MEASURE & COMPARE

Baker Hughes delivers Best-in-Class results

CemenThru™ Mono-Trip Completion Systems Cut Completion Time by up to 75% in 100 wells

Location: Gulf of Thailand

Customer: Chevron

Challenges:

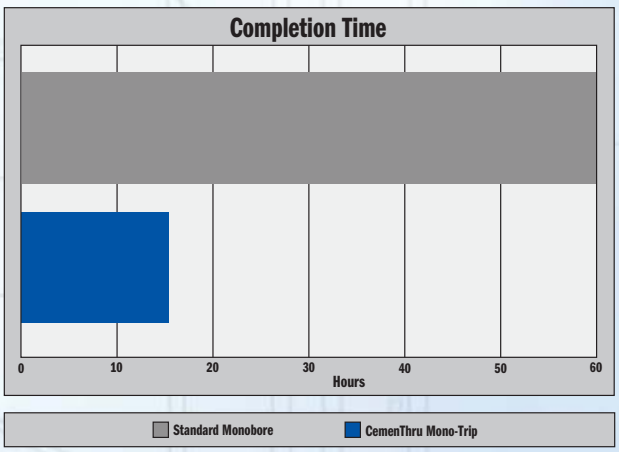
- ✓ Minimize completion time on short-life disposable wells
- ✓ Complete each well in a single trip
- ✓ Provide efficient gas lift
- ✓ Ensure flawless functionality of system components after cementing
- ✓ Perform extensive hazop session to assure comprehensive operational procedure

Solutions:

- ✓ Baker Oil Tools CemenThru™ Mono-Trip Completion System
- ✓ Industry's first cement-tolerant side pocket gas lift mandrel
- ✓ Extensive flow dynamics simulation and testing to confirm completion performance and flow characteristics

Results:

- ✓ 100 wells completed to date date utilizing the Mono-Trip system
- ✓ Up to 75% reduction in completion time



VertiTrak® System and GENESIS® Bits Save $2.5 Million on 17-Well Program

Location: Southwest Oklahoma

Customer: Cimarex Energy

Challenges:

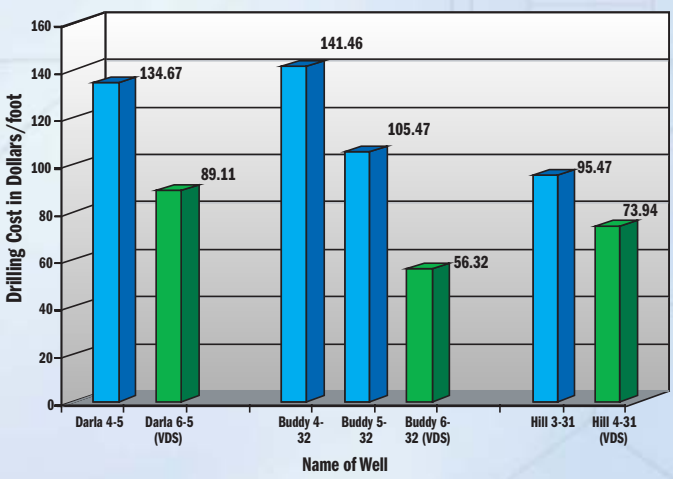
- ✓ Develop reservoir at 12,000 ft TVD by drilling straight holes through faulted, highly dipping formations
- ✓ In 55 prior wells, directional motor assemblies achieved low ROP, needed time-consuming correction runs
  - ✓ Hole inclinations up to 15°, with DLS of 10°/100 ft
  - ✓ High overpull, key seats hampered operations

Solutions:

- ✓ VertiTrak vertical drilling system from INTEQ
- ✓ Genesis XT PDC bits from Hughes Christensen
  - ✓ Optimized for formation and BHA
  - ✓ Zenith-Series™ cutters for high ROP and durability

Results:

- ✓ Baker Hughes helped Cimarex implement its successful 17-well straight hole campaign
- ✓ VertiTrak system with Genesis XT bits saved an average of $150,000 per well, for $2.5 million total savings



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Norwegian groups study drillers' work
Study examines black powder, makeup in dry gas systems

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COVER

An operator uses increased information to improve decision making in the Petrobras Zarate polystyrene manufacturing plant 80 km north of Buenos Aires. The digital automation project allowed the plant to increase production by 3-5%. Companies are increasingly using automation to decrease downtime, increase production, and lower costs. This issue's special report, Process Control Technology, beginning on p. 46, features an article that discusses how companies can best maintain their advanced process control applications. Cover and above photo from Emerson Process Management.

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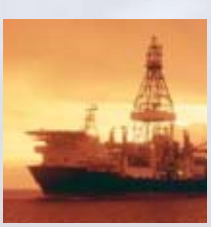

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Aug. 11, 2008

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General Interest — Quick Takes

Coup threatens Mauritania's oil, gas industry

Mauritania's nascent oil and gas industry, already under threat from the al-Qaeda terrorist organization, is facing more uncertainty following a bloodless coup staged by Army commanders.

The coup began when President Sidi Ould Cheikh Abdallahi fired the country's top four military officials. According to reports, the officials had been suspected of supporting lawmakers who had accused the president of corruption and disagreed with his efforts to reach out to Islamic hard-liners.

Abdallahi was detained by presidential guard units and held against his will at the presidential palace compound. Meanwhile, a military junta, which took over state radio and television, announced the formation of a new "state council," led by Gen. Mohamed Ould Abdel Aziz, one of the four generals fired earlier in the day.

A US spokesman issued a statement condemning "in the strongest possible terms" the Mauritanians' military's overthrow of the democratically elected government of Mauritania, while European Union Development Commissioner Louis Michel said the president should be quickly released and returned to his post.

In July, Malaysia's state-owned Petronas said it obtained positive results from its exploration program in Mauritania when a well drilled 2 km away from its original Banda-1 discovery confirmed the existence of "significant" quantities of oil and gas.

Petronas said further exploratory work will be necessary to determine the overall size of the reservoir, but gas resources could be in excess of 1 tcf. Around the same time, al-Qaeda's North Africa network said it planned to attack interests held by the US, which it said was establishing military bases and seeking control of the region's energy sources.

China establishes new energy agency

China's National Development and Reform Commission (NDRC) established a new nine-department government agency, the National Energy Administration (NEA), to secure energy supplies.

Lin Boqiang, an economics professor at Xiamen University, said the consolidation of agencies under NEA signals that China will focus more on energy strategy and planning for sustainable development.

Of the nine merged departments, four were in charge of separate energy sectors, while the other five were involved in policy, development planning, energy conservation, and international cooperation. Responsibility for domestic pricing of energy will be shared by NEA and NDRC. NEA will make proposals concerning price adjustments but will need approval from NDRC and the State Council, while NDRC will consult NEA when it adjusts energy prices.

Apart from pricing, however, NEA will assume NDRC's responsibilities in several other key areas to include charting energy strategy and policies as well as managing separate sectors for oil, gas, coal, electricity, nuclear, and renewable energy.

NEA will manage China's strategic oil reserves, including building and releasing such reserves and supervising the management of commercial reserves.

The new agency will have approval of the biggest overseas investments in energy resources and will negotiate and sign energy contracts with foreign governments and institutions.

The Chinese government announced plans in March to create a bureau to integrate energy management, marking the first time it has established a central organization to deal with energy issues since dissolving the ministry of energy in 1993.

Trinidad and Tobago audit shows 30.8 tcf of gas

An audit of Trinidad and Tobago's natural gas reserves for 2007 shows that the country has 30.8 tcf of gas.

The audit, conducted by Ryder Scott Co., was presented to the Caribbean twin-island nation's standing committee on energy. It shows proved reserves as 16.997 tcf, probable reserves at 7.883 tcf, and possible reserves at 5.888 tcf. The audit shows a rate of reserves to production ratio of 13 years.

In presenting the audit, Ryder Scott Senior Petroleum Engineer Larry McHalffey noted that there had been a virtual 100% replacement of reserves for 2007. He said, "What this means is: for the entire [year of] 2007, all the gas used in Trinidad and Tobago was replaced. This is a positive sign for Trinidad and Tobago." Ryder Scott put Trinidad and Tobago's annual gas use at 1.3 tcf.

The audit also places the Caribbean island's exploration potential of an additional 31.253 tcf.

The figures do not take into account the recently announced discoveries made by PetroCanada and Canada Superior. McHalffey said Ryder Scott also did not consider the Trinidad and Tobago offshore ultradeep water in assessing the exploration potential. Trinidad and Tobago's ultradeep has not been explored but is expected to be bid in 2009. ✦

Exploration & Development — Quick Takes

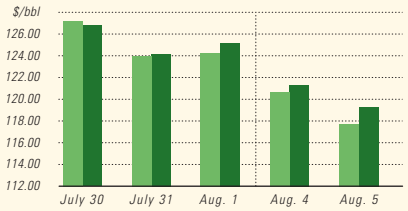
Petrobras to begin Tupi pilot production in 2009

Petroleo Brasileiro SA (Petrobras) plans to start oil production from its giant Tupi field in the Santos basin off Rio de Janeiro state in March 2009, the company's chief executive told reporters Aug. 1 in London.

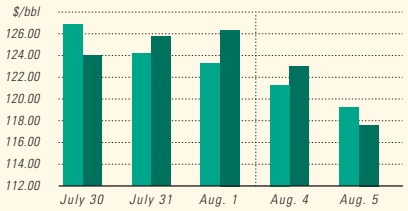
Jose Sergio Gabrielli said initial output in the pilot project

Industry Scoreboard

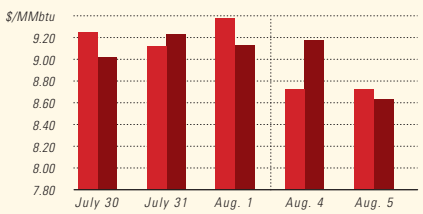
IPE BRENT / NYMEX LIGHT SWEET CRUDE



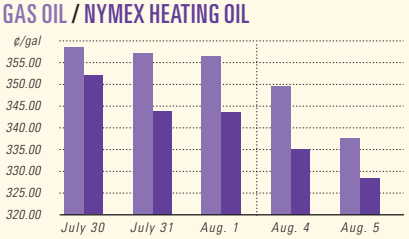
WTI CUSHING / BRENT SPOT



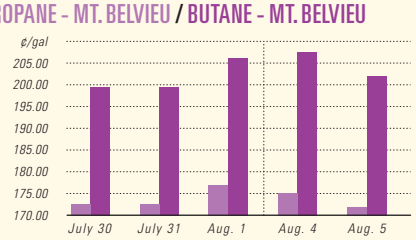
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



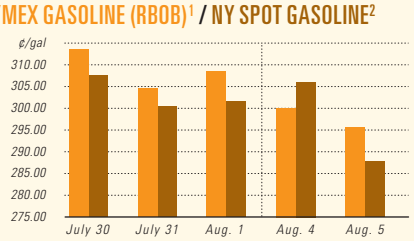
IPE GAS OIL / NYMEX HEATING OIL



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.

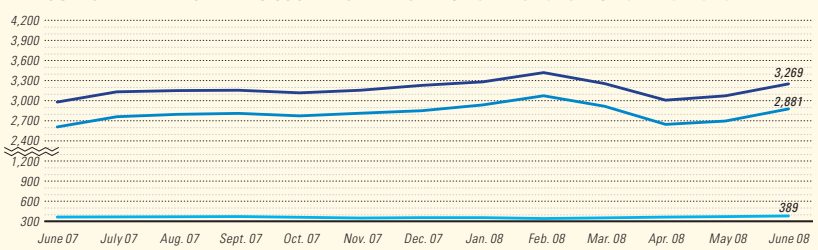
US INDUSTRY SCOREBOARD — 8/11

Latest week 7/25	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	9,375	9,606	–2.4	9,117	9,259	–1.5
Distillate	4,169	4,008	4.0	4,159	4,230	–1.7
Jet fuel	1,553	1,667	–6.8	1,567	1,626	–3.6
Residual	582	667	–12.7	620	760	–18.4
Other products	4,477	4,707	–4.9	4,785	4,825	–0.8
TOTAL DEMAND	20,156	20,655	–2.4	20,036	20,701	–3.2
Supply, 1,000 b/d						
Crude production	5,106	5,123	–0.3	5,121	5,179	–1.1
NGL production[2]	2,188	2,465	–11.2	2,223	2,365	–6.0
Crude imports	10,037	9,914	1.2	9,818	10,006	–1.9
Product imports	3,111	3,738	–16.8	3,214	3,567	–9.9
Other supply[3]	1,492	1,115	33.8	1,429	993	43.9
TOTAL SUPPLY	21,934	22,355	–1.9	21,805	22,110	–1.4
Refining, 1,000 b/d						
Crude runs to stills	14,903	16,030	–7.0	14,903	15,088	–1.2
Input to crude stills	15,118	15,867	–4.7	15,118	15,393	–1.8
% utilization	86.3	90.9	—	86.3	88.2	—

Latest week 7/25	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	295,249	295,330	–81	344,531	–49,282	–14.3
Motor gasoline	213,560	217,085	–3,525	204,720	8,840	4.3
Distillate	130,505	128,109	2,396	126,542	3,963	3.1
Jet fuel–kerosine	41,745	39,992	1,753	41,119	626	1.5
Residual	38,029	38,469	–440	37,190	839	2.3
Stock cover (days)[4]			Change, %		Change, %	
Crude	19.3	19.2	0.5	21.8	–11.5	
Motor gasoline	22.8	23.2	–1.7	21.1	8.1	
Distillate	31.3	30.6	2.3	31.1	0.6	
Propane	45.5	47.3	–3.8	49.4	–7.9	
Futures prices[5] 8/1			Change		Change	%
Light sweet crude ($/bbl)	124.57	126.44	–1.87	75.35	49.22	65.3
Natural gas, $/MMbtu	9.23	9.75	–0.53	5.98	3.25	54.4

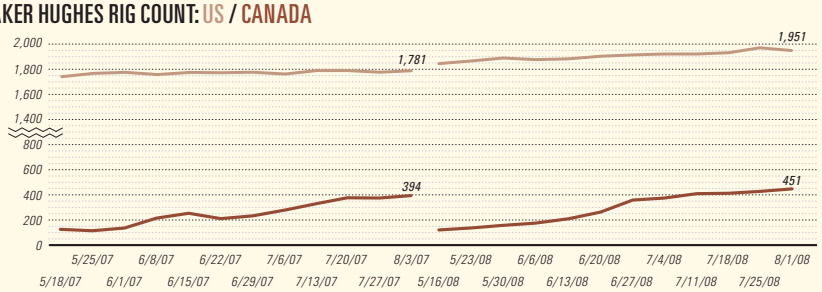
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average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

would be 20,000-30,000 b/d. This is expected to rise to 100,000 b/d in 2010.

Tupi, which holds an estimated 5-8 billion bbl of oil reserves, is challenging because it is in a frontier presalt reservoir deeper at 2,100 m than discoveries in the Campos basin and farther in distance: 300 km vs. 150 km for Campos.

Consequently, Tupi also poses logistical difficulties in accessing the deposit, and Petrobras faces rising costs in a tight services market. Petrobras is keen to focus its personnel on developing the field quickly, which could boost Brazil's current 14 billion bbl oil and gas reserves by more than 50%.

The country's president has established a group to investigate whether a separate oil company should develop Brazil's subsalt reserves. It will present its proposal within the next few months, Gabrielli said. He is a member of the group.

Last year, Petrobras announced a business plan of $112.4 billion for 2008-12, but this did not include Tupi. Gabrielli said the company would have to increase its borrowing, and new figures would be unveiled in September or October. Petrobras expects to order 28 new drilling rigs during 2013-17.

Gabrielli told investors the company plans to produce 1.95 million b/d of oil next year, and production will rise to 2.42 million b/d in 2012 and 2.81 million b/d in 2015.

Encore Acquisition drills its first Sanish well

Encore Acquisition Co. recently completed its first well in the Sanish formation of the Bakken shale in the Williston basin.

Currently, Encore is drilling a second Sanish well in Charlson field. That well is expected to be completed in the third quarter. The company plans to drill six wells total in the Sanish this year.

The recently completed Charlson 11-16H well, in Williams County, ND, was brought on stream July 23 at an initial production rate of 1,106 boe/d through 7-in. casing.

Fort Worth-based Encore has a 96% working interest in the well. The company owns 10,400 net acres in the area.

The company plans to add a third rig to drill Bakken and Sanish wells in August. Upon arrival of the additional rig, Encore plans to drill a Sanish well in its Cherry Creek prospect.

Maurel & Prom discovers oil in Gabon

Maurel & Prom has tested 5,510 b/d of oil from the Omko exploration well that was drilled 6 km east of Onal field in Gabon. M&P expects to appraise the discovery by yearend, depending on rig availability.

Oil was produced from two separate intervals, the Kissenda and the base sandstone. Kissenda, more than 56 m, reached 3,050 b/d through a 40/64-in. choke with a 595 psi head pressure. Base sandstone, more than 43.5 m, produced 2,460 b/d through a 32/64-in. choke with 660 psi head pressure.

In both cases, the oil is 35.7-36.7° gravity, M&P said. The Omko-1 well, formerly named Alonha-C, reached 1,800 m.

The company said the discovery validated the sedimentary basin in the northeast area of Onal field. The company will follow this well with exploration well Alonha B. Other exploration wells are scheduled in this area, among them Alonha A, Onal East, and Maroc, M&P said.

The company will drill exploration well N'Zamo to study the southwestern area of the field. M&P holds 100% interest in the exploration permit Omoueyi, and Gabon has a 15% right of return. ✦

Drilling & Production — *Quick Takes*

Chevron starts production from Agbami oil field

Chevron Corp.'s Nigerian affiliate, Star Deep Water Petroleum Ltd., has started oil production from Agbami field off Nigeria.

Chevron, which said first oil flow from Agbami field was achieved July 29 from a floating production, storage, and offloading vessel, expects initial production to reach more than 100,000 b/d of oil.

It expects production at the field—the largest deepwater discovery in Nigeria—to increase to 250,000 b/d of oil and natural gas liquids by yearend 2009.

Star Deep Water Petroleum signed the agreement in 2005 to award the contract for the construction of the FPSO vessel for Agbami to South Korea's Daewoo Shipping & Marine Engineering Corp.

In January 2000 then-Texaco Inc.—since acquired by Chevron—announced the completion of testing on the Agbami-2 appraisal well, which confirmed that "the Agbami structure is a giant discovery with potential recoverable reserves in excess of 1 billion boe."

It said that "the well test surpassed expectations and, together with other technical data, suggests that the Agbami discovery likely ranks among the largest single finds to date in deepwater West Africa."

According to Texaco, the Agbami-2 well delineated the discovery announced in January 1999. The initial well, Agbami-1, encountered 420 ft of oil pay in multiple zones. Complete appraisal of the field will require further delineation drilling and technical studies.

Apache, EGPC JV lets Salam gas plant contracts

Khalda Petroleum Co., a joint venture of Apache Corp. and Egyptian General Petroleum Corp., let a contract to Petrofac Ltd. for engineering and procurement services for an additional gas train at the Salam natural gas plant on Apache's Khalda Concession in Egypt's Western Desert.

The new facility, expected to come online in late 2010, will be Khalda's fifth gas processing facility at Salam. It will be built next to the third and fourth Salam gas trains, now under construction.

Apache earlier awarded Petrofac contracts totaling $375 million to construct the third and fourth trains, each of which will have the capacity to process 100 MMcfd of gas and 14,000 b/d of condensate.

In November 2006, Apache reported that EGPC and Egyptian Natural Gas Holding Co. had approved construction of the fourth processing train at the Salam plant.

Apache said the fourth train, along with the recently ap-

proved third train, would increase the capacity to process gas from Apache's Jurassic formation gas reserves to 710 MMcfd of gas and 66,000 b/d of condensate, including access to processing capacity at Shell's Obaiyed plant.

At the time, Apache said gross production from its Jurassic fields was "512 MMcfd of gas and 18,200 b/d, the limit of existing processing facilities."

Petrofac last month said it had acquired production engineering firm, Eclipse Petroleum Technology Ltd., for an initial £7 million, with a further payment of as much as £16 million to be determined by "the level of future profitability." Eclipse will form part of Petrofac's facilities management.

StatoilHydro delivers oil to FPSO from Vilje field

StatoilHydro has delivered first oil from Vilje field in the Norwegian North Sea to the Alvheim floating production, storage, and offloading vessel. The field is estimated to hold 52 million bbl of recoverable oil.

Production from Vilje is expected to reach a plateau of 35,000 b/d by the end of second quarter.

Marathon Petroleum Norge AS operates the FPSO, which is connected to the field via a 19-km pipeline. The field has two subsea templates and two production wells.

StatoilHydro operates Vilje with a 28.85% interest. This is the first StatoilHydro-operated field on the Norwegian Continental Shelf that is tied in to an installation operated by another operator.

OGX leases Ocean Quest semi for Campos blocks

Brazil's privately held OGX Petroleo e Gas Participacoes has signed an agreement with Diamond Offshore Netherlands BV, a subsidiary of Diamond Offshore Drilling, for the charter of a third drilling rig.

The Ocean Quest semisubmersible rig, under a 2-year contract, will be used in the Santos basin from the second half of 2009. OGX said the rig can drill as deep as 7,600 m in water as deep as 1,100 m.

OGX last week announced it had contracted two other offshore drilling rigs from Diamond Offshore for 3 years. It said the two rigs also would be used for drilling in the Campos basin as of the second half of 2009.

According to reports, OGX broke an earlier contract signed with Queiroz Galvao Oleo e Gas, a unit of the local industrial conglomerate Queiroz Galvao, for the charter of the Alaskan Star semisubmersible drilling rig.

In early July, OGX announced the signing of a 3-year charter of the Alaskan Star, which Queiroz Galvao Purfuracoes SA purchased in 1995 from Western Co., Houston, for $11.7 million.

Shortly after OGX announced the signing of the Alaska Star, Brazilian federal police raided the home and offices of company founder Eike Batista in a probe of alleged fraud and tax evasion. OGX said the investigation has no relation with the company's operations and does not represent any adverse effect on its business plan.

Founded by Batista in September 2007, OGX was listed on Sao Paulo Stock Exchange Bovespa in June. According to reports, its initial public offering, one of the biggest ever on the Sao Paulo market, was oversubscribed five times.

OGX is said to hold concession rights in some 21 blocks in the Campos, Santos, Espirito Santo, and Para-Maranhao basins. Company plans call for some $1.3 billion investment in the blocks. ✦

Processing — *Quick Takes*

Idemitsu Kosan upgrades Chiba, other refineries

Idemitsu Kosan Co. will spend ¥16 billion to upgrade the 45,000 b/d fluid catalytic cracking unit at its 220,000 b/d Chiba refinery east of Tokyo.

In the face of declining market rates for its fuel oil, the firm aims to increase production of naphtha and propylene, while decreasing production of heavy fuel oil.

After the upgrade, due for completion in April 2011, the unit's production of heavy fuel oil will be reduced by 200,000 kl./year, while its production of naphtha and propylene will increase by 260,000 kl./year.

In May, Idemitsu Kosan Co. sold 30,000 tonnes of heavy grade fuel oil for loading in early June, described by company and trading sources as likely to be its first spot sale of the fuel in 3 years.

Sources said that Chiba was running at nearly full capacity then and that stocks were high. They said such a rare export compounded pressure on an Asian market already "awash" with supply due to weak Chinese demand.

At the time, the price spread between fuel oil and Dubai crude worsened to minus $27.15/bbl from minus $26.80/bbl, more than doubling year-on-year from the 2007 level of $13.55.

Last November, Idemitsu Kosan Co. said it planned to triple its capacity to export refined products at Chiba and at its 160,000 b/d Aichi refinery.

Reports said the refiner wants to export a combined 3 million kl./year of jet fuel, gasoil, and gasoline, up from current capacity of 1 million kl./year, by reforming pipelines and revamping switching pumps.

After revamping the Chiba and Aichi facilities, Idemitsu Kosan plans to expand the export capacity of its 140,000-b/d Hokkaido refinery and 120,000-b/d Tokuyama refinery.

Pemex finds more refineries, pipelines needed

Mexico's Petroleos Mexicanos, in a study released to the country's Congress, has underscored the need for additional refining resources or, lacking them, additional pipelines within the country.

Pemex said construction of a 300,000 b/d refinery in Tula in Hidalgo state would provide the greatest net present value. In addition to the $8.17 billion cost of the refinery itself, investment in associated infrastructure would be $852 million.

The proposed refinery also would require construction of a new $769 million oil pipeline from Nuevo Teapa to the Chicontepec region, while a further $64 million would extend to a new multipurpose pipeline to eliminate bottlenecks.

The study suggested other possible locations for a refinery, in-

cluding a 300,000 b/d facility in Tuxpan, in Veracruz state, which is supplied at the moment by refineries in Tula and Salamanca with some support from the Salina Cruz refinery.

The Pemex study considered other sites for a new refinery, including Campeche in Campeche state; Manzanillo in Colima state; Lazaro Cardenas in Michoacan state; Cadereyta in Nuevo Leon state; Salina Cruz in Oaxaca state; Dos Bocas in Tabasco state; and Minatitlan in Veracruz state. Absent a new refinery, the Pemex report said, Mexico will need to invest some $1.61 billion in central and western Mexico for a number of new pipelines to complement existing distribution systems.

The suggested lines include: a 310 km, 24-in. pipeline from Tuxpan in Veracruz state to Tula in Hidalgo state; 327 km of 18-in. from Tuxpan to Puebla to Valle de Mexico; 241 km from Tula to Salamanca, Guanajuato state; 225 km from Tula to Toluca in Mexico state; 65 km of 8-in. from Tula to Pachuca, Hidalgo state; 99 km from Valle de Mexico to Cuernavaca; 236 km from Salamanca to Guadalajara; 234 km from Salamanca to Aguacalientes to Zacatecas; and 94 km from Salamanca to Leon in Leon state.

Hellenic lets refinery upgrading contracts

Hellenic Petroleum SA has awarded engineering, procurement, and construction management contracts to Foster Wheeler Ltd. for an upgrading project at the company's refinery at Thessaloniki in northern Greece. The scope of the project is the production of low-sulfur fuels, which also results in significant environmental improvements.

Foster Wheeler's scope comprises a 15,000 b/sd continuous catalytic reformer, modification of the existing atmospheric distillation unit in order to switch the operation from high- to low-sulfur crudes and revamp the existing naphtha hydrofiner and crude light ends processing unit to increase the refinery's processing capacity to 26,000 b/sd for light products.

The project is expected to be completed by yearend 2010. ✦

Transportation — *Quick Takes*

Alaska lawmakers grant gas pipeline license

The Alaska Senate on Aug. 1 approved a state license for TransCanada Corp. to pursue federal certification for a 1,715-mile natural gas pipeline from the Alaska North Slope to the Alberta Hub in Canada.

The Alaska House of Representatives approved the measure last month (OGJ, July 28, 2008, Newsletter).

Gov. Sarah Palin praised the legislature's work, noting that this is a first step, and that it does not guarantee pipeline construction. The license is being awarded under the Alaska Gasline Inducement Act. The Senate voted 14-5 in favor of granting TransCanada the license. Under AGIA, TransCanada was one of five companies that applied and the only one that satisfied the guidelines, Palin said previously.

Meanwhile, BP PLC and ConocoPhillips are working on a pipeline proposal called Denali. They announced Apr. 8 plans to build a 4 bcfd gas pipeline that would extend from the ANS to Canada and potentially on to the US (OGJ, Apr. 14, 2008, p. 30).

Shell declares force majeure after Nembe attack

Royal Dutch Shell PLC declared force majeure on its export commitments at its Nigerian Bonny Light terminal after Nigerian militants damaged its Nembe oil trunk pipeline in the Niger Delta.

The Movement for the Emancipation of the Niger Delta (MEND) claimed responsibility for the attacks on two pipelines early on July 28 that forced Shell to shut in the line fed by two smaller lines.

According to Nigerian reports, the main pipeline transports 130,000 b/d of oil to export terminals.

The company did not say how much oil production is reduced or how long it would take to restore supplies. Its force majeure announcement spans July to September supply contracts, but the volume of oil covered is unclear.

The loss is likely to exacerbate already high crude prices. Militants have so far cut Nigeria's output by almost a quarter to pressure the federal government to increase the level of oil revenue given to their communities and reduce their poverty.

YPFB, Transredes start laying GCC gas line

After earlier delays, Bolivia's state-owned Yacimientos Petroliferos Fiscales Bolivianos (YPFB) and recently nationalized gas transporter Transredes began construction of the 130 MMcfd Gasoducto Carrasco-Cochabamba (GCC) natural gas pipeline.

The $170 million GCC line will consist of 250 km of 16-in. pipe extending from the gas-producing region of Carrasco to the city of Cochabamba.

GCC is to help solve gas supply restrictions for the industry in Cochabamba, La Paz, Oruro, and Potosi arising from the insufficient capacity of the Gasoducto al Altiplano (GAA).

In May, it was reported the pending construction of GCC would be delayed by up to 90 days due to the nationalization of Transredes.

On June 2, the Bolivian government took over TR Holdings, the holding company that owned half of Transredes. TR Holdings was controlled by Royal Dutch Shell PLC (50%) and Ashmore Energy International (50%).

After the takeover, which gave YPFB 97.378% of Transredes, the Bolivian government said it would pay AEI and Shell $48/share for their interest in TR Holdings. The two firms reportedly are considering plans to sue the Bolivian government.

Meanwhile, to calm uncertainty over the fate of the company's projects, Transredes' incoming president and director Gary Daher Canedo said in June that the firm would still meet its investment and expansion commitments.

As part of YPFB, Canedo said Transredes would "prioritize" the GCC construction project as well as the extensions of the existing GAA and Gasoducto Villamontes-Tarija (GTV).

In May, before it was nationalized, Transredes had already completed phase two works on the GVT, raising its capacity to 13.8 MMcfd at a cost of $23.5 million.

Last November, Bolivia's President Evo Morales inaugurated the phase three expansion works of the GAA, which will connect to the GCC, increasing its transport capacity to 32 MMcfd from 27 MMcfd. ✦

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Letters

Warming or cooling?

The first thing to be aware of is that the warming effect of carbon dioxide is strongly logarithmic. Of the 3° C. that carbon dioxide contributes to the greenhouse effect, the first 20 ppm has a greater effect than the following 400 ppm. By the time we get to the current level of 384 ppm, each 100 ppm increment will produce only about 0.1° of warming. With atmospheric carbon dioxide rising at about 2 ppm per annum, temperature will rise at 0.1° every 50 years.

If that is true, you will ask, how does the Intergovernmental Panel on Climate Change (IPCC) get its icecap-melting figure of 5° for doubling of the preindustrial level to 560 ppm? An equation called the Stefan-Boltzman equation tells us that in the absence of feedbacks, doubling would produce a rise of 1°. The IPCC climate modeling assumes that the feedback from this rise will be positive; that is, that the extra heat will cause more water vapor in the atmosphere, which in turn will cause more heat to be trapped, and the system compounds away until 1° gets turned into 5°. As described, the Earth's climate would be tremendously unstable, prone to thermal runaway at the slightest disturbance.

The real world evidence says the opposite. In late 2007, a Dr. Roy Spencer of the University of Alabama published a paper analyzing data from the Aqua satellite. Based on the response of tropical clouds, Dr. Spencer demonstrated that the feedback is negative. He calculates a 0.5° warming for a doubling of the preindustrial carbon dioxide level. Global warming is real, but it is also minuscule. Atmospheric temperature rose 0.7° in the 20th century; it has also fallen by the same amount in the last 18 months. Global warming, as caused by carbon dioxide, will be lost in the noise of the system.

If carbon dioxide didn't cause the warming of the 20th century, what did? Well, a good place to start is the sun. In the 20th century, the sun was more active than at any time in the previous 8,000 years. But what is happening now suggests that it will soon be much

quieter. Two Danish researchers, Friis-Christensen and Lassen, demonstrated in a 1991 paper that there is a correlation between the length of a solar cycle and the temperature during the following solar cycle. The longer a solar cycle, the cooler the following solar cycle, and visa versa. In 1996, Butler and Johnson demonstrated the same relationship on climate data from the Armagh observatory in Northern Ireland. I have extended that to the 400 year Central England temperature record, the De Bilt data from Holland, and a number of temperature records from the northeastern US. In the latter, the relationship is that each 1-year increase in solar cycle length will cause a 0.7° decline of atmospheric temperature during the following cycle.

Solar cycles are normally 11 years long. We are currently near the end of Solar Cycle 23, which started in May 1996. It is now just over 12 years long. The previous cycle, 22, was a short one at 9.6 years. The differential is now 2½ years, which equates to a temperature decline of 1.7°. This is in the bag. The way that Solar Cycle 23 is declining, combined with the very weak ramp-up of Solar Cycle 24 sunspot activity, suggests that the month of solar cycle minimum will be July 2009. If that transpires, the cooling will amount to over 2°.

That last time that something like this happened was a period called the Dalton Minimum from 1796 to 1820. This was caused by the very weak Solar Cycles 5 and 6. They were preceded by the very long Solar Cycle 4, which was 13.6 years long. There were quite a lot of crop failures due to cold weather during the Dalton Minimum. That is why there is so much interest in sunspot activity at the moment. Each day's delay in the month of solar minimum will make the second decade of the 21st century two thousandths of a degree colder. That doesn't sound like much, but we may have another year to go.

A little-discussed consequence of the coming doubling of atmospheric carbon dioxide level is the effect on plant growth. Wheat yields have already risen 15% due to the 100 ppm rise from the preindustrial level. Doubling will cause a 50% increase in yield, with similar effects for all other crops. In summary, global warming is real but minuscule, there is a big solar-driven cooling coming in a few short years, and increased atmospheric carbon dioxide is wonderful for plant growth. It therefore follows that burying or trying to limit such a wonderful substance is exactly wrong in science.

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david.archibald@westnet.com.au
Perth

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Spencer, R., Brawell, W., Christy, J., Hnilo, J., "Cloud and radiation budget changes associated with tropical intraseasonal oscillations," Geophysical Research Letters, 34, L15707, 2007.

Calendar

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

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2008

AUGUST

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International Petroleum Petrochemical Natural Gas Technology Equipment Exhibition, Shanghai, +86 21 55611008, +86 21 65282319 (fax), website: postmaster@aiexpo.com.cn, website: www.sippe.org.cn. 20-22.

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.

Deep Water India Summit, New Delhi, +31 (0)26 3653 444, +31 (0)26 3653 446 (fax), e-mail: workshops@energywise.nl, website: www.energywise.nl. 26-27.

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.

Calendar

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.

Rice Global Engineering & Construction Forum, Houston, (713) 552-1236, ext. 3, (713) 572-3089 (fax), website: www.forum.rice.edu. 9.

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.

DGMK Future Feedstocks for Fuels & Chemicals Conference, Berlin, 040 639004 0. 040 639004 50 (fax), website: www.dgmk.de. Sept. 29-Oct. 1.

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

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

OCTOBER

GPA North Texas/NGS East Texas Red River Conference, Tyler, Tex., (713) 222-0852, (713) 222-0858 (fax), e-mail: tom.rommel@accessed.com, website: www.gasprocessors.com. 1-2.

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.

Oil Shale Symposium, Golden, Colo., (303) 384-2235, e-mail: jboak@mines.edu, website: www.mines.edu/outreach/cont_ed/oilshale. 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.

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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.ogsonline.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, +971 (0) 2 4444 909, +971 (0) 2 4444 383 (fax), e-mail: info@adipec.com, 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.

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SEG International Exposition and Annual Meeting, Las Vegas, (918) 497-5542, (918) 497-5558 (fax), e-mail:

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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.

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Annual Houston Energy Financial Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.accessanalyst.net. 18-20.

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

DECEMBER

IADC Well Control Middle East Conference & Exhibition, Muscat, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 2-3.

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.

✦USAEE/IAEE North American Conference, New Orleans, (216) 464-2785, (216) 464-2768 (fax), website: www.usaee.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.

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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.

XSPE 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.

API Exploration & Production Winter Standards Meeting, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 19-23.

API/AGA Oil and Gas Pipeline Welding Practices Conference, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 21-23.

FEBRUARY

SPE Reservoir Simulation Symposium, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website; www.spe.org. 2-4.

IADC Health, Safety, Environment & Training Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 3-4.

Calendar

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.

✦NAPE Expo, Houston, (817) 847-7700, (817) 847-7704 (fax), e-mail: info@napeexpo.com, website: www.napeonline.com. 5-6.

✦Pipeline Pigging & Integrity Management Conference, Houston, (713) 521-5929, (713) 521-9255 (fax), e-mail: clarion@clarion.org, website: www.clarion.org. 9-12.

✦Pipe Line Contractors Association Annual Conference (PLCA), Carlsbad, Calif., (214) 969-2700, e-mail: plca@plca.org, website: www.plca.org. 11-15.

IADC/SPE Managed Pressure Drilling & Underbalanced Operations Conference & Exhibition, San Antonio, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 12-13.

✦International Petrochemicals Technology Conference & Exhibition, London, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: enquiries@europetro.com, website: www.europetro.com. 16-17.

✦International Downstream Technology & Catalyst Conference & Exhibition, London, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: enquiries@europetro.com, website: www.europetro.com. 18-19.

✦Laurance Reid Gas Conditioning Conference, Norman, Okla., (405) 325-2248, (405) 325-7164 (fax), e-mail: bettyk@ou.edu, website: www.engr.outreach.ou.edu. 22-25.

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

MARCH

✦EAGE North African/Mediterranean Petroleum and Geosciences Conference & Exhibition, Tunis, +31 88 995 5055, +31 30 6343524 (fax), e-mail: eage@eage.org, website: www.eage.org. 2-4.

✦SPE Research & Development Conference, Lisbon, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 3-4.

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

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

✦Turkish International Oil & Gas Conference & Showcase (TUROGE), Ankara, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.oilgas-events.com. 10-12.

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.

SPE/IADC Drilling Conference & Exhibition, Amsterdam, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website; www.spe.org. 17-19.

NPRA Annual Meeting, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 22-24.

ACS Spring National Meeting & Exposition, Salt Lake City, (202) 872-4600, e-mail: service@acs.org, website: www.acs.org. 22-26.

NACE Corrosion Conference & Expo, Atlanta, (281) 228-6200, (281) 228-6300 (fax), website: www.nace.org/c2009. 22-26.

SPE Americas E&P Environmental and Safety Conference, San Antonio, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website; www.spe.org. 23-25.

API Spring Petroleum Measurement Standards Meeting, Dallas, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 23-26.

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.

SPE Western Regional Meeting, San Jose, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website; www.spe.org. 24-26.

✦SPE/ICoTA Coiled Tubing & Well Intervention Conference & Exhibition, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. Mar. 31-Apr. 1.

APRIL

✦Georgian International Oil, Gas, Energy and Infrastructure Conference & Showcase (GIOGIE), Tbilisi, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.oilgas-events.com. 2-3.

✦SPE Production and Operations Symposium, Oklahoma City, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 4-8.

✦ATYRAU Regional Oil & Gas Exhibition & OilTech Kazakhstan Petroleum Technology Conference, Atyrau, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.oilgas-events.com. 7-9.

✦GPA Mid-continent Annual Meeting, Oklahoma City, (918) 493-3872, (918) 493-3875 (fax), website: www.gasprocessors.com. 16.

IADC Drilling HSE Middle East Conference & Exhibition, Abu Dhabi, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 21-22.

API Pipeline Conference, Fort Worth, Tex., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 21-22.

AIChE Spring National Meeting, Tampa, (203) 702-7660, (203) 775-5177 (fax), website: www.aiche.org. 26-30.

API Spring Refining and Equipment Standards Meeting, Denver, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 27-29.

✦EAGE European Symposium on Improved Oil Recovery, Paris, +31 88 995 5055, +31 30 6343524 (fax), e-mail: eage@eage.org, website: www.eage.org. 27-29.

MAY

✦EAGE International Petroleum Conference & Exhibition, Shiraz, +31 88 995 5055, +31 30 6343524 (fax), e-mail: eage@eage.org, website: www.eage.org. 4-6.

✦Offshore Technology Conference (OTC), Houston, (972) 952-9494, (972) 952-9435 (fax), e-mail: service@otcnet.org, website: www.otcnet.org. 4-7.

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

IADC Environmental Conference & Exhibition, Stavanger, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 12-13.

✦North American Unconventional Oil & Gas Conference & Exposition, Denver, (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 12-13.

✦Uzbekistan International Oil & Gas Exhibition & Conference, Tashkent, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.oilgas-events.com. 12-14.

NPRA Reliability & Maintenance Conference, Grapevine, Tex., (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 19-22.

IADC Drilling Onshore Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 21.

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

JUNE

✦Caspian International Oil & Gas/Refining & Petrochemicals Exhibition & Conference, Baku, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.oilgas-events.com. 2-5.

AAPG Annual Meeting, Denver, (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 7-10.

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✦GO-EXPO Gas and Oil Exposition, Calgary, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 9-11.

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.

The Petrobras FPSO experience:

Technology evolution and application in the US Gulf of Mexico.

César Palagi

César Palagi is the Walker Ridge Production Asset Manager with Petrobras America Inc. based in Houston. Palagi is responsible for the design and implementation of field development projects for the company's ultra deepwater, lower tertiary discoveries. He has provided technical and managerial E&P services to Petrobras for 28 years.

Palagi holds a Master's degree from Universidade Federal de Ouro Preto, Brazil and a Ph.D. from Stanford University, both in petroleum reservoir engineering.

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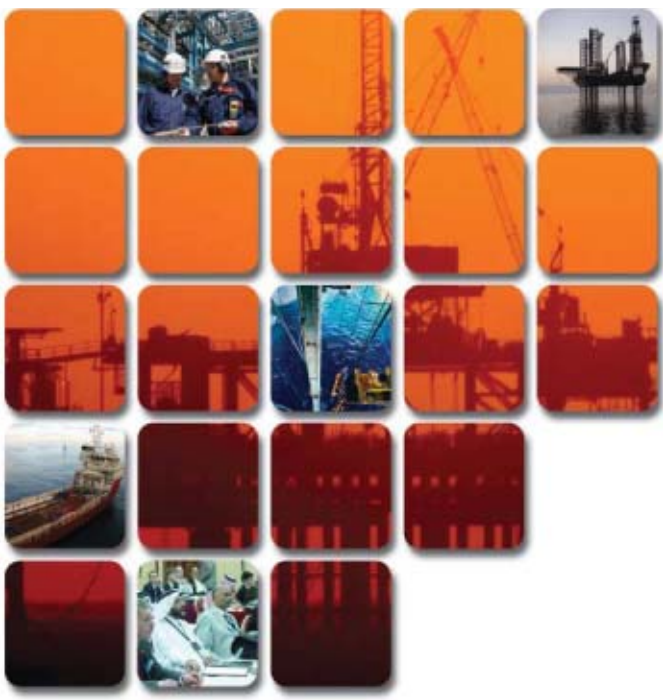

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Journally Speaking

Changing for climate change?

Uchenna Izundu
International Editor

Last month the UK's broadcasting regulator, Ofcom, cleared Channel 4 of "materially misleading the audience so as to cause harm or offense" on its television documentary challenging the theory that man-made activities are causing global warming.

Channel 4, a mainstream commercial broadcaster, ran the program in March 2006. It claimed that man-made global warming was a conspiracy and a fraud. There was outcry from environmentalists, scientists, and the public. One group sent Ofcom 176 pages of detailed complaints, arguing that the film seriously misled viewers.

Ofcom carried out a 15-month investigation and concluded that in the last portion of the program Channel 4 did breach the rules of impartiality on the impact climate change policies were having on developing countries. It also felt that senior high-profile government scientists had been misrepresented because of questionable editing of their quotes. Essentially, Ofcom said that it could not rule on the matter of accuracy because this was not a news program where the standards were different.

Verdict slammed

Critics have slammed the verdict as perverse because they were unhappy with the factual inaccuracies, and they stress that Ofcom's narrowing definition of harm to actual rather than potential is ludicrous.

This incident has been interesting to follow because it has highlighted the media's powerful role in circulating information in an impartial, balanced, and fair way regarding the causes of climate change. How much space should be given to the view that the drivers of global warming are other than man-made? Do editors push journalists to pursue these alternative perspectives in writing copy or broadcasting material? One scientist told me that journalists within British Broadcasting Corp. who wanted to write about these analyses were not encouraged to do so.

The primary fear is that promoting these viewpoints would discourage people from changing their behavior to cut emissions of carbon dioxide and invest in energy efficiency. This era of the oil and gas industry is unique. High energy prices and rising inflation mean that many people are struggling to meet daily living costs. Saving the environment is the last thing on their minds when analysts in the UK are predicting that energy bills could increase by 40% by the end of the year.

According to a survey by Ernst & Young in March, around 60% of respondents did not agree that their home energy bills needed to rise to combat climate change. The opinion poll said that 67% of the sample was not prepared to pay anything extra on home energy bills over the next 12 months to help combat climate change.

But this revelation on environmental apathy is not surprising when people are peeved about cost increases and inconvenience. Global warming campaigners feel that public education is crucial to triggering behavioral change. But mustering a sense of urgency is difficult when the threat is abstract or slow-moving. Opinion poll data show high levels of awareness but no sign of behavioral shift apart from switching of light bulbs and small steps in recycling

If anything, according to a survey initiated by the Environmental Transport Association, environmental apathy is rife. Thirty percent of people felt there was too much coverage in the media about CO_2 emissions, and over half were "bored hearing about it." Men are twice as likely as women to be bored by coverage about CO_2 emissions.

Two minds

Research company Ipsos Mori said in its June report surveying the British public's attitude to climate change: "The research also finds the public caught in two minds: despite large numbers backing government action [on climate change] two in five (41%) acknowledge that they are worried this might lead to restrictions on the things they want to do." And, of course, there is the fear that the government may use the global warming agenda to raise taxes.

For Nick Eyre, senior research fellow at the Environmental Change Institute at the University of Oxford, a change in policy approach can help the public reduce its energy demand. Community-based initiatives, an emphasis on user-friendly feedback, and linking advice to support for action have been some of the recent developments.

But changing behavior will coincide with changing technology to see significant demand reduction. The question is: Who will take responsibility for it? ✦

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Editorial

Acting—again—on energy

For a baffling array of bad reasons, the US Congress produced, before starting its 5-week recess, one beneficial proposition on energy along with a baffling array of wrong proposals, one of which would annul the lonely right one. This may be all anyone should expect from a body that has passed two wayward energy laws in the past 3 years.

At least offshore leasing has new life as a political issue and receives attention in new House and Senate bills. In neither case, however, does the effort go far enough. The Senate measure would allow federal oil and gas leasing off several eastern states but make it subject to state approval, a 50-mile buffer zone, and federal-state revenue sharing. It also would extract $30 billion from oil and gas companies to help fund $84 billion in government support for noncommercial energy and conservation adventures.

Big spending

The House bill is more ambitious about Outer Continental Shelf leasing but still leaves decisions to coastal states. Instead of taxing oil companies, it would spread half the proceeds of the new leasing among various "reserves": $208 billion for conservation, $260 billion for environmental restoration, $390 billion for renewable energy, $130 billion for nuclear waste and carbon capture and sequestration, and so forth. Spending like that can buy a lot of votes.

The direction is clear: OCS leasing where it's prohibited now—but in a package that, after political deals are made, probably would raise taxation of oil companies and waste billions of public dollars on popular but mostly hopeless energy projects.

This lunacy makes clear that the US political class lacks the capacity for rational thought on energy. The deficiency, moreover, is bipartisan.

Republicans are right to want to expand OCS leasing. But they've linked the issue to public anxiety over high gasoline prices. Where were they when action on OCS leasing might have meant something to today's fuel prices?

Democrats, loath to upset environmentalists, skirt the issue by pointing out that new leasing would have no immediate price effect. But they can't make the point without getting even weirder than Republicans.

"The Republicans propose to give away public lands to big oil, which will not immediately reduce the price at the pump and save Americans only 2¢ 10 years from now," said House Speaker Nancy Pelosi of California. Notice the assumption, which echoes a statement by Sen. Barack Obama (D-Ill.), the Democratic presidential nominee-in-waiting: To lease federal acreage for exploration and development is to give something away to oil companies.

That's just stupid. There's no nice way to say it.

Elected officials should know and be willing to acknowledge that federal leaseholders pay for the privilege of risking millions of dollars on exploration in hopes of finding reason to invest even more in development and production, on which they pay royalties and taxes. But Pelosi and her party colleagues give further reason to doubt they know anything about these subjects by offering the existence of undrilled leases as a reason to open no more of the OCS.

Republicans have no right to gloat over the Democrats' serial displays of energy ignorance. They controlled both houses when Congress passed the Energy Policy Act of 2005, which fattened the government's role as fuel arbiter and dispenser of energy subsidies and mandates. A triumph of that law was the ethanol mandate in vehicle fuel, now increasingly recognized as a costly error. Of course Congress expanded the mandate to ridiculous levels in 2007 after Democrats reclaimed both houses. But Republicans made the first mess.

More bewilderment

Their bewilderment doesn't confine itself to Congress. President George W. Bush lowered the intellectual standard with his initial proclamation, in January 2006, that "Americans are addicted to oil." No wonder Americans fantasize about energy independence and an economy devoid of fossil energy.

So lawmakers stagger yet again toward error and needless cost—political ballast for part of a right move on OCS leasing. Meanwhile, voters can learn much from a gasoline price slump that started before their elected officials could fashion a rescue. ✦

Nuclear heat advances oil shale refining in situ

Judy R. Clark
Senior Associate Editor

Technological advances in producing and refining liquid fuels in situ using high-temperature heat from nuclear reactors can resolve two major problems—dependence on oil from unstable areas of the world and greenhouse gas emissions—says MIT nuclear engineer Charles W. Forsberg.

In a presentation to the International Congress on Advanced Nuclear Power Plants (ICAPP 08) in June, Forsberg proposed the use of high-temperature heat (nearly 700° C.) from nuclear reactors to refine (underground) hydrocarbon feedstocks such as heavy oils, tar sands, oil shale, and coal to produce light distillates requiring little additional refining to produce gasoline, diesel, and jet fuel. Underground refining also could recover remaining oil in depleted oil fields.

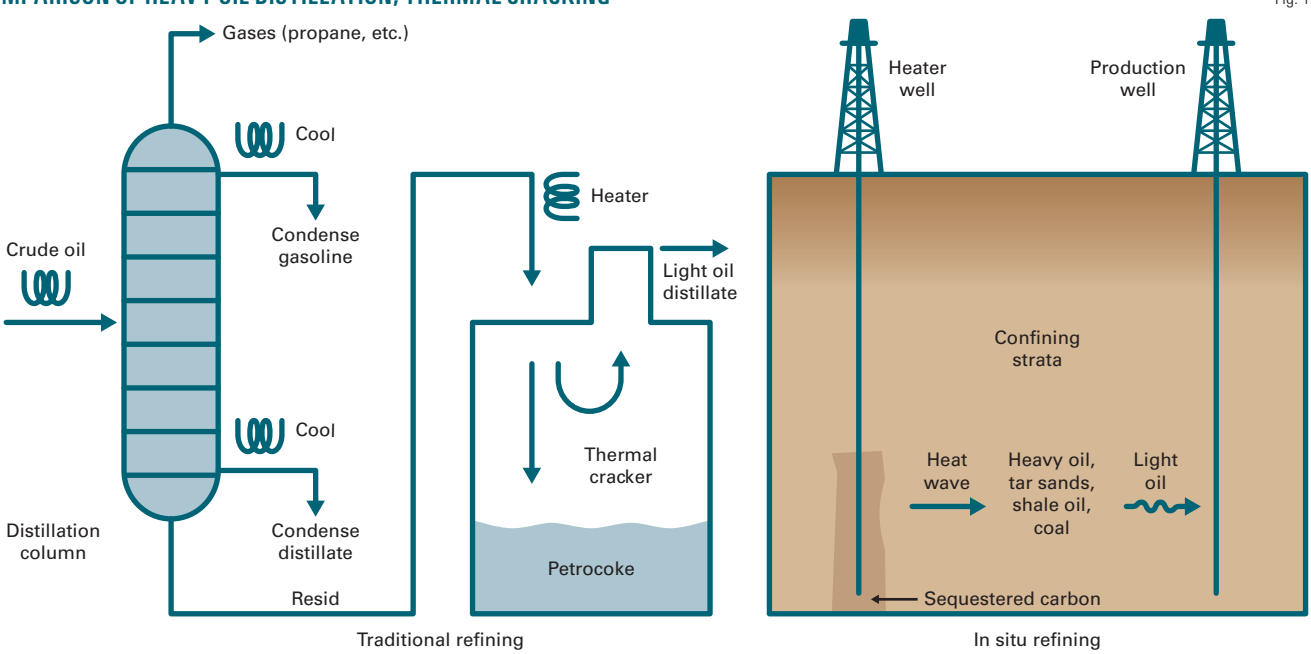
In addition, he said, with major retrofitting at large refineries, nuclear energy also could replace in the mid-term more-costly natural gas in providing high-temperature heat at existing refineries and for producing hydrogen for them in the long term. The high-temperature heat would be used for distillation and thermal cracking—the same processes for which it would be used in underground refining. Several oil companies are looking at nuclear options for heat at refineries and for oil recovery, he said, but retrofitting would be a serious constraint at many refineries. Although nuclear reactors have low operating costs, installation is capital-intensive, Forsberg noted.

While oil supplies 39% of US energy needs, Forsberg said, 149 US oil refineries consume more than 7% of US energy, particularly now that refineries are processing heavier feedstocks requiring more energy to refine. As an extreme case, the production of liquid fuel from coal consumes almost twice the energy value of the liquid fuel produced, he said, making recovery of liquid fuel from coal and some other fossil fuels economically unfeasible with existing technologies if there are constraints on greenhouse gas emissions.

The heavy oil refining trend also implies large increases in carbon dioxide releases per liter of liquid transport fuel produced. These could be greatly reduced by refining in situ, where carbon residue would remain underground, sequestered as carbon solids (coal).

COMPARISON OF HEAVY OIL DISTILLATION, THERMAL CRACKING

Fig. 1



Underground refining

The concept for underground refining is simple, he said. The hydrocarbon deposit is heated to high temperature, and as temperatures increase, volatile hydrocarbons vaporize and move toward recovery wells. They condense in the cooler zones and can then be pumped out of the ground as liquids or vapor.

"This distillation process leaves most impurities behind," Forsberg said. "While capillary forces can hold liquids in cracks in the rock, gasses easily permeate most reservoirs. As the temperature further increases, heavier hydrocarbons will be thermally cracked to produce lighter volatile hydrocarbons that can be recovered. In effect, heating the underground reservoir duplicates the distillation and thermal cracking processes found in a refinery" (Fig. 1).

This option has become potentially viable because of three technical developments, he said: "precision drilling, underground isolation of geological formations with freeze walls, and the understanding that the slow heating of heavy hydrocarbons (vs. fast heating) increases the yield of light oils while producing a high-carbon solid residue." He said the high temperatures required are within the current capabilities of high-temperature reactors.

The environmental advantages of in situ refining would be the reduction of toxic heavy metals from the surface environment by leaving them in the ground, avoiding the handling of many carcinogens in the refinery processing of hydrocarbons, and sequestration underground of the carbon as carbon from the thermal cracking process. Sequestration of carbon as solid carbon is known to work, but "the jury is still out for large-scale sequestration of carbon dioxide," Forsberg said. Any constraints on greenhouse gas releases would provide large economic incentives to use nuclear energy for fuels production.

In addition, it may be possible to undertake hydrocracking by injecting hydrogen into the subsurface while it is being heated, Forsberg said. "However, this option has not been investigated." Underground hydrocracking could potentially increase liquid yields.

The US as oil exporter

The most technical progress has been made in the recovery of shale oil. Shale oil deposits represent the most concentrated sources of fossil fuels in the world as measured in energy content per unit area. Most deposits are more than 500 ft thick, with some of them more than 2,000 ft thick and parts of the Green River basin yielding more than 2.5 million bbl of oil/acre, he said. By comparison, rich coal deposits in Campbell County, Wyo., yield the energy equivalent of less than a half million barrels per acre of oil.

The US contains the largest oil shale deposits in the world within the Green River Formation in Colorado, Utah, and Wyoming, with 500 billion-1.1 trillion bbl of potentially recoverable shale oil, Forsberg said. "The midpoint estimate is 800 billion bbl, or about three times that of Saudi Arabia."

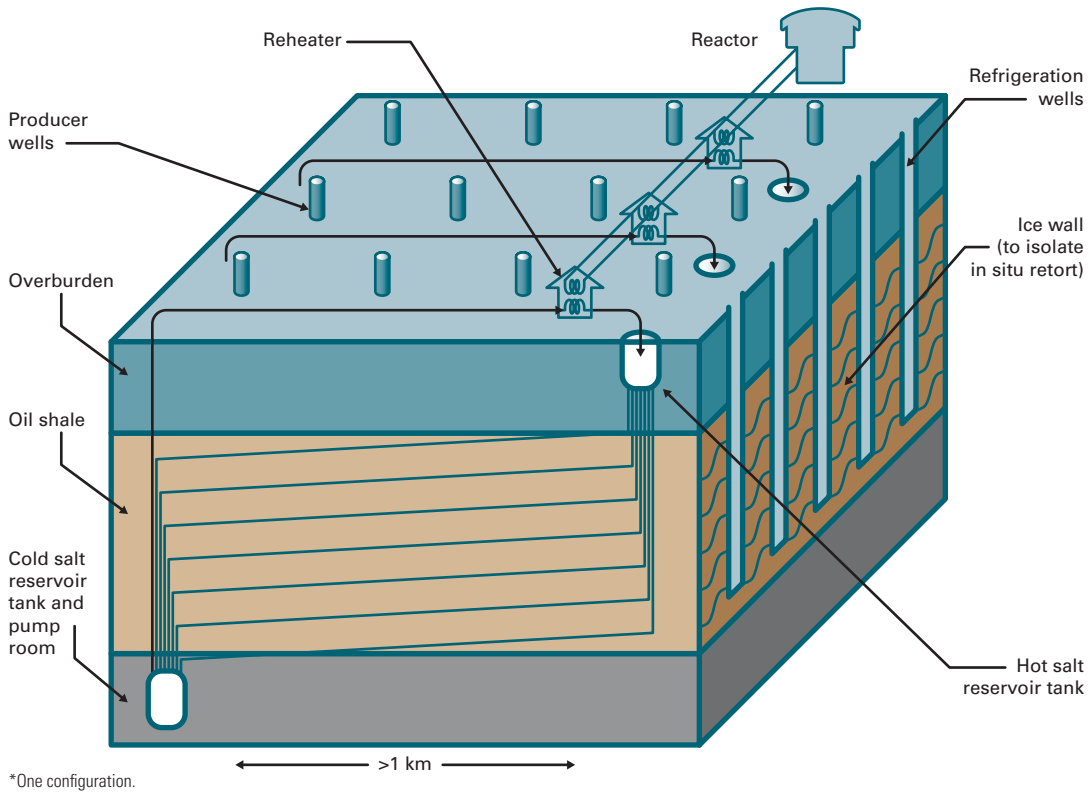
"Using these [nuclear] resources for liquid fuel production would potentially enable the United States to become an exporter of oil while sequestering carbon from the refining process underground" as carbon residue, Forsberg told ICAPP.

Traditional recovery

In the traditional process for shale

OIL SHALE HEATING UNDERGROUND WITH NUCLEAR HEAT*

Fig. 2



*One configuration.

oil recovery, a volume below the retort zone is mined, and staged explosives create rubble of the shale to be retorted. Oxygen is pumped in to burn some of the carbon to produce the required heat, about 480° C.

Traditional processes, however, are expensive, release large amounts of carbon dioxide into the atmosphere, and can produce poor-quality, unstable oil that requires major refining. Initial costs for commercial plants are expected to be $70-95/bbl. With additional industrial experience, costs could drop to $30-40/bbl, Forsberg said.

Shell's in situ process

Shell and others have developed new types of in situ retorting, however, that would produce premium shale oil for about $30/bbl. Shell's in situ conversion process, which involves heating oil shale slowly over many months under chemically reducing conditions and utilizes an ice wall to isolate the in situ retort, is closest to commercial deployment (OGJ, July 10, 2006, p. 18). It has been tested on a small scale and is being scaled up to a precommercial size.

Shell uses electricity for heat—which accounts for about half the total production cost—and requires 15-25 heaters/acre, with the electricity likely created from coal, which is cheaper than gas but environmentally undesirable. The water requirements for the electric power plant also would have a negative environmental impact. Producing 5 million b/d of oil would require 60,000 Mw of electricity.

Compared with traditional processes, it would take 2-3 years of slow heating to 370° C. to release the oil. Higher temperatures could reduce the number of required heaters or decrease the heating time, however.

The nuclear alternative

The nuclear option would transfer high-temperature heat from reactors to oil shale via liquid-metal or liquid-salt heat transport loops (Fig. 2). The distances from reactor to wellhead are short, making heat transport practical.

The process offers several advantages: The energy requirements would be reduced by a factor of 2 or more from systems using electricity, with expensive electricity replaced by lower-cost thermal energy, Forsberg said. With electric heating options, heat is converted to electricity and converted back to heat. The direct use of heat from a nuclear reactor avoids these conversion losses. The use of an intermediate heat transport loop also allows recovery of some of the heat after oil extraction, and the heat can be reused to partly heat the next oil-bearing rock. This can reduce heat requirements by a factor of 2 or more relative to electric heat or combustion heating of the oil-bearing rock.

And because electricity is not used, carbon dioxide emissions are avoided along with the need for excessive water use. In addition, with nuclear heat, all of the products are recovered and none need be burned to provide heat. A light, stable crude oil is produced that leaves impurities in the ground and requires relatively little refining. A high-temperature nuclear reactor can directly produce the necessary heat. "Good economics requires long-term base-load operations," said Forsberg.

Underground refining should be applicable to a wide variety of fossil deposits and is also effective in recovering oil from exhausted fields in which more than half the original oil remains after a field is abandoned. Although oil is held in place by strong capillary forces, when it is vaporized, it will flow and can be recovered even through tight capillaries.

"Technical challenges associated with nuclear energy use for oil shale production include the selection of the appropriate coolant-materials combinations for the heat transfer loops with the development of the startup-shutdown procedures," said Forsberg who is a member of the Nuclear Science and Engineering Department at the Massachusetts Institute of Technology. "About 12 Gw+ of high-temperature heat would be required to produce a million barrels of oil per day, with required reactor temperatures near 700° C." Like all other oil recovery technologies, the applicability of the technology will depend upon the local geology. Only field testing can determine the capabilities and limits of the technology.

Heating oil sands and depleted oil fields differs somewhat from heating oil shale or coal. Heating oil sands and depleted fields lowers the viscosity and surface tension of the oil and allows some fraction of the oil to flow as a liquid to the production wells. Residual oil further heated is either vaporized and condenses near the cooler production wells or is thermally cracked into more volatile hydrocarbons. These applications likely will require less thermal energy. ✦

US Senate, House groups try to break energy logjam

Nick Snow
Washington Editor

Bipartisan groups of US Senate and House members offered new energy proposals as Democratic and Republican leaders continued to trade potshots while a 5-week congressional recess began.

Politically centrist Senators calling themselves "The Gang of 10" unveiled a proposal Aug. 1 that combines responsible, targeted increases in domestic oil and gas production with an intensified effort to move vehicles to nonpetroleum alternatives and a strong federal conservation and energy efficiency commitment. Majority Leader Harry M. Reid (D-Nev.) said he does not agree with all of the ideas but hoped it would help break the Senate's current legisla-

tive stalemate.

In the House, meanwhile, a bipartisan group, which has been meeting since July 15, introduced on July 31 what its members called "a package of common-sense steps that address the short and long-term energy needs of the country; that will help us develop our own resources so that we can move toward energy independence and stop sending hundreds of millions of dollars overseas to buy oil; [and] that will provide stable, significant funding to develop alternative fuels and renewable energy." HR 6709 was sponsored by Rep. John E. Peterson (R-Pa.) and has 47 cosponsors.

Mary L. Landrieu (D-La.) discusses the US Senate's "Gang of 10" energy plan, which features "responsible, targeted" increases in domestic energy production and incentives for renewable and alternative resource development, at an Aug. 1 press conference. Others in the group are, from left, Saxby Chambliss (R-Ga.), John Thune (R-SD), Kent Conrad (D-ND), and Ben Nelson (D-Neb.). Photo from US Senate photographer.

The proposals were similar but not identical. They offered a contrast as other congressional Democrats and Republicans accused each other of ducking serious energy proposals.

Critical challenge

"Our country faces a critical challenge because of skyrocketing energy costs," said Sen. Kent Conrad (D-ND) at the Gang of 10's press conference. "This is not a Democratic issue or a Republican issue. It is an issue that affects all of us. I am committed to working with all of my colleagues in a bipartisan manner to resolve the energy crisis.... We need to act now."

Saying the discussion, although always professional, was sometimes "very direct," Sen. Saxby Chambliss (R-Ga.) said, "I believe this effort epitomizes what the US Senate is all about. Nothing gets done in this body without 60 votes, and you don't get 60 votes without a true bipartisan effort. This has been a cooperative effort on the part of all 10 members."

Sen. Mary L. Landrieu (D-La.) said, "The Senate has come to a screeching halt. But the Gang of 10 has reached a potential breakthrough. This bill would do more to lower [gasoline] prices at the pump than any other plan."

Sen. Lindsey O. Graham (R-SC) added, "Our proposal is not perfect, but it is a bipartisan start on the road to a comprehensive energy strategy leading our nation to independence from foreign oil. It will create new jobs from new technologies good for American wallets and our environment."

The group also included Sens. Blanche L. Lincoln (D-Ark.), Bob Corker (R-Tenn.), Ben Nelson (D-Neb.), John Thune (R-SD), Mark Pryor (D-Ark.), and Johnny Isakson (R-Ga.). Before the Independence Day recess, it urged Reid to convene a day-long energy summit to hear testimony from experts and develop a comprehensive plan. Reid accepted their proposal on July 30 and said he wanted to work with Minority Leader Mitch McConnell (R-Ky.) to hold such a summit when the Senate comes back to work after Labor Day.

Specific provisions

Specifically, the Gang of 10's proposed legislation, which the group named the New Energy Reform Act of 2008, would provide $20 billion in funding to convert 85% of new US motor vehicles to nonpetroleum sources within 20 years.

This would include $7.5 billion for research and development focused on major technological barriers to alternative fuel vehicles such as advanced batteries; $7.5 billion to help US automakers and parts manufacturers retool and re-equip their factories; and consumer tax credits of up to $7,500/vehicle for the purchase of advanced automotive vehicles that do not run primarily on petroleum-derived fuels and $2,500/

WATCHING GOVERNMENT

Nick Snow, Washington Editor

A gas study's unintended impact

Aubrey K. McClendon apparently expected a new natural gas supply study to change the US energy game plan when he came to Washington, DC, on July 28. It may do just that, but in a way that probably won't please producers seeking more access to federal lands.

Chesapeake Energy Corp.'s chief executive officer also is chairman of the American Clean Skies Foundation, which advocates the use of gas as part of a sustainable energy future. The group released a study by Navigant Consulting Inc. that found the US has 2,247 tcf of gas reserves, or a 118-year supply at 2007 demand levels (OGJ, Aug. 4, 2008, p. 30).

Horizontal drilling and other new technologies have opened supplies in shale formations over the last 3-5 years, McClendon and Richard G. Smead, one of the study's authors and overall project manager for Navigant, told reporters at a briefing.

"It's groundbreaking. The size of these shale formations is so big it can't be ignored," McClendon maintained.

More than forecast

Smead said the study tried to use information that's more current than what the US Energy Information Administration uses for its forecasts. "Every EIA natural gas forecast has been exceeded by actual production, with shale gas particularly active in the last 10 years," he said.

His researchers spoke to 114 producers controlling 90% of known North American gas supplies and received responses from 66 about their estimated resources and anticipated production. They found that while overall production from unconventional sources has increased over 10 years, production from shale formations grew more than 660% from less than 1 bcfd in 1998 to about 5 bcfd now.

"Current technology has gone through decades of change in about 3 years. Every indication is that this is the least expensive gas we'll have. The adequacy of this resource is not an issue. It is growing and will continue to grow with the market," Smead said.

It's also more readily available than what may be produced from areas which are currently off-limits, McClendon added. Chesapeake is making most of its discoveries by using new technology to tap formations beneath old fields previously out of reach, he said.

Less critical

"I think this makes lifting the Outer Continental Shelf moratorium less critical. The gas we're talking about is in traditional producing areas on largely private property," McClendon said at the briefing.

He did not emphasize that point when he testified before the US House Select Committee on Energy Independence and Global Warming later that day. But the committee's chairman, Edward J. Markey (D-Mass.), was aware of it.

"If the information in the study is correct, it takes a lot of pressure off us to open more of the OCS. This is something that could happen over 10 years, where Republicans are discussing an option that would take 30 years," he told me following the hearing. ✦

vehicle to retrofit existing cars and trucks.

The bill's energy conservation provisions include extending the renewable energy, carbon mitigation, and efficiency tax incentives (including the production tax credit) through 2012; introducing new tax credits of up to $2,500/vehicle for consumers to purchase highly fuel-efficient vehicles; extending and expanding the $2,500 tax credit for hybrid electric vehicles; and providing $500 million in funding for R&D into new materials and other innovations to increase vehicle fuel efficiency.

Other energy conservation elements include $2.5 billion for the research, development, and deployment of "next generation biofuels and infrastructure"; tax incentives to install alternative fueling stations, pipelines, and other infrastructure; expanding transmission capacity for electricity from renewable sources, and new dedicated funding for weatherization assistance.

More US production

To increase domestic energy production, the Gang of 10's bill would ensure that it is "responsible" and "targeted." For offshore oil and gas, that means consulting with the US Department of Defense to ensure that leasing and drilling occurs in more of the eastern Gulf of Mexico consistent with national security. It means allowing Virginia (where a 2011 federal OCS lease sale already is scheduled), North Carolina, South Carolina, and Georgia to agree to allow federal leasing off their shores.

A 50-mile environmental buffer zone would be retained where new oil production could not take place, and all new production would have to be used domestically, according to the proposal. States that allow offshore production would receive an appropriate share of revenues, and a commission would be created to make recommendations to Congress on areas to consider for future leasing.

The measure also would provide a carbon dioxide sequestration credit for use in enhanced oil recovery to in-

crease production from existing wells. It would provide grants and loan guarantees to develop coal-to-liquids plants with a carbon capture capability (as long as those plants' lifecycle greenhouse gas emissions were below those of the petroleum fuels their production would be replacing). And it would support nuclear energy by providing workforce training and accelerated depreciation for new nuclear power plants, increasing the US Nuclear Regulatory Commission's staff, and supporting spent fuel recycling R&D.

About $30 billion of the bill's $84 billion required investment would be financed partly by payments from the oil and gas industry through actions such as modifying the Section 199 manufacturing deduction "and other appropriate measures to ensure that the federal government receives its fair share from Gulf of Mexico leases," according to the group. It said remaining financial offsets would be finalized after consulting with the Senate Finance Committee on interaction effects with other legislation.

The Gang of 10 said that it would not make an energy market speculation recommendation initially because it was concentrating on supply and demand issues, but may do so after the US Commodity Futures Trading Commission issues a report on the subject in mid-September.

House group's proposal

HR 6709, the bill developed by Peterson and Rep. Neil Abercrombie (D-Ha.) who have cosponsored similar measures, takes a broader approach in its energy production section. It would repeal all federal prohibitions against spending money for onshore and offshore leasing and preleasing activities. Leasing within 25 miles of a state's coastline would be banned, but coastal states could authorize production from 25 to 50 miles offshore within 1 year of the bill's passage.

The 125-mile oil and gas leasing buffer zone in the eastern Gulf of Mexico and appropriations bans on oil shale development would be repealed, but the Interior secretary would have to consult with the Defense secretary to coordinate any leasing. Unresolved issues could be referred to the president, the bill says.

It also would repeal a moratorium on oil shale leasing and prohibitions on federal agencies from entering into contracts for an alternative or synthetic fuel and would allow the use of woody biomass from federal lands for alternative fuel.

The House group's bill specifically allocates shares of the $2.6 trillion it estimates new offshore leasing would produce: 30%, or $780 billion, would go to the US Treasury; 30%, or $780 billion, would go to the affected states; 8%, or $208 billion, would go to a conservation reserve; 10%, or $260 billion, would go to an environmental restoration reserve; 15%, or $390 billion, would go to a renewable energy reserve; 5%, or $130 billion, would go to a reserve for nuclear waste and for carbon capture and sequestration, and 2%, or $52 billion, would go to the Low Income Home Energy Assistance Program (LIHEAP).

Other provisions

HR 6709's two other titles deal with cleaner energy production and conservation incentives and with Strategic Petroleum Reserve modifications and dedication of revenues to existing conservation and energy research programs.

The first of these titles would amend the federal tax code to provide at least 5 years of tax deductions and incentives for conservation and renewable energy projects, including facilities, alternative fuel vehicles and vehicle refueling property, energy efficient appliances, nonbusiness energy property, residential energy-efficient property, a new energy-efficient home credit, energy-efficient commercial buildings, solar energy fuel cell and microturbine properties, clean renewable energy bonds, biodiesel and renewable diesel, and plug-in hybrid cars.

The other title would modify the SPR's supply with a 10% exchange, or 70 million bbl, of its content for lower quality grades, which are used in a growing share of US refinery throughput. The estimated $1.4 billion of revenue that would result would be directed to existing conservation, energy R&D, and conservation programs, including $385 million for carbon capture and sequestration, $170 million for electricity storage and transmission, $110 million for industrial energy efficiency R&D, $100 million for advanced energy research projects, $100 million for LIHEAP, and $65 million for unconventional gas production and environmental research.

The bill was referred to the House Natural Resources Committee where one of its cosponsors, Rep. Jim Costa (D-Calif.), chairs the Energy and Mineral Resources Subcommittee.

"I believe this combination of increasing supply and reducing demand, which this bill does, will reduce our energy costs, along with creating new jobs," Costa said at a July 30 press conference with other cosponsors. "Even more important, this bill provides a framework for moving us toward cleaner and renewable sources of energy, and toward energy independence."

Rep. Thelma Drake (R-Va.) added, "Now, there is a bipartisan solution on the table. This bill gives voice to the beleaguered American public which has said 'enough' and is calling for a comprehensive solution to the energy crisis. It is my sincere hope that the House will take up this bill and allow a vote on the bipartisan energy solution that the American people are demanding." ✦

"Energy independence will require an all-hands-on-deck effort from America: effort from our scientists and entrepreneurs, from businesses, and from every American citizen."

—US Sen. Barack Obama

Obama energy plan calls for increased US oil, natural gas production

Nick Snow
Washington Editor

More domestic oil and gas exploration will be needed as the US makes a transition to a new energy economy, US Sen. Barack Obama (D-Ill.) said in a presidential campaign address in Michigan.

"But we should start by telling the oil companies to drill on the 68 million acres they currently have access to but haven't touched. And if they don't, we should require them to give up their leases to someone who will," he continued in remarks prepared for delivery at Michigan State University in Lansing.

"We should invest in the technology that can help us recover more from existing oil fields and speed up the process of recovering oil and gas resources in Montana and North Dakota, Texas, and Arkansas, and in parts of the West and Central Gulf of Mexico," Obama maintained.

He also reiterated congressional Democrats' proposals to release 70 million bbl of oil from the Strategic Petroleum Reserve as a way to reduce gasoline prices, and to accelerate leasing within the Strategic Petroleum Reserve-Alaska. "And we should also tap more of our substantial natural gas reserves and work with the Canadian government to finally build the Alaska Natural Gas Pipeline, delivering clean natural gas and creating good jobs in the process," Obama said.

Obama, who is the Democrats' presumed 2008 presidential nominee, used the address to introduce what he called a New Energy Plan for America after weeks of energy legislative deadlock in the US Senate and House. Bipartisan groups on both sides of the US Capitol proposed compromises as Congress left for its late summer recess on Aug. 1.

Defer priorities

Emphasizing that simply producing more oil and gas domestically will not come close to making the nation more energy-secure in the long term, Obama said a full transformation of the US economy will be necessary. "This transformation will be costly, and given the disaster we will inherit from the last administration, it will likely require us to defer some priorities," he said.

"Energy independence will require an all-hands-on-deck effort from America: effort from our scientists and entrepreneurs, from businesses, and from every American citizen. Factories will have to retool and redesign. Businesses will need to find ways to emit less carbon dioxide. All of us will need to buy more fuel-efficient cars...and find new ways to improve efficiency and save energy in our homes and businesses," Obama said.

He said that the bipartisan proposal that a group of US senators—calling themselves the "Gang of 10"—announced on Aug. 1 represented progress in developing new energy sources quickly (See related story, p. 24). "It's a plan that would invest in renewable fuels and batteries for fuel-efficient cars, help automakers retool, and make a real investment in renewable sources of energy," he said.

The legislative proposal also has drawbacks, Obama continued. "It includes a limited amount of new offshore drilling, and while I still don't believe that's a particularly meaningful short-term or long-term solution, I am willing to consider it if it's necessary to actually pass a comprehensive plan. I am not interested in making 'the perfect' the enemy of 'the good,' particularly since there is so much good in this compromise that would actually reduce our dependence on foreign oil," he said.

Obama said that if he is elected president, he would immediately direct the full resources of the federal government and the full energy of the private sector to eliminate the US need for oil from the Middle East and Venezuela within 10 years. "To do this, we will invest $150 billion over the next 10 years and leverage billions more in private capital to build a new energy economy that harnesses American energy and creates 5 million new American jobs," he said. ✦

Kempthorne starts preparation of next OCS 5-year plan

Nick Snow
Washington Editor

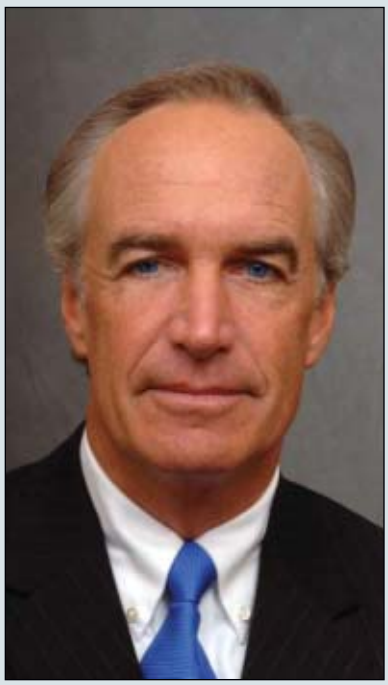
Citing dramatically higher prices, US Department of the Interior Secretary Dirk A. Kempthorne started the Minerals Management Service's next 5-year Outer Continental Shelf lease plan preparation 2 years ahead of schedule.

"When our current 5-year plan was launched in July 2007, oil was selling for $64/bbl. Today, a barrel of oil costs more than $120, almost double the price a year ago. Clearly, today's escalating energy prices and the widening gap between US energy consumption and supply have changed the fundamental assumptions on which many of our decisions were based," he said July 30.

"Areas that were considered too expensive to develop a year ago are no longer necessarily out of reach based on improvements to technology and safety. The American people and [US President George W. Bush] want action and this initiative can accelerate an offshore exploration and development program that can increase production from additional domestic energy resources," Kempthorne said.

He said he directed MMS to take the initial steps by issuing a call for information from all parties on what the next 5-year OCS leasing plan should consider. It is seeking comments to ensure all interest and concerns are considered, Kempthorne said. The governors of all 50 states will be specifically asked for their comments, particularly on issues unique to each state, he indicated. The call for information appeared in the Aug. 1 Federal Register. Comments will be accepted through Sept. 15.

"The president believes coastal states should have a voice in how OCS resources are developed off their shores while ensuring those environments are protected. Also, Congress should provide a way for the federal government and states to participate in revenue sharing from those new leases," Kempthorne said.



"Areas that were considered too expensive to develop a year ago are no longer necessarily out of reach based on improvements to technology and safety. The American people...want action and this initiative can accelerate an offshore exploration and development program that can increase production from additional domestic energy resources."

—US Department of the Interior Secretary Dirk A. Kempthorne

'Send a clear signal'

On July 14, Bush lifted the executive OCS withdrawal which his father, President George H.W. Bush, instituted 18 years earlier, but congressional oil and gas leasing moratoriums which have been in place for up to 26 years in some cases remain on 85% of the OCS. "Now, its up to the United States Congress to make a decision as to whether or not you're going to continue to face high gasoline prices at the pump or whether or not the United States will send a clear signal to the world that we're tired of being dependent on oil from overseas and we're going to find it right here," the current president told an audience in Euclid, Ohio, on July 30.

President Bush said, "The American people must understand that new technologies make it easier to protect coral reefs, for example, when we drill offshore. New technologies enable us to explore for oil and gas in ways that were not possible 20 years ago. You can have one platform and directionally drill from it. So I signed an executive order that said: Why don't we explore for oil and gas offshore? If we've got a problem with not having enough oil, let's go after some right here in the United States of America in environmentally friendly ways."

The current 5-year OCS plan runs from July 1, 2007, through June 30, 2012, and includes 21 lease sales in eight of the 26 OCS planning areas in the Gulf of Mexico, Alaska, and the Atlantic Ocean, according to DOI. It does not include any areas covered by congressional bans with the exception of a single sale in 2011 off Virginia, which MMS added after the state included possible OCS activity in a comprehensive energy strategy Gov. Timothy M. Kaine signed into law in early 2006.

Kempthorne noted that the next 5-year OCS plan could consider any part of the OCS although leasing of any area currently covered by a moratorium would require congressional action. Currently banned OCS portions contain an estimated 18 billion bbl of oil and 76 tcf of natural gas, according to DOI.

It said that Kempthorne used au-

Nelson criticizes Kempthorne's OCS leasing plan

Nick Snow
Washington Editor

US Sen. Bill Nelson (D-Fla.) said Interior Secretary Dirk A. Kempthorne has taken "a questionable step" in beginning to prepare a new 5-year Outer Continental Shelf oil and gas leasing plan ahead of schedule.

"It is becoming increasingly clear that [US President George W. Bush] is set on putting oil rigs off the state of Florida before he leaves office in January, regardless of the fact it will have no effect on energy prices. The president's plan for lifting the quarter century ban on offshore drilling has been called 'cruelly misleading,' and rightly so," Nelson said in a July 31 letter to Kempthorne.

"You and he both know exploiting our coastlines won't bring down gasoline prices. In fact, a recent report from inside the administration's energy office found it will have no impact on prices," he maintained.

Nelson said the secretary, who announced on July 30 that he was beginning preparation of the next 5-year OCS leasing plan 2 years earlier because of higher crude oil and natural gas prices, took the "highly unusual step" when the current plan has been in operation "only a little more than 1 year."

"Existing federal law established a ban on such preleasing activities. Public Law 109-432 prohibits any leasing, preleasing, or other activity east of the Military Mission Line in the Gulf of Mexico—until June 30, 2022," he wrote Kempthorne.

Nelson said the real answer to record-high gasoline prices is the rapid deployment of alternative fuels and vehicles such as cars that run on hydrogen instead of petroleum. Oil and gas producers also need to drill more aggressively on federal land they have leased already, he added.

House Republicans have opposed serious, responsible proposals to increase supply, reduce prices, protect consumers, and transition America to a clean renewable energy independent future added Speaker Nancy Pelosi (D-Calif.). "The American people deserve better," she said.

Republicans in the Senate, where a bill with similar provisions was defeated the previous week, as well as in the House question Democrats' assertions that excessive energy commodities speculation by index funds and institutional investors is largely responsible for inflated crude oil prices. House Republicans also charge that Pelosi keeps bringing bills to the floor under suspended rules so amendments leading to a fuller energy issues debate can't be proposed.

thority under the 1978 OCS Lands Act Amendments which allows the Interior secretary to develop "out of cycle" leasing programs and requires various procedural steps, including several public comment rounds and multiple environmental reviews.

Initial reactions

National Ocean Industries Association Pres. Tom Fry, a former director of MMS and the US Bureau of Land Management, said Kempthorne's action will allow DOI "to reverse two decades of poor public policy where we have refused to even consider the energy available on the vast majority of our public submerged lands."

Fry said, "It's as if we've been bypassing several large grocery stores with a wide selection to shop instead at a small convenience store with a limited selection."

Fry said the OCS's energy resources are vital to US economic prosperity, and safety records show that they can be produced in an environmentally responsible manner. "Now, with global demand for oil increasing, gasoline prices soaring and an American public looking for relief at the pump, we must consider the entire offshore area that is owned by all the American people," he said.

The Institute for Energy Research (IER) applauded DOI's plan to include OCS areas currently under moratoriums in its next 5-year leasing plan. IER Pres. Thomas Pyle said, "Assuming the congressional ban expires, this decision sets the stage for the opening of hundreds of millions of offshore federal lands that have never been explored for their energy potential. It's the kind of proactive step we rarely see the government take, but given the urgent need to increase domestic energy supplies, it's the right thing to do. The United States has been fighting its economic and energy battles with one hand tied behind its back for too long."

US Senate Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM), said, "This is very good news. The administration has embraced the proposals that Senate Democrats have been calling for all this week. Recently, I praised Secretary Kempthorne for speeding up lease sales in the National Petroleum Reserve-Alaska. Secretary Kempthorne appears to be using his authority wisely."

An 'unworthy' hoax

Other congressional Democrats reacted more to Bush's remarks than to Kempthorne's action. US House Speaker Nancy Pelosi (D-Calif.) called the president's proposals to expand OCS oil and gas leasing "a hoax unworthy of the serious debate we must have to relieve the pain of consumers at the pump and to promote energy independence...." She said, "Americans know that, thanks to the two oilmen in the White House, consumers are now paying $4/gal for [gasoline]. But what Americans should

realize is that what the president is calling for is drilling as close as 3 miles off of America's pristine beaches and in other protected areas."

US Senate Majority Leader Harry M. Reid (D-Nev.), noted: "If the president truly cares about Americans paying record-high energy prices to fill their tanks and heat their homes and wants to make them more secure, he can release oil from the Strategic Petroleum Reserve, accelerate production in the 68 million acres already open for drilling, open up new leases in areas that are not environmentally protected, crack down on greedy oil traders who artificially inflate energy prices, and support efforts in Congress to extend renewable energy tax credits that spur investment in clean energy sources. Unfortunately, he has shown no interest in doing anything but continuing more of the same failed policies that have produced the highest oil and gas prices ever."

Congressional Republicans continued to press Pelosi and Reid (D-Nev.) to allow votes on proposals to remove leasing bans on the OCS and elsewhere before Congress recesses on Aug. 1. House Minority Leader John Boehner (R-Mo.) said, "The American people understand that the only ones standing in the way of lower [gasoline] prices are the Democrats in charge of Congress. Rank-and-file Democrats have a choice this week: Vote to leave town for 5 weeks, or join us in demanding a vote."

Senate Minority Leader Mitch McConnell (R-Ky.) said, "The Democrat leadership has already tried to take us off this issue four times in the last 5 days. About eight in 10 Americans disagree with them. The American people think $4/gal gasoline is a crisis that must be dealt with now."

After the House formally voted to adjourn a week earlier than originally scheduled, Republican Conference Chairman Adam Putnam (Fla.) said Democrats "should be held in contempt for voting to skip town without dealing with America's energy crisis," adding, "Democrats are out of touch, out of support, out of excuses and out of time." ✦

Pressure to switch votes stops US commodities bill

Nick Snow
Washington Editor

US House Democrats charged Republican leaders with pressuring many GOP members to change their votes and defeat an energy commodities reform bill on July 30. The measure, which came to the floor under a rules suspension, fell short of the two-thirds majority needed for passage in a 276-151 vote.

"With the support of more than 290 members, including more than 75 Republicans, HR 6604 was well on its way to being passed over the two-thirds vote requirement, sending a clear signal that transparency and enforcement would return to the commodities and futures markets. Then Republican leadership demanded that members change their votes in order to protect President Bush," Agriculture Committee Chairman Collin Peterson (D-Minn.) said following the vote.

He said, "HR 6604 is a bipartisan bill that passed the Agriculture Committee by voice vote. It is the product of a comprehensive series of hearings to examine the issues surrounding futures trading from all sides. And it clearly has enough support to pass this House. We will continue to pursue meaningful steps to address the conditions that have thrown some futures markets into disorder and hope that members will have the courage of their convictions to join us."

House Speaker Nancy Pelosi (D-Calif.) added, "By organizing a reversal of votes, the Republican leadership sent a strong message to the American people: The Republican conference is playing politics with the pain American consumers and businesses are facing at the pump. Today's vote marks the 13th time a majority of House Republicans have opposed serious, responsible proposals to increase supply, reduce prices, protect consumers and transition America to a clean renewable energy independent future. The American people deserve better."

Republicans in the Senate, where a bill with similar provisions was defeated the previous week, as well as in the House question Democrats' assertions that excessive energy commodities speculation by index funds and institutional investors is largely responsible for inflated oil prices. House Republicans also say that Pelosi keeps bringing bills to the floor under suspended rules so amendments leading to a fuller energy issues debate can't be proposed. ✦

Apex Oil to pay for Illinois pollution cleanup

Nick Snow
Washington Editor

Apex Oil Co. Inc. has been ordered to clean up contamination from its former refining operations in Hartford, Ill., the US Department of Justice and Environmental Protection Agency jointly announced July 29. Chief Judge David R. Herndon of the US District Court for the Southern District of Illinois issued the order on July 28 following a 5-week trial of a DOJ-EPA lawsuit against Apex in January and February.

The cleanup, which will cost the privately held Clayton, Mo., oil products

company at least $150 million, involves extensive soil and groundwater contamination, the federal agencies said.

Soil and groundwater beneath Hartford, north of St. Louis on the Mississippi River, have been contaminated for years with more than 1 million gal of leaded gasoline and other petroleum products from refinery and pipeline leaks and spills, DOJ and EPA said. They said preliminary cleanup work began in 2004 under an agreement EPA reached with four other refiners (BP America Inc., Shell Oil Co., Sinclair Oil Corp., and Valero Energy Corp.).

DOJ sued Apex in 2005 after it refused to assist in the cleanup. The company is the legal successor to Clark Oil & Refining Corp., which owned a refinery next to Hartford during 1967-88. The court ruled that Apex was responsible for multiple leaks and spills that contributed to the contamination beneath Hartford and violated the federal Resource Conservation and Recovery Act, DOJ and EPA said.

The judge also ordered Apex to begin work promptly on the final groundwater and soil remedy for the community. This will involve installation of an extensive liquid and vapor extraction to remove and treat petroleum hydrocarbon contamination that is smeared into soil and floats on top of groundwater beneath Hartford, the government agencies said. ✦

Iran threatens to close Straits of Hormuz with missile launch

Eric Watkins
Senior Correspondent

The Iranian government, in a standoff with the United Nations Security Council over its "inalienable right" to develop nuclear power, has threatened to use a newly tested short-range missile to close the Straits of Hormuz, if necessary.

"No enemy vessels would be able to escape it within a 300-km radius from the borders of Iran," said Gen. Mohammad Ali Jafari, commander of the country's Revolutionary Guards, referring to a new Iranian-built antiship missile.

The Straits of Hormuz, described by the US Energy Information Administration, as a major "choke-point" of world oil shipping, sees about 17 million b/d of crude oil.

To avert an attack by the US or its allies in the region, Iran has repeatedly threatened to exert its control over the waterway. Underlining the international stand-off, the US has pledged to keep the shipping route open.

Threat follows talks

Jafari's threat followed talks between Iran and the representative of six world powers which ended on Aug. 4 without resolving the international dispute row over Tehran's nuclear work.

The West fears Iran aims to build nuclear warheads under cover of a civilian program. Tehran denies the charge, saying that it nuclear program aims at mastering the technology needed to generate electricity, not bombs.

The UN Security Council has imposed three sets of limited penalties on Iran since 2006, but the Iranian government remains undeterred in its efforts to secure the technology it claims to need. Indeed, Iranian officials claim the sought-after technology is a national right. "Enrichment is Iran's inalienable right," said an Iranian foreign ministry. "When it comes to our inalienable rights, we will press ahead."

US and European Union officials stated that the telephone conversation with Iran on Aug. 4 was "not conclusive." They accepted a pledge by Tehran to provide a written response by Aug. 5 to the latest offer by the EU and US.

While accepting the offer of a 1-day delay, however, Western officials vowed further steps if the response was unclear. "We agreed in the absence of a clear, positive response from Iran that we have no choice but to pursue further measures against Iran as part of this strategy," said US State Department spokesman Gonzalo Gallegos.

Following talks between the two sides in mid-July, Western officials had set an informal deadline of Aug. 2 for Tehran to respond to their offer to refrain from steps to impose more UN sanctions if Iran froze expansion of its nuclear work.

In particular, world powers offered to start prenegotiations during which Tehran would add no more uranium-enriching centrifuges and in return face no further sanctions.

But Tehran dismissed the idea of freezing its uranium enrichment program, and a week later Iranian President Mahmoud Ahmadinejad that his country already had 5,000-6,000 uranium-enriching centrifuges. ✦

UK government changes approach on biofuels

Uchenna Izundu
International Editor

The UK will cautiously proceed with increasing the use of biofuels, following the conclusions of a review by a leading scientist.

The report by Ed Gallagher urged that production of biofuels must be sustainable or it could seriously jeopardize land use, boost greenhouse gas emissions, and potentially contribute to rising food prices.

Biofuels production should focus on idle and marginal land and use second-generation biofuels, which use waste parts of plants for energy, to minimize

competition with food production, according to the review.

Under the UK's Renewable Transport Fuel Obligation (RTFO), which came into effect in April, 2.5% of fuel sale volumes must be from biofuels (OGJ Online, Apr. 15, 2008). The level of the obligation is due to rise to 3.75% in April 2009 and 5% in April 2010. Ruth Kelly, transport secretary, said the government would consult stakeholders about making changes later in the year.

However, the UK will also push for the European Union to ensure that its 10% renewable transport fuels target for 2020 is conditioned upon sustainability and without significant impacts on food prices.

The government said it would "press that the sustainability criteria for biofuels, currently being negotiated, should address indirect, as well as direct, effects on land use."

Critics have called for a moratorium on biofuels because they are unsustainable and are contributing to higher food prices, but Gallagher rejected this approach arguing that it would "reduce the ability of the biofuels industry to invest in new technologies or transform the sourcing of its feedstock to the more-sustainable supplies necessary to create a truly sustainable industry."

Clare Wenner, head of transport biofuels at the Renewable Energy Association, said that proposals did not give the industry consistent, reliable, and long-term targets. "However, no progress will be made unless there is investment in production and research."

Alwyn Hughes, chief executive of Ensus, which is building a wheat-based ethanol plant in northeast England, was "concerned" at the government's change in approach to existing commitments under the RTFO.

"We think this is unnecessary when sustainable production can already be achieved," Hughes said. "Such a move would only serve to jeopardize the industry's ability to deliver the substantial benefits that are possible." ✦

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Japan calculates the odds

The price of oil continues to pinch in Japan. To be sure, the world's benchmark super crude oil tanker rates from the Gulf to Japan fell to 7-month lows last week due to ample availability of vessels.

Baltic Exchange data showed freight rates for very large crude carriers in the export route from the Gulf to Japan fell to Worldscale 151 late on July 31, dropping by 29.5 points from the day before.

That was the lowest level since early June and the biggest single-day drop since early January for the 2 million bbl vessels plying the route.

Still, Japanese leaders are taking no chances on continued low rates for oil or oil transport from the Middle East as underlined by a free-trade agreement signed between Japan and Brunei in June 2007 came into effect July 31.

Reducing dependency

It was another effort by Tokyo to reduce dependency on Middle Eastern supplies and shorten its long and expensive supply chain from the gulf.

The agreement will substantially increase investment in Brunei, with Japan being the sultanate's largest export destination. Brunei sent shipments worth around ¥293.8 billion in 2007, mainly in the form of oil and natural gas.

It is also an important step for resource-poor Japan in its efforts to secure stable energy supplies, with around 70% of the country's total imports of LNG coming from Brunei.

Japan's efforts to diversify from Middle Eastern oil have achieved modest success as crude oil imports in June declined 9.4% from a year earlier to 105.80 million bbl.

Imports from the Middle East captured 83.6% of that total, down 2.5%. It represented the fifth consecutive month that the Middle Eastern share slipped below the year-before level.

Saudi Arabia remained the biggest crude exporter to Japan, accounting for 31.64 million bbl, up 0.8%. Following Saudi Arabia was the UAE with exports at 25.73 million bbl, down 7.3%.

Qatar replaces Iran

Qatar replaced Iran as the third biggest crude exporter to Japan by boosting exports 53.6% to 13.33 million bbl against Iran's 8.24 million bbl, down 53.4%. For the record, Russia was fifth on the list with 4.91 million bbl, up 2.2%.

But more has to be done about pricing as Japan's military may have to cancel its largest annual naval exercise for the first time in half a century due to soaring energy prices.

The Maritime Self-Defense Force's maneuvers have not been called off since it started in 1954, even during the oil crisis of the 1970s.

This year's drill was planned for November, although official dates had not been announced.

"In order to secure enough fuel for emergency relief activities, we've cut down on the scope of our exercises, but there is a limit," said a MSDF official.

"Now," he said, "we are considering canceling the upcoming large-scale naval drill, which would consume large amounts of fuel." ✦

Caspian gets another large oil find on Lagansky block

Eric Watkins
Senior Correspondent

Lundin Petroleum AB, Stockholm, said its Morskaya-1 exploration well, which was drilled on Lagansky block in the northern Caspian Sea off Russia, has encountered a major oil accumulation in the Aptian and Neocomian sandstone reservoirs.

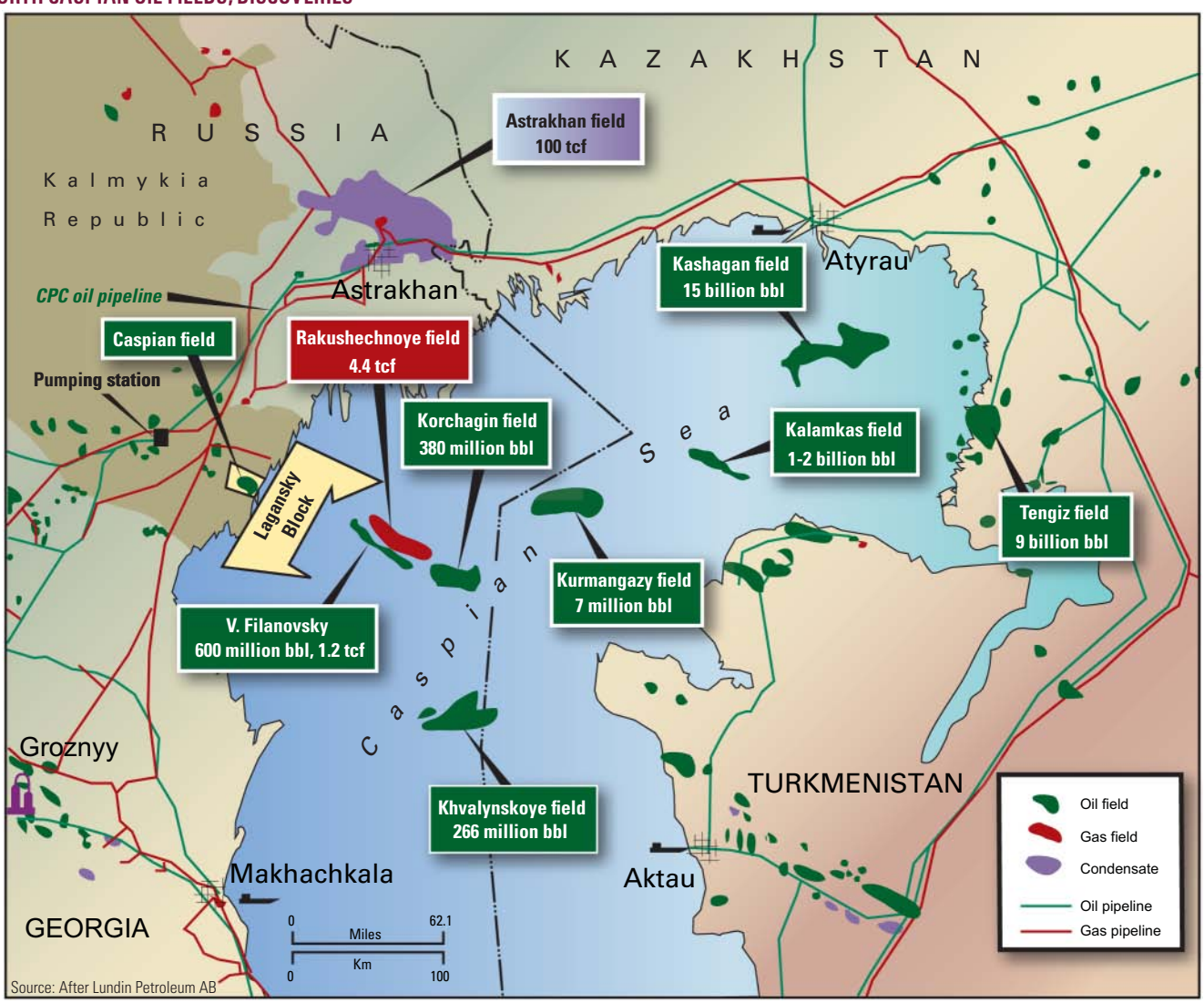
The discovery well also found minor amounts of natural gas in the overlying Albian reservoir.

Morskaya joins numerous other giant and supergiant discoveries of varying recoverable volumes in the northern Caspian, all of which have yet to be placed on production (see map).

Calling the discovery a "major milestone" for the company, Lundin President and Chief Executive Officer Ashley Heppenstall said Morskaya-1 "will have a material impact" on the company. "We look forward to our forthcoming exploration and appraisal program to further realize the excellent potential of this area," Heppenstall said.

The Neocomian formation was perforated over a 7-m interval and tested at a stabilized rate of 1,700 b/d of oil on a 5⁶⁄₆₄-in. choke. The Aptian formation

NORTH CASPIAN OIL FIELDS, DISCOVERIES



Source: After Lundin Petroleum AB

was perforated over 21-m interval and tested at a stabilized 800 b/d of oil on a 36/64-in. choke.

"The flow rates were severely constrained by facilities and larger rates will be possible during development," Lundin Petroleum said.

The company was to test the Albian in future appraisal wells because of time constraints associated with the short drilling season.

Morskaya-1 was drilled to a depth of 2,082 m in less than 2 m of water. A significant amount of cores, wireline logs, and reservoir fluid samples has been acquired.

The Morskaya structure straddles the license boundary on the east side of the Lagansky block and the adjoining acreage controlled by the Caspian Oil Consortium and is on trend with several major oil and gas discoveries made by OAO Lukoil.

Lundin said the Lagansky block contains significant additional prospectivity and following the testing of the Morskaya-1 well the Marine Drilling Complex (MDC) will be transported to the Laganskaya-1 well location west of Morskaya, where drilling is expected to commence at the end of September.

Lundin plans to drill another two wells in 2009. Petrovskaya-1 will target a large anticline to the northwest and on trend with the Morskaya discovery. The second well will most likely appraise the Morskaya discovery.

Lundin has a 70% stake in Lagansky block. In July 2007, OAO Gazprom signed a call option agreement with Lundin to acquire a 50% stake plus one share in the block. ✦

Southwestern Energy's Fayetteville output nears 500 MMcfd

Southwestern Energy Co., Houston, said its gross operated production from the Fayetteville shale play area in north-central Arkansas was 500 MMcfd of natural gas, including 12 MMcfd from 14 wells producing from conventional reservoirs.

The company has 857,000 net acres in the play. The production rate a year ago was 200 MMcfd.

The company projected that estimated ultimate recovery could be improved by 15-20% from horizontal wells on which it has employed closer perforation cluster spacing. It tested the technique on 38 wells in the first half of 2008 and plans to use it on all of its wells the rest of the year.

The company, running 22 rigs in the play, is drilling longer laterals generally and plans to test spacing of 80 acres or less later in 2008. It said its knowledge of how to drill and complete wells in the shale is "consistently improving."

Southwestern placed 83 wells on production at an average 2.54 MMcfd in the quarter ended June 30, compared with 58 wells at 1.26 MMcfd in the quarter ended Mar. 31, 2007. Lateral length averaged 3,562 ft vs. 2,104 ft.

For the quarter ended Mar. 31, 2008, when 75 wells went on production, those 75 wells averaged 2.15 MMcfd after 30 days, and 72 of the wells averaged 1.93 MMcfd after 60 days.

The company had drilled and completed 619 operated wells, 554 of them horizontal, as of June 30. The wells produced 29.6 bcf of gas in the quarter ended June 30 at an average realized price of $8.17/Mcf. The wells are in 33 pilot areas in eight counties in Arkansas.

Southwestern hired 69 employees in the quarter, most of them in the E&P segment.

Other public companies with substantial acreage or operations in the play include Chesapeake Energy Corp., XTO Energy Inc., Petrohawk Energy Inc., Carrizo Oil & Gas Inc., PetroQuest Energy Inc., Storm Cat Energy Corp., Talisman Energy Inc.-Hallwood Energy LP, and Edge Petroleum Corp., which is to merge with Chaparral Energy Inc. ✦

Apache boosts Egypt western desert production

Apache Corp. said it has proved a Jurassic Safa formation oil play that could cover as much as 830 sq miles in Egypt's western desert, most of it on company-operated acreage.

Meanwhile, the company has hiked production to 15,000 b/d from 1,100 b/d from Umbarka field, discovered in 1968. Apache has drilled 137 wells in the field since assuming operation in March 2001. A 7,300-acre waterflood in Cretaceous Upper Bahariya produces about 70% of the field's output.

Apache plans to drill five more Cretaceous Alam El Bueib-3D wells at Umbarka, where the Umbarka-174 well went to 11,306 ft and tested 4,300 b/d of oil from 46 ft of perforations in an independent three-way fault closure of 150 acres northeast of the main field.

The Safa success came at the Heqet-2 well, drilled to appraise the 1991 Heqet-1 discovery in the Greater Khalda area of the Faghur basin 66 miles southwest Qasr field and 66 miles east of the border with Libya.

With the Heqet-2, TD 14,700 ft, producing 2,100 b/d of oil, Apache plans to drill four wildcats targeting Jurassic oil pools in the Heqet and Neigh South areas, said G. Steven Farris, president and chief executive officer.

"Using improvements in fracture stimulation technology, we have turned a marginally economic play into a potentially significant oil accumulation," Farris said. "We are studying other ways

to increase productivity through fracture stimulation."

The Heqet Safa oil accumulation is estimated to cover 835 acres. Oil produced in Heqet and nearby Kalabsha and Neith fields is found in Jurassic-aged sands below 14,000 ft that were sourced from nearby Jurassic-aged shales and coals buried in the Faghur basin. Faghur is much cooler than the Shushan basin, location of Qasr, Apache's largest field; thus a large part of Faghur is oil-bearing as opposed to the hotter-temperature, gas-bearing Shushan basin, Apache said. ✦

Australia

Rodinia Oil Corp., Calgary, let a contract to Ryder Scott Co. LP to estimate hydrocarbon resource potential on its acreage in the remote, nonproducing Officer basin in Western Australia and South Australia.

Rodinia Oil management interpretation of seismic and gravity and magnetic data indicates the possibility of more than 12 large closures of 10,000-157,000 acres that contain at least four prospective reservoir horizons 50-500 m thick.

Several features on the closures are classified as high risk drillable anomalies. A second phase seismic program is planned in early 2009.

Egypt

Melrose Resources PLC, Edinburgh, said its 2008 capital budget included $1 million for an aeromagnetic survey and geologic studies on a frontier exploration block in southwestern Egypt along the border with Sudan.

The 57,000 sq km Mesaha Block in the Sahara Desert is in the unexplored Mesaha Trough and within 100 miles of the border with Libya.

Melrose is operator with 40% interest. Hellenic Petroleum SA and Oil Search Ltd. each hold 30%. The block was awarded in late 2006.

Portugal

A group led by Petrobras International Braspetro BV let a contract to SCAN Geophysical ASA, Oslo, to shoot more than 8,500 line-km of 2D seismic in the Atlantic off Portugal.

The M/V Geo Searcher is using a 10,000-m long MSX solid (gel-filled) streamer system and a 4,200 cu in. source array designed for low frequency output.

Braspetro and Lisbon concerns Partex Oil & Gas (Holdings) Corp. and Galp Energia SA hold four blocks that cover 12,159 sq km in 200-3,000 m of water in the Lusitanian basin.

Spain

Leni Gas & Oil PLC started a waterflood pilot in June at Ayoluengo field in northern Spain's Burgos region.

Judged capable of recovering another 4-6 million bbl of oil, the field has produced 17 million bbl of 37° gravity oil since discovery in 1964. Repsol-YPF SA operated a successful pilot waterflood in the 1990s but never implemented a fieldwide program.

The field's produced water is injected into one well, and the pilot is to inject fresh water produced from a shallow aquifer into two more wells.

Ayoluengo, which produces oil from the Lower Cretaceous Sargentes sandstone at 4,100 ft, has averaged 115 b/d in recent months.

Alaska

A spreadsheet error indicated too low a level of exploratory drilling in Alaska in 2008 in OGJ's Midyear Forecast (see table, OGJ, July 14, 2008, p. 38).

OGJ estimates that 14 exploration wells of all types were drilled in the state in the first half of 2008 and that the total for the full year will be 30 exploration wells.

Louisiana

Encore Acquisition Co., Fort Worth, plans to explore the Jurassic Haynesville shale for gas in North Louisiana in early 2009.

The company, which on May 21 said it plans to explore strategic alternatives, on July 15 closed the $54 million acquisition of partners' interests in the Greenwood Waskom/Stateline prospect.

Encore became operator of five units that produce from the Cotton Valley formation and acquired the Haynesville rights in each unit with 92% average working interest and 72% net revenue interest.

The acquisition added 3,200 net acres to Encore's 10,000 net acres in Elm Grove and Greenwood Waskom fields in the heart of the Haynesville play. The company also owns 8,000 net acres in the extensional area of the play.

Mississippi

Encore Acquisition Co., Fort Worth, said it amassed 208,000 acres the past 2 years in areas of southern Mississippi and southeastern Louisiana's Florida parishes believed prospective for oil in the Cretaceous Tuscaloosa marine shale.

The public company, which on May 21 said it is exploring strategic alternatives, has drilled two horizontal wells (OGJ, Dec. 29, 1997, p. 91; Oct. 11, 1999, p. 103).

The first well made 150-200 b/d of oil for 7 days from a 1,500-ft lateral, and the second well has a 3,100-ft lateral.

Norwegian groups study drillers' work

Norway's Petroleum Safety Authority surveyed drillers to better understand human factors affecting safety in drilling and well operations.

Drillers working on 34 different drilling units on the Norwegian Continental Shelf responded to a questionnaire. The survey was a joint project between Norway's Petroleum Safety Authority and Det Norske Veritas, with input from 187 drillers working for eight drilling contractors operating floating and fixed drilling units in 2007.

Drilling and well operations are potentially risky. Breakdown in the interaction between human beings, technology, and organizational problems can contribute to serious incidents.

In autumn 2005, the Petroleum Safety Authority Norway (PSA) and Det Norske Veritas (DNV) prepared a report entitled "Human Factors in drilling and well operations."[1] At that time, drillers' work emerged as an area requiring further study. The data presented in this article are part of the follow-up to the 2005 report.

Purpose

The purpose of the study was to provide drilling companies with insight into potential risk factors linked to drillers' tasks so that they can work independently to prioritize improvements. PSA and DNV also wanted an overview of how drillers perceive their own work.

Method

In spring 2007, the PSA approached nine drilling contractors that operate on the Norwegian shelf. These contractors were asked to complete a questionnaire to map how drillers perceive their own work on at least one mobile and one fixed facility (where relevant). The PSA requested the following information:

- Summary of responses from individual drillers.
- Short presentation of potential measures identified by the company to follow-up any identified factors.
- "Positive stories" in the improvement work.

Eight of the contractors chose to participate, and their responses form the basis for this article, which excerpts a report by the PSA.[2]

PSA and DNV prepared the questionnaire in connection with audits in 2006. DNV prepared an interview guide based on issues that emerged in previous work on "Human Factors in drilling and well operations," which was used in a PSA workshop.[1] Drillers from three different drilling contractors also provided input for the questionnaire.

As a consequence of the survey, the companies have identified areas with potential for improvement. The feedback received from the companies indicates that concrete measures have been implemented to varying degrees. In addition to a general compilation, the companies that participated in the survey received individual feedback regarding their own results and follow-up.

PSA and DNV elected not to use statistical tools to evaluate the collected data; therefore, only general trends are examined and qualitative evaluations presented here.

The PSA presented the most important results of the study at a seminar in December 2007. Some of the companies involved presented their experiences and intended follow-up.

Scope

The study sheds light on the drillers' work on the Norwegian shelf. Among

Study participants

Diamond Offshore Netherlands BV
Dolphin AS
Maersk Contractors Norge AS
Odfjell Drilling AS
Saipem SPA Norwegian Branch
Seadrill Management AS
Stena Drilling AS
Transocean Offshore Ltd.

the positive feedback is that interaction between management and drillers, as well as among colleagues, is perceived as being good in all of the companies. Another positive factor is that several companies have outlined measures to respond to identified issues.

Based on the drillers' own perception, some issues remain regarding the drillers' daily work, related to:

- Workload and responsibility.
- Management.
- Competence and understanding of risk.
- Procedures—formulation and compliance.
- Physical design of the drilling area.
- Design of the drilling systems, including handling of alarms.

Requirements, role clarity

In the survey, the drillers respond that they know what is expected of them on the job. After their free periods, the drillers need to acquaint themselves with certain new circumstances but most still feel that they have control over their work. The drillers rarely find their tasks too difficult.

A central problem in the driller's workday is that about half of them feel they have too many tasks and, from time to time, an excessive workload. The actual job done by drillers is demanding in the sense that some aspects must be constantly monitored and require an immediate response. The drillers' perception is that a substantial amount of their time is spent on administrative tasks (including logging of the work performed) and on daily maintenance.

In addition, the drillers experience two main disruptions during the workday: the telephone and people in the driller's cabin. The drillers state that there is an unnecessarily high volume of phone calls to the driller's cabin. Some of them find it difficult to admit the presence of other personnel is a disruption.

One driller commented on job demands: "In connection with hectic or critical situations and a lot of inquiries via telephone and radio, the driller's cabin might be full of personnel, which can be a distraction. Downtime is a burden as we have to do everything possible to avoid it, while at the same time we cannot control situations involving equipment failure, computer problems, etc."

One fourth of the drillers state that they sometimes work so hard that they are pushing the limit of what is prudent. Most feel that they are chained to the operator's chair in the driller's cabin. It is also worth noting that one-third of drillers state that they sometimes lose concentration when sitting in the chair and that they have trouble staying awake throughout the entire shift.

"It creates uncertainty when the company, the operator, and the authorities have procedures and guidelines that cover the same topic."

Most drillers respond that they are relieved from duty when they need it. At the same time, one half of the drillers state that it is not always possible to take a break when they feel it necessary. One third of the drillers say that they rarely speak when they have too much to do. It is therefore important to emphasize openness and good communication.

Company response

Examples of how the companies regulate use of the telephone in the driller's cabin:

- Strive to change attitudes. Get the message out to all personnel on board—least possible disturbance of the driller through phone calls. Call the assistant driller instead.
- Close telephone lines from land.
- Give first priority to radio communication.
- Introduce cordless telephone with number display so the driller does not have to stretch to reach the telephone.

Examples of measures to control access to the driller's cabin:

- Restrict use of the driller's cabin as a meeting room.
- Change attitudes. Get the message out regarding restricted access. Consider how information regarding disturbances in the driller's cabin can best be communicated to relevant personnel.
- Encourage drillers to speak up if there are still too many people in the driller's cabin.

Measures at companies to reduce job demands include:

- Review the drillers' work together with the drillers, with the goal of drawing up guidelines for workloads and quality assurance of work programs.
- Appoint a working group of personnel responsible for HSE. The rig management, driller, and assistant driller should examine shift schemes, review the opportunity to take breaks, and provide varied work.
- Make greater use of relief from assistant driller and tool pusher.
- Introduce "quiet days." This measure entails reducing the number of morning meetings to 3 days from 5 days/week. In addition, e-mails are not sent offshore unless they involve critical information.
- Develop integrated operations, unload administrative routines, and plan better.
- Develop the "rig manager" program, which contains a planning module for both maintenance and drilling. This insures that the drilling program incorporates important maintenance tasks.

Management, colleagues

The drillers in the study say that drilling supervisors or tool pushers are involved in the work and there is sufficient support and help from management when needed. Drillers' experience, however, that the tool pusher or drilling supervisor prioritizes meetings ahead of the actual drilling operations. Moreover, drillers feel they lack feed-

back regarding work performed.

Only a few drillers feel that they have sufficient time and resources to function as a work supervisor. In spite of the time pressure, they assess their own efforts as supervisors to be good. They are particularly concerned that the drilling crew has a good understanding of risk, both in general and in particular for the work to be performed.

Drillers in all companies feel that there is a good environment on the shifts and that they receive help and support from each other. One driller commented on the support from management and colleagues as follows:

"When the workload is high, recognition of this would be appreciated. Our leaders do not pressure us into speeding up. They say…take the time required to perform the function safely and with the desired outcome."

Companies proposed several modifications in management, particularly the need to provide training in:

- The responsibility that follows with the leader's role, including the importance of giving feedback both on a daily basis and in more formal aspects.
- Addressing employee appraisal conferences.

Procedures, program

Most drillers say that they follow procedures. At the same time, most say that, from time to time, there are too many administrative systems and procedures. In some companies, this results in drillers taking shortcuts.

One third of the drillers said that, for some work operations, they do not know if procedures exist, while 20% state that they do not always have time to read the applicable procedures. In total, 7 of the 187 drillers responded that they often take shortcuts in relation to the procedures.

One driller put it this way: "It creates uncertainty when the company, the operator, and the authorities have procedures and guidelines that cover the same topic. [They must] try to ensure that we as users have one document to deal with."

Nearly one half of the drillers feel that the work programs are difficult to understand. This may be because some drillers say that they have little time to check the work program in advance. Some drillers also say there are times when the daily work programs are not signed by the tool pusher or drilling supervisor. This could indicate a lack of quality assurance of the work program.

Companies have proposed several improvements in procedure:

- Make procedures more user friendly and appropriate.
- Review existing procedures to reduce the number of documents.
- Make procedures more easily accessible. For example, they should be stored where the work is performed.
- Improve knowledge of existing procedures. This may be part of a general need for training and the methods that introduce new personnel to rig-specific factors or procedures.
- Introduce periodic procedure courses to maintain awareness of procedures.
- Review the mentor arrangement to ensure transfer of the company's desired attitudes and values to new employees, including the principle that procedures must be used and followed.

Examples of measures the contractors plan in relation to the work program:

- Check whether necessary time is allocated to qualify the work program before the work is started.
- In cooperation with the operator, ensure there is adequate time to review the work program.

KEY DATA Table 1

Number of facilities asked	34
Distribution fixed/mobile facilities	10/24
Number of completed questionnaires	187

Technical systems, physical aspects

Drillers' perceptions of the technical drilling systems in the driller's cabin and the physical working conditions in the drilling area vary among companies and facilities. Some main trends, however, are evident from the responses regarding physical working conditions, alarms, and drilling systems.

- *Physical working conditions.* According to the survey, 47% of drillers are satisfied with the physical design of the driller's cabin. Half of drillers experience muscle pain and eye fatigue when operating the drilling system. This can, in part, be linked to long, high-pressure working days during which the driller feels chained to the work chair.

Work as a driller can result in strains on eyes, neck, back, and arms. The drillers' physical ailments may be directly connected to the design of the technical systems and physical conditions. The survey shows a need for a review of the driller's cabin and the drilling systems on many of the facilities.

A risk factor that emerges from the survey is that 24% experience poor visibility from the driller's cabin. Good visibility of the activity on and above the drill floor is a prerequisite for safe drilling operations. Poor visibility could lead to the driller assuming an unfortunate working position in order to see more clearly, which can lead to unnecessary strains in the musculoskeletal system.

Other factors that emerge in the survey include irritating noise and bothersome odor from oil vapor. Unfortunate working postures and irritating noise may be factors that contribute to drillers often feeling tired during a shift.

- *Alarms, drilling systems.* Most of the drillers state that they know what to do in connection with the various alarms.

Several surveyed, however, said that alarms do not function properly. Examples include:

1. A large number of unnecessary alarms—that is, alarms to which drillers do not respond (56% of respondents).
2. The alarm system does not provide support in connection with interruptions in operations, i.e., the system does not provide guidance as to the actions the driller should take (21%).

Shell's experience with a Norwegian semisubmersible

Norske Shell AS used the Ocean Vanguard semisubmersible, operated by Diamond Offshore Drilling Inc. (DODI), to work in Draugen oil field, on Haltenbanken, in the Norwegian North Sea (northeast of Njord and Ormen Lange fields).

According to Norske Shell's Callum Smyth, the company needed to do major servicing on some of the older wells. He said the drilling crews showed character despite the problems encountered in the field and that the work was done efficiently. Because of the crews' adaptability, "with all parties pitching in to make the job both safe and successful...the Vanguard has now proven itself as a completions rig."

'Excellent teamwork'

Before the rig came to Shell in summer 2006, the Diamond Offshore crew had never performed completion operations with the unit. According to Shell, all companies involved—Diamond Offshore, FMC, Kværner, Vestbase, Halliburton, Schlumberger, Seadrill, Oceaneering, Expro, Odfjell, Fugro, Smith Red Baron, and Shell—managed to go straight into a subsea flow base replacement operation.

The operation was performed safely and within budget with difficult rig limitations. For instance, the work required custom-built skids to move the christmas tree and flow base on the rig.

SWIT

The Ocean Vanguard reequipped from drilling to seabed-based water injection and treatment (SWIT) work and conducted a two-well workover operation. DODI crews pulled the christmas trees and tubing, replaced tubing with new pipe, and refurbished the trees. The teamwork resulted in an impressive performance, according to Shell, and the operation planned for 73 days was delivered in 60 days.

One notable success was the fact that one of the trees pulled was turned around, with FMC working night and day for 4 weeks, and rerun as part of the project. This was not in the origi-

Statoil Hydro has an extendable, 2-year contract through April 2010 for the Ocean Vanguard semisubmersible. Last month, the PSA gave consent for the rig to drill the 6608/11-6 well off Norway. The rig is one of four semisubs Diamond Offshore is operating in the North Sea (photo courtesy Diamond Offshore Drilling Inc.).

3. The drilling system does not provide support in connection with critical situations—situations in which the driller needs support from the system (19%).

4. The drilling system rarely provides an early warning when something is wrong (23%).

5. Critical actions linked to alarms or the drilling system in general do not always require a confirmation (34%).

Both during operations and particularly in connection with critical situations, it is important that the drilling system and the alarms provide support for the driller and help to prioritize the most important tasks at any given time so that he or she can concentrate on carrying out the correct actions at the right time. Drillers feel that there is room for improvement in this area.

Another aspect of the technical systems is the visual displays. The feedback from drillers is inconsistent in this area. A majority respond that the visual displays provide support and assistance and that they provide a good overview of the operation. In spite of this, nearly half the drillers feel there is too much information to deal with. They also experience that the drilling system provides too many opportunities to change variables in the displays, so that the information is not consistent.

The mix of old and new systems on several facilities means that drillers must deal with multiple systems with considerable differences in how information is presented. Coordination of the systems (e.g., a review of how information is presented) can help achieve a manageable volume of information, as well as fewer units of measurement to deal with.

Several other publications provide guidelines for the evaluation of alarm and drilling systems.[3 4]

The companies proposed several measures in connection with physical aspects and the drilling systems:

- Map the physical design of drillers' cabins on all rigs together with drilling personnel and personnel with expertise in ergonomics and human factors. Based on that mapping, make the necessary improvements to satisfy the requirements in NORSOK S-002.

nal work scope at the time of project sanction, says Shell, and the successful completion by the Ocean Vanguard crew prevented a second intervention with another vessel or rig.

The offshore crews have worked well together, illustrated by the results (three wells back in service) as well as the quality and quantity of the daily safety focus (STOP, TOFS, JSA's, etc.).

Result

The Ocean Vanguard rig worked with Norske Shell for 98 days in 2006. The resulting four wells returned to service, contributing about 3,000 cu m oil equivalent, which is 20% of the Draugen total daily production.

The E1 well is online and producing 500-750 cu m/day oil, ready for gas lift. The SWIT wells are both running with a total of 21,000 cu m/day combined injection (maximum rate from pump) with a reduced back pressure (20 bar lower due to the larger tubing) and full integrity on the annulus and tubing.

Source

Rigamarole, Spring 2007, Diamond Offshore Drilling Inc., p. 47, www.diamondoffshore.com/downloads/rigamarole_spring_2007.pdf

- Map the user-friendliness of the drilling systems to see which systems do not meet current requirements, including alarm requirements. What should be done to achieve systems that support the driller in his-her work?
- Review the alarm system, focusing on which functions the driller should handle, and what information is necessary in order to safeguard these functions.

Understanding risk

The responses from the drillers indicate that most feel their own understanding of risk is good. As work supervisors, the drillers also believe that they are able to ensure that the personnel working for them have a good understanding of risk. Risk understanding on the part of employees in the service companies is also perceived as being good, although the responses here show a somewhat lower score.

An important follow-up question to which the survey does not provide a clear answer is what drillers include in the term "understanding of risk." Is it a clear understanding of the entire risk picture, both the risk associated with the work taking place on the drill floor and the risk associated with the operation down in the well?

One reason to question drillers' understanding of risk is that the results of the survey show that more than 20% report they often do not have time to carry out a safe job analysis (SJA). Some drillers also say that SJAs do not help to bring attention to what is important for implementing a safe operation.

Meetings, planning, communication

Several respondents consider the departure meetings to be too general. In their responses, some companies have commented that they are intended to be general. Other companies want to do something about the departure meetings to make them more relevant for the drillers.

One third of drillers responded they did not always receive necessary information in the shift meetings and 45% experienced that there was not enough time to review the work descriptions in the shift meetings. An overview of the situation and work to be done is important for drillers to have an understanding of the risk associated with the work.

Three quarters of drillers often implement "prejob meetings" before each individual job. Nearly all drillers believe that these meetings often contribute to the safe execution of the job.

Training

A third of drillers say there is little support for updating their professional expertise. Often, the training they do receive is unrelated to the jobs they actually do. In most the drilling companies, there were three areas for improvement highlighted by drillers:

- Simulator training (beyond training in pressure-control simulator).
- Seminars in which the team trains together.
- Courses related to professional disciplines.

The degree of training and follow-up of new employees varies among companies. About one third of drillers state they rarely receive training in local conditions when they arrive on a new facility and only half say that they have a 1-week overlap on new facilities.

Companies proposed several training-related measures:

- Give personnel an opportunity to work as extra personnel in connection with promotions. This will provide better training prior to starting a new job.
- Consider facilitating a 1-week overlap in connection with transfers to a new unit.
- Review of existing internal mentor arrangement. Examine training and course matrix, transfer of experience, and attitudes.
- Arrange well integrity seminars four times/year; include all drillers in these seminars.
- Offer e-training course in "downhole understanding" to all drillers.

General questions

Only the four largest companies have submitted information regarding the general questions. The survey shows that 74 of 144 drillers have felt insecure on one or more occasions due to critical conditions during drilling operations in the last 12 months. Of these, as many as 9 drillers have felt insecure on more than 6 occasions. Insecurity on the job can entail considerable mental strain.

Workday

The driller's work is complex, including many demanding tasks while monitoring a well. The driller supervises work on the drill floor and helps create an understanding of the risks. The working day is characterized by inter-

ruptions and the work requires continuous decision-making. At the same time, the driller must handle a large amount of information and complex screen displays. The survey indicates that there are areas in need of improvement so that drillers can manage risk and perform work safely.

Several significant framework conditions have emerged in the survey:

• Expectations for the driller position. About half of drillers feel that they have too many tasks. A fourth of drillers state that they sometimes work so hard they push the limit of what is prudent. Only a few feel that they have sufficient time and resources to function as a work supervisor.

In connection with reporting subsequent to audits, the PSA questioned whether distribution of tasks and responsibilities in drilling is clearly defined.

Some companies have proposed training assistant drillers to provide more relief for drillers. Solutions related to roles and responsibilities in this context vary from company to company.

Most drillers experience that, from time to time, there are too many administrative systems and procedures for them to deal with. Nearly half experience that the work programs are difficult to understand. This may be linked to time pressure, but the quality and user-friendliness of the procedures and the work program are probably also contributing factors. The quality of the content and execution of the drilling program, daily work program, and safe job analyses are key elements in understanding the risk scenario.

During audits, the PSA has seen that procedures do not always cover the activity that takes place. These are critical factors in the need for a good understanding of the overall risk.

Half the drillers who responded to the general questions stated they have felt insecure one or more times due to critical conditions during drilling operations during the last 12 months. This may be the result of limited capacity to handle requirements and roles, simultaneous work operations and the impact of external stress factors.

• *Competence, understanding of risk.* One third of drillers feel that they are given few opportunities to update their professional expertise. These drillers said the training they receive is not very well adapted to the job they actually do, including their job as supervisor. Several drillers state they receive little training in local conditions when they arrive at a new facility. In addition, many experience deficient training and drills with the rest of the crew.

"Nearly half of the drillers feel that there is too much information to deal with."

Drillers state that they have a good understanding of risk. Nevertheless, the feedback indicates that there are problems associated with the value of the SJA, use of procedures, understanding of the drilling program, as well as training and workloads.

Therefore, there are reasons to question the drilling crew's actual opportunity to obtain an adequate picture of risk.

• *Physical design.* Fewer than half the drillers are satisfied with the physical design of the driller's cabin. At the same time, half the drillers report they have muscle pain and eye ailments. One risk factor that emerges in the survey is that a fourth experience reduced visibility from the driller's cabin.

A third of drillers state that they sometimes lose concentration when sitting in the chair and have trouble staying awake on the job. This may be linked to many drillers feeling they receive insufficient relief.

Nearly half of drillers feel that there is too much information on the screen displays and too many alarms to deal with. This contributes to drillers' perception that the drilling system provides inadequate support for their job performance in critical situations.

Continued work

The responses from the questionnaire survey indicate that weaknesses exist in both the human, organizational, and technical arenas, and in the interplay among them. The PSA hopes that the survey results will contribute to improving driller's work and provide good experience transfer within the industry.

The Norwegian drilling contractors have initiated various follow-up activities to improvement systems and conditions. Some companies are still in the planning phase, while others have made substantial progress in proposing and implementing measures. Some proposed measures emerge in the report, while others were presented at the seminar in 2007.[5] ✦

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Nexen updates Long Lake SAGD project progress

Guntis Moritis
Production Editor

Phase 1 of the Long Lake steam-assisted gravity drainage (SAGD) and upgrading project in the Athabasca region of northern Alberta continues its ramp-up, as explained in a recent Nexen Inc. presentation.

Nexen and OPTI Canada Inc. are jointly developing Long Lake. Nexen operates the SAGD portion, while OPTI is the builder and operator of the upgrader. The project is on a 63,000-acre lease.

The Long Lake project initiated first steam in the ground in mid-April 2007, with first production of synthetic crude through its upgrader anticipated late in third-quarter 2008.

The project will reach the 72,000 b/d Phase 1 full-design bitumen production capacity in 2009, according to Nexen.

Long Lake

The Long Lake project is 40 km southeast of Fort McMurray and will use OPTI's proprietary OrCrude unit in the bitumen upgrading process (Fig. 1). The OrCrude unit removes asphaltenes from the bitumen. These asphaltenes then enter a gasifier that produces a syngas fuel for steam generation and hydrogen feed for the hydrocracker.

Leaving the hydrocracker is a 39° API gravity synthetic crude, called a Premium Sweet Crude (PSC). Table 1 compares PSC with West Texas Intermediate crude and Syncrude's Sweet Premium (SSP). Besides the PSC, butane is another product coming from the upgrader. With Phase 2, the upgrader will also provide diluent, and at that time, the PSC gravity will decrease to 38° API.

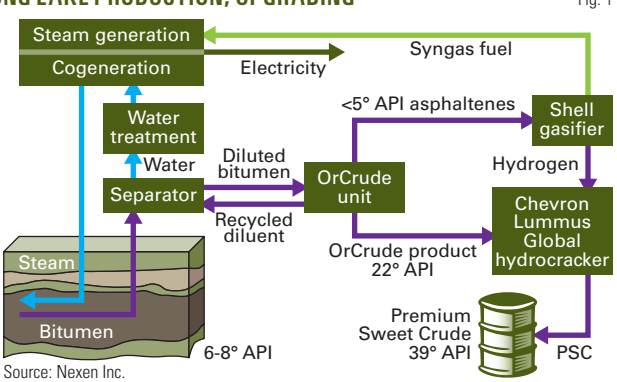
When operational, the Long Lake upgrader will produce about 60,000 b/d of PSC. Nexen expects first commercial production through the upgrader in late summer 2008 with full production 12-18 months later.

Nexen says Long Lake has more than 2 billion bbl of recoverable bitumen, which translates to a production life of about 40 years once all phases are complete. The companies have applied for regulatory approval for Phase 2 that will double the upgrading capacity to 144,000 b/d, and eventually the project may produce as much as 288,000 b/d of bitumen, with completion of additional phases.

Table 2 compares the Long Lake reservoir with other reservoirs produced with SAGD.

Long Lake production, upgrading

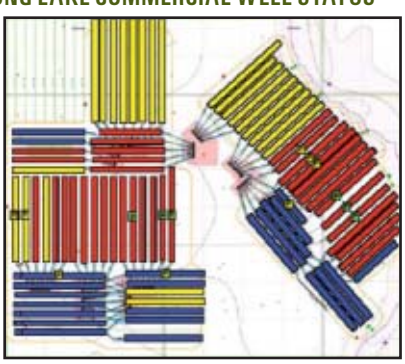
Fig. 1



Source: Nexen Inc.

Long Lake commercial well status

Fig. 2



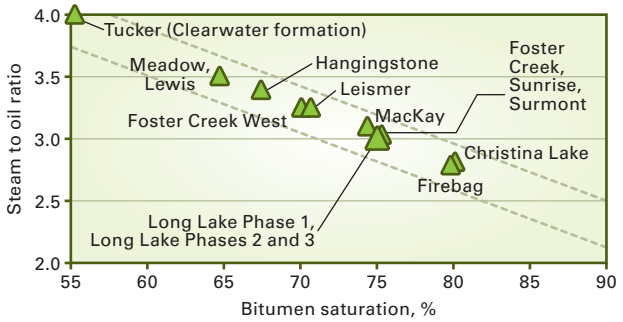
May 31, 2008
35 well pairs converted to SAGD production
23 well pairs on steam circulation
Installed three ESPs
Preliminary ESP candidates identified

Circulating
On SAGD
P ESP candidates
P ESP installed
Shut in waiting on steam

Source: Nexen Inc.

RESERVOIR QUALITY

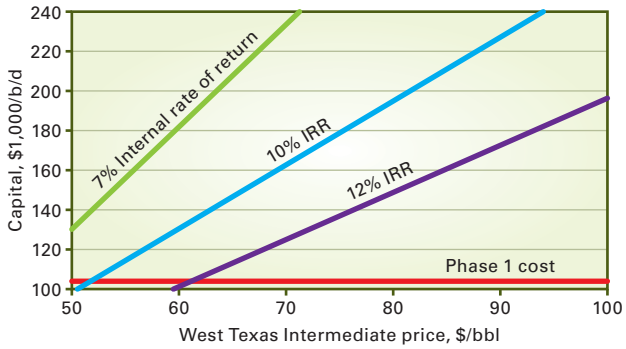
Fig. 3



Note: all projects within McMurray formation except Tucker.
Source: Nexen Inc.

PHASE 2 ECONOMICS

Fig. 4



Source: Nexen Inc.

SAGD progress

Nexen says that at the end of May 2008, 35 well pairs were in SAGD production and that the producing wells met expectations with oil rates increasing and steam-oil-ratios (SOR) decreasing (Fig. 2). A well pair consists of a horizontal lateral for steam injection drilled above a horizontal producing wellbore.

For producing the wells, the company uses gas lift as well as electric submersible pumps. As development continues, it plans to switch to ESPs for lifting bitumen from the wells.

In Phase 1, each borehole in the well pair is 800-m long and well pairs are spaced about 100-m apart. For Phase 2, the plan calls for spacing well pairs closer together at about 70 m and drilling shorter 600-m laterals.

For testing the wells, the project has grouped the wells to test separators, with typical well tests lasting 12-24 hr/well. Wells are tested twice a month. In the next phase, Nexen plans to install individual well mass flow and water-cut meters. This will provide 24 hr/day and 7 day/week surveillance of the production that can increase rapidly, according to Nexen.

After 3 months on production, the best wells produce about 500 b/d of bitumen, although average wells produce 50-100 b/d. Nexen says in a typical SAGD project, the bulk of production comes from a minority of wells.

For steam generation, the project currently uses a mix of saline and nonsaline water but will go to all saline in Phase 2. Nexen estimates that during the life of the project it will use 90% recycled water.

For the drilled well pairs, some are on SAGD and produce bitumen, while other pairs are only circulating steam. The fact that only some well pairs are on production explains why the overall SOR is June was a high 5.0, Nexen says.

In June, bitumen production averaged 10,000 b/d, and wells on production averaged an SOR less than 3.5. The company says this is in line with its long-term expectation to decrease the SOR to about 3.0. Fig 3 compares the company's long-term SOR expectations with other SAGD projects.

In SAGD operations, the industry typically circulates steam in the well pair for 12-18 months to preheat the reservoir before production. The circulation largely heats the reservoir by conduction. Longer circulation periods allow the steam chamber to form along the entire horizontal well length to obtain better conformance. Nexen targets about 90 days of effective circulation to the toe of the horizontal. Steam at the toe

PRODUCT COMPARISON

Table 1

	West Texas intermediate (WTI)	2005 Syncrude (SSP)	Long Lake (PSC)
Gravity, °API	38.7	34	39
Sulfur, ppm	4,500	1,040	<10
Transportation fuel, %	61.4	57	70.4
Gas-oil, %	24.1	40.4	27.6
Diesel cetane No.	56	40	47

Source: Nexen

RESERVOIR COMPARISON

Table 2

Project	Operator	Pay thickness, m	Bitumen saturation, %	Porosity, %	Reservoir depth, m	No. of cores analyzed	Reservoir pressure, kPa	Injection pressure, kPA
Long Lake	Nexen	40	74.9	34.9	253	155	1,200	2,750
Christina Lake	Encana	25	80.4	34.7	399	32	2,000	5,000
Firebag	Suncor	37	80.0	33.8	285	164	800	3,000
Surmont	ConocoPhillips	30	74.7	36.1	402	12	1,700	1,700
Foster Creek	Encana	25	73.7	33.9	500	73	2,700	2,700
Mackay River	PetroCanada	15-35	73.5	34.6	137	90	500	1,700
Tucker Lake	Husky	30	54.0	36.0	480	48	—	—

Note: The core analysis is from public EUB data.
Source: Nexen

ensures that latent heat is available, the company says.

Nexen also has done diesel soaks on 70% of the wells to assist conformance. It typically has injected 200-300 bbl of diesel that dissipates in the reservoir.

The wells in the commercial area have preformed much better than those in the pilot because the pilot had a much poorer quality reservoir, Nexen says

Phase 2 construction

Nexen says that construction of Phase 2 will incorporate many lessens learned during Phase 1. For Phase 2, its plan is to complete about 30% of the detailed engineering at sanction instead of the 15% completed in Phase 1. The company plans to obtain the equipment globally and fabricate the modules and to assemble them in and outside of Alberta for Phase 2. In Phase 1, it obtained the equipment globally but conducted fabrication and assembly in Alberta.

Unlike Phase 1, which had two main contractors initially and 10-15% of the work done on lump sum contracts, the company for Phase 2 plans to have multiple contracts and minimal on site lump sum contracts. It also will manage by itself more of the construction activity than in Phase 1.

To start Phase 2 construction, Nexen wants more clarity on the regulations for carbon capture so that it can include these rules in the design of the expansion. For instance, going to precombustion carbon capture with gasification would lower the volumes needed to be treated, Nexen says.

Fig. 4 shows Nexen's Phase 2 expected internal rate of return for various oil prices and capital expenditures. ✦

Monitoring, best practices maintain APC applications

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Model predictive control (MPC) has become the de facto standard for implementing advanced control strategies. Ensuring that implemented MPC applications continue to perform well and deliver expected benefits requires a combination of appropriate monitoring technology and best practices for maintaining the advanced control applications.

This article reviews some of the key issues in monitoring and maintaining advanced control applications.

Maintaining high-performance multivariable control applications is a difficult problem that involves different groups of individuals and work processes. This article describes the problem in an industrial context and presents some best practices for monitoring advanced control applications.

Model predictive controllers have had a significant positive effect in the process industry and led to substantial benefits in improved operability of individual process units. Reduced energy use, increased throughput, and improved quality have led to substantial monetary benefits that are about 1.4% of operating costs.

Initial process improvements and benefits, however, may not be sustained unless appropriate steps are taken to monitor and continuously adapt advanced process control (APC) performance to changing conditions. The appropriate steps involve a combination of the right measures and work processes to detect, diagnose, and remedy any significant performance degradation of the APC application in real time.

Advanced process control

Since their inception in the early 1980s, multivariable model-based controllers have become the technology of choice for implementing APC applications. More than 5,000 applications exist worldwide and this number continues to increase.[1]

Many commercial technologies use model-based predictive control. The common theme among the different technologies is the presence of a model of the process. The model lies at the heart of the controller and has a great deal of influence on its performance.

Adoption and implementation of APC technology significantly improves the economics of a process. Table 1 summarizes the savings in production costs expressed as a percentage of production costs.[2]

Benefits associated with advanced control are due to reducing variability in key process variables through multivariable model based control and subsequently operating at the most profitable constraints through a constrained optimization scheme that is often a part of the APC application (Fig. 1).

Fig. 1 shows that once the application is commissioned, various reasons may cause the APC application to move away from an economic optimum. This results in deterioration of the benefits from the advanced controller.

Based on our experience in commissioning and supporting many APC applications during the past 20 years, some of the main reasons for this deterioration include:

- Lack of APC resources.
- Lack of operator training.
- Changes in process dynamics.

PROCESS CONTROL SAVINGS

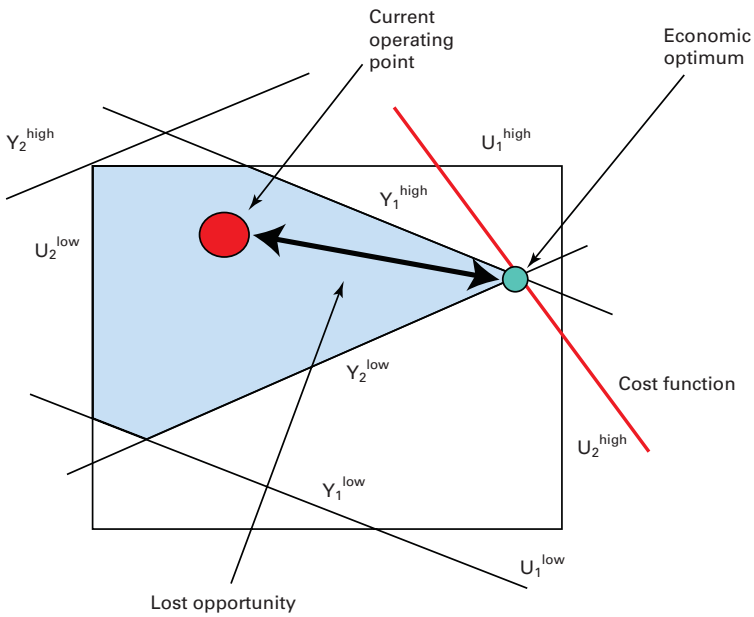
Table 1

Category of process control	Savings in production costs, % of total
Final control device performance and basic loop tuning	1.5
Unit operations control	0.8
Advanced control	1.4
Online optimization	0.5

Source: Reference 2

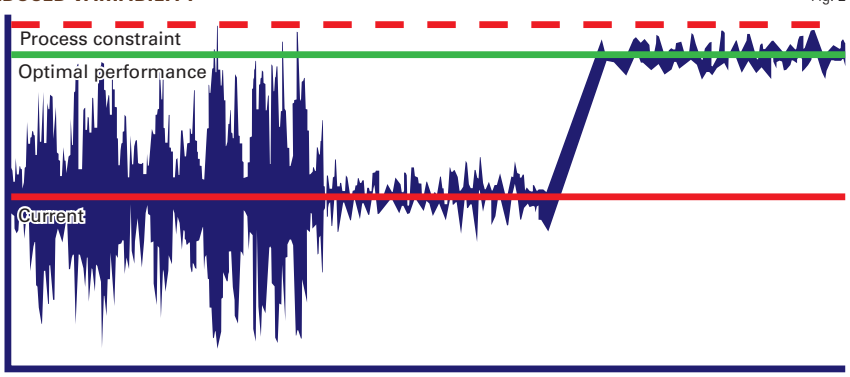
MULTIVARIABLE CONSTRAINED CONTROL

Fig. 1



REDUCED VARIABILITY

Fig. 2



• Inability to quantify APC performance.

• Inability to link APC benefits to process performance.

• Lack of APC best practices.

• Inability to visualize model quality.

• Inability to visualize and assess performance of the supporting cast: PID controllers, valves, and inferentials.

• Inability to rationalize and explain APC behavior in real time.

• Lack of management support.

This article gives a broad overview of the most commonly encountered issues and best practices when companies try to sustain performance of their APC asset base. We have shown examples wherever possible to illustrate these issues.

APC

Implementation of an APC application in an operating facility has an immediate positive effect in many ways.

Fig. 2 shows that APC reduces variability in key operating parameters by moving that variability to available manipulated variables.

This reduction in variability may, in and of itself, be valuable, but reducing variability creates an opportunity to shift the operating point of the process closer to limits and constraints. This shift is normally the key contributor to value delivered by APC applications (Fig. 1). A recent survey of industrial practitioners and vendors indicated that the economic assessment of advanced control applications is still ad-hoc.[3]

Moving and holding to this new operating point changes the performance requirements of many other aspects of the business. If these changes in performance are not achieved, benefits delivered by the APC application will be less than its potential.

These elements include:

• *Instrumentation.* Faulty instruments will increase instability or cause part or all of the APC application to be turned off, or otherwise reduce the value that the application delivers. Ensuring the application delivers full value requires improved identification of instrumentation issues and modified prioritization of repair efforts to account for this effect.

• *Computer systems.* Issues with computer hardware, software, or networks will prevent communication between the APC application and the process. This will directly reduce application uptime. Adding APC and control monitoring systems also increases the number of systems that must be maintained. It may also increase the complexity of the system maintenance problem.

• *Process.* Many aspects of the process will reduce the application's effectiveness. Some of these include unmeasured or infrequently measured limits, unmeasured disturbances, process behavior changes (such as heat exchanger fouling, or catalyst decay), and process modifications.

TYPICAL ROOT CAUSES, REMEDIAL ACTIONS

Table 2

Root-cause diagnosis	Adapt-and-improve actions
External disturbance	• Eliminate the disturbance. • Attenuate the disturbance. • Measure and include disturbance in APC.
Process change	• Engineered change. Anticipate process changes before they occur, include application revamp as part of change. • Process problem. Repair process to original state. • Normal change. Measure the change, include in strategy. • Normal change. Tune or modify application.
Instrumentation problem	• Prioritize issue and have repaired. • Use an alternate instrument in the application. • Tune or modify application to handle this problem (improve fault tolerance).
Soft sensor problem	• Treat soft sensor as an application. • Monitor, diagnose, adapt, and improve soft sensor. • Modify the APC application to improve fault tolerance.
Application tuning or model problems	• Verify application objectives. • Improve fault tolerance. Evaluate linearizing calculations; scheduled tuning, and model. • Parameters based on process conditions.
Operator skills and knowledge	• Provide regularly scheduled, standard training. • Provide ad-hoc training when issues are identified. • Information exchange on the issue. • Timely.
Engineer or management knowledge	• Provide regularly scheduled, standard training. • Provide ad-hoc training when issues are identified. • Information exchange on the issue. • Timely.
Measurement variable problems	• Ensure benchmark values are appropriate. Manage changes. • Ensure data used in measurement variable determination is appropriate. • Ensure objectives align with the performance analysis and benchmarks.
Hardware, software, or network problems	• Repair issue. • Improve system fault tolerance. Improve availability.

To enable an application to continue to deliver high value, the operator must identify when aspects of the process are limiting the value delivered and either adapt the application or repair the process. Changes in process economics may invalidate some of the application's control objectives.

• *Control system.* The control system itself can cause poor control performance. When constraints become active for the first time, because the process has moved to a new operating region, poor quality models that were once unimportant become important. Also, improvements in the system's fault tolerance are required for the application to run when other problems (instrument, process, computer, or other) exist.

• *Staff.* The skills, knowledge, and capabilities of staff assigned to support APC applications have a large effect on the success of the applications. Having work processes and tools in place to better support that staff is important to allow for succession and reducing the work when new people take on the job.

Satisfying these more stringent requirements is difficult. Having tools that automatically generate performance statistics will allow properly trained staff to use good work practices and achieve high application performance.

Best practices

Precise activities and people performing those activities involved in monitoring and maintaining an APC application depends upon the organization's particular requirements. These requirements include desired core competencies, value that the applications deliver, and number of applications needing support.

When an organization's requirements lead to having a control engineer performing the monitoring and maintenance tasks, tactical high-value job activities might include:

• Daily monitoring of application performance and issue identification.

• Regularly challenging the application limits, seeking ways to allow it to do more.

• Performing regular maintenance on the application to improve fault tolerance and control performance

Strategic high value job activities would include:

• Documenting procedures and activities to enable job succession better.

• Supporting regulatory control.

• Examining and challenging performance benchmarks and target operating points.

Table 2 shows APC application performance categories and adaptive or improvement action that should be taken.

Monitoring APC applications

There are four different aspects of analyzing a multivariable-constrained control scheme that is model-based:

1. *Utilization.* This is the first level of analysis. If the controller is unused, there is likely a fundamental problem. Similar comments apply to the use of individual manipulated variables (MVs) and controller variables (CVs). If critical variables are being turned off, it affects the controller's ability to deliver performance or benefits.

2. *Performance.* A controller may be on, yet performing poorly. In such cases, one must analyze performance of the various CVs, constraint variables, etc. An MV may be on, but at its limits, which means it is not being effectively used.

3. *Diagnostics.* If performance is not meeting expectations, there could be several reasons: model plant mismatch, improper tuning, instrumentation issues, etc. If crucial CVs are being under or overpredicted, responsiveness of the application to address any disturbances or target changes will be diminished.

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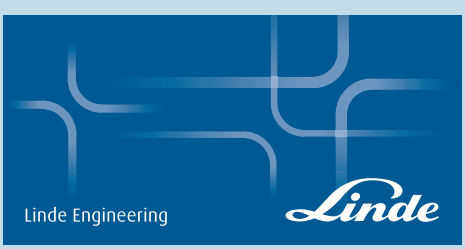
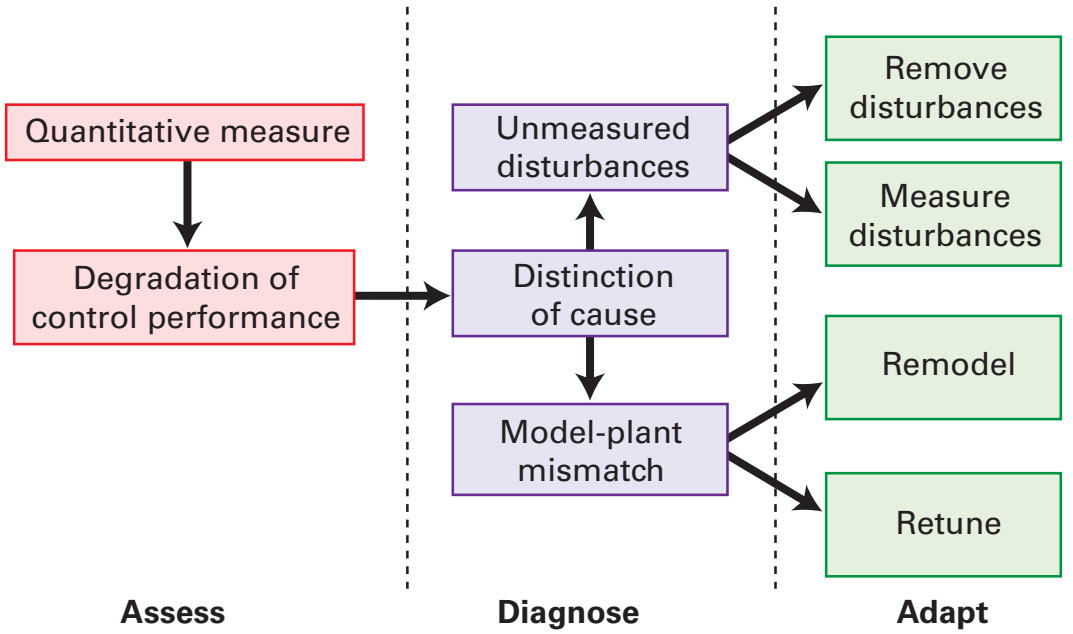


4. *Remediation.* Having understood the reasons for unsatisfactory performance, one often must prioritize and make those changes to the controller or process that will result in the improvement of performance without excessive cost or effort.

Fig. 3 shows a representative schematic of the typical workflow involving the assess, diagnose, and remedy steps for any APC application

REPRESENTATIVE SCHEMATIC OF APC APPLICATION Fig. 3



Performance monitoring

Measurement of APC performance is a nontrivial problem. Three key aspects of APC performance include variability, constraint performance, and model performance.

Variability

Variability is an important measure because it is the basis on which APC applications are implemented. It is important to ensure that the multivariable controller reduces variability up to the level anticipated in the initial estimates.

A multivariable controller is able to derive benefits by operating the unit against the right constraints. It is important, therefore, to monitor active constraints and ensure there are sufficient degrees of freedom for the controller.

Lastly, the model is at the heart of the predictive controller and is the single most important tuning parameter. Tracking model performance and ensuring that it is satisfactory ultimately ensures good health of the controller.

Variability is a commonly used approach for establishing variability measurements relative to a historical baseline data set. Before commissioning, a historical baseline is selected. Typical estimates of the reduction in process variability due to multivariable control are about 50%.

After commissioning, the variability (i.e., standard deviation of key controlled variables) is compared to the baseline and improvements noted. Postcommissioning variability then becomes effectively the new benchmark for further comparison. The expectation from any application is that it achieves at least the postcommissioning variability.

Seasonal changes account for long-term patterns in underlying variability. For example, summer conditions may often mean a distillation column is cooling limited and variability is higher. In technical terms, there are two benchmarks that are considered here: open-loop variability, prior to controller commissioning; and closed-loop variability, postcontroller commissioning.

A shortcoming of using absolute variability as a benchmark is its dependence on underlying process distur-

EQUATIONS

$$\text{Relative variability} = 100 * \frac{\sigma^2_{CV_{des}}}{\sigma^2_{CV_{ach}}} \quad (1)$$

$$\text{Effective utilization} = 100 * \frac{\text{Time}[MV_{LO} < MV < MV_{Hi} \cap MV \text{ is ON} \cap \text{Controller is ON}]}{\text{Total time}} \quad (2)$$

$$\text{Model performance} = 100 * \frac{\sigma^2_{CV_{pred}}}{\sigma^2_{CV_{ach}}} \quad (3)$$

Nomenclature

σCV_{ach} = Variability achieved
σCV_{des} = Variability desired
σCV_{pred} = Variability predicted

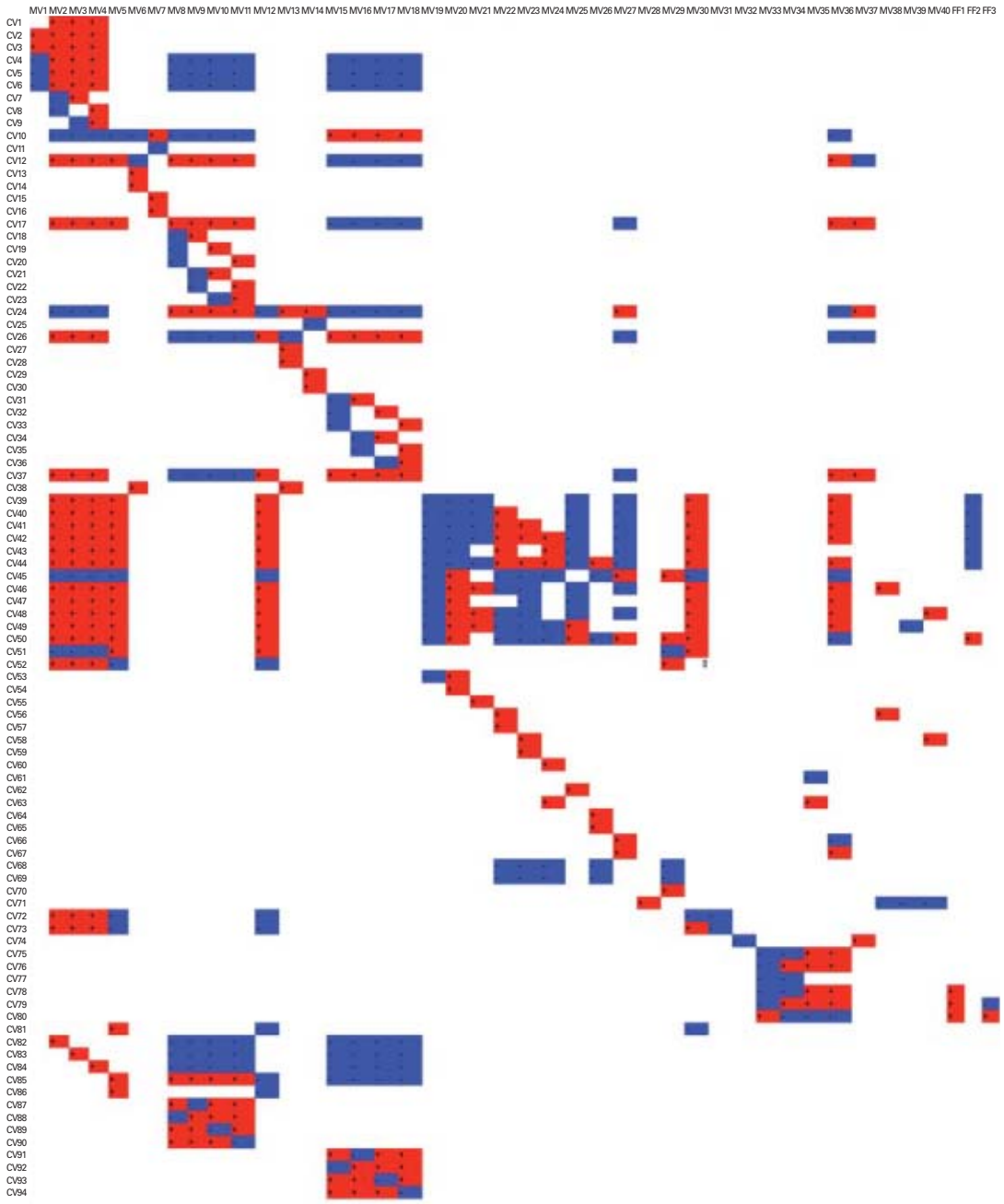
bances. One can compare variability for APC applications at two points in time in a fair manner assuming that nothing else has changed—disturbance magnitude and dynamics are the same.

This can lead to both false positives and false negatives. Variability may decrease due to the overall process being more stable or variability may increase because of process changes being made elsewhere.

A more accurate representation of closed-loop performance is based on closed-loop performance requirements such as settling time, rise time, overshoot, integral of the absolute error, integral square error, etc. These measures are invariant to the scale of the disturbance and are thus normalized. Some commercially available APC technologies directly incorporate such a measure into their controller tuning stage.

MODEL GAIN MATRIX*

Fig. 4



*40 MV, 94 CV, 3 FF crude column.

Desired variability can be established through historical benchmarking (postcommissioning) or design considerations (closed-loop response requirements) as previously discussed. One can calculate relative variability at an individual CV level and aggregate it to the controller level (see Equation 1 in attached equation box).

Constraint performance

An operator or engineer interacting with an APC application would like to know if:

1. The right constraints are targeted.
2. The key constraints are not being compromised.
3. There are adequate degrees of freedom to achieve 1 and 2.

Quite often, one comes across an APC application that is being used but the limits on critical MVs have been tightened. This leads to a situation in

which the controller is effectively full open due to a lack of degrees of freedom.

The reason for tightening MV limits may be due to a lack of performance or a lack of training. In either case, the real measure of controllability of any application is effective utilization rather than merely having individual variables or the application being used (on).

A measure called effective utilization (Equation 2) measures the relative degrees of freedom available to a multivariable controller.

This measure can be calculated over any time scale and captures the degrees of freedom or manipulated variables available to the controller. It can be calculated at the variable level and aggregated to the controller level with a weighting scheme. One should consider availability of the process unit when computing this measure.

Model performance

Key questions a practitioner is interested in answering are:

- Which models are at fault?
- What is the effect of model error on performance?
- What model parameters does one need to update—gain, time constant, or time delay—to recover performance?

In the ideal case, one would like to answer these questions based on operating data without having to perform intrusive testing. Commonly used measures of model quality are based on prediction errors and a visual comparison of measurements with unbiased predictions (or simulation).

A disturbance model other than the integrated, white-noise model is rarely used in commercial APC technologies; therefore, engineers focus mainly on comparing the error in the model's deterministic portion.

Fig. 4 shows a vivid example of the scale and complexity of the problem in the form of a 40 MV x 94 CV x 3 feed forward (FF) variable model matrix from a crude column APC application (Fig. 4).

The color-coding indicates positive (red) and negative gain (blue) models.

TARGETS FOR PERFORMANCE VARIABLES Table 3

Targets	Effective utilization	Variability	Model performance
	%		
Daily	>50	<150	50-150
Weekly	>80	<125	50-150
Monthly	>90	<125	75-125
Quarterly	>90	<110	75-125
Yearly	>90	<110	75-125

An operator or APC engineer who is interacting with this application daily must solve the puzzle of which MV-CV models are causing a particular behavior—particular constraint tradeoffs or variability increases—and the appropriate actions needed to rectify that model behavior.

As a start, one can measure the relative variability of the model prediction compared to the CV measurements (Equation 3).

The prediction is the raw or unbiased prediction for each CV. This allows tracking of the process predictability in relative terms and flag significant deviations from benchmark performance. A good benchmark comes from the post-commissioning data for which model performance is considered satisfactory.

Table 3 shows some guidelines for the key variables for any APC application. Variables listed are at the overall application level and related to individual CV-MV performance measures through a weighted average based on the relative importance of each CV and MV. Variability is relative to design performance or desired variability. Model performance is relative to benchmarked model performance.

These targets take into account that there will be short-term variations in the different performance measures due to operating point changes and disturbances. It is essential that the ownership team agree on these goals for the APC applications.

Performance monitoring

A team involving vendor and ownership personnel—consisting of process control engineers, operators, and managers—often commissions an APC application. The process control engineer with appropriate APC training is eventually responsible for maintaining and troubleshooting the controller as necessary.

The operator uses the application on shift basis to ensure that the process is operating at the right state, it is stable, and the key constraints are being met. The process control engineer is involved with the application daily to ensure that any issues raised by operators are addressed, known issues with the application are addressed, and operators are running the controller as recommended.

The technical and process control personnel and plant managers are often concerned with adequate uptime of the application, given the level of effort and resources that have been invested in commissioning the application. If it is a well running application, operators, shift supervisors, and plant managers will treat the APC as they would any other plant asset—it is essential to the smooth operation of the facility and needs to be running well.

Based on profiles of the ownership personnel, the kind of information each member wants differs. The composition and roles of APC ownership discussed here are representative; each organization will have its own roles and responsibilities based on resource availability and organizational structure.

- *Operator.* An operator wants to know, from a real-time interface, what the controller is doing at any given instant and why it is doing so. In more technical terms, this is the knowledge of active constraints and the cause-effect behavior between MVs and CVs that cause constraints to be active or given up on.
- *Shift supervisor.* A shift supervisor is concerned if the operators must pay too much attention to one or more controllers and they are having to take the application offline. In other words, the level of operator interactions, process

Responsibility matrix

Table 4

Role	Utilization	Benefits	Performance	Diagnostics
Operator	A*	R	R	C
Shift supervisor	R	R	C	C
Plant manager	I	A	I	I
Production engineer	I	R	C	C
Process engineer	I	C	I	C
Technical manager	R	R	I	I
Process control engineer	R	R	A	A
Instrument and electrical technician	—	I	C	R

*R = Responsible, A = Accountable, I = Informative, C = Consultative.

Performance monitoring time scales

Table 5

Role	Utilization	Benefits	Performance	Diagnostics
Operator	Minutes	Daily	Minutes	Daily
Shift supervisor	Daily	Monthly	Daily	Weekly
Plant manager	Monthly	Quarterly	Quarterly	Quarterly
Production engineer	Daily	Weekly	Daily	Weekly
Process engineer	Monthly	Monthly	Monthly	Monthly
Technical manager	Monthly	Quarterly	Monthly	Weekly
Process control engineer	Daily	Daily	Daily	Daily
Instrumentation and electrical technician	Monthly	Monthly	Monthly	Weekly

stability, and controller uptime is of concern to this group.

- *Plant manager.* The plant manager has a reason to be concerned if the controller uptime is unsatisfactory and the controller is not achieving process stability.
- *Production engineer.* The responsibility of the production engineer is to achieve the production targets that have been set by the planning and scheduling team and the plant manager. Safety is a key priority for this individual. He or she tends to be concerned with the APC application if it is engaging in behavior that, for example, cuts feed rates and compromises the production targets or is causing off-spec incidents resulting in emissions or off-spec product. Operators or shift supervisors usually provide this information.
- *Process engineer.* A process engineer is involved in the application's design to ensure that key variables are included and the controller targets the "optimal" constraints. At some sites, a real-time optimizer (RTO) layer may sit above the APC layer and send targets and set points.

The process engineer wants to ensure the APC application is achieving the target changes that may be sent by the RTO every few hours. The process engineer may also become involved in troubleshooting if the underlying process behavior is causing a problem with the application.

- *Technical, process control manager.* This group is concerned with application uptime and benefits. One of the other groups, if necessary, will bring to its attention issues requiring additional resources. If the process, for example, has undergone some changes recently and a full step test is required to update the plant models, this group will be involved in justifying the resource allocation.
- *Process control engineer.* Any issues observed by the rest of team are important to the process control engineer. In addition to controller uptime, active constraints, and process stability, the process control engineer is also the one who is concerned about the "why" part.

This means that things like process variability relative to a benchmark, cycling in the controller, degrees of freedom available, constraint give ups, underlying PID controller performance, inferential and analyzer performance model performance, operator interactions, tuning problems, and process nonlinearities that affect application behavior all become important to this individual because he has the responsibility for addressing these issues.

- *Instrument and electrical technician.* This person only gets involved if an issue raised by one of the other people needs to be addressed to recover APC performance. An example is a sticky valve or a malfunctioning sensor or analyzer. This group needs information on the diagnostics pertaining to the instruments and valves that have been flagged.

Table 4 shows a representative responsibility matrix for the different aspects of an APC application. In this article, we have reviewed a few key measures pertaining to use, performance, and diagnostics.

Table 5 outlines the typical time scales for monitoring different facets of the APC application, as we outlined in the roles previously discussed. ✦

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BLACK POWDER—1

Study examines sources, makeup in dry gas systems

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Dhahran

Internal corrosion generates black powder inside pipelines, while the composition of transported gas determines the powder's composition. Preventing its occurrence or effectively managing the effects of black powder require knowledge of its chemical composition and physical properties, formation mechanisms, and sources. Despite its common occurrence in the gas industry, black powder is not well understood in terms of composition and physical properties, source, formation, prevention, or management of its effects.

This first part of two articles reviews the recent laboratory and field work conducted at Saudi Aramco's Research and Development Center to determine the compositions, sources, and formation mechanisms of black powder in gas transmission systems. Microhardness, nano-indentation, x-ray diffraction (XRD), x-ray fluorescence (XRF), and scanning electron microscopy (SEM) techniques, as well as several bacterial analysis methods analyzed black powder samples collected from the field.

Based on presentation to NACE Corrosion 2008 Conference, New Orleans, La., Mar. 16-20, 2008.

Equations

H_2O (condensed water) + CO_2 (in gas) → H_2CO_3 (carbonic acid) (1)

H_2CO_3 + Fe (pipeline steel) → $FeCO_3$ + H_2 (2)

$2H^+ + SO_4^{-2} + CH_4 \rightarrow H_2S + CO_2 + 2H_2O$ (3)

H_2O (condensed water) + H_2S (in gas) → $H_3O^+ + HS^-$ (4)

HS^- + Fe (pipeline steel) → FeS + H_2 (5)

$2Fe + H_2O$ (condensed water) + $3/2\ O_2 \rightarrow 2 - FeO(OH)$ (6)

$8\gamma\text{-}FeO(OH) + Fe \rightarrow 3Fe_3O_4 + 4H_2O$ (7)

$FeCO_3 + 1/6\ O_2 \rightarrow 1/3\ Fe_3O_4 + CO_2$ (8)

$2Fe_9S_8 + 9H_2O + 27/2\ O_2 \rightarrow 18\gamma\text{-}FeO(OH) + 2S_8$ (9)

$2H_2S + O_2 \rightarrow 2H_2O + 2S$ (elemental) (10)

$3FeS + 2O_2 \rightarrow Fe_3O_4 + 3S$ (elemental) (11)

Next week's concluding article will describe black powder's physical and mechanical properties and presents a summary and brief discussion of various black powder management methods.

Background

Most sales-gas pipeline operators experience black powder.[1-6] It occurs in several forms, including a wet tar-like substance (Fig. 1) or a dry, fine powder (Fig. 2). Black powder occurs in both recently commissioned and older sales-gas transmission pipelines. It can contaminate the customer sales-gas supply, either interrupting the customer's operations or reducing the quality of the customer's products.

Black powder can also harm gas pipeline operations themselves, leading to instrument-scraping delays, reduced inline inspection accuracy, control valve erosion, and flow reduction.

Black powder additionally poses a potential health and environmental hazard, with mercury and naturally occurring radioactive materials such as Pb-210 present in some samples. Iron sulfides are also potentially pyrophoric. Such materials require special procedures for handling and disposal of any removed black powder.

Composition, sources

Black powder consists of various forms of iron sulfide, iron oxide, and iron carbonate, mechanically mixed or chemically combined with any number of contaminants such as salts, sand, liquid hydrocarbons, and metal debris. Different gas pipeline operators report different compositions for the black powder removed from their pipelines. Some literature reports black powder as being predominantly iron sulfides,[1-3] while others report the complete absence of iron sulfides but the presence of iron oxides and hydroxides such as Fe_3O_4 and FeOOH.[4-6] Still others report a combination of all of these products (iron sulfides, iron carbonates, and iron oxides).[5]

These products share a common

Wet tar-like black powder can collect at scraper door receivers of dry gas pipelines. This photo shows an accumulation at such a location on Saudi Aramco's gas transmission system (Fig. 1).

Black powder more often manifests itself as a dry, fine powder, as pictured here (Fig. 2).

source; corrosion of the internal walls of the pipeline. More specifically, reactions of iron (Fe) present in ferrous pipeline steel with condensed moisture containing oxygen (O_2), hydrogen sulfide (H_2S), and carbon dioxide (CO_2) form black powder.

The perceived absence of condensed water in dry gas pipelines often leads to an underestimation of the internal corrosion risk.[1-7] Under normal conditions, gas pipelines are under minimal corrosion risk. It is not, however, possible to eliminate water from pipelines completely.[7] Water vapor can condense on the inner walls of the pipeline due to high dewpoints. It can also enter the pipeline through periodic upsets that cause moisture carryover. This water, coupled with corrosive species such as CO_2, H_2S, and O_2, even in amounts as low as ppm levels, can result in unexpected internal corrosion and the formation of corrosion products such as $FeCO_3$, FeS, and iron oxides, respectively.[1-5]

These components are benign in dry gas but become corrosive in the presence of condensed water.[1]

Formation mechanisms

Internal corrosion of sales-gas transmission pipelines provides the main cause for the formation of black powder. Corrosion due to H_2S, CO_2, and O_2 in such pipelines follows established mechanisms. Simplified electrochemical reactions describing these corrosion processes and their respective corrosion products appear in the Equations box. Condensed water is a necessary condition for these reactions to proceed.

- Siderite ($FeCO_3$) formation due to CO_2 corrosion. Siderite corrosion product found in black powder forms via the chemical reaction of CO_2, a naturally occurring constituent of natural gas, with condensed water, producing carbonic acid which in turn reacts directly with steel to produce $FeCO_3$ (Equations 1-2).
- Iron sulfides formation due to H_2S corrosion. Hydrogen sulfide can occur naturally as a constituent of natural gas or be produced by sulfate reducing bacteria (SRB).[1] These anaerobic bacteria use the reduction of sulfate as a source of energy and oxygen (Equation 3).

Iron sulfides (FeS) corrosion products usually form from H_2S dissolved in condensed moisture reacting directly with the steel wall of the pipeline (Equations 4-5).

- Iron oxides formation due to oxidation. Oxygen in gas pipelines comes from oxygen ingress through leaks at low-pressure points throughout pipeline systems.[1] Oxygen ingress in gas lines can cause corrosion in small concentrations and even combustion in larger amounts.[8,9] A 1988 survey of 44 natural gas transmission pipeline companies in North America showed their gas quality specifications allowed maximum O_2 concentrations ranging from 0.01 mole % to 0.1 mole %, with typical values of 0.02 mole %.[8,9]

Oxygen content of about 0.01 mole % has little effect on steel corrosion in the presence of stagnant water inside sales-gas transmission pipelines, while

DEWPOINTS, CALCULATED MOISTURE CONTENTS; 2006*

Table 1

Sample Point	Measured dewpoint, – °C. at 130 psi – July	February	Calculated moisture – content, mg/l. – July	February	Line – pressure, psi – July	February	Dewpoint, °C. at – line pressure – July	February
1	–11	–18	0.23	0.13	900	900	15.8	7.0
2	–3	–7	0.43	0.32	900	900	26.0	21.1
3	–17	–19	0.14	0.12	900	900	8.3	6.0
4	–17	–18	0.14	0.13	900	900	8.3	7.2
5	–14	–11	0.18	0.23	740	720	9.1	12.4
6	–20	—	0.11	0.55	740	720	2.0	26.4
7	–11	–15	0.23	0.17	740	720	12.8	7.8

*Maximum moisture content in typical sales gas specification is 0.112 mg/l.; equivalent to dewpoints of 5, 2.2, and 1.9 °C. at 900, 740, and 720 psi, respectively.

0.1 mole % produces fairly high corrosion rates. Transmission pipelines should consider limiting maximum oxygen concentrations to 10 ppm vol (0.01 mole %).[8 9]

In cyclical wet-dry environments with low dissolved oxygen, such as those experienced in gas pipelines, the direct oxidation of pipeline steel walls usually leads to formation of iron oxides (Equation 6).[10]

FeO(OH) can exist in α, β, or γ form. These type of environments lead to an unstable γ-FeO(OH), which quickly transforms to magnetite-Fe_3O_4 and water (Equation 7).

Water nearly saturated with dissolved oxygen will often lead to the presence of hematite (Fe_2O_3).

Microbiologically induced corrosion (MIC) resulting from acid-producing bacteria (APB) or iron-oxidizing bacteria (IOB) may also lead to iron-oxide formation. Again, however, condensed water is a prerequisite for these bacteria to thrive and multiply and MIC cannot occur in the absence of water.

Other sources can also produce magnetite-Fe_3O_4 found in black powder: mill scale, which is expected to be a minor and short-term contributor at new pipelines, and conversion, by oxidation inside the pipeline, of $FeCO_3$, and FeS corrosion products. The conversion of $FeCO_3$ to Fe_3O_4 is sluggish and occurs during dry cycles (Equation 8).[11]

Conversion of FeS, however, occurs rapidly and can happen during wet cycles (Equation 9).[7] The produced γ-FeO(OH) will quickly transform to Fe_3O_4 (Equation 7).

Sampling

Analysis of sales-gas samples collected from different sampling points focused on H_2S, CO_2, and O_2. Indirect and direct methods measured moisture content of the gas. The latter used the methanol scrubbing method and the former the panametrics dewpoint analyzer method. Collecting twice from each sampling point, once during summer and once during winter, accounted for temperature variations. No samples were collected from untreated sour gas as it is known to lead to internal corrosion of the transporting system.

Black powder sampling locations included receiving traps, pump stations, and filter cartridges. Only two of these samples were wet tar-like, with the remaining samples made up of dry, fine powder. Samples collected from manifolds and pipelines carrying associated wet sour gas had a wet slurry-like appearance. Not opening pipeline equipment until collection staff was on site avoided possible oxidation of the black powder samples.

Technicians placed the black powder samples immediately in silicon oil under inert gas (argon). XRD and XRF techniques immediately identified the phase and elemental composition of the black powder, respectively. Bacterial analysis on a number of black powder samples occurred both in-house and at the Gas Technology Institute (GTI), Des Plaines, Ill. Scanning electron microscopy (SEM) and XRD also examined the morphology and particle size of the black powder, respectively.

Hardness measurement

Two techniques measured the hardness of black powder:

- Solid-state sintering of the compacted loose powder followed by microhardness measurement of the compacted and sintered discs.
- Nano-indentation of individual black powder particles.

Hardness measurements also used conventional microhardness techniques on compacted and sintered discs. Colloidal silica polished the discs to a 20 nanometer finish. Seven measurements used a 200-g load on the cross section of the metallographically prepared discs. Chemical thermodynamic modeling and experimental trial and error ensured solid-state sintering, avoiding the formation of new phases.

Individual black powder particles underwent nano-indentation measurements. Mounting the particles in epoxy immobilized the individual grains for subsequent testing, and the samples were polished to a 20-nanometer finish using colloidal silica. A single indent occurred on individual particles, with an average of 12 particles tested per sample.

Results

Table 1 shows measured dewpoint temperatures at 130 psi by the panametrics analyzer method for gas samples collected at different sampling points. It also shows calculated moisture content at 130 psi and dewpoint temperatures at line pressures. Direct measurement of moisture content using the methanol scrubbing method showed similar moisture contents. The table shows all gas samples, except for one collected at Sample Point 6, to have a calculated moisture content exceeding the maximum moisture content of 0.112 mg/l. (7 lb water/MMcf) typically specified by sales-gas pipeline operators.

Fig. 3 shows typical temperature variations experienced in the eastern province of Saudi Arabia. Comparing Fig. 3 with Table 1 shows some dewpoint temperatures, at line pressure,

CORROSION COMPONENT SUMMARY

Table 2

Component	Typical sales gas maximum	Measured level
H_2S, ppm	16	1-15
O_2, mol %	0.02	0.01-0.03
CO_2, mol %	3	<1.62
Moisture, mg/l.	0.112	0.12-0.55

CORROSION PRODUCTS

Table 3

Source	Major	Minor
Sales gas pipelines	Fe_3O_4, α-and γ-FeOOH	$FeCO_3$
Sour gas pipelines	FeS, FeS_2	Fe_3O_4, α-and γ-FeOOH, $FeCO_3$

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are equal to or less than ambient temperatures experienced during winter. These results show high susceptibility to moisture condensation on the inner walls of pipelines during the winter.

Table 2 shows measured concentrations of gas components deemed critical to internal corrosion of sales-gas pipelines. Typical sales-gas specifications adopted by many gas line operators allow comparison. Table 2 shows O_2, H_2S, and CO_2 levels within typical sales-gas specifications. The measured O_2 level is typical of that reported by the gas industry, though measured moisture exceeds the maximum limit of 0.112 mg/l. These chemicals are benign in dry gas but form weak acids when dissolved in moisture, leading to internal corrosion of pipeline steel.

Table 3 shows XRD analysis results of black powder samples collected from sales gas and sour-gas pipelines. Black powder collected from sales-gas pipelines consisted predominantly of iron oxides with minor amounts of iron carbonate. No iron sulfides were detected in these powders. Black powder collected from sour-gas pipelines, however, consisted primarily of iron sulfides and iron carbonate.

Table 4 shows the different compounds found in black powder samples and their potential sources. Comparison of Table 4 and Table 3 shows the possibility of several potential sources for black powder in sales-gas pipelines. The moisture content values and composition of the sales gas (Tables 1 and 2, respectively) suggest internal corrosion due to low dissolved oxygen corrosion is the main source of black powder in sales-gas lines.

The conversion of primary corrosion products such as FeS and $FeCO_3$ to secondary iron-oxide corrosion products, as well as microbiologically induced corrosion and degradation of mill scale, also make smaller contributions to the formation of black powder. H_2S-induced corrosion dominates in black powder collected from sour-gas pipelines. The presence of minor amounts of Fe_3O_4, as well as α-and γ-FeOOH, shows oxygen ingress into these lines leading to direct corrosion and conversion of small amounts of FeS into these iron oxide species.

XRD detected elemental sulfur in the range of 3-14 wt % in some black powder samples. XRF analysis, by contrast, detected sulfur in all black powder samples. The difference suggests sulfur detected by XRF is not entirely elemental, but is combined in an amorphous compound not detectable by XRD.

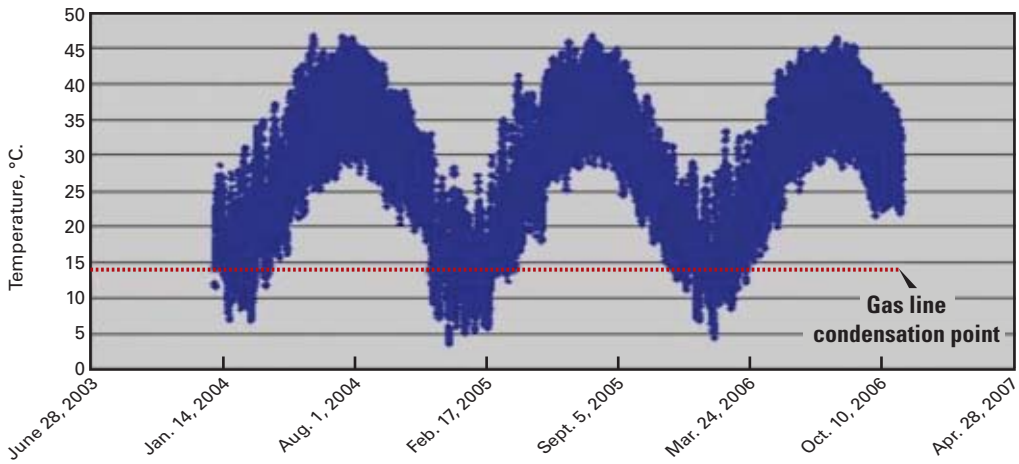
The small amounts of elemental sulfur detected by XRD most likely stem from oxidation inside the pipeline of small amounts of H_2S or FeS caused by oxygen ingress (Equations 10-11).

XRF analysis revealed the presence of minor contaminants such as salts, sand, metal debris (from eroded equipment), and sulfur. These minor contaminants make up 15-20 wt % of black powder. XRF also detected mercury of 0.5-2 wt % in some black powder samples.

Fourier-transformed infrared (FTIR), thermal gas analysis (TGA), and gas chromatography-mass spectroscopy (GC-MS) analyzed the wet tar-like black powder samples for organic contents. Results showed these samples containing 41 wt % organic-based liquid, with the balance being solid phase corrosion products. The liquid phase contained 36 wt % triethylene glycol (TEG), with the balance being a hydrocarbon-based liquid. The TEG desiccant likely carried over from upstream dehydration processes. TEG carryover can also contribute

TEMPERATURE VARIATION, EASTERN SAUDI ARABIA

Fig. 3



POTENTIAL SOURCES OF BLACK POWDER CONTENTS

Table 4

Compound	Potential sources
Fe_3O_4	Low dissolved oxygen-induced corrosion Conversion of γ-FeOOH Bacterial-induced corrosion (APB, IOB) Conversion of $FeCO_3$ and FeS (in situ) due to oxygen ingress Mill scale (minor and short-term)
FeOOH	Low dissolved oxygen-induced corrosion
Iron sulfides	H_2S-induced corrosion a. Chemical source b. Bacterial source (SRB)
Siderite - $FeCO_3$	CO_2 corrosion

to internal corrosion of these pipelines.

An in-house conventional cultivation medium analyzed a limited number of the collected black powder samples for sulfate reducing bacteria (SRB), general aerobic bacteria (GAB), and nitrogen-utilizing bacteria (NUB). Analysis in the US at GTI also sought acid-producing bacteria (APB) and iron-oxidizing bacteria (IOB). SRB, IOB, and APB bacteria cause microbiologically induced corrosion (MIC) of steel in the presence of condensed moisture (water).[1]

Test results showed microbial corrosion to be a low-potential black powder source, caused most likely when it did occur by APB or IOB. The absence of SRB in black powder collected from sales-gas pipelines agrees with the absence of FeS in the chemical composition of black powder. The absence of SRB in black powder collected from sour gas also identifies naturally occurring H_2S reactions with the steel pipeline as the source of iron sulfide (Equations 4-5).

Acknowledgment

The author acknowledges Saudi Arabian Oil Co. (Saudi Aramco) for its support and granting permission to present and publish this work. ✦

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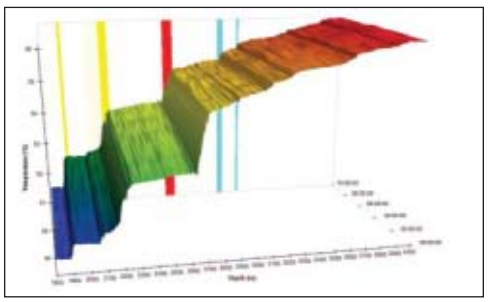
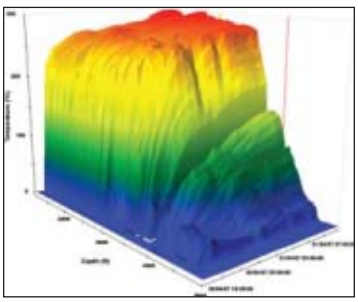
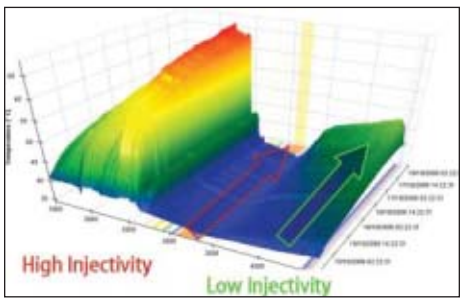






Images from the new system show sample of digital flow profile (left), high temperature distributed temperature sensing well monitoring (middle), and flow profile of high and low injectivity zones (right).

New real time digital well flow profiling sysytem

This new real time digital flow profiling system is designed to aid increased production, reduce operating costs, and improve recovery.

The system is suited for these well types:

- Conventional and complex.
- Multilateral.
- Intelligent oil or gas producer-injector.
- Long horizontal.
- Ones with infrequent or no production logging technology (PLT) deployment.

The firms says its system provides continuous PLT-type data in deviated and complex wells without the costs, risks, and deferred production issues associated with conventional logging techniques. As well as monitoring the flow distribution in production and injection wells in real time, the system also provides information often not accessible with traditional production logging technology, the company notes.

Zonal flow allocation is determined using Sentinel distributed temperature sensing (DTS) technology. With a resolution of 0.01° C. every 1 m along the wellbore, the Sentinel system is usable in wells where other permanent monitoring solutions fail to identify thermal events, the company points out.

The ability to provide updates every 10 sec also allows transient events to be analyzed, providing a new dimension in DTS interpretation.

Source: **Sensornet,** Sensornet House, 340 Centennial Park, Elstree, Hertfordshire, WD6 3TJ, UK.

Paradigm BV,

Amsterdam, has appointed Richard H. Ward regional vice-president, China. As regional vice-president, Ward manages and develops business and marketing strategies targeting the needs of oil and gas E&P interests in China. Located in Beijing, he reports directly to Jorge Machnizh, president and chief operating officer at Paradigm. Ward joins Paradigm with over 35 years of global business development experience in the energy industry.

Ward

He has held various executive positions with BGP Ltd., serving as a marketing consultant at its headquarters in Zhuozhou, China, and as vice-president of business development in Houston. At BGP, he was also responsible for strategic advising on marine and land seismic opportunities worldwide. Ward previously served on the company's merger and acquisition team, developed joint venture strategy for the Middle East, and introduced the company to opportunities in South America. Prior to that, he held positions with Landmark Graphics, YPF SA, Veritas Geophysical, and Western Geophysical. He has worked extensively in international business development for public and private companies in the US, China, Latin America, Europe, Africa, Canada, and the Middle East. Ward attended Trinity University in San Antonio, where he earned a BS in geology.

Paradigm provides solutions for digital subsurface asset management, serving oil and gas companies worldwide.

Seismic Micro-Technology (SMT),

Houston, has entered into a collaboration with NVIDIA Corp. to improve the performance of SMT Kingdom software using NVIDIA Quadro graphics cards. The integration of NVIDIA technology with SMT's software provides comprehensive new workflows that allow novice and experienced users to quickly and efficiently model the subsurface. In addition, the agreement gives SMT customers access to NVIDIA CUDA technology, an award-winning C-compiler and software development kit that allows software developers to tap into the parallel architecture of the GPU. By running CUDA on Quadro professional solutions, developers have the ability to process and visualize large amounts of geoscientific data in real time, instead of minutes or hours.

SMT develops and markets Windows-based geoscientific interpretation software.

NVIDIA provides visual computing technologies.

IDS,

London, has signed a contract with Premier Oil's group drilling division to implement its new IDS DataNet2 rich internet applications. A 3-year global services contract, it is an extension of an existing contract with Premier, which IDS has held since 1998. From DataNet2, the Premier contract is focused initially on DrillNet (drilling reporting services) and GeoNet (geological reporting services). Premier is also currently reviewing StockNet, the IDS inventory and asset management services product, in its Vietnam operations. In addition, Premier has options on three additional Datanet2 products: ProNet, for completions reporting; SafeNet, which focuses on the environmental and HSE aspects of drilling; and VisNet, for data visualization and analysis. These stand-alone yet complementary IDS products are all rich internet applications.

IDS provides intuitive end-to-end, web-delivered, upstream reporting services, with full support 24 hours a day, 365 days a year.

Fugro,

Leidschendam, the Netherlands, has created Fugro Gravity & Magnetic Services (FGMS) to market its worldwide gravity and magnetic capabilities for oil and gas exploration and production. FGMS is the business development arm of Fugro Airborne Surveys, Fugro Ground Geophysics, and Fugro Robertson (marine). It will provide the oil and gas industry with a full spectrum of potential field tools, including technologies such as FALCON airborne gravity gradiometry and Fugro-LCT Software and tying together the whole spectrum of gravity and magnetic services: data acquisition and processing, interpretation, multiclient offerings, and software for marine, land, and airborne applications.

Fugro provides advanced surveying, seismic, oceanographic, meteorological, and positioning services and interprets and processes data collected at sea, on land and from the air.

Mustang Engineering,

Houston, has launched a synthesis gas business line (SynGas) within its midstream business unit. Mustang provides conceptual, front-end engineering, detail engineering, procurement, and construction management services for its SynGas projects. In addition, Mustang provides program development and project management, assisting its clients in developing projects, from front-end engineering studies through commissioning and start-up. Mustang's midstream business unit provides services in other business lines: LNG regasification, liquefaction, and gas processing, as well as offering a suite of proprietary LNG Smart technologies.

Mustang, a subsidiary of John Wood Group PLC, is an independent services provider to the global oil, gas, chemical, and manufacturing industries. The company specializes in design, engineering, procurement, project management, and construction management and offers these services through its six business units: upstream oil and gas, midstream, pipeline, automation and control, refining and petrochemicals, and process and industrial.

Baker Oil Tools,

Houston, has installed more than 2 million ft of its EQUALIZER inflow control completion systems to achieve successful production rates in horizontal wells in more than 20 oil and gas fields around the world. Since its worldwide introduction in 1998, the EQUALIZER system has attained individual lateral installation lengths of more than 13,000 ft. The system is applicable for a variety of wellbore conditions, including those that require viscous fluid, kill pill cleanup, or multiphase flow.

Baker Oil Tools is a world leader in well completion and intervention solutions. It is a division of Baker Hughes, which provides reservoir consulting, drilling, formation evaluation, completion, and production products and services to the worldwide oil and gas industry.

Expro,

Reading, UK, has agreed to acquire the oil and gas metering business of Connecticut-based CiDRA Corp. for $60.5 million cash. The acquisition will form the basis for a new business to be called Expro Meters. Expro Meters will develop, manufacture and sell a range of flow meters for the oil and gas market, in addition to providing production testing services on a rental basis. It will enable Expro to take ownership of a range of proprietary flow meter technology that is based on nonintrusive flow measurement of wet gas and bubbly liquids and that features a nonintrusive, clamp-on design that enables the flow meters to be deployed on new or existing installations, lowering technical risks and operating costs associated with flow measurement.

In addition, Expro has announced that its acquisition by the private equity consortium Umbrellastream has been completed. Expro accepted Umbrellastream's offer of £1.8 billion in June after rejecting a takeover bid from Halliburton.

Expro is a market leader in providing services and products that measure, improve, control, and process flow from high-value oil and gas wells.

Baker Botts LLP,

Houston, has added Kevin Keenan as a partner in its global projects department. He will be based in Houston. Keenan, whose energy practice focuses on LNG projects and transactions, also has extensive experience in public and private project developments, including petroleum refineries, offshore marine terminals, and pipeline construction. He has represented clients in a variety of negotiations for energy resources, such as biodiesel, crude oil, crude oil products, natural gas, and LNG. His expertise in LNG ranges from infrastructure development to the various aspects of shipping that are central to the industry, including shipbuilding and charter negotiations. Prior to joining Baker Botts, Keenan was a partner with Akin Gump Strauss Hauer & Feld in London and Houston. He is a member of the Houston Bar Association, the State Bar of Texas, the Association of International Petroleum Negotiators, and the American Bar Association's Environment, Energy and Resources Section. Keenan received a BA in history and political science from Idaho State University and his law degree from Georgetown University Law Center.


Keenan

Baker Botts is a leading international law firm with offices in Austin, Beijing, Dallas, Dubai, Hong Kong, Houston, London, Moscow, New York, Riyadh, Washington, DC, and Palo Alto, Calif.

Schlumberger,

Houston, has recently acquired three oil field service companies.

Schlumberger has acquired Staag Imaging LP, a Houston-based provider of leading-edge depth imaging technologies for seismic data processing. Staag, which will become part of the Schlumberger WesternGeco business unit, is one of the first providers of a commercial full waveform inversion (FWI) technique. Staag's FWI is an automatic, data-driven tool that uses the two-way wave equation method to build highly accurate velocity models of the subsurface, including complex geology formations such as salt bodies. This FWI technology can automate a large part of the velocity model building workflow. The accurate models it produces can then be used to exploit the power of WesternGeco's complementary high-resolution reverse time migration capability.

Schlumberger also has acquired the business of Extreme Engineering Ltd., a Calgary-based supplier of unmanned measurement-while-drilling (MWD) systems from its founders and investors that include the Shell Technology Ventures Fund 1 BV managed by Kenda Capital BV. Extreme's MWD systems will complement Schlumberger's PowerDrive rotary-steerable drilling systems. The goal in 2009 will be to expand Extreme's technologies to regions outside North America. Extreme Engineering, which will continue to operate under its own brand, maintains major operational bases in Calgary, Denver, and Fort Worth, backed by engineering and manufacturing facilities in Calgary.

In addition, Schlumberger has acquired IES Integrated Exploration Systems, an Aachen, Germany-based supplier of advanced petroleum systems modeling software and services for the E&P industry. IES specializes in modeling the generation, migration, and entrapment of oil and gas using its PetroMod software. This technology is used to estimate undiscovered hydrocarbons in frontier basins and to enable oil and gas companies to mitigate risk in exploration prospects. The Aachen location will become a Schlumberger Center of Excellence for Petroleum Systems Modeling.

Schlumberger is the world's leading oil field services company, supplying technology, integrated project management and information solutions that optimize performance for customers working in the oil and gas industry.

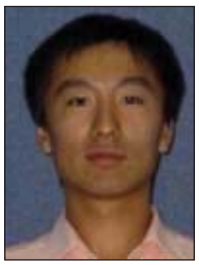
Cameron,

Houston, has acquired the DynaTorque line of products and services from Hines Corp., Spring Lake, Mich. The products will be offered through Cameron's flow control division, part of the company's drilling and production systems group. DynaTorque designs, manufactures, markets, and sells manual gear operators, overrides, components, accessories, and specialty products, including mechanical partial stroke test devices, for use with valves, actuators, and dampers. The company has a manufacturing plant in Muskegon, Mich.

Cameron is a leading provider of flow equipment products, systems, and services to worldwide oil, gas, and process industries.

Data-Linc,

Bellevue, Wash., has appointed Ren Ding sales representative in China. He will be based in Beijing. Ren brings to Data-Linc 5 years of sales experience in automation products and systems with a strong background in account development and distributor management. He served as a sales engineer with Mitsubishi Electric and most recently as an account manager for Rockwell Automation. During his career he has worked closely with heavy industry applications, including metal, mining, port, manufacturing, and factory and machinery control, among others. Ren graduated from Beijing University of Chemical Technology (China) with a BS in automation and a minor in PC theory, PLCs, and programming languages.


Ding

Data-Linc is a leading provider of industrial data communication solutions, designing and manufacturing high-performance modems for a broad range of industrial applications.

Honeywell's

Phoenix-based Process Solutions business has recognized industrial control providers Wilson-Mohr and AC Controls Co. Inc. as its 2007 Distributors of the Year. These recognitions mark the first time Honeywell has honored two companies with the award, which is given annually to the company's top-performing US distributor that demonstrates significant growth in product lines and overall sales.

Sugarland, Tex.-based Wilson-Mohr is a leading products and services provider to several process industries, including chemical, oil and gas, petrochemical, utility, and pulp and paper. The company is certified on Honeywell's complete product line from distributed control system (DCS) equipment to field instruments.

AC Controls, based in Charlotte, N.C., provides integration services and combustion and process control systems and distributes instrumentation controls to manufacturers in the Southeastern US. Additionally, it owns and operates one of the region's largest valve automation centers and employs an ongoing training program to ensure technical service providers stay abreast of the latest technological advancements.

Honeywell International, Morris Township, N.J., is a diversified technology and manufacturing leader, serving customers worldwide with aerospace products and services; control technologies for buildings, homes and industry; automotive products; turbochargers; and specialty materials.

UOP LLC,

Des Plaines, Ill., has opened its new UOP Engineering Design Center in Houston. The new facility expands key engineering resources, allowing UOP to better support petroleum refiners and petrochemical producers located in the region. The new design center will include process and project design engineering expertise. The office is currently hiring experienced design engineers and was expected to be fully functional at the end of July.

In addition, UOP has formed an alliance with Rentech Inc. to jointly offer technology for the production of clean fuels, specialty waxes, and chemicals. The nonexclusive agreement between UOP and Rentech will provide a one-stop solution for refiners, petrochemicals, and synthetic fuel producers to convert synthesis gas to ultraclean fuels, specialty waxes and chemicals. The offering aligns Rentech's process to convert synthesis gas from biomass and fossil resources and hydrocarbons with UOP's hydrocracking and hydrotreating processes that process and upgrade hydrocarbons to fuels and chemicals. The Rentech process utilizes an iron-based catalyst to convert synthesis gas into ultraclean hydrocarbons.

UOP, a wholly owned subsidiary of Honeywell, is a leading international supplier and licensor of process technology, catalysts, adsorbents, process plants, and consulting services to the petroleum refining, petrochemical, and gas processing industries.

FMC Technologies Inc.,

Houston, has promoted Jay A. Nutt to controller. He previously served as FMC's assistant corporate controller. Nutt began his career with FMC Corp. in 1987. During his 21-year career, he has progressed through a number of positions of increasing responsibility. In 2001, following FMC Corp.'s spin-off of FMC Technologies, he was named division controller of Energy Production Systems. He advanced to controller of Energy Systems in 2007 and assumed his current responsibilities in January 2008. Nutt has a BS in accounting from Michigan State University and an MBA from Loyola University.


Nutt

FMC Technologies designs, manufactures, and services subsea production and processing systems, surface wellhead systems, high-pressure fluid control equipment, measurement solutions, and marine loading systems for the oil and gas industry.

DO2 Technologies Inc.,

Calgary, has licensed its OpenInvoice electronic invoicing platform to Black Hills Production & Exploration Inc. to automate and enhance the company's accounts payable reconciliation and approval processes. The unit of Rapid City, S.D.-based Black Hills Corp. has oil and gas operations in Colorado, Wyoming, and New Mexico. The multiyear license agreement with DO2 Technologies provides electronic invoicing solutions to increase invoice processing accuracy and enhance the capture of early payment discounts. Black Hills expects to reduce invoice processing and data storage costs as a result of efficiencies gained through electronic routing/approval and elimination of paper documents.

DO2 Technologies is a leading global provider of electronic-invoicing software solutions that enable buyers and suppliers to automate shared financial processes.

Imports of crude and products

	Districts 1-4		District 5		Total US		
	7-25 2008	7-18 2008	7-25 2008	7-18 2008	7-25 2008	7-18 2008	*7-27 2007
	1,000 b/d						
Total motor gasoline	870	1,128	95	17	965	1,145	1,225
Mo. gas. blending comp.	739	743	91	17	830	760	875
Distillate	121	102	—	—	121	102	339
Residual	261	147	125	4	386	151	322
Jet fuel-kerosine	71	60	48	3	119	63	265
Propane-propylene	76	75	7	3	83	78	66
Other	744	726	–38	66	706	792	288
Total products	**2,882**	**2,981**	**328**	**110**	**3,210**	**3,091**	**3,380**
Total crude	**8,757**	**8,507**	**1,248**	**1,299**	**10,005**	**9,806**	**10,165**
Total imports	**11,639**	**11,488**	**1,576**	**1,409**	**13,215**	**12,897**	**13,545**

*Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—August 1, 2008

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	9.33	7.10	8.26	6.96	7.49	8.16
Everett	7.90	5.23	7.42	5.26	5.98	8.28
Isle of Grain	9.91	7.14	9.05	7.00	7.92	9.09
Lake Charles	5.91	3.45	5.61	3.65	4.06	6.72
Sodegaura	8.46	10.38	8.70	9.99	9.24	7.50
Zeebrugge	10.37	7.93	9.72	7.78	8.71	9.71

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

Crude and product stocks

District	Crude oil	Motor gasoline		Jet fuel, kerosine	Fuel oils		Propane-propylene
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD 1	14,179	59,808	33,394	10,299	47,339	13,908	3,657
PADD 2	62,711	50,075	18,204	6,818	30,264	1,524	20,394
PADD 3	150,086	69,917	33,338	14,329	35,948	17,249	20,266
PADD 4	14,094	5,767	1,686	495	2,824	262	[1]1,569
PADD 5	54,179	27,993	21,422	9,804	14,130	5,086	—
July 25, 2008	**295,249**	**213,560**	**108,044**	**41,745**	**130,505**	**38,029**	**45,886**
July 18, 2008	**295,330**	**217,085**	**108,836**	**39,992**	**128,109**	**38,469**	**45,311**
July 27, 2007[2]	**344,531**	**204,720**	**93,238**	**41,119**	**126,542**	**37,190**	**49,948**

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

Refinery report—July 25, 2008

District	REFINERY OPERATIONS		REFINERY OUTPUT				
	Gross inputs	Crude oil inputs	Total motor gasoline	Jet fuel, kerosine	Fuel oils		Propane-propylene
					Distillate	Residual	
	1,000 b/d						
PADD 1	1,420	1,427	2,103	110	531	97	58
PADD 2	3,230	3,199	2,194	185	1,048	36	203
PADD 3	7,400	7,349	3,148	775	2,363	293	722
PADD 4	517	514	282	28	164	10	[1]162
PADD 5	2,769	2,673	1,318	494	618	131	—
July 25, 2008	**15,336**	**15,162**	**9,045**	**1,592**	**4,724**	**567**	**1,145**
July 18, 2008	**15,331**	**15,112**	**9,210**	**1,543**	**4,625**	**650**	**1,101**
July 27, 2007[2]	**16,331**	**16,210**	**9,429**	**1,441**	**4,327**	**677**	**1,131**
	17,594 Operable capacity		**87.2 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

	*8-1-08	*8-3-07	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	133.81	85.61	48.20	56.3
Brent crude	125.34	76.27	49.07	64.3
Crack spread	8.47	9.34	–0.88	–9.4
FUTURES MARKET PRICES				
One month				
Product value	135.90	86.77	49.13	56.6
Light sweet crude	124.57	76.78	47.79	62.2
Crack spread	11.33	9.99	1.34	13.4
Six month				
Product value	138.05	86.08	51.97	60.4
Light sweet crude	126.13	74.44	51.69	69.4
Crack spread	11.92	11.64	0.28	2.4

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

OGJ GASOLINE PRICES

	Price ex tax 7-30-08	Pump price* 7-30-08	Pump price 8-1-07
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	358.9	403.3	294.0
Baltimore	352.4	394.3	287.6
Boston	355.4	397.3	286.3
Buffalo	347.3	406.9	303.6
Miami	354.2	405.8	304.6
Newark	354.4	387.3	276.6
New York	340.3	399.9	302.6
Norfolk	348.3	386.3	276.6
Philadelphia	344.9	395.6	297.7
Pittsburgh	342.6	393.3	288.0
Wash., DC	359.5	397.9	296.0
PAD I avg	350.8	397.1	292.1
Chicago	362.3	420.2	305.5
Cleveland	340.7	387.1	265.1
Des Moines	342.0	382.1	289.1
Detroit	342.6	397.0	296.6
Indianapolis	336.9	387.0	294.1
Kansas City	342.1	378.1	281.2
Louisville	353.9	390.8	297.0
Memphis	339.5	379.3	291.0
Milwaukee	345.4	396.7	296.1
Minn.-St. Paul	347.6	388.0	279.0
Oklahoma City	336.8	372.2	272.7
Omaha	342.7	385.0	289.6
St. Louis	345.6	381.6	298.0
Tulsa	335.1	370.5	274.7
Wichita	330.5	373.9	290.1
PAD II avg	342.9	386.0	288.0
Albuquerque	346.6	383.0	286.2
Birmingham	351.1	389.7	278.7
Dallas-Fort Worth	353.4	391.8	278.4
Houston	351.4	389.8	277.9
Little Rock	349.2	389.4	277.0
New Orleans	350.9	389.3	278.7
San Antonio	347.8	386.2	276.3
PAD III avg	350.1	388.5	279.0
Cheyenne	353.5	385.9	287.0
Denver	369.8	410.2	307.8
Salt Lake City	364.4	407.3	305.1
PAD IV avg	362.6	401.1	300.0
Los Angeles	371.5	435.4	311.9
Phoenix	365.0	402.4	301.9
Portland	367.0	410.4	309.9
San Diego	369.6	433.5	323.0
San Francisco	379.3	443.2	320.0
Seattle	365.0	419.4	300.9
PAD V avg	369.6	424.0	311.3
Week's avg.	**351.4**	**395.8**	**291.8**
July avg.	**361.3**	**405.7**	**295.2**
June avg.	**360.2**	**404.2**	**309.4**
2008 to date	**306.2**	**350.0**	—
2007 to date	**227.9**	**271.5**	—

*Includes state and federal motor fuel taxes and state sales tax. Local governments may impose additional taxes.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

REFINED PRODUCT PRICES

	7-25-08 ¢/gal		7-25-08 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	293.48	New York Harbor	350.24
Gulf Coast	291.30	Gulf Coast	351.92
Los Angeles	301.55	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	288.94	ARA	368.98
Singapore	294.76	Singapore	366.90
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	301.35	New York Harbor	239.00
Gulf Coast	301.55	Gulf Coast	250.90
Los Angeles	305.55	Los Angeles	295.88
		ARA	263.78
		Singapore	253.63

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

BAKER HUGHES RIG COUNT

	8-1-08	8-3-07
Alabama	3	6
Alaska	5	7
Arkansas	56	50
California	43	36
Land	43	35
Offshore	0	1
Colorado	114	104
Florida	2	1
Illinois	1	0
Indiana	2	4
Kansas	13	15
Kentucky	12	9
Louisiana	189	181
N. Land	78	60
S. Inland waters	25	22
S. Land	29	37
Offshore	57	62
Maryland	1	1
Michigan	2	3
Mississippi	12	14
Montana	11	20
Nebraska	0	0
New Mexico	80	85
New York	6	5
North Dakota	71	40
Ohio	13	13
Oklahoma	207	187
Pennsylvania	24	17
South Dakota	2	4
Texas	920	835
Offshore	7	9
Inland waters	1	1
Dist. 1	16	25
Dist. 2	31	31
Dist. 3	66	65
Dist. 4	89	82
Dist. 5	178	177
Dist. 6	128	113
Dist. 7B	31	38
Dist. 7C	72	58
Dist. 8	137	112
Dist. 8A	31	20
Dist. 9	43	42
Dist. 10	90	62
Utah	48	36
West Virginia	26	32
Wyoming	76	66
Others—OR-1; TN-2; VA-8; WA-1	12	10
Total US	**1,951**	**1,781**
Total Canada	**451**	**394**
Grand total	**2,402**	**2,175**
Oil rigs	392	306
Gas rigs	1,550	1,470
Total offshore	67	74
Total cum. avg. YTD	**1,836**	**1,751**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 42.

Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

SMITH RIG COUNT

Proposed depth, ft	Rig count	8-1-08 Percent footage*	Rig count	8-3-07 Percent footage*
0-2,500	89	3.3	66	7.5
2,501-5,000	140	45.7	109	53.2
5,001-7,500	245	13.0	226	23.8
7,501-10,000	472	3.1	417	3.5
10,001-12,500	476	2.3	446	1.3
12,501-15,000	341	—	274	—
15,001-17,500	139	—	114	—
17,501-20,000	92	—	63	—
20,001-over	36	—	35	—
Total	**2,030**	**6.1**	**1,750**	**7.8**
INLAND	31		38	
LAND	1,944		1,646	
OFFSHORE	55		66	

*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]8-1-08	[2]8-3-07
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	16	20
Alaska	729	695
California	663	665
Colorado	57	42
Florida	6	5
Illinois	28	27
Kansas	99	103
Louisiana	1,340	1,278
Michigan	16	16
Mississippi	56	56
Montana	95	94
New Mexico	163	160
North Dakota	121	124
Oklahoma	173	171
Texas	1,355	1,338
Utah	48	52
Wyoming	150	149
All others	63	89
Total	**5,178**	**5,084**

[1]OGJ estimate. [2]Revised.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

	8-1-08 $/bbl*
Alaska-North Slope 27°	127.45
South Louisiana Sweet	128.00
California-Kern River 13°	111.20
Lost Hills 30°	119.35
Wyoming Sweet	115.10
East Texas Sweet	121.00
West Texas Sour 34°	114.00
West Texas Intermediate	121.50
Oklahoma Sweet	121.50
Texas Upper Gulf Coast	118.00
Michigan Sour	114.50
Kansas Common	120.50
North Dakota Sweet	112.75

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

WORLD CRUDE PRICES

$/bbl[1]	7-25-08
United Kingdom-Brent 38°	129.16
Russia-Urals 32°	123.61
Saudi Light 34°	123.70
Dubai Fateh 32°	125.80
Algeria Saharan 44°	128.85
Nigeria-Bonny Light 37°	131.87
Indonesia-Minas 34°	134.42
Venezuela-Tia Juana Light 31°	124.83
Mexico-Isthmus 33°	124.72
OPEC basket	127.74
Total OPEC[2]	124.82
Total non-OPEC[2]	125.46
Total world[2]	125.11
US imports[3]	122.59

[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]

	7-25-08	7-18-08	7-25-07	Change, %
	bcf			
Producing region	752	752	923	–18.5
Consuming region east	1,363	1,308	1,495	–8.8
Consuming region west	346	336	400	–13.5
Total US	**2,461**	**2,396**	**2,818**	**–12.7**
	May 08	**May 07**	**Change, %**	
Total US[2]	**1,836**	**2,179**	**–15.7**	

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

WORLDWIDE CRUDE OIL AND GAS PRODUCTION

	May 2008	Apr. 2008	5 month average — production — 2008	2007	Change vs. previous year — Volume	%	May 2008	Apr. 2008	Cum. 2008
	Crude, 1,000 b/d						Gas, bcf		
Argentina	600	630	625	631	–6	–0.9	145.0	140.0	697.18
Bolivia	40	39	40	45	–4	–9.3	43.0	41.9	209.10
Brazil	1,815	1,797	1,782	1,745	37	2.1	36.0	37.0	181.00
Canada	2,467	2,544	2,537	2,601	–64	–2.5	445.0	484.0	2,429.30
Colombia	578	567	565	521	44	8.5	24.0	22.0	110.00
Ecuador	500	500	500	502	–2	–0.4	1.0	1.0	5.00
Mexico	2,798	2,767	2,860	3,153	–293	–9.3	212.4	201.4	1,013.20
Peru	104	113	107	113	–6	–5.7	10.0	8.0	41.00
Trinidad	110	107	113	125	–12	–9.2	115.0	114.3	578.72
United States	5,110	5,162	5,123	5,196	–72	–1.4	1,816.0	1,756.0	8,876.00
Venezuela[1]	2,360	2,320	2,376	2,410	–34	–1.4	75.0	70.0	372.00
Other Latin America	80	80	80	80	0	–0.1	5.5	5.3	27.20
Western Hemisphere	**16,561**	**16,626**	**16,709**	**17,121**	**–413**	**–2.4**	**2,927.9**	**2,881.0**	**14,539.70**
Austria	16	16	16	17	–1	–6.4	5.2	5.0	25.90
Denmark	291	291	291	313	–22	–7.2	29.1	28.4	148.19
France	19	20	20	19	1	6.4	3.0	3.0	15.24
Germany	59	60	61	69	–8	–11.0	43.7	45.9	238.91
Italy	105	107	107	109	–2	–2.0	25.0	25.0	128.00
Netherlands	35	35	38	42	–4	–10.4	200.0	250.0	1,520.00
Norway	2,247	2,111	2,194	2,377	–183	–7.7	270.0	301.2	1,558.00
Turkey	41	41	40	40	–1	–2.0	—	—	—
United Kingdom	1,501	1,510	1,493	1,596	–103	–6.5	224.0	225.1	1,187.31
Other Western Europe	4	4	4	4	—	–1.5	2.2	2.0	13.23
Western Europe	**4,317**	**4,195**	**4,264**	**4,587**	**–323**	**–7.0**	**802.2**	**885.7**	**4,834.77**
Azerbaijan	940	920	939	824	115	14.0	30.0	30.0	156.00
Croatia	15	15	15	16	–1	–6.3	5.8	5.6	28.05
Hungary	15	15	15	17	–2	–12.1	6.8	7.5	35.76
Kazakhstan	1,400	1,400	1,384	1,080	304	28.1	50.0	50.0	313.00
Romania	95	95	95	98	–3	–3.3	18.0	17.0	88.00
Russia	9,720	9,680	9,738	9,866	–128	–1.3	1,900.0	2,000.0	10,100.00
Other FSU	400	400	400	420	–20	–4.8	500.0	400.0	2,490.00
Other Eastern Europe	50	50	50	47	2	4.9	19.0	18.8	94.35
Eastern Europe and FSU	**12,636**	**12,576**	**12,636**	**12,369**	**267**	**2.2**	**2,529.6**	**2,528.9**	**13,305.16**
Algeria[1]	1,380	1,380	1,386	1,338	48	3.6	280.0	270.0	1,375.00
Angola[1]	1,944	1,932	1,910	1,645	265	16.1	5.0	5.0	24.60
Cameroon	85	89	87	84	4	4.6	—	—	—
Congo (former Zaire)	20	20	20	20	—	—	—	—	—
Congo (Brazzaville)	240	240	240	240	—	—	—	—	—
Egypt	610	620	622	648	–26	–4.0	135.0	135.0	680.00
Equatorial Guinea	320	320	320	320	—	—	0.1	0.1	0.30
Gabon	240	220	228	230	–2	–0.9	0.3	0.3	1.53
Libya[1]	1,730	1,750	1,754	1,692	62	3.7	35.0	32.0	169.00
Nigeria[1]	1,900	1,840	1,982	2,188	–206	–9.4	80.0	70.0	383.00
Sudan	480	480	480	462	18	3.9	—	—	—
Tunisia	78	79	80	98	–17	–17.9	1.7	3.7	24.63
Other Africa	217	217	217	218	–1	–0.5	9.1	8.7	44.40
Africa	**9,244**	**9,187**	**9,327**	**9,182**	**145**	**1.6**	**546.2**	**524.7**	**2,702.46**
Bahrain	170	170	170	171	–2	–1.1	25.0	24.0	119.88
Iran[1]	3,640	3,930	3,928	3,916	12	0.3	280.0	300.0	1,480.00
Iraq[1]	2,510	2,400	2,412	1,956	456	23.3	20.0	19.0	95.20
Kuwait[1,2]	2,635	2,600	2,597	2,409	188	7.8	40.0	38.0	193.00
Oman	720	710	722	720	2	0.3	60.0	55.0	288.00
Qatar[1]	850	830	844	798	46	5.8	170.0	165.0	835.00
Saudi Arabia[1,2]	9,065	8,920	8,993	8,491	502	5.9	220.0	210.0	1,075.00
Syria	380	380	386	392	–6	–1.5	18.0	17.0	88.00
United Arab Emirates[1]	2,660	2,650	2,636	2,566	70	2.7	135.0	130.0	665.00
Yemen	310	310	314	350	–36	–10.3	—	—	—
Other Middle East	—	—	—	—	—	–47.7	9.3	9.4	52.25
Middle East	**22,940**	**22,900**	**23,002**	**21,770**	**1,232**	**5.7**	**977.3**	**967.4**	**4,891.33**
Australia	448	453	426	447	–21	–4.8	116.1	111.4	544.90
Brunei	153	147	166	186	–19	–10.4	31.9	31.6	172.54
China	3,821	3,761	3,779	3,763	16	0.4	257.9	217.9	1,194.90
India	698	676	682	687	–5	–0.8	89.7	86.8	427.29
Indonesia[1]	860	860	860	848	12	1.4	200.0	190.0	980.00
Japan	15	16	18	18	—	0.9	9.4	10.6	57.27
Malaysia	750	760	766	744	22	3.0	150.0	145.0	735.00
New Zealand	64	62	62	19	43	227.7	14.0	13.0	61.90
Pakistan	69	66	67	66	1	1.9	122.9	120.4	618.67
Papua New Guinea	42	42	43	50	–7	–14.0	1.0	0.9	4.80
Thailand	236	226	221	211	11	5.1	44.0	44.0	225.00
Viet Nam	280	280	294	324	–30	–9.3	15.5	15.0	74.50
Other Asia-Pacific	30	30	31	36	–5	–13.9	97.5	95.3	483.47
Asia-Pacific	**7,464**	**7,380**	**7,415**	**7,399**	**16**	**0.2**	**1,150.0**	**1,081.9**	**5,580.24**
TOTAL WORLD	**73,163**	**72,863**	**73,352**	**72,427**	**925**	**1.3**	**8,933.2**	**8,869.6**	**45,853.65**
OPEC	32,034	31,912	32,178	30,257	1,921	6.3	1,541.0	1,500.0	7,651.80
North Sea	4,058	3,930	3,996	4,304	–309	–7.2	582.9	629.6	3,348.03

[1]OPEC member. [2]Kuwait and Saudi Arabia production each include half of Neutral Zone. Totals may not add due to rounding.
Source: Oil & Gas Journal. Data available in OGJ Online Research Center.

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Doha's collapse will cut energy use the hard way

The Editor's Perspective

by Bob Tippee, Editor

Adherents of the minimalist approach to energy consumption have much to cheer in the collapse July 29 of the Doha Round of trade negotiations.

After all, anything that suppresses economic activity also crimps the use of energy and whatever environmental consequences come with it. To the minimalist camp, every reduction in the use of energy, especially hydrocarbon energy, advances humanity. Failure of the Doha Round negotiations, over a special safeguard mechanism in farm products for developing countries, will suppress economic activity.

That doesn't have to mean disaster. During most of the nearly 7 years since the Doha Round began, trade has flourished, and the global economy has mostly expanded.

A world trade agreement is neither essential to trade nor the only type of agreement possible. Doha's collapse doesn't preclude new regional or bilateral deals.

Furthermore, as World Trade Organization officials were quick to assert, the latest stalemate doesn't mean the round is finished. The outlook, though, isn't cheery. If anything, protectionism, especially involving farm products, is hardening.

China and India, with growing populations beginning to reap the fruits of industrialization, have received blame for holding fast to their farm subsidies. But Europe and the US were hardly magnanimous in this area.

In the US, in fact, Congress seems to have turned hostile toward trade in general and farm trade in particular. Earlier this year, it overrode a veto of a farm bill loaded with subsidies and blocked a trade agreement with Colombia using a rules change that has hurt US creditability on trade issues.

While a stalled Doha Round need not be disastrous for the global economy, it surely won't help. Trade benefits economies and fosters development. An agreement lowering barriers would boost trade and thus stimulate economies.

So even if the world's economic system stays healthy without a successful and fair outcome from the Doha Round and despite high energy prices and other troubles, it's reasonable to think it would have become healthier with one.

That's one way to conserve energy. But it's a tough way. Ask anyone who's chronically hungry.

(Online Aug. 1, 2008; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

July was bad for oil

US crude dropped $15.92/bbl in July for the biggest dollar loss in a single month since it began trading on the New York Mercantile Exchange. On July 31, benchmark US light, sweet crudes fell more then 2% to $124.08/bbl, marking "the worst month for oil (in percentage terms) since December 2004, though oil is still up 29% year-to-date," said analysts in the Houston office of Raymond James & Associates Inc.

"US gasoline demand is down an alarming 3.5% this year, though the global demand picture still looks brighter," said Raymond James analysts. However, Paul Horsnell, Barclays Capital Inc., London, said the oil market has been "behaving fairly rationally and efficiently" in recent months. "Having first gone through something of a short-run overshooting of prices in the wake of supportive news flow and some temporary market dynamics, an efficient correction has been made. The move back down in prices has been orderly, not a bubble bursting, and is a gentle adjustment back to a price range whose potential long-term equilibrium has not really been subject to much in the way of investigation and testing."

Horsnell expects volatile oil prices through August due to geopolitical and economic pressures. Crude rebounded Aug. 1 after Israeli Deputy Prime Minister Shaul Mofaz said Iran may be nearing a breakthrough in its nuclear program, fanning fears of a preemptive strike by US or Israeli forces.

Iran did not respond to the Aug. 2 United Nations deadline to halt its nuclear program.

Prices will likely fluctuate in a fairly wide range before escalating again in coming months but are not likely to fall to a far lower trading range. "A large part of the reason for that is the global market balances. The demand side of the market does not seem to be quite as soft at the global level in reality as it currently is in market sentiment," Horsnell said

He sees temporary "demand reaction" to current high energy prices rather than the extensive demand destruction of the 1970s. Meanwhile, he said, "Non-OPEC supply is still the mouse that does not roar, and its trajectory is still disappointing relative to consensus expectations. Indeed, further down the line, we are increasingly coming to the conclusion that the potential pace of decline of non-OPEC supply after 2010 is likely to become a matter of some concern for the market."

The Energy Information Administration reported the first decline in US gasoline inventories in 5 weeks, down 3.5 million bbl to 213.6 million bbl in the week ended July 25. "The gasoline demand season is slowly coming to an end (vehicle miles drop seasonally in September)," said Olivier Jakob at Petromatrix, Zug, Switzerland. "Stocks of gasoline usually draw during the month of August, and based on normal patterns it should be expected to see further gasoline draws in the next 4 weeks."

Jakob said, "We usually do not pay much attention to the jet kerosine number [in the EIA weekly report], but jet demand [for] the 4 weeks is down 5.2% from a year ago and at the lowest level for that time of the year since 1998. Airlines had been grounding some of their capacity to offset the price increase of jet fuel, and this is starting to show up in the demand numbers and provides a strong increase in the days of cover for jet fuel."

Asian demand

For the first time this year, imports of crude into "the four main Asian countries"—China, Japan, India, and South Korea—were lower in June than for the same period a year ago, Japan's imports were reduced because of refinery maintenance and declining demand for petroleum products. Japanese domestic sales were down 5.5% from a year ago, including an 8.9% drop in gasoline sales. "Crude oil imports were still higher from a year ago in emerging Asia and for the first half of the year are in line with the increased refinery run levels," Jakob said. "India's oil product sales in June were officially reported up only 0.4% vs. a year ago, which is a first warning sign."

Jakob said, "The big question mark for the global supply and demand remains the levels of Chinese product imports once the closing ceremony of the Olympic Games is over."

He said, "Asian-4 refinery runs increased during June mainly due to an increase from China more than offsetting a drop in Japan and South Korea. Chinese imports of diesel reached a record high on Olympic stock-building while net imports of fuel were cut in half from May."

(Online Aug. 4, 2008; author's e-mail: samf@ogjonline.com)

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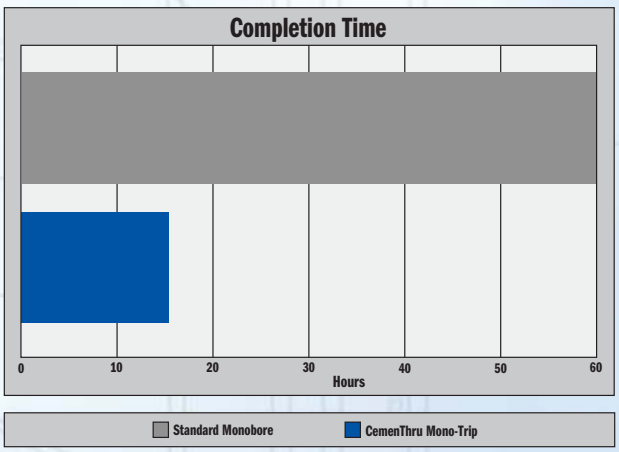

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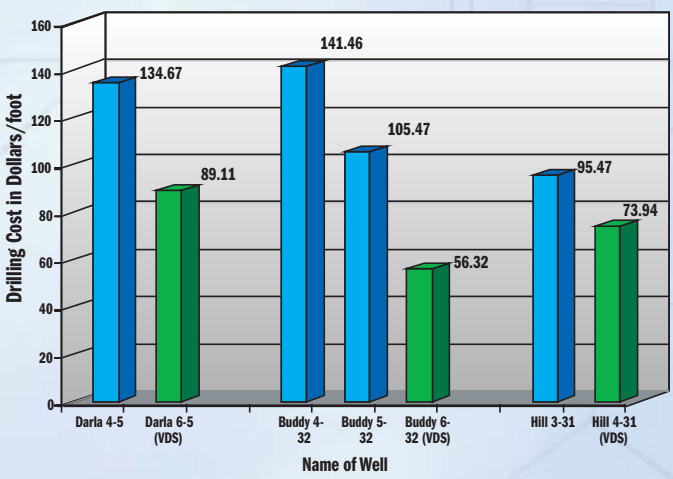

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