average of about 110,000 net b/d of oil by 2012. Current production is about 30,000 net b/d.

In October 2006, EnCana announced it had entered into an agreement with ConocoPhillips to create an integrated oil business. At that time, independently determined best estimates of recoverable bitumen for Foster Creek and Christina Lake were disclosed at more than 6.5 billion bbl and more than 2.5 billion bbl for Borealis, which is not part of the joint venture with ConocoPhillips.

"As a result of today's announcement, the greater focus on the in-situ oil sands assets of IOCo and given that IOCo will have all of its upstream operations in Western Canada, it is anticipated that EnCana will be reviewing the need to report the in-situ resources and other assets to be held by IOCo under the standards required by Canadian securities regulatory authorities," the company said.

"Over the next decade, IOCo's target as part of the integrated oil sands joint venture with ConocoPhillips is to increase gross upstream bitumen production from Foster Creek and Christina Lake to 400,000 b/d (200,000 b/d net to IOCo) and downstream refining capacity to about 510,000 b/d (255,000 b/d net to IOCo)," the company said.

IOCo's well-established shallow-gas resource plays in Alberta "are capable of providing strong cash flow to help grow production from its high-quality oil sands resources," the company said.

IOCo's designated assets were producing about 100,000 b/d of oil and natural gas liquids and about 925 MMcfd of gas, while the refinery assets were processing about 225,000 b/d of net oil.

GasCo assets

Separately, GasCo is expected to become the second-largest gas producer in North America, the company said. The company will hold plays in key basins in Alberta, British Columbia, Wyoming, Colorado, Texas, Louisiana, and off Nova Scotia.

GasCo will hold the company's portfolio of gas resource plays: coalbed methane and Bighorn in Alberta, Cutbank Ridge and Greater Sierra in British Columbia, Jonah in Wyoming, Piceance in Colorado, and Fort Worth and East Texas plays in Texas.

In addition to these established plays, operating teams recently achieved some promising exploration results in a number of North American shale plays, such as Horn River in British Columbia and the Haynesville shale in Louisiana, plus the Mannville CBM play in central Alberta, the company said.

GasCo also will hold EnCana's remaining international interests and midstream assets. It will target a production growth rate of 7-9%/year, the company said.

EnCana, which has an enterprise value of about $75 billion, employs about 6,500 people, 500 of whom work in Calgary. The company was formed in 2002 by a merger between PanCanadian Energy Corp. and Alberta Energy Co.

BG to buy Origin

BG offered to acquire all shares in Origin at a cash price of $14.70 (Aus.)/share, which is a 40% premium on the previous closing price of $10.47/share. The offer values the Australian integrated energy entity at just under $13 billion. Just prior to the bid, Origin had a market capitalization of $9.2 billion.

Origin acknowledged the bid, but said further discussions must take place that may or may not lead to an agreed transaction. The bid also is subject to approvals from shareholders, Australia's ACCC, and Foreign Investment Review Board.

The BG bid is second in the energy resources industry only to Shell's ultimately failed attempt to take over Woodside Petroleum in 2001 for $10 billion.

Origin is Australia's second largest energy retailer, with an extensive portfolio of gas-fired and renewable electric power plants, gas transmission pipelines, and shares in onshore and offshore gas production—notably Bass basin in Tasmania and Otway basin in Victoria. It also has some 2,570 petajoules of 2P coal seam methane (CSM) reserves in southeast Queensland.

In New Zealand, Origin controls electricity retailer Contact Energy, which supplies 27% of New Zealand's electricity needs.

Supporting its interest in Australian CSM, BG Group also is securing a 9.9% share in Brisbane-based Queensland Gas Co. (QGC) and a 20% stake in QGC's CSM acreage in the Surat-Bowen basin of southeast Queensland.

BG and QGC plan to jointly develop a 3-4 million tonne/year LNG plant on Curtis Island near Gladstone based on CSM reserves. The plan is to bring gas into Gladstone via a 380 km pipeline to feed the $8 billion plant initially flagged at having one train, but with potential to expand to three trains.

BG may also invest in Santos' proposed CSM-fed LNG plant in Gladstone. It is touted as a potential predator for Santos once the 15% shareholding cap is removed later this year. However, if BG acquires Origin, the Australian Competition and Consumer Commission (ACCC) won't allow it to move on Santos as well.

PERSONNEL MOVES AND PROMOTIONS

Dragon Oil appoints chief executive officer

Dragon Oil PLC has appointed **Abdul-Jaleel Al-Khalifa** as chief executive officer.

Al-Khalifa brings to Dragon Oil 23 years of leadership and technical experience in exploration and petroleum engineering. He joins the company from Saudi Aramco, where he managed a range of departments for 12 years while based in Dhahran.

Hussain M. Sultan, current Dragon Oil chairman and chief executive officer, will continue in the role of executive chairman.

Other moves

Chevron Corp. has promoted **Melody Meyer** to president of Chevron Energy Technology and **Louie Ehrlich** to president and chief information officer (CIO) of Chevron Information Technology, effective June 1.

Meyer currently is vice-president of the Gulf of Mexico strategic business unit in Covington, La. During her career, she has held operating management assignments in Kazakhstan and Angola and senior positions in Chevron's North America upstream organization, including vice-president of the Midcontinent business unit in Houston.

Ehrlich joined Chevron in 1981 as a programmer-analyst in New Orleans, La. He has held several senior roles, including CIO for Chevron's downstream marketing business. Ehrlich currently is vice-president of services and strategy and CIO for global downstream.

Occidental Petroleum Corp. has announced the election of **William E. Albrecht** as president of its Oxy Oil & Gas USA subsidiary.

Separately, **Todd A. Stevens** will succeed Albrecht in his formerly held position as Oxy Oil & Gas vice-president, California operations.

Prior to this promotion, Stevens has held a series of finance roles during his 13-year career at Oxy.

Marathon Oil Co. has appointed **Annell R. Bay** as senior vice-president, exploration, effective June 23. Bay will succeed **Philip G. Behrman**, who will retire July 1.

Bay has served as vice-president, exploration, at Shell Exploration & Production Co. since 2004.

Houston-based Striker Oil & Gas Inc. (formerly Unicorp Inc.) has named **Robert G. Wonish** to serve as the company's president and chief operating officer.

Wonish has more than 32 years of experience in the oil and gas industry.

Most recently, Wonish served during 2007-08 as president and chief operating officer of Petroleum Engineers Inc. He also has held positions at Panaco Inc. and Amoco Production Co.

Royal Dutch Shell PLC has appointed **Mark Quartermain** president of Shell Energy North America LP (SENA) and Shell Energy North America Inc. as well as head of Shell Energy Trading Ltd.'s leadership team, effective May 1.

Quartermain currently serves as SENA senior vice-president, south region. He joined Shell in 1983 and has extensive experience within Shell Energy Trading's network, having worked in key positions within the crude, products, and risk management groups. Quartermain also helped establish Shell's European gas trading activities.

Rex Energy Corp. has appointed **James Watson** vice-president of drilling for its Appalachian basin region.

Watson will manage the company's drilling programs, including its Marcellus shale drilling activities. Before joining Rex, Watson served as Range Resources Corp.'s manager of drilling for Appalachia shale.

Watson has more than 18 years of experience in drilling for oil and gas in the Appalachian basin.

Mariner Energy Inc. has promoted **Mike McCullough** to vice-president, acquisitions and divestitures, and **Ken Moore** to vice-president, onshore land.

McCullough joined Houston-based Mariner in 2004 as senior reservoir engineer and was promoted to manager, exploitation and acquisitions, in 2006 before taking on his current responsibilities.

Moore began his career at Mariner in 2003. He was named business development manager, onshore, in 2004.

Gold Point Energy Corp., Vancouver, BC, has named **Kevin Allison** vice-president, exploration.

Allison is a petroleum explorationist with 30 years' experience in North American and international geological and geophysical prospecting. He has worked in 26 countries, including Delta Petroleum Corp., Pangaea Energy Corp., Apache International, Hunt Oil Co., Phillips Petroleum Co., and Texaco Inc.

Gold Point Energy is developing energy projects in North and South America.

Harvest Natural Resources Inc. has appointed **Patrick R. Oenbring** vice-president, western operations.

Oenbring has 34 years of experience in the oil and gas business in both technical and management positions.

Before joining Harvest, Oenbring was chief operating officer for Cygnus Oil & Gas Co. He also has served as senior project manager for Technip Offshore Inc. and president and general manager of Occidental Petroleum of Qatar.

Arc, AWE merger

There also will be the creation of a new publicly listed exploration company called Buru Energy Ltd. that will hold Arc's Canning basin onshore exploration and production assets in Western Australia. AWE will hold 15% of Buru through Arc.

The merger is subject to approval by Arc shareholders and various court approvals.

The combined portfolio will contain AWE's share of the Tui oil field off New Zealand, the Yolla field in the Bass basin of Tasmania, and the Casino gas field in the Otway basin off western Victoria as well as Arc's onshore Perth basin oil and gas fields. Both companies already had interests in the offshore Perth basin Cliff Head oil field.

AWE's managing director Bruce Wood will remain in that position within the merged entity while Arc's managing director Eric Streitberg will be invited to join the AWE board as a nonexecutive director. Streitberg also will become chairman of the new Buru Energy.

The timetable for the transaction began with the signing of the merger implementation agreement on Apr. 24 and will lead through various court hearings and approvals to a final implementation date scheduled for mid-August.

Stone, Bois d'Arc merge

Bois d'Arc Energy is a 49% subsidiary of Comstock Resources Inc., Frisco, Tex., which has entered into a stockholder agreement to vote in favor of the deal.

Stone said the acquisition and merger will create one of the largest oil and gas companies in the US, with operations focused mainly in the Gulf of Mexico.

When the deal closes, expected in the third quarter, Stone expects to produce about 300 MMcfd of gas equivalent and to have more than 700 bcf of gas equivalent in proved reserves.

Total, Northern Lights

Northern Lights, which is 100 km northeast of Fort McMurray, is estimated to hold 1.08 billion bbl of bitumen that would be recovered using mining technologies.

Total will work with China Petroleum & Chemical Corp. (Sinopec), which holds the remaining 40% stake in Northern Lights.

"An application for the mining development of the Northern Lights project was submitted to the Alberta authorities in mid-2006 and is being reviewed," Total said. The added asset will strengthen Total's presence in the Athabasca region, the company said.

Total spokeswoman Patricia Marie told OGJ that the group was considering upgrading the bitumen recovered from its three fields in Canada—Surmont, Joslyn, and now, Northern Lights—using a single upgrader. It currently has an upgrader project planned for Joslyn, but could consider drawing a maximum of synergies from the three fields, which lie near each other. ✦

Method is alternative to soil gas for detecting seepage anomalies

James M. Fausnaugh
Geotech.org
Littleton, Colo.

Through the years, many geochemical methods have been developed for the detection of near surface hydrocarbon seepage anomalies. The methods most often used require the capture and analysis of gas phase hydrocarbons. This has proven to be difficult and expensive, requiring the use of special drilling rigs and sample containers.

Other methods, usually termed as indirect, have the ability to detect hydrocarbons but are less frequently used due to the incorrect assumption they do not directly detect seepage anomalies.

Methods are now available that directly detect hydrocarbons but do not require gas capture or special sampling tools.

GC detection

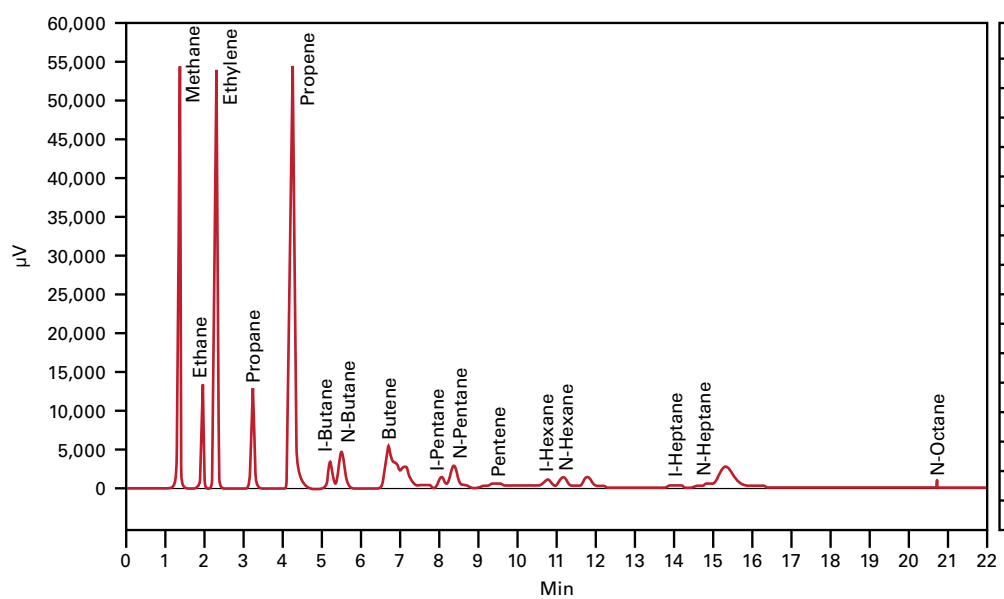
Near surface geochemical exploration is the application of measurements of alteration products in soils, bottom sediments, or the water column, to detect and delineate hydrocarbons seeping from an oil and gas reservoir. Surface geochemical techniques are dependent upon some degree of leakage from a subsubsurface oil and gas reservoir.

Devolatilization and thermal degradation of oils produce a continual leakage of light hydrocarbon components from the reservoir. All viable methods of surface geochemistry depend on various mechanisms of hydrocarbon migration from the reservoir, with a primary vertical vector with no lateral dispersion.[1]

Gas chromatography, which is the primary method of soil gas analysis, is an instrumental method for the separation and identification of chemical compounds. A sample is introduced into a heated injector, carried through a separating column by an inert gas, and is detected as a series of peaks on an output device as the gas components leave the column. Each component of the gas mixture reaches the detector at a different time and produces a signal at a characteristic retention time. The area under the peak is related to the concentration of that component in the sample (Fig. 1).

TYPICAL GAS CHROMATOGRAM OF SOIL HYDROCARBONS

Fig. 1

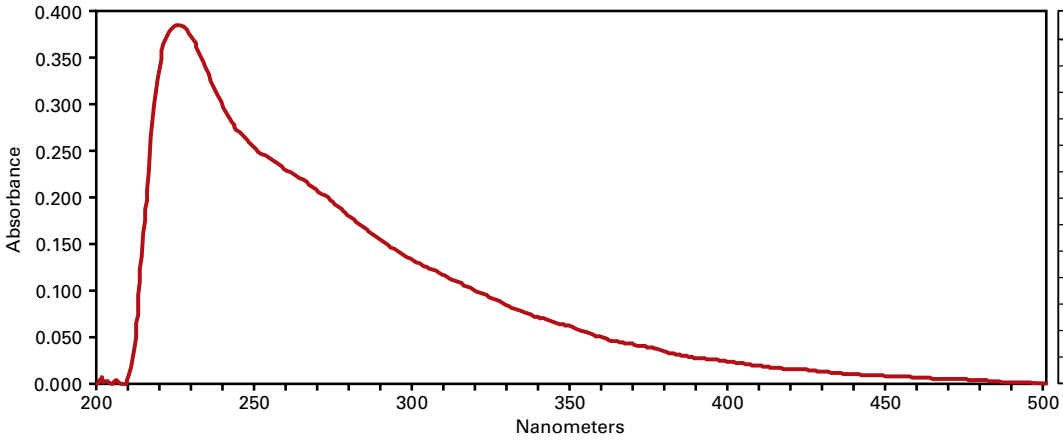


Hydrocarbon, parts per billion	
Methane	184890
Ethane	19883
Ethylene	95680
Propane	18867
Propene	107828
I-Butane	4952
N-Butane	7321
Butene	19132
I-Pentane	2140
N-Pentane	4660
Pentene	2271
I-Hexane	1579
N-Hexane	2382
I-Heptane	511
N-Heptane	768
N-Octane	125

The chromatogram is read from left to right with increasing molecular weight towards the right. Methane is therefore much lighter than n-Octane. Hydrocarbon concentration tends to decrease with increasing molecular weight.

UV-VIS SPECTRUM OF SOIL HYDROCARBONS

Fig. 2

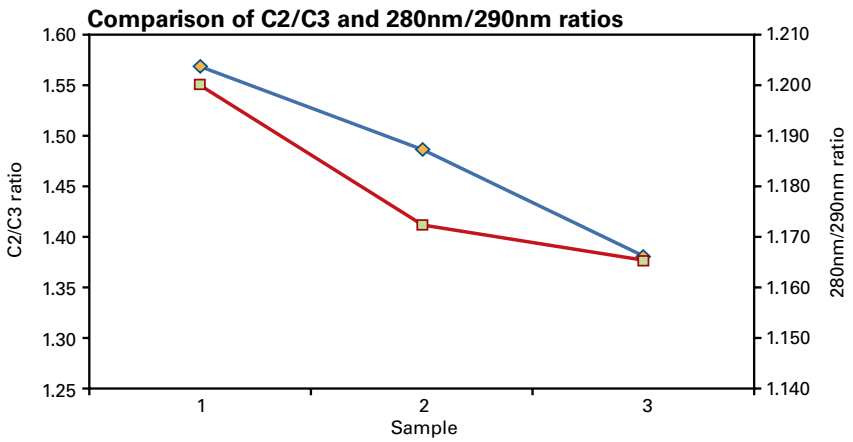


Wavelength	Absorbance
230	0.37051
240	0.29571
250	0.25201
260	0.22841
270	0.20591
280	0.17901
290	0.15321
300	0.13191
310	0.11541
320	0.09901
330	0.08354
340	0.07045
350	0.06085

The intensity of the spectrum is greatest in the ultraviolet range and decreases toward the visible light range. Unless the solution has color, little curve detail is expected above 350 nanometers. UV-Vis spectroscopy measures a myriad of saturated, unsaturated, and ring-shaped hydrocarbons in solution that are represented by an absorbance value at each wavelength.

DIRECT RELATIONSHIP OF RATIOS

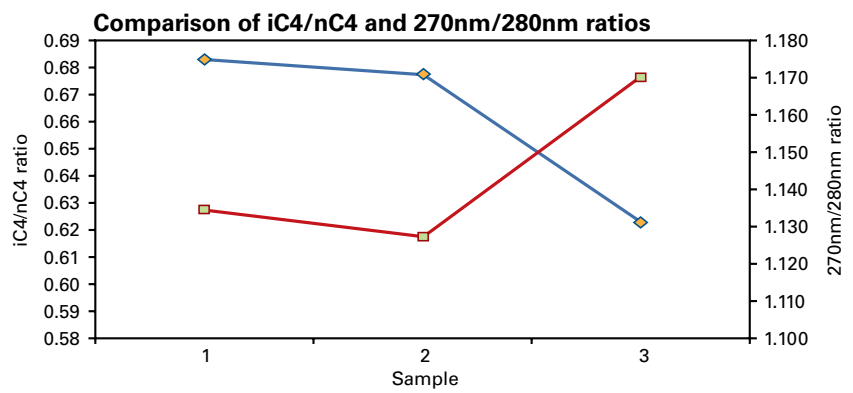
Fig. 3



The graph shows the direct relationship of the C2/C3 and 280nm/290nm ratios. These ratios can be used to characterize a seepage anomaly. For instance, Sample 1 has a higher gas content than Sample 3, which appears oilier.

INVERSE RELATIONSHIP OF RATIOS

Fig. 4



The graph shows the inverse relationship between the iC4/nC4 and 270nm/280nm ratios. These ratios can be used to determine the maturity of the hydrocarbons associated with the seepage anomaly. The iC4/nC4 values are less than one, indicating mature hydrocarbons with Sample 1 being less mature than Sample 3. The 270nm/280nm ratio shows the same relationship, though greater maturity is indicated by increasing values.

UV alternative

Ultraviolet-Visible light spectroscopy offers an alternative to gas chromatography.

A UV-Vis spectrophotometer measures the intensity of light passing through a sample and compares it to the intensity of the light before it passed through the sample. The ratio of the before and after measurements is called transmittance and is usually expressed as a percentage (%T). Absorbance, A, is based on the transmittance using the relationship $A = -\log(\%T)$.

Samples for UV-Vis spectroscopy are most often liquids placed in a transparent cell known as a cuvette. Cuvettes are typically rectangular in shape, commonly with an internal width of 1 cm (Fig. 2).

UV-Vis spectroscopy measures hydrocarbons that are soluble in water without the need to measure associated gases. Rather than measure hydrocarbon gas in parts per million (ppm) or parts per billion (ppb), UV-Vis spectroscopy measures the soluble hydrocarbon concentration in absorbance units.

Absorbance is directly proportional to the path length (cell width) and the concentration of the absorbing chemical species. The resulting peak height, or intensity, is analogous to concentration. Also, different molecules absorb radiation of different wavelengths.

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An absorption spectrum will show a number of absorption bands corresponding to structural groups within the molecule. Instead of measuring light hydrocarbon gases such as methane, ethane, and propane, UV-Vis spectroscopy measures a myriad of saturated, unsaturated, and ring-shaped hydrocarbons in solution, which are represented by an absorbance value at each wavelength. When mapped, the absorbance value, which represents hydrocarbon concentration, reveals reservoir seepage anomalies at the earth's surface.

CORRELATION MATRIX*

Table 1

Wavelength, nm	Methane	Ethane	Propane	I–Butane	N-Butane
NM_260	–0.02829	–0.08658	–0.07352	–0.01173	–0.06049
NM_270	–0.04074	–0.34298	–0.04212	0.19991	–0.04534
NM_280	0.03918	0.68863	–0.03853	–0.55372	0.01037
NM_290	0.13951	0.68917	0.04477	–0.45818	0.08069
NM_300	0.11466	0.60382	0.01699	–0.42884	0.05085
NM_310	0.09903	0.55853	0.00172	–0.41344	0.03393
NM_320	0.09155	0.53134	–0.00595	–0.40011	0.02378
NM_330	0.08444	0.51607	–0.01125	–0.39231	0.01487
NM_340	0.07455	0.49807	–0.01669	–0.38353	0.00649
NM_350	0.05755	0.48183	–0.02850	–0.38015	–0.00909

Hydrocarbon	Mean	Min.	Max.
Methane	69	43	100
Ethane	4.6	2.3	8.6
Propane	6.7	3.0	12.9
I-Butane	6.8	1.5	30.1
Butane	2.9	1.5	5.9

*of hydrocarbon homologs and UV-Vis hydrocarbons with low concentrations. Red numbers indicate higher positive and negative correlations. Ethane and i-butane show some correlation. The accompanying table indicates lower hydrocarbon concentrations in parts per million.

The electrons responsible for absorption of ultraviolet and visible radiation by organic molecules are of two types: 1) those that participate directly in bond formation and are associated with more than one atom and 2) nonbonding or unshared outer electrons that are largely localized around atoms of oxygen, the halogens, sulfur, and nitrogen.[5]

The wavelength at which an organic molecule absorbs energy depends upon how tightly its various electrons are bound. The shared electrons in single bonds, such as carbon-carbon or carbon-hydrogen, are firmly held and their excitation requires more energy, which is found in the wavelengths less than 180 nm.

Certain nonbonding electrons such as the unshared electrons in sulfur, bromine, and iodine are less energetic than the shared electrons of a saturated bond. Organic molecules containing these elements exhibit useful peaks in the UV region. Electrons making up double and triple bonds in organic molecules are relatively easily excited by radiation so species containing unsaturated bonds generally exhibit useful absorption peaks.[3 5]

Use in exploration

UV-Vis spectroscopy is well suited as an oil and gas exploration tool due to its ability to provide a large amount of data relating to the complex chemistry of the milieu being investigated, specifically the near surface soils.

Vertically seeping hydrocarbons react with soil organic matter (SOM) which alters the SOM within a seep relative to the background SOM. Various biological processes help integrate free reservoir related hydrocarbons into the SOM. Condensation and addition chemical reactions provide the pathways.

Any of the soil hydrocarbons can be altered, with the primary ones being humic acids, fulvic acids, carbohydrates, and proteins. X-ray analysis, electron microscopy, and viscosity measurements of fulvic acids indicate a relatively open, flexible structure perforated by voids of varying dimensions. These voids can trap or fix organic and inorganic compounds that fit into the voids, provided the charges are complimentary.[4]

Many of the phenomena measured in near surface soils to detect seepage anomalies are regulated by the various components of humic and fulvic acids. These include the movement of halogens, fragmentation and integration of aliphatic and aromatic hydrocarbons, pH

CORRELATION MATRIX*

Table 2

Wavelength	Methane	Ethane	Propane	N-Butane	N-Pentane	I-Butane	I-Pentane	Ethylene	Propene	Butene
NM_230	0.90911	0.51907	0.60280	0.54442	0.53279	0.58388	0.40730	0.82495	0.60216	0.49620
NM_240	0.92049	0.54296	0.62505	0.56785	0.55643	0.60653	0.43288	0.84055	0.62442	0.52047
NM_250	0.91786	0.53735	0.61983	0.56235	0.55088	0.60122	0.42687	0.83692	0.61920	0.51477
NM_260	0.91362	0.52843	0.61152	0.55359	0.54204	0.59276	0.41730	0.83110	0.61089	0.50570
NM_270	0.92580	0.55452	0.63578	0.57918	0.56787	0.61747	0.44531	0.84796	0.63517	0.53223
NM_280	0.93989	0.58668	0.66551	0.61065	0.59966	0.64779	0.48002	0.86806	0.66492	0.56497
NM_290	0.94424	0.59713	0.67514	0.62087	0.60998	0.65762	0.49136	0.87443	0.67455	0.57562
NM_300	0.95486	0.62398	0.69976	0.64709	0.63650	0.68278	0.52060	0.89038	0.69919	0.60301
NM_310	0.96023	0.63844	0.71296	0.66119	0.65077	0.69628	0.53643	0.89871	0.71240	0.61778
NM_320	0.96542	0.65311	0.72630	0.67548	0.66523	0.70994	0.55254	0.90697	0.72575	0.63277
NM_330	0.96664	0.65668	0.72953	0.67895	0.66875	0.71326	0.55647	0.90895	0.72899	0.63642
NM_340	0.96796	0.66060	0.73309	0.68277	0.67262	0.71690	0.56080	0.91111	0.73255	0.64044
NM_350	0.96890	0.66342	0.73564	0.68551	0.67540	0.71952	0.56391	0.91265	0.73510	0.64332

Hydrocarbon	Mean	Min.	Max.
Methane	145	119	185
Ethane	16	13	20
Ethylene	72	60	95
Propane	14	11	18
Propene	78	55	108
I-Butane	3.5	2.4	4.9
N-Butane	5.5	3.9	7.3
Butene	12.3	6.3	19.1
I-Pentane	1.5	0.8	2.1
N-Pentane	3.2	1.9	4.7

*of hydrocarbon homologs and UV-Vis hydrocarbons. Red numbers indicate significant positive correlations. The accompanying table indicates moderate hydrocarbon concentrations in parts per million. Methane, propane, i-butane, ethylene, and propene show some correlation.

buffering, oxidation-reduction reactions, cation exchange capacity, carbonate deposition, and the presence and growth of soil flora and fauna.[6]

One favorable aspect of the UV-Vis hydrocarbon analysis is that soil samples are acquired from the very near surface with a small shovel or garden trowel. This eliminates the need for portable drilling equipment or gathering samples at depth. It also allows for proper sample location integration; a single sample is made up of several sample points at one location. Because the gas phase is not a requisite for analysis, sample preparation consists of air drying and sieving. This leads to better reproducibility and nominal data leveling from survey to survey.

CORRELATION MATRIX*

Table 3

Wavelength	Methane	Ethane	Propane	N-Butane	N-Pentane	I-Butane	I-Pentane	Ethylene	Propene	Butene
NM_230	0.73462	0.89385	0.80497	0.86465	0.49558	0.34798	0.20730	0.69492	0.51680	0.69673
NM_240	0.78547	0.93462	0.88179	0.93002	0.58993	0.44596	0.29171	0.79330	0.64014	0.79148
NM_250	0.79172	0.94253	0.88696	0.93743	0.58651	0.44702	0.28639	0.80894	0.64808	0.80761
NM_260	0.80004	0.93779	0.88166	0.92915	0.56470	0.43135	0.27056	0.78914	0.61899	0.78690
NM_270	0.80294	0.92566	0.87351	0.91730	0.54768	0.42193	0.26395	0.76580	0.58813	0.76119
NM_280	0.80522	0.92483	0.87098	0.91501	0.53979	0.41589	0.25814	0.75776	0.57575	0.75462
NM_290	0.80752	0.92750	0.87049	0.91536	0.53431	0.40997	0.25053	0.75592	0.57195	0.75361
NM_300	0.80925	0.92418	0.86936	0.91242	0.52989	0.40934	0.24880	0.75467	0.57095	0.75112
NM_310	0.80907	0.92149	0.86315	0.90664	0.51657	0.39801	0.23735	0.74253	0.55489	0.74028
NM_320	0.80761	0.92179	0.86344	0.90811	0.51994	0.40005	0.24084	0.74136	0.55209	0.73897
NM_330	0.80890	0.91790	0.86455	0.90701	0.52091	0.40526	0.24531	0.74177	0.55483	0.73675
NM_340	0.80928	0.91598	0.86069	0.90182	0.51137	0.39721	0.23638	0.73791	0.55175	0.73438
NM_350	0.80879	0.91349	0.85846	0.89856	0.50728	0.39449	0.23309	0.73712	0.55184	0.73317

Hydrocarbon	Mean	Min.	Max.
Methane	175	54.5	538
Ethane	11.2	3.9	40.5
Ethylene	76.9	45	129
Propane	15.4	4.0	44.7
Propene	136	60	211
I-Butane	10.2	1.4	39.0
N-Butane	6.8	1.7	24.6
Butene	94	32.6	171
I-Pentane	5.1	0.5	21.0
N-Pentane	3.3	1.4	8.4

*of hydrocarbon homologs and UV-Vis hydrocarbons. Red numbers indicate significant positive correlations. The accompanying table indicates high hydrocarbon concentrations in parts per million. Methane, ethane, propane, n-butane, ethylene, and butene show correlation.

CORRELATION MATRIX*

Table 4

UV-Vis ratios	Methane, %	C_3/C_1 x 1,000	C_2/C_3	iC_4/nC_4	C_1/C_2	C_1/C_3	C_1/C_4	C_1/C_5
230/240	0.0889	–0.0277	–0.1722	0.1002	0.0753	0.0197	0.0754	0.0144
240/250	0.1381	–0.1653	0.0917	–0.2100	0.0142	0.1516	0.2586	–0.1361
250/260	–0.1427	–0.0259	0.4030	–0.2580	–0.3008	–0.0467	–0.1144	–0.2582
260/270	–0.0444	–0.1273	0.4486	–0.3319	–0.2513	0.0612	–0.0274	–0.1333
270/280	–0.0421	–0.1456	0.4888	–0.3792	–0.2675	0.0747	0.0102	–0.1763
280/290	0.0198	–0.1704	0.4341	–0.3310	–0.1978	0.1245	0.0611	–0.0926
290/300	–0.0405	0.1578	–0.3574	0.2637	0.1406	–0.1264	–0.0466	0.0008
300/310	–0.0995	0.1023	–0.0960	0.0548	–0.0284	–0.1231	–0.0880	–0.1344
310/320	–0.0238	–0.0129	0.0185	–0.0320	–0.0528	–0.0348	–0.0444	–0.0897
320/330	–0.0591	–0.0417	0.1860	–0.1838	–0.1496	–0.0224	–0.0820	–0.1178
330/340	0.0393	0.0749	–0.2342	0.2141	0.1552	–0.0055	0.0984	0.0471
340/350	0.0491	0.0556	–0.2235	0.1827	0.1409	0.0024	0.1314	–0.0140

*of standard hydrocarbon ratios and UV-Vis ratios of wavelengths. Red numbrers indicate significant positive and negative correlations. This comparison is of anomalous hydrocarbon data from the Appalachians in the eastern US.

Hydrocarbons are often used to characterize seepage anomalies and the reservoirs associated with them. This is accomplished using ratios of the various hydrocarbon homologs. There is potential for hydrocarbon characterization with UV-Vis hydrocarbon analysis. Because the absorbance numbers at each wavelength indicate hydrocarbons then the ratios of the wavelengths may indicate various hydrocarbon characteristics.

High correlations

Comparisons of UV-Vis absorbance data and conventional gas chromatography (GC) measurements yield a very high correlation.

As the concentration of the hydrocarbon gas homologs increases so does the corresponding intensity of the absorbance. Hydrocarbons analyzed by GC and UV-Vis exhibit linear relationships when compared to adjacent homologs or wavelengths respectively. Therefore, a correlation matrix is a reasonable tool for method comparisons.

The first notable comparison establishes the concentration connection. Conventional hydrocarbon homologs and UV-Vis wavelengths correlate with concentration. High hydrocarbon sample concentrations tend to generate higher correlations while lower hydrocarbon concentrations yield correlations near zero. A comparison of the matrices shows that as concentration decreases fewer hydrocarbon homologs correlate with the UV-Vis hydrocarbons (Table 1), while the sample set with the highest concentrations has the greatest correlation with more of the hydrocarbon homologs (Table 3).

High correlation with the unsaturated hydrocarbons ethylene, propene, and butene seems logical due to the presence of double bonds, which are easily excited in the UV range. Lower correlation with the unbranched saturated hydrocarbons is expected due to the C-C and C-H bonds being excited

CORRELATION MATRIX*

Table 5

UV-Vis ratios	Methane, %	C_3/C_1 x 1,000	C_2/C_3	iC_4/nC_4	C_1/C_2	C_1/C_3	C_1/C_4	C_1/C_5
230/240	–0.3963	0.3549	0.9393	–0.7890	–0.6781	–0.2838	–0.1952	0.0136
240/250	–0.6562	0.6218	0.9991	–0.5653	–0.8691	–0.5613	–0.4835	–0.2904
250/260	–0.7229	0.6913	0.9987	–0.4870	–0.9110	–0.6352	–0.5621	–0.3773
260/270	0.1905	–0.2341	0.5823	–0.9980	–0.1456	0.3063	0.3919	0.5751
270/280	0.0177	–0.0623	0.7142	–0.9721	–0.3146	0.1370	0.2267	0.4248
280/290	–0.3448	0.3025	0.9189	–0.8218	–0.6363	–0.2302	–0.1405	0.0690
290/300	0.2606	–0.3035	0.5223	–1.0000	–0.0740	0.3741	0.4571	0.6325
300/310	0.2454	–0.2884	0.5357	–1.0000	–0.0897	0.3594	0.4430	0.6202
310/320	0.9923	–0.9968	–0.5916	–0.3698	0.8950	1.0000	0.9963	0.9564
320/330	–0.4334	0.3927	0.9526	–0.7632	–0.7076	–0.3227	–0.2350	–0.0272
330/340	–0.3964	0.3549	0.9394	–0.7889	–0.6782	–0.2839	–0.1952	0.0135
340/350	–0.5416	0.5035	0.9829	–0.6774	–0.7895	–0.4373	–0.3535	–0.1507

*of standard hydrocarbon ratios and UV-Vis ratios of wavelengths. Red numbers indicate significant positive and negative correlations. This comparison is of data over a producing field in the Midcontinent US.

only below 180 nm. However, vibration and rotational energy of single bonds and the presence of unshared electrons may add to transition energies causing spectral shifts to wavelengths above 180 nm (Tables 2 and 3).

Correlation between ratios from GC hydrocarbon data and UV-Vis hydrocarbon data exhibit some meaningful correlations. The C2/C3 relationship has been used to estimate GOR and hydrocarbon maturity. Moderate to high correlations suggest that the UV-Vis hydrocarbon data might be used to estimate gas content and degree of hydrocarbon maturity. Correlations show that the C2/C3 ratio is directly proportional to the 280 nm/290 nm ratio (Tables 4 and 5 and Fig. 3).

The iC4/nC4 relationship is used to determine hydrocarbon maturity.[2] Values greater than unity indicate immature hydrocarbons while values less than unity are within the oil window. High inverse correlations between iC4/nC4 and the 270 nm/280 nm ratio indicate that higher UV-Vis ratios are equivalent to lower iC4/nC4 ratios (Tables 4 and 5 and Fig. 4). The matrices verify that the ratios most often represented are C2/C3 and iC4/nC4.

The final observation related to the GC and UV-Vis hydrocarbon correlations relates to regional differences. Differences in locale may yield differences in correlations due to changes in organic material, overburden thickness, type of seepage, or variations in the ecosystem.

Overall advantages

The following general rules indicate that UV-Vis hydrocarbon analysis is a viable exploration tool and is a possible alternative to gas phase samples.

- UV-Vis hydrocarbon analysis is comparable to conventional GC analysis with respect to measuring hydrocarbon concentration. Results indicate that hydrocarbon alteration of the soil organic matter is measured and not the reservoir hydrocarbons.
- Because the altered SOM is being measured, sample acquisition is from the very near surface eliminating the need for special sampling equipment. Sample preparation allows for greater reproducibility and decreases the need to level data.
- UV-Vis hydrocarbon analysis can be used to characterize alteration signatures by using ratios of the wavelengths within the UV-Vis light spectrum. Degree of correlation and the ratios used are dependent on either local or regional soil chemistry. ✦

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The author

Jim Fausnaugh (jmfausnaugh @geotech.org) is the owner of geotech.org in Littleton, Colo. He has nearly 30 years of experience using surface geochemical techniques and has helped develop and introduce methods that have since become standard geochemical tools. He has performed all phases of sample acquisition, analysis, and interpretation with Skyline Labs, Petro-Mineral Exploration, Petro Labs, and GRDC Inc. He has a BS in geology from Fort Lewis College.

Argentina

The Mendoza government formally authorized Oromin Explorations Ltd., Vancouver, BC, to exploit oil and gas on the 7,694 sq km Santa Rosa Block in Argentina's Cuyana basin.

The 300 sq km of greatest exploration interest on the block covers a large, untested dome less than 1,200 m deep that is defined by four regional seismic lines.

Otto Energy Ltd., Perth, has a letter of intent with Oromin that enables it to earn up to a 41.24% working interest by spending up to $2,297,381.

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E1345 Current E1145C Historical 1989 to current

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OILSANDPRJ

Production Projects Worldwide — List of planned production mega-projects.
PRODPROJ

See website for prices

www.ogjresearch.com

The basin has produced more than 940 million bbl of oil.

Brazil

Petroleo Brasileiro SA (Petrobras) and partners are evaluating the possibility of using a different rig to complete drilling an exploration well on the Serpa subsalt prospect on Block 24 in the Espirito Santo basin off Brazil.

The well has not yet reached its primary objective or its projected total depth of 19,500 ft, but the partnership was "encouraged by evidence of an active petroleum system in the subsalt section encountered in the well," said 30% partner Anadarko Petroleum Corp.

Petrobras is operator with 40% working interest, and EnCana Brazil Ltda. has 30%.

Georgia

Frontera Resources Corp., Houston, said it appears to have established sustainable oil production with no associated flow of sediment at its Dino-2 well in the Taribani field unit in Block 12 in eastern Georgia's Kura basin (see map, OGJ, Nov. 26, 2007, p. 32).

Zone 9, a 10-m reservoir at 2,300 m, has produced at rates as high as 150 b/d of 36° gravity oil on a 4/64-in. choke with 1,500 psi surface pressure drawdown from bottomhole pressure of 5,900 psi after frac.

The well will remain on test for 20-60 days, and the workover rig and frac equipment are moving to the T-45 location for a frac pac completion attempt in Zone 9 at 2,400 m.

Montana

Bill Barrett Corp., Denver, plans to start a program in the second quarter of 2008 to drill as many as four vertical wells to Cretaceous Cody shale in the overthrust southeast of Helena, Mont.

The company tested gas flows from Cody shale at the Draco and Leviathan wells in the area, but production capability depends on the discovery of commercial quantities of gas to support pipeline construction. The company has a 50% operated working interest in the Circus and Toston-Six Mile areas, where it had amassed 162,000 acres by the end of 2007.

North Dakota

Continental Resources Inc., Enid, Okla., initiated a frac job in the Three Forks/Sanish formation in early May on the Bice 1-29H well in Dunn County, ND.

In this part of the Williston basin Nesson anticline, the Lower Bakken shale underlies the widely exploited Middle Bakken shale and overlies the little explored Three Forks/Sanish.

"Continental is testing the theory that the Three Forks/Sanish zone is not being drained by wells that have been drilled in the Middle Bakken horizontal lateral, and, therefore, that the Three Forks/Sanish may hold significant additional reserve potential under the company's acreage," the company said.

Oregon

US Geothermal Inc., Boise, Idaho, has spud the first full-size geothermal well at its Neal Hot Springs project in northern Malheur County, eastern Oregon, 90 miles northwest of Boise.

The NHS-1 well is permitted to 3,500 ft at a spot near a 1979 discovery well drilled by Chevron Minerals. US Geothermal expects 30 days of drilling and 60 days of flow and reservoir tests.

The company has leased 9.6 sq miles in the area where a suite of wells drilled by Chevron identified a commercial geothermal resource at 2,820 ft. Consultants reported likely reservoir temperatures of 311-320° F. Gravity and magnetic data were used to identify drilling locations.

The development plan anticipates 26 Mw of power production.

Tennessee

Logs from a well in Morgan County, Tenn., appear to show 17 ft of net pay in the Cambrian Rome formation, which has never produced in Tennessee, said Montello Resources Ltd., Calgary.

The John Bowen-2 well log showed the potential gas zone at 8,275 ft. A completion attempt is planned. The well site is 1 mile from a gas pipeline.

Utah

Delta Petroleum Corp., Denver, said its Federal 28-11 well in 28-22s-17e, Grand County, Utah, is averaging 200 b/d of oil and 600 Mcfd of gas from the O and P intervals of Pennsylvanian age in the northwestern Paradox basin.

Meanwhile, the company reached total depth in the quarter ended Mar. 31 at the Federal 31-36, Federal 26-43D, and Federal 36-24H wells, all in its Greentown project area in Grand County. It plans to drill laterals as long as several thousand feet at these wells in both the Pennsylvanian Cane Creek shale and shallower O interval.

The company's Greentown gas pipeline is expected to be in service by the end of June.

Delta plans to drill later this year at its Cocklebur Draw prospect in Southwest Colorado to different geologic intervals than those at Greentown.

Washington

Delta Petroleum Corp., Denver, is moving a rig to the Columbia River basin to spud the Gray 31-23 wildcat on its 100% owned Bronco prospect in Klickitat County, Wash. (OGJ, Jan. 14, 2008, p. 35).

Delta expects the well to emerge from basalt at 8,000 ft and to be one of the basin's only wells to penetrate the entire Eocene Roslyn formation, which it reckons will be 4,500 ft thick. Projected total depth is 15,000 ft.

The well, to be drilled with or without third-party participation, is expected to spud during May 2008. The company said it continues to be in discussion with several industry companies regarding participation.

New fluids prevent formation damage to Tarim sandstones

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Researchers at China University of Petroleum have developed new drilling and completion fluids to minimize damage in Jurassic sandstones.

This work addresses the characteristics of geological structure, lithology, permeability, porosity, and mineral components of a typical high-pressure, low-permeability, dense reservoir formation in China's Tarim oil field.

The main types of damage in these low-permeability formations are water-blocking and stress sensibility.

Numerous studies have shown that the extent of water-blocking damage ranges from 70% to 90%,[1-5] and stress-sensitivity damage ranges from 25% to 60%.[6]

In a laboratory setting, China University of Petroleum developed new low-permeability drilling and completion fluids composed mainly of highly effective surfactants, temporary plugging agents, various types of bridging agents, and polyether glycol.

Both laboratory evaluation experiments and field tests have shown that the new low-permeability KCl sulfonated polymer drilling fluids are suitable for high-pressure exploratory wells. The permeability ratios (K_s'/K_s) of cores from a test well drastically increased after use of the new drilling fluids.

In addition, the new, low-damage drilling fluids have many other advantages such as good rheological properties, high temporary plugging effect, and low filtration.

This article introduces characteristics of damage for low-permeability, high-pressure, tight sandstone reservoirs in Tarim oil field and presents the approaches to prevent damage during drilling and completion operations.

Target reservoirs

Low-permeability reservoirs, including microfractured reservoirs, are commonly characterized by thick mud cake, complicated structure, high sensitivity to invasive fluids, high capillary pressure, water-blocking, anisotropic target formation, and high flow resistance. They have lots of natural microfractures, leading to stress sensitivity.

Water sensitivity and water-blocking are caused by invasive fluids and are major causes of damage. Stress sensitivity caused by the alteration of effective stress, which equates to the overburden pressure minus formation pressure, is the other main damaging factor.

Once damaged, formation permeability can rarely be recovered.

Geological characteristics

Jurassic formations in Tarim oil field occur 4,534.5 to 4,968 m deep in high, steep structures. The Jurassic section includes tight sandstone and coal intervals. Main mineral types are quartz (46%), rock cuttings (46%), a bit of feldspar (6%), and mud minerals (7%).

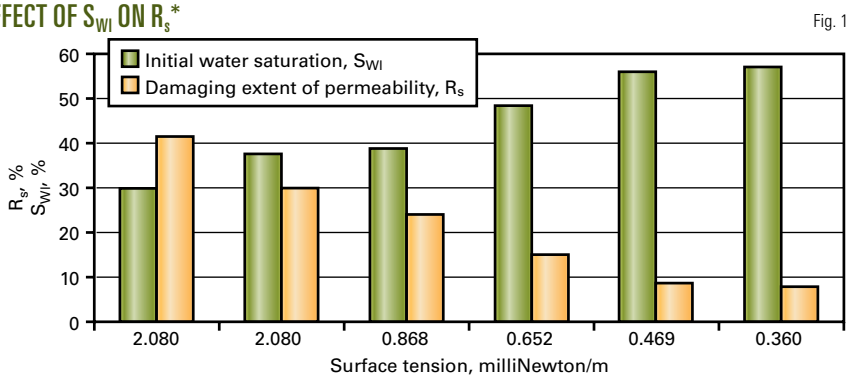
Porosity is filled mainly with clay, calcium, and carbon substances. The clay minerals include illite, chlorite, and occasionally smectite and kaolinite.

Cores taken from the Jurassic target formation show that main types of porosity are dissolved pores between particles, some pores within particles, and microfractures.

The pressure coefficient of the target formation is 1.25 to 1.87; temperature is 120° C.; effective porosity ranges

EFFECT OF S_{WI} ON R_s*

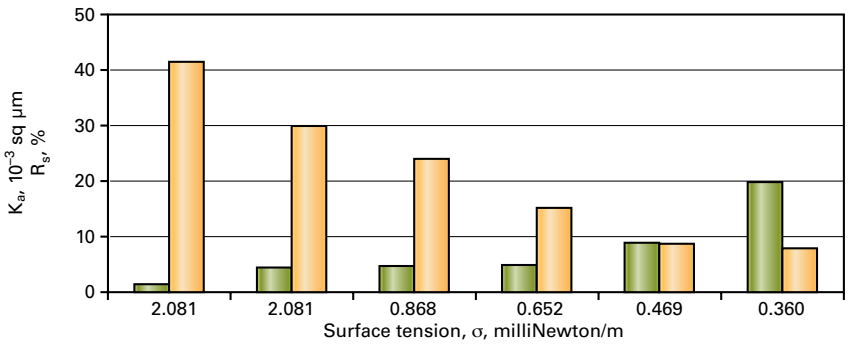
Fig. 1



*At close values of N_2 permeability, K_a, different values of oil-water interfacial tension, σ_{o-a}.

EFFECT OF K_a ON R_s*

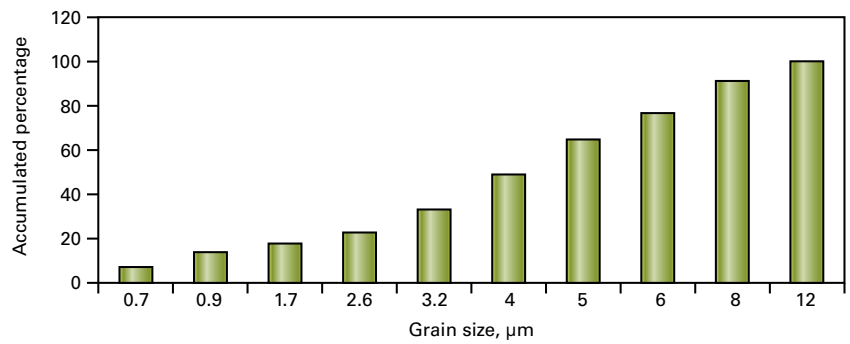
Fig. 2



*At close values of original water saturation, S_{WI}; different values of oil-water interfacial tension, σ_{o-a}.

PARTICLE-SIZE DISTRIBUTION, QCX-1*

Fig. 3



*Temporary plugging agent.

from 0.3% to 14.4% (average 5%); permeability ranges from 0.01 × 10^{-3} sq µm to 380 × 10^{-3} sq µm.

In short, the target formation can be distinguished as a low-permeability, high-temperature, high-pressure reservoir with microporosity.

Potential damage

We analyzed cores taken from the target formation in Well YN2 (depth 4,543.8 to 4,552 m).

The main types of potential damage are certain sensitivity to invasive fluids such as light flow rate sensitivity, salt sensitivity (critical level of mineral ions is 43,428 mg/l.), alkali sensitivity (critical pH value is 10), and midextent stress sensibility.

This study looks primarily at damage mechanisms and origins of water-blocking.

Water-blocking or filtrate-blocking is one of the most damaging mechanisms in low-permeability formations, especially in low-permeability gas reservoirs. When drops of invasive fluids move into small micropore throats, deformation will occur at the oil-liquid interface, and the extent of deformability is different in two ends (r_1, r_2 is curvature radius of two ends, respectively).

Capillary pressure ΔP is expressed with the following equation:[7]

$$\Delta\rho = 2\sigma\,(1/r_1 - 1/r_2)$$

Such additional resistance is the so-called "water-blocking effect" because of the stacking of water-blocking. While a string fluid drop coexists in a same capillary, flow resistance of oil or gas phase in target formation will greatly increase and permeability of the oil-gas phase remarkably decrease.

Generally speaking, water-blocking is notable when the diameter of formation pore throat is less than 10 µm.

The experimental results of pressing Hg in and out of core samples taken from the Jurassic target formation reveal that the diameters of pore throats in target formation range from 0.01 to 9.0 µm. Consequently water-blocking damage caused by capillary effect cannot be ignored.

Apart from some abnormal high-pressure spheres, the pressure coefficient of drilling fluids is larger than that of the target formation and can reach 1.90 g/cc. If there is insufficient shielding, packing, framing, and filling particles, large quantities of filtrate can invade the formation.

It can be seen from water-blocking damage experiments of low-permeability cores taken from the Jurassic target formation that the maximal damaging extent of permeability was 41.5% (Fig. 1). Along with reduction in core permeability, K_a, original water saturation, S_{wi}, and increase in oil-water interfacial tension, σ_{o-a}, the damaging extent R_s of water-blocking shows an upward trend (Fig. 2).

Because of well depth, high pressures, and drilling interruptions, the drilling period and duration of time that drilling fluids were soaking into the formation were prolonged; hence the amount of invasive fluids increased. In particular, various kinds of macromolecule polymer treating agents were absorbed on the borehole wall and reduced the radii of micropore throats. This eventually resulted in relatively higher extent of

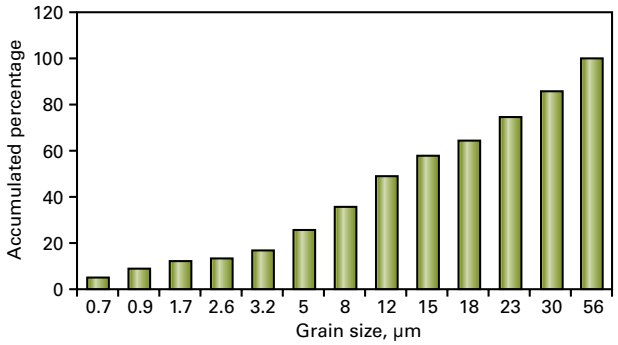
SURFACE TENSION, COMMONLY USED SURFACTANTS

Table 1

Serial number	Agents, concentration 0.4%	Mass per drop/g	Surface tension, mN/m
1	ABS	0.0072	34.75
2	OP-10	0.0047	35.45
3	Sodium oleate	0.0053	40.33
4	Peregal	0.0065	48.97
5	1231(cation)	0.0052	39.41
6	Tween	0.0073	55.15
7	Turkey red oil	0.0058	43.82
8	ABSN	0.0045	34.00

Particle-size distribution, QS-2*

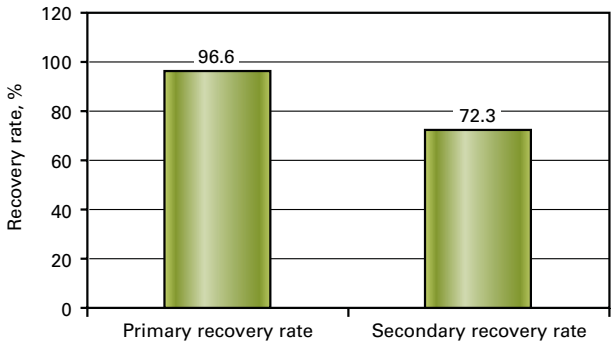
Fig. 4



*Temporary plugging agent.

Cuttings recovery

Fig. 5



damage to formations with low permeability and micropore throats.

Fluid study

Based on current drilling technology and known damage factors in Jurassic formations with low-permeability, guidelines to develop new drilling fluids include:

1. Selecting effective surfactants to minimize filtration and water-blocking.
2. Selecting compound temporary shielding or packing agents mixed with framing, filling, and deforming particles to form thinner and tighter mud cake on borehole wall. The formed mud cake should have a good toughness, high strength, and drainage rate to protect formation from stress damage and long-term exposure to drilling fluids.
3. Optimizing various treating agents to avoid damage caused by macromolecule polymer agents pressed into formation along with drilling fluid filtrate.

It is also necessary to optimize fluids to prevent formation collapse by inhibiting sloughing and staying within a safe density window.

Selecting surfactants

Lab experiments tested many surfactants commonly used to minimize surface tension (Table 1). These included:

- Alkyl benzene sulfonate (ABS).
- Alkyl phenol alkoxylate, nonionic (OP-10).
- Sodium oleate.
- Peregal (nonionic).
- 1231 (cation).
- Tween.
- Turkey red oil (sulfonated castor oil; anionic).
- ABSN.

Based on the low mass/drop, OP-10 and ABSN had the most efficient capacities to reduce surface tension (Table 1).

Temporary plugging effect of new low-damage drilling fluids*

Table 2

Core number	K_s, 10^{-3} µm²	Contaminated mud	K_s', 10^{-3}µm²	K_s'/K_s, %
1	7.81	Before optimizing	4.86	62.2
2	6.78	After optimizing	6.06	89.4
	Rise in permeability recovery			27.2

*Lab test results.

Temporary plugging

Temporary plugging agents in drilling fluids can quickly form thin, strong, tough mud cake that can prevent small particles and filtrate from deeply invading formations. Ideally, temporary plugging agents should be easy to drain out afterwards. High-quality drilling fluids with good temporary plugging characteristics can be designed by compounding framing and deforming particles, etc.

On the basis of size distribution of pore throats of target formation with low-permeability in Jurassic system and size distribution of present temporary plugging agent particles such as QCX-1, QS-2, etc. (Figs. 3-4).

After numerous experimental tests, we chose QCX-1 as the optimal plugging agent with compatible framing particles for Jurassic formations. To the QCX-1, we added deforming particles such as FB-2 (particle-size distribution of 0.04 to 75 µm; median particle size 12.0 µm), and asphalt base materials FT-1, AL, and YL-80 to reinforce effect of temporary shielding and plugging, and low filtration.

Rheology, inhibition, compatibility

Experiments with different formulations allow characterization of successful fluids by low-solid phase, nondispersed, sylvite sulfonated polymer. This contains 3% bentonite grouting + 0.2% KPAM + 4% SMP-1 + 2% DFD-140 + 4% SPNH + 0.4% LV-CMC + 6% KCl + 3% MHR-86D (lubrication) + 0.2% ABSN + 2%QCX-1 + 1.5% FB-2 + $BaCO_3$.

The measured rheology parameters include:

- Density, 1.86 g/cc.
- Apparent viscosity, 55 mPa-sec (1 megaPascal-sec = 1 cP).
- Plastic viscosity, 38 mPa-sec.
- Dynamic shearing force, 17 Pa.
- Initial gel strength, 5 Pa.
- 10-mi gel strength, 15 Pa.
- API filtration, 4.5 ml.

RHEOLOGY OF ON-SITE MUD*

Table 3

Mud number	ρ, g/cc	AV, cP	PV, cP	YP, Pa	G10″/10′, Pa	API, FL ml	HTHP FL, ml	pH
1	1.9	51	37.5	13.5	2/5	1.0	2.0	9.0
2	1.9	70	55.0	15.0	3/8	1.0	1.8	9.5

*At 120° for 16 hr.

EXPERIMENTAL RESULTS, PERMEABILITY RECOVERY

Table 4

Core number	K_s, $10^{-3}\mu m^2$	Polluting means	K_s', $10^{-3}\mu m^2$	K_s'/K_s, %
1	3.90	static state	3.33	85.38
2	6.88	static state	5.92	86.00
Average				85.69

- HTHP filtration, 8.0 ml.
- pH value, 9.0.

The experimental results show that rheological properties, filtration, and temporary plugging effect of the new fluids meet the requirements for use in the target formation. The primary and secondary recoveries of rock cuttings were 96.6% and 72.3%, respectively (Fig. 5). The new, low-permeability drilling fluids are good inhibitors and are compatible with formation rock. Also, mixing drilling fluid with in situ fluids in 1:1 proportion resulted in no obvious abnormal phenomena.

Permeability recovery

The test conditions of core samples included a confining pressure of 4 MPa and a flow rate of 1.0 ml/min. The initial permeability, K_S, of core samples taken from the Jurassic target formation was measured by displacing with neutral kerosine.

Next, lab personnel reversely contaminated the cores with drilling fluids for 4 hr then removed them from the fluids, removed the mud cake, reversed core direction, displaced with neutral kerosine, measured permeability K_S' of contaminated cores, and calculated the permeability recovery K_s'/K_S of contaminated cores.

Table 2 data show that the permeability recovery of cores contaminated with new, low-damage drilling fluids increased 27.2% (with added surfactant and temporary plugging agents).

New fluid effectiveness

The new KCl-sulfonated polymer drilling fluids were first field tested in the Jurassic section of preliminary prospecting well YN4 (depth 3,641 m) in Tarim oil field. Table 3 shows the rheological properties and permeability recovery of wellsite drilling fluids taken from well YN4.

We tested Core No. 1 (Table 4) with high-concentration agents such as KCl, FT-1, AL, FB-2, and YL-80 (able-deforming agents). The rheological properties and filtration performance were acceptable; API filtration was 1.0 ml, and HTHP filtration was 2.0 ml.

The formed mud cake was thin, dense, and tough, reflecting that particle-size distribution of various kinds of treating agents was reasonable, and relatively low filtration was good enough to protect the formation.

The second drilling fluid system (Table 3) was added to 2% QCX-1 + 3% FB-2 + 0.2% ABSN + 3% EP-553 (polybasic alcohol). The results show that viscosity and shearing force of the drilling fluids increased a bit, while the rest of the parameters changed little.

As shown in Table 4, permeability recovery (K_s'/K_S) was more than 85%, indicating that the second drilling fluid can protect formation from damaging.

Field tests with the new, low-damage drilling fluids in Jurassic formations show that drilling trips were successful and drilling rates were quick, with low frictional resistance and no borehole instability.

Learnings

The new fluids were field tested in Well YN4 by Tarim Drilling team and the research team from China University of Petroleum, Beijing. Based on the results from laboratory evaluation experiments and these field tests, we draw the following conclusions:

- Water-blocking and stress sensibility are two main damaging types of low-permeability tight sandstone reservoir. Experimental results of target formation core samples show that the damaging extent of water-blocking could reach 41.5%.
- The main factors influencing water-blocking include permeability, porosity, initial water saturation (gap between irreducible water saturation and original water saturation), and oil-water interfacial tension. Other influencing factors include lithology, types of formation cement, pore structure, properties of invasive fluids, etc.
- The new, low-damage, broad spectrum KCl/sulfur polymer drilling and completion fluids appear to prevent water-blocking, are effective plugging agents, prevent collapse, and have high permeability recovery. The new fluid provided effective formation protection and stabilized the wellbores. ✦

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CMMS improves refining maintenance management

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To operate a world-class maintenance organization, plant operators need precise information combined with the ability to act quickly in response to impending emergencies. A computerized maintenance management system (CMMS) can help refiners eliminate the vast majority of unscheduled equipment repairs.

This article discusses the features of a CMMS that are important for plant owners to demand.

The main objective of maintenance management is to achieve the optimum balance between plant availability and maintenance resource use. The effective matching of labor and material resources for maintenance planning and control is a dynamic activity.

Plant management needs reliable information of both equipment performance and costs, which will allow them to make informed decisions. It is therefore essential to adapt to techniques that would provide accurate and timely information for making the maintenance function more meaningful and reduce the unforeseen plant outages.

Implementation of a computerized maintenance system is an effective way to achieve this goal. Selection and proper implementation of the correct CMMS is an integral part of achieving maintenance management success.

CMMS

The maintenance department should:

- Provide effective maintenance services that support facility operational requirements.
- Reduce unscheduled equipment downtime through effective maintenance planning.
- Use the CMMS report generator to provide meaningful management reports that will increase the control of maintenance activities.
- Use CMMS to ensure that maintenance is performed efficiently through organized planning and the coordinated use of materials, manpower, and time.
- Create and maintain measurements of maintenance performance within CMMS.

One of the highest priorities of a maintenance manager should be keeping the equipment operating (reducing equipment downtime). The corresponding goal is to reduce downtime by some percentage.

Assuming that a CMMS package has provisions for entering and tracking downtime, the operator should carefully log all downtime and enter the information in CMMS; total as well as specific equipment downtime can be retrieved and compared with last month's, last year's, or last week's.

Objectives should be to measure and maximize maintenance program effectiveness. Specific areas for measurement should include percent of rework, percent of planned maintenance work, and percent of unplanned maintenance work. The maintenance manager should

Based on a presentation to the Oil & Gas Maintenance Technology Conference & Exhibition, Dec. 9-13, 2007, Manama, Bahrain.

establish standards that will assign actual costs for equipment downtime and then track both planned and unplanned downtime.

The CMMS should include the following options.

Asset management, register

This option will facilitate the creation of an asset register. The asset register holds comprehensive details of each asset or piece of equipment.

Typical data stored include asset number, department, asset name, model, serial number, drawing numbers, purchase price, location, supplier, planned and unplanned maintenance history, etc.

Preventive maintenance

Maintenance schedule should have a flexible set up, allowing each asset to have a defined maintenance profile. This may include details of various periods, trades required, procedures required, estimated job times, and when the equipment is available, etc.

The preventive maintenance (PM) procedure library is generally a database of all the PM procedures required for the maintainable assets in the system. In a paper system, records contain details of PM to be carried out on all equipment. Each time maintenance is scheduled, the technician must refer to the procedure on file.

The operator generally desires a system that allows many assets to be linked to a single procedure that is convenient to use. If the procedure requires modification, it should be done only once and all linked assets will continue to use the modified version in the library.

Unplanned work reporting

When a defect or breakdown occurs, someone from production must notify the required trade group. This is done through the nearest terminal by inputting brief details of the fault, the asset number or description, and the reporter's name.

When this is done the software offers the reporter a choice of printers. After one has been selected the work order is printed in the relevant workshop. The work order is then automatically added to the list of outstanding work.

The main objective of maintenance management is to achieve the optimum balance between plant availability and maintenance resource use. The effective matching of labor and material resources for maintenance planning and control is a dynamic activity.

Scheduling planned maintenance

Most systems include a maintenance scheduler. When the scheduler runs, it scans each asset in turn and checks the periods when maintenance is required. It then looks at the last maintenance date for each period and, if due, creates a planned maintenance work instruction for the asset.

Typically, the planned maintenance scheduler will be "rolled forward" each week, producing work instructions and adding them to the list of outstanding work. Users may be required to decide whether they would prefer the scheduler to run automatically, in real time, or by intervention at a particular time each day or each week.

Work orders

In addition to generating unplanned work orders, the CMMS should have a means of outputting hard copies of planned work orders. The system should separate the planned work orders into various trades, asset groups, and locations before they are printed.

Other points are whether the user requires work order formats to be reconfigurable. Most companies want to design their own work order forms.

Viewing outstanding work

Maintenance managers and supervisors need to check outstanding work orders quickly. The system should support a quick and easy method of selectively displaying lists of these work orders by trade, work type, department, etc.

Purchasing

Most fully integrated packages support some kind of inventory-management option. If this option is used, the operator should carefully specify it to ensure that it meets local requirements.

One benefit of opting for stock control is that trade groups can have access to the inventory database allowing them to find spare part numbers and check stock levels of maintenance spares. Some systems allow spares to be linked to equipment, thus simplifying the search and ensuring that no obsolete spares are held in inventory.

Some users consider that the greatest financial returns from a CMMS are through improved stock control procedures.

Condition monitoring

Condition monitoring is a form of predictive maintenance in which continuous monitoring of the condition of specific areas of plant and equipment occurs. When any predefined limit is exceeded, an alarm output is turned on. This alarm output can be input to a CMMS so that a work order is generated immediately. This is particularly suited to continuous processing where plant failure could be extremely costly.

Typical conditions that can be monitored are temperature, vibration, over voltage or current, and liquid level—any condition that a sensor can detect.

Statistical data, reports

CMMS has extensive information readily available for fault analysis, costing, and work statistics. This is one of the most important functions of a CMMS.

Lube data

Maintenance procedures should, at a minimum, indicate the type of lubricant. If the requirements were taken from manufacturer's literature, the procedure probably includes the lubricant manufacturer, grade, and brand name.

Importing all lubricant data and application requirements into the CMMS allows the operator to develop a lubricant equivalency matrix, which he can use to minimize the number of different brands and grades needed and probably reduce the total quantity kept on hand by about 50%.

A single lube map can take the place of several procedures, which a lube team can perform in much less time and in fewer separate efforts. Consolidating lubrication requirements is an obvious cost-saving practice.

Daily scheduling, job control

This covers areas such as how work is allocated to the workforce, and how a "reasonable" time for job completion is generated. It also includes how daily priorities are set and decisions made regarding the deferral or cancellation of planned work to incorporate daily breakdowns.

Weekly scheduling

An effective weekly scheduling system permits the allocation of jobs to specific days, so that parts can be delivered to the job site "just in time," and so that equipment can be shut down and cleaned before the tradesman arrives to perform the maintenance task.

It also compares labor requirements of the schedule with labor available from the work crew for each day of the schedule, and allows effective decision-making regarding the need for supplementary labor or the need to reschedule work before the schedule is finalized.

Maintenance budgeting

Maintenance activities generate maintenance costs, and although some sites prepare maintenance budgets based on a bottom-up assessment of maintenance activities they expect to perform, few report actual costs vs. those budgeted activities. Most CMMSs only permit the reporting of actual costs against budgeted amounts; therefore an essential element of cost control is lost because the manual effort involved in reconciling the budgeted activities with those actually performed means that this task is not performed.

Maintenance activities generate maintenance costs, and although some sites prepare maintenance budgets based on a bottom-up assessment of maintenance activities they expect to perform, few report actual costs vs. those budgeted activities.

This being the case, the budgeting and cost control procedure should clearly be "owned" by these people, with people at this level responsible for preparing maintenance budgets and controlling costs to within those budgets.

Maintenance effectiveness

Included in this process are activities such as failure analysis and reliability-centered maintenance (RCM) analysis.

To make informed decisions regarding equipment maintenance strategies and equipment design modifications, one must record information about:

- The number of failures.
- Root causes of those failures.
- Maintenance costs associated with those failures.
- Production costs associated with those failures. These may incorporate more than just downtime costs.
- Any safety or environmental implications associated with those failures.

When evaluating CMMSs, there are five major factors that one must consider. Careful examination of these factors during the evaluation process will help ensure ongoing CMMS success:

1. *Comprehensive maintenance management functionality.* This should include three major elements: work management, physical asset management, and resource management. The work management component of CMMS optimizes day-to-day operations, manages corrective work orders, and supports a PM program

The physical asset management component acts as the "filing cabinet" of CMMS, providing quick and easy retrieval of important information such as: planned and unplanned work history, assets accounting information, warranty and service contracts, nameplate data, scanned documents, libraries of computer-aided drawings, and complete descriptive information.

The resource management component of a CMMS supports a full inventory and purchasing system. Furthermore, it tracks in-house labor and contracted service costs.

2. *Extensive management reporting capabilities.* CMMSs provide extensive management reporting capabilities that include detailed and summary reports, graphical reports, and easy-to-use report writing tools that do not require programming knowledge.

3. *PM procedure library.* This will minimize the start-up time necessary to establish and implement a PM program and provide conformance to generally accepted PM inspection schedules. After many PM actions have been performed and recorded on the same equipment, sufficient data is available for determining whether the equipment needs more or less frequent PM work and how PM frequency should be adjusted.

4. *Multiple system interfaces.* The CMMS should be able to work together effectively and transparently with multiple systems. Direct interfaces between the CMMS and other diagnostic and monitoring systems such as predictive maintenance can assist greatly in

streamlining the maintenance process by allowing maintenance personnel to respond to early warning signals before they escalate into critical repair problems.

A CMMS builds on these types of interfaces to automatically create work orders and update equipment histories based on alarms and test results received through these interfaces.

5. *RCM integration.* The CMMS system should fully integrate and take advantage of RCM.

In selecting a CMMS, the operator should conduct a formal review to determine the key performance indicators (KPIs). Then the operator must consider where the data to produce these KPIs is going to come from.

Frequently these KPIs will require data from different systems; for example, maintenance cost/tonne may require data from the CMMS or accounting system and the production systems. Maintenance safety statistics may need data from a totally separate system.

Reliability and maintainability indicators should look better in a CMMS. The mean time between failures (MTBF) should increase and the mean time to repair (MTTR), if managed correctly, should stay at the pre-implementation low level.

A maintenance workforce in a reactive state will have a very low MTBF of equipment and an equally low MTTR. This may be masked, if not measured and regularly reported, by the fact that machine availability may still be at a high level.

What the indicator shows is that a plant or piece of machinery is unreliable and breaks down often; and that workers are good at fixing these breakdowns. The culture that is fostered in these situations can be the most difficult obstacle in the implementation of a CMMS and realizing its possible gains.

Machine availability

With the amount of day-to-day data available in a CMMS that pinpoints problem areas and modifies processes and routines, other factors are easier to achieve. A reduction in the amount of breakdown work, or increase in overall availability of plant and equipment, of 5% is a realistic and achievable goal.

Inventory holdings

As the work content becomes more planned out, the inventory department will become more predictive. The will reduce the requirement to keep large volumes of parts and materials on a "we might need it" basis.

If the plant owner can reduce inventory, the logistical requirements to manage the inventory function also decreases dramatically, particularly that of the purchasing department and actual inventory management personnel.

RCM

A CMMS should have the functionality to support RCM. RCM is the method that best addresses the requirement for maximum reliability at minimum cost, or more pragmatically, doing the right maintenance at the right time.

RCM results in a maintenance program that focuses PM on specific probable failure modes only. It has a strong bias toward condition monitoring and trend analysis of equipment performance.

Nonintrusive condition monitoring, such as vibration monitoring and oil analysis, can reveal deterioration in performance and warn of impending loss of equipment functionality or failure. When sufficient data are available, the operator can use trending and perform maintenance when measurements stray out of a predetermined safe operating range.

Performing appropriate maintenance just in time can produce significant cost savings, in addition to increased equipment uptime. RCM is a powerful tool for optimizing just-in-time maintenance actions.

RCM targets only preventable failure causes with actions intended to prevent them, predictable failure mechanisms with actions that take advantage of the predictability of the mechanism, or telltale signs that indicate that the failure mechanism is in its early stages so that the operator can take steps to prevent functional failure. RCM does not result in overmaintaining equipment with actions that do not address specific failure modes.

RCM can result in significant reductions in direct maintenance costs.

Ideally, the plant operator should integrate the CMMS with a predictive maintenance system. At a minimum, the predictive maintenance system should accurately monitor real-time equipment performance and alert the maintenance professional to any changes in performance trends.

Maintenance measurements

One of the universal objectives of any maintenance improvement plan must be to improve the ratio of planned vs. unplanned work. The ultimate goal is to have no unplanned maintenance.

In practice, many unorganized maintenance departments will have a ratio of 90% unplanned to 10% planned work; much of their work will be reactive. A CMMS will make this easy to monitor and produce a suitable measurement. Over time, it can be used, along with the other statistics, to reverse the trend.

Many other maintenance factors that have relevance, including:

- Percent overtime hours.
- Cost of maintenance.
- Backlog of work.
- Average time per breakdown job.
- Cost of spares.
- Cost of labor.
- Equipment effectiveness.
- Total maintenance cost per unit of output.
- Cost of lost output due to unplanned downtime.

• Cost of lost output due to planned downtime.
• Downtime percentages, by area and by asset.
• Mean time between stops or MTBF.

Future of CMMS

In the future, users of CMMS will demand these additional functions:

• Planning indicators and capabilities.
• Automatic scheduling as a forecast of man-hour capacity levels.
• Automatic scheduling according to materials availability levels.
• The ability to schedule work on the basis of equipment operation or condition.
• Control of inventory levels and materials planning for 3-5 years.
• Equipment condition monitoring and alarm generating capabilities.
• Asset register creation and the inclusion of equipment or component tracing capabilities.
• Project management capabilities.
• Shutdown planning capabilities.

Predictive maintenance

Ideally, the plant operator should integrate the CMMS with a predictive maintenance system. At a minimum, the predictive maintenance system should accurately monitor real-time equipment performance and alert the maintenance professional to any changes in performance trends.

There are many measurements that a predictive maintenance package could track including vibration, oil condition, temperature, flow, etc. CMMS is a great organizational tool but can not directly monitor equipment condition.

A predictive maintenance system excels in monitoring equipment condition. It is ideal to combine the two technologies into a seamless system that avoids catastrophic breakdowns but eliminates needless repairs to equipment that is running satisfactory. ✦

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Extending mole-sieve life depends on understanding how liquids form

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Houston

Well-designed, monitored, and operated molecular sieve dehydration systems in natural gas processing plants effectively remove moisture for more than 2,000 regeneration cycles. Numerous plants, however, experience moisture breakthrough with newly installed molecular sieve.

When good molecular sieve material is used and dehydration problems exist, they commonly result from a few process design oversights not identified during original detail design.

Retrograde hydrocarbon condensate by itself or with excessive heat rate during regeneration, stagnant piping traps, and undersized separation tend to be leading causes of chronic molecular sieve underperformance. Elongation of the mass transfer zone and subsequent early moisture breakthrough (channeling) in molecular sieve dehydration beds have been the major operational economic failing in many BP-operated gas plants.

Based on a presentation to the 87th GPA Convention, Grapevine, Tex., Mar. 3-5, 2008.

Once root causes are identified and remedied, however, molecular sieve units can perform for more than 2,000 regenerations without channeling and with minimum maintenance.

This article discusses causes that commonly go unnoticed during original design and are not always considered during troubleshooting. This article also discusses other causes of molecular sieve underperformance and summarizes experiences from several BP operated plants around the world.

The article also explains design shortfalls and describes installed remedies and resulting molecular sieve performance, along with some operational and design tips that help extend molecular sieve life and performance.

BP performance

Historically at BP, molecular sieve dehydration underperformance has played a large role in degrading several processing plant operating economics. Specifically, this dehydration underperformance has resulted in annual mole sieve replacement (and associated decrease in plant throughput or availability), chronic reduction in plant capacity, long-term reduction in NGL recoveries, and shutdowns to remove ice and mole sieve dust from brazed aluminum exchangers at various sites.

Some of BP's NGL plants experienced moisture breakthrough from the molecular sieve dehydration units within days of initial service or early molecular sieve replacement; some have required bed replacement after fewer than 400 regenerations (1-year operation). Other plants have operated for decades without having to replace molecular sieve and perform per design for more than 2,000 regenerations (5 years' operation).

What explains the discrepancy in performance? Also, other than following published design guidelines, working with molecular sieve manufacturers during the design phase, and purchasing good molecular sieve, what can be done to ensure molecular sieve dehydration performs per design for more than 2,000 regenerations? What are the fundamental problems experienced with existing systems and what can be done to improve performance?

Liquids

Liquid contaminants (hydrocarbons and water) generated from one or a

RETROGRADE CONDENSATION, INLET COMPRESSION

Fig. 1

Fig. 1a

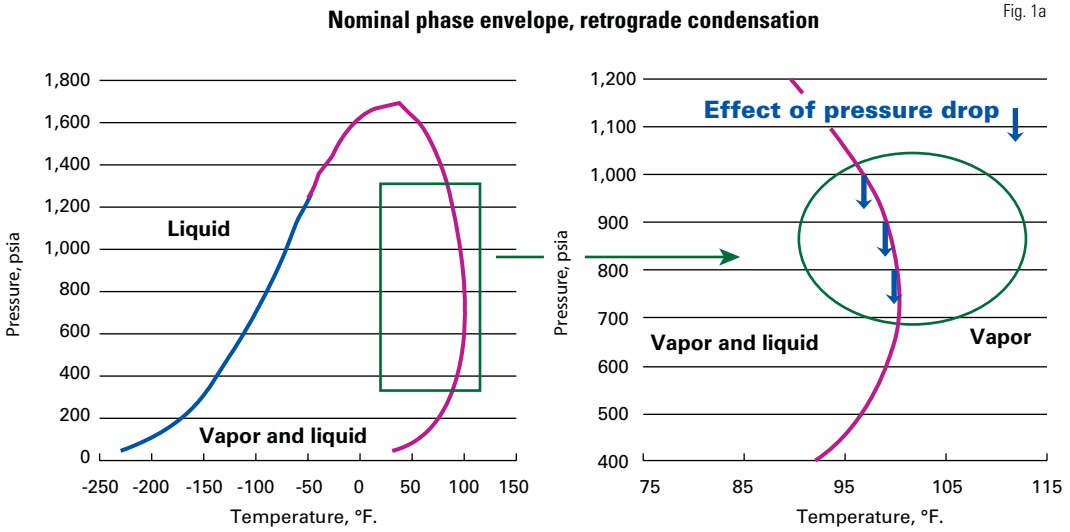
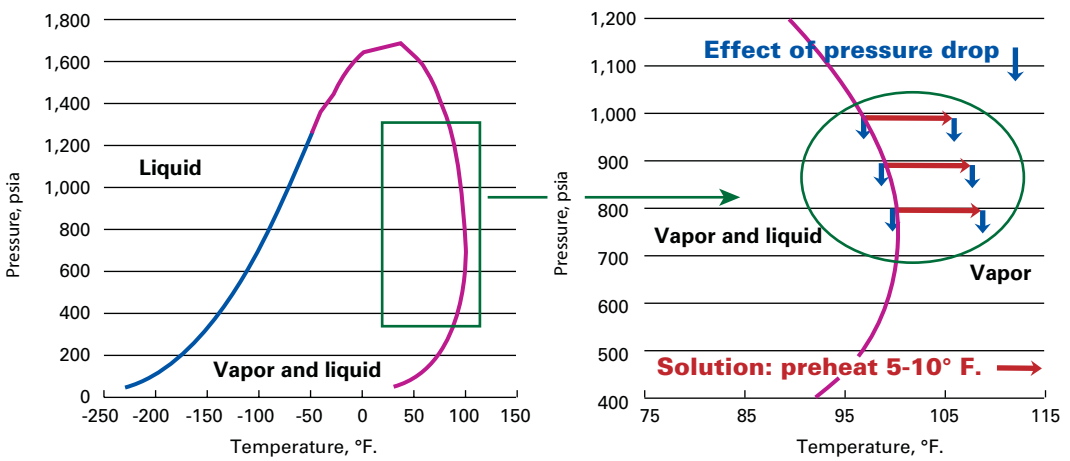


Fig. 1b



combination of retrograde condensation, stagnant piping pockets, poor separation, or excessive heat input rate during regeneration have been leading causes of poor molecular sieve performance and reduced plant economic performance within BP.

The presence of free liquids (either hydrocarbons or water) in a stream expected to be 100% vapor results in chronic early breakthrough or channeling. Responding to symptoms and not to the cause exacerbates dehydration problems.

Examples of secondary problems include excessive dust formation, mechanical failure of support screens, accelerated channeling, and possibly contamination of downstream equipment with mole sieve dust.

Free-liquid damage

Liquids can damage molecular sieve via several mechanisms. Regardless of the mechanism, however, the net effect in each case is an elongation of the mass transfer zone and subsequent reduced moisture removal capacity and channeling.

The following summarizes established molecular sieve damage mechanisms:

1. Liquid hydrocarbons block access to micro pores. This slows the mass transfer rate of moisture adsorption plus the heavier hydrocarbons tend to crack during regeneration and permanently restrict sites for moisture adsorption.[1]

2. Liquid droplets hitting the molecular sieve tend to act like a hammer and mechanically crush the sieve.

3. During regeneration, liquid hydrocarbons reflux around the vessel wall and cake into a donut-shaped solid agglomerate along the interior wall of the vessel.[2]

4. Also during regeneration, liquids refluxing at the top of the bed can lift the top layer of support balls and the top few inches of molecular sieve. Sieve movement results in increased dust formation (through abrasion) and movement of the support balls disrupts flow distribution and creates a nonhomogeneous flow profile.

5. An excessive heat input rate during regeneration creates water refluxing at elevated temperatures that destroys the molecular sieve binder.[3]

Along with channeling causing ice or hydrates in downstream processing, other problems tend to crop up. Specifically, operational personnel respond with what they control: increase regeneration temperatures, decrease cycle times, and increase regeneration-gas flow rate.

All of these responses may increase

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COOLING EFFECTS

Fig. 2

Fig. 2a

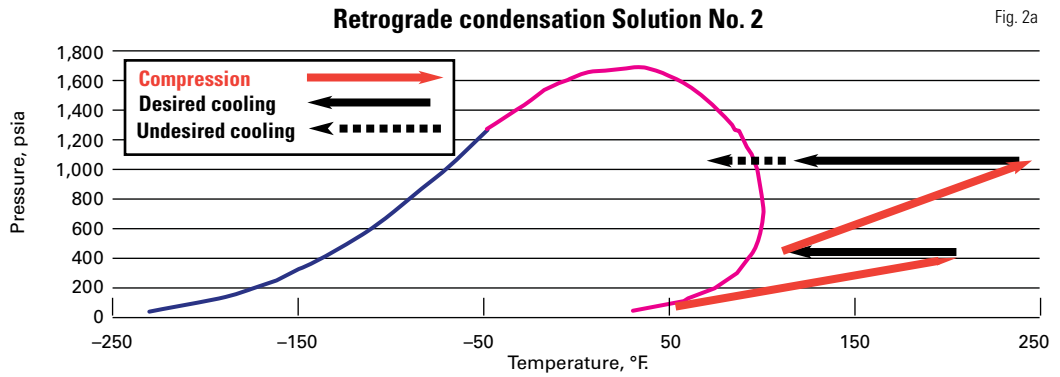
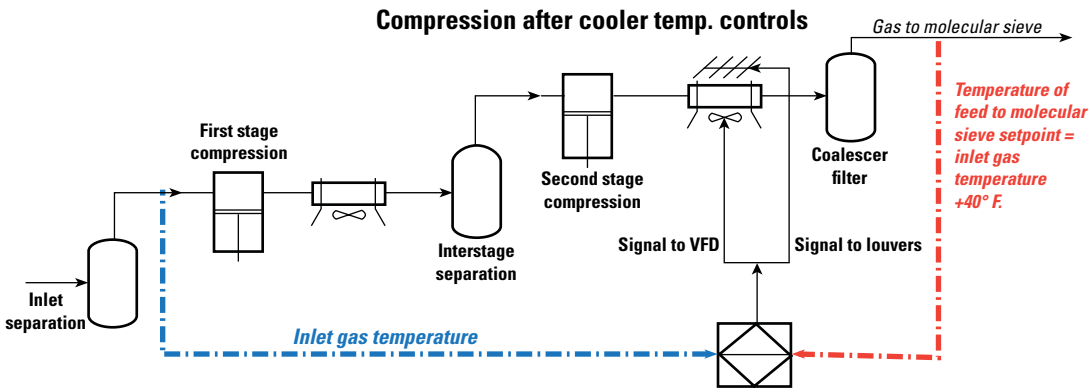


Fig. 2b



dust formation and formation of agglomerates, which then escalate channeling and reduce moisture removal capacity. The problems are typically tolerated until mole sieve changeout. New molecular sieve is sometimes installed with a guard layer, but the channeling may still occur as before.[3]

When specifying molecular sieve designs, designers normally assume the feedstock is 100% vapor. Sometimes this is correct, but this assumption is the leading cause of poor molecular sieve performance. Even with good separation upstream, liquid hydrocarbons can still form.

How can this be?

Retrograde condensation

Dehydration may occur with gas at its hydrocarbon dewpoint, that is, downstream of liquid-vapor separation. It is common, however, that gas at its hydrocarbon dewpoint experiences a natural phenomenon called retrograde condensation.

Fig. 1a illustrates a typical phase envelope drawing and the impact of retrograde condensation. Any drop in pressure between the separator and the outlet of the molecular sieve bed will cause liquid hydrocarbons to form via retrograde condensation process.

• Solutions to retrograde condensation: preheat. Preheating the inlet gas 5-10° F. ensures that condensation cannot occur between the separator and bottom inches of the molecular sieve dehydrator (Fig. 1b). Preheating with a waste energy stream such as propane-refrigeration compressor discharge (in parallel with existing propane condensers) or residue-gas compressor discharge provides for efficient energy sources. Alternatively, other heat sources can be considered.

Three BP locations have installed preheaters (two after original plant start-up) and have extended mole sieve replacement to more than 2,000 regenerations from fewer than 500, and the incremental adsorption temperature had no negative effect on NGL recoveries.

• Solution to retrograde condensation: after-compression temperature control. Gas leaving inlet compression (and upstream of mole sieve adsorbers) requires good temperature control. Excess cooling of inlet-gas compression upstream of molecular sieves can result in retrograde condensation (Fig. 2a).

This hydrocarbon condensation is further exacerbated in fall and spring operations and when piping dead legs exist (described in Fig. 3a). Installing good temperature control after compression provides the same result as installing inlet preheating.

At one North Texas plant, tuning of temperature-control loops along with installation of variable frequency drives (VFDs) on the inlet-gas compressor after coolers (Fig. 2b) was part of the solution that enabled the plant to increase dehydration capacity (and subsequent plant capacity) to 48.0 MMscfd from 36.0 MMscfd.

Liquid traps in inlet piping

Piping around molecular sieves is prone to high stresses due to thermal cycles. Hence, piping design focuses on a routing that minimizes the effects of thermal stresses. This can sometimes result in liquids pooling upstream of the molecular sieve dehydration bed (Fig. 3a).

Between the wet gas header and the

inlet isolation valve is a stagnant piece of pipe. During the regeneration cycle, this pipe and its contents have the potential to cool to dewpoint temperature pending the gas composition, which is a problem if the temperature of the wet gas entering the dehydration unit is above atmospheric.

As the vapor cools, water and hydrocarbons can condense and remain in the stagnant leg. When the regeneration cycle (heating and cooling) is over and the inlet isolation valve opens, these liquids are forced into the top of the molecular sieve bed with the inlet gas. This mechanism and the damage it causes are repeated as it recurs with every regeneration cycle.

To solve inlet piping traps, various piping arrangements can be made for new or old installations. Fig. 3b describes a drain system installed at one facility to remove the stagnant liquids that had pooled.

Liquid traps in regeneration pipe

As with hydrocarbon condensation from wet inlet-gas piping, both hydrocarbon and water vapor condensing in the regeneration-gas piping can occur with poor piping design.

During the regeneration cycle, warm to hot, water and hydrocarbon-saturated gas leaves the top of the molecular sieve bed. This stream immediately cools upon contact with the regeneration-gas outlet piping. Hydrocarbon and water condensing ensues.

When the bed goes from cooling to adsorption, the inlet isolation valve opens and the pooled liquid flows to the top of the molecular sieve bed. Fig. 4a describes a commonly installed liquid trap in regeneration-gas piping.

Since this is a piping design flaw, numerous solutions are available. Fig. 4b shows the modification installed at one facility

Poor upstream separation

Poor vapor-liquid separation and a lack of redundancy in level control indication on separators are leading causes of problems in gas processing in general and molecular sieve dehydration specifically.

As a rule, the bigger the separator, the better the bulk separation of vapor and liquid. A large separator with a demister pad upstream of molecular sieve dehydrators, however, does not guarantee sufficient vapor-liquid separation. This is because there will always be some liquid carryover, be it sub-μ-size mist or slugs of liquid.

Bulk separation followed by coalescer-type filters on gas streams upstream of molecular sieves (and on regeneration-gas streams from reciprocating compressors) is essential for keeping liquid hydrocarbons and free water out of the molecular sieve. Both separation devices require redundant level indication to minimize the possibility of carryover.

In the case of retrograde condensation, however, good separation upstream of dehydration will not prevent hydrocarbon liquids from forming and damaging the mole sieve.

Other problems, contaminants

Among other problems and contaminants are methanol injection, mechani-

Inlet piping

Fig. 3

Fig. 3a

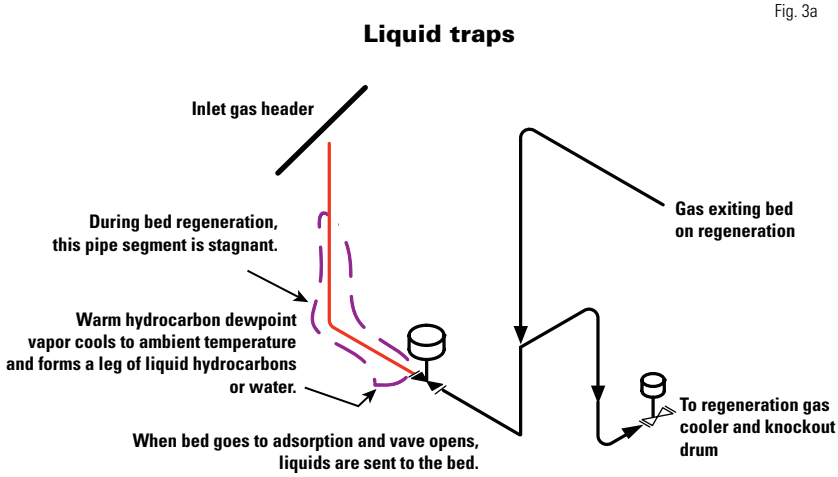
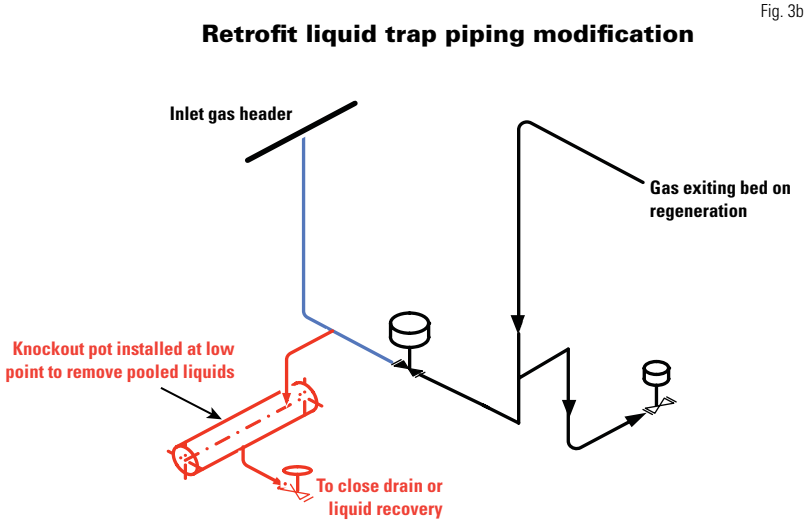


Fig. 3b



REGENERATION GAS PIPING

Fig. 4

Fig. 4a

Regeneration piping, liquid formation locations

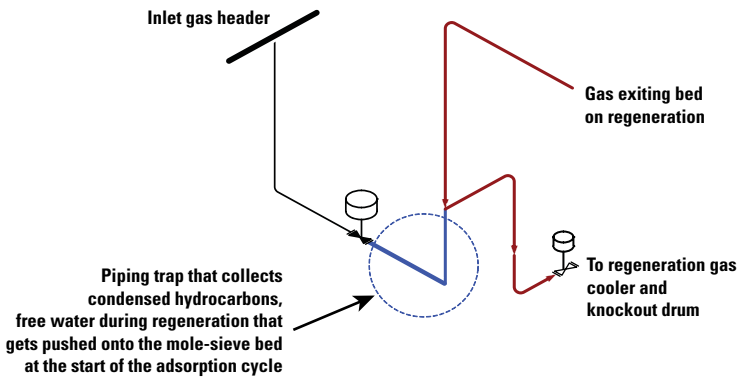
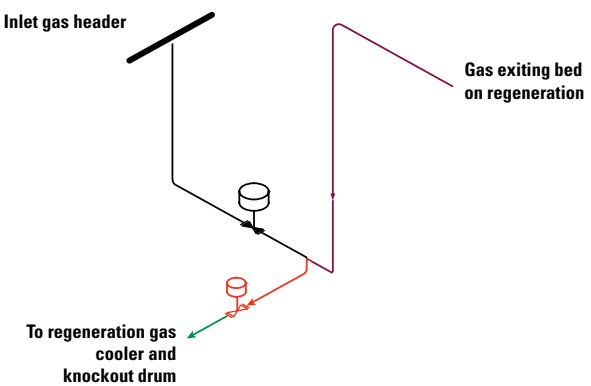


Fig. 4b

Isolation valve replacement



cal damage, poor regenerations, depressuring and repressuring rates, isolation valve, and inlet distribution.

Methanol

Methanol injection in gas gathering pipelines is a common method to inhibit hydrate formation. Methanol adsorbs considerably more on 4A sieve than 3A. Replacing 4A sieve with 3A was part of a success story at one BP facility. Before changing to 3A sieve, NGL tariff limits should be researched to determine whether methanol passing through the sieve into the cryogenic process exceeds NGL specifications for allowable methanol in the NGL product.

Mechanical damage

The support screens on which the molecular sieve sits tend to be made of thin stainless steel. Molecular sieve dehydrator vessels generally consist of 2.5+ in. thick carbon steel. When hot regeneration gas (usually 450-550° F.) flows into the vessel, the stainless-steel support grid undergoes a rapid thermal expansion and corresponding increase in diameter.

The carbon steel vessel ID is virtually unchanged, on the other hand, because there is more mass and less relative surface area for heat transfer and thermal expansion of carbon steel wall is less than stainless steel. Hence the rope packing between the support screen and the vessel becomes compressed.

As the regeneration continues, the vessel wall warms, and the ID grows when cooling gas is applied, the thermal cycle is reversed. That is, the support screen shrinks quickly and the vessel ID slowly decreases. In large-diameter molecular sieve vessels, the difference in metal growth and shrinkage between the support screen and the vessel becomes significant.

Specifically, molecular sieve dust and extrudate or spheres tend to fall into the rope packing. After numerous regeneration cycles, the rope packing begins to lose its elasticity due to the solid material. The support screen then loses the ability fully to expand and the longer screens tend to buckle.

Buckling has ranged from minor (with no operational problems) to major (in which the molecular sieve fell into the cavity beneath the support screen). In the latter, pressure drop across the bed increased and channeling (on both adsorption and regeneration) was exacerbated. Operators' response may be to increase regeneration temperature and reduce cycle times, worsening the problem.

If the system lacks appropriate instrumentation or is not monitored, the support screen problem may not be identified until the vessel is opened for the molecular sieve replacement. Replacing or repairing the screens can add weeks to the molecular sieve changeout time (which reduces plant availability). Proper instrumentation and daily monitoring of regeneration and dust-filter pressure drop help identify a problem and prepare adequate plans before vessel entry.

Where the bed had collapsed through the screen, there were several mechanisms used to resolve the issue. First was installation of a preheater on the inlet gas to prevent retrograde con-

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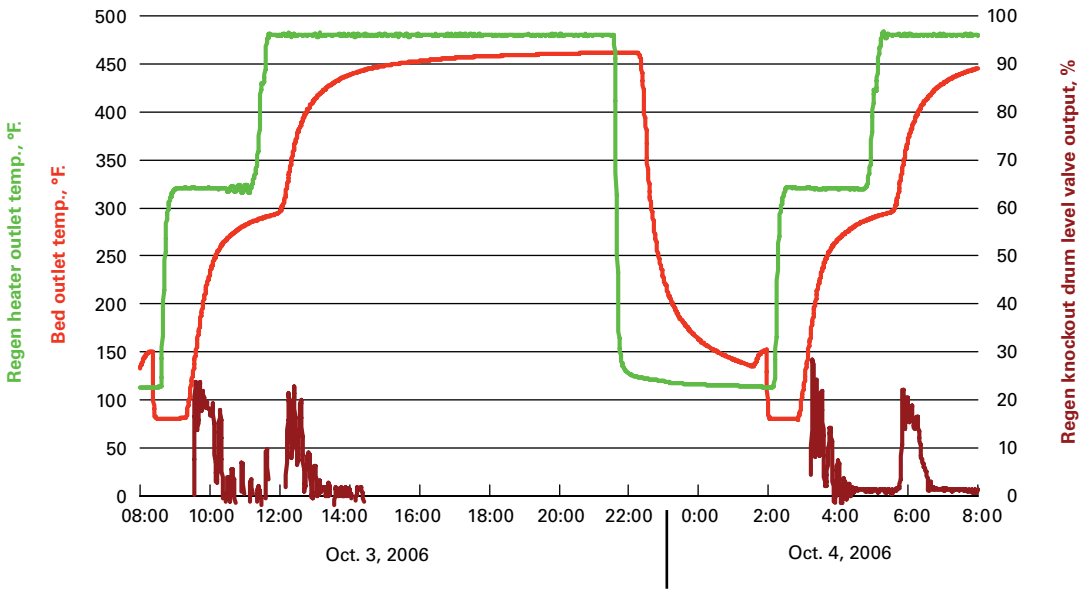
REGENERATION MONITORING VARIABLES

Fig. 5



densation. Second was to switch to 3A sieve and regenerate at 475° F. instead of 550° F. Thirdly, due to the switch to 3A, the methanol adsorption decreased and the water capacity increased to the extent that the regeneration could be extended. The extension was sufficient that a two-staged heat input was used during regeneration.

Hence the difference in thermal expansion between the support screen OD and the vessel ID was reduced. Fourthly, "L" flashing was added above the rope packing to minimize the dust falling into the rope packing.

For new installations with large diameter adsorption beds, absolute tolerances in diameter grow. Therefore, there is a greater chance for varying radii (e.g., egg-shaped vessels). The more egg-shaped a vessel, the greater the chance for the support screen to lack the necessary growth clearance. Hence, vessel ID taken at 45° and sent to the screen manufacturer before ordering the support screen is recommended. This enables thermal expansion of the grid to occur without binding.

Poor regenerations

Well designed molecular sieve systems have staged heat inputs in the regeneration process. This reduces the risk of water reflux damage during the regeneration cycle.[1]

Fig. 5 illustrates a regeneration cycle in which heat input is controlled to prevent water condensation and reflux and to minimize mechanical damage to the vessel internals due to excessive thermal stresses.

Also, poor regenerations in well designed systems tend to cause anomalous problems. Power outages, control system failures, and spikes of water in the inlet gas can all lead to insufficient moisture removal

Daily monitoring with process historian data provides a simple mechanism to ensure dehydration is complete and can reveal poor regenerations before they become a problem. Fig. 5 presents an example of regeneration data that are examined daily.

The heat during this regeneration may appear to be excessive, however; during adsorption the bed was exposed to a larger than expected amount of moisture and the heat cycle was extended (and the cooldown cycle shortened) to ensure a thorough regeneration.

Depressure, repressure rates

Rapid changes in bed pressure in the switch from regeneration to adsorption or the switch from adsorption to regeneration can lift the bed, which increases dust formation and can result in heterogeneous bed depth (and the possibility of gas channeling). Published information suggests a maximum rate of pressure change no greater than 0.8 psi/sec.

Isolation valves

Valve leakage can mask good molecular sieve performance. Use of proven isolation and switching valves minimizes moisture mechanically slipping by the molecular sieve beds.

In addition to valve leak testing at the factory, isolation and switching valve seat testing should be considered at site in particular if it can easily be adopted into pneumatic testing during precommissioning.

Furthermore, dehydration system logic and valve stroking should also be fully validated as part of precommissioning.

Inlet distribution

Layers of ceramic balls on the top and the bottom of the molecular sieve bed are low-cost measures to prevent channeling during adsorption and regeneration in addition to proper inlet-gas distribution devices. ✦

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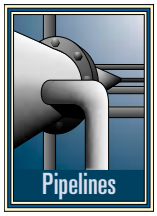
Theresa Elizondo is a senior process engineer at BP America Inc., Houston. Her current position is with BP's E&P Technology Group, operations and engineering team providing process engineering support for operations and projects worldwide. She holds a BSc (1988) in chemical engineering from the University of Texas at Austin, after which she was hired by Amoco Corp.



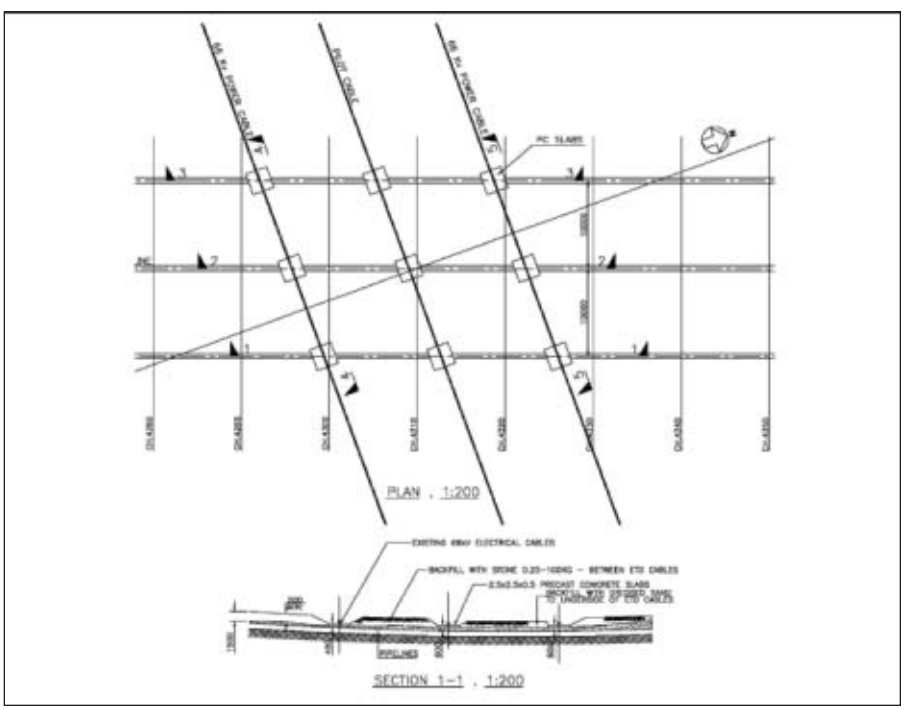
Shallow-water gas network navigates multiple problems

David McGlone
Bahrain Petroleum Co.
Awali, Bahrain

Design and installation of the offshore portion of Bahrain Petroleum Co.'s Khuff gas transmission and distribution networks (three 18-in. OD high-pressure natural gas lines) required careful planning and implementation to avoid damaging fisheries and migratory bird stops located in the shallow-water environment and impeding shipping through the commercial channel.

The offshore segment links the wharf valve station at Sitra to the Hidd metering station, roughly 6 km away on the east side of Bahrain's Muharraq island.

This article details problems related to the protection of the environment during construction and subsequent commissioning of the pipelines. The article will also present construction methods used, including steps taken to maintain access to Mina Salman port via the shipping channel and detail the design, construction, installation, and commissioning of these three 18-in. pipelines through shallow inshore waters and across the only shipping channel to the port of Mina Salman.



This illustration shows Bapco's advance plans for crossing the three 66-kv cables on the north side of QAQ Island, providing power to the ASRY dry dock and AISCO iron ore palletizing plant (Fig. 1).

Background

Bapco began expanding the Khuff gas transmission and distribution networks in Bahrain in 1996, seeking to increase gas delivery to meet rising demand for natural gas for power generation and other local industries.

Offshore pipelines emerged as an option to provide gas to a new power station in the Hidd area and to customers encouraged to participate in Bahrain's development. These projects included both the increase in electricity and desalinated water supply and development of the Hidd Industrial Area and Sheikh Khalifa bin Salman deepwater port.

Other options for gas transport included laying pipelines from near the Sitra power station or across the newly built Sheikh Khalifa causeway and bridge.

Consultation with government bodies and engineering companies prompted the decision to lay three parallel pipelines across the channel from a point near Bapco's Sitra tank farm and marine terminal, terminating at Hidd Industrial Area, 1 km north of the Arab Shipbuilding and Repair Yard (ASRY).

Offshore requirements

Initial steps in determining offshore requirements also included a gas network analysis of what additional transmission pipeline links would be required to improve flow rates and maintain delivery pressures to the distribution system. This review determined an additional five gas transmission pipelines, running parallel to existing pipelines, would be required in the Bahrain field area. Customer locations and requirements provided the basis for the distribution system review. The review also determined the need to both upgrade existing and

install new distribution and metering stations.

Offshore detail

The pipeline system needed to deliver 475 MMcfd at no less than 500 psig. Plans considered the sensitive location, maintenance, and security of supply. The decision to install three pipelines provided 100% redundancy.

The location of the pipelines and proposed future development in the area highlighted the need to use ASME B31.8 Location Class 3 and 4 design criteria, supplemented by Det Norske Veritas requirements for offshore submarine pipelines.

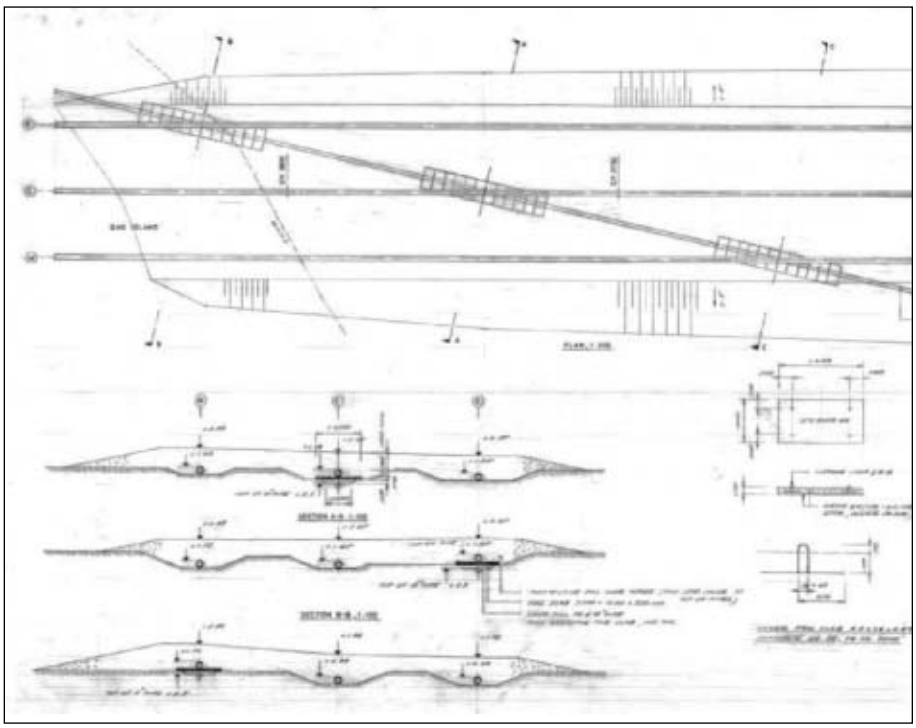
Theses codes classified the first 4,000 m of pipeline, located near the Sitra Marine terminal and Sitra Island, as Location Class 4 and the remaining section running across QAQ Island to the Hidd metering station as Location Class 3. The design required the pipe be purchased in two thicknesses; 10.3 mm and 12.4 mm. Pipe consisted of API 5L Gr. X52 PSL2, coated with a three-layer polyethylene system.

Design of the pipeline required a concrete weight coating to overcome buoyancy factors and provide mechanical protection. Installation at an invert depth of 3 m required extensive trenching with a dredger in the deepwater channel and tracked machinery in the shallow-water areas.

Offshore needs

The coastal marine environment of Bahrain is important to the local people. They have been fishing in both the shallow and deep waters of the area for generations. Bapco sought to protect this marine environment during front-end engineering and design and conducted environmental impact studies. Shallow-water fish traps needed to be moved for trenching and pipelay, and local fishermen had to be considered and alternative locations for traps provided.

QAQ Island was also home to migrating terns. Bapco considered the effect of installation work on the terns' nesting practices. The contractor was obliged to return marine and island habitats to their original state on completion of the project.



This illustration shows Bapco's advance plans for crossing the 10-in. gas line on QAQ Island supplying the iron ore pelletizing plant with high-pressure Khuff gas (Fig. 2).

Bapco welded pipe joints into 348-m lengths at this onshore fabrication yard. A total of 51 strings was fabricated and installed (Fig. 3).

Crossing the Mina Salman navigation channel required caution, as it is the only means of accessing the port of Mina Salman. Planning and execution

Excavation of the trench from the wharf valve station across QAQ Island used tracked excavators, working during daylight at low tide in the offshore areas. The excavators created their own causeways using excavated fill (Fig. 4).

This photograph shows the path of the trenching works from WVS to QAQ Island (Fig. 5).

of the crossing required communication with and cooperation of the port authority, coast guard, and Bahrain defense force. All parties had to agree to scheduling of pipe trench works and pipe pulling. Penetration of the freshwater aquifer also had to be avoided. This aquifer lay only a few feet below the target depth of the pipelines at places in the deepwater channel.

Facilities of three major utilities also required crossing. These crossings were:

- Electricity Distribution Directorate power cables-pilot cable close to QAQ Island (Fig. 1). These 66 kv cables, located on the north side of QAQ, provide power to ASRY dry dock, AISCO iron ore pelletizing plant, and other residential-business users. Bapco placed severe restrictions on the contractor relating to scheduling of the work on the crossing, protecting the cables from damage, and maintaining the minimum vertical clearance.
- Existing 10-in. gas line on QAQ Island (Fig. 2). This gas pipeline supplies high-pressure Khuff gas to the AISCO iron ore pelletizing plant and had to be crossed on the south side of QAQ Island. Maintenance of gas supply to this customer was important and Bapco took measures to avoid damaging the line and potentially interrupting service.
- Hidd dry dock road, adjacent pipelines, cables, and services. This four-lane highway provides the only land access to ASRY dry dock and is adjacent to power, telephone, and water services. Onshore activities at Hidd included installing a metering station and pipelines to customers. These pipelines ran at right angles to the offshore pipeline and had to be crossed.

Onshore fabrication

Bapco established an onshore fabrication yard (Fig. 3) for welding pipe joints into strings about 348 m long, building a total of 51 strings. Fabrication included welding pipes together, weld inspection, holiday testing of coating, pressure testing, concrete weight coating installation, heat shrink sleeve application, and bracelet aluminum anodes installation.

Setup within the pipe yard allowed completed strings to be rolled across the pipe racks to the launch ramps, where pipe strings were gathered in order of laying. The two thicknesses of pipe required they be arranged in the correct order for pulling and launching. Following fabrication, Bapco prepared the pipes for launching into the sea via a preinstalled access way under the dry dock highway.

Offshore excavation

Offshore activities included excavation of the trench from the pipeline's wharf valve station to and across QAQ Island with tracked excavators. The excavators either created their own causeway with excavated fill or were loaded onto barges (Fig. 4). A barge-mounted grab bucket and dredger completed excavation and trenching across the shipping channel.

Trenching works in some of the shallow waters from the WVS to QAQ Island could occur only at low tide and during daylight hours with tracked ex-

cavators (Fig. 5-6). Some shallow-water fish traps also needed to be removed in coordination with owners and marine organizations.

Extra care was taken where the new lines crossed the 10-in. line supplying high-pressure gas to the iron ore pelletizing plant at the southern shore of QAQ Island (Fig. 7). Precautions included installation of marker posts or buoys along the 10-in. gas line and 8-in. jet fuel line. A pipeline locator, followed by hand excavation of trial holes, determined the exact location of the jet fuel line.

Preserving the integrity of the local freshwater aquifer, which lay only a few feet below the bottom of the trench in the area of the shipping channel, required close monitoring of excavation activities and liaison with the water resource directorate.

Bapco excavated trenches between WVS and QAQ Island using this marine channel trenching barge (Fig. 6).

Pipe positioning

Launch of each of the 51 strings took place from the pipe yard through the pipe launch system under the dry dock highway. Casings installed under the highway used the open cut method. Rollers installed on either side of the casing helped launch the strings.

A 300-mt capacity linear gripper winch bottom pulled strings in trenches near WVS. These winches worked from a barge anchored in shallow water. They ran along the trench through QAQ Island and across the marine channel. On QAQ Island rotating guides allowed the pipes to negotiate the curve on the island. Buoyancy aids attached to each string reduced the submerged weight while maintaining negative buoyancy and stability.

The capacity of the winch proved to be inadequate during the first bottom pull. The pipeline contractor decommissioned the pipe pull barge and located a 200-mt capacity winch spread on QAQ Island. Flotation devices again provided some buoyancy. Pulling each string from the yard entailed welding the next string to it, performing NDT on the weld, applying heat-shrink sleeves and concrete weight, and then resuming the pull. This sequence installed the pipeline on the bottom of the trench from QAQ Island to the dry dock highway crossing.

Trench crossing the 10-in. gas pipeline at the southern portion of QAQ Island required care in its execution (Fig. 7).

Shallow waters in the area between WVS and QAQ Island required each string be floated into position on the surface. All activity related to the pulling or floating of strings from the fabrication yard ran through the various marine agencies to ensure shipping was not unduly affected.

Offshore field tie-ins used welding on pontoons from which completed lengths were lowered (Fig. 8).

Excavation retrieved a soft-form pig and conventional bidirectional pig caught inside the damaged pipeline (Fig. 9).

Offshore welds

Fabricating the pipeline in sections required several tie-in welds over the offshore trenches. Floating pontoons supported these tie-ins. The pontoons floated above the tie-in point and the two sections to be joined were rigged and lifted out of the water. Workers removed end caps, completed pipe-end preparation and completed the tie-in weld. This process required marine, rigging, fabrication, welding, inspection, diving, coating, and concrete weight coating services be available on the pontoon at various times during the tie-in work. Lowering the pipe into the trench ensured correct alignment (Fig. 8).

Postinstallation surveys

Following installation, divers conducted a line survey including video to ensure the three pipelines were in the correct location and minimum distances between pipelines had been observed. Barge-mounted cranes made any necessary corrections to properly align the pipes. Permission to backfill the trenches occurred only after verification the pipelines had been laid in the proper location.

Application of a protective rock layer followed backfill, addressing the tendency of ships to drag anchor in the marine channel area.

Hydrostatic testing

Following construction activities, including installation of pig launching and receiving facilities at each end, the pipelines underwent various swabbing activities to clean them internally and confirm roundness had remained within specification. Specification for the gauging plate was 95% ID.

The pipeline contractor enlisted the assistance of the Bahrain civil defense fire service to expedite swabbing and pigging. The fire service provided newly acquired fire trucks and pumps to fill the line with water. This not only provided a reliable pumping system, but also gave the fire brigade the opportunity to severely test newly acquired equipment.

Repairs

Swabbing and gauge plate runs revealed the easternmost pipeline had a serious obstruction, either internal or external. The pipeline contractor recruited a specialist company to smart pig the line and locate the obstruction, following other efforts to address the blockage via conventional pigging.

Locating the obstruction with a combination of information received from the smart pig and closely monitoring the amount of water used to push the pigs to the obstruction allowed precise reexcavation of the pipeline and confirmation of external damage by divers. Subsea repair entailed cutting out the defective pipe and replacing it with sound pipe. The relatively shallow depth allowed air-supplied hypobaric welding (Figs. 9-10).

Contractors completed the swabbing and hydrostatic testing of the other two pipelines during this repair work.

Following repair, they also satisfactorily hydrotested the third line.

Commissioning

Superdry air (dewpoint, –20° C.) dewatered and dried the pipelines following construction and inspection. Nitrogen purged the pipelines before gas was introduced. Bapco's gas operations section handled final commissioning. ✦

The author

David McGlone (david_mcglone@bapco.net) is senior inspection engineer at Bahrain Petroleum Co., Kingdom of Bahrain. He has also served as inspection engineer, head services engineer, and quality coordinator at past companies.

Bapco cut the damaged length of pipe (shown here) out of the pipeline and replaced it with good pipe (Fig. 10).

Equipment/Software/Literature

Gas engine introduced to compressor operations

This firm's 34SG gas engines now are available for gas compressor operations.

With outputs of 4,050-9,000 kw (5,430 to 12,070 bhp), these gas engines are suited for gas pipelines and gas storage.

Three versions are available: the 9-cylinder in-line 9L34SG with 4,050 kw (5,430 bhp) shaft power, the 16-cylinder 16V34SG engine with 7,200 kw (9,655 bhp), and the 20-cylinder 20V34SG with 9,000 kw (12,070 bhp) shaft power. The nominal speed is 750 rpm. Compared with gas turbines often used for driving compressor sets in this power range, 34SG engines offer lower fuel gas consumption and greater turndown ratios, the company says.

Engines have a full-load efficiency of 46.3% (heat rate 5,493 btu/hp-hr), a 30% speed turndown ratio (to 525 rpm), and a 70% torque turndown ratio. Engine efficiency and exhaust emissions remain virtually unchanged on the whole load range. The 34SG engine has low exhaust emissions. NOX emissions remain below the 500 mg/cu Nm dry at 5% O_2 level throughout the entire speed and torque range. Engines have a fully electronic control system for all the main engine functions: gas feed, charge airflow, fuel gas flow control, individual cylinders, and ignition control.

Source: **Wartsila Corp.,** John Stenbergin ranta 2, Box 196, FI-00531, Helsinki, Finland.

New gauge for oil field use

This new oil field safety case gauge features a solid front and blowout back.

The gauge features a 0.5% ANSI/ASME Grade 1A accuracy, full rotary movement and a micrometer pointer for easy calibration. The 4.5 in. dial helps make the gauge easy to read. (Four in. and 6 in. dials are available.)

It's suited for uses where high pressure buildup may cause ruptures in the bourdon tube. A solid wall separates the tube from the gauge face, thereby forcing the back to blow out in the case of catastrophic failure. Its safety glass lens is shatterproof.

Source: **Winters Instruments,** 121 Railside Rd., Toronto, Ont. M3A 1B2.

New reservoir engineering software package

Newly released GOCAD Suite Version 2.5.2 is a software package for reservoir engineering and advanced geologic and seismic interpretation.

The suite includes four work flow-based applications for improved functionality and interconnectivity in structural analysis. Version 2.5.2 extends interdisciplinary 3D subsurface modeling with integrated work flows, rigorous data analysis, new documentation, and the addition of plug-in extensions.

Source: **Paradigm Geotechnology BV,** Telestone 8, Teleport, Naritaweg 165, 1043 BW Amsterdam, Netherlands.

Services/Suppliers

Douglas-Westwood Ltd.,

Reid

Aberdeen, has appointed Andrew Reid managing director. John Westwood, company founder and former managing director, will assume the role of executive chairman. Previously operations director with divisional responsibility for the firm's transactions services business, Reid will continue to be based at Douglas-Westwood's Aberdeen office. He joined Douglas-Westwood in 2006 and was appointed to the board in 2007. Previously, Reid was a mergers and acquisitions advisor focused on the oil and gas industry managing buyside and sellside mandates and corporate development projects at Ernst & Young. He also has extensive experience as an energy analyst, including market modeling, forecasting, and due-diligence studies at Ernst & Young and ODS Petrodata. Prior to these appointments, he was a sellside equity analyst responsible for European oil service coverage with investment bankers Simmons & Co. He holds an MA in economics and an MBA.

Douglas-Westwood was formed in 1990 and has grown to become a leading provider of market research, strategic reviews, and commercial due-diligence services to both investment houses and players in the energy sector.

Transocean Inc.,

Houston, has named Terry B. Bonno vice-president, marketing. Bonno previously served as director, marketing, North and South America Unit—which covers the U.S. Gulf of Mexico, Canada, Trinidad and Tobago, and Brazil—since March 2005. She brings 26 years of industry experience, including 17 years with Global Marine Inc. and Applied Drilling Technology Inc., two subsidiaries of GlobalSantaFe Corp. that were assumed in a recent merger with the company, and 9 years with Transocean. Bonno has served in various management positions in accounting, corporate planning, and marketing, including manager, sales and contracts turnkey; manager, asset sales; and senior sales representative, North America. She also served in the company's Europe and Africa Unit (EAU) as marketing manager, West Africa South, from 2003 to 2005. Bonno is a certified public accountant and holds a bachelor's in business administration-accounting from Stephen F. Austin State University. In addition, Transocean has named Simon Crowe vice-president, planning and strategy. Previously, he served as director, finance, for EAU. Crowe joined the company in 2004 as EAU finance director. Before joining Transocean, he served in various finance functions with three international energy companies. Crowe holds a degree in physics from Liverpool University. He is also a member of the Chartered Institute of Management Accountants in the UK.

Transocean Inc. is the world's largest offshore drilling contractor and a leading provider of drilling management services worldwide.

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Supporting Organization: GEP

Imports of crude and products

	Districts 1-4 5-2 2008	Districts 1-4 4-25 2008	District 5 5-2 2008	District 5 4-25 2008	Total US 5-2 2008	Total US 4-25 2008	Total US *5-4 2007
	1,000 b/d						
Total motor gasoline	1,362	1,329	132	56	1,494	1,385	1,222
Mo. gas. blending comp.	977	907	121	47	1,098	954	578
Distillate	186	272	1	1	187	273	327
Residual	209	261	108	164	317	425	211
Jet fuel-kerosine	131	54	—	60	131	114	324
Propane-propylene	127	119	12	14	139	133	101
Other	–44	442	74	48	30	490	827
Total products	**2,948**	**3,384**	**448**	**390**	**3,396**	**3,774**	**3,590**
Total crude	**9,435**	**9,182**	**1,193**	**1,033**	**10,628**	**10,215**	**10,991**
Total imports	**12,383**	**12,566**	**1,641**	**1,423**	**14,024**	**13,989**	**14,581**

*Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—May 9, 2008

Receiving terminal	Liquefaction plant: Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	8.51	6.37	7.80	6.24	7.07	7.71
Everett	9.96	7.39	9.50	7.43	8.10	10.33
Isle of Grain	9.91	7.39	9.12	7.28	8.05	9.15
Lake Charles	8.29	5.81	8.00	6.05	6.48	9.06
Sodegaura	7.08	9.17	7.33	9.32	8.48	6.25
Zeebrugge	9.07	6.62	8.34	6.50	7.27	8.34

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	16,039	58,401	31,740	9,060	31,620	14,382	2,997
PADD 2	67,110	49,873	18,168	7,650	27,868	1,200	10,975
PADD 3	170,625	69,094	32,985	12,412	31,200	16,327	15,025
PADD 4	13,809	5,713	1,854	639	2,986	270	[1]762
PADD 5	58,000	28,802	21,729	9,031	12,050	6,418	—
May 2, 2008	**325,583**	**211,883**	**106,476**	**38,792**	**105,724**	**38,597**	**29,759**
Apr. 25, 2008	**319,929**	**211,089**	**103,151**	**38,738**	**105,831**	**39,522**	**28,540**
May 4, 2007[2]	**341,159**	**193,471**	**89,000**	**40,043**	**118,764**	**38,773**	**28,697**

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

Refinery report—May 2, 2008

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	1,318	1,316	1,825	104	477	102	57
PADD 2	3,281	3,206	2,305	197	984	39	228
PADD 3	7,469	7,309	2,937	671	2,147	392	715
PADD 4	462	462	260	28	158	14	[1]115
PADD 5	2,418	2,356	1,350	400	473	168	—
May 2, 2008	**14,948**	**14,649**	**8,677**	**1,400**	**4,239**	**715**	**1,115**
Apr. 25, 2008	**15,021**	**14,748**	**8,964**	**1,471**	**4,238**	**656**	**993**
May 4, 2007[2]	**15,541**	**15,306**	**8,931**	**1,398**	**4,206**	**669**	**1,092**
	17,588 operable capacity		**85.0% utilization rate**				

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

Additional analysis of market trends is available through **OGJ Online**, *Oil & Gas Journal's* electronic information source, at http://www.ogjonline.com.

OIL&GAS JOURNAL online research center

OGJ crack spread

	*5-9-08	*5-11-07	Change $/bbl	Change, %
SPOT PRICES				
Product value	133.50	87.47	46.03	52.6
Brent crude	120.92	64.27	56.65	88.1
Crack spread	12.59	23.20	–10.62	–45.8
FUTURES MARKET PRICES				
One month				
Product value	136.67	87.86	48.82	55.6
Light sweet crude	123.00	61.89	61.11	98.7
Crack spread	13.68	25.97	–12.29	–47.3
Six month				
Product value	132.48	79.67	52.81	66.3
Light sweet crude	120.91	66.92	53.99	80.7
Crack spread	11.58	12.75	–1.17	–9.2

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

OGJ GASOLINE PRICES

	Price ex tax 5-7-08	Pump price* 5-7-08	Pump price 5-9-07
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	333.2	372.9	299.9
Baltimore	317.5	359.4	302.7
Boston	312.5	354.4	294.0
Buffalo	316.7	376.9	307.4
Miami	331.6	381.9	315.7
Newark	313.8	346.7	283.4
New York	303.3	363.1	303.7
Norfolk	307.9	345.5	290.6
Philadelphia	313.2	363.9	304.6
Pittsburgh	312.0	362.7	293.6
Wash., DC	332.8	371.2	307.9
PAD I avg.	317.6	363.5	300.3
Chicago	346.4	397.3	339.9
Cleveland	307.1	353.5	299.9
Des Moines	309.3	349.7	296.6
Detroit	314.1	363.3	305.3
Indianapolis	314.6	359.6	306.9
Kansas City	305.9	341.9	292.6
Louisville	333.6	370.6	304.9
Memphis	308.0	347.8	286.9
Milwaukee	324.6	375.9	316.9
Minn.-St. Paul	314.6	355.0	298.3
Oklahoma City	309.2	344.6	292.9
Omaha	306.2	352.6	301.9
St. Louis	323.0	359.0	294.2
Tulsa	304.3	339.7	293.2
Wichita	301.1	344.5	295.6
PAD II avg.	314.8	357.0	301.7
Albuquerque	312.3	348.7	303.2
Birmingham	315.1	353.8	289.6
Dallas-Fort Worth	317.1	355.5	293.5
Houston	312.4	350.8	290.6
Little Rock	312.5	352.7	288.6
New Orleans	311.4	349.8	287.2
San Antonio	307.9	346.3	278.2
PAD III avg.	312.6	351.1	290.1
Cheyenne	302.0	335.3	288.1
Denver	324.9	365.3	306.7
Salt Lake City	304.3	347.2	300.1
PAD IV avg.	310.7	349.3	298.3
Los Angeles	331.9	390.4	344.0
Phoenix	302.7	340.1	306.6
Portland	324.0	367.3	328.3
San Diego	340.5	399.0	352.9
San Francisco	347.3	405.8	369.3
Seattle	323.9	376.3	335.2
PAD V avg.	328.4	379.8	339.4
Week's avg.	**316.8**	**360.4**	**304.6**
Apr. avg.	**296.4**	**339.3**	**278.3**
Mar. avg.	**276.1**	**319.7**	**254.0**
2008 to date	**276.1**	**319.7**	—
2007 to date	**207.3**	**250.9**	—

*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

	5-2-08 ¢/gal		5-2-08 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	285.39	New York Harbor	321.11
Gulf Coast	285.14	Gulf Coast	316.36
Los Angeles	295.14	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	270.53	ARA	345.54
Singapore	274.83	Singapore	328.07
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	300.39	New York Harbor	195.55
Gulf Coast	309.14	Gulf Coast	206.86
Los Angeles	306.14	Los Angeles	212.96
		ARA	209.41
		Singapore	205.71

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

BAKER HUGHES RIG COUNT

	5-9-08	5-11-07
Alabama	6	4
Alaska	5	8
Arkansas	45	44
California	40	33
Land	38	32
Offshore	2	1
Colorado	121	109
Florida	0	0
Illinois	1	0
Indiana	2	2
Kansas	11	14
Kentucky	10	8
Louisiana	150	184
N. Land	51	61
S. Inland waters	22	27
S. Land	21	32
Offshore	56	64
Maryland	0	0
Michigan	1	1
Mississippi	12	14
Montana	10	20
Nebraska	0	0
New Mexico	76	78
New York	8	5
North Dakota	61	33
Ohio	12	12
Oklahoma	210	182
Pennsylvania	19	14
South Dakota	3	2
Texas	889	819
Offshore	10	12
Inland waters	1	1
Dist. 1	30	21
Dist. 2	33	25
Dist. 3	59	57
Dist. 4	93	91
Dist. 5	179	171
Dist. 6	120	117
Dist. 7B	34	38
Dist. 7C	69	57
Dist. 8	125	114
Dist. 8A	23	24
Dist. 9	38	33
Dist. 10	75	58
Utah	40	43
West Virginia	26	33
Wyoming	71	70
Others—AZ-1; NV-3; OR-2; TN-5; VA-6	17	9
Total US	**1,846**	**1,740**
Total Canada	**122**	**103**
Grand total	**1,968**	**1,843**
Oil rigs	361	282
Gas rigs	1,475	1,456
Total offshore	69	77
Total cum. avg. YTD	**1,790**	**1,738**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 46.

Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

SMITH RIG COUNT

Proposed depth, ft	5-9-08 Rig count	5-9-08 Percent footage*	5-11-07 Rig count	5-11-07 Percent footage*
0-2,500	83	6.0	54	9.2
2,501-5,000	118	55.0	112	49.1
5,001-7,500	213	14.5	227	17.6
7,501-10,000	418	4.3	404	2.7
10,001-12,500	463	2.5	434	3.9
12,501-15,000	282	—	268	0.7
15,001-17,500	117	—	103	0.9
17,501-20,000	76	—	78	—
20,001-over	37	—	38	—
Total	**1,807**	**7.3**	**1,718**	**7.6**
INLAND	28		40	
LAND	1,722		1,613	
OFFSHORE	57		65	

*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]5-9-08	[2]5-11-07
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	15	20
Alaska	720	755
California	655	670
Colorado	43	52
Florida	6	6
Illinois	24	27
Kansas	93	101
Louisiana	1,354	1,332
Michigan	15	16
Mississippi	50	51
Montana	91	91
New Mexico	162	163
North Dakota	115	116
Oklahoma	170	170
Texas	1,345	1,356
Utah	44	51
Wyoming	143	145
All others	61	73
Total	**5,106**	**5,195**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

	5-9-08 $/bbl*
Alaska-North Slope 32°	96.05
South Louisiana Sweet	128.25
California-Kern River 13°	113.25
Lost Hills 30°	121.35
Southwest Wyoming Sweet	117.46
East Texas Sweet	122.00
West Texas Sour 34°	115.00
West Texas Intermediate	122.50
Oklahoma Sweet	122.50
Texas Upper Gulf Coast	119.00
Michigan Sour	115.50
Kansas Common	121.50
North Dakota Sweet	115.25

*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

	5-2-08 $/bbl[1]
United Kingdom-Brent 38°	113.52
Russia-Urals 32°	106.95
Saudi Light 34°	109.97
Dubai Fateh 32°	108.05
Algeria Saharan 44°	115.32
Nigeria-Bonny Light 37°	117.49
Indonesia-Minas 34°	113.75
Venezuela-Tia Juana Light 31°	110.06
Mexico-Isthmus 33°	109.95
OPEC basket	112.08
Total OPEC[2]	110.25
Total non-OPEC[2]	110.16
Total world[2]	110.21
US imports[3]	108.98

[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]

	5-2-08	4-25-08	5-2-07	Change, %
	bcf			
Producing region	549	531	688	–20.2
Consuming region east	690	652	760	–9.2
Consuming region west	197	188	272	–27.6
Total US	**1,436**	**1,371**	**1,720**	**–16.5**
	Feb. 08	**Feb. 07**	**Change, %**	
Total US[2]	**1,465**	**1,649**	**–11.2**	

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

Statistics

INTERNATIONAL RIG COUNT

Region	Apr. 2008 Land	Apr. 2008 Off.	Apr. 2008 Total	Apr. 07 Total
WESTERN HEMISPHERE				
Argentina	88	—	88	86
Bolivia	2	—	2	3
Brazil	20	26	46	36
Canada	105	1	106	101
Chile	1	—	1	1
Colombia	40	—	40	35
Ecuador	7	—	7	9
Mexico	65	37	102	85
Peru	5	2	7	7
Trinidad	1	4	5	6
United States	1,765	64	1,829	1,750
Venezuela	65	17	82	79
Other	—	—	—	2
Subtotal	**2,163**	**151**	**2,314**	**2,200**
ASIA-PACIFIC				
Australia	15	15	30	23
Brunei	1	1	2	4
China-offshore	—	19	19	17
India	57	24	81	83
Indonesia	41	24	65	51
Japan	4	1	5	4
Malaysia	—	9	9	18
Myanmar	7	—	7	9
New Zealand	4	1	5	5
Papua New Guinea	4	—	4	2
Philippines	2	—	2	—
Taiwan	—	—	—	—
Thailand	3	7	10	13
Vietnam	—	8	8	8
Other	—	2	2	3
Subtotal	**138**	**111**	**249**	**240**
AFRICA				
Algeria	30	—	30	25
Angola	1	6	7	5
Congo	1	1	2	3
Gabon	1	1	2	2
Kenya	—	—	—	—
Libya	15	—	15	11
Nigeria	3	6	9	7
South Africa	—	1	1	—
Tunisia	2	1	3	3
Other	2	2	4	4
Subtotal	**55**	**18**	**73**	**60**
MIDDLE EAST				
Abu Dhabi	9	3	12	13
Dubai	—	—	—	1
Egypt	46	9	55	38
Iran	—	—	—	—
Iraq	—	—	—	—
Jordan	—	—	—	1
Kuwait	13	—	13	11
Oman	55	—	55	47
Pakistan	19	—	19	18
Qatar	2	10	12	10
Saudi Arabia	65	13	78	73
Sudan	—	—	—	—
Syria	21	—	21	21
Yemen	13	—	13	14
Other	1	—	1	1
Subtotal	**244**	**35**	**279**	**248**
EUROPE				
Croatia	—	—	—	1
Denmark	—	3	3	4
France	1	—	1	—
Germany	9	1	10	5
Hungary	3	—	3	2
Italy	3	1	4	3
Netherlands	—	3	3	4
Norway	—	19	19	23
Poland	1	—	1	2
Romania	17	3	20	2
Turkey	5	—	5	5
UK	1	17	18	32
Other	6	—	6	4
Subtotal	**46**	**47**	**93**	**87**
Total	**2,646**	**362**	**3,008**	**2,835**

Definitions, see OGJ Sept. 18, 2006, p. 42.
Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

OIL IMPORT FREIGHT COSTS*

Source	Discharge	Cargo	Cargo size, 1,000 bbl	Freight (Spot rate) worldscale	$/bbl
Caribbean	New York	Dist.	200	224	1.90
Caribbean	Houston	Resid.	380	207	1.97
Caribbean	Houston	Resid.	500	211	2.01
N. Europe	New York	Dist.	200	319	4.36
N. Europe	Houston	Crude	400	224	4.53
W. Africa	Houston	Crude	910	182	4.04
Persian Gulf	Houston	Crude	1,900	102	4.18
W. Africa	N. Europe	Crude	910	208	3.42
Persian Gulf	N. Europe	Crude	1,900	74	2.23
Persian Gulf	Japan	Crude	1,750	119	2.88

*April 2008 average.
Source: Drewry Shipping Consultants Ltd. Data available in OGJ Online Research Center.

WATERBORNE ENERGY INC. US LNG IMPORTS

Country	Apr. 2008	Mar. 2008	Apr. 2007	Change from a year ago, %
	MMcf			
Algeria	—	—	24,450	—
Egypt	—	—	14,190	—
Equatorial Guinea	—	—	—	—
Nigeria	3,030	—	9,030	–66.4
Norway	—	3,030	—	—
Qatar	—	—	—	—
Trinidad and Tobago	30,320	22,050	50,870	–40.4
Total	**33,350**	**25,080**	**98,540**	**–66.2**

Source: Waterborne Energy Inc. **NOTE: No new data at press time.**
Data available in OGJ Online Research Center.

PROPANE PRICES

	Mar. 2008	Apr. 2008	Mar. 2007	Apr. 2007
	¢/gal			
Mont Belvieu	147.47	159.03	103.71	110.83
Conway	146.63	157.08	100.47	107.93
Northwest Europe	165.01	168.13	100.54	103.47

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

MUSE, STANCIL & CO. REFINING MARGINS

	US Gulf Coast	US East Coast	US Mid-west	US West Coast	North-west Europe	South-east Asia
	$/bbl					
Apr. 2008						
Product revenues	134.07	121.80	126.74	130.00	124.87	121.22
Feedstock costs	–117.19	–114.04	–110.38	–106.11	–110.40	–113.36
Gross margin	16.88	7.76	16.36	23.89	14.47	7.86
Fixed costs	–2.09	–2.41	–2.35	–2.74	–2.35	–1.82
Variable costs	–2.69	–1.76	–2.37	–4.47	–3.78	–1.12
Cash operating margin	**12.10**	**3.59**	**11.64**	**16.68**	**8.34**	**4.92**
Mar. 2008	10.70	1.05	8.96	15.18	6.42	4.97
YTD avg.	9.37	1.62	8.96	14.63	5.48	3.44
2007 avg.	12.36	6.36	18.60	20.89	5.75	2.26
2006 avg.	12.39	6.13	14.91	23.69	5.88	1.06
2005 avg.	12.53	6.98	12.31	20.55	5.51	1.52

Source: Muse, Stancil & Co. See OGJ, Jan. 15, 2001, p. 46
Data available in OGJ Online Research Center.

MUSE, STANCIL & CO. GASOLINE MARKETING MARGINS

Mar. 2008	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	330.40	318.59	356.92	330.13
Taxes	58.87	38.40	63.70	52.71
Wholesale price	264.46	273.34	282.91	266.13
Spot price	257.74	265.05	276.30	248.83
Retail margin	7.01	6.85	10.31	11.29
Wholesale margin	6.72	8.29	6.61	17.30
Gross marketing margin	**13.73**	**15.14**	**16.92**	**28.59**
Feb. 2008	28.64	19.16	–1.94	29.87
YTD avg.	25.50	20.77	13.58	32.44
2007 avg.	26.96	23.12	19.05	31.10
2006 avg.	19.74	20.34	18.03	27.90
2005 avg.	19.77	16.26	20.39	27.13

*The wholesale price shown for Chicago is the RFG price utilized for the wholesale margin. The Chicago retail margin includes a weighted average of RFG and conventional wholesale purchases.
Source: Muse, Stancil & Co. See OGJ, Oct. 15, 2001, p. 46.
Data available in OGJ Online Research Center.
Note: Margins include ethanol blending in all markets.

MUSE, STANCIL & CO. ETHYLENE MARGINS

	Ethane	Propane	Naphtha
	¢/lb ethylene		
Apr. 2008			
Product revenues	73.28	124.19	151.60
Feedstock costs	–38.94	–90.65	–149.77
Gross margin	34.34	33.54	1.83
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–6.76	–8.03	–10.90
Cash operating margin	**22.20**	**19.15**	**–16.26**
Mar. 2008	17.69	18.63	–13.86
YTD avg.	18.42	18.00	–10.78
2007 avg.	14.41	14.14	–7.42
2006 avg.	19.53	22.44	1.34
2005 avg.	14.43	20.68	1.28

Source: Muse, Stancil & Co. See OGJ, Sept. 16, 2002, p. 46.
Data available in OGJ Online Research Center.

MUSE, STANCIL & CO. US GAS PROCESSING MARGINS

Apr. 2008	Gulf Coast	Mid-continent
	$/Mcf	
Gross revenue		
Gas	9.84	8.18
Liquids	1.65	4.55
Gas purchase cost	10.96	10.98
Operating costs	0.07	0.15
Cash operating margin	**0.47**	**1.60**
Mar. 2008	0.51	1.64
YTD avg.	0.56	1.74
2007 avg.	0.44	1.48
2006 avg.	0.26	0.97
2005 avg.	–0.06	0.25
Breakeven producer payment % of liquids	70%	64%

Source: Muse, Stancil & Co. See OGJ, May 21, 2001, p. 54.
Data available in OGJ Online Research Center.

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Southern Star Central Gas Pipeline (SSCGP) is an interstate natural gas transportation company, headquartered in Owensboro, KY. SSCGP operates a 6,000-mile pipeline system transporting natural gas from Kansas, Oklahoma, Texas, Wyoming and Colorado to markets in the Mid-continent. We provide competitive salaries and benefits.

Southern Star provides a fun, friendly, and modern working environment as well as competitive salaries and excellent benefits. We are seeking an experienced professional with skills and qualifications in the following area.

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This position reports directly to the Manager of Design Engineering and provides engineering direction and technical assistance for the design, development, and execution of natural gas facilities; including but not limited to: measurement, regulation, pipeline, and other related gas handling equipment/facilities.

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Communication and Collaboration
Work with third party engineering consulting firms on more complex projects to ensure facilities meet all applicable standards and specifications.
Work with customers to develop measurement and pipeline facilities in accordance with their service/business needs.
Provide engineering technical support, troubleshooting, and problem solving for operating issues relating to pipelines, gas regulating and measurement equipment, electronic automation, and other gas handling facilities.
Participate in studies and projects to enhance the overall safety, reliability, and efficiency of the gas transmission system.

Assist with development and implementation of Company Design Standards and Specifications

Required:

Bachelors Degree in Engineering
Minimum 2 years experience serving as design, construction, or project engineer for natural gas facilities
Intermediate skill level in Microsoft Office applications

Preferred:

Fundamentals of Engineering Certificate
Minimum 2 years experience in Measurement design of Natural gas facilities
Demonstrated problem-solving and interpersonal skills
Demonstrated strong verbal and written communication skills
Experience working with minimal direction
Experience successfully working on multiple, diverse projects and meeting deadlines
Demonstrated customer-focus skills
Experience working on teams

Working environment will require exposure to construction sites, outside elements, large engine rooms and gas handling facilities. Some overnight travel (< 25%) is required.

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Website: www.sscgp.com
Deadline: May 30, 2008

How to apply:

If you have qualifications we need, want a job that uses your existing skills and encourages you to develop new ones, provides varied work challenges, and allows you to work with a great group of people, this position might be a perfect fit. Please forward your resume, which should provide evidence of how you meet each minimum requirement mentioned and any preferences listed, to: SSCGP HR Department, Job Postings, PO Box 20010, Owensboro, KY 42304 or e-mail your resume to jobs@sscgp.com. You must include the Job# identified above or your resume will not be considered.

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Introduction to Petroleum Refining, Technology and Economics: Colorado School of Mines. August 12-14, 2008. Overview of the integrated fuels refinery of today, from the crude oil feed to the finished products. Emphasis is placed on transportation fuels production and the refinery process used.
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Intensity rising in the politics of energy villainy

Intensity is rising in the politics of energy villainy.

This brand of politics, peculiar to the US, treats energy not as a vital national concern but as a morality play.

If something goes wrong with energy—meaning gasoline prices rise—politicians identify villains and heroically flail away.

Villains teem in legislation about which discussion has revived in Congress.

The Editor's Perspective

by Bob Tippee, Editor

Oil companies! Oil speculators! Price gougers! OPEC! Villains—all of them!

So elected heroes are now preparing to charge into political battle to subdue the scoundrels with taxes, regulations, even criminal prohibitions.

They're also brandishing anew the threat of a windfall profit tax, the imposition of which would give them something to pound their chests about.

History, though, spoils the tale. It shows that windfall profit taxes don't lower gasoline prices. Windfall profit taxes lower oil supplies. And lower oil supplies raise gasoline prices.

Even for elected heroes, this is not difficult to understand. So why would elected heroes want to repeat an expensive mistake?

If there's a dark force elevating oil prices it's the cumulative effect of past decisions hostile to the development of domestic oil and gas supply, including the original windfall profit tax. Other decisions suppressing supply now or in the past include refusal to approve leasing of the Arctic National Wildlife Refuge Coastal Plain, moratoriums on oil and gas leasing of the Outer Continental Shelf, and regulatory impediments to refinery and pipeline construction.

Sinister, too, is the dominant fantasy that the economy can somehow show no strain—and that consumers can somehow benefit—from the replacement of high-potential, low-cost energy forms with low-potential, high-cost substitutes.

So if energy has to be construed in dramatic terms in order to attract the attention it needs then, yes, the subject does have its villains.

They're lawmakers who take simplistic political advantage of complex energy problems, who propose to repeat historic mistakes, and who refuse to act except in token ways on energy consumers' premier interest: abundant and affordable supply.

These villains don't need to be slain. They just need to be removed from office before they do any more harm.

(Online May 9, 2008; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

Energy prices continue climbing

The June contract for US light, sweet crudes jumped to a record of $126.27/bbl May 9 on the New York Mercantile Exchange before closing at a record $125.96/bbl, gaining a total $9.64/bbl over five trading sessions that week.

North Sea Brent crude gained $10.84/bbl to $125.40/bbl that same week. Gasoline matched crude's gains on NYMEX, up $9.66/bbl to $3.20 gal. "But no one could come close to the weekly gains of heating oil at $17.64/bbl, [closing at a record $3.64/gal on May 9]" said Olivier Jakob at Petromatrix, Zug, Switzerland.

The price rally was fueled in part by evidence that Venezuelan President Hugo Chavez has aided rebels in the attempted overthrow of the government of Colombia. Investors fear Venezuela will cut off crude supplies to the US if the US government imposes sanctions against that country.

Market speculation

Many analysts attribute the oil-price surge to a general weakness of the US dollar against other key currencies and to the large amount of speculative funds invested into the commodities market. As a result, a bill is pending in the US Senate that would impose speculative-trading limits for West Texas Intermediate on the London markets, like those on the New York market.

"Since 2002 and the beginning of the boom in commodity prices, it has become increasingly fashionable to blame a large part of this rise on the speculative community," said Adam Sieminski, chief energy economist for Deutsche Bank, "While we agree that disconnects between price and underlying physical fundamentals can occur due to investor flows, we believe that such anomalies cannot persist for long and that underlying fundamentals remain the ultimate drivers of commodity prices, forward curves, and volatility."

Moreover, he said, "The rally in nonexchange traded commodity prices, such as molybdenum, cadmium, and ferrochrome, since the end of 2002 has been similar if not greater in magnitude than the rally in exchange traded commodities, such as crude oil and copper, where speculative inflows are possible." Sieminski said, "We believe this refutes the claim that speculators have been the primary drivers of rising commodity prices during this cycle. Rather it may be an indication of the increasing pricing power that resides with commodity producing companies and countries."

Sieminski said, "The oil price has continued to rally in the face of a stronger US dollar and confirms to us that this relationship was always built on shaky foundations. We do not see any signs yet that non-OECD [Organization for Economic Cooperation and Development] oil demand is suffering from the rise in oil prices. On our various measures, oil prices would need to rise above $150/bbl to be considered extreme."

Goldman Sachs Group Inc. forecast crude costs could escalate to $150-200/bbl within 2 years (OGJ Online, May 6, 2008). In 1985, a team of Goldman Sachs analysts forecast a spike of crude prices to $50-105/bbl at some point within a few years because of continued unexpected strength in world oil demand and economic growth, especially in the US and China. Olivier Jakob at Petromatrix, Zug, Switzerland, said, "Crude oil is currently held up in a tug-of-war between the Goldman reality and the physical reality. Even though the world economy has not yet proven that it was able to cope with the first super spike (on a dollar-adjusted basis we are only starting to approach the $105/bbl of the first Goldman super spike), it still makes a great story to support pension funds piling more into commodities."

Meanwhile, higher prices are having virtually no major impact on world oil demand because of government subsidies that reduce the true cost for fuels in many countries. Nor will it produce new crude supplies because the only readily available spare production capacity is controlled by the Organization of Petroleum Exporting Countries.

Abdalla Salem El-Badri, OPEC secretary general, said, "There is clearly no shortage of oil in the market. OECD commercial oil stocks remain above the 5-year average, with days of forward cover at a comfortable level of more than 53 days. US crude inventories, meanwhile, rose by almost 6 million bbl last week, which is a further indication that oil supplies are plentiful. OPEC member countries continue to produce at more than 32 million b/d. In addition, a number of new OPEC crude oil projects have started to come on-stream and OPEC spare capacity continues to increase, with the figure currently standing above 3 million b/d. At the same time, crude oil movements indicate that some member countries are unable to find buyers for their additional supply."

(Online May 12, 2008; author's e-mail: samf@ogjonline.com)

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