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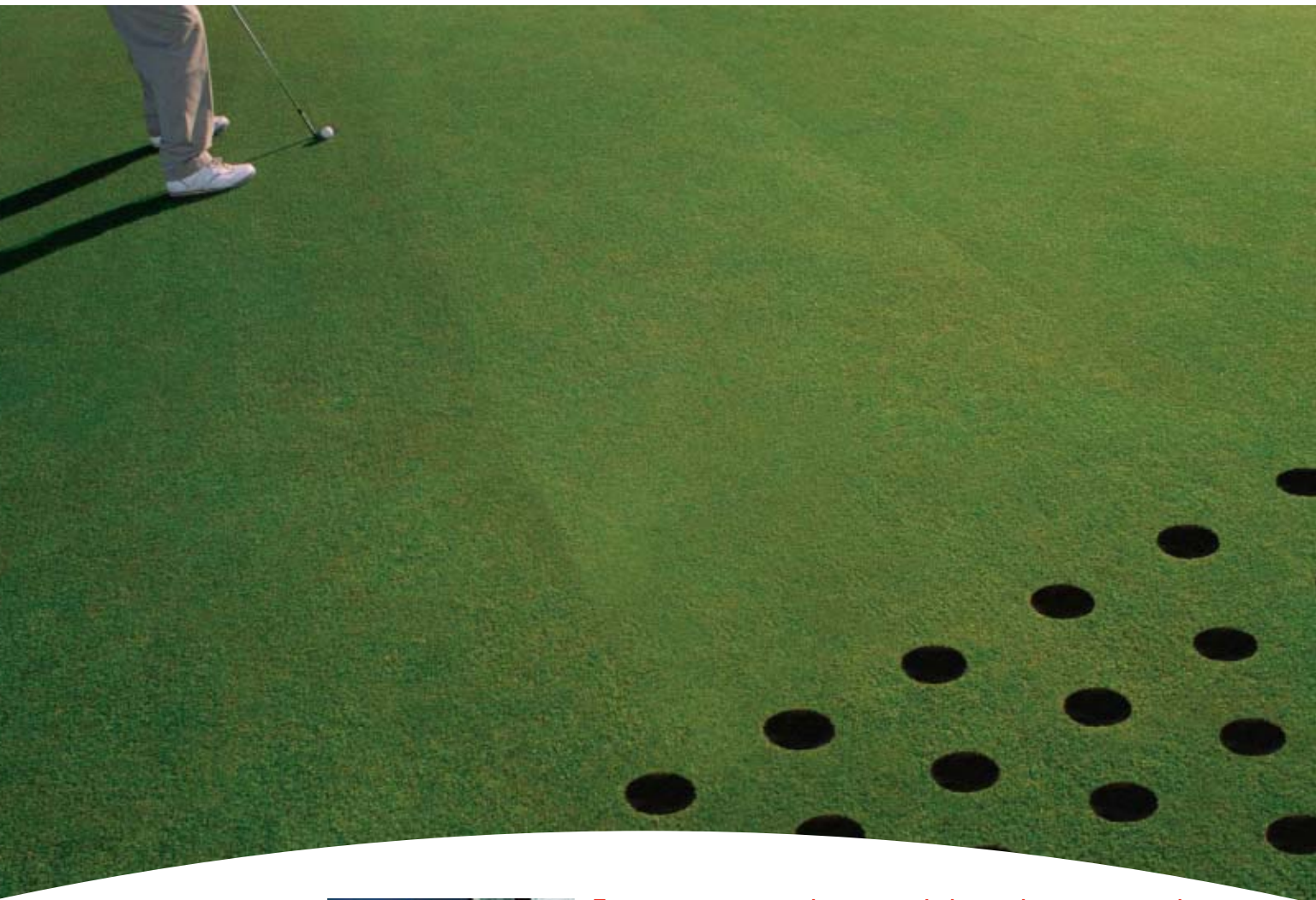
Offshore Technology Update

Loss categories, hazard types in marine operations described
Mathematical model forecasts year conventional oil will peak
US propane: Cold hits supply; markets shrug
LNG supply diversity cuts risk exposure

opportunity



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OIL&GAS JOURNAL®

May 7, 2007
Volume 105.17

OFFSHORE TECHNOLOGY UPDATE

REGULAR FEATURES

COVER

While general topics such as climate change and market instability received attention at the Offshore Technology Conference this year, the focus remained on technology. The cover shows some of the technologies receiving annual awards at the event. Shown are Weatherford's OverDrive System (left), Versabar Inc.'s Versabar Deck Raising System (right), and Halliburton Co.'s Honey Comb Base Tank System (center). OTC coverage begins on p. 20. Photos from Weatherford, Versabar, and Halliburton.

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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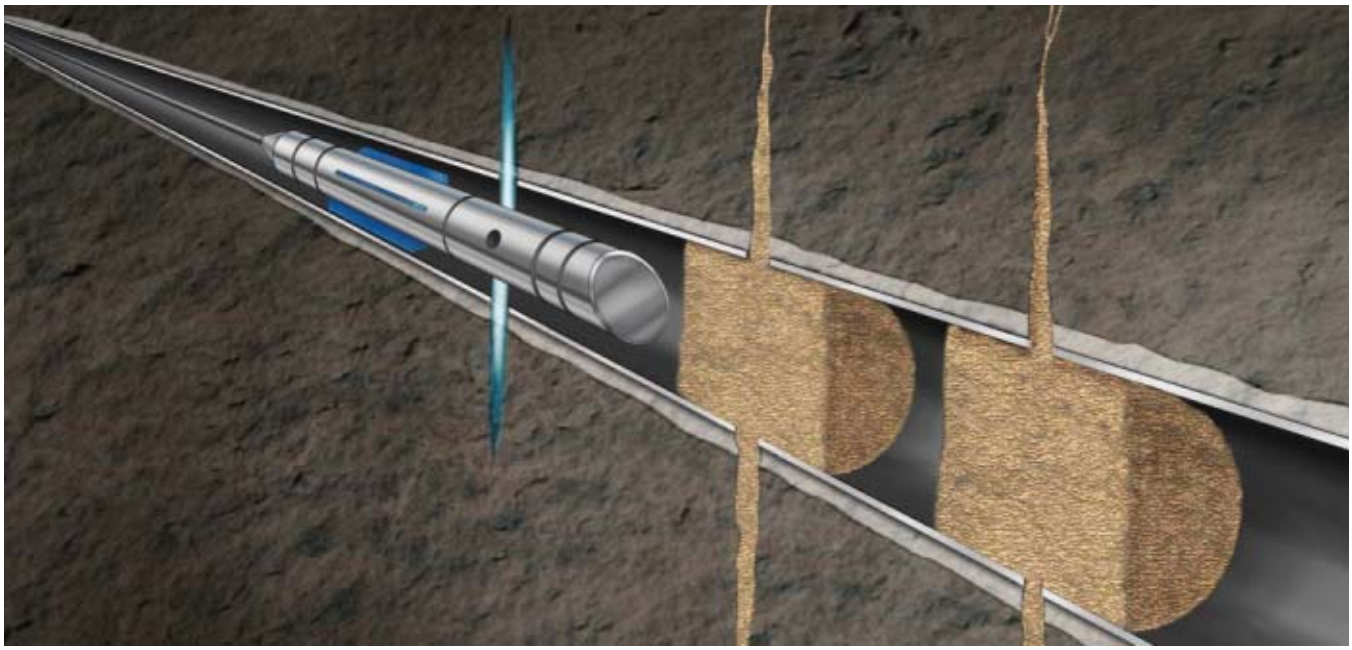

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Industry Challenge

- Improve sustained production
- Consistently create fractures in cased and cemented horizontal wellbores
- Optimize frac design
- Overcome flow-convergence issues, especially in near-wellbore region

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OGJ Newsletter

May 7, 2007

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General Interest — Quick Takes

Saudis, citing oil attack plans, arrest 172

Saudi Arabia's ministry of interior Apr. 27 announced the arrest of 172 Islamic militants it said were plotting to attack the country's oil installations.

Interior Ministry spokesman Brig. Mansour al-Turki said the militants had reached an advanced stage of readiness. He said that, apart from setting the exact time, the militants had the personnel, money, arms, and all the necessary elements for terror attacks.

The ministry, in a statement read on state television, said police seized weapons and more than 20 million riyals ($7 million) in cash from seven armed cells.

"Some had begun training on the use of weapons, and some were sent to other countries to study aviation in preparation to use them to carry out terrorist operations inside the kingdom," the statement said.

"One of their main targets was to carry out suicide attacks against public figures and oil installations and to target military bases inside and outside [the country]," it said.

Regarding the latest arrests, al-Turki said, "It is obvious that the deviant group is still trying to revive its criminal activities in the kingdom."

Chinese oil workers released in Ethiopia

Seven Chinese workers kidnapped by members of the Ogaden National Liberation Front (ONLF), who attacked a Chinese oil company operating in Ethiopia, have been released, the Chinese Foreign Ministry said (OGJ Online, Apr. 27, 2007).

Earlier, a spokesman for the International Committee of the Red Cross in Ethiopia said the men had been released on Apr. 29 but declined to provide other details. He said the ICRC would transport the men to a safe location before handing them over to Ethiopian and Chinese authorities.

The Chinese ministry said survivors of the ONLF attack, along with bodies of victims, were flown back to their hometown in central China's Henan Province.

The ONLF launched its attack on Apr. 24, killing 65 Ethiopian and nine Chinese workers at the Abule exploration site in Degeh Bur Zone in eastern Ethiopia and kidnapping the seven Chinese and two Ethiopian workers.

The ONLF, which said all of those held were in good health and had been treated well, includes ethnic Somalis from Ethiopia's eastern Ogaden region who claim to be fighting for self-determination.

NGSA: US gas producers' costs nearly triple

US natural gas producers' costs have nearly tripled since 2003 because of growing finding and production costs, reported Natural Gas Supply Association Chairman Chris Conway Apr. 26.

"A combination of increasing activity along with higher per-unit service and technology rates led US producers to spend about $156 billion last year alone in response to continuing tight supply," said Conway, who also is president of gas and power at ConocoPhillips.

"Compared to the $56 billion spent in 2003, that's an increase of almost 200%," he added during a Canadian Embassy briefing with the Canadian Association of Petroleum Producers.

While some costs are coming down from peaks reached following Hurricanes Katrina and Rita, Conway said, expenses remain high as more unconventional supplies are tapped. International competition for offshore rigs, deeper resource recovery levels, and a growing onshore fleet also are contributing, he said.

US gas well completions, nevertheless, were a record 31,587 during 2006, according to an analysis performed for NGSA by ICF International's unit EEA Inc. The number of onshore rigs drilling for gas doubled from 2003 to more than 1,400, it added.

Domestic gas reserves increased to 196 tcf at yearend 2005 from 158 tcf in 1999, the analysis said. Gas reserves in shale, tight sands, and coalbed formations climbed to 19.9 tcf in 2005 from 18.4 tcf in 2004, it indicated.

Conway said the US gas reserve changes during 2004-05 show that most of the increase in the Lower 48 states came from shale and tight sands formations. "The Rockies and eastern Texas dominate recent tight-sand reserve additions," he said. "The Barnett play in northern Texas dominates shale-gas reserves."

Baker Hughes to pay $44 million to settle charges

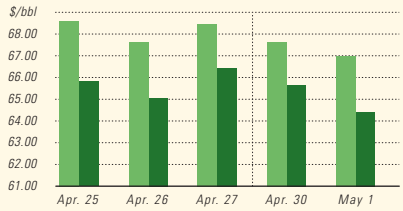
Baker Hughes Inc. and a subsidiary agreed to pay more than $44 million in fines to settle federal charges that it and one of its employees violated the Foreign Corrupt Practices Act, said the US Department of Justice and the Securities and Exchange Commission on Apr. 26.

The combined fines and penalties are the largest sanction so far in an FCPA case, the two federal agencies said. The charges stemmed from allegations that Baker Hughes Services International Inc. (BHSI) and one of its employees paid more than $4 million in bribes over 2 years to an intermediary that the company believed would relay the payments to a Kazakhstan national oil company official. Separate SEC charges alleged additional FCPA violations by Baker Hughes in Nigeria, Angola, Indonesia, Russia, Uzbekistan, and Kazakhstan.

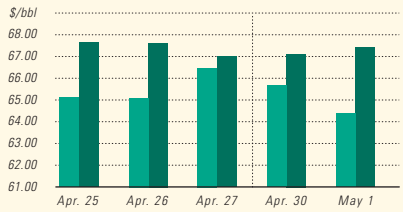
BHSI pleaded guilty in federal district court in Houston to violating the FCPA's antibribery provisions, conspiracy to violate the FCPA, and aiding and abetting falsification of its parent company's records. It simultaneously entered into a deferred prosecution agreement with DOJ and accepted responsibility for its employees' conduct.

Industry Scoreboard

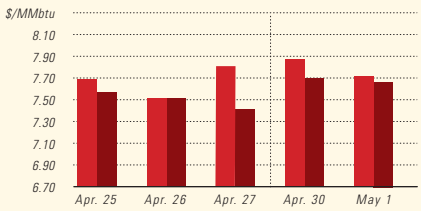
IPE BRENT / NYMEX LIGHT SWEET CRUDE



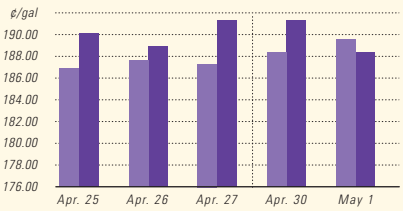
WTI CUSHING / BRENT SPOT



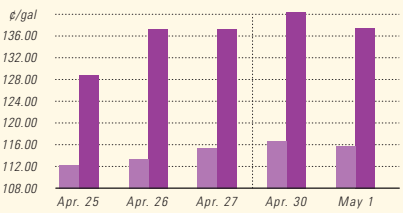
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



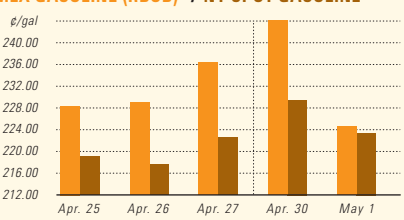
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



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



[1]Reformulated gasoline blendstock for oxygen blending
[2]Nonoxygenated regular unleaded.

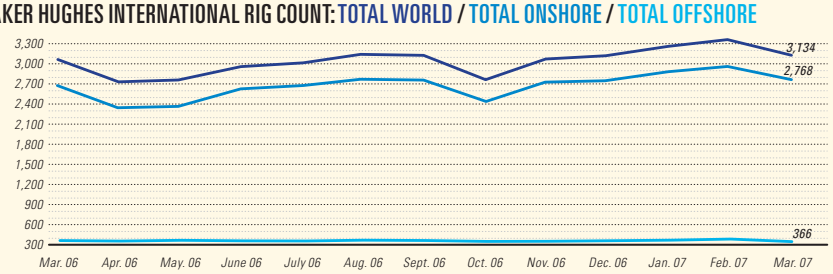
US INDUSTRY SCOREBOARD — 5/7

Latest week 4/27	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	9,221	9,139	0.9	9,123	8,958	1.8
Distillate	4,214	4,084	3.2	4,387	4,257	3.0
Jet fuel	1,554	1,644	–5.5	1,603	1,571	2.1
Residual	754	687	9.8	751	786	–4.5
Other products	4,857	4,646	4.5	4,976	4,754	4.7
TOTAL DEMAND	20,599	20,200	2.0	20,840	20,326	2.5
Supply, 1,000 b/d						
Crude production	5,172	5,065	2.1	5,262	5,045	4.3
NGL production	2,419	1,727	40.0	2,420	1,695	42.8
Crude imports	9,811	9,800	0.1	9,722	9,804	–0.8
Product imports	3,352	3,512	–4.6	3,154	3,469	–9.1
Other supply[2]	989	1,205	–17.9	947	1,192	–20.5
TOTAL SUPPLY	21,742	21,309	2.0	21,505	21,204	1.4
Refining, 1,000 b/d						
Crude runs to stills	14,819	14,924	–0.7	14,656	14,727	–0.5
Input to crude stills	15,272	15,302	–0.2	15,095	15,076	0.1
% utilization	88.1	88.0	—	87.1	86.8	—

Latest week 4/27	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	344,794	339,428	5,366	346,861	–2,067	–0.6
Motor gasoline	198,293	198,505	–212	206,527	–8,234	–4.0
Distillate	119,678	116,754	2,924	114,632	5,046	4.4
Jet fuel	39,644	39,482	162	41,333	–1,689	–4.1
Residual	39,466	40,253	–787	40,477	–1,011	–2.5
Stock cover (days)[3] **4/20**			**Change, %**		**Change, %**	
Crude	22.1	22.0	0.5	23.4	–5.6	
Motor gasoline	20.8	21.0	–1.0	22.0	–5.5	
Distillate	27.2	27.0	0.7	28.5	–4.6	
Propane	23.0	22.8	0.9	31.5	–27.0	
Futures prices[4] **4/27**			**Change**		**Change**	**Change, %**
Light sweet crude, $/bbl	65.49	62.86	2.63	72.20	–6.71	–9.3
Natural gas, $/MMbtu	7.64	7.46	0.17	7.07	0.57	8.0

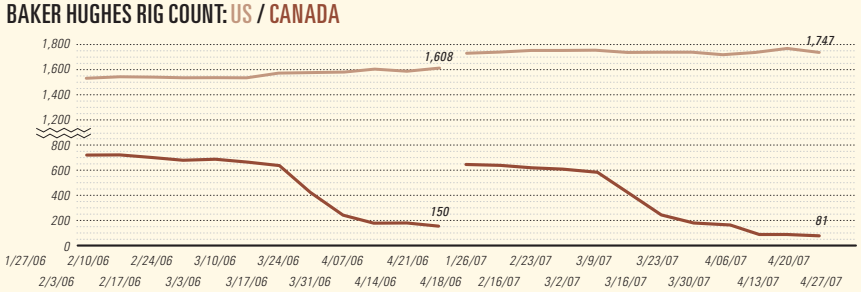
[1]Based on revised figures. [2]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil.
[3]Stocks divided by average daily product supplied for the prior 4 weeks. [4]Weekly average of daily closing futures prices.
Sources: Energy Information Administration, American Petroleum Institute, 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

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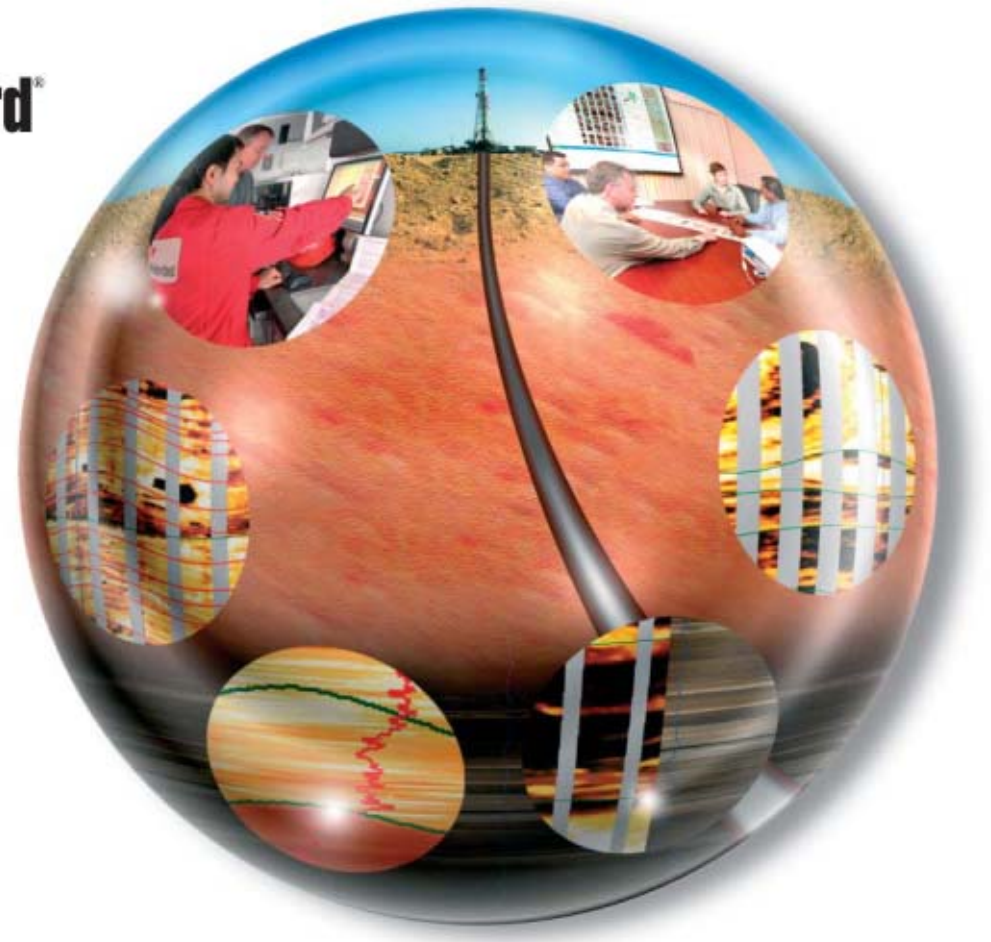

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BHSI agreed to pay an $11 million criminal fine, serve 3 years of organizational probation, and adopt a comprehensive antibribery compliance program, DOJ said. In related charges, SEC said, Baker Hughes agreed to pay $10 million in civil penalties and more than $23 million in disgorgement and prejudgment interest.

SEC said it also charged Roy Fearnley, a former business development manager for Baker Hughes, with violating the FCPA and aiding and abetting violations of the act. It said Fearnley has not reached a settlement with the commission.

DOJ said BHSI submitted a bid in February 2000 on behalf of Baker Hughes to perform project management, oil drilling, support, and other services as four international oil companies and Kazakhoil developed Karachaganak oil field in Kazakhstan.

Soon after, Kazakhoil demanded that Baker Hughes pay a commission to an Isle of Man consulting firm, which supposedly was the national oil company's agent. Although the consulting firm performed no services for Baker Hughes, BHSI agreed in September 2000 to pay it an amount equal to about 2% of its revenue on the Karachaganak project and 3% on future projects in Kazakhstan.

BHSI was awarded the contract the following month, DOJ said. From May 2001 through November 2003 it paid $4.1 million in commissions to the consulting firm's account in a London bank from a BHSI account in Houston, the federal agency said.

Baker Hughes and BHSI voluntarily disclosed the violations and cooperated in investigations of the allegations and implementation of reforms, DOJ and SEC said.

China's crude exports fall as imports rise

China's rising demand for oil is slashing the country's oil exports and boosting imports, according to statistics released by the General Administration of Customs.

The agency reported an 83.2% year-on-year decline in oil exports and an 8.8% rise in imports for March.

Cao Xiaoxi, chief engineer of Sinopec's Economic and Development Research Institute, said the figures reflect a 5% tariff aimed at discouraging export trade. "It's a long-term, clear policy to rein in crude and oil product exports," Cao said.

The outlook for imports is unclear.

Niu Li, an economist with the State Information Center affiliated with China's top economic planner, the National Development and Reform Commission, said there is no guarantee that oil imports will rise this year. He said high global oil prices would dampen local demand.

In March, China exported 218,988 tonnes of oil. In February it exported no oil, while January exports stood at 300,000 tonnes.

During the next 2-3 months, Chinese demand gains against year-earlier levels are projected at 6% for diesel, 6.5% for gasoline, 5.5% for kerosine, and 20% for naphtha. ✦

Exploration & Development — *Quick Takes*

BP makes 13th oil find on Angola's Block 31

BP Exploration (Angola) Ltd. has made an oil discovery on ultradeepwater Block 31 off Angola. The Miranda find is the company's 13th discovery to date on the block.

Miranda flowed on test at 3,822 b/d through a $^{48}/_{64}$-in. choke. The well is 11 km south of the recently announced Titania discovery made earlier this year (OGJ Online, Jan. 30, 2007).

The Jack Ryan drillship drilled in 2,436 m of water 375 km northwest of Luanda, and reached 5,116 m TVD subsea.

Block 31 spans 5,349 sq km in 1,500-2,500 m of water.

Sonangol is the concessionaire of Block 31 and holds 20% interest. BP holds 26.67% and its partners are Esso Exploration & Production Angola (Block 31) Ltd. 25%, Statoil Angola AS 13.33%, Marathon International Petroleum Angola Block 31 Ltd. 10%, and Total SA unit Tepa (Block 31) Ltd. 5%.

Indonesia well confirms 1974 Kutei gas find

Aabar Petroleum Investments Co. PJSC, Abu Dhabi, gauged gas at the Makassar Straits-4 well on the 5,920 sq km Sebuku production-sharing contract, confirming for the second time a 1974 Ashland Petroleum discovery off East Kalimantan.

MS-4, TD 5,367 ft, cut 279 ft of net gas pay in a single reservoir and a total of 318 ft of gross gas pay. MS-4 and the earlier MS-1 well 1.2 km east proved a combined 618 ft gas column.

MS-4 flowed 16 MMcfd and 23 MMcfd, respectively, on two drillstem tests. The company said the strong flow rates confirm excellent reservoir properties in the Lower Miocene Upper Berai carbonate zone.

The drillship is moving to the MS-3 location 2.75 km south of MS-1.

Aabar, through its wholly owned subsidiary PearlOil (Sebuku) Ltd., is operator with 50% participating interest. It will hold 100% interest after acquiring the other interest from its former partner, subject to government approval.

Drilling nears in Colorado's San Luis basin

Lexam Explorations Inc., Toronto, is awaiting interpretation of the first 3D seismic survey in the San Luis basin of Colorado to determine whether to proceed with drilling of two permitted wildcats in the nonproducing basin.

The Colorado Oil & Gas Conservation Commission approved permits to drill two 14,000 ft wildcats on the company's Baca project to test primarily for gas in Cretaceous Dakota, estimated to be 50-120 ft thick with 15-21% porosity in the target area. Gas in the Lower Tertiary section is a secondary objective (OGJ, Sept. 1, 1997, p. 78).

Interpretation results of the 25-sq-mile survey are expected in mid-May. Lexam holds 75% interest and ConocoPhillips 25% in more than 100,000 acres 45 miles southwest of Florence oil field. Completed well cost for the two holes is estimated at $21 million.

Eni acquires, will operate license off Congo

Eni SPA will operate 1, 103 sq km of new exploration acreage off Congo (Brazzaville) following the signing of the new license with the Congolese authorities. The permit is 15 km offshore in 20-50 m of water.

Eni said the acreage, Marine XII, has proved oil reserves, which it did not define, and potential for gas and condensates, which will

be developed through an integrated gas-to-power project. Eni will build a 300-450 Mw power plant near the Djeno terminal that it said would contribute "to enhancing the power and reliability of the local electrical system."

Eni will have 90% stake in the license area and will work with Société Nationale des Pétroles du Congo, which holds the remaining 10%. The partners will shoot a 3D survey.

Eni also has increased its acreage in Brazzaville through the recent acquisition of the onshore M'Boundi field and other assets for $1.4 billion (OGJ Online, Feb. 23, 2007). That deal covers Maurel & Prom's 48.6% interest in M'Boundi oil field; 66% interest in Kouakouala A oil field; 50% interest in the Kouakouala B, C, and D production concession; and a 50% interest in the Kouilou exploration permit, in which the seller will retain 15%. ✦

Drilling & Production — *Quick Takes*

Chevron shuts down Nigeria production after attack

Chevron Corp. has shut down 15,000 b/d of oil production in Nigeria after one Nigerian sailor was killed and six foreign oil workers were kidnapped by members of the militant group Movement for the Emancipation of the Niger Delta (MEND), who attacked Chevron's Oloibiri floating production, storage, and offloading vessel off southern Bayelsa State on May 1.

A Chevron spokesperson said the firm had shut down the production from Funiwa oil field to avoid any additional security or safety incidents following the attack. The FPSO supports the Funiwa oil field.

MEND spokesman Jomo Gbomo said the hostages would be released on May 30, if oil companies and Bayelsa State government officials made no attempt to secure their release or offered ransom money.

Gbomo, who warned that such offers would be viewed as a "slight" and would "worsen the situation of these hostages," identified the men as Raffele Pascariello, Alfonso Frawza, Ignazio Gugliota, Mario Celetano, John Stapleton, and Juricha Ruis.

Gbomo said the attack on Chevron's facilities should also be interpreted as a warning to Royal Dutch Shell PLC, which has recently returned to fields in Bayelsa and Delta states earlier attacked by MEND. MEND is fighting for more local control over the Niger Delta's oil wealth.

Sakhalin-1 partners drill record ERD Well

Exxon Neftegas Ltd. (ENL) reported the completion of drilling of the Z-11 well on Sakhalin Island off Eastern Russia to a total measured depth of 37,016 ft—the world's longest measured depth extended-reach drilling (ERD) well, according to parent company ExxonMobil Corp.

The Z-11 well is the 17th ERD producing well to be completed as part of the multiphase Sakhalin-1 project. It was drilled in 61 days, more than 15 days ahead of schedule, and below expected cost with no safety or environmental incidents, ExxonMobil said.

The Sakhalin-1 project includes Chayvo field, which lies 5-7 miles offshore. The Z-11 well was drilled to the Chayvo reservoir from the Yastreb rig—the world's largest land-based drilling rig, ExxonMobil said. Chayvo field reached its peak production rate of 250,000 b/d of oil in February after startup in October 2005.

Since the first Sakhalin-1 well was drilled in 2003, the time required to drill these world-class wells has been reduced by more than half, ExxonMobil said.

ENL holds 30% interest in the Sakhalin-1 project and serves as operator. Other partners are Japan's Sakhalin Oil & Gas Development Co. Ltd. 30%, Rosneft units RN-Astra 8.5% and Sakhalinmorneftegas-Shelf 11.5%, and India's ONGC Videsh Ltd. 20%.

Oil flow starts from field off Indonesia

Indonesia 's upstream oil and gas regulator BP Migas said Hess Corp. has begun producing oil from Ujung Pangkah field in the Java Sea off East Java ahead of the original schedule (OGJ Online, Aug. 13, 2004).

BP Migas Deputy Chief Dodi Hidayat said flow started in April from the field, originally expected to start producing in 2009.

Production of 1,600 b/d of crude oil is transported by shuttle tanker to a storage facility in Tuban, East Java. ✦

Processing — *Quick Takes*

Total to pay fine, upgrade Port Arthur plant

Total Petrochemicals USA Inc. agreed to pay $2.9 million in fines and upgrade pollution controls at its 240,000 b/d Port Arthur, Tex., refinery to settle federal charges that it violated the Clean Air Act, the US Department of Justice and the Environmental Protection Agency said May 1.

The Total SA subsidiary agreed to make $37 million of changes designed to reduce the plant's sulfur dioxide emissions by more than 800 tons/year, nitrogen oxides by more than 180 tons/year, and carbon monoxide by more than 120 tons/year, the federal agencies said.

Total also agreed to upgrade leak detection and repair practices, to adopt strategies to ensure the proper handling of benzene wastewater, and to implement programs to minimize the flaring of hazardous gases.

The settlement is the first for a US refinery to include fixed penalties for the flaring of hydrocarbon gases, according to EPA. Under the agreement, penalties will apply to future flaring at the plant of both acid gas and hydrocarbon gases that contain hydrogen sulfide and sulfur dioxide.

Total also agreed to install a supplemental environmental project in which it will install new infrared cameras to detect equipment leaks, EPA said. Such leaks may contain emissions which contribute to ground-level ozone and smog.

Sinopec JV plans Chinese chemical plant

Sinopec Zhenhai Refinery & Chemical has established a 4.44 billion yuan venture with Lyondell Chemical Co. to construct a

propylene oxide-styrene monomer (POSM) manufacturing facility in Ningbo, China, across Hangzhou Bay from Shanghai.

The plant will produce 274,000 tonnes/year of propylene oxide and 602,000 tpy of styrene under an agreement that also will allow SZRC to tap into Lyondell's POSM technology.

Feedstock will come from an SZRC plant now under construction that will be capable of producing 1 million tpy of ethylene. A Sinopec spokesman said the project is 75% owned by SZRC and 25% by Lyondell.

Lyondell said it will contribute POSM technology and overall operating and technical experience in exchange for a share of the propylene oxide (PO) profitability from the plant. It said the two partners will jointly market all PO manufactured by the new facility, which is due for completion in 2009.

China's National Development and Reform Commission wants to more than double the country's ethylene output capacity. It plans a 4.38 million-tonne increase by upgrading existing plants and a further 6.2 million-tonne increase through construction of new facilities.

China produced 7.55 million tonnes of ethylene in 2005.

Sonatrach lets EPC contract for Arzew LPG trains

Algeria's Sonatrach signed an engineering, procurement, and construction contract Apr. 22 with Japan's Ishikawajima-Harima Heavy Industries Co. and Itochu Corp. for the construction of three separation trains at the GP1/Z liquefied petroleum gas plant within the Arzew industrial complex in western Algeria.

The project, due for completion by September 2010, includes the three LPG trains having a separation capacity of 1 million tonnes each and two temperature-controlled product stocking jigs, each with a capacity of 70,000 cu m.

The plants will have a total capacity of 3 million tonnes/year of commercial propane and butane and will be integrated into the Arzew complex at Oran. They will be supplied by Sonatrah's LPG terminal in Béthioua.

Suncor starts maintenance at Sarnia refinery

Suncor Energy Products Inc., Calgary, said it will begin planned maintenance Apr. 25 at its 70,000 b/cd refinery in Sarnia, Ont.

The work, which will start on the refinery's alkylation and catalytic cracker units, is expected to be complete in June.

The refinery's hydrocracker unit also is scheduled to be shut down for about 8 weeks, beginning in August, to complete modifications designed to enable the refinery to process sour crude from the company's oil sands operation.

Throughout the shutdown periods, certain sections of the refinery will continue production. Suncor said it has made supply preparations and expects to meet all customer supply agreements. ✦

Transportation — *Quick Takes*

Shell plans LNG terminal at Fos-sur-Mer

Shell Energy Europe plans to build an LNG regasification terminal at Fos-sur-Mer on southeastern France's Mediterranean coast. Shell signed an agreement with Port of Marseille authorities for the project, which will have an initial capacity of about 8 billion cu m/year in the first stage. Costs have not yet been disclosed.

The terminal will not be operational before 2015, considering the many authorizations needed, said Shell France spokeswoman Mathilde Nithard.

The regasification terminal would have the same capacity as the Fos Cavaou terminal that Gaz de France and Total ASA expect to have on stream at yearend near the site of Shell's planned terminal. Both plants are larger than Gaz de France's existing terminal at Fos-sur-Mer.

Surprisingly, the project was announced barely a month after a CGT strike that blocked the Fos-sur-Mer hydrocarbon terminal for more than 2 weeks in March, costing refineries in the area about €25 million (OGJ, Apr. 9, 2007, Newsletter).

At the time, the strike seemed likely to discourage further area investments, but Shell's project timetable allows time for things to change, Nithard pointed out.

Shell's regasification terminal is the last in a list of such projects recently announced for France's coasts. ExxonMobil a year ago had a similar project in view at Fos but has since abandoned it.

China-Myanmar oil line funded; gas line planned

China's National Development and Reform Commission has approved funds for an oil pipeline between China and Myanmar. Construction is expected to start this year.

Official reports said the line will link Myanmar's deepwater port of Sittwe with Kunming, the capital of China's southwestern Yunnan Province. Myanmar also will receive a Chinese government loan of some $83 million to develop its oil resources.

Further reports said China also will invest 8 billion yuan ($1 billion) to build a 2,380-km natural gas pipeline linking Myanmar with Kunming.

Jamaica to put out bids for floating LNG terminal

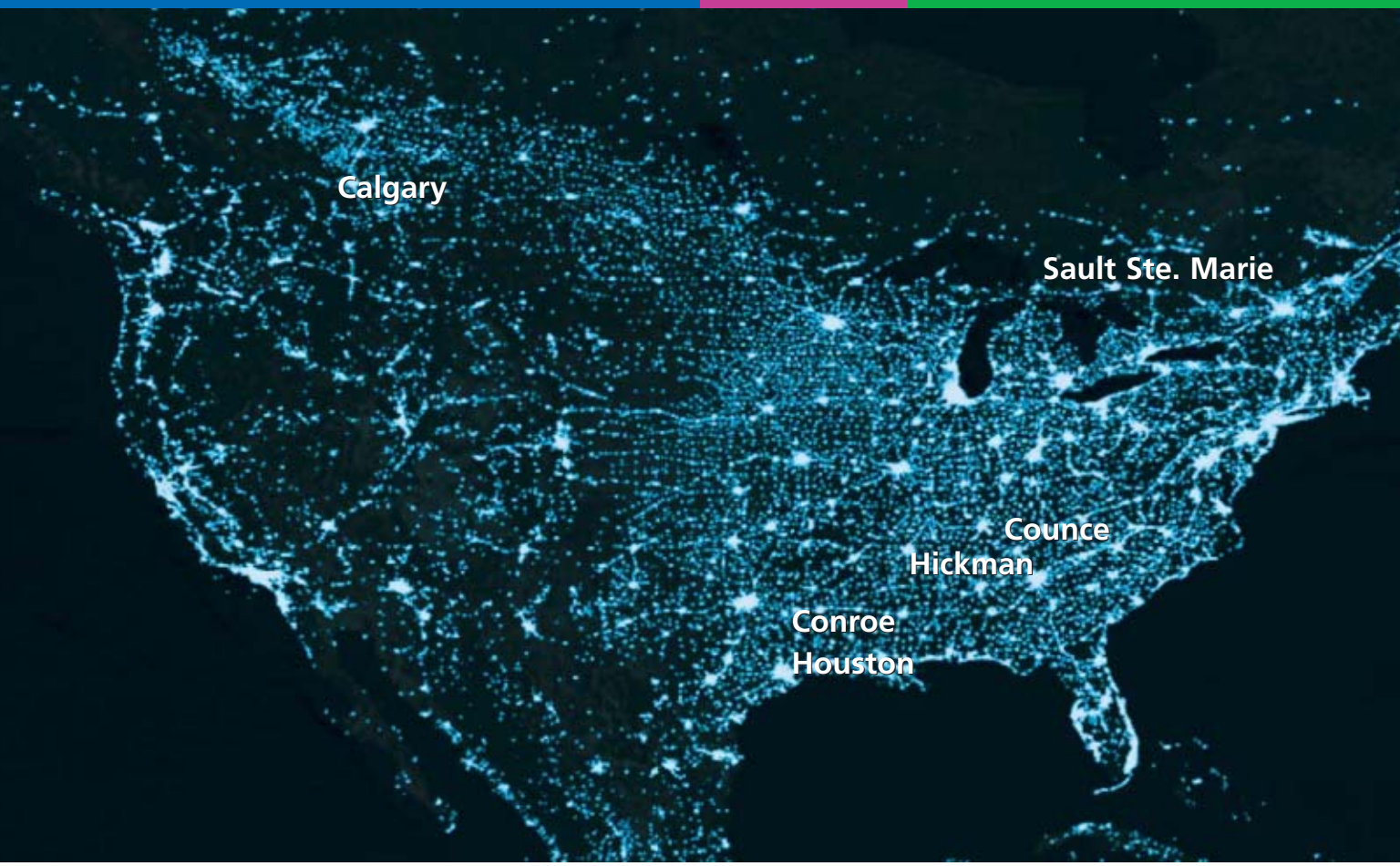
State-owned Petroleum Corp. of Jamaica has put out bids for a floating LNG terminal and is also seeking "bridging volumes of LNG" to facilitate its planned 2009 first receipt of LNG.

Jamaica has been trying to get LNG from Trinidad and Tobago and even signed a memorandum of understanding with the Caribbean island, but earlier this year the twin-island nation told Jamaica it would not be able to meet the 2009 start-up date because it does not have additional LNG available.

In the prequalification documents Jamaica said it appears that neither Trinidad and Tobago nor Venezuela can provide LNG by the start-up date.

The document reads, "It appears that LNG from either of these two sources (Trinidad and Venezuela) will not be available in time to meet the 2009 target for the first gas in Jamaica. Therefore the government of Jamaica is now seeking bridging volumes of LNG to facilitate the 2009 start up."

Jamaica will open bids on June 15 for the floating LNG terminal, which will now replace the $350 million regasification facility that was originally planned for Port Esquivel, Old Harbour. ✦



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Middle East Influence on Global Energy and Petrochemical Markets Conference, Manama, (281) 531-9966 (fax), website: www.cmaiglobal.com/EvConferences.aspx?eventid=Q6UJ9A008E3S. 7-9.

GPA Permian Basin Annual Meeting, Midland, Tex., (918) 493-3872, (918) 493-3875 (fax), website: www.gasprocessors.com. 8.

Annual Oil and Gas Pipelines in the Middle East Conference, Abu Dhabi, +44 (0) 1242 529 090, +44 (0) 1242 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.theenergyexchange.co.uk. 14-15.

AchemAsia Exhibition and Conference, Beijing, +49 (0) 69 7564 249, +49 (0) 69 7564 201 (fax), e-mail: achemasia@dechema.de, website: www.achemasia.de. 14-18.

International School of Hydrocarbon Measurement, Norman, Okla., (405) 325-1217, (405) 325-1388 (fax), e-mail: lcrowley@ou.edu, website: www.ishm.info. 15-17.

INTERGAS IV International Oil & Gas Conference & Exhibition, Cairo, +44 20 7978 0081, +44 20 7978 0099, e-mail: erenshaw@thecwcgroup.com, website: www.intergasegypt.com. 15-17.

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.ite-exhibitions.com. 15-17.

IADC Drilling Onshore America Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: info@iadc.org, website: www.iadc.org. 17.

ERTC Asset Maximization Computing and Reliability Conference, Rome, 44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 21-23.

Libya Oil & Gas Conference and Exhibition, Tripoli, +44 20 7978 0083, +44 20 7978 0099 (fax), e-mail: sshelton@thecwcgroup.com, website: www.cwclog.com. 21-24.

Asia Bottom of the Barrel Technology Conference & Exhibition, Kuala Lumpur, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: conferences@europetro.com, website: www.EuroPetro.com. 22-23.

NPRA Reliability & Maintenance Conference & Exhibition, Houston, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 22-25.

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tion, Nairobi, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com. 23-25.

Asia Petrochemicals and Gas Technology Conference & Exhibition, Kuala Lumpur, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: conferences@europetro.com, website: www.EuroPetro.com. 24-25.

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SPE European Formation Damage Conference, Scheveningen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. May 30-June 1.

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International Caspian Oil & Gas Exhibition & Conference, Baku, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: julia.romanenko@ite-exhibitions.com, website: www.caspianoil-gas.co.uk. 5-8.

International Liquefied Petroleum Gas Congress & Exhibition, Nice, 32 2 566 91 20 32 2 566 91 29 (fax), website: www.aegpl.com. 6-8.

Society of Petroleum Evaluation Engineers Annual Meeting, Vail, Colo., (713) 651-1639, e-mail: bkspee@aol.com, website: www.spee.org. 9-12.

PIRA Scenario Planning Conference, London, 212-686-6808, 212-686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 11.

Asian Petrochemicals & Gas Technology Conference & Exhibition, Kuala Lumpur, +44 (0) 20 7357 8394, e-mail: Conference@EuroPetro.com, website: www.europetro.com. 11-12.

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✦Health and Safety Excellence Conference, Barcelona, +420 257 218 505, +420 257 218 508 (fax), e-mail: healthandsafety@jacobfleming.com, website: www.jacobfleming.com. 12-13.

GO-EXPO Gas and Oil Exposition, Calgary, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 12-14.

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GazChem Conference, Port of Spain, +44 20 7903 2444, +44 20 7903 2432 (fax), e-mail: conferences@crugroup.com, website: www.britishsulphurevents.com/Gazchem07_prog.htm. 17-20.

Newfoundland Ocean Industries Association Conference, St. John's, Newf., (709) 758-6610, (709) 758-6611 (fax), e-mail: noia@noianet.com, website: www.noianet.com. 18-22.

Offshore Newfoundland Petroleum Show, St. John's, Newf., (403) 209 3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 19-20.

Brasil Offshore International Oil & Gas Trade Show & Conference, Macae, 55 11 3816 2227, 55 11 3816 2919 (fax), e-mail: contato@brasiloffshore.com, website: www.brasiloffshore.com. 19-22.

PIRA Scenario Planning Conference, Houston, 212-686-6808, 212-686-6628, e-mail: sales@pira.com. website: www.pira.com. 25.

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Journally Speaking

A Gulf of Mexico evolution

Nina M. Rach
Drilling Editor

After granting several individual exceptions, the US Minerals Management Service is establishing standard operating procedures for managed-pressure drilling (MPD) in the Gulf of Mexico.

With a shift toward deeper drilling, operators are examining all technologies to improve safety and control costs. Drillers need precise control over downhole pressures because of the narrowed window between downhole pore pressure and allowable hydrostatic pressure in the fluid column. Excess hydrostatic pressures can cause formation or "skin" damage, reduce productivity, and waste drilling fluids.

Operators say MPD facilitates exploration and development because it allows drilling not otherwise technically possible. MPD uses an equivalent mud weight that combines static mud weight, equivalent circulating density, and surface backpressure maintained at or generally above openhole pore pressure.

MPD allows controlled returns to surface. Proponents attest that the closed mud returns system is inherently safer than conventional systems that are open to the atmosphere. Closed, pressurized systems have become common on US land rigs.

There are several variations of MPD:

- Constant bottomhole pressure (BHP), in which the objective is to maintain a constant annular pressure profile, as covered in the proposed MMS guidelines.
- Pressurized mudcap drilling, used to prevent cross flow in fractured formations and lost-circulation zones.
- Dual-gradient MPD, in which a lighter fluid is injected into the annulus to change the hydrostatic head in part of the wellbore.
- Health, safety, and environment, in which the closed mud returns system prevents accidental exposure to hazardous gases.

Both underbalanced drilling and MPD are being implemented worldwide, as seen during 2 days of project reviews at the recent International Association of Drilling Contractors/Society of Petroleum Engineers Managed Pressure Drilling and Underbalanced Operations Conference in Galveston.

MMS notice

Fred Hefren of MMS gave an update on the proposed notice to lessees pertaining to MPD and discussed how permitting might be streamlined.

He said the MMS will continue to review MPD projects and use what it learns to establish policy, work with industry to develop standards and policies required to permit MPD, and continue to issue permits case by case until standards are approved.

Don Hannegan of Weatherford Controlled Pressure Drilling & Testing Services, SPE distinguished lecturer for 2006-07, told OGJ that the IADC MPD subcommittee and the Offshore Operators Committee (OOC) contributed materials to the MMS in an effort to avoid development of overly prescriptive regulations.".

Mike Conner, MMS section chief, told OGJ on Apr. 30 that the draft of the notice to lessees discussed in Galveston is being reviewed in Washington, DC, and that he expects it to be issued in 2-3 months. "Basically, what was presented in the draft is what engineers will use for guidelines" in applications for drilling permits, he said. Permitting would not change dramatically under the MMS initiative, although familiarity should speed approvals. MPD guidelines will need to be incorporated into drilling regulations.

MMS last issued revised drilling regulations in March 2003.

Four operators have applied for permits to use MPD in the gulf. Conner said only two have gone forward. Unocal used the constant BHP variation from a production platform south of Galveston. Shell Exploration & Production used a dynamic annular pressure control system to produce a constant BHP while drilling the Mars A-14 sidetracks from a tension-leg platform. Shell discussed the project in Galveston, calling the system a "promising new tool" for drilling narrow pore-pressure and fracture-gradient windows.

Research projects

In 2004, the Drilling Engineers Association sponsored DEA 155, which attracted funding from the MMS and is also known as Technology Assessment and Research Project 582, "A Probabilistic Approach to Risk Assessment of Managed Pressure Drilling in Offshore Drilling Applications."

Principal Investigator Ken Malloy of MOHR Engineering is leading this joint industry project involving operators, contractors, and regulatory bodies to develop cohesive MPD practices.

On Mar. 27, 2007, MMS issued a progress report for Project 582. Since the Houston kickoff meeting in May 2006, MOHR has listed and described MPD variations and has transferred MPD data from Gulf of Mexico drilling reports. MOHR is reviewing MPD drilling report data; writing risk-reliability practices; creating a common data exchange for consistency of various descriptions between operators; soliciting additional data; and creating a database.

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Editorial

Fuels and political favors

Political motivations for government action on renewable energy have roared into full view in the US. The sight isn't pretty.

Protests have emerged in Washington, DC, against a plan announced last month by ConocoPhillips and Tyson Foods Inc. to use animal fat in the production of ultralow-sulfur diesel fuel. The companies earlier secured a ruling by the Internal Revenue Service that their process qualifies for a $1/gal tax credit that the Energy Policy Act of 2005 (EPACT) created for diesel made via thermal depolymerization of waste oils and fats. They plan to process about 1 billion lb/year of fat with hydrocarbon streams at ConocoPhillips refineries, eventually producing as much as 175 million gal/year of what the oil company calls "renewable diesel."

The protest

Protesting lawmakers want to overturn the tax interpretation, which ConocoPhillips Chairman and Chief Executive Officer James Mulva says is essential to profitability of the venture with Tyson. According to the Houston Chronicle, Rep. Lloyd Doggett (D-Tex.) planned to introduce legislation correcting the "abuse." The IRS interpretation came after Rep. Roy Blunt (R-Mo.), sponsor of the thermal-depolymerization tax break, warned the agency against broadening the provision's scope. Changing World Technologies, West Hempstead, NY, uses thermal depolymerization and the tax break to make biodiesel from animal and other food wastes at a plant in Carthage, Mo., which is in Blunt's district.

The early-April IRS ruling angered the National Biodiesel Board, a trade group in Jefferson, Mo. "If Congress lets this stand," said Joe Jobe, the group's chief executive, "our government will be handing over US taxpayer money to some of the richest companies in the world, and it will not provide many of the benefits that the biodiesel tax incentive has given back to America." EPACT added the thermal-depolymerization credit while extending the $1/gal biodiesel incentive enacted in 2004. In a list of objections to the IRS ruling, the biodiesel group said, "The oil companies could put a stranglehold on materials used to make biodiesel, stunting the growth of the biodiesel industry."

In a business with plenty of room to grow, worry about "strangleholds" seems ingenuous. Biodiesel capacity in place at the beginning of this year amounted to 56,000 b/d, less than 2% of the US diesel market. ConocoPhillips plans to make, at most, 11,400 b/d of its renewable diesel. Where's the stranglehold? Or is this just a coddled industry wanting to avoid competition?

A larger question lurks in the dust-up. What does Congress really want from renewable energy?

The usual explanations—environmental benefits and displacement of foreign oil—are long past tiresome, usually exaggerated, and often wrong. To whatever extent they're valid, Congress should welcome energy from untraditional sources in whatever amounts it comes, whatever its source.

For too many lawmakers, though, the real motive is much different from those advertised. The real motive is to dispense political favors, such as tax credits and market guarantees for suppliers of uneconomic energy. With prices elevated for gasoline and diesel fuel—thanks partly to laws and regulations making both fuels much costlier than ever to produce—voters dislike political favors to oil companies. So when an oil company avails itself of an incentive for an activity Congress supposedly wants to encourage, it has committed "abuse."

Contradictions of purpose like this emerge whenever a government chooses fuels and decides who profits from the incentives it must concoct to bring costly energy to market. The inevitably political choices corrupt energy policy. They also cost too much.

Money machine

Another National Biodiesel Board objection to expansion of the thermal polymerization incentive is that it will become "an unanticipated drain on the US Treasury." This is unvarnished hypocrisy. It should make lawmakers who saw fit to turn energy policy into a magic money machine cringe. Better yet, it should make them confine the governmental role in energy to research and let markets do the rest. Renewable energy should develop efficiently and sustainably, which means competitively.

Most of all, Congress should quit fleecing Americans. Its manipulations are corroding the economy and the credibility of energy policy. ✦

OTC speakers see new era for the oil and gas industry

This report was reported and written by Judy R. Clark, senior associate editor; Paula Dittrick, senior staff writer; Uchenna Izundu, international editor; Steven Poruban, senior editor; Nina M. Rach, drilling editor; Guntis Moritis, production editor; and Angel White, associate editor.

The oil and gas industry has entered a new era characterized by diversity of energy supply, market uncertainty, and changing roles for oil companies, said speakers at the Offshore Technology Conference in Houston Apr. 30-May 3.

Among key elements of this new era are alternative energy sources subsidized by governments, increased concern about global climate change, soaring exploration and production costs, supply and demand uncertainties, and the need for maintaining price and market stability.

Those subjects received attention in several general sessions at the 2007 OTC, at which registration was expected at presstime last week to meet or surpass last year's 24-year high of 59,236.

In other sessions, speakers addressed technical advances and trends in the Gulf of Mexico as well as regional developments in Norway, Nigeria, Nova Scotia, and Sri Lanka.

SPECIAL Report

Offshore Technology Update

Panel discussion

In a panel discussion, Sadek Boussena, former Algerian Minister of Energy and current advisor at Société Générale, said the "new market" equals "uncertainty."

Resulting from increases in oil prices, increasingly stringent environmental regulations, and geopolitics, uncertainty about future demand and the supply ultimately available from alternative sources complicates decisions about investments in oil production.

Boussena said the Organization of Petroleum Exporting Countries has an interest in keeping the market stable and tries to adjust members' output to meet market requirements. But it also must develop spare capacity, which Brousenna estimated at 2-2.5 million b/d, primarily in Saudi Arabia.

Another panelist, Edgard Habib, chief economist at Chevron Corp., said a global oil-demand shift in the direction of Asia and an increase in nationalism worldwide are changing the geography of energy. "We are living in a very robust globalization," he said, with great flows of trade, information, and money. "This environment is very good for the energy industry because of the balance of trade."

Habib said, "Governments can alter the fuel mix. We'll have to wait and see what happens with the climate change issue." The US was the first nation to mandate reductions in the sulfur content of gasoline and diesel. But it will not accept the Kyoto Protocol on Climate Change, he said, "because it would shave 2% off US gross domestic product, which would not be tolerated" while China is growing at such a rapid pace and using so much coal.

Cornelia Meyer, chairman and vice-president, UK, the British Swiss Chamber of Commerce, said OPEC has emphasized that investment in infrastructure depends on demand security.

"One of the biggest threats to security of demand is high oil price," said Meyer. "If it is too high, investors will go to renewables and nuclear." Consistently high prices also stimulate conservation. She said energy efficiency can cut demand by 10% by 2030.

Keeping prices high enables investment in fossil fuel developments such as tar sands and shale that otherwise would be ignored as uneconomic, countered Broussena. He said OPEC

cannot make or control prices because other market forces affect price, but it wants to "influence" prices. "OPEC's one objective is to stabilize the market, and prices are very important to that end," he said.

Hasan Qabazard, director of the OPEC Secretariat's research division, said the price band OPEC targeted during 1989-98 was too low. It caused a surge in demand and a proliferation of sports utility vehicles until 2003, when spare production capacity decreased and the price of oil rose. "It killed investment, basically. We are not defending any price," Qabazard said. Broussen added, "If prices will stay at this level [$50-60/bbl], OPEC will be very happy."

Habib said, "Sixty-five dollar oil has not affected the world economy in the least."

Faud Al-Zayer, head of the OPEC Secretariat's statistics division, said balance is the key to creating security of supply and demand and to developing cooperation between national oil companies and international oil companies.

Al-Zayer said the organization is committed to ensuring adequate oil supply and is investing heavily in new capacity because spare capacity helps stabilize the market.

Nimat Abu Al-Soof, OPEC Secretariat upstream oil industry analyst, said OPEC has more than 130 projects in execution or planning stages, mostly downstream. He said planned upstream capacity expansion projects involve investments of $200-370 billion by 2020. "OPEC spare capacity could build to 6-9 million b/d before 2010," while requirements for OPEC crude likely will drop or remain flat until 2009.

Habib said the boom in investment will enable technology to unlock upstream and downstream production.

"The impression that we are running out of oil" is erroneous, Al-Zayer said, adding that OPEC has almost doubled its conventional resources since 1960. "We expect that to continue."

A pessimistic view

A pessimistic view of offshore supply came in a separate OTC session from Matthew Simmons of Simmons & Co. International.

Peak offshore oil production is a reality, Simmons said, but the oil and gas industry isn't certain when it will occur—or if it has already happened—or what to do about it. The debate over peak oil, he said, eventually will surpass global warming as an issue of general concern.

Even the rate of oil production decline is debatable because of "awful energy data." Most rates of decline are based anecdotally on specific areas, he said, adding that the global decline is probably 10-20%/year.

Relying on oil sands and shales for future oil supply is like "turning gold into lead," Simmons said, referring to the energy needed to produce from these unconventional sources.

If the industry is to stave off a rapid offshore oil production decline, Simmons said, its offshore drilling fleet will need to be replaced and refurbished. It can mitigate the decline in offshore oil production by drilling more rapidly, he said. Unless the rig fleet expands, however, the production decline eventually will accelerate.

The world's 51 fourth-generation offshore rigs now average 18.7 years in age, while the 34 ultradeepwater rigs average 9.8 years, Simmons said. "The offshore fleet is getting long in the tooth."

And how long refurbishment can last "is a mystery," Simmons said. "Rust never stops; it can only be slowed down."

The world's drilling fleet currently has 126 new rigs or upgrades pending, some of which will start entering the fleet by 2008. Overbook, meanwhile, is stretched beyond 2011, he said.

While technological advances will stretch out the oil production decline curve, these "will be limited in scope," Simmons said.

In the mid to long-term, life after the peak of offshore oil production will be based on energy from the ocean but not hydrocarbons, Simmons said.

Water covers 70% of the planet, but scientists know only about 5% of the ocean floor, which is "the last low-hanging energy fruit."

Climate change

Although fossil fuels will continue to be vital energy sources worldwide well into the future, the oil and gas industry can adapt its business to help ensure a transition toward a low-carbon global economy, UK Energy Minster Peter Truscott told an OTC luncheon.

The UK has introduced its own climate-change legislation, and it acknowledges the need for international cooperation toward reducing greenhouse-gas emissions. Constraints on carbon emissions will be mandated sooner or later, and most businesses would prefer the certainty of a regime, Truscott said.

"In our view, government can never supplant business in providing technology solutions," he said, adding that governments are in a position to work toward an integrated policy on energy security and climate change.

"In March, European leaders... announced an ambitious, integrated European climate and energy policy, including an independent target to cut greenhouse-gas emissions across Europe by 20% by 2020 in relation to 1990's; also to introduce efficiency measures to cut by 20% total European energy consumption predicted for 2020," Truscott said. "The objective that lay at the heart of these decisions was to set Europe on the fast-track to becoming the world's first competitive, energy-secure, low-carbon economy."

Climate change issues have been a UK priority since 2005 when Prime Minister Tony Blair deemed it an international priority issue. Recently, UK environmental officials outlined legislation setting a series of targets for reducing carbon dioxide emissions with a 60% reduction in CO_2 emissions by 2050. The UK government expects to publish a white paper in May regarding domestic energy policy.

Truscott advocates a public-private partnership in which the UK government encourages the development of carbon pricing and trading schemes that ensure energy prices reflect all production and consumption costs, including environmental costs. The UK government also encourages technology development.

"We see government's role as stimulating investment in a broad range of [research and development] activities," Truscott said. "This will not only include the use of carbon pricing but also government funding aimed at accelerating the development and market penetration of new lower carbon technologies and supportive regulatory frameworks—for example by raising building and product standards and using public procurement to create market pull for the most efficient technologies."

China's growth

China's economic growth poses great uncertainty for the global oil and gas business because it will affect oil supply and demand, said Fatih Birol, International Energy Agency chief economist.

The World Bank and International Monetary Fund have continuously underestimated China's economic growth, he said in a panel discussion on energy challenges and future directions. Assuming 6.7%/year GDP growth for China over the next 15-30 years in a reference case, IEA says Chinese oil demand might grow from 7 million b/d at present to 11 million b/d.

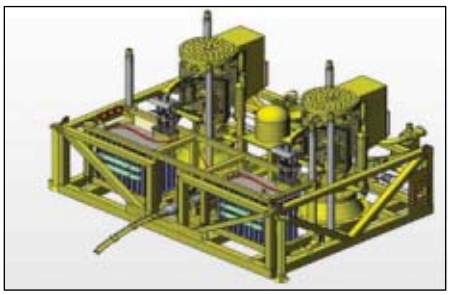
Birol cautioned that China expects its GDP growth to be higher, which would mean greater oil requirements. "China wants to move away from heavy industry to light services, and this could affect its oil demand," he said.

Oil price elasticity of demand is losing importance, according to Birol, because member countries of the Organization for Economic Cooperation and Development have become richer and are less sensitive to energy prices changes compared with developing countries. Energy consumption is shifting to developing nations, and their governments are heavily subsidizing prices by about $100 billion/year.

"The oil demand is in the transportation sector," Birol said. "Around 98% of growth for oil came from the transport sector, and we can't switch to another fuel more easily."

Birol stressed that vehicle energy efficiency is important, saying, "This could have more of an effect than turning to biofuels." He said it was important that the government take the initiative to help develop biofuels, which cannot be left to market forces.

Another panelist, Clay Sell, US deputy secretary of energy, said research by the US government will find economic ways to produce ethanol from cellulose rather than corn within 5 years.



The SeaBooster by Aker Kvaerner is one of 14 technologies recognized in the OTC Spotlight on Technology (see story, p. 28). Photo from Aker Kvaerner.

National oil companies

National oil companies (NOCs) will dictate the future rules of the global energy business, according to 69% of delegates who attended a special OTC roundtable discussion.

Speakers acknowledged that NOCs hold the majority of the world's energy resources and are increasingly exerting control over development.

Olufisoye O. Delano, managing director of Nigerian Petroleum Development Co. (NPDC), said NOCs are similar to other commercial companies but focus on supplies and economic development for their own countries. "We don't expect international oil companies (IOCs) to do that as they have a different agenda," he said. "They will be committed to the GDPs of their own countries."

Delano said NPDC has witnessed market growth in Middle East and the Far East, when 30 years ago Nigeria dealt primarily with the West. A key challenge for NOCs is balancing domestic supply needs with the economic compulsion to export oil, he said. "Customers are now driven by market issues and security of supply."

Only 15% of delegates said IOCs will determine the future rules of doing business in energy, followed by 12% voting for those with breakthrough technologies, and 3% asserting it would be owners of assets, rigs, and large vessels.

Two main trends are shaping the ways NOCs do business, said Sell of the US Department of Energy. "Their governments see them as cash cows to gain revenues to invest in other social programs; they focus on control of the reserves and prohibit others from coming in to develop them."

For Jesús Reyes-Heroles, director general of Petroleos Mexicanos, the challenge facing NOCs is developing the financial resources to meet investment needs. He said Mexico's congress is discussing how Pemex, which historically has been heavily taxed, should evolve. The government now taxes Pemex profits rather than revenues, as in the past. The Mexican constitution prohibits private ownership of oil and gas resources.

"We don't anticipate in the short term to have any private E&P companies come in, but there could be interesting opportunities in the downstream in the future," Reyes-Heroles said.

Narrowing of the IOC role in international upstream projects will create opportunities for service firms, said Peter Goode, executive chairman of Aibel Group, a subsidiary of Vetco International Ltd. "Service companies will continue to encroach on IOCs—they carry the burden of technical development, responsible for capital investment in equipment and operations personnel. Consolidation will accelerate within the services sector," he said.

Gulf of Mexico

The importance to the Gulf of Mexico of deepwater operations received attention in a US Minerals Management Service report released at OTC.

Deepwater leases last year produced 70% of the oil and 40% of the natural gas produced in the gulf, according to the report, Deepwater Gulf of Mexico 2007: Interim Report of 2006 Highlights. It said oil and gas operators announced 12 deepwater discoveries in 2006, with the deepest in 7,600 ft of water.

More than half of the active oil and gas leases in the gulf are in more than 1,000 ft of water, which MMS defines as deep water.

"There's solid evidence in both leasing and exploration activities to confirm the oil and gas industry's continued interest and motivation to explore and develop the deepwater frontier in the Gulf of Mexico," Lars Herbst, acting GOM regional director, told reporters at an OTC news conference.

In gulf Outer Continental Shelf lease sales, the number of tracts in 1,500-4,999 ft of water receiving bids increased by 32% from 2005 to 2006. The number of tracts in 5,000-7,499 ft of water receiving bids increased by 29%.

"MMS granted 30 new technology approvals in 2006," noted Herbst. "This set a record for the number of approvals for first-time use of technology in deep water."

Examples of technology advancements that MMS approved for use on federal leases during 2006 include:

- A high-integrity pressure-protection system (HIPPS). Although a HIPPS has not been proposed for a specific development, MMS did approve the general concept in July 2006. The system allows use of pipelines not rated for the well's full shut-in tubing pressure (SITP). The HIPPS employs valves, logic controllers, and pressure transmitters to protect the unrated section before the pipeline is overpressured or ruptured (rather than relying simply on steel strength). A section of pipe upstream of the well and downstream of the HIPPS valves—as well as a short section of pipe upstream of the HIPPS values—will be rated to the full SITP.
- The use of preset polyester moorings for deepwater drilling rigs. The use of polyester mooring lines on production facilities still is considered a new technology in the gulf even though it is common practice to use this type of mooring line on mobile offshore drilling units. One stipulation for allowing the use of polyester moorings traditionally has been that the polyester moorings may not come in contact with the seafloor. After studying the polyester moorings, MMS granted approval for preset moorings with the stipulation that the lines be inspected and tested every 6 months.
- Various forms of subsea boosting such as a subsea pump allowing enhanced oil recovery. Shell Exploration & Production Co. proposed a separation and boosting system that will separate production fluids at the seafloor and direct them to the surface host via a pump at the base of a production riser for use at the Perdido development. BP Exploration & Production Inc. received approved to use electric subsea multiphase pumps at King field. The pumps will boost operating system pressure, lowering flowing tubing pressures at each well. This increases flow rates, which will extend the field's life by an estimated 2 years and will increase ultimate recovery.
- A conceptual plan for a floating production, storage, and offloading vessel. Petrobras America Inc. submitted a conceptual deepwater operations plan for installation of an FPSO with two wells in Cascade field and one well in Chinook field. Initial production from these fields is expected in 2009. A single point disconnectable turret mooring system will ensure the FPSO can leave in case of hurricanes. Another new technology involved was the use of free-standing hybrid risers.

Gulf production

Oil production in the Gulf of Mexico is forecast to rise to as much as 2.1 million b/d by 2016 from current levels of 1.35-1.4 million b/d, MMS said.

Total gulf oil production is expected to exceed 1.7 million b/d from existing shallow and deepwater commitments by operators. If announced discoveries and undiscovered resources realize their full potential, production could reach 2.1 million b/d.

Natural gas production is forecast to recover in the next 3 years to a possible high of 8.3 bcfd from 8 bcfd today, MMS said in its "Gulf of Mexico Oil and Gas Production Forecast: 2007-16."

Activity used for the forecast included 16 deepwater projects scheduled to come on stream by Dec. 31. Independence Hub, expected to start gas production during the second half of 2007, is forecast to be the biggest single contributor to gas production.

Independence Hub involves a consortium of companies gathering gas from seven deepwater fields. Anadarko Petroleum Corp. is the operator.

Oil production in the gulf increased steadily during 1991-2001, leveled off through 2003, and declined in 2004-05, partly because of hurricanes.

Shallow-water production declined steadily after 1997 but was offset by increasing deepwater oil production during most of that time.

Gas production has followed a similar trend, but increasing deepwater gas production hasn't prevented an overall decline in total gulf gas production during 2006, MMS said.

Deepwater expandables

During OTC, Nexen Petroleum USA Inc. said it installed 6,867 ft of an openhole solid expandable tubular (SET) system in Aspen oil field on Green Canyon Block 243 off Louisiana.

Enventure Global Technology provided the system, which was installed Mar. 25 in what company officials called a world record water depth for a SET system. Aspen 1 is in 3,143 ft of water.

Don Schultz, Nexen deepwater drilling manager, said the project involved a "tremendous technological advantage"

that he expects other operators will use in the deepwater gulf in the future.

Nexen planned to drill through depleted sands at its producing Aspen project to 24,000 ft, but the first sidetrack to the original wellbore took an influx at 20,000 ft.

To preserve production of 5,000 b/d, Nexen wanted to maximize hole size for a second sidetrack and chose a SET system to reach 24,000 ft with a 7-in. flush-joint liner. Expandable tubulars enabled Nexen to isolate depleted zones and attain the hole size.

Enventure said the project involve specialty pipe and 191 expandable liner joints with threaded connections. A high-capacity launcher was built and run through the pipe, expanding the liner connections and the pipe at the same time.

Schultz said the SET system greatly reduced mechanical risks.

Hurricane preparation

Gulf of Mexico operators need to prepare for what is forecast to be another "very active" hurricane season, according to speakers in another OTC panel discussion.

The 2007 hurricane season could produce as many as 17 storms, 5 of which could be major hurricanes. Meteorologists estimate a 74% chance of a major hurricane hitting the US this year.

"Not all rigs are suited to work in the central Gulf of Mexico during hurricane season," said Allen J. Verret, executive director of the Offshore Operators Committee, an industry trade association in New Orleans.

Also, companies need to "improve drilling planning to mitigate risks," he said, explaining that some wells may need to be drilled when storms are not a threat. He reminded the conference attendees that the peak of the Atlantic hurricane season is in September.

Furthermore, Verret said companies must identify assets that are at risk, prioritize the risks, and evaluate methods to reduce exposure to storms, such as utilizing subsea operations. However, he pointed out that even subsea operations won't make companies' facilities totally safe from harm, as shown by damage to pipelines in the Gulf of Mexico from Hurricanes Katrina and Rita in 2005.

Frank Puskar, president of Energo Engineering Inc., Houston, said companies may need to increase deck elevation on new platforms and should be concerned about deck elevation of existing platforms. He explained that of 120 platforms destroyed during Hurricanes Ivan in 2004, Katrina, and Rita, "60% had wave in the deck."

Puskar said platforms designed with modern American Petroleum Institute RP 2A guidelines with new design deck elevations had a "good chance of not being destroyed." API RP 2A is the recommended practice for planning, designing, and constructing fixed offshore platforms.

MMS needs to work more closely with the industry and US Coast Guard to get information quickly when facilities are adrift, said Alex Alvarado, chief of pipelines for the MMS Gulf of Mexico office. He said about 20,000 miles, or 60%, of the pipelines in the gulf were affected by Hurricanes Katrina and Rita, and pipeline repairs are continuing.

In fact, 2-3% of gulf pipeline capacity is still down after the 2005 storms, said Allen S. Brown, associate editor of American Society of Mechanical Engineer's Mechanical Engineer magazine.

Alvarado said the industry has completed most inspections to determine the full extent of pipeline damage. To date, 655 pipelines have been reported damaged, of which 142 have diameters of 10 in. or greater.

Of the 655 pipelines damaged, 216 were associated with platform damage, 13 were associated with third-party impact, 12 were displaced by currents, 72 were exposed, 142 were related to riser damage, 26 had crossing damage, and 173 were the result of other or unknown damage, he said.

"Katrina and Rita were the most difficult hurricane response and recovery effort [for the industry]," Alvarado said.

A first in Norway

Among other regional reports, Statoil ASA issued a project update for the world's first full-scale subsea separation system at Tordis field, off Norway.

Statoil's Hans Kristiansen told OGJ that Subsea 7 was to begin drilling the injector well May 4 using the Bjorland Dolphin rig. Drilling to 1,000 m will take about 40 days, to get to the Miocene Utsira formation, Europe's largest saltwater and carbon dioxide storage formation. This will reduce future water discharge into the sea.

The subsea separation station was built by Kongsberg FMC and is scheduled for installation in August. The 1,200-tonne module will be installed in a single lift by the Saipem 7000 heavy-lift vessel. Commissioning is expected to take about 6 weeks, with first production by Oct. 1.

Statoil expects to recover an additional 35 million bbl of oil from Tordis using the new subsea separation system.

Tordis has been producing oil since 1994 through a tieback to Staoil's Gullfaks C platform. Water production has increased to 70-80% over the last few years and sand production to about 500 kg/day. In 2003, Statoil began to plan a subsea separation, boosting, and injection system in order to prolong production 15-20 years. In 2005, Statoil awarded a $100 million contract for the separation, boosting, and injection system to FMC Technologies Inc. (OGJ Online, Nov. 10, 2005).

In 2006, CDS Engineering BV and FMC Kongsberg were recognized with an OTC Spotlight award for their Tordis compact subsea separator with integrated solids handling (OGJ, May 8, 2006, p. 25).

FMC's Ann Christin Gjerdseth told OGJ that Statoil installed a small pipeline inline manifold at Tordis in 2006 to reroute the Tordis well stream to Gullfaks C via the new subsea separation station.

Gjerdseth said the design highlights of the Tordis separator are the internal level detectors for sand, emulsion, water, and oil and the gas bypass line,

which allows the size of the separator to be greatly reduced. The integrated sand management system includes a gravity-based cyclonic device. The sand slurry will be injected downstream of the water-injection pump, which was qualified with tungsten carbide impellers, for increased wear resistance.

One of the most significant aspects of the engineering process was moving topside technology to the seafloor, said Gjerdseth. This required a shift to meld the differences between heavily instrumented topside design with the guiding principles of simple, easily replaceable component design for subsea installations, where equipment interaction is limited. FMC worked toward an acceptable level of process control and instrumentation within the short delivery time and limited weather window for installation.

While the current tank design is workable to 1,500 m, the material limit is only about 2,000 m. Ultradeep installations will require inline separation, Gjerdseth said. Future innovations for deepwater projects will include subsea compression facilities and long-distance power transmission.

Brazilian gas

Petroleo Brasileiro SA (Petrobras) plans to increase gas production from the Espirito Santo basin in southeastern Brazil from 27.5 million cu m/day to 70 million cu m/day by 2011, the company reported at OTC. The basin holds over 1.5 billion boe, 11.5% of Brazil's total reserves.

Brazil has made increasing domestic gas production a priority to help reduce reliance on imports, particularly after its relations with Bolivia—a major exporter—became strained when Bolivia exerted state control over its resources and changed participation terms.

In 2010, local production may exceed 20 million cu m/day, or 40% of the Brazilian gas offered in southeastern and southern Brazil, Petrobras said.

Producing fields in Espirito Santo basin are Golfinho (light oil) and Peroá Canapu and Camarupim gas fields. Golfino started production last May through the Capixaba floating production, storage, and offloading system. "The Cidade de Vitória FPSO will go into operation in the same field in the second half of 2007. Each of these units is capable of producing 100,000 b/d," Petrobras said.

Separately, Brazil plans to launch its ninth bidding round in September or October, Energy Minister Silas Rondeau said. He explained that the bidding round has been delayed because of difficulties in allocating blocks but did not give details on how many would be offered or their locations.

Brazil's President Luiz Inacio Lula da Silva is expected soon to announce a number of business initiatives to help develop the country's oil and gas industry, Rondeau added.

Nigerian investment

Nigeria expects to see $60 billion of oil and gas investment across a variety of operations through 2008 and more after that, said Fisoye Delano, managing director of Nigerian Petroleum Development Co. Ltd.

The country is eager for investors to help develop its domestic gas infrastructure, Delano stressed at an industry breakfast. Nigeria's gas demand is expected to grow from 1 bcfd in 2006 to over 10 bcfd by 2010 driven by power generation and industrial development.

Although the oil and gas operations in the country have been disrupted by attacks on equipment and kidnappings, the government has ambitious plans. It wants a gas pipeline connecting the south of the country to the north and an interconnector between eastern and western grids. "We want gas processing plants, at least three or four, to support growth," Delano said. He said the government is offering incentives for investment.

Nigeria plans to eliminate gas flaring in 2008, Delano added. It presently flares 32% of its gas production with LNG projects and new pipelines.

"Nigeria wants to grow its [oil] reserves to 40 billion bbl by 2010 and production capacity to 4.5 million b/d by 2010. We want our gas revenues to match crude oil revenues," Delano said. Over 2 million b/d of additional production from offshore fields in 2006-11 is planned.

Susan Farrell, senior director of corporate advisory services at PFC Energy, raised questions about future deepwater production in Nigeria. "As new discovery sizes fall and companies develop their portfolios faster than they find new fields, there is a predictable peak to the current investment and production growth cycle," she said.

Farrell said the geological potential of Nigeria is high but noted that political risks limit onshore and shallow-water prospects.

"Nigeria has 500,000 b/d of oil shut in, and we think it will stay offline until the end of the year," she said.

Delano assured delegates that the government is working to engage rebellious Niger Delta communities and share value from oil and gas developments in those areas.

The Niger Delta receives only 13% of the wealth generated from oil and gas in their region. Militants from the Niger Delta are pressing for 50% of the proceeds, while the government has proposed 18%.

Sri Lanka

Sri Lanka is preparing to launch an offshore licensing round and expects to have bid documents available in August as it starts a road show in Houston, said Neil DeSilva, director general, Petroleum Resources Development Secretariat.

DeSilva said Sri Lanka will offer three parcels in the Mannar basin off the west coast. The basin has been divided into eight blocks. India and China's state oil companies have been promised one block each.

DeSilva said Sri Lanka's oil and gas potential is supported by its shared geology with countries that have commercial oil and gas production.

The Mannar basin has thick sedimentary rocks with large structures that

are compared geologically to Brazil, he said. It also contains regions of shallow gas. The source rocks are of Cretaceous and Jurassic age.

Petroleum Minister A.H.M. Fowzie said Sri Lanka is soliciting cooperation from the US as it begins to develop its oil and gas industry. He said the country needs technical resources to exploit its oil and gas.

During 2001 and 2005, over 6,000 km of 2D seismic data have been acquired. These data, along with interpretation reports and well data, will be included in the bid packages that will be available by midyear, De Silva said.

He explained that earlier exploration efforts in Sri Lanka were unsuccessful as they were in the shallowest parts of the basin.

Nova Scotia

Also announcing plans at OTC for an offshore licensing round was Nova Scotia. The province plans to launch the round in November with flexible terms aimed at attracting midsize companies in particular, said Diana Lee Dalton, chair of the Canada-Nova Scotia Offshore Petroleum Board.

Dalton said high costs have prevented midsize independent companies from pursuing exploration, and the petroleum industry has complained that Nova Scotia has a burdensome regulatory regime. "We want to offer smaller companies terms that mean they can get out in 3 years if they don't find something," she said. Nova Scotia recently implemented initiatives to streamline its regulatory process.

Nova Scotia, a proven oil and gas province, is relatively underexplored with only 127 exploration wells drilled on the Scotian Shelf. Producers have a 7-month window in which to drill wells in harsh conditions, which increases costs. Most exploration has been in shallow water.

Dalton was unable to give details of how many blocks would be offered and in what basins, adding that geologists are carrying out a study to collect geological information and analyse it before offering comprehensive data packages to potential bidders. "There has been a downturn in exploration, and we feel that we've got a lot of potential," she said.

Alison Scott, deputy energy minister for Nova Scotia, said the ministry would offer attractive terms for companies to develop their discoveries under its newly revamped regulatory regime. She told OGJ that potential explorers have been reluctant to drill because they do not know the geology. ✦

OTC Spotlight on Technology recognizes 14 technologies

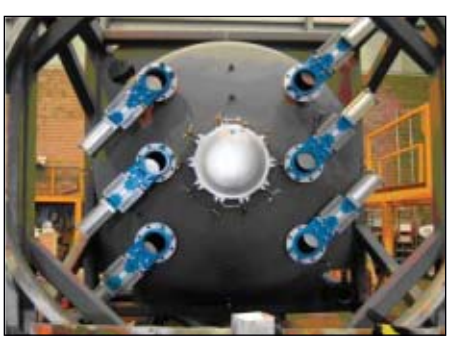
Nina M. Rach
Drilling Editor

Guntis Moritis
Production Editor

The Offshore Technology Conference of 2007 recognized 14 diverse technologies in its Spotlight on New Technology Awards. The award program, which began in 2004, highlights new technologies in offshore drilling and production.

OTC recognized:

- Aker Kvaerner Subsea for the SeaBooster seawater injection system.
- Aker Kvaerner Well Services for the PowerTrac Cone Crusher wellbore scale removal mill.
- Baker Oil Tools for the Diamond FRAQ polymer-free high-performance fracturing fluid.
- Baker Oil Tools for the linEXX solid expandable monobore liner extension system.
- DYNAenergetic GMBH & Co. KG for the DYNAenergetics no-debris perforating gun system.
- FARO Technologies Inc. for the FARO TrackArm portable computerized measurement device.
- Halliburton Co. for the Honey Comb Base (HCB) tank system for handling drill cuttings.
- Jet-Lube Inc. for the SEAL-GUARD ECF and NCS-30 ECF thread compounds, which meet stringent North Sea environment standards.
- MODEC International LLC for the MOSES self-stable integrated platform (SSIP) tension-leg platform (TLP).
- Single Buoy Moorings Inc. (SBM) for the LNG toroidal swivel, which allows transfer of LNG through weathervaning installations.
- Impact Solutions Group for its Secure Drilling system for detecting kicks or mud losses and then automatically managing backpressure.
- Versabar Inc. for its hydraulic cylinder system for raising the topsides on Eugene Island 330C and 330B platforms.
- Vetco Gray for the MR-6H SE automated marine riser connection.
- Weatherford International Ltd. for its OverDrive system, which improves top-drive casing running and drilling operations.



Halliburton's Honey Comb Base drill cuttings tank system, which simplifies storage and transfer and saves space, received recognition at the OTC Spotlight on Technology. Photo from Halliburton.

To be considered, each technology had to be less than 2 years old, be proven through full-scale application or successful prototype testing, have

broad interest and appeal, and provide significant benefits beyond existing technologies.

Drilling technologies

Three awards went to drilling systems.

The closed-loop Impact Solutions Secure Drilling System (SDS) analyzes drilling data to detect kicks or losses and automatically manage backpressure at the surface. SDS keeps circulating volumes as small as possible and incorporates existing drilling and pressure control equipment with minimal upgrades and equipment additions.

In its basic form, SDS lets the driller see real-time changes in flow and pressures. It allows overbalanced, near-balanced, or underbalanced drilling, thus enabling each section of the well to be optimized based on downhole conditions.

Weatherford International's OverDrive system enhances safety and efficiency of top-drive casing running and drilling operations.

The primary component is the set of TorkDrive heavy-duty and modular tools used for making up and breaking out casing, mounted directly to the rig's top drive. The TorkDrive tools combine the functions of conventional power tongs, bails, elevators, thread compensators, and fill-up circulation tools.

The OverDrive system can rotate and push down casing while running to help prevent differential sticking. It offers high-speed string rotation with the top drive when drilling or reaming-with-casing and lowers the number of workers needed on the rig floor.

Halliburton's HCB bulk cutting storage tank, recognized for improved wellsite safety and efficiency, simplifies cuttings transfer and storage. The system eliminates the need for cutting boxes, which create safety risks and occupy deck space. Halliburton says the HCB tank system is easily installed and does not need to be close to solids-control equipment.

The HCB system can be coupled with the air-operated SupaVac SV400 long-distance pumping and transfer system, which can vacuum drill cuttings up to 165 ft and pump as much as 20 tons/hr of drill cuttings to a distance of 490-650 ft. The HCB tank discharges cuttings over long distances, up to 48 tons/hr horizontally and 30 tons/hr vertically.

Perforating, fracturing

The DYNAenergetic no-debris gun (NDG) system uses an internal sliding sleeve to close shot holes in the gun after the shot, reducing fragments from cases of the shaped charges.

DYNAenergetic says NDG testing (made in accordance with the new API RP 19b Section V standard) proved that no debris can exit the gun during or after the shot. The NDG can accommodate any standard shaped charge. Quality control shots with shaped charges in a NDG setup have shown little or no penetration loss.

The Baker Oil Tools Diamond FRAQ is the first polymer-free high-performance fracturing fluid. The fluid is the first viscoelastic (VES) fluid with polymeric fracturing fluid performance properties and formation and proppant pack cleanup capability. The fluid uses nanoparticle technology to associate (pseudocrosslink) VES micelles, stabilize VES micelle structures to 300° F., and form a pseudo-filtercake composed of highly viscous VES fluid (micelles) and nanoparticles.

Internal breakers in Diamond FRAQ work over a wide mix-water salinity and temperature range to reduce viscosity and clean up VES fluid.

Liners, risers

The Baker Oil Tools linEXX solid expandable monobore liner extension system optimizes casing configurations for drilling deeper or isolating trouble zones without reducing hole size. The system consists of:

- RC9 series recess casing shoe.
- FORMlock expandable liner hanger/packer.
- LinEXX solid expandable casing.
- RNX retrievable guide shoe.
- CatEXX hydraulic, top-down expansion system.

Vetco Gray said its fully automated MR-6H SE marine drilling riser connection design combines field-proven technology of the H-4 subsea wellhead connector and the dog-style marine riser (MR-).

To make the fully automated connection, hydraulic units on the spider engage a cam ring on the box that actuates six dogs into the profile in the pin. The pin is lowered into the box and guided into place with an internal guide pin. Then the spider does the rest, automatically making up the connection.

Fully automating the connection takes people out of a potential hazard. Vetco Gray says it takes less than 1 min to make and break the MR-6H SE connection. A string of MR-6H SE can be run in about half the time of a flanged riser system.

Subsea production

Aker Kvaerner's SeaBooster is a subsea processing system for injecting seawater into a subsea completed injection well. The system eliminates the need for flowlines and a topsides water injection pump. It can inject up to 151,000 b/d with differential pressures up to 4,100 psi.

The system has a filtration module for subsea solids removal prior to injection of water into the reservoir as well as provisions for chemical injection to prevent reservoir souring.

A Hayward Tyler freshwater and glycol-filled electric motor drives the SeaBooster.

Milling, thread compounds

Aker Kvaerner's PowerTrac Cone Crusher scale mill assembly is run in conjunction with the Aker Kvaerner's PowerTrac Advance (PTA) wireline tractor. The PTA tractor wheel section can act as an anchoring device in vertical sections and an anchoring and forward thrust device in horizontal wellbores.

The Cone Crusher's main body has

four rotating cutting cones. Each cutting cone is free-rotating in its own axis and is independent of the rotating speed of the main body. Each cone also has a different cutting pattern that crushes scale.

The ECF thread compounds developed by Jet-Lube comply with stringent North Sea environmental guidelines for offshore chemicals. The SEAL-GUARD ECF for premium casing and tubing connections and the NCS-30 ECF for drillstring connections meet Norway's Yellow standards and the UK's E classification.

Jet-Lube says these are the most stringent thread compound requirements to date and required a total reformulation of the pipe compounds to meet both the performance and environmental requirements.

Both ECF compounds are nonmetallic and rated for 65-500° F. applications.

Computerized measurement

The FARO Technologies TrackArm portable computerized measurement device replaces hand tools and large, expensive fixed-coordinate measuring machines. The TrackArm combines two technologies: the FAROArm and FARO Laser Tracker to measure geometric features and directly import 3D measurements into digital form for CAD model or part size verification.

The FAROArm uses optical encoders, advanced error coding, and temperature compensation technology to record 3D points on items ranging from palm-sized to 12 ft. The FARO Laser Tracker X uses laser targets and Xtreme ADM technology to measure items up to 230 ft.

Production platforms

Two technologies for production platforms were recognized with Spotlight Awards.

The MODEC International MOSES SSIP is a TLP with inherent stability that allows quayside topsides integration and commissioning to the hull structure and wet-towing of the integrated platform. It eliminates the need for temporary buoyancy or crane-assisted installation.

The hull configuration has a central base structure, four rectangular pontoon tendon support structures (TSS), and four vertical columns. The TSS supports eight tendons via top connectors on a porch arrangement. The tendons connect to seabottom piles.

The SSIP TLP can support various drilling or workover rigs and many top-tension risers and flowline risers. It accommodates both wet and dry trees.

Versabar's deck-raising system used 32 synchronously controlled, 260-ton hydraulic cylinders to lift the topsides 14 ft on two eight-leg platforms in the Gulf of Mexico: Eugene Island 330C and 330B.

Versabar says the lift pinned the cylinders to lower padeyes welded to the existing legs and upper padeyes integral to the split extension sleeve. It says the 40.5-in. diameter, 1.5-in. wall extension sleeves captured the legs during the final leg cuts and with the rub rails limited lateral movement during the raising to 0.25 in. The work involved cutting the legs between two bushings installed near the top of the legs. Prior to the lift, the work required welding the top of the extension sleeve to the upper bushing. After rising, work required welding the bottom of the extension sleeve to the lower bushing.

Versabar says a 12-in. diameter, 1.75-in. wall pin inserted into the leg provided a storm-safe condition at all times except when removed to raise the platforms.

LNG transfer

SBM's LNG Toroidal Swivel allows offshore LNG transfer through weathervaning turret-moored or single-point-moored installations. SBM can configure the swivel to allow the passage of multiple LNG streams up to 20 in. in diameter and a 16-in. vapor return.

Composite material bearings and thermal rods inside the toroid shield the swivel seals from thermal deformations when cooled to the operating −165° C. temperature and 10.5 bar pressure.

SBM says the swivel has undergone extensive tests that simulated 5 years of continuous service and expects the process to receive ABS approval in 2007. ✦

Venezuela takes operational control of Orinoco oil fields

Peter Howard Wertheim
OGJ Correspondent

Venezuela President Hugo Chavez's government took over that country's last remaining privately run oil fields on May 1, intensifying a decisive struggle with the oil industry over one of the world's most lucrative deposits.

In 2006 Venezuela took control of 32 privately operated oil fields (OGJ Online, Jan. 9, 2006).

Oil Minister Rafael Ramirez declared that the oil fields had reverted to state control just after midnight. The companies ceding control include BP PLC, ConocoPhillips, ExxonMobil Corp., Chevron Corp., Total SA, and Statoil ASA.

These foreign companies have invested more than $17 billion in those projects, now estimated to be worth $30 billion. Venezuela has indicated it may just pay the lesser amount, using oil and tax forgiveness to further reduce the cash payout.

All but ConocoPhillips have agreed in principle to state control and Venezuela has warned that it may expropriate the company's assets if it doesn't follow suit.

Chavez says state-owned Petroleos de Venezuela SA (PDVSA) is assuming at least 60% on each of the Orinoco

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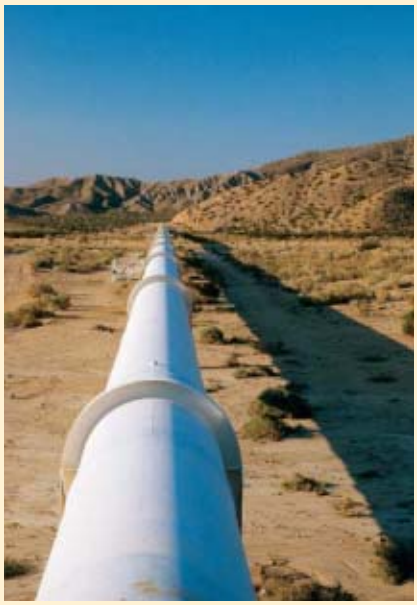

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belt operations, but has invited the companies to stay as minority partners. They have until June 26 to negotiate the terms, including compensation and reduced stakes.

If Chavez persuades the foreign companies to stay, Venezuela will be on track to develop the world's largest known oil reserves and possibly surpass Saudi Arabia as the nation with the most reserves, say energy experts.

But if the multinationals decide to leave, the Orinoco belt region could end up starved of the investment and know-how needed to transform the Orinoco's tar-like crude into marketable oil. Chavez says government firms from China, India, and elsewhere can step in, but industry experts say they doubt they are qualified to face technical challenges.

Petrobras in Venezuela

Some oil companies still need convincing that Venezuela will be a good place to do business. Others believe that Venezuela may still prove enticing because three quarters of the world's proven reserves are already controlled by state monopolies.

Brazil state-owned Petroleo Brasileiro SA (Petrobras) says it is being pressured to sign an exploration contract for the giant Carabobo extra-heavy oil field in the Orinoco belt without knowing how much it will have to pay for the deal.

A company source told OGJ that it had already allocated $1 billion to invest in this field. According to Petrobras, to implement the accord, the Brazilian company must pay a bonus whose value has not been determined after a year of negotiations.

Other sources say the Brazilian company may abandon the project with PDVSA to exploit Carabobo field. Under the accord signed last January, PDVSA will have a 60% stake in the Carabobo project, and Petrobras a 40% stake. The letter of intent also included the establishment of a joint capital company to develop the Carabobo-1 field.

In exchange, Petrobras would have a 60% stake in a planned 200,000 b/d refinery to be built near Recife, capital of Pernambuco state, in northeastern Brazil. This refinery is slated to, in part, refine oil from Carabobo. PDVSA would have the other 40%. The refinery is slated to be built by 2011.

Carabobo field has reserves of 5 billion bbl of oil, said PDVSA Pres. Rafael Ramirez. The Venezuelan company and foreign oil firms, among them Petrobras, are currently trying to make a more precise estimate of the heavy oil reserves in Carabobo and the Orinoco basin. According to the Venezuelan government the Orinoco belt has estimated reserves of 274 billion bbl.

Last January's agreement also included the development of five oil fields in Venezuela, with 40% percent participation by Petrobras and 60% by Venezuela and the creation of a plant in Venezuela for improving extra-heavy oil from the Orinoco belt. ✦

Malaysian pipeline, refinery complex in discussion stages

Eric Watkins
Senior Correspondent

A proposed refinery complex and pipeline across northern Malaysia are at the discussion stage, according to a senior Malaysian official.

But reports suggest that the project, which purportedly aims to safeguard oil shipments against terrorism and piracy in the Malacca Straits, may not be needed. Malaysian Deputy Prime Minister Datuk Seri Najib Tun Abdul Razak said the oil and gas pipeline project between the country's northern provinces of Kedah and Kelantan remains at the proposal stage.

"There are proposals to have a refinery and a pipeline that will take it across. As far as I know, it is still at a discussion stage. Nothing has been finalized," Najib said.

"It's primarily for commercial purposes because they think they can transport the oil at a lower cost and also avoid some of the risks relating to heavy traffic at the Straits of Malacca," Najib said.

Apart from the 320-km pipeline, plans call for a 200,000 b/d coastal refinery to be constructed by a joint venture of local firm SKS Development Sdn. Bhd. and National Iranian Oil Co. (NIOC).

On Apr. 11, regional government officials said construction was due to begin by August on a refinery and the oil pipeline across northern Malaysia, offering companies the chance to avoid the increasingly congested Malacca Straits.

They said oil could be offloaded on peninsular Malaysia's west coast, piped across the country's northern regions, and then reloaded onto tankers for onward passage to Far Eastern markets, Japan and China in particular.

The Malaysian officials said about 70% of the $14.5 billion cost would be foreign investment, with a large proportion coming from NIOC and unnamed Saudi and Chinese investors.

Analysts reportedly believe the pipeline project is politically motivated, as it would enable shippers and purchasers to avoid Singapore, a US ally, if relations between the US and Iran deteriorate further.

Piracy down

Adm. Timothy Keating, the top US commander in the Pacific, said Apr. 16 that countries along the Malacca Strait have vastly improved security in the strategic shipping route over the last 5 years.

Separately, an Apr. 17 report issued

by Singapore's Nanyang Technological University said piracy and armed robbery attacks against ships in Southeast Asia have been reduced greatly, and the overall number of attacks in the region is on a downward trend.

The number of incidents for the first quarter is the lowest in the past 5 years. There were 12 armed robbery and piracy incidents reported in the first quarter, 10 of which were actual attacks and two attempted raids.

The report said more than half of the attacks during the period were carried out against tankers, and most took place within Indonesian waters, including the vicinity of the Balongan oil export terminal east of Jakarta.

"The Indonesian ports and anchorages remained the regional hotspots for armed robbery and piracy activities," the Nanyang report said. ✦

API: US drilling at 21-year high in 1Q

Nick Snow
Washington Correspondent

US oil and gas drilling reached a 21-year peak during 2007's first 3 months and was nearly twice the level of first-quarter drilling activity during the 1990s, the American Petroleum Institute said on Apr. 26.

An estimated 11,771 oil wells, natural gas wells, and dry holes were completed during the period, 1% more than the total for 2006's first quarter, API said in its latest quarterly well completion report.

It said gas remained the primary US drilling target, with an estimated 7,085 completions, a first-quarter record. But an oil drilling resurgence that began in 2000 continued with an estimated 3,674 completions. That was second only to 2006's initial 3 months, when estimated oil drilling was at 1988 levels, API said.

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Trouble in Nigeria

The ink was barely dry on a report by the International Maritime Bureau about pirate attacks on oil ships and installations around the globe when some bad guys decided to put the findings in neon lights with an attack on a Chevron Corp. floating production, storage, and offloading vessel off Nigeria.

The May 1 attack on Chevron's Oloibiri FPSO off Bayelsa state resulted in the death of one Nigerian sailor and the kidnapping of six foreign oil workers by members of Movement for the Emancipation of the Niger Delta (MEND).

This is not the first time for MEND to make its appearance in these columns. Last year, it was reported that the militant group had announced a mobilization of its fighters to counter a new military offensive by the Nigerian government (OGJ, Oct. 9, 2006, p. 30).

MEND's pledge

"In good time we will redeem our pledge to the people of the Niger Delta to halt altogether the rape of our land by the Nigerian government and conniving oil companies," MEND said. Their script hasn't changed much since then.

This time around, MEND—which made no apology for the death of the sailor—said its attack on Chevron's facilities should also be interpreted as a warning to Royal Dutch Shell PLC, which has recently returned to fields in Bayelsa and Delta states after earlier attacks by the militant group.

In a word, the fight will continue between the rebels and the government over control of Nigeria's oil revenues—with hapless international companies caught in the middle and paying the price in human terms as well as in oil dollars.

That's pretty much in keeping with the IMB report on piracy that found the number of attacks in Nigeria has doubled when compared with the first quarter of 2006.

Attacks increasing

"The six attacks reported for the first quarter of 2007 included a number of violent attacks against vessels and crew working in offshore oil installations," the report said.

"In these cases," it said, "crew members were both assaulted and abducted." The report went on to note that attacks on other vessels were also reported in the Niger Delta region, concluding that "an alarming total of 40 crew members were taken hostage or kidnapped in Nigeria alone."

It is not as though things can't change since the reported incidents of piracy dropped significantly in Southeast Asia, with Indonesia recording nine incidents, down dramatically from 19 last year.

Especially impressive is the fact that just two incidents were recorded in the Malacca Straits, which according to the IMB, "now represents an excellent example of how cooperation between authorities can tackle and suppress piracy attacks."

The improvement in Southeast Asia followed considerable international pressure on the governments of countries along the Malacca Straits. If international pressure can contain piracy in those infested waters, then the same pressure needs to be applied to Nigeria. ✦

Onshore fields bolstered 2006 US gas output

Alan Petzet
Chief Editor-Exploration

Land drilling bolstered US gas production in 2006, a warmer than normal year characterized by lower imports from Canada, reduced LNG imports from fewer countries, and above average storage levels, said the US Energy Information Administration.

All data are preliminary, EIA said, but total marketed gas production climbed 2% on the year to 19.34 tcf in 2006 even though 2005-06 Gulf of Mexico output fell due to hurricanes.

Gulf production, usually more than 20% of annual marketed US gas output, dropped 21% in 2005 and 13% through October 2006 to 15% of cumulative marketed production.

Marketed production outside the gulf as of October 2006 was 13.68 tcf, more than 4% higher than the 2005 level. Many producing states recorded gas output gains in 2006, and a majority of the increase came from the top three producing states, Texas, Oklahoma, and Wyoming. They accounted for 73% of the increase.

Texas gas output in the 10 months was 259 bcf or 5% on the year and 46% of the overall increase. An average 133 rigs were active in 2006 in Texas District 5, a 24-county area where the Barnett shale and several East Texas plays hold force. This was a 53-rig increase from 2005. Oklahoma and Wyoming gas production each climbed 5%.

Transport and storage

To move gas from new wells, crews added 12.3 bcfd of gas pipeline capacity in the US in 2006, 50% more than they laid in 2005 and 44% more mileage.

The main driver was gas production in Colorado-Wyoming and Northeast Texas. Twenty-one of the 45 US gas pipeline projects completed in 2006 were located in the two areas. Three medium-to-large gas lines totaling 2.4 bcfd of capacity and 192 miles were added in the gulf.

EIA said 2006 US gas imports totaled 3.4 tcf, down 5%.

Gas imports from Canada grew in 2004-05 and stalled in 2006 at 3.6 tcf, down 103 bcf from 2005, because less gas was available from Canada despite slightly more production. LNG imports fell 8% to 584 bcf. The LNG came from four countries—Trinidad and Tobago, Egypt, Nigeria, and Algeria—considerably fewer countries than in previous years when the Middle East and Pacific Basin contributed.

Working gas in storage at the start of the 2006-07 heating season was 3.452 tcf, the highest level since 1990. The first ever weekly net injection (1 bcf) occurred during a winter season occurred in the week ended Dec. 29, 2005, and mid-2006 injections were well below average.

Estimated exploratory completions, accounting for just under 6% of the first-quarter's total, fell 21% year-to-year as developmental completions rose 3%.

The report did not surprise domestic drilling observers. "It's consistent with the Baker Hughes rig count, which is at its highest level since 1986," said Mark S. Urness of Calyon Securities in New York. "The difference is that today, we have a much larger percentage—roughly 86%—drilling for gas."

Relatively higher prices are causing more oil wells to be drilled, he said. "For natural gas, some of the growth reflects concern over relying heavily on Canadian imports as their internal demand grows," Urness told OGJ. Large, publicly traded drilling contractors are not drilling as many US wells, but privately owned firms, often with five or fewer rigs, have increased their activity, he said.

Frederick Lawrence, vice-president of economics and international affairs at the Independent Petroleum Association of America, said "We're seeing more independents take a domestic focus. They're prioritizing their onshore portfolios and concentrating work on positions they have built up."

Rockies active

API does not report US drilling regionally, but other observers said activity remains particularly strong in the Rocky Mountains.

"Probably the two hottest areas are the Uinta-Piceance and Green River basins," said Marc W. Smith, executive director of the Independent Petroleum Association of Mountain States, Denver.

"Our members are optimistic about transportation out of the region. It also looks as if producers in the Powder River basin are coming up with solutions to their produced water. Barring any regulatory surprises, I think we'll continue to see good, sustainable growth."

Smith said the Rockies labor market remains tight, although it has improved from 18 months ago because of producers, drilling contractors, and service and supply companies' training initiatives.

Lawrence observed, "Independents are hiring a lot of staff, using more rigs and calling on more frac trucks and other services. But production per well is declining so more wells are being drilled."

Producers' costs also are climbing, Lawrence noted. The IPAA official cited a study by John S. Herold Inc. that found preliminary finding and development costs above $30/bbl at the end of 2006, compared with about $15/bbl at the end of 2004. Lower gas prices were among the negative factors, he said.

"Oil activity is growing. We haven't given up on it. A lot of oil plays like the Bakken are exciting, but they're also costly. The question now is whether the high prices will bring the majors back into the domestic drilling picture." ✦

US officials defend exclusions used in land management

Nick Snow
Washington Correspondent

Categorical exclusions (CEs) from environmental documentation authorized under the Energy Policy Act of 2005 are not compromising federal lands in the US West, land-use officials told a hearing by two House Resources Committee subcommittees on Apr. 26.

Section 390 of the law allows the Bureau of Land Management to use five CEs for onshore oil and gas activities in development areas that have gone through full analysis under the National Environmental Policy Act (NEPA), said Tony L. Ferguson, minerals and geology management director at the US Forest Service.

New activity must be within existing areas with land use plans approved within the previous 5 years or with surface disturbance limited to 5 acres and a previous project with a NEPA process decision, he said.

"These are not rubber stamps. Other environmental laws apply, and there are instances where we have added conditions," Ferguson told the Energy & Minerals Resources and the National Parks, Forests and Public Lands subcommittees.

Public involvement in the CEs is limited because extensive NEPA and other evaluations on the sites already have taken place, said Henri Bisson, BLM's deputy director for operations.

"But their use does not exclude application of other regulations. We provide guidance to our managers encouraging consultation with other agencies where appropriate," he said. The Forest Service has used Section 390 CEs to approve about 300 projects.

Additional CE

The US Department of Agriculture agency promulgated another CE for limited oil and gas exploration and development in new fields, he said in written testimony.

He said the White House Council on Environmental Quality reviewed the new CE and determined that it conforms to NEPA and its implementing regulations. The new exclusion allows approval of a surface operations plan for oil and gas work and initial development activities adjoining a new field. But it limits activity to 1 mile of new road construction, 1 mile of road reconstruction, 3 miles of individual or colocated pipelines or utilities disturbance, and 4 drillsites.

The new CE has been used twice since its approval on Feb. 15, Ferguson said.

Western governors generally support the CEs authorized in the 2005 energy act, according to John Emmerich, deputy director of the Wyoming Game & Fish Department. He testified on behalf of the Western Governors Association and the Association of Fish & Wildlife Agencies.

Emmerich added, however, that western states' chief executives believe a CE provision in a subpart of the law "appears to provide a legal option to deny state fish and wildlife agencies the opportunity to protect and adequately manage fish and wildlife resources on BLM lands by authorizing oil and gas development without adequate analysis, disclosure, and state agency involvement."

WGA seeks removal of that type of CE.

Bisson said BLM asks its project managers to call for "best management practices" in applications for permits to drill and associated rights-of-way. These include:

- Reducing the "footprint" of roads and wellheads by choosing the smallest safe standard and best location for facilities, and by employing interim reclamation.
- Selecting colors, shapes, sizes, and locations of facilities that reduce visual contrast.
- Discouraging raptor predation on sensitive species by installing perch-avoidance structures or buying power lines on lease areas.
- Reducing wildlife disturbance by centralizing or automating production facilities to reduce frequency of travel to each wellhead.
- Using common utility corridors or burying flowlines in a roadway or an adjacent right-of-way.
- Drilling multiple wells from a single location, centralizing production facilities, or moving facilities away from the site.

"Much of the cleanup we're doing now is from wells drilled in the 1920s and '30s. None of the operators today are walking away from leases without doing proper reclamation," Bisson said.

Reclamation bonds

But Peggy Utesch, a Colorado landowner testifying on behalf of the Western Organization of Resource Councils and Western Colorado Congress, said higher reclamation bonds are needed.

In 2004, she said, BLM and the Wyoming government estimated it would cost $4 million to reclaim 120 wellsites that Emerald Restoration & Production abandoned 3 years earlier under a $125,000 blanket bond. The state's conservation fund contributed $2.6 million, "but the balance will be paid by taxpayers or the cleanup will not happen," she said.

Claire M. Moseley, executive director of Public Lands Advocacy in Denver, said the bonds' purpose is to make the operator aware of its reclamation responsibility, not cover the entire cost which can run into hundreds of thousands of dollars in some cases. "The small operators would be the ones most affected by increased bonding costs. They would be the ones who wouldn't drill wells as a result," she said.

Utesch responded: "There are two ways to look at small producers and what they do. I have seen instances where they have chosen to walk away from a $25,000 bond instead of paying $100,000 for proper reclamation." ✦

WATCHING GOVERNMENT

Nick Snow, Washington Correspondent

Confronting split estates

Could 2007 be the year that US Congress addresses the split estates question? The idea that another entity—often the federal government—could hold subsurface rights to an individual's property is incomprehensible in most of the US. It's a part of life in the West, however, and it can lead to conflicts.

It's remarkable that it hasn't done so more often. Energy and mineral lessees say it's because they've learned to operate with minimal disruptions to surface activities. Some surface land owners respond that they have no choice but to cooperate, and that they are tired of it.

The conflict quickly surfaced (for lack of a better term) as two House Natural Resources Committee subcommittees held a hearing on Apr. 26 about land use issues created by onshore oil and gas resource development.

Rep. Mark Udall (D-Colo.), a member of one of the subcommittees who introduced a bill addressing split estates and other Western land issues in February, asked Henri Bisson, deputy director for operations at the US Bureau of Land Management, how much advance notice surface land owners receive of subsurface leasing.

"The first place where leasing decisions are made is in development of the land use plans. We have instructed our field offices to advertise this extensively," Bisson replied.

Negotiated agreements

"We have about 19,500 wells currently on split estates. Of these, the operators have moved about 20 to the bonding process. The others have negotiated agreements with the surface land holders," Bisson said.

Rancher Steve Adami of Sheridan, Wyo., said he is intimately acquainted with 12 of those 20 wells. When he learned that several of his neighbors had reached agreements with producers, he asked them what they had learned. Then he tried to obtain conditions when a producer told him that he held subsurface leases on his land.

"When we asked for some changes in the language ensuring proper reclamation, restrictions on water disposal, and $1.37/day more money than was being offered...what we received was nothing. The initial offer was withdrawn and the operator 'bonded on,'" Adami said at the hearing.

Grazing value

Although they invited him to the meetings, the operator and BLM then made the development decisions, Adami said. "The BLM's response to my protest that they allowed industry to post a $2,176 bond against a reasonable reclamation estimate of $3 million or more was that they were only required to collect a bond for loss of grazing value."

In most other instances, energy producers and surface land owners have good relationships, maintained Claire M. Moseley of the Public Lands Advocacy in Denver.

"BLM has done a good job of soliciting feedback from land owners and industry alike to determine how best to address the split estate issue," Moseley said. When the federal agency held nine public meetings on the issue, it found that very few actual conflicts exist and the current process is working well, she said. ✦

Interior proposes 21 OCS lease sales in 5-year plan

NUS Interior Sec. Dirk Kempthorne announced a preliminary final 5-year Outer Continental Shelf leasing plan on Apr. 30 that DOI says could produce 10 million bbl of oil, 45 tcf of gas, and $170 billion in revenues if fully implemented.

The plan was submitted to Congress. If it does not act within 60 days, Kempthorne said, he is authorized to make it final.

The plan proposes 21 lease sales in 8 of the 26 OCS planning areas in the Gulf of Mexico, Alaska, and Virginia, which Kempthorne said was added at the request of the state's leaders.

The proposed lease sale off southeastern Virginia in 2011 includes a 50-mile buffer added at the state's request. It also includes an exclusion at the mouth of Chesapeake Bay to prevent interference with military activity and commercial shipping.

DOI emphasized that no federal oil and gas leasing would occur off Virginia unless a presidential withdrawal and congressional moratorium are lifted.

US Minerals Management Service said while there will be no leasing off Virginia immediately, companies can shoot seismic surveys while the area is still under moratorium.

"The estimates are pretty solid in the Gulf of Mexico because there's been a lot of activity there," said MMS Director Johnny Burton. "They are much less so because there's been no leasing for more than 20 years. That's also the case to some extent in Alaska. The data could improve if drilling takes place."

Kempthorne said the preliminary 5-year plan includes two other areas previously not available, the North Aleutian Basin planning area off Alaska and the Sale 181 South area of the Gulf of Mexico.

The proposed 5-year leasing program runs from July 1, 2007, through June 30, 2012. ✦

OFFSHORE ENERGY LOSS—1

Loss categories, hazard types in marine operations described

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Offshore operations present a unique set of environmental conditions and adverse exposure not observed in a land environment.

It is possible to engineer some risks to a very low threshold of probability, but losses and unforeseen events can never be entirely eliminated because of cost considerations, the human factor, and environmental uncertainty.

The purpose of this three-part series is to provide a statistical assessment and comparison of offshore energy losses using the Willis Energy Loss database.

In Part 1, we describe the loss categories and hazard types of offshore operations. Part 2 contains loss statistics and statistical analysis, and Part 3 summarizes the impact of weather on loss statistics.

Introduction

Risk events occur infrequently in the offshore environment but have the potential to generate large losses.

Due to the remoteness of facilities and the challenges presented by a marine environment, drilling and construction projects are major undertakings that require the use of large and expensive marine vessels.

Operating in an offshore environment is always more uncertain and unpredictable than onshore activities. This is due to the influence of numerous independent and uncontrollable variables in the offshore environment, from adverse sea conditions and weather, and availability and performance of equipment, to defects in plans and specifications.

Events result in delay and often significant financial repercussions. Space constraints make it difficult to mitigate hazards by separating equipment, personnel, and hazardous material. Nonroutine operations dramatically increase the number of personnel and level of marine activity, material handling, and other support activities.

Insurance coverage

Offshore oil and gas insurance can be traced to exploration activities in the Gulf of Mexico in the early 1960s.[1]

The first policies were associated primarily with the control of blowouts. As the costs of drilling escalated with more complex targets and deeper water, it became clear that expenditures following the loss of well control would be substantial.

The London market began to cover the cost to redrill a blowout as a separate policy from control expenditures. Over time, these two coverages merged to provide the basis of the operators extra expense (OEE) coverage. Pollution liability policies resulted in a separate market covering cleanup and containment risks. By the late 1960s, the market expanded to cover the risks of direct physical loss or damage to platforms, rigs, and equipment.

Today, two basic coverages apply to offshore installations.

1. For fixed platforms, pipelines, and subsea developments, the market has developed an "all risks" coverage based on the London Standard Platform form. Areas of coverage include property and casualty (P&C), liability, business interruption, workers compensation, life, and health. P&C coverage is intended to provide postloss financing for any physical property damaged or destroyed.
2. For floating production systems, marine policy forms such as the Institute Time Clauses Hull Port Risks that cover maritime perils such as stranding, collision, and contacts, are in common use.

Insurance claims on time-element coverage are typically categorized as business interruption (BI) from damage to platforms, pipelines, tankers, etc. owned by the assured, and contingent business interruption (CBI), associated with damage to upstream facilities such as processing plants, trunklines, and refineries owned by third parties.

The major factor affecting losses in a hurricane is direct physical damage caused to the platform and time element losses due to business interruption. Repair times depend on the extent of damage, facility location relative to support services, and availability of equipment and contractors to perform the work. Production shut-ins may also be due to damage to onshore facilities such as refineries, terminals, and processing stations.

Energy loss database

The Willis Energy Loss database is a compilation of onshore and offshore loss claims across each segment of the energy supply chain.

The database contains records covering nine regions of the world of insured losses greater than $1 million. The first record of claims data varies with each region, but most start from the early 1970s.

The Willis database partitions the world into nine geographic regions in terms of loss categories and loss types (Table 1).

Third party property losses and sudden and accidental pollution claims are included in the data elements, as are death and injury settlements that formed part of recognized figures, only for major property claims.[2]

The risk associated with offshore energy is broadly described in five categories: weather perils, marine perils, drilling perils, production perils, and political risks.

Weather perils include environmental factors such as storms, wind, hurricanes, typhoons, lightning, and ice/snow/freezing.

Marine perils include fatigue and corrosion arising from environmental conditions, collision with attendant or passing vessels, foundation failure, subsidence, and mudslides.

Drilling perils include surface and subsurface blowouts. Production perils include fire, explosion, and equipment failure.

Maintenance and construction activities, such as pipelaying, piling operations, and construction defects, are included in the production risk category.

Political risks include war risk, asset confiscation, expropriation or nationalization, and damage caused by labor dispute or by terrorists.

Loss categories

Offshore drilling rigs are classified into two categories: mobile offshore drilling units (MODUs) and fixed units.

Fixed units, also known as platform rigs, are drilling units that are placed upon a platform or other structure. MODUs are classified in terms of bottom-supported (shallow water) rigs and floating (deepwater) rigs.

DATABASE ELEMENTS

Table 1

Loss categories
Floating production, storage, and offloading
Floating storage unit
Pipeline
Platform
Rig
Single buoy mooring
Subsea completion
Vessel
Well
Loss type
Business interruption
Liability
Operators extra expense
Physical damage
Seepage and pollution

In bottom-supported units, the rig is in contact with the seafloor during drilling, while a floating rig floats over the site while it drills, held in position by anchors or equipped with thrusters to be dynamically positioned. Both units float when moved from one site to another. Bottom-supported units include jack ups, tenders, submersibles, and barges. Floating units include semisubmersibles and drillships.

Caissons, well protectors, and fixed platforms are widely used throughout the shallow water basins of the world. Caissons and well protectors protect the wellbore from damage, while fixed platforms host the drilling rigs and treatment facilities.

Fixed platforms have an economic water depth limit of about 1,500 ft. Subsea completions and floating production systems are employed in deeper water. In a subsea completion (SC), valves and equipment used to control the fluid are placed on the seafloor and are typically used as an alternative to a satellite platform for recovering reserves beyond the reach of the drillstring, or in deep water in conjunction with a floating production system.

Floating production systems (FPS) are employed in a wide variety of fields throughout the world. An FPS is a production vessel that is connected to a subsea pipeline, while a floating, production, storage, and offloading vessel (FPSO) processes and stores oil on board a vessel prior to being offloaded into shuttle tankers. Production floaters in service or available numbered 188 in 2006.

FPSOs are by far the most common deepwater development system in use worldwide at 115 vessels. There were also 39 production semis, 20 tension leg platforms (TLPs), and 14 spars. Spars and TLPs are popular in the Gulf of Mexico. A floating storage unit (FSU) is essentially a storage tanker into which processed oil is pumped from a fixed platform or semisubmersible. Seven floating storage vessels are installed primarily in Southeast Asia, West Africa, and the North Sea.

Once oil and gas are produced, separated, and treated on an offshore facility, they must eventually be sent to market by pipeline or tanker. Since laying a pipeline is not always feasible or economic, tanker ships are often utilized. A single buoy mooring system (SBM) is a system to which the production is routed and to which a tanker ties up in order to load the produced oil.

Numerous construction and specialized support vessels are involved in the offshore energy industry and may be involved in loss incidents.[3] Common vessels include derrick barges, pipelay vessels, pipelay and bury barges, construction support ships, dive support vessels, anchor handling towing supply vessels, platform supply vessels, tugs, and crew boats.

Hazard type

A peril is an event that causes damage, while a hazard is an event that can lead to, or intensify, a peril.

Some perils adhere to the magnitude-frequency rule, which specifies that over a sufficient time small catastrophes will recur frequently and large ones periodically. The frequency-severity rule specifies that the larger the event, the more severe the damage and losses.[4] In some cases, the severity of a disaster is independent of the magnitude of the disaster; i.e., a large magnitude event can cause little damage. All perils are not necessarily insurable, but they represent the main types of hazard to which offshore facilities are exposed.

Anchor/jacking/trawl

Anchors are used to hold drilling rigs, floating production units, and various other vessels at station when operations are in process or when heavy weather advances.

Temporary units such as semisubmersibles are typically anchored to the ocean floor through mooring lines, which are designed for low-return storms and may break away during hurricanes. Permanent units such as floating production systems are typically designed for high category storms. Rigs that lose station during severe weather and drag their anchors may damage pipelines.

Blowout

A blowout is a well-related hazard that may occur during exploratory drilling or during production operations. During drilling, if the bit penetrates a high-pressure zone unexpectedly, oil or gas or a mixture of both, may rush into and up the wellbore, dilute the mud, and reduce its pressure. This is called a "kick" and it can lead, if unchecked, to an uncontrollable gusher at the wellhead (a blowout).

A surface blowout is an aboveground uncontrolled flow, while an underground blowout is a belowground uncontrolled flow. Surface blowouts cause large volumes of oil and gas to be released in and around the platform, creating significant potential for loss or damage to the facility by fire, explosion, or cratering. Surface blowouts have received the most attention over the last half-century (Kuwait, Piper Alpha, Ixtoc, Santa Barbara), but underground blowouts are actually more common.

Blowouts occur primarily during exploratory drilling, although there is also risk of a blowout during production, since maintenance activities require reentering wells for workover, sidetracking, or deepening. The first exploration well in an area will be drilled very carefully because the geologic formations are untested and the risk of overpressure may result in a blowout. After a few wells are drilled, the stratigraphic layers where overpressures can be expected are known, and drilling can proceed faster and safer.

Capsize/collapse

Rigs, platforms, and floating production systems may capsize during heavy weather.

Failure of primary structural components such as main braces, jacket legs, deck legs, and piles often lead units to list or capsize.

Loadings caused by wave inundation of the deck are usually the primary cause of damage to the integrity of a structure. Inundation of the deck increases the horizontal load and overturning moment, resulting in the potential failure of structural members and collapse. Bottom current loading or foundation failure may also lead to failure because of soil instability and mud slide conditions.

Collision

The risk of a ship colliding with an offshore platform depends upon a number of factors, such as the proximity of the platform to shipping lanes, the frequency of traffic, and weather conditions.

Infrastructure located in/near high-frequency, rough weather shipping lanes has a greater probability of collision than isolated infrastructure. The potential for loss or damage will depend upon the speed at which the vessel is traveling, its size, and the nature of its cargo.

The impact between a vessel and a platform may result in structural failure and the failure of wellhead or pipeline risers. A collision between an LNG carrier and a platform, or an oil tanker and a LNG regasification facility, could have devastating consequences if fire or explosion result. Grounded ships frequently spill the material they are transporting.

In the Gulf of Mexico and North Sea, several incidents in recent years have occurred during severe weather where drilling rigs and FPSOs have broken adrift from their mooring in high density infrastructure regions, contributing to the failure of pipelines.

Corrosion

Corrosion refers to the deterioration of a solid body through interaction with its environment.

Steel units in a saltwater environment are especially susceptible to corrosion and are normally evaluated in terms of three zones: the splash zone, the submerged zone, and the atmospheric zone.

The "splash zone" is that portion of the structure which, due to the action of tides, seas, and winds, is intermittently wetted by seawater. The "submerged zone" refers to that portion of the structure that extends downward from the splash zone, including surfaces below the mud line. The "atmospheric zone" extends upward from the splash zone and is exposed, to varying degrees, to salt spray, sun, dew, and chemical spillage.

Each of the three zones of a platform is exposed to a different corrosive environment, which varies with structure and site-specific factors.

Design/workmanship

In the early years of offshore development, structural integrity was largely the responsibility of the designers, who worked to a variety of standards drawn

from coastal and onshore engineering experience.

Structural engineers followed deterministic construction practices and dealt with uncertainty not by quantifying it but by incorporating explicit factors of safety in design procedures.[4-6] Safety factors/design margins are intended to account for a wide range of unknowns, including construction loads and stresses, changes in loading assumptions, and uncertainties in environmental loads.[7]

Probabilistic methods began to be applied in the late 1960s, and in the 1970s hazard analysis was applied for critical industrial installations such as nuclear facilities, petrochemical plants, and liquefied natural gas plants.[8] Movement of offshore construction into deeper waters of the Gulf of Mexico and other frontier areas led to increasingly severe environmental loadings and more complex design requirements. The latest edition of the API Recommended Practice 2A uses consequence-based design.

In the US, operators design their structures to satisfy API RP 2A guidelines and federal regulations. The Minerals Management Service (MMS), the federal agency responsible for regulating the offshore industry, will generally accept the risk of losing a structure where there is no threat to life or the environment.

Owners may be willing to accept the risk on less important structures (such as caissons and well protectors), but monetary considerations usually dictate increased capacity for structures with a high production rate, facilities that serve as a transportation or processing hub, and deepwater structures.

From an economic perspective, for a given probability of an extreme weather event, the investment required to avoid damage must exceed some fraction of the cost to repair the damage. A tradeoff exists that attempts to balance the potential costs of damage and disruption due to a catastrophic weather event against the benefits of a more robust (but expensive) design.

Earthquakes and tsunamis

Earthquakes represent a peril to any structure fixed to the seabed in proximity to a fault line or active tectonic region.

Earthquakes impose severe dynamic loadings, and since the timing of their occurrence cannot be predicted (unlike hurricanes or severe storms, for example), evacuation of personnel is impractical. Safety considerations thus require critical attention, since a structure might collapse and lead to a blowout, or shock forces may create electrical disturbances in equipment leading to fire or explosion.

The offshore regions of the world most affected by earthquake are those in the Pacific Basin, and include the active offshore producing regions of California, Chile, Malaysia, Indonesia, and New Zealand.

Tsunamis (tidal waves) are caused by the energy released as a result of an undersea earthquake. The effect of a tsunami depends on several factors. In shallow water, depending on the height of the swell, a tsunami could be devastating if the platform is not built sufficiently above the mean sea level. In deep water, the effect of a tsunami is expected to be less severe because platforms are built higher to avoid wave forces.

In all recorded incidents to date, the impact of tsunamis on offshore infrastructure has been negligible.

Fire/lightning/explosion

Hydrocarbons are processed at high temperature and pressure and create an ever-present danger of fire and explosion.

The type of fire and heat flux will depend on the fuel being released, its state, and in the case of liquids, conditions such as pressure and velocity. The size of the fire will depend on the release rate and ventilation conditions, inventory, and surroundings, and the degree to which a fire will spread depends upon the effectiveness of the safety apparatus.

Regulatory authorities have strict fire prevention rules, and platforms are equipped with leak detection systems, sensors, fire-fighting equipment, and emergency shutdown systems. Fire prevention is a top priority, and offshore operators regularly practice fire and evacuation exercises.

In harsh climate areas such as the North Sea, topside facilities are usually totally enclosed, which may allow gas from a leak to accumulate in a confined location leading to a vapor cloud explosion.

Heavy weather

The predominant patterns of ocean winds are their circulation around the permanent high-pressure areas that cover the ocean, clockwise in the northern hemisphere, counterclockwise in the southern hemisphere.

When energy flows become concentrated and are released, forces are created that disrupt physical conditions, geography, and weather. The violent storms are known as tropical cyclones in the Indian Ocean, Arabian Sea, and off Australia; as hurricanes in the Atlantic and South Pacific; and as typhoons in the western Pacific.[9]

In harsh environments such as the North Sea, severe storms with high winds and rough seas occur throughout the year with wave heights reaching 100 ft or more. The Gulf of Mexico and South China seas are relatively calm for most of the year but will experience seasonal windstorms of ferocious intensity with wave heights reaching 70-90 ft. Environmental conditions in West Africa are benign throughout the year.

Ice/snow/freeze/icebergs

Hydrocarbon producing regions that border the Arctic and Antarctic circles (e.g., Cook Inlet in Alaska, the Beaufort Sea, Nova Scotia) as well as operations in the north Caspian are subject to severe ice, freezing conditions, and drifting icebergs.

Specialized man-made islands have been used to withstand the large lateral loads involved with pack ice, while off Nova Scotia drifting icebergs are

constantly monitored, and contingency planning involves marine vessels ready to tow drifting icebergs away from the danger zone.

Leg punch-through

A jack-up drilling rig is a barge with legs that can be lowered or raised.

Once in position, the legs are lowered, hoisting the drilling platform above the water. Jack-up rigs are either mat-supported, with the jacket legs attached to a submerged mat, or independent-leg, where the individual legs are driven down independently into the ocean floor.

As the legs of a jack up are driven down into the ocean floor, a leg may punch through, bend, or collapse. During extreme weather, the legs of jack-up rigs may break, the unit collapse, or the legs may shear, and the barge set adrift.

Mechanical failure

Mechanical failures are often due to corrosion and fatigue.

Fatigue is structure weakening due to the constant stress exerted on the installation over its life. Frequent storms magnify fatigue effects and "use up" a structure's fatigue life.

Visual inspection with divers or remote controlled vehicles are capable of finding parted, buckled, and missing braces and legs, typically the result of overloads from collisions and storms; cracks at tubular joints; corrosion pitting; and loss of weld metal on structures with incomplete cathodic protection.

Regular maintenance is required to avoid component breakdown and to provide early detection. Most fixed platforms have a high degree of structural redundancy, and in the Gulf of Mexico are evacuated in the event of potential extreme loading (i.e., with the approach of a hurricane). In the North Sea, logistical complexities and environmental factors are such that crews usually ride out the storm.

Piling operations

Conventional platforms in moderate water depths consist of jackets with piling installed in each jacket leg.

As the water depth or the environmental forces increase, or the soil conditions at the site worsen, the number or size of the piles that provide lateral support and fix the jacket to the seabed increase. The number and size of pilings required are related to the magnitude of gravity and environmental loads and the characteristics of the foundation soils at the site.

In most offshore structures, piles are large diameter, thick-walled steel pipe ranging from 3-7 ft (1-2 m) in diameter and in lengths from 130-1,000 ft (40-300 m).[3]

Additional piling may be added to the structure through sleeves (called "skirt piling") framed into the bottom of the jacket. Pilings are driven with high-energy impact hammers, and if the pile encounters a boulder or rock during the operation, damage can result.

Pipelaying/trenching

Building an offshore pipeline is a complex operation that may require hundreds or thousands of individual steel joints of pipe welded together on board a lay barge and then laid on the seafloor in a continuous process.

The pipeline has to achieve the correct trajectory as it passes through the water and settles on the seabed to prevent breaking or buckling. Pipelines are empty when installed and are subject to high hydrostatic pressure during installation.

Various methods of pipelaying have been employed and are selected based on expected environmental conditions, availability and cost of equipment, length and size of line, and constraints of adjacent lines and structures. Pipeline damage may occur in installation during severe sea states when the barge is subjected to dynamic surge.

Trenches are frequently dug after the pipe is laid to protect it. Burial of pipelines in deep water to reduce loss due to anchor drag is usually not cost effective, but for key trunklines where the potential loss of revenue due to shut-in is factored in may favor burial.

Stuck drillstem

A well penetrates many different types of rock formations until total depth is achieved, and as the well continues deeper into the earth, the operating environment becomes more hostile (temperatures and pressures increase, rock formation becomes harder, etc.) and drilling becomes more difficult.

A stuck drillstem occurs when the drillstring is stuck in the hole, usually by "doglegs" or an inappropriate mud program, and cannot be removed. Stuck pipe is one of several categories of drilling problems that include sloughing shale, lost circulation, formation damage, and embrittlement.

Subsidence and landslide

Subsidence is a common phenomenon in the oil and gas fields of the Louisiana coastal plain, but it has been encountered on relatively few offshore fields, with the most notable exception being Ekofisk field in the North Sea.

As a hydrocarbon reservoir is depleted, the seabed may drop, creating a gap between the sea level and the lower portions of the structure. The structure subsequently becomes more susceptible to damage by extreme wave heights and may develop foundation weakness.

An underwater landslide (mud slide) refers to the downward movement of seafloor material en masse. Mud slides can result in damage to structures that are embedded in or in the path of the mudslide, and pose a serious threat to pipelines, flowlines, and structures where soils are soft and sediment unstable.

Only a few continental margins around the world possess the right combination of high sedimentation rates, unconsolidated soils, shelf configuration, and frequent storms/earthquakes for mud slides to be prevalent.

Landslide damage in the Gulf of Mexico has been identified in hurricanes Betsy, Camille, and Georges, but was particularly destructive during Hurricane Ivan. Other major river deltas

where mud slides have been observed include: Yellow River (China), Yukon River (North Bering Sea), and Klamath River (California).

Wind and storms

Northern Hemisphere windstorm events form between July and October, with peak activity occurring in August and September.

The peak season for Southern Hemisphere events is in February and March.

The typhoons of the Western Pacific occur from May to December.

North Atlantic hurricanes can have a storm diameter ranging from 100-800 miles, with an eye of 10-40 miles, and can last anywhere from 5-15 days.

Most Atlantic hurricanes follow a westerly path and veer northward, but the specific path depends on atmospheric conditions that exist at the time of the event.

Western Pacific typhoons have diameters that range from 100-1,000 miles. The patterns of hurricane activity can be observed from history and explained by the physics and climatology of hurricane formation and motion. Tropical cyclones form regularly, but the number achieving hurricane strength is relatively small, and the actual number making landfall is smaller still.

High wind speed, high wave height, and landslides are the main weather-related threats to offshore infrastructure. Platform damage may be due to the failure of structural components, such as main braces, jacket legs, and piles, or displacement of deck equipment, such as quarters modules and drilling rigs.

Piping and connections between storage and process units, derricks, construction cranes and heliports are particularly vulnerable to wind-induced failure. If storm waves inundate the structure, this may result in structural fatigue and damage, flooding of equipment (compressors, electrical lines, pumps, etc.), flowline and riser rupture, and storage tank destruction.

Next: Offshore loss statistics and statistical analysis. ✦

The authors

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Vietnam

TGS-NOPEC Geophysical Co. ASA, Asker, Norway, began acquiring a 46,000 sq km nonexclusive aeromagnetic survey in the untested Mekong Delta in collaboration with state Petrovietnam.

A planned second phase will include aerogravity data. The area being surveyed is adjacent to production but lacks geophysical data to define basin architecture.

Louisiana

Daybreak Oil & Gas Inc., Spokane, was to run liner and test Eocene Cockfield at the Haas-Hirsch-1 well in Krotz Springs field, St. Landry Parish.

Logs indicated that Cockfield sandstones at 10,252-294 ft and 10,616-634 ft MD contain at least 15 and 10 net ft of potential gas pay, respectively.

Prospect generator Vision Exploration LLC has identified other Cockfield and Oligocene Frio reservoir targets on the farmout that Daybreak and partners will pursue pending a successful completion. Krotz Springs gas-condensate field, discovered in 1942, has produced more than 900 bcf of gas, most of it from Lower Frio and Cockfield sandstones.

Pennsylvania

CNX Gas Corp., Pittsburgh, said two vertical wells at its emerging Nittany exploratory coalbed methane play in west-central Pennsylvania were fracture treated in two lower zones.

Gas is pipeline quality with heating value slightly above 1,000 btu/Mcf and less than 1.2% carbon dioxide.

CNX plans to start building infrastructure at Nittany, where 42 drillsites have been acquired. CNX will apply for drilling permits for eight more wells in the original 2007 program.

CNX said in 2006 that the Nittany play targets 180 bcf of gas. The company holds 235,000 acres in the area, where it expects mostly vertical drilling.

Texas

Gulf Coast

Delta Petroleum Corp., Denver, has identified numerous shallow Yegua and Frio targets in Southeast Texas and is seeking permits to drill three shallow tests similar in geophysical appearance to its Aeolis prospect.

Drilling is to start later in the second quarter.

Aeolis-1, a shallow Yegua formation well, began producing in November 2006 at 1.3 MMcfd of gas and 190 b/d of condensate. The Big Thicket Pipeline, shut-in most of January, resumed operation Jan. 30, whereupon Aeolis-1 was allowed to reach flow capacity and is now making 2.3 MMcfd and 300 b/d.

TD is 7,780 ft. The well is on a seismic anomaly south of Newton field in Newton County. Delta holds 100% interest in more than 21,000 acres in the area.

Mathematical model forecasts year conventional oil will peak

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A new mathematical model can forecast when worldwide conventional oil production will peak with a minimal amount of information.

In recent years, many attempts to model conventional oil production have included poor assumptions that have resulted in a wide range of estimates for the peak production year. Peak year estimates have ranged from ~2004 to ~2040.[1-7]

Problems with some of these models include:

- The Association for the Study of Peak Oil and Gas (ASPO) and Bakhtiari models fail to explain fully the mathematics used to generate the models and hence the underlying assumptions are unclear.[1,2]
- The Deffeyes and Parker models use simplistic bell curves that do not adequately fit the data.[3,5]
- The EIA model includes the US Geological Survey (USGS) estimated 3 trillion bbl of recoverable oil and uses a reserves/production (R/P) approach to determine the decline rate.[4] The latter

Equations

$$IBC(x) = \frac{2y_p}{1 + \cosh R(x - x_p)} \quad (1)$$

$$1) \quad p(x_c) = P(x_c) \quad (2)$$

$$i) \quad p^{[i-1]}(x_c) = P^{[i-1]}(x_c);\ \text{for } 2 \le i \le n \quad (3)$$

$$n+1) \quad p(x_1) = IBC(x_2) \quad (4)$$

$$n+2) \quad p^{[1]}(x_1) = IBC^{[1]}(x_2) \quad (5)$$

$$n+3 \quad \int_{x_c}^{x_1} p(x)\,dx = \int_{x_q}^{x_2} IBC(x)\,dx \quad (6)$$

$$M(x) = \begin{cases} IBC(x); & x < xa_0 \\ SP(x); & xa_{i-1} \le x < xa_i;\ \text{for } 1 \le i \le m \\ p(x); & x_c \le x < x_1 \\ IBC(x + (x_2 - x_1)); & x_1 \le x \end{cases} \quad (7)$$

$$r^2 = \frac{\sum_{i=x_c+1}^{2,100}(FPD(i) - \overline{FPD})^2 - \sum_{i=x_c+1}^{2,100}(FPD(i) - M(i))^2}{\sum_{i=x_c+1}^{2,100}(FPD(i) - \overline{FPD})^2} \quad (8)$$

Nomenclature

Functions

$\overline{FPD}$	Average future production data during the period x_c+1 to 2,100 (average of future data points, in Fig. 2a)
FPD(x)	Future production data, (future points, in Fig. 2)
HPD(x)	Historic production data, billion bbl/year
IBC(x)	Ideal bell curve function, billion bbl/year
M(x)	The model's function, billion bbl/year
p(x)	Polynomial used to model production in the first future years
P(x)	High-degree polynomial used to model most recent historic production
r^2	The correlation function
$SP_i(x)$	The i-th simple polynomial used to model the i-th anomaly in the historic data

Variables

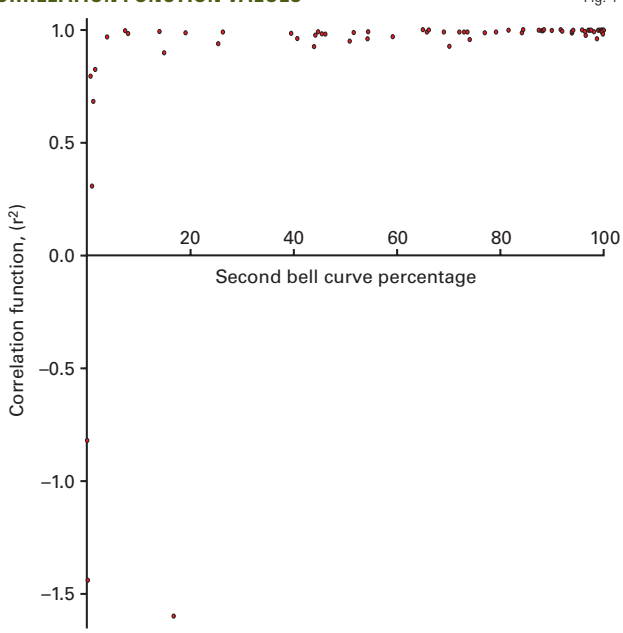
n	Degree of p(x), an important component of the model
R	Ideal slope constraint
x	Time variable (y)
x_1	Time the model changes from p(x) to the shifted ideal bell curve (y)
x_2	Time the model changes from p(x) to the shifted ideal bell curve relative to the unshifted ideal bell curve (y)
x_{ai-1}	Time the i-th anomaly occurred (y)
x_c	Current year (last year of historic data) is the same as x_{am} (y)
x_p	Ideal peak year (y)
x_q	The current year relative to the unshifted ideal bell curve (y)
y_p	Maximum ideal production rate, billion bbl/year

Superscripts

[i]	The i-th derivative of a function

Correlation function values

Fig. 1



OIL RESERVES

Table 1

Country	Reserves, billion bbl	References	Comments
OPEC			
Venezuela	52.4	16	Other estimates are higher,[17] heavy oil is not included
Iran	93.5	10	Removed ~44 billion bbl reserves[14] from the BP estimate[10]
Iraq	115.0	10,16,17	Large speculation[13]
Kuwait	48.0	18	This is lower than other estimates[10 16 17]
Qatar	15.2	10,17	
Saudi Arabia	130.0	19	Al-Husseini states the oil fields currently in production contain 130 billion bbl and that there are 130 billion bbl of reserves that have not been developed.[19] In 1990, Saudi Arabia increased its reserves estimate from ~170 to ~260 billion bbl, a move that is considered purely political.[14] Between 1990 and present, the country has produced ~50 billion bbl of oil. Al-Husseini's estimate of 130 billion bbl of oil is therefore considered more realistic. The 130 billion bbl of oil reserves not developed is believed not to exist.
UAE	69.9	16	Suspicious reserves increase in 1988, to 96 billion bbl from 32 billion bbl.[14]
Algeria	15.2	16	
Libya	39.0	17	
Nigeria	36.6	16	
Indonesia	4.3	10	
Total OPEC	**619.1**		
FSU			
Azerbaijan	7.0	10,17	
Kazakhstan	26.0	20	Estimates vary to 40 from 9 billion bbl.[10 17]
Russia	67.1	16	Estimates vary to 75 from 60 billion bbl.[10 17]
Turkmenistan	1.1	21	Values range between 0.55-1.7 billion bbl, with 1.1 billion bbl assumed.
Uzbekistan	0.6	10,17	
Total FSU	**102.5**		
REST OF THE WORLD			
Denmark	1.3	10,16,17	
Italy	0.7	10,16	
Norway	9.9	16	
Romania	1.0	17	
UK	4.0	10	
Other Europe	1.8	16	
Oman	4.8	16	
Syria	2.5	17	
Yemen	4.0	17	
Other Middle East	0.7	16	
Angola	25.0	20	Other estimates are lower[10 16 17]
Congo (Brazzaville)	1.8	10,16	
Egypt	3.7	10,17	
Equatorial Guinea	1.8	10,16	
Gabon	2.5	17	
Sudan	6.4	10,16	
Tunisia	1.7	20	
Other Africa	1.5	10,16	
US	32.3	10	Includes 3 billion bbl from the Chevron Corp. deepwater discovery[22]
Canada	4.7	16	Tar sands are not considered
Mexico	14.8	16	
Argentina	2.7	17	
Brazil	12.2	20	
Colombia	1.5	10,16,17	
Ecuador	5.1	10	
Peru	1.0	16,17	
Trinidad and Tobago	1.0	17	
Other Americas	2.0	17	
Australia	3.6	16	
Brunei	1.4	17	
China	18.3	17	
India	5.9	10	
Malaysia	3.0	16,17	
Thailand	0.5	10,16	
Vietnam	2.6	20	
Other Asia	1.0	10	
Total rest of the world	**188.7**		

YET TO BE FOUND RESERVE ESTIMATES

Table 2

Region	Scenario 1 (Billion bbl)	Scenario 2 (Billion bbl)
OPEC	150	350
FSU	75	175
Rest of the world	75	275
Total	**300**	**800**

approach is invalid.[8]

• The Wells model uses a bell curve fitted to the rest of the world data (RoW) that calculates the ultimate recoverable reserves of oil rather than the model requiring this information.[6 7]

• Hubbert's bell curve requires essentially two assumptions.[8] The first is that production at all times is at a maximum rate. This condition requires that there is sufficient demand for oil and no political interference, amongst others. The second assumption is that the estimate of ultimate recoverable reserves is accurate.

Such events as the two oil crises in the 1970s, the collapse of the Soviet Union, and production capacity exceeding demand in the 1990s have shown that the first assumption is invalid.

Model description

The new model for forecasting worldwide conventional oil production requires historic oil production data (HPD(x)) and an estimate of ultimate recoverable reserves.

The model generates an ideal bell curve (IBC(x)) from Equation 1 (equation box) using data prior to anomalies in production. The curve has the total area equal to the ultimate recoverable reserves. The model considers crude plus NGL production.

In the equation, y_p is the production at the peak year, R is a slope constant, x is the year, and x_p is the peak year.

The xa_{i-1} is the year the i-th anomaly occurred. Production after the anomalies is then modeled with m small-degree polynomials $SP_i(x)$ (degree 1 or 2, $1 \le i \le m$) fitted to the data until the model reaches the last historically known production point, $HPD(x_c)$. The x_c is the last year of historically known production and let $xa_m = x_c$.

The model then locates the unique point $IBC(x_q)$ on the ideal bell curve, where the amount of oil produced according to the ideal bell curve is the

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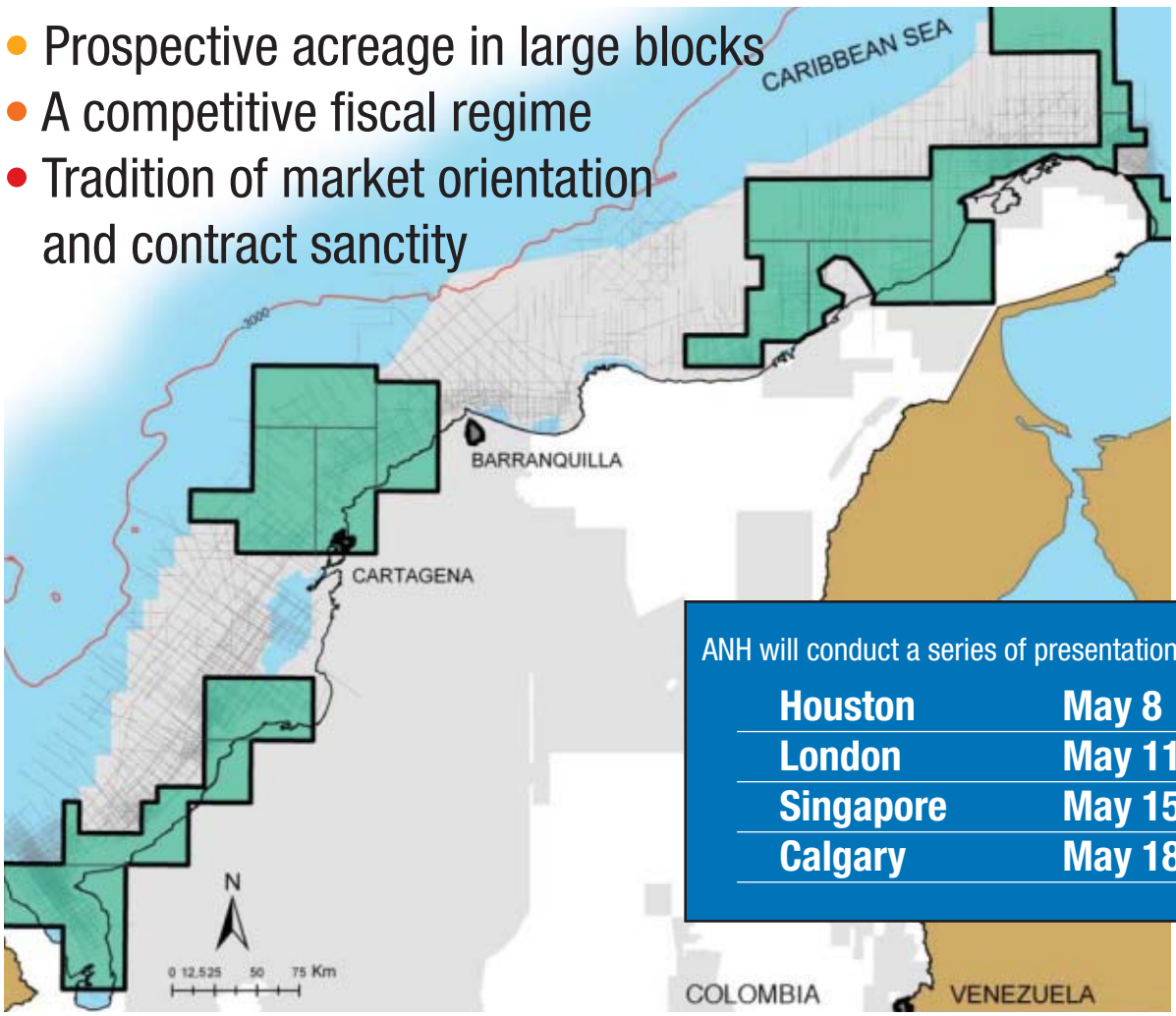

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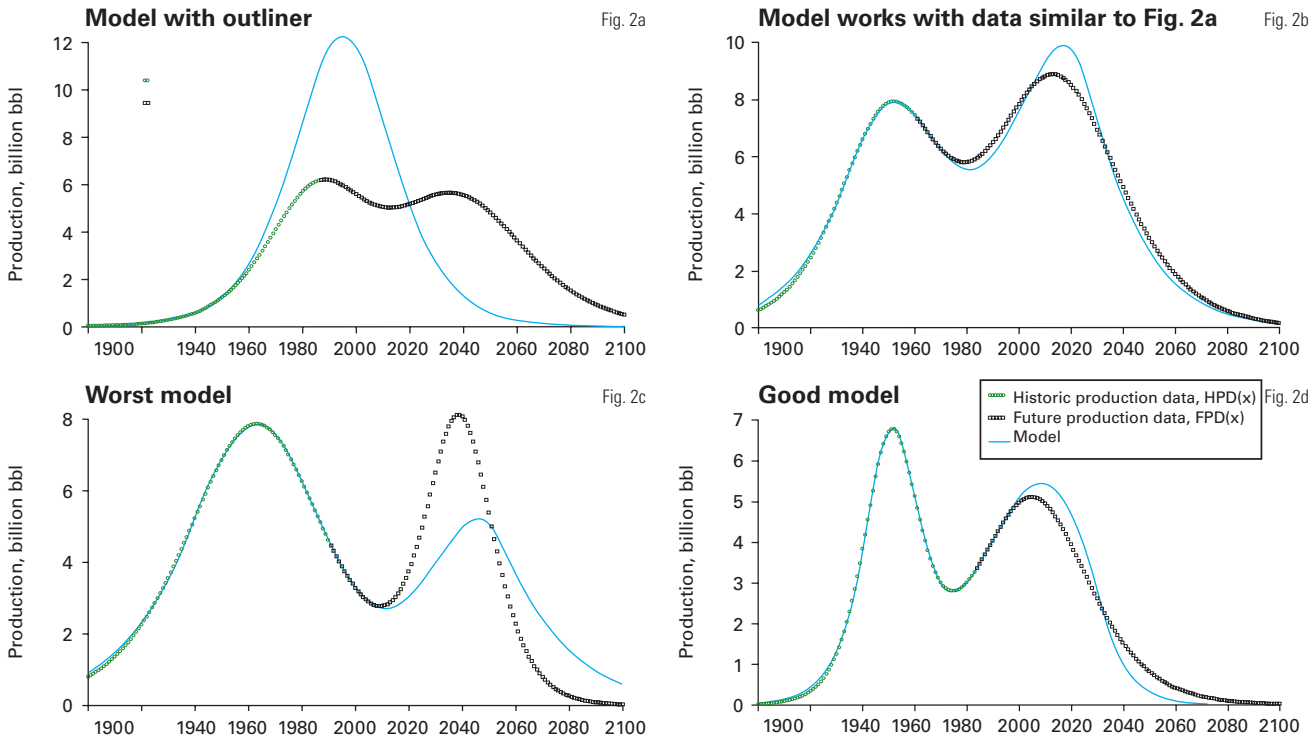
TESTING MODELS

Fig. 2



same as the amount of oil produced to the year x_c.

In the next step, the model fits a high-degree polynomial to the most recent production data (P(x)) and solves Equations 2-6.

In the equations, p(x) is an n-th degree polynomial, where n is chosen. There are n + 1 variables in the polynomial and the extra variables x_1 and x_2. In essence, the polynomial p(x) assumes that current trends will continue, until reaching x_1. At x_1, the trend reaches the ideal bell curve shifted by $x_1 - x_2$ so that the produced oil estimate from the ideal bell curve equals the estimate from the n-th degree polynomial.

Equation 7 defines the model M(x).

The model requires the availability of a good estimate of ultimate recoverable reserves and that current trends continue until production reaches the ideal bell curve.

Two bell curves randomly generated and added together indicate the accuracy of the model. The test requires selecting a random year x_c between the 2 peak years and truncating the data at the random year. The model uses only production data up to year x_c (HPD(x)) and ultimate recoverable reserves as inputs to estimate future production FPD(x).

The model then calculates correlation factor r^2 (Equation 3) for future data points (FPD(x)).[9] Fig. 1 indicates the model's accuracy.

In general, accuracy improves as the percentage of the second bell curve increases. A comparison of height at the last known date to height of the second-bell-curve peak gives the second-bell-curve percentage. If the second-bell-curve percentage is less than 5%, the model's error increases significantly.

Fig. 2a shows the graph of the outlier with an r^2 value of −1.6. The outlier occurs because the model failed to solve Equations 2-6 for n = 2, 3, and 4 and defaulted to the original ideal bell-curve estimate, which models the data accurately to 1960 and fails thereafter.

Fig. 2b shows a similar data set in which the model could solve Equations 2-6 for n = 4.

The model is incapable of accurately modeling the data if historic production data stops before 1% of the second-bell-curve production occurs.

Fig. 2c shows the curve with lowest r^2 value ($r^2 = 0.68$) that excludes the outlier ($r^2 = -1.6$) and historic production data with <1% of the second-bell-curve production. As expected, the data have the smallest percentage greater than 1% from the second bell curve.

Fig. 2d depicts a graph of an accurate model ($r^2 = 0.97$). In the figure, 60% of the second bell curve is contained in the HPD(x).

The testing indicates that the model is robust (average $r^2 = 0.96$) and capable of accurately modeling future data if historic production data from the second bell curve is greater than 1%. The average r^2 calculation excludes data

with less than 1% of the second bell curve in the data.

Predicting peak oil

The model requires conventional oil production data and an estimate of the world's total recoverable conventional oil, such as from References 10 and 11.

The following example calculation breaks world data into three sections: OPEC, FSU, and RoW. Angola recently joined OPEC; however, for this example it is considered part of RoW.

The world has produced about 1,030 billion bbl of conventional oil, broken down as 400 billion bbl from OPEC, 160 billion bbl from FSU, and 470 billion bbl from RoW.

Table 1 lists estimated proved reserves. Estimates for the UAE, Kuwait, Iraq, Iran, and Saudi Arabia's oil reserves remain uncertain.[12-15]

Fig. 3 shows a distinct trend since the late 1960s of a decline in oil discoveries.[6] Scenario 1, therefore, assumes this trend will continue and lead to the discovery of an additional 300 billion bbl of oil.

It is possible that one or two large fields may be discovered similar to one in the late 1920s and another in the 1930s that contained 100 and 170 billion bbl, respectively. Scenario 2, therefore, assumes three large fields totaling 500 billion bbl will be found in addition to the 300 billion bbl.

Table 2 shows the distribution of this assumed additional oil.

Scenarios 1 and 2 then have ultimate oil recovery of 2,234 billion bbl and 2,734 billion bbl, respectively. With these values, the model generates Figs. 4a and 4b.

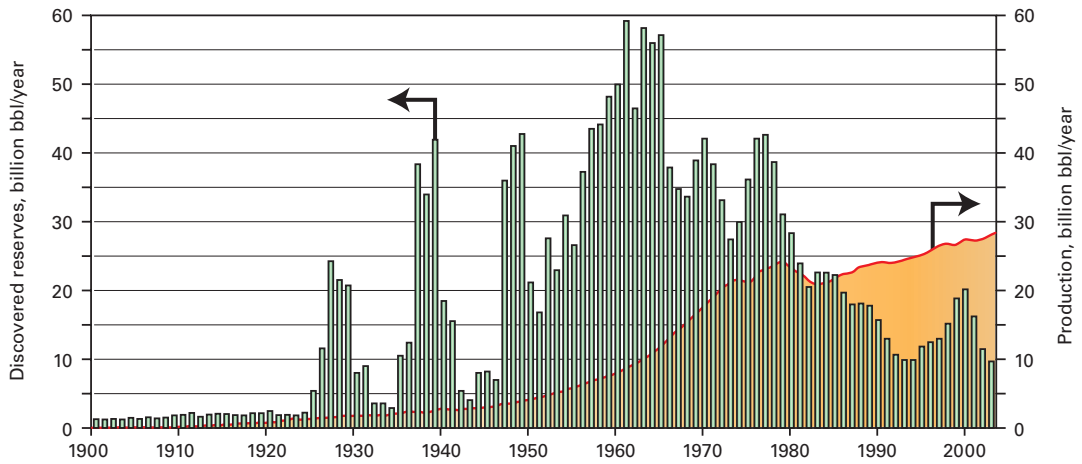
A reasonable assumption from analysis of the model is that if the ultimate recovery estimate is accurate, then the model should be accurate for RoW and FSU. Also reasonable given past OPEC oil production trends is to assume future OPEC production will have anomalies that are impossible to predict as to when they occur or their significance.

Scenarios 1 and 2 estimate that world's conventional oil will peak in 2012 and 2024, respectively. Non-OPEC production peaks in 2009 in Scenario 1 and in 2017 in Scenario 2.

The world has large unconventional oil reserves and various programs are developing alternative sources of energy; however, supply disruption is

Backdated oil discoveries

Fig. 3



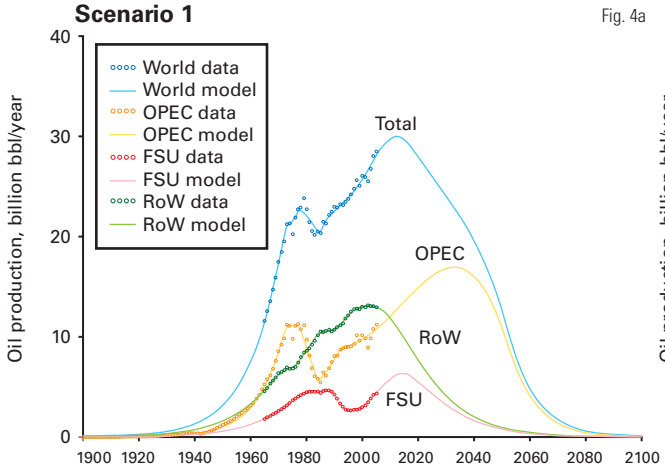
Source: Reference 6

Production forecasts

Fig. 4

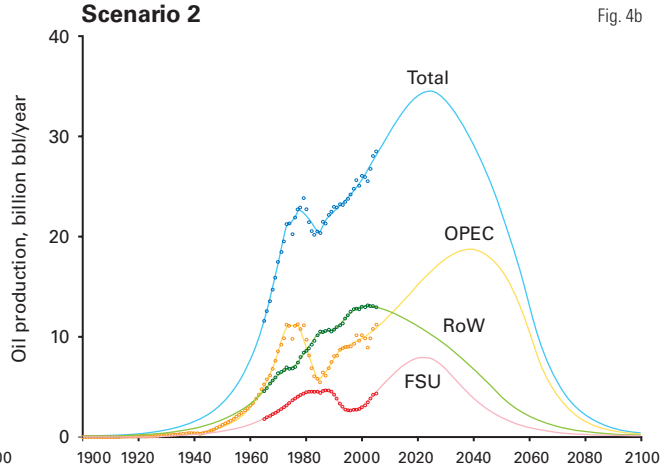
Scenario 1

Fig. 4a



Scenario 2

Fig. 4b



unavoidable unless these sources are developed prior to the peak in conventional oil production. ✦

References

1. Aleklett, K., "IEA accepts peak oil," ASPO web site www.peakoil.net/uhdsg/weo2004/AnalysisWorldEnergyOutlook2004.pdf, retrieved Mar. 30, 2007.

2. Bakhtiari, A.M.S., "World oil production capacity model suggests output peak by 2006-07," OGJ, Apr. 26, 2004, pp. 18-20.

3. Deffeyes, K.S., "World's oil production peak reckoned in near future," OGJ, Nov. 11, 2002, pp. 46-48.

4. Wood, J.H., Long, G.R., and Morehouse, D.F., "Long-term world oil supply scenarios," EIA web site http://tonto.eia.doe.gov/FTPROOT/petroleum/itwos04.pdf., retrieved Mar. 30, 2007.

5. Parker, H.W., "Demand, supply will determine when oil output peaks," OGJ, Feb. 25, 2002, pp. 40-48.

6. Wells, P.R.A., "Oil supply challenges—1: The non-OPEC decline," OGJ, Feb. 21, 2005, pp. 20-28.

7. Wells, P.R.A., "Oil supply challenges-2: What can OPEC deliver?," OGJ, Mar. 7, 2005, pp. 20-28.

8. Cavallo, A.J., "Predicting the peak in world oil production," Natural Resources Research, Vol. 11, No. 3, 2002, pp. 187-95.

9. Urroz, G.E., "Non-linear regression and correlation," Utah State University web site http://www.engineering.usu.edu/cee/faculty/gurro/Classes/ClassNotesAllClasses/CEE3030/Slides/Regression&DataFitting_Part2.pdf, retrieved Mar. 30, 2007.

10. BP Statistical Review of World Energy, June 2006, BP web site http://www.bp.com/statisticalreview, retrieved Mar. 30, 2007.

11. Annual Statistical Bulletin 2005, Haylins, J., editor, OPEC web site http://www.opec.org/library/Annual%20Statistical%20Bulletin/interactive/FileZ/Main.htm, retrieved Mar. 30, 2007.

12. Hussain, A., "Market gives OPEC opportunity to improve oil reserves data," OGJ, June 27, 2005, pp. 20-22.

13. "Conference hears contrasting outlooks for Iraq" OGJ, Apr. 17, 1995, pp. 26-27.

14. Campbell, C.J., "Just how much oil does the Middle East really have, and does it matter?," OGJ, Apr. 4, 2005, pp. 24-26.

15. Kashfi, M., "Lack of data casts doubt on Iranian reserves hike," OGJ, Nov. 1, 2004, pp. 20-21.

16. World Oil reserves estimate, EIA web site http://www.eia.doe.gov/pub/international/iea2004/table81.xls, retrieved Mar. 30, 2007.

17. OGJ reserves estimate, EIA web site http://www.eia.doe.gov/pub/international/iea2004/table81.xls, retrieved Mar. 30, 2007.

18. "Kuwait oil reserves only half official estimate—PIW," Reuters web site http://today.reuters.com/business/newsarticle.aspx?type=tnBusinessNews&storyID=nL20548125&imageid=&cap, Jan. 20, 2006, retrieved Mar. 30, 2007.

19. Al-Husseini, S., "Rebutting the critics: Saudi Arabia's oil reserves, production practices ensure its cornerstone role in future oil supply," OGJ, May, 17, 2004, pp. 16-20.

20. The World Factbook, CIA web site, www.cia.gov/cia/publications/factbook/index.html, retrieved Mar. 1, 2007.

21. Caspian Sea Region: Survey of Key oil and gas statistics and forecasts, EIA web site www.eia.doe.gov/emeu/cabs/Caspian/images/caspian_balances.xls, July 2006, retrieved Mar. 30, 2007

22. Mufson, S., "U.S. Oil reserves get a big boost," Washington Post web site www.washingtonpost.com/wp-dyn/content/article/2006/09/05/AR2006090500275.html, Sept. 6, 2006, retrieved Mar. 30, 2007.

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Riserless mud-recovery system used in Sakhalin wells

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SAKHALIN RMR—Conclusion

In 2006, Russia's CJSC Elvary Neftegaz, a joint venture between OAO Rosneft and BP Exploration Operating Co. Ltd., drilled the top hole sections of two wells off Sakhalin Island using a riserless mud-recovery system from a semisubmersible rig.

Part 1 of this series, published Apr. 23, describes how the RMR system was designed and organized. This concluding part reviews the permitting process, operations, and lessons learned during the 2006 drilling season and presents future plans.

Rig systems integration

Although the system does not have a large deck footprint, it was essential to identify a suitable location to avoid conflict with other deck-space intensive applications such as skip and ship of drilled cuttings. The RMR service provider, AGR Subsea AS, visited the Transocean Legend semisubmersible drilling rig in South Korea in July 2005 during mobilization. The visit identified the optimum location starboard aft, close to the shaker house. Further discussions clarified that the location presented no risk or obstruction to personnel access, especially with respect to the aft lifeboat stations and fast rescue craft.

Transocean appointed a single point of contact to ensure that all the right operations and engineering personnel were involved in the project. This allowed full consultation concerning the RMR equipment interfacing with the rig systems, especially the routing of the return line to the shaker house. Transocean Inc.'s engineering department reviewed several options before deciding to hard pipe the line from the landing platform, through the BOP control area, and through the bulkhead of the adjoining shaker room. This routing satisfied classification requirements, including hazardous zone certification, given that there could be gas in the return flow.

Previous operations in Norway and the Caspian had been powered from the rigs' power distribution systems. Limitations of the Legend's system, however, suggested that an independent power source would be required. A 300-kw mobile generator set was procured in Singapore, shipped to South Korea, and installed on board the rig during the 2006 refit.

New equipment introduced to a rig may affect many of the rig systems and third-party services. Full involvement of all concerned is critically important to successful installation and operation. In this case, in addition to Transocean, it was necessary to engage other equipment manufacturers, including the wellhead manufacturer and the remotely operated vehicle contractor. The ROV unit would play a major part in the deployment, makeup, and operation of the RMR system. The operator's drilling supervisors would be responsible for overseeing the operation.

The project group held a meeting in Busan, South Korea, in November 2005 during demobilization from Sakhalin. The group, including AGR Subsea's project manager and Elvary Neftegaz personnel, gathered to review the system, its deployment, and operations in order to identify risks and engineering interface issues. The result was an outline plan of actions relating to modifications of the permanent guide base, ROV procedures, topside handling, moon-pool handling, and overall safety management.

A senior drilling supervisor spent time on board a semisubmersible in the Caspian Sea to witness deployment and operation of the system on another company-operated exploration well. This first-hand experience provided valuable input to the detailed planning and safety reviews.

The project team also undertook an integrated hazard and operability review. The aim was to consider and review potential risks associated with running and operating the system. A risk-engineering consultancy planned and facilitated the exercise. The risk workshop reviewed the four stages of operating the system: installation, deployment, operation, and recovery. Each stage was broken down into discrete activities and considered from the points of view of safety, feasibility, and optimum performance.

The hazop review produced a list of more than 50 recommendations and actions. These were subsequently assigned to individuals charged with closing out the action items. These activities were in addition to those risks and actions previously identified in the project risk register and actions tracker.

PERFORMANCE COMPARISON, FOUR WELLS

Table 1

Well	Event	Times	Total days	Pilot hole, days	Drilling time, days	Section length, m	Comments
PL1[1]	Complete running anchors	2004/07/19 01:00					
	Complete pilot hole	2004/07/22 17:00		3.67			
	Commence 26-in. hole	2004/07/25 23:00					WoW for skip and ship
	Reach casing point	2004/07/29 12:00			3.54	562	Bit balling
	Land 20-in. casing	2004/08/01 11:45	13.45				26-in. hole drilled in two passes
UD1[1]	Complete running anchors	2005/07/28 01:00					Fish lost in pilot hole
	Complete pilot hole	2005/08/01 01:00		4.00			
	Commence 26-in. hole	2005/08/05 08:30					
	Reach casing point	2005/08/10 15:00			5.27	644	Bit balling
	Land 20-in. casing	2005/08/12 09:00	15.33				26-in. hole drilled in two passes
VS1[2]	Complete running anchors	2006/07/02 07:00					
	Commence 17½-in. hole	2006/07/04 17:00					
	Reach casing point	2006/07/08 01:00			3.33	769	17½-in. section cautiously
	Land 13⅜-in. casing	2006/07/09 07:15	7.01				
SV1[2]	Complete running anchors	2006/08/18 18:00					
	Commence 17½-in. hole	2006/08/20 02:00					
	Reach casing point	2006/08/22 14:15			2.51	728	17½-in. hole drilling rate improved
	Land 13⅜-in. casing	2006/08/23 14:30	4.85				Precasing wiper trip eliminated

[1]Wells PL1 and UD1 drilled with pilot hole and riser. [2]Wells VS1 and SV1 drilled using riserless mud recovery system.

This workshop provided the service provider, AGR Subsea, with information needed to finalize deployment, operating, and recovery procedures. The procedures were incorporated into the detailed hole section instructions prepared by the operations team. These documents were subjected to a critical review in order to finalize the shallow gas procedures.

Russian certification

As with other jurisdictions, the Russian Federation has detailed verification and certification procedures for new or foreign equipment. Timely action is required to ensure trouble-free importation, use, and export of a new system. "Technical passports" must be prepared for each piece of equipment so that it can be reviewed against the relevant GOST standards to enable the issue of certificates of conformity to Gosstandart of the Russian Federation.

Once the equipment is certified as meeting Russian Federation standards, it is then submitted to RostechNadzor (RTN), the Russian Federation ministry responsible for industrial safety. RTN reviews the submission and, if it is accepted, will issue a "permit to use" the equipment in the Russian Federation. There are no clearly defined rules as to the amount of information and data required for each submission. Current regulatory guidance is wide in scope and open to interpretation. The most important documents are:

- Copy of the contract between the operating company and service provider.
- Copy of all equipment technical specifications, drawings, and process flow diagrams.
- ISO 9000 certification of the manufacturer.
- Certificates of compliance from original manufacturer, including Ex0 [IEC area-of-use designation standard for electrical components subject to oil immersion] certificates for electrical equipment where appropriate.
- Factory acceptance test reports.
- Details of operating environment.
- System description and operating procedures.

The result is a "technical passport" containing almost enough design information to enable a system to be manufactured. Most of the documentation had to be translated into Russian. Due to the large amount of information and data required, it was the service provider's responsibility to obtain the necessary certification and permit. There are several well-qualified engineering consultancies familiar with certification and permitting that can assist foreign companies in developing the required packages of documentation.

The certification process took almost 4 months including the RTN permit for use. Although this was a somewhat protracted process, involving numerous clarifications, it resulted in a trouble-free import and export. The exercise demonstrated the need to allow adequate time for the certification process within the overall project schedule.

Fabrication, mobilization

With concept and potential benefits firmly established and peer review completed, focus moved to detailed engineering design and with emphasis on the possible risk of hose failure in the strong current conditions.

Hydraulics modeling of the recovery hose and pump performance based on actual surface-hole geometry, drilling fluids, and water depth concluded that a single 300 kw pump unit would suffice. Using a variable-speed drive, the system was capable of a range of flow rates up to 1,100 gpm, which was deemed sufficient for surface-hole drilling.

Elvary Neftegaz took a contract with the RMR service provider in late 2005. Procurement and manufactur-

ing commenced during fourth-quarter 2005, with a target completion of late January 2006. Although the timing was tight, AGR Subsea met the schedule, and factory acceptance testing commenced early February 2006 in Bergen.

A key aspect of the acceptance test was to run the pump continuously for a 48-hr endurance run while recording flow rates and motor performance throughout. The motor was submerged in water for the test to dissipate the heat it generated. Power supply and data acquisition were managed through the control cabin. The pump and motor had to meet a predetermined range of parameters to confirm acceptance.

The complete program lasted 1 week. The equipment was then prepared for shipment to Busan, where the drilling rig was to be released back to Elvary Neftegaz having worked for another operator during the winter of 2005-06.

Operational experience

The system was deployed on the top-hole section of the two exploration wells drilled during summer 2006, in the Kaigansky-Vasuykansky license area, in the south of the Sakhalin V area. The system functioned as planned and was virtually trouble-free. There were moderate seas but the currents were low to negligible for the first well, thus avoiding the risks of problems with the hose or the capabilities of the ROV. In 2006, authorities permitted use of the system on a trial basis, and contingency plans were made to revert to the conventional method should the system suffer a major failure.

Vasukanskaya-1

The suction module was run on drill pipe with a stand of drill collars below the running tool to help stabilize and centralize for engagement onto the 30-in. wellhead housing. The operation was monitored throughout by the ROV. The pump module and return hose were then deployed from the starboard aft of the rig. This activity had no impact on drilling operations as the rig crew was making up the 17½-in. drilling assembly concurrently.

The pump was landed on the seabed about 30 m from the well and the ROV made up the suction hose and umbilical jumper cable to the suction module with no difficulty. The total installation time was less than 15 hr, but due to the concurrent operations, only 7 hr of rig time lay on the critical path.

The team held meetings on the rig before drilling commenced to review shallow gas and system operating procedures to ensure full understanding of specific roles and responsibilities, particularly under emergency conditions. The ROV was deployed to maintain a continuous watch on the system and provide an additional visual aid for monitoring the mud level in the suction module.

Under steady-state conditions, the system is normally operated in automatic mode with the pump speed, and hence the mud level, controlled by the pressure sensor in the suction module housing. At the beginning of the section, however, seawater and high-viscosity (hi-vis) pills were used. The operator had to maintain control of the fluid level by monitoring the fluid level using the subsea cameras and lights mounted on the housing and adjusting pump speed manually. Before starting to drill, a 100 bbl hi-vis pill was circulated at 950 gpm to help the operator establish the subsea pump speed and aid visual identification of the mud cap level.

After drilling 7 m, the pump started to cutout as a result of generator fuel starvation. The problem was traced to a fuel line blockage due to rust and sediments in the fuel tank. After cleaning and restarting, there were still no returns at the shakers. The trouble was determined to be a blockage of the return hose with sand and cuttings settling down after the pump cut out. Workers unblocked the hose and flushed it clean by opening the pump bypass valve and pumping seawater via a 2-in. connection on the return hose manifold at deck level.

After the start-up problems were resolved, the system worked faultlessly and the section drilled at an average rate of 18 m/hr with a maximum of 40 m/hr and flow rates of 900-1,050 gpm. Because the section was sandier than expected, it took longer to mud up with native clays. The 17½-in. section was drilled to 1,000 m TVD, a total of 763 m in 41 hr.

Notwithstanding the 3½ hr lost due to the generator cutout and return hose blockage, the section was drilled in a half day less than originally planned, to which must be added the 4 days saved through elimination of drilling and abandonment of the pilot hole. Credit was given to the system for improved hole cleaning and reduced waste at surface. Improved hole condition contributed to the reduced casing running time.

The ROV disconnected the suction hose and power umbilical, and the suction module was recovered before the 13⅜-in. casing was run. The running tool was installed in the bottomhole assembly while pulling out of hole and the suction module was easily recovered. The ROV then connected the suction hose to the permanent guide base manifold outlet so that mud returns could be taken back to the rig while running casing. It also enabled the casing to be washed down without mud loss should this have been required.

The pump and return hose were recovered after cementing the 13⅜-in. casing, while the BOP stack was being run. By this time, the current had strengthened to 2-3 knots, and the return hose had wrapped itself around the winch umbilical. This complication did not seriously affect recovery nor was any damage to the hose visible.

Savitskaya-1

Although the currents were stronger at this location, the operation went smoothly. The crew ran the pump while waiting for cement and landed on the seabed without incident, although the current ranged from 2 knots at surface to 1.5 knots at the seabed.

Charting a New Course for Energy Leaders

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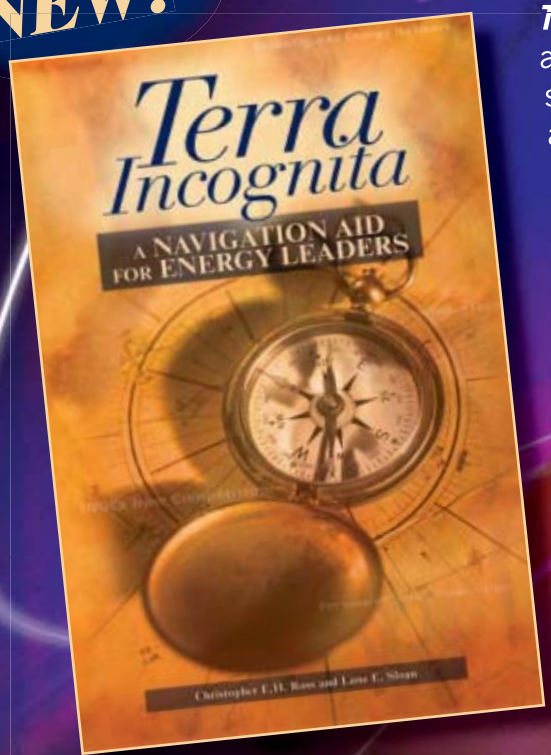

Terra Incognita: A Navigation Aid for Energy Leaders addresses the forthcoming transition in energy supplies, identifies strategic leadership challenges ahead, and summarizes lessons learned from interviews with more than 20 energy company leaders.

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After drilling and cleaning out the 30-in. conductor, the crew attempted to engage the suction module. After several failures, the rig had to be winched over 8 m before the suction module could be placed over the 30-in. wellhead housing. The current was sufficiently strong to create difficulties for the ROV when making up the suction hose and umbilical jumper cable but this was achieved while the rig crew made up the drilling assembly.

The 17½-in. hole section commenced without incident and progressed down to 479 m, where mud returns were lost. ROV inspection of the hose showed that it had been caught around the pump frame and kinked. Several attempts to release the hose failed due to the strong currents. The current at the time was 1.8 knots and had changed direction by 180° in a short period. After a wait of 7½ hr for slack water, the hose was cleared and operations recommenced.

Drilling continued from 479 m until reaching section TD at 967 m. Performance in this section exceeded expectations, and it was completed in 17 hr at an average ROP of 28 m/hr. The total interval took 33 hr including the time lost due to the kinked hose. The improvement in hole condition and penetration rate was attributed to use of a 1.12-sp gr bentonite mud system. Hole conditions at casing point were sufficiently good to eliminate a wiper trip before running the 13⅜-in. casing. This saved a further half day over past performance.

The crew recovered the suction module without difficulty before running casing. Although the current did not abate, the ROV successfully disconnected the suction hose and jumper cable from the suction module in just 45 min. The suction hose was transferred to the permanent guide base to capture mud returns. The pump and return hose were recovered without problems during the running of the BOP and marine riser.

Lessons learned, plan

Table 1 compares the performance achieved in the 2006 wells with operations in 2004 and 2005. The overall saving of about 9 days/well from the average of the 2004-05 wells results from:

- Eliminating a pilot hole and attendant abandonment problems.
- Avoiding running and recovering the riser and hydraulic latch connector.
- Improved performance resulting from drilling a single 17½-in. section as opposed to a 26-in. hole in two passes.

If a full sized 26-in. hole were to be drilled in future, without any improvement in drilling performance and allowing 5½ days to drill a 750-m interval, the time savings with the riserless mud-recovery system would still be 7 days over the alternative method.

Nevertheless, there are some problems still to address and operational performance can be further improved. Wash-up sessions were conducted by teleconference after each hole section to ensure that lessons were captured and would be employed in the 2007 drilling campaign. Most were procedural and, with only one exception, called for no changes to the equipment. The single modification was the idea to incorporate a bend restrictor in the flexible return hose to prevent the kinking that was encountered in the strong currents. This component had been manufactured but failed to reach the rig in time to be retrofitted before the pump was deployed in 2006.

There remain further trials to prove that the system can handle the full range of well-design options employed off Sakhalin. The two wells drilled in 2006 had a slimmed-down design, with the 20-in. surface casing replaced by 13⅜-in. casing. One of the wells planned for 2007 has a conventional design (20-in. casing), requiring the system to handle the significantly larger volumes of mud and cuttings generated in 26-in. hole. The aim is to attempt the section in a single pass with a 26-in. bit.

The second goal is the ability to operate safely in the presence of shallow gas. The most significant safety benefit of the system, during drilling in shallow gas-prone areas, is the ability to select a mud weight, build volume to the required properties, and then to exploit all the advantages of a closed circulation system (control mud weight and properties while maintaining the well open to the sea). Keeping the well open to the sea provides a true dual-gradient subsea mudlift capability and creates the overbalance conditions that almost entirely eliminate the conditions required for an influx.[1]

The precise drilling procedures for these conditions have still to be worked through, specifically regarding the size of hole to be drilled. On one hand, simulations show that the larger annulus provides a longer warning time of an impending kick. On the other hand, if it is required to perform an accurate evaluation of the surface hole with logging-while-drilling tools, then a pilot hole must be drilled. The balance between these two considerations still has to be evaluated, and the risks associated with the alternative procedure (simultaneous drilling and underreaming) assessed.

From a theoretical perspective, the risk-reduction studies carried out by Norway's SINTEF indicated that there is only minimal likelihood of gas entering the system during a kick and that pump power consumption is a much more sensitive detection indicator than the conventional pit-gain method.

In practice, pit-gain measurement is unavailable during conventional surface-hole drilling in which returns are taken to seabed. Under these conditions, shallow gas kicks are normally only detected when they reach the wellhead and are observed by the ROV. Therefore, the advanced warning provided by the pump power demand provides rig crews with valuable additional response time.

Results

Although the technology has been applied and proven elsewhere, the challenge of introducing it in a remote area

with difficult operating conditions that exist offshore Sakhalin was not taken lightly. The results of the 2006 season demonstrated that:

1. The riserless mud-recovery system delivered its anticipated safety and environmental benefits while improving operational efficiency by 9 days/well without the use of a marine riser.
2. Novel systems can be imported and their designs verified and permitted for use in the Russian Federation as long as adequate time is allowed for the process.
3. A thorough project risk assessment followed by detailed technical risk-reduction studies guided systems design and allowed development of operational procedures.
4. A rigorous process of hazard and operability reviews involving all participants in the operation enabled the system to be installed, commissioned, and operated on the rig in a trouble-free manner.
5. Operational experience highlighted the benefits of running a quality mud in the system and showed that further refinement of procedures and installation of a bend restrictor in the return hose are required.
6. The RMR system still has to prove its ability to handle returns from 26-in. surface hole.
7. The RMR system offers the prospect of a significant reduction of risk during drilling in shallow gas prone areas, although the detailed procedures must still be developed.

Acknowledgments

The authors thank the management of CJSC Elvary Neftegaz for permission to publish this paper. ✦

Reference

1. Smith, K.L., Gault, A.D., Witt, D.E., Weddle, C.E., "Subsea Mudlift Drilling Joint Industry Project: Delivering Dual Gradient Drilling Technology to Industry," SPE Annual Technical Conference and Exhibition, New Orleans, Sept. 30-Oct. 3, 2001, SPE 71357.

FOURTH-QUARTER 2006
FIRST-QUARTER 2007

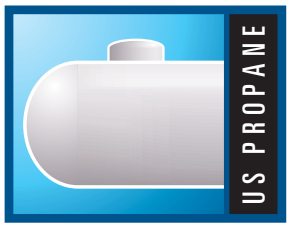
Extended cold challenges C_3 supply, distribution; markets remain unfazed by production decline

Dan Lippe
Petral Worldwide Inc.
Houston

Weather is always an important influence on propane supply-demand trends during the winter heating season. With mild winters during past 4 years, US propane marketers and wholesalers were probably lulled into complacency about the impact of truly cold weather on propane supply and the distribution system.

Heating degree-days during winter 2006-07 totaled 4,915 for the Northeast, 5,315 for the Midwest, and 2,356 for the Southeast—key regional markets for retail propane sales. The 30-year averages for heating degree-days in these regional markets were 5,262 for the Northeast, 5,580 for the Midwest, and 2,581 for the Southeast. During winter 2006-07, the Northeast had 6.1% fewer heating degree-days, the Midwest had 4.8% fewer heating degree-days, and the Southeast had 8.7% fewer heating degree-days. During February, however, these regional markets had 10-20% more heating degree-days than the 30-year average.

The period of colder-than-average temperatures during late January through early March tested propane supply, the distribution system, and the market's ability to adjust to strong space-heating demand. Neither the full winter nor February, however, revealed the full impact of the gradual decline in US propane production on retail propane markets in the US. During an average cold winter, retail propane sales will probably be 30-40 million bbl more than during winter 2006-07, but total production during 2006-07 was almost 20 million bbl less than in 1999-2000.



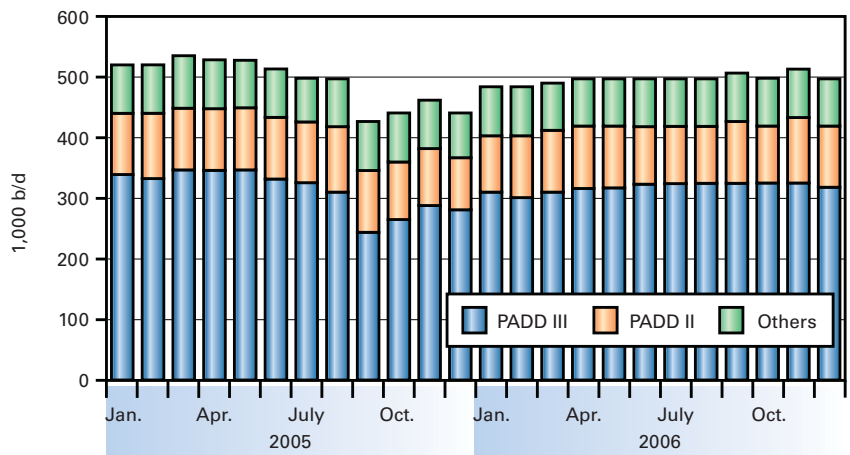
Feedstock demand

During October 2006, feedstock demand for propane tracked the typical

Propane feedstock demand is one of the most important balancing elements of the overall propane market in North America. When colder weather pushes sales and consumption in retail markets steadily higher, ethylene producers on the Gulf Coast have substantial capability to reduce their consumption and effectively offset some or all of the impact of a colder-than-normal winter. Historically, most of the seasonal decline in ethylene feedstock demand has occurred during the fourth quarter. Frequently, feedstock demand for propane rebounds during the first quarter.

US GAS-PLANT PROPANE PRODUCTION

Fig. 1



Source: US Energy Information Administration

seasonal pattern. Ethylene producers used only 290,000 b/d vs. 348,000 b/d during third-quarter 2006. Feedstock demand diverged from the typical seasonal pattern in November and December. Feedstock demand increased to 324,000 b/d in November and 341,000 b/d in December.

Propane's share of fresh feed averaged 18% in October and then increased to 19.8% in November and 20.4% in December. For fourth-quarter 2006, propane accounted for about 19% of fresh feed. During 2000-04, propane's share of fresh feed during the fourth quarter averaged 16-17%.

Feedstock demand for propane jumped to 402,000 b/d in January 2007 (consistent with typical seasonal patterns) but declined to 328,000 b/d in February. Based on a rebound in ethylene plant operating rates, Petral estimates that feedstock demand averaged 350,000-360,000 b/d in March.

Propane's share of fresh feed jumped to 23.4% in January 2007 but declined to 20.2% in February. Historically, propane's share of fresh feed during the first quarter averaged 18-20% during 2002-04. The industry's historical proven minimum propane demand was 190,000 b/d (December 1996), or only 12% of fresh feed. In today's market, 12% of fresh feed would be 200,000-210,000 b/d.

Petral estimates that the ethylene industry, operating at minimum propane consumption during a normally cold winter, could have reduced feedstock demand by 25 million bbl vs. actual demand.

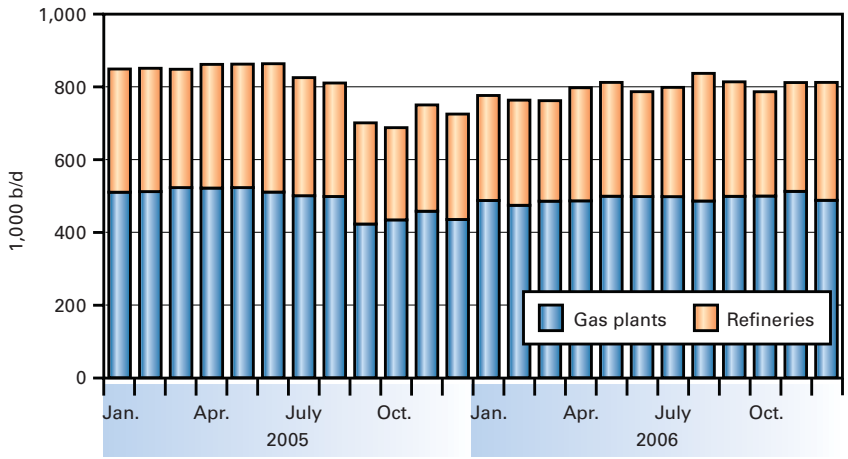
Table 1 summarizes trends in ethylene feedstock demand for propane.

Ethylene plants will operate at 92-93% of capacity rates during second and third-quarter 2007. Total feedstock demand will average 1.73-1.75 million b/d, and propane consumption in the ethylene feedstock market will average 350,000-370,000 b/d.

Fig. 1 illustrates historic trends in ethylene feedstock demand.

TOTAL US PROPANE PRODUCTION

Fig. 2



Source: US Energy Information Administration

Retail demand

Winter 2006-07 was warmer than normal in every month except February. During November and December 2006, heating degree-days in the Northeast, Southeast, and Upper Midwest were 10-30% below the 10-year average and were also below the 30-year average.

In January 2007, heating degree-days were again well below average. February 2007, however, proved to an unusually cold month with heating degree-days 18-30% above the 10-year and 30-year averages. Heating degree-days were again below average in March 2007.

Petral estimates that total retail propane sales averaged 800,000-820,000 b/d in fourth-quarter 2006, or 15,000-25,000 b/d lower than in fourth-quarter 2005. We estimate that total retail propane sales increased to 1.1-1.12 million b/d in first-quarter 2007, or 60,000-70,000 b/d higher than in first-quarter 2006. Although demand in January 2007 was about 100,000 b/d lower than in January 2006, the cold weather in February boosted demand to 1.3 million b/d, or about 150,000 b/d higher than in February 2006.

During a truly cold winter, retail propane sales will be significantly higher than during winter 2006-07. The record high for retail propane sales occurred during winter 2000-01 and totaled an estimated 210 million bbl, or about 35 million bbl more than this winter.

Retail propane markets in the US and

ETHYLENE FEEDSTOCK DEMAND FOR PROPANE

Table 1

Month	Feedstock consumption, 1,000 b/d	Portion of fresh feed, %
October 2006	290.6	18.1
November	323.6	19.8
December	341.6	20.4
January 2007	402.0	23.4
February	328.1	20.2
March*	354.6	20.7

*Forecast.
Source: Petral Worldwide Olefin Plant Survey

Propane's use as a space-heating fuel in residential and commercial markets reaches its seasonal peak each year during fourth and first quarter. Residential and commercial propane demand begins to increase during October and usually reaches peak demand during December-January.

US PROPANE INVENTORIES

Table 2

Month	PADD 2	PADD 3	Other regions	US total
		Million bbl		
July 2006	23.0	27.7	7.72	58.4
August	25.4	31.2	7.75	64.3
September	26.4	36.6	8.18	71.1
October	25.1	38.8	8.42	72.3
November	24.4	35.8	8.37	68.5
December	22.7	31.2	7.75	61.6
January 2007	17.0	23.6	6.85	47.4
February*	9.9	17.2	3.32	30.4
March*	7.9	12.6	3.10	23.5

*Based on weekly survey estimates.

Canada will face significant obstacles in meeting demand during a truly cold winter. Inventories in primary storage will almost certainly be fully depleted before the end of February in a winter with average heating degree-days.

Our estimates of retail propane sales are based on heating degree-days from the US National Weather Service's Climate Prediction Center. We also estimated retail sales for winter 2006-07 based on results of the propane end-use sales survey for 2005 and conducted annually by the American Petroleum Institute.

Propane supply

Gas processors experienced record strong profit margins in all producing regions during fourth-quarter 2006 and first-quarter 2007. We have to conclude that US propane production was at full-recovery levels for both gas plants and refineries during fourth-quarter 2006 and first-quarter 2007.

Data published by the US Energy Information Administration show that total production from gas plants and net propane production from refineries averaged only 808,000 b/d. Production was 13,000 b/d lower than the average for third-quarter 2006 but was 81,000 b/d higher than during fourth-quarter 2005.

During winter 2006-07, domestic propane production totaled about 150 million bbl, or about 15 million bbl less than historic production during 1997-98 and 2001-02. Because the US has not had a normally cold winter during 2001-06, the decline in domestic production has had little direct impact on retail propane consumers.

Gas plants

EIA statistics show that gas plant propane production averaged 504,000 b/d for fourth-quarter 2006. Propane production was at its high in November 2006 and averaged 513,000 b/d. Production in December 2006 averaged only 499,000 b/d, or 20,000-30,000 b/d lower than typical full-recovery volumes before 2005.

Petral expects gas plant production to average 490,000-500,000 b/d in first-quarter 2007, but EIA reported only 479,000 b/d for January 2007. Production is likely to average 490,000-500,000 b/d again in second-quarter 2007. Fig. 2 illustrates trends in propane production from gas plants.

Refineries

In fourth-quarter 2006, propane production from refineries (net of propylene for propylene chemicals markets) averaged 304,000 b/d, a decline of 15,000 b/d from net refinery supply in third-quarter 2006 but 27,000 b/d higher than year earlier volumes, according to EIA.

Net refinery production was at its lowest level in October 2006 and averaged only 288,000 b/d. Production increased during November and December and averaged 317,000 b/d in December 2006, or 27,000 b/d higher than year earlier volumes. Refinery operating rates and gasoline production volumes were at their lowest level in October 2006, but both increased during November and December. Hence the trend in net refinery propane production during fourth-quarter 2006 was consistent with trends in refinery operations.

EIA also reported that net refinery propane production increased to 324,000 b/d in January 2007, the second highest monthly refinery production volume since the industry returned to full capacity after the 2005 hurricane season. The increase in net refinery propane production in January was somewhat surprising in view of decline in refinery operating rates.

Petral expects propane supply from refineries to average 325,000-335,000 b/d in first-quarter 2007 and to increase to 335,000-345,000 b/d in second-quarter 2007. Fig. 3 illustrates trends in total propane production (gas plants and refineries).

Imports

Based on data from the US Census Bureau's Foreign Trade Division, propane imports from Canada increased in fourth-quarter 2006, consistent with the seasonal pattern. Imports from Canada averaged only 162,000 b/d in fourth-quarter 2006, however, or about 8,000 b/d lower than year earlier volumes and about 10,000 b/d below the average for 2000-05.

Consistent with the seasonal increase in retail propane sales, propane imports from Canada typically increase to peak seasonal volumes of 150,000-175,000 b/d during the fourth quarter and 175,000-200,000 b/d during the first quarter. Additionally, propane imports from outside North America usually decline sharply during the fourth quarter. Imports from international sources typically remain at seasonally minimum levels during the first quarter.

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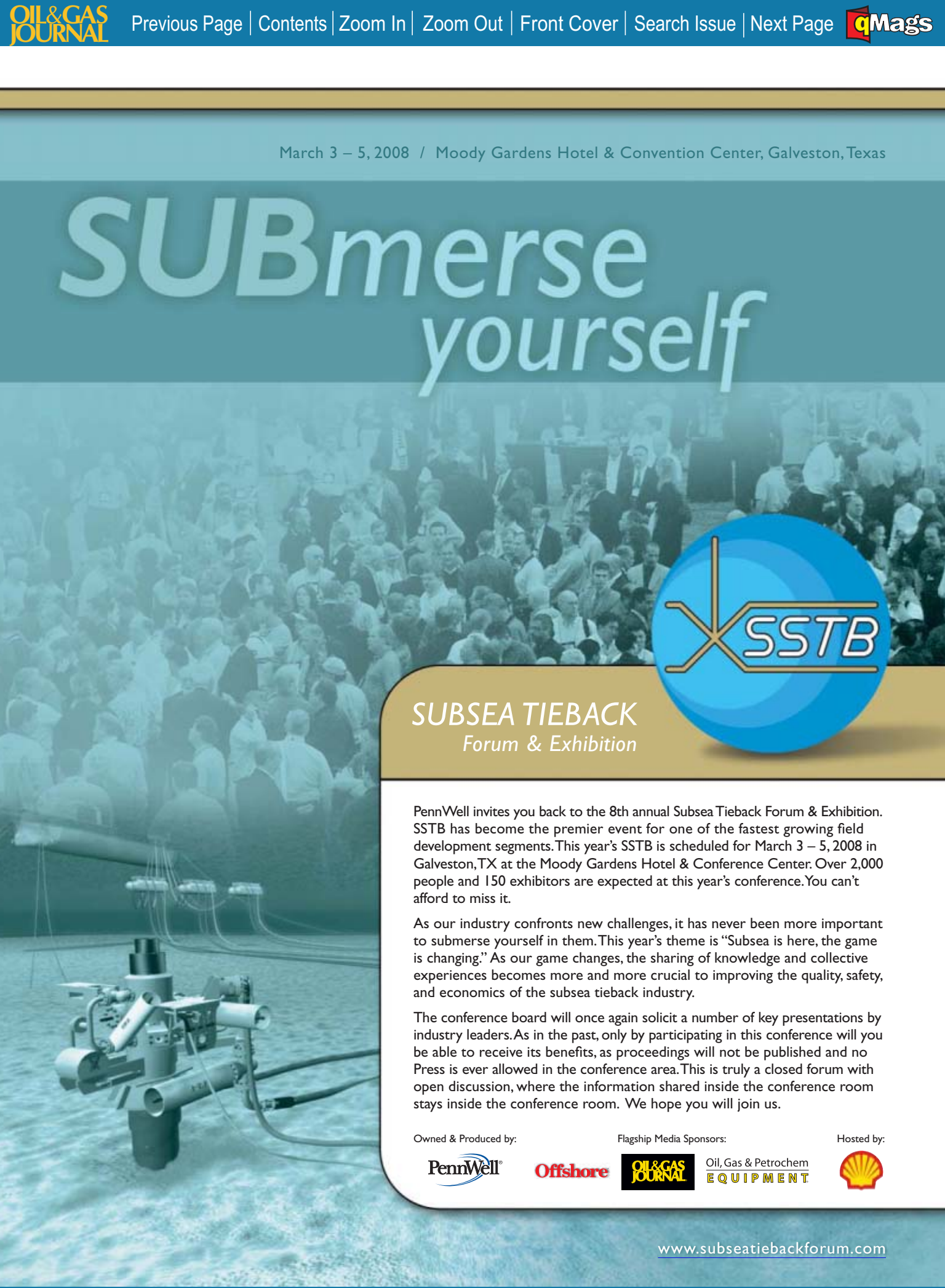

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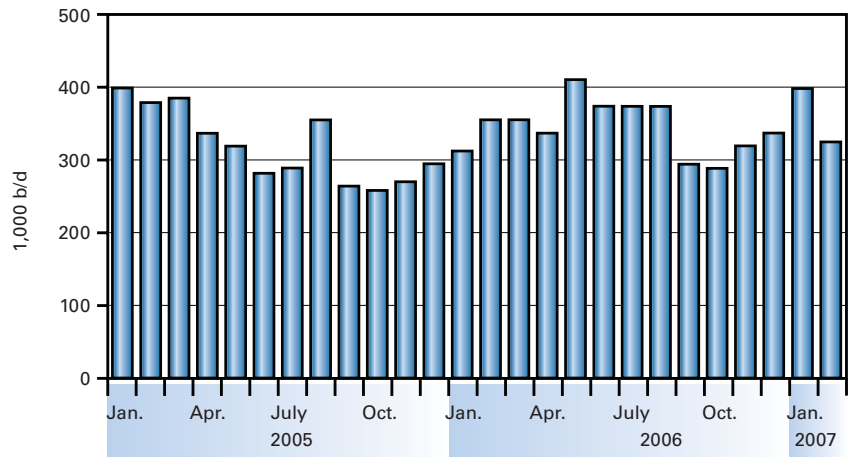
US ETHYLENE FEEDSTOCK DEMAND FOR PROPANE

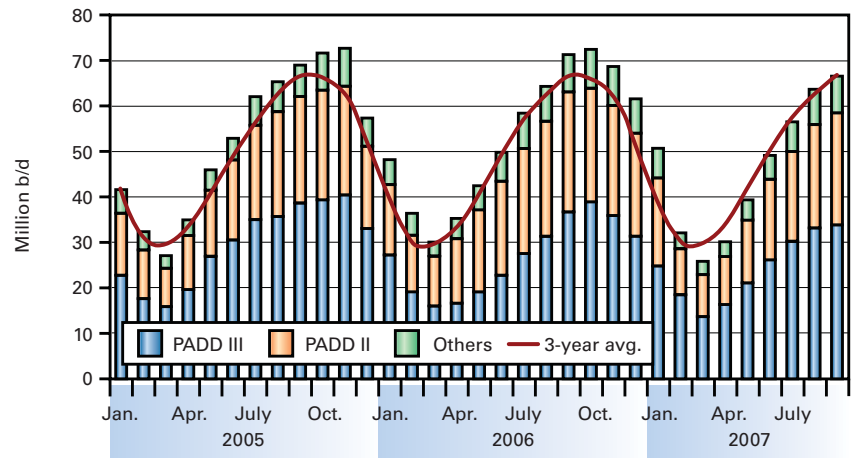
Fig. 3



Source: Petral Worldwide Inc.

US PROPANE INVENTORY

Fig. 4



Source: US Energy Information Administration

Petral estimates that propane imports from Canada increased to 225,000-240,000 b/d in first-quarter 2007. Even though inventories of purity propane in underground storage were slightly below average at the end of December 2006, Canadian producers and marketers responded to the surge in space heating demand during first-quarter 2007.

Based on propane inventory statistics published by the National Energy Board of Canada, producers and marketers have demonstrated that they can pull Canadian inventories to less than 1 million bbl at the end of the winter heating season. Inventories of purity propane totaled 1.85 million bbl at the end of February.

Consistent with seasonal supply trends, international imports averaged only 55,000 b/d during fourth-quarter 2006, as reported by the Foreign Trade Division. International imports were 110,000 b/d less than year earlier volumes but were about 6,000 b/d higher than the average for fourth-quarters of 2003 and 2004. Petral estimates that international propane imports averaged 35,000-45,000 b/d during first-quarter 2007, and all international cargoes but one moved into the US through East Coast import terminals.

Overall inventory trends

Oct. 1 normally marks the beginning of the inventory liquidation season for the US. Occasionally, propane inventories have not reached their seasonal peak until mid to late October. In fourth-quarter 2006, however, propane inventory in primary storage reached its seasonal peak on schedule during the last week of October.

Propane inventory in primary storage reached a peak of 72.2 million bbl at the end of the last week of October, according to the EIA's weekly inventory report. The EIA's more accurate monthly inventory statistics, published in the Petroleum Supply Monthly, confirmed the weekly statistics.

For North America, overall, inventories reached a seasonal peak of 86.1 million bbl at the end of October, or 3.9 million bbl higher than the inventory peak in 2005. As the winter heating season developed, propane markets used all of the year-to-year inventory surplus and more.

During a typical winter, propane markets pull 40-44 million bbl of inventory from primary storage. During the 1980s and 1990s, the market considered 60 million bbl of inventory in primary storage at the beginning of the heating season to be adequate and more than 60 million bbl was surplus supply.

With a typical seasonal draw of 40 million bbl, however, inventories in primary storage declined to a seasonal low of about 21 million bbl on a few occasions. Accounting for pipeline fills, brine availability, and other distribution system constraints allows a seasonal minimum inventory of 20 million bbl to be viewed as a practical minimum.

Since 2001, however, inventories consistently reached seasonal peaks of 65-72 million bbl (a comfortable volume for the current market), but the cumulative withdrawal of product from storage exceeded 41 million bbl only during winter 2002-03. During that winter, inventories fell to a

seasonal low of 21.6 million bbl at the end of March 2003 from a seasonal peak of 71 million bbl at the end of September 2002.

This year, total heating degree-days for the winter were again 5-8% below average. The combination of strong feedstock demand during November through January, however, and very strong retail demand during February resulted in a cumulative withdrawal of about 48.5-49.0 million bbl, based on EIA's weekly inventory reports. Inventory in primary storage in the US declined to a minimum of 23.0-23.5 million bbl.

At the beginning of the heating season, purity propane in primary inventory in Canada totaled 11.5 million bbl at the end of August, or about 3 million bbl more than year earlier volumes. Based on statistics from the National Energy Board, Canadian companies withdrew 10 million bbl of propane from primary storage during the winter heating season and pulled inventories to a seasonal low of 700,000-800,000 bbl at the end of March.

Fig. 4 illustrates trends in propane inventory.

In a truly cold winter, retail propane demand will be 20-30 million bbl higher than winter 2006-07. Unless inventories are significantly higher than 72 million bbl, the market will pull inventories to record low levels. Furthermore, markets will require feedstock demand for propane to fall to near historically minimum levels to maintain the supply-demand balance.

Regional trends

On Oct. 1, 2006, propane inventory in primary storage in Petroleum Administration for Defense District (PADD) II (Table 2) totaled 26.4 million bbl, or about 2.4 million bbl above the average for 2001-04. By the end of January 2007, inventory in primary storage in PADD II totaled about 17 million bbl and remained 2.5 million bbl higher than the 3-year average.

By the end of February 2007, however, EIA's weekly report indicates that inventories in PADD II declined to 9.5-10 million bbl, or almost 1 million bbl below the 3-year average. Inventories in PADD II continued their decline, falling to a seasonal minimum of 7.5-8.0 million bbl at the end of March 2007, and were 1.0-1.5 million bbl below average.

Propane inventory in primary storage in PADD III totaled 38.8 million bbl at the end of October 2006. Inventory in PADD III was about 4.7 million bbl above the 3-year average. By the end of January 2007, inventory in primary storage in PADD II totaled 23.6 million bbl and was 4.8 million bbl higher than the 3-year average.

Withdrawals of inventory accelerated during February, and inventories fell to a seasonal low of 12.4-12.8 million bbl at the end of March 2007. Inventories were about 2.5 million bbl below the 3-year average. The inventory swing during first-quarter 2007 (from surplus to deficit) totaled about 7.3 million bbl.

Pricing, economics

In most market situations, trends in

NELSON-FARRAR COST INDEXES

Refinery construction (1946 Basis)
(Explained on p.145 of the Dec. 30, 1985, issue)

	1962	1980	2004	2005	2006	Jan. 2006	Dec. 2006	Jan. 2007
Pumps, compressors, etc.	222.5	777.3	1,581.5	1,685.5	1,758.2	1,727.4	1,791.7	1,799.2
Electrical machinery	189.5	394.7	516.9	513.6	520.2	510.9	528.2	527.7
Internal-comb. engines	183.4	512.6	919.4	931.1	959.7	944.3	963.8	969.5
Instruments	214.8	587.3	1,087.6	1,108.0	1,166.0	1,116.1	1,224.8	1,239.9
Heat exchangers	183.6	618.7	863.8	1,072.3	1,162.7	1,079.2	1,179.4	1,179.4
Misc. equip. average	198.8	578.1	993.8	1,062.1	1,113.3	1,075.6	1,137.6	1,143.2
Materials component	205.9	629.2	1,112.7	1,179.8	1,273.5	1,200.3	1,297.1	1,310.0
Labor component	258.8	951.9	2,314.2	2,411.6	2,497.8	2,469.3	2,557.1	2,558.6
Refinery (Inflation) Index	237.6	822.8	1,833.6	1,918.8	2,008.1	1,961.6	2,053.1	2,059.1

Refinery operating (1956 Basis)
(Explained on p.145 of the Dec. 30, 1985, issue)

	1962	1980	2004	2005	2006	Jan. 2006	Dec. 2006	Jan. 2007
Fuel cost	100.9	810.5	971.9	1,360.2	1,569.0	1,643.2	1,474.0	1,386.2
Labor cost	93.9	200.5	191.8	201.9	204.2	202.6	198.4	218.1
Wages	123.9	439.9	984.0	1,007.4	1,015.4	991.6	1,003.6	1,065.6
Productivity	131.8	226.3	513.3	501.1	497.5	489.4	505.9	488.5
Invest., maint., etc.	121.7	324.8	686.7	716.0	743.7	726.5	760.4	759.8
Chemical costs	96.7	229.2	268.2	310.5	365.4	354.4	365.7	363.4
Operating indexes								
Refinery	103.7	312.7	486.7	542.1	579.0	576.5	575.5	574.7
Process units*	103.6	457.5	638.1	787.2	870.7	890.2	841.5	816.6

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

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

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

crude oil prices and ethylene feedstock-parity values are the dominant influences on propane prices. Winter 2006-07 was not exceptional until March 2007.

At the beginning of the heating season, propane prices in Mont Belvieu averaged 93.7¢/gal in October 2006, or almost 20% lower than the July average of 116.3¢/gal. Despite the sharp decline in spot prices, propane's ratio vs. West Texas Intermediate increased to 66.9% in October 2006 vs. 65.7% in July 2006. These comparisons indicate that propane simply tracked the decline in WTI prices during third-quarter 2006.

WTI prices stabilized in November 2006 and then staged a modest rally in December. Again consistent with crude oil pricing trends, spot propane prices in Mont Belvieu increased to 96.4¢/gal in December 2006 but were 65.3% of WTI.

Spot propane prices in Mont Belvieu dipped below 90¢/gal in January 2007 and averaged 89.3¢/gal. Propane's ratio vs. WTI was stronger in January, however, and averaged 69.2%.

During sustained cold weather, propane prices in Mont Belvieu increased to 97.9¢/gal in February and an estimated 103.8¢/gal in March. Propane's ratio vs. WTI was steady in February and averaged 69.4% but jumped to 71.9% in March.

Parity values

In view of the ethylene industry's significant capability to adjust its consumption of propane within 1 or 2 months, propane prices vs. alternative ethylene feedstock values are a very good measure of the strength or weakness in spot prices in Mont Belvieu. During fourth-quarter 2006, spot prices in Mont Belvieu averaged 95.2¢/gal, but propane's feedstock-parity value averaged only 89.7¢/gal. By this measure, propane prices were stronger than during third-quarter 2006.

During first-quarter 2007, spot prices averaged about 97¢/gal, but feedstock-parity values averaged 93.4¢/gal. Despite the surge in propane prices, spot prices for ethane and natural gasoline kept pace. Propane's premium relative to average feedstock-parity values was consistently 3-4¢/gal during first-quarter 2007.

Spring, summer 2007 prices

If WTI prices average $58-62/bbl during second-quarter 2007, as forecast, spot propane prices in Mont Belvieu will likely average 97¢/gal but slide from 100¢/gal in April to 91-93¢/gal in June.

During third-quarter 2007, WTI prices will decline by $6-8/bbl and average $55-57/bbl. Based on the decline in WTI prices and the bearish trend in spot prices for light naphthas and other feedstocks derived from crude oil, propane prices will average 86-89¢/gal during third-quarter 2007. ✦

The author

Daniel L. Lippe (danlippe@petral.com) is president of Petral-Worldwide Inc., Houston. He founded Petral Consulting Co. in 1988 and cofounded Petral Worldwide in 1993. He has expertise in economic analysis of a broad spectrum of petroleum products including crude oil and refined products, natural gas, natural gas liquids, other ethylene feedstocks, and primary petrochemicals. Lippe began his professional career in 1974 with Diamond Shamrock Chemical Co., moved into professional consulting in 1979, and has served petroleum, midstream, and petrochemical industry clients since that time. He holds a BS (1974) in chemical engineering from Texas A&M University and an MBA (1981) from Houston Baptist University. He is an active member of the Gas Processors Association, serving on the NGL Market Information Committee and currently serving as vice-chairman of the committee.

LNG TRADE—
Conclusion

Supply diversity cuts risk exposure

David Wood
David Wood & Associates
Lincoln, UK

COMMENT

Consumers of LNG must have a broadly diversified supply base to minimize consequences of any potential supply disruption. Expanding the number of suppliers often increases risk exposure, which can be most effectively moderated by pulling supplies from widely varied sources.

Part 1 of this article (OGJ, Apr. 16, 2007, p. 57) examined the risks faced by the US as it expands sources of its natural gas supplies, as well as efforts made to address these risks.

This concluding part completes the examination of the US situation before turning toward Europe's still-increasing dependence on Russia as it primary gas supplier.

US supplies

Qatar Petroleum (QP) signed a 5-year $10 billion agreement with ExxonMobil in 2003 for the Qatargas II project, part of the world's largest LNG shipping facility being built at Ras Laffan. It also prompted the Qatargas III and IV projects to be sanctioned in 2004 with ConocoPhillips and Shell, respectively, each of which plans to deliver large quantities of LNG to Europe and the US.

These projects hold great strategic significance in terms of potentially difficult-to-secure natural gas supplies over the next decade.

Qatar, itself an OPEC member, is a small state sandwiched between two main OPEC powers, Saudi Arabia and Iran, in one of the most politically unstable regions of the world. It will require a long-term, high profile military presence from the US in the Arabian Gulf to maintain the integrity of these projects.

Any change in politics in Qatar from its current pro-US position, or more extreme stances from OPEC, could potentially jeopardize or interrupt LNG supplies. Future warfare in the Persian Gulf between other nations could cause the Straits of Hormuz, a major petroleum shipping chokepoint and exit to the gulf, to close temporarily.

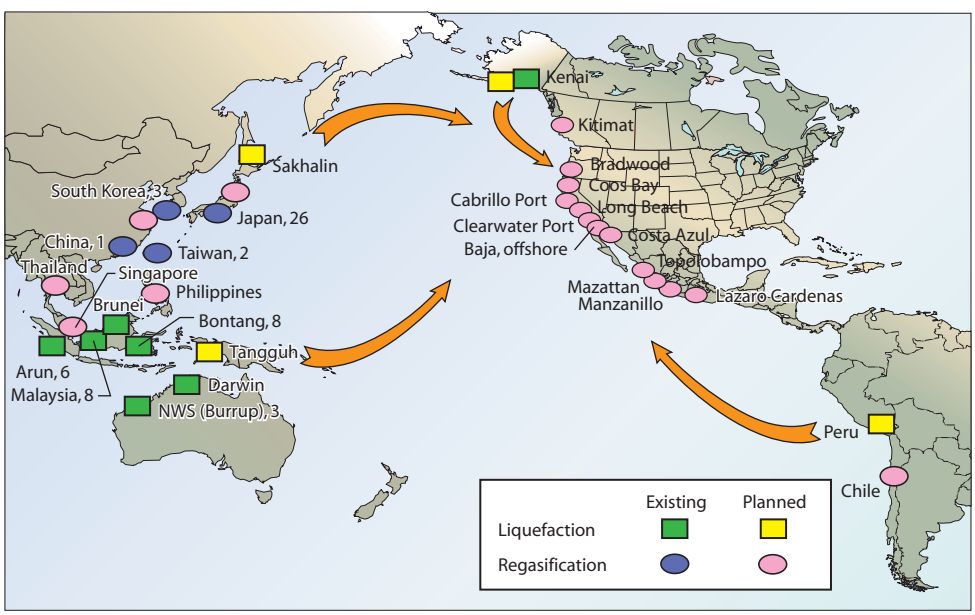
Events such as vessel collisions or terrorist attacks on LNG shipping in the Straits of Hormuz could also have short-term effects on LNG supplies, causing price spikes for natural gas customers.

Such scenarios are not difficult to develop and suggest that dependence on a few very large LNG suppliers would provide only limited security of supply for consumers.

The US belief that building tens of new regasification facilities in North

PACIFIC RIM LNG FACILITIES, 2006

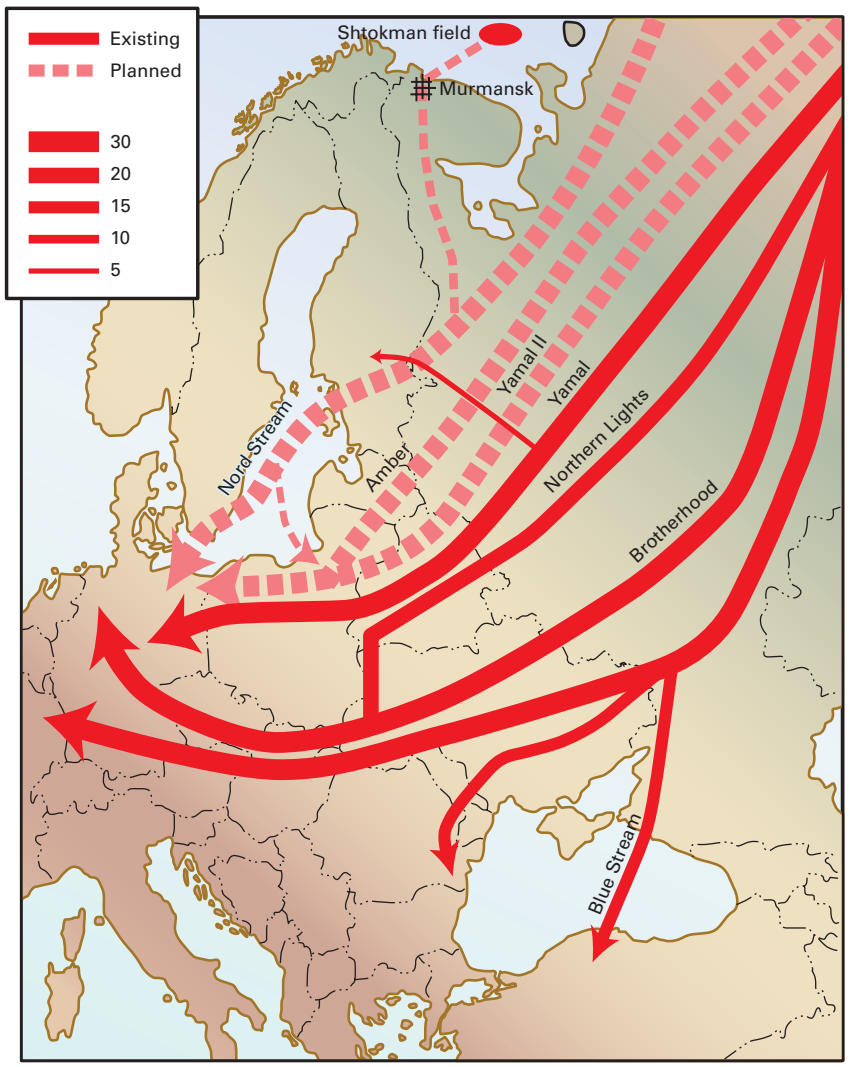
Fig. 1



Source: David Wood & Associates

MAIN RUSSIA-TO-EUROPE EXPORT GAS PIPELINES, BILLION CU M/YEAR

Fig. 2



Source: David Wood & Associates; Centre for Eastern Studies (Warsaw)

America (Canada, US, and Mexico) will, on its own, solve the security of supply issue misses part of the problem. Inadequate access to LNG shipping and strategic stocks of LNG could cause future supply interruptions even with extensive onshore LNG regasification capacity in place.

Construction of several new LNG receiving facilities along the Atlantic and Pacific coasts and reinforcement of gas pipeline transmission and distribution networks to interconnect with vulnerable market areas are clearly essential. The US, however, needs to educate states that believe their security of supply can be established remotely by contracting supplies from LNG receiving facilities outside their own backyard that they are fooling themselves.

Areas such as New England and California, already vulnerable because of their locations at the end of long pipeline networks, would become even more vulnerable if political disputes with major LNG suppliers lead to supply interruptions to North America (the same case can be argued for Germany in Europe).

To improve its security of gas supply, the US need look no further than developing a modern liquefaction plant in Alaska to bring its gas reserves to the California market.

The Alaska Gasline Port Authority and Sempra LNG have been trying to advance such an LNG solution, which would offer more flexibility of destination than the very expensive alternative of building a pipeline from Alaska to the Lower 48 states across Canada. Political wrangling among the Alaska state government, US federal government, Canada, and the major oil companies holding the gas resources on the North Slope over tax credits for a trans-Alaska gas pipeline project has led to polarized positions in the pipeline-vs.-LNG discussion.

The 1920 Jones Act, requiring water transport between US ports to use only vessels owned by US citizens, constructed in the US, and manned by North American crews also impedes pursuit of the LNG option for Alaska's gas resources.

It has been 30 years since an LNG tanker was last built in a US shipyard. The capital costs of building such a vessel today in a US yard would likely be more than double the costs of building it in an Asian yard. Operating costs for US-owned and manned LNG carriers would also be substantially higher than for foreign vessels.

Many consider it unlikely that Congress would grant an Alaskan LNG project a waiver to the Jones Act. But without such a waiver, it will be difficult for an Alaskan LNG project to compete commercially in exporting LNG to California.

It is in the interest of US gas consumers to resolve these issues quickly and move forward with either a pipeline or, preferably, an LNG facility. There are plenty of other LNG producers around the Pacific Rim keen to supply the western North America gas market when proposed facilities are finally built (Fig. 1).

Alaska needs to progress an LNG facility soon to take a share in this market, providing a stable supply alternative to the West Coast in the event of supply interruptions from countries such as Russia, Peru, and Indonesia.

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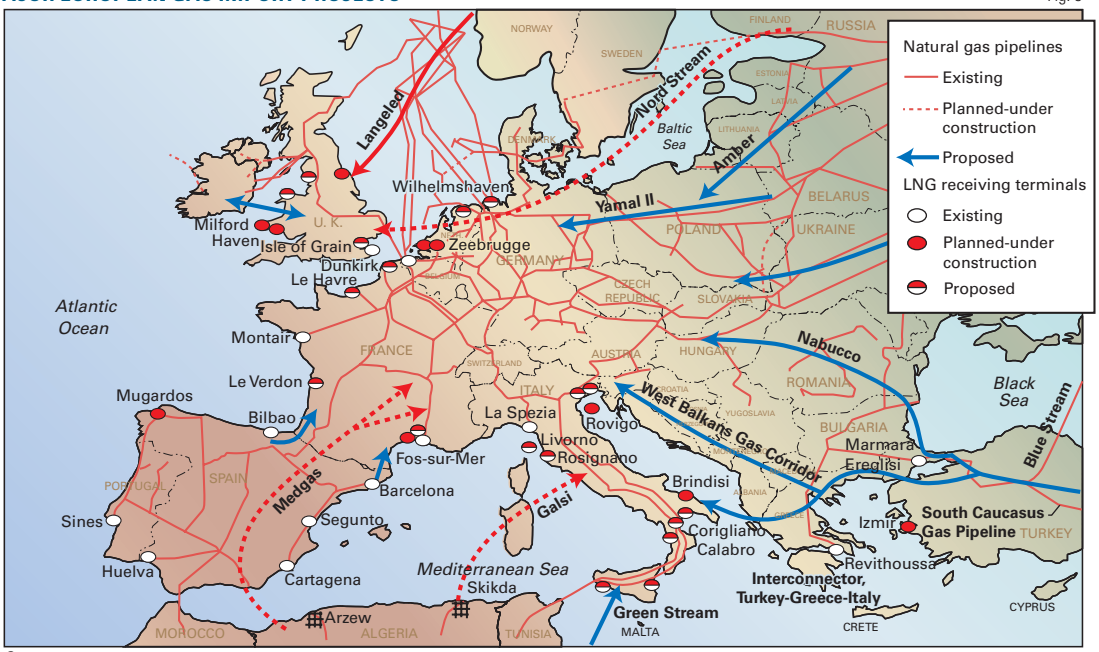
MAJOR EUROPEAN GAS IMPORT PROJECTS

Fig. 3



Source: David Wood & Associates; International Energy Agency

European dependence

Germany, Europe's largest gas consumer, seems intent to take delivery of even more Russian gas since former Pres. Schroeder joined Gazprom, with Gazprom expanding equity positions in some German utilities and showing interest in doing so in other EU countries, given its pursuit of Centrica in the UK.

Russia provided some 23% of the gas consumed by the European Union in 2004, but 33% of the gas consumed by Germany. This may well provide Germany with lower prices in the short-term, but will also make it more vulnerable to supply interruptions and price hikes moving forward.

If Gazprom also gains control of consuming utilities, it is easy to see that Russia will increase its supply dominance and prices will move higher.

The gas supply interruptions in January and February 2006, caused by Russia's dispute with Ukraine, and the January 2007 pipeline dispute with Belarus, have, however, prompted even Germany to look at alternatives to diversify its gas supply.

The Northern European (Trans-Baltic or Nord Stream) offshore pipeline linking Russia directly to Germany is Russia's preferred solution, avoiding Poland and Belarus, and Germany sanctioned this project in 2006 (Fig. 2). While removing some of the risk associated with supply interruption caused by disputes between Russia and intermediate countries, the Northern European line locks Germany even more firmly in Russia's supply grasp and seems shortsighted.

Some German energy companies are now openly seeking LNG import supplies and may build their own LNG receiving terminal at Wilhelmshaven.

Developing alternatives

The Nabucco gas pipeline offers a potential new route for natural gas from Iran and the Caspian region to reach Western Europe through Turkey. At 3,200 km in length, Nabucco, as currently envisaged could move some 30 billion cu m/year to Turkey, delivering 15 billion cu m/year to Austria with the balance taken by countries along the route. Russia, however, will likely do all in its power to stop the Caspian states from supplying major volumes of gas to Western Europe.

The Nabucco project—together with other new pipelines from Algeria and Libya across the Mediterranean, the proposed Turkey-Greece-Italy interconnector, the Trans-Balkan corridor, and the Langeled line from Norway to the UK (Fig. 3)—offers diversity of supply. But these pipelines are still ultimately linked to a few large producers: Iran, Algeria, Libya, and Norway.

This supply base is insufficient to provide true security of supply and avoid market manipulation.

LNG plays a large role in avoiding overdependence on unreliable gas suppliers. Belgium, France, and Spain have long realized this and have invested heavily to expand their LNG regasification infrastructure. The UK, Italy, and Netherlands are in the process of joining them.

Those terminals, however, should have a wide range of supply sources, ideally not influenced by Russia, Algeria, Qatar, and Iran, which are likely to control most of the pipeline gas for potential supplied to Europe beyond 2020. They should also be integrated with expanded underground gas storage capacity, which could minimize the effects of short-term gas supply interruptions.

A key factor in the high geopolitical risks associated with natural gas is the heavy concentration of reserves and supply infrastructure in a relatively small number of producing countries. There is a danger that shortsighted policies will enable these major gas suppliers to flood the EU markets with cheap gas in the short-term, giving them the

control necessary to gradually price out smaller competitors and then begin raising prices on their own.

Political hurdles

Limited third-party access to domestic gas markets stands as another impediment to supply diversification. Those countries most resistant to deregulation in practice (France, Germany, and Italy) feature former monopoly national holding companies obstructing the path of new entrants to their markets, despite EU directives toward gas liberalization. Such policies allow very little customer choice in determining suppliers.

This situation may change during 2007, as and when compliance with the second EU gas directive is reviewed, but access to gas customers through monopoly owned pipeline networks remained difficult in France and Germany in 2006.

Development plans in France call for more LNG receiving terminals, not to be controlled by Gaz de France (GdF) and Total (former monopoly holders). First development will likely occur at Le Havre and Le Verdon, but Dunkirk and St. Nazaire are also earmarked for future development.

French company, Poweo, and Austria's Verbund are planning a 412-Mw combined cycle gas turbine at Le Havre to be fueled by gas from a new LNG terminal. GdF operated a 0.5 billion cu m/year LNG plant at Le Havre between 1965 and 1989, and this may be the site used. 4Gas, formerly PetroPlus of the Netherlands, started environmental impact assessment and safety case planning for Le Verdon in third-quarter 2006.

Political ends

EU leaders met in October 2006 with Russian Pres. Vladimir Putin in Helsinki to seek guarantees that Russia would not interrupt gas supplies for political reasons. The meetings insulted the intelligence of most gas consumers in the EU, showing the naiveté of EU politicians regarding global energy markets and monopolistic suppliers.

If Russia or a small group of countries succeeds in capturing the European gas market, it is likely that they will individually or as a cartel exercise that power to extract higher prices.

Russia wants to maintain the impression that it has no intention of exploiting a dominant gas supply position in Europe. Both history and recent events suggest otherwise.

Even if Germany fails to heed this risk, other EU countries will be more attentive and when Russia does threaten to close the pipeline valves on Germany it can be certain that its European partners will charge above-market prices for relief gas.

The UK's recent experience remedying its winter gas shortages at a high price serves as a cautionary tale in this regard. ✦

Equipment/Software/Literature

Portable 3D seismic acquisition system

The new Geode DZ is a 24 bit, portable 3D distributed seismic acquisition system that brings ease-of-use, economy, and GPS synchronized continuous monitoring to high resolution petroleum and research surveys.

Featuring 20 khz, 24-bit bandwidth (allows surveys in hard rock), and a modern, intuitive, and easy-to-use software interface, the system uses rugged, lightweight analog/digital and line tap modules that are connected by ethernet to a standard Windows computer. The overall result is faster, lower cost high resolution 3D surveys, the company says.

The DZ's intuitive graphical software eases the transition to 3D surveys. User friendly linked modules include wizard-based OMNI Tools for quickly planning, modeling, and simulating all aspects of a survey, and this firm's seismic acquisition suite of tools for efficient data collection, extensive QC testing (including state-of-the-art line and geophone testing), and graphically monitoring and controlling the features and operation of the DZ hardware.

The Geode DZ is backed by a 3 year parts and labor warranty. The architecture is backwards compatible with existing Geode hardware which can be simply incorporated into a new 3D system.

A variety of sources can be used, including environment friendly weight drops, vibrators, and pseudorandom (Mini-Sosie) sources as well as explosives.

Source: **Geometrics Inc.**, 2190 Fortune Drive, San Jose, CA 95131.

Services/Suppliers

Intec Engineering

Houston, has announced the appointment of Stephen Rivers as engineering director, Asia Pacific. He will be based in Perth, but have responsibilities for the entire region. Steve Lee and Brandon Hughes, operations managers for Intec South East Asia and Australasia, respectively, will continue in their positions and will work alongside Rivers.

Rivers has spent the last 23 years in the offshore oil and gas industry, specializing in the design and construction of marine pipelines, structures, and process decks.

Intec Engineering, a Heerema Group company, is a leading engineering and project management company. Its technical disciplines include marine pipelines and risers, subsea systems, systems engineering, flow assurance, floating systems, LNG terminals, and marine installation management.

Fulbright & Jaworski LLP

London, has announced that Jeremy Sheldon has joined the firm as a partner in the London energy practice. Sheldon has advised energy companies in regions ranging from Africa to the Middle East and countries from Canada to Kazakhstan on issues from waste projects to infrastructure development.

Fulbright & Jaworski LLP is a leading full-service international law firm operating from 16 locations.

LeTourneau Technologies Inc.

Longview, Tex., is a new organization formed by six companies to apply proprietary captive technology to achieve product leadership performance in several markets, including oil and gas drilling. Dan Eckermann is president of the new organization.

The business units include LTI Drilling Systems, formerly LEWCO, and LTI Offshore Products, formerly LeTourneau Marine Group. The remaining four units focus on the mining, forestry, power, and steel markets.

LeTourneau Technologies Inc. is owned by the Rowan Companies Inc., and operates worldwide.

Implicit Monitoring Solutions LP

Dallas, has announced the appointment of David Kerr as president. Kerr, who has more than 30 years of oil and gas experience, served as president of Kerr Pump Corp. for 25 years.

Implicit Monitoring Solutions LP is a leading provider of remote asset performance and control monitoring services.

Wood Mackenzie

Edinburgh, has announced its acquisition of Hill & Associates, Annapolis, Md.-based providers of analysis and advisory services on coal and electricity markets. The combination enables Wood Mackenzie to provide deep expertise in oil, gas, coal, and power sectors of the energy market.

Wood Mackenzie provides a range of research products and consulting services to the energy and life sciences industries.

API IMPORTS OF CRUDE AND PRODUCTS

	Districts 1-4		District 5		Total US		
	4-20 2007	[1]4-13 2007	4-20 2007	[1]4-13 2007	4-20 2007	[1]4-13 2007	4-21 2006
	1,000 b/d						
Total motor gasoline	611	397	15	92	626	489	497
Mo. gas. blending comp.	568	496	56	42	624	538	810
Distillate[2]	150	324	17	68	167	392	251
Residual	384	360	27	28	411	388	509
Jet fuel-kerosine	116	106	139	141	255	247	135
LPG	308	286	5	6	313	292	282
Unfinished oils	580	629	5	28	585	657	486
Other	606	329	4	27	610	356	406
Total products	**3,323**	**2,927**	**268**	**432**	**3,591**	**3,359**	**3,376**
Canadian crude	1,535	1,382	169	164	1,704	1,546	1,821
Other foreign	7,305	7,568	880	567	8,185	8,135	9,847
Total crude	**8,840**	**8,950**	**1,049**	**731**	**9,889**	**9,681**	**11,668**
Total crude	**12,163**	**11,877**	**1,317**	**1,163**	**13,480**	**13,040**	**15,044**

[1]Revised. [2]Includes No. 4 fuel oil.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

PURVIN & GERTZ LNG NETBACKS—APR. 20, 2007

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	6.94	5.00	6.18	4.91	5.56	6.16
Everett	6.18	4.31	5.82	4.41	4.73	6.46
Isle of Grain	1.98	0.45	1.46	0.39	0.80	1.52
Lake Charles	5.10	3.41	4.86	3.57	3.79	5.68
Sodegaura	4.40	6.37	4.61	6.10	5.50	3.93
Zeebrugge	5.54	3.69	4.98	3.62	4.16	5.00

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

Additional analysis of market trends is available through **OGJ Online**, *Oil & Gas Journal's* electronic information source, at http://www.ogjonline.com.

OGJ CRACK SPREAD

	*4-20-07	*4-21-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	81.74	93.06	–11.32	–12.2
Brent crude	66.29	72.51	–6.22	–8.6
Crack spread	15.45	20.91	–5.46	–26.1
FUTURES MARKET PRICES				
One month				
Product value	83.41	90.37	–6.96	–7.7
Light sweet crude	63.01	72.21	–9.20	–12.7
Crack spread	20.40	18.16	2.24	12.3
Six month				
Product value	79.64	86.34	–6.70	–7.8
Light sweet crude	67.60	75.37	–7.77	–10.3
Crack spread	12.04	10.96	1.07	9.8

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

API CRUDE AND PRODUCT STOCKS

	Crude oil	Motor gasoline		Jet fuel Kerosine	Fuel oils		Unfinished oils
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD I	13,826	52,893	26,165	9,700	40,574	15,574	7,133
PADD II	74,269	47,042	16,043	7,427	29,547	1,303	14,936
PADD III	182,815	65,026	27,122	12,826	31,317	17,033	45,729
PADD IV	14,471	5,462	1,722	540	3,183	346	3,276
PADD V	[1]54,047	28,082	20,270	8,989	12,133	5,997	23,861
Apr. 20, 2007	**[1]339,428**	**198,505**	**91,322**	**39,482**	**116,754**	**40,253**	**94,935**
Apr. 13, 2007[3]	**333,884**	**198,587**	**91,711**	**39,347**	**118,540**	**40,145**	**95,270**
Apr. 21, 2006	**344,821**	**202,542**	**86,635**	**41,367**	**115,974**	**41,607**	**93,732**

[1]Included in total motor gasoline. [2]Includes 5.057 million bbl of Alaskan crude in transit by water. [3]Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

API REFINERY REPORT—APR. 20, 2007

District	REFINERY OPERATIONS					REFINERY OUTPUT			
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	Percent operated	Total motor gasoline	Jet fuel, kerosine	Fuel oils Distillate	Fuel oils Residual
	1,000 b/d					1,000 b/d			
East Coast	3,236	1,415	1,419	1,618	87.7	1,717	74	533	130
App. Dist. 1	32	26	26	95	27.4	33	0	5	0
Dist. 1 total	**3,268**	**1,441**	**1,445**	**1,713**	**84.4**	**1,750**	**74**	**538**	**130**
Ind., Ill., Ky.	2,033	2,023	2,027	2,355	86.1	1,257	89	592	48
Minn., Wis., Dak.	387	378	381	442	86.2	358	25	125	10
Okla., Kan., Mo.	801	635	635	786	80.8	520	22	233	6
Dist. 2 total	**3,221**	**3,036**	**3,043**	**3,583**	**84.9**	**2,135**	**136**	**950**	**64**
Inland Texas	928	618	639	647	98.8	400	40	175	8
Texas Gulf Coast	3,785	3,276	3,404	4,031	84.5	1,302	311	948	160
La. Gulf Coast	3,231	3,112	3,162	3,264	96.9	1,236	359	863	138
N. La. and Ark.	224	181	191	215	88.8	80	13	43	5
New Mexico	156	105	105	113	92.9	113	3	39	0
Dist. 3 total	**8,324**	**7,292**	**7,501**	**8,270**	**90.7**	**3,131**	**726**	**2,068**	**311**
Dist. 4 total	**647**	**524**	**525**	**596**	**88.1**	**140**	**33**	**152**	**15**
Dist. 5 total	**2,702**	**2,401**	**2,669**	**3,173**	**84.1**	**1,548**	**336**	**529**	**149**
Apr. 20, 2007	**18,162**	**14,694**	**15,183**	**17,335**	**87.6**	**8,704**	**1,305**	**4,237**	**669**
Apr. 13, 2007*	**18,678**	**14,940**	**15,415**	**17,335**	**88.9**	**8,824**	**1,357**	**4,259**	**706**
Apr. 21, 2006	**17,103**	**15,042**	**15,420**	**17,115**	**90.1**	**7,945**	**1,467**	**3,673**	**665**

*Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

Statistics

OGJ GASOLINE PRICES

	Price ex tax 4-18-07	Pump price* 4-18-07	Pump price 4-19-06
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	234.4	274.1	283.4
Baltimore	237.9	279.8	286.4
Boston	228.2	270.1	278.8
Buffalo	226.1	286.2	288.6
Miami	242.7	293.0	296.7
Newark	226.4	259.3	270.6
New York	218.1	278.2	288.4
Norfolk	233.2	270.8	284.1
Philadelphia	233.5	284.2	289.1
Pittsburgh	223.5	274.2	282.5
Wash., DC	249.1	287.5	295.6
PAD I avg.	225.4	271.2	285.8
Chicago	256.9	307.8	306.1
Cleveland	227.5	273.9	274.9
Des Moines	229.5	269.9	271.0
Detroit	227.9	277.1	279.0
Indianapolis	233.9	278.9	277.0
Kansas City	228.1	264.1	266.9
Louisville	243.8	280.7	283.3
Memphis	229.1	268.9	272.2
Milwaukee	236.3	287.6	287.1
Minn.-St. Paul	228.9	269.3	276.1
Oklahoma City	229.6	265.0	264.2
Omaha	228.7	275.1	281.2
St. Louis	234.8	270.8	268.8
Tulsa	231.5	266.9	266.8
Wichita	225.6	269.0	265.9
PAD II avg.	225.0	267.2	276.0
Albuquerque	239.4	275.8	280.6
Birmingham	231.2	269.9	276.4
Dallas-Fort Worth	236.3	274.7	287.3
Houston	232.4	270.0	281.0
Little Rock	227.8	268.0	274.1
New Orleans	229.5	267.9	276.8
San Antonio	219.6	258.0	269.2
PAD III avg.	222.6	261.0	277.9
Cheyenne	226.6	259.0	250.6
Denver	230.5	270.9	268.1
Salt Lake City	221.4	264.3	249.2
PAD IV avg.	222.2	260.8	255.9
Los Angeles	266.9	325.4	303.8
Phoenix	249.6	287.0	283.2
Portland	260.0	303.3	277.7
San Diego	276.8	335.3	308.7
San Francisco	291.1	349.6	308.6
Seattle	258.6	311.0	292.9
PAD V avg.	267.2	318.6	295.8
Week's avg.	**236.7**	**280.3**	**280.3**
Mar. avg.	**210.4**	**254.0**	**235.4**
Feb. avg.	**184.4**	**228.0**	**229.6**
2007 to date	**199.3**	**242.9**	—
2006 to date	**194.9**	**237.3**	—

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

REFINED PRODUCT PRICES

	4-13-07 ¢/gal		4-13-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	213.99	New York Harbor	189.66
Gulf Coast	219.44	Gulf Coast	187.81
Los Angeles	254.51	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	199,29	ARA	192.49
Singapore	202.14	Singapore	197.19
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	218.51	New York Harbor	113.10
Gulf Coast	226.51	Gulf Coast	113.69
Los Angeles	272.01	Los Angeles	131.92
		ARA	107.42
		Singapore	131.71

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

BAKER HUGHES RIG COUNT

	4-20-07	4-21-06
Alabama	3	5
Alaska	8	7
Arkansas	42	18
California	35	30
Land	34	26
Offshore	1	4
Colorado	114	84
Florida	0	0
Illinois	0	0
Indiana	2	0
Kansas	14	7
Kentucky	8	6
Louisiana	189	183
N. Land	62	57
S. Inland waters	30	18
S. Land	33	33
Offshore	64	75
Maryland	0	0
Michigan	2	2
Mississippi	18	6
Montana	22	24
Nebraska	0	0
New Mexico	76	94
New York	6	4
North Dakota	32	28
Ohio	13	7
Oklahoma	178	175
Pennsylvania	14	14
South Dakota	2	2
Texas	836	726
Offshore	11	14
Inland waters	1	4
Dist. 1	22	21
Dist. 2	37	21
Dist. 3	54	70
Dist. 4	89	78
Dist. 5	169	131
Dist. 6	126	101
Dist. 7B	45	38
Dist. 7C	60	37
Dist. 8	111	83
Dist. 8A	24	27
Dist. 9	31	30
Dist. 10	56	71
Utah	43	37
West Virginia	32	27
Wyoming	71	103
Others—ID-1; NV-2; TN-3; VA-3	9	2
Total US	**1,769**	**1,591**
Total Canada	**98**	**176**
Grand total	**1,867**	**1,767**
Oil rigs	292	259
Gas rigs	1,473	1,331
Total offshore	76	93
Total cum. avg. YTD	**1,737**	**1,535**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 46.

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

SMITH RIG COUNT

Proposed depth, ft	4-20-07 Rig count	4-20-07 Percent footage*	4-21-06 Rig count	4-21-06 Percent footage*
0-2,500	52	5.7	48	2.0
2,501-5,000	100	55.0	84	45.2
5,001-7,500	209	22.9	221	17.6
7,501-10,000	432	3.0	350	2.2
10,001-12,500	429	3.7	365	2.1
12,501-15,000	268	0.3	274	—
15,001-17,500	111	0.9	117	0.8
17,501-20,000	68	—	69	—
20,001-over	37	—	15	—
Total	**1,706**	**8.0**	**1,543**	**6.1**
INLAND	34		42	
LAND	1,611		1,437	
OFFSHORE	61		64	

*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]4-20-07	[2]4-21-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	17	22
Alaska	758	788
California	666	684
Colorado	51	62
Florida	6	6
Illinois	30	28
Kansas	94	95
Louisiana	1,350	1,212
Michigan	14	15
Mississippi	51	48
Montana	90	96
New Mexico	161	160
North Dakota	100	104
Oklahoma	165	171
Texas	1,325	1,298
Utah	42	49
Wyoming	140	144
All others	62	71
Total	**5,122**	**5,053**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	4-20-07
Alaska-North Slope 27°	50.46
South Louisiana Sweet	64.75
California-Kern River 13°	53.15
Lost Hills 30°	61.10
Wyoming Sweet	59.38
East Texas Sweet	60.78
West Texas Sour 34°	53.15
West Texas Intermediate	60.00
Oklahoma Sweet	60.00
Texas Upper Gulf Coast	56.75
Michigan Sour	53.00
Kansas Common	59.00
North Dakota Sweet	53.00

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.

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

WORLD CRUDE PRICES

$/bbl[1]	4-13-07
United Kingdom-Brent 38°	66.78
Russia-Urals 32°	63.28
Saudi Light 34°	62.34
Dubai Fateh 32°	63.97
Algeria Saharan 44°	69.41
Nigeria-Bonny Light 37°	69.60
Indonesia-Minas 34°	68.56
Venezuela-Tia Juana Light 31°	59.33
Mexico-Isthmus 33°	59.22
OPEC basket	64.63
Total OPEC[2]	63.99
Total non-OPEC[2]	61.74
Total world[2]	62.97
US imports[3]	58.66

[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]

	4-13-07	4-6-07	Change
	Bcf		
Producing region	636	642	–6
Consuming region east	663	706	–43
Consuming region west	247	244	3
Total US	**1,546**	**1,592**	**–46**
	Jan. 07	**Jan. 06**	**Change, %**
Total US[2]	**2,379**	**2,371**	**0.3**

[1]Working gas. [2]At end of period.
Note: Current data not available.
Source: Energy Information Administration
Data available in OGJ Online Research Center

API IMPORTS OF CRUDE AND PRODUCTS

	Districts 1-4		District 5		Total US		
	4-27 2007	[1]4-20 2007	4-27 2007	[1]4-20 2007	4-27 2007	[1]4-20 2007	4-28 2006
	1,000 b/d						
Total motor gasoline	404	611	5	15	409	626	437
Mo. gas. blending comp.	565	568	43	56	608	624	836
Distillate[2]	205	150	17	17	222	167	449
Residual	290	384	28	27	318	411	189
Jet fuel-kerosine	56	116	64	139	120	255	299
LPG	254	308	5	5	259	313	231
Unfinished oils	587	580	9	5	596	585	424
Other	324	606	4	4	328	610	433
Total products	**2,685**	**3,323**	**175**	**268**	**2,860**	**3,591**	**3,298**
Canadian crude	1,699	1,535	141	169	1,840	1,704	1,922
Other foreign	7,723	7,305	893	880	8,616	8,185	8,383
Total crude	**9,422**	**8,840**	**1,034**	**1,049**	**10,456**	**9,889**	**10,305**
Total crude	**12,107**	**12,163**	**1,209**	**1,317**	**13,316**	**13,480**	**13,603**

[1]Revised. [2]Includes No. 4 fuel oil.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

PURVIN & GERTZ LNG NETBACKS—APR. 27, 2007

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	6.94	4.86	6.18	4.76	5.55	6.15
Everett	6.16	4.31	5.80	4.41	4.86	6.44
Isle of Grain	1.54	0.13	1.17	0.05	0.57	1.21
Lake Charles	5.13	3.41	4.92	3.57	3.81	5.67
Sodegaura	4.50	6.37	4.71	6.21	5.60	4.02
Zeebrugge	5.55	3.69	5.02	3.62	4.20	5.03

Definitions, see OGJ Apr. 9, 2007, p. 57. Source: Purvin & Gertz Inc. 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

	*4-27-07	*4-28-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	86.71	87.64	–0.93	–1.1
Brent crude	67.31	72.52	–5.21	–7.2
Crack spread	19.40	15.11	4.29	28.4
FUTURES MARKET PRICES				
One month				
Product value	88.86	87.40	1.46	1.7
Light sweet crude	65.57	72.20	–6.63	–9.2
Crack spread	23.29	15.20	8.09	53.2
Six month				
Product value	82.10	85.26	–3.16	–3.7
Light sweet crude	69.35	75.45	–6.10	–8.1
Crack spread	12.75	9.80	2.95	30.1

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

API CRUDE AND PRODUCT STOCKS

	Crude oil	Motor gasoline		Jet fuel Kerosine	Fuel oils		Unfinished oils
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD I	15,567	54,111	27,274	9,837	42,098	15,001	6,654
PADD II	75,720	47,559	15,701	7,721	29,958	1,244	15,171
PADD III	184,221	63,680	26,848	12,447	32,136	17,183	45,998
PADD IV	14,716	5,686	1,646	592	2,986	269	3,298
PADD V	[1]54,570	27,257	19,497	9,047	12,500	5,769	22,092
Apr. 27, 2007	**[1]344,794**	**198,293**	**90,966**	**39,644**	**119,678**	**39,466**	**93,213**
Apr. 20, 2007[3]	**339,428**	**198,505**	**91,322**	**39,482**	**116,754**	**40,253**	**94,935**
Apr. 28, 2006	**346,861**	**206,527**	**90,898**	**41,333**	**114,632**	**40,477**	**94,013**

[1]Included in total motor gasoline. [2]Includes 5.390 million bbl of Alaskan crude in transit by water. [3]Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

API REFINERY REPORT—APR. 27, 2007

District	REFINERY OPERATIONS					REFINERY OUTPUT			
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	Percent operated	Total motor gasoline	Jet fuel, kerosine	Fuel oils Distillate	Fuel oils Residual
	1,000 b/d					1,000 b/d			
East Coast	3,335	1,422	1,429	1,618	88.3	1,732	75	539	185
App. Dist. 1	65	59	59	95	62.1	50	0	15	0
Dist. 1 total	**3,400**	**1,481**	**1,488**	**1,713**	**86.9**	**1,782**	**75**	**554**	**185**
Ind., Ill., Ky.	2,180	2,079	2,083	2,355	88.5	1,281	114	602	46
Minn., Wis., Dak.	396	385	388	442	87.8	365	26	121	11
Okla., Kan., Mo.	840	699	699	786	88.9	546	22	254	3
Dist. 2 total	**3,416**	**3,163**	**3,170**	**3,583**	**88.5**	**2,192**	**162**	**977**	**60**
Inland Texas	908	631	637	647	98.5	370	39	171	8
Texas Gulf Coast	3,908	3,225	3,331	4,031	82.6	1,321	304	892	172
La. Gulf Coast	3,514	3,262	3,266	3,264	100.1	1,211	392	855	122
N. La. and Ark.	230	197	199	215	92.6	82	12	47	7
New Mexico	165	107	107	113	94.7	112	2	41	1
Dist. 3 total	**8,725**	**7,422**	**7,540**	**8,270**	**91.2**	**3,096**	**749**	**2,006**	**310**
Dist. 4 total	**646**	**544**	**546**	**596**	**91.6**	**192**	**31**	**168**	**15**
Dist. 5 total	**2,593**	**2,343**	**2,588**	**3,173**	**81.6**	**1,552**	**348**	**490**	**140**
Apr. 27, 2007	**18,780**	**14,593**	**15,332**	**17,335**	**88.5**	**8,814**	**1,365**	**4,195**	**710**
Apr. 20, 2007*	**18,162**	**14,694**	**15,183**	**17,335**	**87.6**	**8,704**	**1,305**	**4,237**	**669**
Apr. 28, 2006	**16,502**	**14,749**	**15,023**	**17,115**	**87.8**	**8,141**	**1,349**	**3,717**	**577**

*Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

Statistics

OGJ GASOLINE PRICES

	Price ex tax 4-25-07	Pump price* 4-25-07	Pump price 4-26-06
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	234.9	274.6	293.1
Baltimore	238.6	280.5	296.7
Boston	228.7	270.6	288.9
Buffalo	226.6	286.7	298.1
Miami	243.3	293.6	304.8
Newark	226.8	259.7	280.8
New York	218.6	278.7	298.1
Norfolk	233.9	271.5	296.0
Philadelphia	234.0	284.7	299.0
Pittsburgh	224.0	274.7	292.1
Wash., DC	250.0	288.4	305.1
PAD I avg.	225.4	271.2	295.7
Chicago	257.6	308.5	314.0
Cleveland	228.2	274.6	283.6
Des Moines	230.2	270.6	278.9
Detroit	228.4	277.6	286.9
Indianapolis	234.6	279.6	282.9
Kansas City	228.6	264.6	275.6
Louisville	244.6	281.5	291.0
Memphis	229.8	269.6	280.0
Milwaukee	237.2	288.5	296.3
Minn.-St. Paul	229.3	269.7	282.0
Oklahoma City	230.2	265.6	272.0
Omaha	229.2	275.6	290.3
St. Louis	235.5	271.5	276.9
Tulsa	232.2	267.6	274.2
Wichita	226.2	269.6	273.2
PAD II avg.	225.0	267.2	283.9
Albuquerque	240.1	276.5	287.5
Birmingham	231.9	270.6	284.7
Dallas-Fort Worth	237.1	275.5	296.4
Houston	233.1	271.5	289.6
Little Rock	228.4	268.6	283.3
New Orleans	230.2	268.6	284.2
San Antonio	220.2	258.6	277.7
PAD III avg.	222.6	261.0	286.2
Cheyenne	227.2	259.6	256.8
Denver	230.5	270.9	276.0
Salt Lake City	221.8	264.7	257.0
PAD IV avg.	222.2	260.8	263.2
Los Angeles	267.2	325.7	311.9
Phoenix	250.2	287.6	294.3
Portland	260.4	303.7	285.8
San Diego	277.2	335.7	317.5
San Francisco	291.3	349.8	317.5
Seattle	259.2	311.6	300.9
PAD V avg.	267.6	319.0	304.6
Week's avg.	**237.3**	**280.9**	**288.8**
Apr. avg.	**234.7**	**278.3**	**270.5**
Mar. avg.	**210.4**	**254.0**	**235.4**
2007 to date	**199.3**	**242.9**	—
2006 to date	**197.9**	**240.4**	—

*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

	4-20-07 ¢/gal		4-20-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil, No. 2	
New York Harbor	204.50	New York Harbor	183.63
Gulf Coast	209.75	Gulf Coast	180.15
Los Angeles	233.25	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	197.87	ARA	183.21
Singapore	197.57	Singapore	187.98
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	215.50	New York Harbor	113.10
Gulf Coast	221.00	Gulf Coast	113.33
Los Angeles	242.75	Los Angeles	131.92
		ARA	103.46
		Singapore	124.15

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

BAKER HUGHES RIG COUNT

	4-27-07	4-28-06
Alabama	3	4
Alaska	6	7
Arkansas	43	20
California	33	34
Land	32	28
Offshore	1	6
Colorado	109	82
Florida	0	0
Illinois	0	0
Indiana	2	0
Kansas	13	7
Kentucky	8	6
Louisiana	183	194
N. Land	60	56
S. Inland waters	28	21
S. Land	32	40
Offshore	63	77
Maryland	0	0
Michigan	2	1
Mississippi	18	6
Montana	21	22
Nebraska	0	0
New Mexico	74	97
New York	6	5
North Dakota	34	27
Ohio	13	7
Oklahoma	177	174
Pennsylvania	14	14
South Dakota	2	2
Texas	823	730
Offshore	9	13
Inland waters	2	4
Dist. 1	19	25
Dist. 2	31	22
Dist. 3	55	66
Dist. 4	91	79
Dist. 5	168	136
Dist. 6	118	105
Dist. 7B	44	37
Dist. 7C	65	37
Dist. 8	109	76
Dist. 8A	26	30
Dist. 9	34	31
Dist. 10	52	69
Utah	43	39
West Virginia	32	26
Wyoming	79	102
Others—ID-1; NV-2; TN-3; VA-3	9	2
Total US	**1,747**	**1,608**
Total Canada	**81**	**150**
Grand total	**1,828**	**1,758**
Oil rigs	283	254
Gas rigs	1,460	1,353
Total offshore	73	96
Total cum. avg. YTD	**1,738**	**1,539**

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	4-27-07 Rig count	4-27-07 Percent footage*	4-28-06 Rig count	4-28-06 Percent footage*
0-2,500	55	5.4	51	—
2,501-5,000	105	52.3	95	45.2
5,001-7,500	216	18.0	224	16.5
7,501-10,000	421	2.6	346	2.3
10,001-12,500	435	3.9	369	2.7
12,501-15,000	264	0.7	275	—
15,001-17,500	109	0.9	120	0.8
17,501-20,000	73	—	71	—
20,001-over	33	—	15	—
Total	**1,711**	**7.4**	**1,566**	**6.3**
INLAND	37		43	
LAND	1,613		1,460	
OFFSHORE	61		63	

*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]4-27-07	[2]4-28-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	17	22
Alaska	761	800
California	667	684
Colorado	52	62
Florida	6	6
Illinois	31	28
Kansas	95	98
Louisiana	1,358	1,213
Michigan	15	15
Mississippi	52	48
Montana	90	95
New Mexico	161	161
North Dakota	101	103
Oklahoma	166	171
Texas	1,330	1,300
Utah	42	50
Wyoming	141	144
All others	62	70
Total	**5,147**	**5,070**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	4-27-07
Alaska-North Slope 27°	50.46
South Louisiana Sweet	67.00
California-Kern River 13°	55.55
Lost Hills 30°	63.40
Wyoming Sweet	61.71
East Texas Sweet	63.11
West Texas Sour 34°	55.40
West Texas Intermediate	62.25
Oklahoma Sweet	62.25
Texas Upper Gulf Coast	59.00
Michigan Sour	55.25
Kansas Common	61.25
North Dakota Sweet	55.00

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.

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

WORLD CRUDE PRICES

$/bbl[1]	4-20-07
United Kingdom-Brent 38°	66.78
Russia-Urals 32°	63.28
Saudi Light 34°	62.34
Dubai Fateh 32°	63.97
Algeria Saharan 44°	69.41
Nigeria-Bonny Light 37°	69.60
Indonesia-Minas 34°	68.56
Venezuela-Tia Juana Light 31°	59.33
Mexico-Isthmus 33°	59.22
OPEC basket	64.63
Total OPEC[2]	63.99
Total non-OPEC[2]	61.74
Total world[2]	62.97
US imports[3]	58.66

[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]

	4-20-07	4-13-07	Change
	Bcf		
Producing region	647	636	11
Consuming region east	664	663	1
Consuming region west	253	247	6
Total US	**1,564**	**1,546**	**18**
	Feb. 07	**Feb. 06**	**Change, %**
Total US[2]	**1,649**	**1,886**	**–12.6**

[1]Working gas. [2]At end of period.
Note: Current data not available.
Source: Energy Information Administration
Data available in OGJ Online Research Center

PACE REFINING MARGINS

	Feb. 2007	Mar. 2007	Apr. 2007	Apr. 2006	Change 2007 vs. 2006	Change, % 2007 vs. 2006
	$/bbl					
US Gulf Coast						
West Texas Sour	11.13	16.43	21.45	20.12	1.33	6.6
Composite US Gulf Refinery	12.08	16.83	21.35	21.82	–0.46	–2.1
Arabian Light	13.09	17.50	22.47	23.65	–1.18	–5.0
Bonny Light	5.84	9.70	12.17	13.53	–1.36	–10.1
US PADD II						
Chicago (WTI)	11.75	16.98	23.96	19.36	4.61	23.8
US East Coast						
NY Harbor (Arab Med)	13.20	17.81	17.81	18.05	–0.25	–1.4
East Coast Comp-RFG	15.30	20.38	20.39	20.80	–0.41	–2.0
US West Coast						
Los Angeles (ANS)	23.96	29.31	29.03	23.63	5.40	22.9
NW Europe						
Rotterdam (Brent)	3.42	3.47	2.63	1.44	1.19	82.7
Mediterranean						
Italy (Urals)	8.60	8.79	7.89	9.62	–1.72	–17.9
Far East						
Singapore (Dubai)	7.71	7.93	8.28	4.98	3.30	66.2

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

US NATURAL GAS BALANCE
DEMAND/SUPPLY SCOREBOARD

	Feb. 2007	Jan. 2007	Feb. 2006	Feb. 2007-2006 change	Total YTD 2007	Total YTD 2006	YTD 2007-2006 change
	bcf						
DEMAND							
Consumption	2,532	2,452	2,152	380	4,984	4,325	659
Addition to storage	50	56	54	–4	106	164	–58
Exports	56	76	59	–3	133	115	18
Canada	19	39	33	–14	58	65	–7
Mexico	32	32	20	12	65	39	26
LNG	5	5	6	–1	10	11	–1
Total demand	**2,638**	**2,584**	**2,265**	**373**	**5,223**	**4,604**	**619**
SUPPLY							
Production (dry gas)	1,585	1,610	1,557	28	1,585	1,557	28
Supplemental gas	6	6	6	0	6	6	0
Storage withdrawal	782	740	539	243	1,522	913	609
Imports	308	382	326	–18	691	682	9
Canada	264	329	282	–18	593	602	–9
Mexico	0	0	5	–5	0	2	–2
LNG	44	53	39	5	98	78	20
Total supply	**2,639**	**2,439**	**2,263**	**376**	**3,804**	**3,158**	**646**

NATURAL GAS IN UNDERGROUND STORAGE

	Feb. 2007	Jan. 2007	Dec. 2006	Feb. 2006	Change
	bcf				
Base gas	4,214	4,215	4,211	4,204	10
Working gas	1,649	2,379	3,070	1,886	–237
Total gas	**5,863**	**6,594**	**7,281**	**6,090**	**–227**

Source: DOE Natural Gas Monthly
Data available in OGJ Online Research Center.

WORLDWIDE NGL PRODUCTION

	Jan. 2007	Dec. 2006	1 month average 2007	1 month average 2006	Change vs. previous year Volume	Change vs. previous year %
	1,000 b/d					
Brazil	86	87	86	88	–2	–2.2
Canada	712	711	712	685	27	3.9
Mexico	411	396	411	438	–27	–6.2
United States	1,771	1,734	1,771	1,684	87	5.2
Venezuela	200	200	200	200	—	—
Other Western Hemisphere	166	180	166	165	1	0.6
Western Hemisphere	**3,346**	**3,307**	**3,346**	**3,260**	**86**	**2.6**
Norway	315	322	315	299	16	5.4
United Kingdom	168	164	168	164	5	2.8
Other Western Europe	19	19	19	220	–1	–3.8
Western Europe	**503**	**505**	**503**	**483**	**20**	**4.1**
Russia	420	410	420	410	10	2.4
Other FSU	160	160	160	160	—	—
Other Eastern Europe	16	18	16	20	–4	–19.5
Eastern Europe	**596**	**588**	**596**	**590**	**6**	**1.0**
Algeria	341	328	341	295	46	15.6
Egypt	65	65	65	65	—	—
Libya	60	60	60	60	—	—
Other Africa	197	199	197	180	17	9.2
Africa	**663**	**652**	**663**	**600**	**63**	**10.4**
Saudi Arabia	1,510	1,510	1,510	1,460	50	3.4
United Arab Emirates	400	400	400	400	—	—
Other Middle East	681	670	681	670	11	1.6
Middle East	**2,591**	**2,580**	**2,591**	**2,530**	**61**	**2.4**
Australia	75	75	75	74	1	1.8
China	180	180	180	180	—	—
India	38	35	38	43	–5	–11.7
Other Asia-Pacific	220	220	220	220	—	–0.2
Asia-Pacific	**513**	**510**	**513**	**517**	**–4**	**–0.8**
TOTAL WORLD	**8,211**	**8,142**	**8,211**	**7,980**	**231**	**2.9**

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

OXYGENATES

	Jan. 2007	Dec. 2006	Change	YTD 2007	YTD 2006	Change
	1,000 bbl					
Fuel ethanol						
Production	11,621	11,023	598	11,621	8,942	2,679
Stocks	8,593	8,747	–154	8,593	6,173	2,420
MTBE						
Production	1,797	1,503	294	1,797	3,732	–7,145
Stocks	2,215	1,589	626	2,215	3,032	–817

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

US HEATING DEGREE-DAYS

	Mar. 2007	Mar. 2006	Normal	2007 % change from normal	Total degree-days July 1 through Mar. 31 2007	Total degree-days July 1 through Mar. 31 2006	Total degree-days July 1 through Mar. 31 Normal	% change from normal
New England	949	906	913	3.9	5,384	5,224	5,681	–5.2
Middle Atlantic	826	799	827	–0.1	4,764	4,639	5,159	–7.7
East North Central	727	846	864	–15.9	5,424	5,165	5,699	–4.8
West North Central	675	830	858	–21.3	5,670	5,362	6,021	–5.8
South Atlantic	303	370	373	–18.8	2,387	2,432	2,606	–8.4
East South Central	293	439	452	–35.2	3,094	3,086	3,305	–6.4
West South Central	164	202	263	–37.6	2,067	1,851	2,175	–5.0
Mountain	492	679	633	–22.3	4,288	4,080	4,468	–4.0
Pacific	308	552	416	–26.0	2,498	2,530	2,672	–6.5
US average*	**500**	**559**	**593**	**–15.7**	**3,738**	**3,624**	**3,981**	**–6.1**

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

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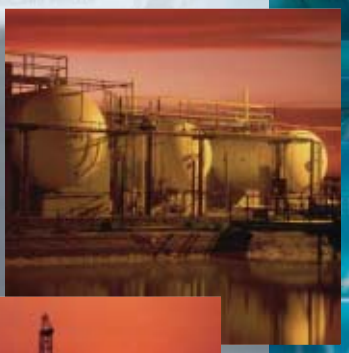

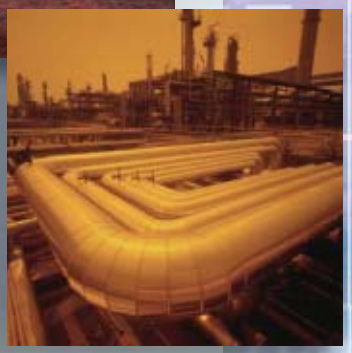

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Ethanol thrives on word tricks of persuasion

While ethanol claims a burgeoning share of the US fuel market, courtesy of taxpayers, a once-common name for gasoline-alcohol blends remains in relative disuse.

Remember gasohol?

It's what everyone called 90:10 gasoline-ethanol blends when they cruised into the motor fuel market aboard generous tax breaks in the 1980s.

Ethanol makers disliked the noun, though. Years ago, someone from a large ethanol maker called this writer to complain about repeated reference to "gasohol" in an editorial. Fuel so named had become difficult to sell, he explained. Motorists associated the term with engine-performance problems that many of them had experienced with gasoline-alcohol blends.

The gripe must have been part of a larger and apparently successful campaign. Despite ethanol's new popularity as a fuel additive, the word "gasohol" is colloquial at best. Remember when labels first appeared on gasoline pumps to let consumers know which of them dispensed fuel containing ethanol? Ethanol makers, fearful of a market preference for neat gasoline, protested the disclosure. They called it a sinister tactic of Big Oil.

Consumer attitudes about gasohol have reversed, of course—thanks somewhat to improvements in fuel chemistry but mostly to management of public opinion.

Americans have heard for years that ethanol in fuel offers supply and environmental advantages worthy of lavish public support. They apparently believe ethanol represents an energy panacea that costs nothing, despite clear evidence to the contrary. So what a triumph of persuasion it was when Congress passed the ethanol mandate in the Energy Policy Act of 2005! What victory sparkled in President George W. Bush's call in January to quintuple the mandate! Linguistic tricks persist. They're essential to the shaping of attitudes. In Texas and Ohio, Kroger stores are marketing (as opposed to selling much) E85, the 85:15 ethanol-gasoline blend that requires flex-fuel engines. The grocery chain's gasoline pumps—the ones with traffic, as opposed to the E85 dispensers with giant ears of corn painted on their sides—sport this label: "Enriched by 10% ethanol."

Enriched? It makes you wonder if, in the event of some hopefully improbable lapse in the produce department, Kroger would post signs touting lettuce as "Enlivened by bugs."

(Online Apr. 20, 2007; author's e-mail: bobt@ogjonline.com)

The Editor's Perspective

by Bob Tippee, Editor

Market Journal

by Sam Fletcher, Senior Writer

Analysts see tight oil market

Most analysts now see the world market for crude and petroleum products continuing to tighten through the rest of this year, pushing prices higher.

"It is a self-evident fact that the current state of the commodity markets provides a positive operating environment for the entire energy complex," said Wayne Andrews in the Houston office of Raymond James & Associates Inc. "Our 2007 forecast is $64.11/bbl for crude oil and $7.56/Mcf for natural gas. We have an even more bullish long-term price deck—$70/bbl oil and $10/Mcf gas—with a 2% price inflator after 2008." He said, "We continue to believe in the long-term sustainability of historically robust oil and gas prices." Analysts at Barclays Capital Research in London see crude prices averaging $10/bbl higher during the second half of 2007 than in the first half.

On Apr. 27, the June contract for benchmark US crudes rebounded $1.40 to $66.46/bbl, the highest closing in almost a month on the New York Mercantile Exchange, after Saudi Arabian authorities arrested 172 Islamic militants accused of plotting attacks on oil installations. The May contract for reformulated blendstock for oxygenate blending (RBOB) escalated by 7.1¢, or 3.1%, to $2.36/gal, its highest level since early August.

Société Générale Group analysts foresee "a supply-driven market for the next 2 months." There recently has been "not a single day without news of a US refinery experiencing unexpected problems," they said. "The Europe-to-US gasoline arbitrage has reopened but is not as profitable as [recent New York market prices] would suggest. The market is convinced US gasoline stocks won't build for the next 3 weeks," they said. "Crude supply does not appear as an issue as long as US refinery runs stay low. The market is expecting Nigeria production to increase with the 'imminent' return of Forcados" oil field to production.

'Explosive start'

This year started with many analysts anticipating relatively hard landings for the US and Chinese economies. Others expected sharp acceleration of supply growth among crude producers outside the Organization of Petroleum Exporting Countries.

"Indeed, price behavior at the very start of the year seemed initially to signal a sharp discontinuity, with prices falling by more than $12/bbl over just the first 12 trading days of the year," said Barclays Capital analysts. "After that explosive start, most crude and oil product prices have first recovered their early losses and then moved higher as a somewhat less exciting truth has been revealed. In short, the general trends in 2007 are very much a continuation of the patterns of 2005 and 2006."

Demand has increased, while non-OPEC supply "is still struggling to find second gear rather than racing on ahead," Barclays Capital analysts reported. "The existing logistical distortions within the supply chain are still there and have generally become worse, while some other market distortions have become significant. The exposure to potential shocks remains acute, and weather conditions alone are continuing to create an enhanced level of price volatility. Furthermore, even under conditions of extreme downwards pressure at the front of the curve in early January, we detected no significant shift in a general market perception of stronger prices going forward. Indeed, the lowest settlement for the back end of the [NYMEX]-traded [benchmark US crudes] curve this year has been $59.67/bbl, after which, back-end prices moved fairly remorselessly back into the upper $60s."

So far this year, wholesale gasoline prices have been more volatile than crude prices, with gasoline crack spreads moving through wide arcs and at several points reaching levels above $25/bbl at the front of the curve as absolute futures market RBOB gasoline prices pushed on beyond $90/bbl, said Barclays Capital analysts. Moreover, benchmark US crude prices have dislocated away from both cash markets in the main US regions and other crude oil futures indicators. At the extremes, the US benchmark crude has traded at unprecedented levels of more than $5/bbl below Brent at the front of the curve and is currently projected by Barclays Capital to average less than front-month Brent across the year as a whole for the first time ever.

Because US crude is "pipeline-based," it has always been affected by logistical dislocations in the Midwest, particularly at its Cushing pricing point. "When those dislocations bite, then [benchmark US crude] can dislocate away from indicators of broader global market conditions," said Barclays analysts.

"Tightness and lack of flexibility have continued upstream, downstream, and midstream and the bottlenecks and lack of availabilities in the markets for skilled and experienced labor and key items of capital equipment have remained entrenched," they said.

(Online Apr. 30, 2007; author's e-mail: samf@ogjonline.com)

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OIL SANDS AND HEAVY OIL TECHNOLOGIES 2007 PRELIMINARY PROGRAM

WEDNESDAY, JULY 18, 2007

3:00 p.m. – 5:00 p.m. **WELCOME & INTRODUCTION**

Bob Tippee – Editor, *Oil & Gas Journal*
Federal Minister of Environment – (to be invited)

5:00 p.m. – 7:00 p.m. **EXHIBITION HALL NETWORKING RECEPTION**

THURSDAY, JULY 19, 2007

7:30 a.m. – 8:30 a.m. **NETWORKING BREAKFAST**

8:30 a.m. – 10:00 a.m. **OPENING SESSION**

8:30 a.m. – 8:45 a.m. **WELCOME & INTRODUCTION**

Bob Tippee – Editor, *Oil & Gas Journal*

8:45 a.m. – 10:00 a.m. **KEYNOTES/PANEL DISCUSSION**

Dr. Eddy Isaacs – Managing Director – *Alberta Energy Research Institute (AERI)*
Mr. Alan Fair – *Syncrude*
Dr. Mike Raymont – *Energy Inet*
Dr. Sam Shaw – *Northern Alberta Institute of Technology (NAIT)*

Speakers will address issues affecting oil sands and heavy oil development from the perspectives of government, private companies, joint government-industry research, and training.

10:00 a.m. – 10:30 a.m. **COFFEE BREAK**

SESSION 1

SUSTAINABILITY TRACK

10:30 a.m. – 12:00 noon **STEAM GENERATION**
Co-Chair: Derek Macdonald – *Alstom Canada*
Co-Chair: Robert St.Denis – *Nebraska Boiler/NATCOM*

CFB Technology: Economic, Clean and Efficient Steam and Power Generation for the Oil Sands Industry
Speaker & Co-author: Scott Darling – *ALSTOM*
Co-authors: Iqbal F. Abdulally and Donna Bowles – *ALSTOM*

ALSTOM's CFB technology provides the opportunity for clean, efficient stream generations for the oil sands industry.

Products for Meeting Large Steam Demands From the Ramp Up in Tar Sands Bitumen Production
Speaker & Co-author: M. Vasudevan
Co-author: Robert St. Denis – *Nebraska Boiler Co./ERI/Natcom*

Multi-Pollutant Control Options for the Combustion of Bitumen-Based and Related Fuels
Speaker & Co-author: William DePriest – *Sargent & Lundy Canada Company*
Co-author: Thomas Longlais – *Sargent & Lundy Canada Company*

The paper discusses commercially available and proven emission control technologies for application in the combustion of bitumen-based and related fuels in the SAGD process.

OPTIMIZATION TRACK

10:30 a.m. – 12:00 noon PROJECT MANAGEMENT 1
Co-Chair: Paul Brown – *Colt Engineering*
Co-Chair: Guntis Moritis – *Oil & Gas Journal*

Improve Modular Design, and Parallel Multi-site Engineering and Fabrication by Exploiting the Latest Design Tools
Speaker & Co-author: Steve Gibbons – *AVEVA*
Co-author: Bob Aldridge – *AVEVA*

Making the most efficient use of engineering design resources by standardization and re-use of modular designs.

Engineering Aspects of Heavy Module Transports
Speaker & author: Jan Wolter Oosterhuis – *Dockwise USA Inc.*

An overview of the technical aspects of large module shipping.

Rail-Veyor Bulk Material Transport System
Speaker & Co-author: M.F. "Mike" Dibble – *Rail-Veyor Systems Inc.*
Co-author: Fred Baker – *Wallbridge Mining*

Rail-Veyor – an efficient, lower capital and operating cost bulk material transport system whose time has finally come.

UPGRADING TRACK

10:30 a.m. – 12:00 noon UPGRADING 1
Co-Chair: Michael Freeman – *M-I SWACO*
Co-Chair: Keng Chung – *Well Resources*

The Upgrading Conundrum: At the Source or at the Market?
Speaker & Co-author: David G. Freyman – *Barnes & Click*
Co-authors: Paul Harmon and John Schmalz – *R.W. Beck*

This presentation will review the factors influencing whether to site upgraders proximate to the production source or within refineries close to refined products markets.

Challenges and Strategies for Heavy Oil Development
Speaker & author: Xingyi Wang – *PetroChina*

This paper highlights some of the technology selection criteria for heavy oil development.

Upgrading Technology Selection
Speaker & author: Scott Sayles – *KBC Advanced Technologies*

This paper discusses some of the concepts involved in determining investment locations for upgrading Canadian Heavy Crude or Tar Sands Oils.

12 noon – 1:30 p.m. LUNCH

SESSION 2

SUSTAINABILITY TRACK

1:30 p.m. – 3:00 p.m. HEAT & POWER
Co-Chair: Harry Morehead – *Siemens Canada Ltd.*
Co-Chair: Derek Macdonald – *Alstom Canada*

Alstom's GT11N$_2$ Gas Turbine Package– Suite for the Oil Sands Industry
Paul Wiecek – *Alstom Power Inc.*

The Experience of Snamprogetti – Lessons Learned from Five Gasification/IGCC Projects over 3,500 MWth
Speaker & Co-author: Dario Camozzi – *SNAMPROGETTI ITALY*
Co-authors: A. Cipelli, D. Brkic – *SNAMPROGETTI ITALY*

The paper will cover the *SNAMPROGETTI* gasification/IGCC experience and the lessons learned through the last 10 years of design and operation.

THURSDAY, JULY 19, 2007 (continued)

Reliable and Efficient Extraction & Upgrading Operations
Speaker & Co-author: Stephan Faucher – *Siemens Industrial Turbomachinery, Inc.*
Co-author: Helmut Wanka – *Siemens*

The Siemens Steam Turbine Technology can either be used for mechanical drives to drive compression and/or pumping equipment in the various processes or for power generation, possibly with cogeneration, in order to produce electricity.

OPTIMIZATION TRACK

1:30 p.m. – 3:00 p.m. PROJECT MANAGEMENT 2
Co-Chair: Frank Forte – *Jacobs Canada*
Co-Chair: David Nakamura – *Oil & Gas Journal*

Managing Alberta's Construction Labor Supply Challenges
Speaker & Co-author: Stephan Kushner – *Merit Contractors Association*
Co-author: Bill Stewart – *Merit Contractors Association*

Issues, factors and trends respecting the ability of Alberta's construction industry to meet unprecedented service demands will be explored.

Shell Canada's Oil Sands Expansion: Meeting the World's Energy Challenge
Speaker & author: Ramzi Fawaz – *Shell Canada*

Ramzi Fawaz will discuss the key issues, challenges and opportunities associated with executing AOSP Expansion 1 – the largest capital investment ($10-12.8 billion CDN) in *Shell Canada*'s history.

Speaker & Titles – TBD

UPGRADING TRACK

1:30 p.m. – 3:00 p.m. UPGRADING 2
Co-Chair: Keng Chung – *Well Resources*
Co-Chair: Dr. Shunlan Liu – *Alberta Energy Research Institute*

Producing Petrochemical Feedstock from Heavy Oils Derived from Alberta Oil Sands – New Technology
Speaker & Co-author: Mike Oballa – *NOVA Chemicals Corporation*
Co-author: Dr. Vasily Simanzhenkov – *NOVA Chemicals Corporation*

This paper outlines and expands on two new technologies (NHC and ARORINCLE) which, when integrated into an upgrader/refinery complex, produce petrochemical feedstocks like ethylene, propypene and BTX.

Producing Premium Synthetic Crude Oil from Oil Sands Derived Bitumen: Syncrude's Experience
Speaker & Co-author: Sok Yui – *Syncrude Canada Ltd.*
Co-author: Keng Chung – *Well Resources*

This paper introduces Syncrude's newly installed upgrading processes to produce premium quality synthetic crude oil, a monitoring tool of diesel cetane number and jet fuel smoke point, and its application to the commercial plant.

Eni Slurry Technology
Speaker: Alberto Delbianco – *Eni Div. E&P, Italy*
Co-authors: Nicoletta Panariti, Vincenzo Piccolo and Lorenzo Tagliabue – *Eni Div. R&M*

EST (Eni Slurry Technology) is a new technology internally developed by Eni that allows the total conversion of the heaviest fraction of the barrel into useful products with a significant impact on the economic and environmental valorization of hydrocarbon resources.

3:00 p.m. – 3:30 p.m. COFFEE BREAK

SESSION 3

SUSTAINABILITY TRACK

3:30 p.m. – 5:00 p.m. EMISSIONS
Co-Chair: Randy Whitt – *ConocoPhillips*
Co-Chair: Chris Lehecka – *ConocoPhillips*

Controlling Oil Sands Industry Bitumen Fired Boiler Emissions to Reduce Costs
Speaker & author: Garrett Billemeyer – *Belco Technologies*

Removing H_2S from Produced Gas in Oil Sands Applications
Speaker & Co-author: William Rouleau – *Gas Technology Products*
Co-author: Tony Barnette – *Gas Technology Products*

A technical review of the LO-CAT liquid redux process for hydrogen sulfide removal from oil sand applications.

Next Generation Wet Electrostatic Precipitators
Speaker & author: John Caine – *Southern Environmental Inc.*

This paper will document the advantages of a Membrane WESP to remove $PM_{2.5}$, SO_3 and Hg^{+2} emissions and present detail performance results of full scale and pilot units installed and operated in different flue gas conditions.

Alternate – DynaWave Wet Gas Scrubber – A Versatile Choice for Treating SO_2 Emissions
Speaker & Co-author: Randy F. Kixmiller – *MECS, Inc.*
Co-author: Steven F. Meyer – *MECS, Inc.*

The versatile DynaWave wet gas scrubbing system is presented to demonstrate how the system can be utilized to control emissions within the Oil Sands and Heavy Oil Industry.

OPTIMIZATION TRACK

3:30 p.m. – 5:00 p.m. MINING
Co-Chair: Janet Annesley – *Shell Canada Limited*
Co-Chair: Steve Reynish – *Western Oil Sands*

Innovative and Reliable Separation/Distillation Designs for Upgrading and Extraction
Speaker & author: Darius Remesat – *Koch Glitsch Canada*

This presentation shares learnings and advancements in dealing with upgrading specific distillation and separations.

Paper to be announced

Oil Sands Slurry Pump, Wear, Operating and Downtime Costs
Speaker & Co-author: Graeme Addie – *GIW Industries*
Co-author: John Sharpe – *J.A.S. Solutions Ltd.*

Paper shows how wear varies with different designs, operating speeds, and different duties along with the variation of the impact of the wear on the cost of an operation and that the pump capital cost can be related to downtime cost.

3:30 p.m. – 5:00 p.m. UPGRADING PANEL DISCUSSION
Chair: Keng Chung – Well Resources

Jim Scinta – *ConocoPhillips*
Dr. Duke Du Plessis – *AERI*
Other Participants: TBD

5:00 p.m. – 6:30 p.m. EXHIBITION HALL NETWORKING RECEPTION

FRIDAY, JULY 20, 2007

7:30 a.m. – 8:30 a.m. **NETWORKING BREAKFAST**

7:45 a.m. – 8:15 a.m. **Alberta Minister of Energy – to be invited**

SESSION 4

SUSTAINABILITY TRACK

8:30 a.m. – 10:00 a.m. **WATER**
Co-Chair: Randy Whitt – *ConocoPhillips*
Co-Chair: Guntis Moritis – *Oil & Gas Journal*

The Shift toward the Use of Evaporation for SAGD Produced Water Treatment
Speaker & author: Bill Heins – *GE Water & Process Technologies*

This presentation provides technical and economic data exploring why the SAGD industry has shifted to the use of evaporation for produced water treatment.

Developments in Evaporator Technologies for SAGD
Speaker & Co-author: Dorothy Neu – *Veolia Water Systems & Technologies*
Co-authors: Keith Minnich, Mark Nicholson – *Veolia Water Systems & Technologies*

This paper presents variations in evaporators designed for use in produced water treatment.

Principles of a Liquid Desiccant Dehumidification System (LDDS) for Water Extraction from Combustion Gases
Speaker & Co-author: Bruce C. Folkedahl – *University of North Dakota Energy & Environmental Research Center*
Co-authors: Greg Weber – *University of North Dakota Energy & Environmental Research Center*;
John Copen – *Siemens Power Generation, Inc.*

Siemens Power Generation, Inc. (SPG) and the *Energy & Environmental Research Center (EERC)* have successfully completed a pilot-scale program consisting of 5 weeks of testing that has proved the viability of a system to recover a significant portion of the water vapor contained in flue gases that is of a quality similar to that of a reverse osmosis system outlet (RO Out).

Alternate – Breakthrough in SAGD Water Management Using a Novel Reverse Emulsion Breaker
Speaker & Co-author: Alberto Franco-Fuenmayor – *Baker Petrolite*
Co-authors: Michael P. Squicciarini, Wes Suhai, Brian R. Young and Frederick J. Morrison – *Baker Petrolite*

A breakthrough chemical treatment for challenging reverse emulsions in a SAGD Commercial Plant in Northeast Alberta, Canada.

OPTIMIZATION TRACK

8:30 a.m. – 10:00 a.m. **IN SITU 1**
Co-Chair: Shawn Davis – *Suncor Energy*
Co-Chair: S.M. Farouq Ali – *HOR Heavy Oil Recovery Technologies Ltd.*

Optimizing the Oil Sands Resource Development for Sustained Economic Success
Speaker & author: Glenda Wylie – *Halliburton*

A review of soon-to-be-released revolutionary heavy oil technologies will be discussed that support increasing oil recovery and reducing non-productive drilling time.

Geomechanics in Heavy Oil Thermal Production Mechanisms
Speaker & author: Prof. Maurice Dusseault – *University of Waterloo Earth Sciences Department*

High pressures and temperatures lead to large volume expansions, shear, permeability improvements and other phenomena that help recovery efficiency.

PCM Vulcain: High Temperature Progressing Cavity Pump for Thermal Activation on Heavy Oil
Co-speaker & Co-authur: Nicolas Parise – *PCM Oil & Gas, France*
Co-speaker & Co-authur: Alex Damnjanovic – *KUDU Inc.*

After one and a half period of field tests, PCM aims at studying and comparing its latest patented technology, a metal to metal progressive cavity pump, with today's artificial lift solutions in thermal recovery.

CO_2 TRACK

8:30 a.m. – 10:00 a.m. CO_2 CAPTURE
Co-Chair: Derek Macdonald – *ALSTOM*
Co-Chair: Chris Lehecka – *ConocoPhillips*

CO_2 Solutions for Clean Combustion
Speaker & Co-author: Nancy C. Mohn – *Alstom Power*
Co-author: John Marion – *Alstom Power*

The Incorporation of Life Cycle Assessment into Economic and Environmental Evaluations of Technology Alternatives for Oil Sands Development
Joule Bergerson – *University of Calgary*

Speaker & Titles – TBD

10:00 a.m. – 10:30 a.m. COFFEE BREAK

SESSION 5

SUSTAINABILITY TRACK

10:30 a.m. – 12 noon ALTERNATIVE FUELS
Co-Chair: Harry Morehead – *Siemens Canada*
Co-Chair: David Nakamura – *Oil & Gas Journal*

Can Bitumen Be Used to Fuel Oil Production from Oil Sands
Speaker & author: Dennis Finn – *Wartsila North America, Inc.*

This paper will present the technical feasibility of using emulsified bitumen as fuel in large reciprocating engines being used to drive generators for electric power generation.

The Siemens Entrained Flow Gasification Process: Application with Asphaltene and Petcoke Feedstocks
Speaker & Co-author: Christiane Schmid – *Siemens Fuel Gasification Technology GmbH*
Co-authors: Frank Hannemann and Friedemann Mehlhose – *Siemens Fuel Gasification Technology GmbH*

The paper will review the Siemens gasification technology and current projects with a focus on applications of and requirements of the oil sands business, like preparation requirements for different potential feedstocks, correlation between feedstock quality and process characteristics.

Alternate: Design Considerations for Combustion of Bitumen-Based Fuels
Speaker & Co-author: William Rosenquist – *Sargent & Lundy Canada Company*
Co-author: Thomas Longlais – *Sargent & Lundy Canada Company*

The paper discusses critical boiler and burner design considerations and parameters for the successful combustion of bitument-based fuels for application in the SAGD process.

FRIDAY JULY 20, 2007 (continued)

OPTIMIZATION TRACK

10:30 a.m. – 12 noon **IN SITU 2**
Co-Chair: Glenda Wylie – *Halliburton*
Co-Chair: Guntis Moritis – *Oil & Gas Journal*

The Influence of Mineral Transformation on the Thermally Induced Wettability Alterations
Speaker & Co-author: Mehdi Escrochi – *Shiraz University, Iran*
Co-authors: Moein Nabipour, Prof. Shahab Ayatollahi – *Shiraz University, Iran*;
Prof. Ali Al-bemani, Dr. Rashid Al-maamari, Dr. Majad Al-Wadahi – *SQU, Oman*; Prof. Fathi Boukadi – *PI, UAE*

It has been shown that ISC has several effects on the petro physical properties of both sandstone and limestone. It is also shown that the wettability of the Oil-Brine-Rock system is influenced by the changes in mineral composition of the rock.

Outstanding Performance in Heavy Oil with Venturi and Gamma Ray Combination: From Flow Loop Validation to Field Cases
Speaker & Co-author: Dr. Bruno Pinguet – *Schlumberger Testing*
Co-authors: Elsi Guerra, Hudson Holmes, Wilmar Angulo and Cristina Ribeiro – *Schlumberger Testing*

This paper presents accurately the performance of the Vx Technology from modelization to commercial operation including flow loop tests through practical information, knowledge sharing to overcome all classical problems with multiphase meter.

Twin Screw Multiphase Pumps for Subsurface and Surface Applications
Speaker & author: Pradeep Dass – *Can-K Group/Dass Motors & Pumps Inc.*

Twin screw multiphase pumps for subsurface and surface applications for the oil and gas industry.

CO_2 TRACK

10:30 a.m. – 12 noon **CO_2 Panel Discussion**
Chair: Janet Annesley – *Shell Canada Limited*

Speaker & Titles – TBD

12 noon – 1:30 p.m. **LUNCH**

CONFERENCE WRAP-UP

1:30 p.m. – 3:00 p.m. **LIVE WEBCAST**

The live webcast Recap and Discussion: Oil Sands and Heavy Oil Technologies Conference, July 18-20, Calgary, will include a conference summary by members of the board of advisors followed by questions from conference delegates in attendance as well as oil industry professionals participating remotely via computer

Recognition Awards

Closing Remarks

OIL SANDS HEAVY OIL TECHNOLOGIES

OIL SANDS AND HEAVY OIL TECHNOLOGIES
Conference & Exhibition
July 18 – 20, 2007, Calgary, Alberta, Canada, Calgary TELUS Convention Centre

2007 Registration Form

First Name: _____ Last Name: _____

Title/Position: _____

Company: _____

Address: _____

City/State/Zip: _____ Country: _____ Postal Code: _____

Telephone: _____ Fax: _____

Email: _____

Registration confirmation will be sent via-email, if a unique email address is provided above.

1. Type of Company or Organization:
- ☐ 10 Oil/Gas company
- ☐ 20 Consulting Company
- ☐ 30 Contractor
- ☐ 40 Engineering/Construction
- ☐ 50 Financial
- ☐ 60 Service/Supply
- ☐ 65 Government/Library/Education
- ☐ 70 Other _____

2. Job Function:
- ☐ 02 Management (CEO, Pres.VP)
- ☐ 05 Engineering/Technical/Geoscience
- ☐ 06 Superintendent/Field Professional/Foreman
- ☐ 10 Purchasing/Consulting
- ☐ 12 Other _____

3. Areas of Interest/Involvement:
- ☐ 10 Exploration
- ☐ 05 Drilling
- ☐ 01 Production
- ☐ 29 Gas Processing
- ☐ 23 Pipeline/Transportation
- ☐ 15 Refining
- ☐ 19 Petrochemical
- ☐ 39 Financial
- ☐ 46 Other _____

4. Purchasing Role: ☐ Specify ☐ Recommend ☐ Approve ☐ None

For Information on corporate packages for 11 or more attendees, contact Registration:
Phone +1 918 831 9160
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3 ways to register:

Pre-register on line before July 12, 2007.
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2 Website:
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3 Mail:
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Dallas, TX 75397-3059 USA

For questions please call:
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Conference Fees:

1. Individual Delegate (Full Conference Registration)*
Includes:
- Access to all Conference Sessions
- Access to Exhibition Hall, including any scheduled receptions
- Coffee Breaks in Exhibition Hall
- Delegate Lunch on Thursday and Friday (Ticketed)

☐ Paid By June 18, 2007 ..... US$ 785
☐ Paid After June 18, 2007 ..... US$ 935

2. Corporate Plan (5 delegates)
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- Delegate Lunch on Thursday and Friday (Ticketed)

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3. Exhibitor Delegate
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*Your full-price registration fee includes a one-year paid subscription to *Oil & Gas Journal* (US$ 69.00 value).

4. ☐ Student Conference Delegate ..... US$ 50
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5. Single Day Conference Delegate (Thursday OR Friday)
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- Access to Conference Sessions on the corresponding day
- Access to Exhibition Hall, including any scheduled receptions
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☐ Thursday, Paid By June 18, 2007 ..... US$ 535
☐ Thursday, Paid After June 18, 2007 ..... US$ 635
☐ Friday, Paid By June 18, 2007 ..... US$ 535
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6. ☐ Exhibit Visitor ..... US$ 25
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7. Additional Lunch Tickets (for non-delegates)
☐ Thursday ..... ( ) @ US$ 30/day
☐ Friday ..... ( ) @ US$ 30/day

TOTAL PAYMENT AMOUNT = US$ _____

Payment must be received prior to the conference. If payment is not received by the conference date, the registration fee must be guaranteed on charge card until proof of payment is provided. Make check payable to PennWell/Oil Sands Technologies 2007.

Cancellation: Cancellation of registration must be received in writing. Any individual, exhibitor, or corporate registrations cancelled before June 18, 2007 will receive a 50% refund of registration fee. After June 18, 2007, no refunds will be permitted. Substitutions may be made at any time by contacting the registration office.

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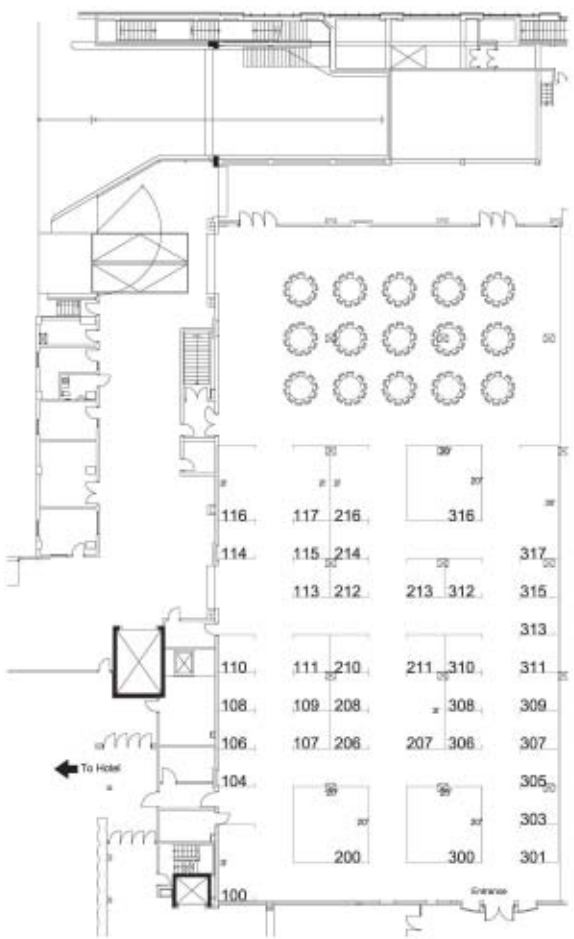
OIL SANDS AND HEAVY OIL TECHNOLOGIES

Conference & Exhibition

2007 Floorplan

July 18 – 20, 2007, Calgary, Alberta, Canada
Calgary TELUS Convention Centre



Oil Sands and Heavy Oil Technologies 2007 Exhibitor List: (as of 4/17/07)

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- Dehydration and Environmental Systems
- Dockwise Shipping B.V.
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Conference & Exhibition

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