Week of June 18, 2007/US$10.00

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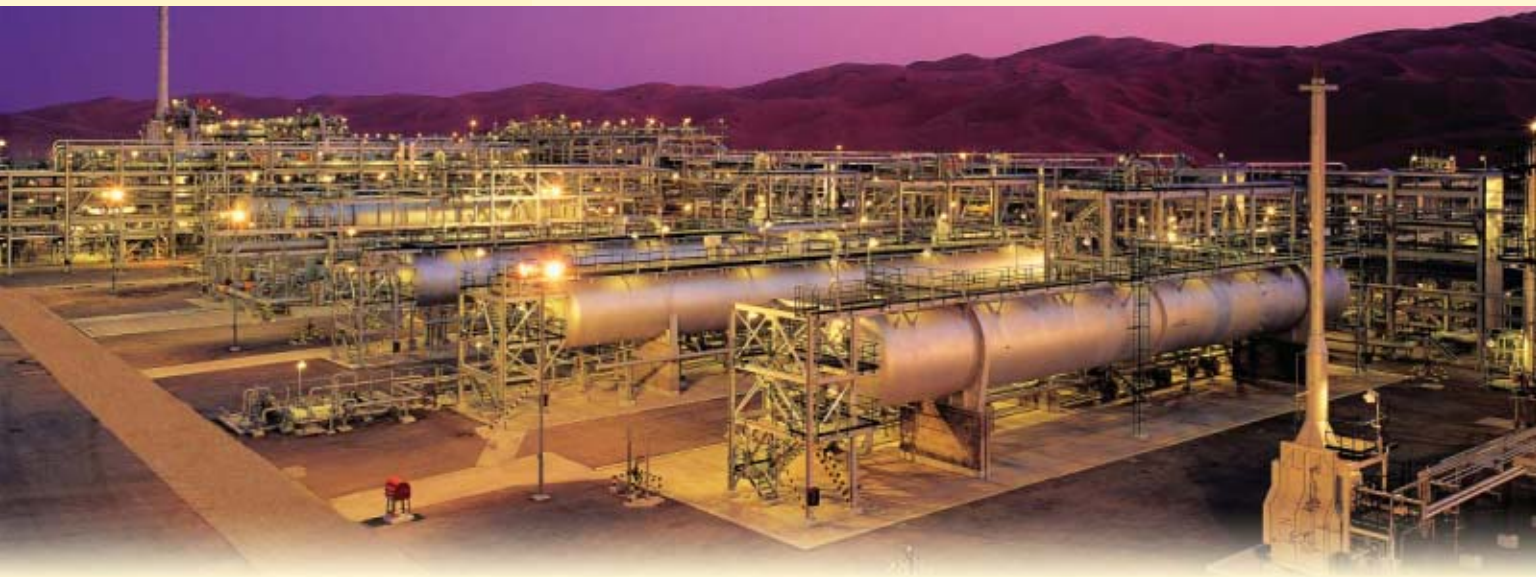
Worldwide Gas Processing

E&P firms report mixed first-quarter results
Six domains characterize W. Canada structured belt
BHP Billiton's Neptune platform sails out to gulf
Method determines axial force in subsea pipelines

OIL&GAS JOURNAL®

June 18, 2007
Volume 105.23

WORLDWIDE GAS PROCESSING



REGULAR FEATURES

COVER

In late 2006, Statoil ASA, on behalf of Kollsnes gas processing plant operator Gassco, awarded a 790 million kroner contract to Vetco Aibel for upgrades at the 143-million cu m/day plant near Bergen. Involved is engineering, installation, construction, and commissioning of a new gas compressor from the condensate plant and a new condensate train. The Kollsnes plant currently processes gas from Troll, Kvitebjørn, and Visund and sends it on through four pipelines to Europe. This upgrade will be completed by fourth-quarter 2008. Oil & Gas Journal's exclusive, annual Gas Processing Report, which begins on p. 50, presents more detail on worldwide activity last year. Cover photo from Statoil; above photo of the Shaybah field gas-oil separator plant is from Saudi Aramco.

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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OGJ Newsletter

June 18, 2007

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General Interest — Quick Takes

Nigeria's May production lowest since 2003

Violence pulled Nigerian oil production in May to its lowest level since early 2003, according to the International Energy Agency's June Oil Market Report.

IEA estimated average production during the month at 2.01 million b/d, down 245,000 b/d from April.

Production shut-ins in May reached a high of nearly 1 million b/d and averaged more than 800,000 b/d for the month.

IEA estimates Nigerian production capacity at 2.49 million b/d, excluding 545,000 b/d considered long-term shut-in.

During May, the agency said, attacks on offshore vessels and onshore pipelines and pumping stations caused these production cuts:

- Abiteye field, 55,000 b/d, now restored.
- Bomu manifold, attacked twice, 170,000 b/d, now restored.
- Funiwa field, 15,000 b/d, now restored.
- Akri and Oshi fields, 80,000 b/d, now being restored.
- Nembe pipeline leak, 77,000 b/d, still offline.
- Okono field offshore, 65,000 b/d, still offline.
- Tebida field, 40,000 b/d, still offline.

IEA called security of oil industry workers "precarious" and noted that many non-Nigerian service companies have withdrawn from the Niger Delta. It also cited Chevron Corp.'s withdrawal of nonessential offshore workers for a month because of security problems (OGJ Online, May 2, 2007). This month, following political developments seen as potentially disruptive, the UK advised its citizens to leave Bayelsa, Delta, and Rivers states.

IEA said workers' unions are considering a strike this month to protest oil price increases and the sale of government stakes in two refineries.

MMS announces latest RIK contracts

The US Minerals Management Service will receive more than 3.7 million bbl of oil as royalties in-kind under contracts awarded to four US producers, the Department of the Interior agency said.

Chevron Products Co., Shell Trading Co., ExxonMobil Oil Corp. and Marathon Petroleum Co. submitted the winning bids. They will supply some 3,726,000 bbl over 9 months, or 13,800 b/d, beginning July 1, MMS said.

The RIK program came under fire in Congress. Section 201 of HR 2337 would limit such royalties to purchases for the Strategic Petroleum Reserve. The bill went through markup by the House Natural Resources Committee starting June 6 and was approved by final vote June 13.

MMS said taking royalties in-kind allows it to generate more revenue by reselling it on the open market. The program also reduces regulatory costs and reporting costs and shortens the compliance cycle, MMS said.

In a June 5 letter to Natural Resources Committee Chairman Nick J. Rahall (D-W.Va.), Deputy US Sec. of the Interior P. Lynn Scarlet said the RIK program has generated $28.8 million in additional federal revenue. It also reduced administrative costs by 30% from royalty in-value activities, saving another $2.3 million, she said.

The bill's provision also would eliminate partnerships MMS has with several states regarding royalties in-kind and end a program under which RIK crude is used to help supply small refiners, Scarlet said.

Quebec authorizes carbon emissions tax

Quebec has authorized Canada's first carbon emissions tax, effective Oct. 1. An estimated $200 million (Can.) of annual tax revenues will be used to reduce greenhouse-gas emissions and improve public transit, officials said.

The Quebec cabinet approved the tax, which was proposed more than a year ago. Quebec's Natural Resources Minister Claude Bechard suggested oil companies would absorb the tax rather than pass it on to consumers, but analysts expect retail prices to rise.

The amount of the tax varies according to the amount of carbon dioxide each fuel produces. The tax is to 0.8¢ (Can.)/l. for gasoline, 0.9¢ /l. for diesel, 0.96¢ /l. for light heating oil, and $8/tonne for coal.

Three companies, Petro-Canada Products Ltd., Shell Canada Ltd., and Valero Energy Corp., operate refineries in Quebec. ✦

Exploration & Development — Quick Takes

BP, Noble make deepwater gulf find with Isabela

BP PLC and Noble Energy Inc. hit hydrocarbon pay with their Isabela prospect about 150 miles southeast of New Orleans in the Gulf of Mexico. Isabela lies on Mississippi Canyon Block 562 in 6,500 ft of water and was drilled to 19,100 ft TD. The discovery found "hydrocarbons in two high-quality reservoirs," Noble said.

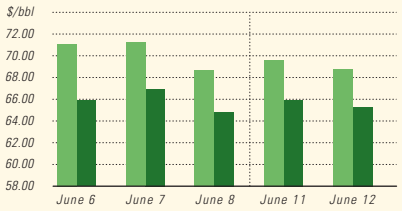
The well, which was spud on Feb. 28, has been temporarily suspended pending development plans. The most likely development scenario, says Noble, is a subsea tieback to nearby Na Kika production facility, operated by BP.

Chuck Davidson, Noble Energy chairman, president, and chief executive, said Isabela could add production by late 2009. Noble also has acquired an interest in adjacent acreage with additional exploration potential.

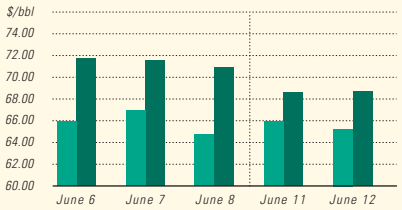
BP operates Isabela with a 66.67% interest. Noble holds 33.33%.

Industry Scoreboard

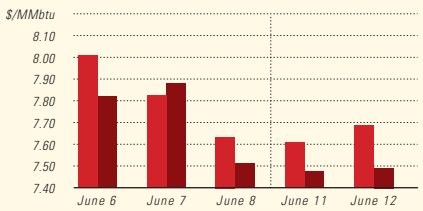
IPE BRENT / NYMEX LIGHT SWEET CRUDE



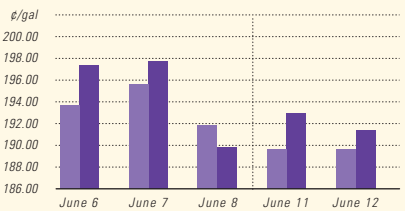
WTI CUSHING / BRENT SPOT



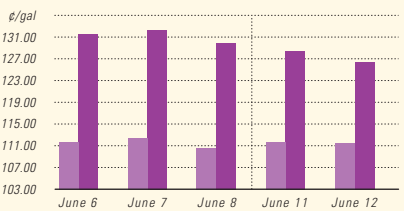
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



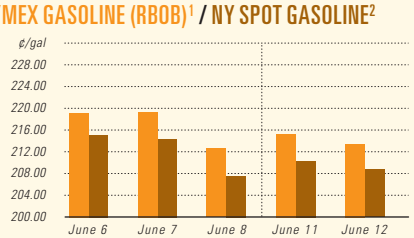
IPE GAS OIL / NYMEX HEATING OIL



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.

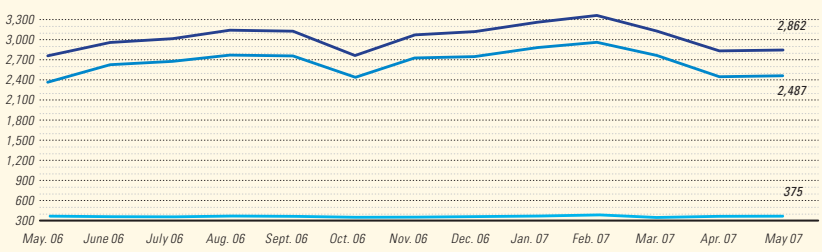
US INDUSTRY SCOREBOARD — 6/18

Latest week 6/8	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	9,504	9,349	1.7	9,177	9,097	0.9
Distillate	4,178	4,046	3.3	4,340	4,183	3.7
Jet fuel	1,566	1,659	–5.6	1,602	1,604	–0.2
Residual	781	600	30.2	762	724	5.2
Other products	4,868	4,927	–1.2	4,953	4,832	2.5
TOTAL DEMAND	20,897	20,581	1.5	20,834	20,440	1.9
Supply, 1,000 b/d						
Crude production	5,200	5,134	1.3	5,240	5,083	3.1
NGL production[2]	2,260	2,351	–3.9	2,380	2,140	11.2
Crude imports	10,049	10,355	–3.0	9,832	10,021	–1.9
Product imports	3,454	3,829	–9.8	3,257	3,555	–8.4
Other supply[3]	1,036	836	23.9	979	1,092	–10.4
TOTAL SUPPLY	21,998	22,504	–2.3	21,687	21,891	–0.9
Refining, 1,000 b/d						
Crude runs to stills	14,914	15,611	–4.5	14,721	15,047	–2.2
Input to crude stills	15,416	15,945	–3.3	15,167	15,388	–1.4
% utilization	89.0	91.6	—	87.5	88.6	—

Latest week 6/8	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	348,157	346,436	1,721	348,035	122	—
Motor gasoline	205,403	208,541	–3,138	213,884	–8,481	–4.0
Distillate	122,157	124,867	–2,710	121,509	648	0.5
Jet fuel	41,187	41,488	–301	40,148	1,039	2.6
Residual	35,343	35,526	–183	42,614	–7,271	–17.1
Stock cover (days)[4] **6/1**			**Change, %**		**Change, %**	
Crude	22.1	22.1	—	22.4	–1.3	
Motor gasoline	21.3	21.0	1.4	22.5	–5.3	
Distillate	29.3	28.8	1.7	29.7	–1.3	
Propane	39.8	37.9	5.0	40.4	–1.5	
Futures prices[5] **6/8**			**Change**		**Change**	**Change, %**
Light sweet crude, $/bbl	65.82	63.93	1.89	71.58	–5.76	–8.0
Natural gas, $/MMbtu	7.97	7.84	0.13	6.24	1.73	27.7

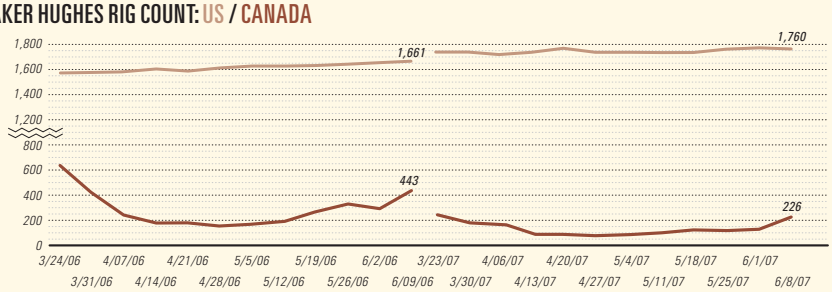
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average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

Marathon drills Droshky appraisal well in gulf

Marathon Oil Corp. has completed a successful appraisal of its Droshky discovery on Green Canyon Block 244 in the Gulf of Mexico 137 miles off Louisiana.

The appraisal program consisted of drilling a downdip sidetrack well in about 2,900 ft of water and a lateral sidetrack well.

The downdip sidetrack encountered more than 600 ft of net oil pay, and the lateral sidetrack encountered 300 ft of net oil pay.

The discovery well, which was drilled to 21,190 ft TD, had encountered 250 ft of net oil pay (OGJ, Apr. 16, 2007, Newsletter).

Based on the results of the three well penetrations, Marathon estimates the Droshky discovery holds mean reserves of 80-90 million gross boe.

Preliminary analysis suggests that Droshky holds 30-32° gravity oil, which is similar to that of Troika field. All pay intervals are in the Upper Miocene formation, Marathon said.

The company expects to produce this field via subsea completions through the Troika field production system, 2 miles away and the Bullwinkle platform.

Marathon said production could start as early as 2010 if regulatory approvals and key equipment deliveries are timely.

First Calgary lets contract for Algeria's MLE project

First Calgary Petroleums Ltd. has let a front-end engineering and design contract to Genesis Oil & Gas Consultants Ltd. for its Menzel Ledjmet East (MLE) project on Block 405B in Algeria.

The FEED study is expected to take 6 months, FCP said.

FCP is working with Sonatrach to develop the block by 2009 under a $1.3 billion development plan. The partners will produce 200 MMcfd of gas from MLE oil and gas field in Algeria's Berkine basin and will build associated infrastructure (OGJ Online, Feb. 19, 2007).

MLE, which is pegged to hold reserves of 230 million boe, will send gas to a gas plant, field gathering system, and facilities designed to process 230 MMcfd of raw gas on a gross basis along with associated gas liquids and oil. There are proposals to increase the plant's capacity to as much as 400 MMcfd.

Gulfsands to develop Khurbet East in Syria

Gulfsands Petroleum PLC, London, has suspended for future production the Khurbet East-1 discovery well on Block 26 in Syria after conducting a drillstem test (OGJ Online, Mar. 28, 2007).

During the test, the well flowed 35° gravity oil to the surface at the rate of 478 b/d from a 102-m interval of Triassic Kurrachine dolomite at 3,098 m, the deepest of four reservoirs indicating hydrocarbons. GOR was 2 Mscf/bbl.

Gulfsands said wireline logs in the discovery well indicated 26.4 m of net oil pay in Cretaceous Chilou at 1,319 m and 22.5 m of net oil pay in Cretaceous Massive at 1,917 m. The company also cored 16 m of net pay in Tertiary Butmah at 2,850 m and recovered gas.

It refrained from testing the shallower zones to preserve mechanical integrity of the well for production.

Gulfsands, operator with a 50% interest in the block, will drill the Khurbet East-2 appraisal well immediately to test Cretaceous and Tertiary targets.

It plans to shoot a 3D seismic survey over the Khurbet East structure, a large fault-bound structural culmination with closure mapped at multiple intervals. Areal extent is 15 sq km at the level of the Kurrachine dolomite formation.

The discovery well is 12 km southwest of Souedieh oil field and 12 km south of Roumelan oil field. Development can use existing infrastructure.

Iraq Taq Taq wells flow oil at high rates

The TT-06 appraisal well in Taq Taq field in the Kurdistan sector of northeastern Iraq has flowed oil at an aggregate rate of 18,900 b/d of 48° gravity at a low gas-oil ratio from three unstimulated Cretaceous-age formations.

It is the third appraisal well drilled in the field since 2006 by Taq Taq Operating Co., a joint venture of Genel Enerji AS and Addax Petroleum Corp., Calgary. TT-04 tested at nearly 30,000 b/d, and TT-05 tested at more than 25,000 b/d.

A 105-m perforated Shiranish interval flowed 15,380 b/d, 51 m of Kometan flowed 2,020 b/d, and 10 m of Qamchuga flowed 1,500 b/d on $^{128}/_{64}$, $^{40}/_{64}$, and $^{32}/_{64}$-in. chokes, respectively. TT-06 is the third of a six-well appraisal program.

Addax said it anticipates that "constructive efforts of the Kurdistan Region and Iraq towards finalizing a legal framework will enable the corporation to generate a full development plan for the Taq Taq field."

Taq Taq field, 60 km northeast of Kirkuk, was discovered in 1978. Two more wells were drilled in the 1990s.

Petrobras, ONGC sign asset swap deal

Petroleo Brasileiro SA (Petrobras) has entered into a swap deal with Oil & Natural Gas Corp. (ONGC), whereby Petrobras will gain participating interest in certain of ONGC's offshore exploration blocks off India, while ONGC will gain equity in certain of Petrobras's blocks off Brazil.

This swap agreement marks Petrobras's first entry into India.

ONGC will have 25-30% equity in three exploration blocks off Brazil. In kind, Petrobras will have 15-40% stake in three deepwater blocks off India.

In Brazil, the blocks are in Maranhão, in the Sergipe-Alagoas basin, and in the Santos basin. In India, the blocks to be explored are in the Krishna Godavari, Mahanadi, and Cauvery basins. All of these blocks are in deep waters and at least one well will be drilled in each basin. ✦

Drilling & Production — *Quick Takes*

Oman resumes oil exports following cyclone

Oman lost more than $200 million in the first 3 days of its oil exports' suspension due to Tropical Cyclone Gonu, an Omani official said on June 11.

The Mina Al-Fahl oil terminal, through which Oman exports 650,000 b/d of crude, resumed oil exports June 9. Now all of the country's oil ports, including Sultan Qaboos and Sur terminals, are functioning normally.

The unnamed Omani official told the Kuwait News Agency that Omani oil pipelines were not affected by the storm but that it caused extensive damage to the country's infrastructure, including electricity, communication, and transportation sectors.

Meanwhile, shipments of LNG from the Oman LNG terminal at Sur resumed June 10 after exports were halted earlier in the week as a precautionary measure. Oman LNG exports most of its LNG to Japan, South Korea, and India.

The Sur facility was operating at full capacity on June 10 with the first ship under way since the beginning of the storm, according to an official of Oman LNG.

The resumption of activity at Oman's oil and gas export facilities followed the general reopening of the country's main port of Sohar on June 7, after being closed June 6 as the cyclone approached.

The port reopened the morning of June 7 having no major damage, according to Jan Meijer, chief executive of Sohar Industrial Port Co., which operates the facility.

Mubarek infill well spudded off Sharjah

Sky Petroleum Inc., Austin, Tex., said drilling has started on the K2-ST3 sidetrack in Mubarek oil field operated by Crescent Petroleum Co. International Ltd. off Sharjah.

PT Apexindo's Rani Woro cantilever jack up is drilling the well at the Mubarek K wellhead platform to a target depth of 13,500 ft in the Late Cretaceous Ilam/Mishrif oil reservoir. The well sidetracks the Mubarek K-2 well, drilled to test the Early Cretaceous Thamama reservoir, which produces gas and condensate in the field.

Results are expected in third quarter after testing, Sky said.

The well is the second well in a Mubarek infill-drilling program covered by an agreement Sky signed in 2005 with Buttes Gas & Oil Inc., a subsidiary of Crescent Petroleum, Sharjah. Sky's commitment is two wells with costs capped at $25 million. It has the option to drill four more wells capped at $12.5 million each.

The first well, H2, had produced 83,692 bbl of oil by Mar. 31, since coming on stream May 16, 2006.

Mubarek, producing since 1974, is undergoing redevelopment after the companies identified attractive prospects from a 3D seismic survey. The field has produced more than 100 million bbl of oil. It has nine wellhead platforms, a production platform with capacities of 60,000 b/d of oil and 150 MMscfd of gas, infield pipelines, and a 600,000 bbl floating storage unit.

Sky's agreement includes a right of first refusal for exploration of the Sir Abu Nu'ayr prospect off Abu Dhabi. That project is under evaluation.

China's Jidong field to serve domestic market

Anticipated production from Nanpu block in China's Jidong field will likely go to the country's domestic market, according to a Western oil company executive.

Early indications suggest the Nanpu oil is 32° gravity with a sulfur content of 0.1%, according to Paul Wright, project manager for Chevron Corp.'s commercial integration team.

That makes the oil a heavier sweet grade and best suited for processing by China's domestic refiners, Wright told an industry conference in Singapore. While not involved in the development of the block, Chevron has been drilling in Bohai Bay, where the Nanpu block is located.

PetroChina earlier said its discovery at the Nanpu block, reported to be China's largest in 30 years, holds proven reserves of 405 million tonnes of oil and 140 billion cu m of gas. ✦

Processing — *Quick Takes*

Sinopec to raise product exports through JV

China Petroleum & Chemical Corp. (Sinopec) plans to increase its product exports by joining with two Singapore-based companies, ItalSing Petroleum Co. Pte. Ltd. and AP Oil International Ltd., to produce its brand-name lubricants for Asian Pacific markets.

Sinopec's automotive lubricants will be made in Singapore by Italsing, a joint venture of Singapore Petroleum Co. and Eni International BV, while AP Oil will make the Chinese firm's marine lubricants.

Sinopec said it is considering a direct manufacturing presence in the city-state, but will first focus on developing the market through contract manufacturing.

No details were reported on the value of the contract manufacturing deals with the two Singapore companies, but Sinopec said it would initially produce 5,000-7,000 tonnes/year of lubricants through them.

In a separate statement, AP Oil said it has a 5-year contract with Sinopec to blend mainly marine lubricants. It said the volume would vary according to Sinopec's requirements.

Lyondell lets contract for Chinese chemical plant

A unit of Lyondell Chemical Co. has let a contract to Jacobs Engineering Group Inc. for engineering design services related with Lyondell's 4.44 billion yuan venture with Sinopec Zhenhai Refinery & Chemical for a propylene oxide-styrene monomer (POSM) manufacturing facility to be built in Ningbo, China.

Jacobs is committed to prepare the technical details of Lyondell's project design package for what is to be the largest POSM facility in the world.

The facility is expected to produce 274,000 tonnes/year of propylene oxide and 620,000 tonnes/year of styrene monomer. It is slated for operation in 2009.

Lyondell earlier said it is to get a share of the propylene oxide (PO) profitability from the plant in exchange for its POSM technology and overall operating and technical experience, and the two partners will jointly market all PO manufactured by the new facility (OGJ, May 7, 2007, Newsletter).

Iran in early planning stages for Asian refineries

Iranian Oil Minister Kazem Vaziri-Hamaneh said his country is in discussions to store strategic oil reserves in China and to build refineries elsewhere in Asia.

Vaziri-Hamaneh said Iran was in discussions to store crude in China, but he offered few details apart from telling reporters at a news conference: "We have some plans."

Elsewhere, Vaziri-Hamaneh said Iran is finalizing five Asian joint-venture refinery projects in China, Indonesia, Malaysia, Singapore, and Syria for a total capacity of 1.1 million b/d.

"We are supposed to be the partner in these refineries and also to provide the crude oil for those refineries," he told reporters on the sidelines of the conference in Malaysia.

Vaziri-Hamaneh did not offer details on the projects, but a National Iranian Oil Co. official said Iran aimed to supply crude to a planned refinery in northern Malaysia.

In April Malaysian officials said discussions were under way over a proposed refinery complex and pipeline across northern Malaysia.

Apart from a 320-km pipeline, they said, plans call for a 200,000 b/d coastal refinery to be built by a joint venture of local firm SKS Development Sdn. Bhd. and NIOC (OGJ Online, Apr. 17, 2007). ✦

Transportation — *Quick Takes*

Final North Baja gas line EIS completed

Staffs from the US Federal Energy Regulatory Commission and the California State Lands Commission (CSLC) jointly concluded that the proposed North Baja natural gas pipeline expansion project will be environmentally acceptable, the agencies said on June 8.

The project, which has been proposed by a US subsidiary of TransCanada Corp., would be the US portion of a system to deliver natural gas from terminals in Mexico to California and other southwestern US markets. It would be built adjacent to a line which was completed in 2002. A Sempra Energy subsidiary would own the Baja California segment.

The US segment, reviewed by FERC and CSLC, would be comprised of an 80-mile loop of 42-in. and 48-in. line; a 2.1-mile, 36-in. lateral to Southern California Gas Co.'s existing Blythe compressor station; a 46-mile, 16-in. lateral to the existing Imperial Irrigation District El Centro generating station, and other associated facilities.

The agencies issued a final environmental statement and review that were prepared in collaboration with the US Bureaus of Land Management and Reclamation. BLM will use the documents to consider amending the California Desert Conservation Area Plan and the Yuma District Resource Plan, the agencies indicated.

The project's sponsor said it plans to minimize its impact on the Imperial Dunes Recreation Area by building the pipeline through the dunes within the All American Canal/Interstate 8 corridor.

FERC and CSLC noted that directional drilling would be used to avoid disturbing the Colorado River, All American and East Highline canals beds and banks, and associated wetland and riparian areas. The project's sponsor has agreed to consult with the appropriate Indian tribes and regulatory agencies before beginning construction, they said.

Illinois-Gulf Coast crude line under study

Enbridge Inc. and ExxonMobil Pipeline Co. are studying a crude oil pipeline that would connect refining centers on the US Gulf Coast with production in the oil sands region of Alberta.

The pipeline under study would carry crude from a hub at Patoka, Ill., to Beaumont, Tex., and on to Houston. Straight-line distances total about 715 miles.

At Patoka, the pipeline would link with Enbridge systems that carry crude from Edmonton and Fort McMurray, Alta., to the Chicago area and eastern Canada.

Enbridge said it and ExxonMobil Pipeline have held discussions with potential shippers about the scope, timing, and value of the proposal. It said the project is targeted to be in service as soon as the end of 2010.

Enbridge is expanding its capacity to carry crude from Alberta.

Its Southern Access mainline expansion, under construction, ultimately will add 400,000 b/d of capacity between Hardisty, Alta., and Flanagan, Ill., near Chicago.

Its planned Alberta Clipper project involves construction of a 36-in. diameter pipeline from Hardisty to Superior, Wis., and the addition of pumping capacity on a new 42-in. pipeline between Superior and Flanagan. It has increased the expected capacity of the project to 450,000 b/d from 400,000 b/d.

In its Southern Access extension, Enbridge would lay a 36-in. pipeline with 400,000 b/d of capacity between Flanagan and Patoka.

Cyprus seeks bids for LNG supplies, gas storage

Cyprus will launch a tendering process for LNG supplies and gas storage infrastructure, according to local reports.

The government will accept tenders for a temporary offshore storage facility as a stop gap and it also is seeking companies interested in constructing a permanent onshore site.

The LNG supplies and gas storage will help Cyprus to reduce carbon emissions within the European Union. Government spokesman Vasilis Palmas was quoted as saying that the Cypriot cabinet had approved both a LNG regasification terminal and gas storage, but did not give a timeframe.

Rows have broken out among political circles in Cyprus, however, on whether it should opt for land-based gas storage or a floating offshore unit. Government officials estimate that an onshore facility could take 5-7 years to complete.

Critics have argued against a floating storage unit, claiming it is a risk as the technology is untested and could be a waste of taxpayers' money. A floating unit is estimated to take as long as 5 years to implement.

Cyprus is committed to using cleaner forms of energy within the EU by 2009. The island relies mainly upon heavy fuel oil for its electric power generation. ✦

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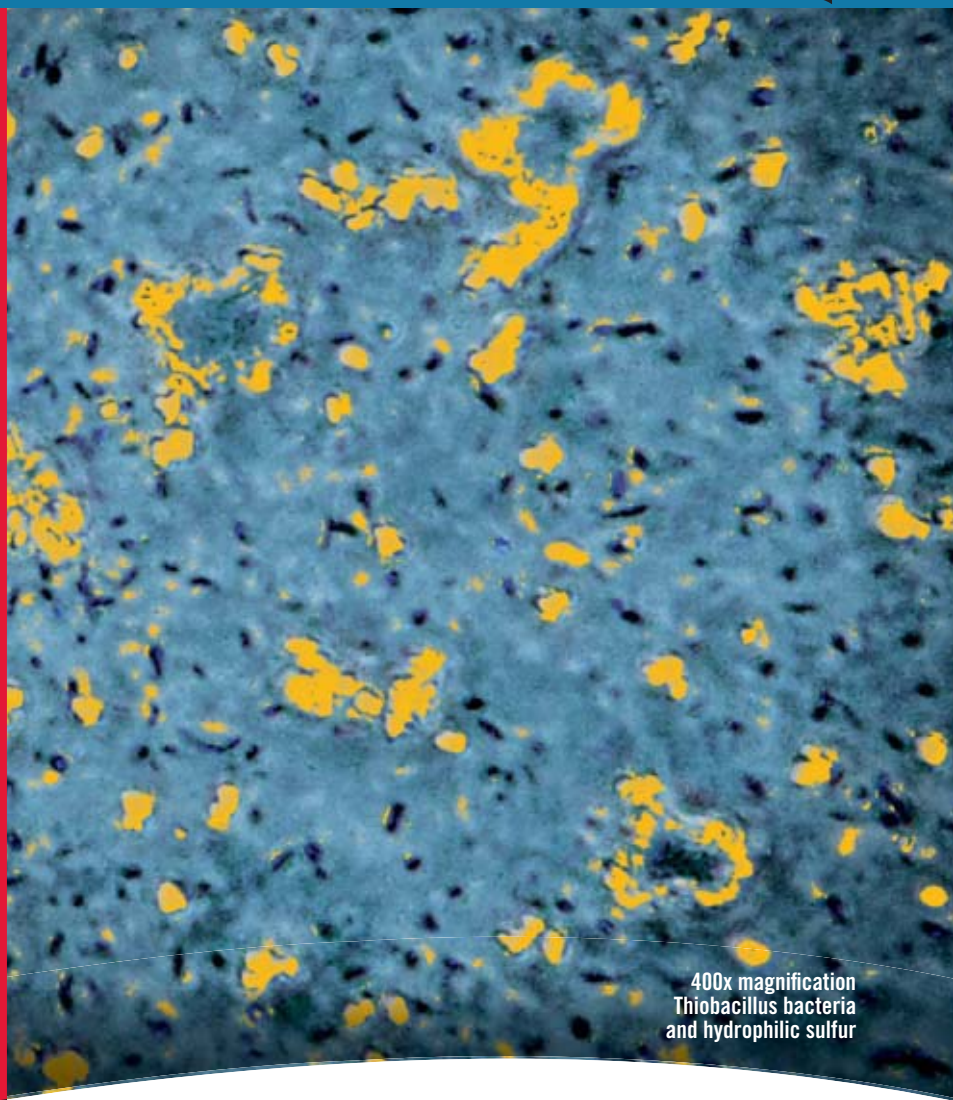

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Calendar

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

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

2007

JUNE

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.

Russia & CIS Refining & Petrochemicals Business Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 25-26.

API Exploration and Production Standards Conference on Oilfield Equipment and Materials, San Francisco, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 25-29.

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

CERA East Meets West Executive Conference, Istanbul, (800) 597-4793, (617) 866-5992 (fax), e-mail: register@cera.com, website: www.cera.com. 26-28.

Power-Gen Europe Conference, Madrid, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwell.com. 26-28.

Russian Petroleum Congress, Moscow, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com. 26-28.

Moscow International Oil & Gas Conference & Exhibition, Moscow, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 26-29.

JULY

IPAA OGIS, London, (202)

857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 11.

Carbon Sequestration Development & Finance Summit, Houston, (818) 888-4444, website: www.infocastinc.com/sequest07.html. 11-13.

Oil Sands and Heavy Oil Technologies Conference & Exhibition, Calgary, Alta., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwellpetroleumgroup.com. 18-20.

Purvin & Gertz Annual Asia LPG Seminar, Singapore, (713) 236-0318, (713) 236-8490 (fax), e-mail: glrodriguez@purvingertz.com, website: www.purvingertz.com. 25-28.

West China International Oil & Gas Conference, Urumqi, Xinjiang, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com. 26-27.

International Petroleum & Petrochemical Exhibition, , Urumqi, Xinjiang, +44 (0) 207 596 5233, +44 (0) 207 596 5106 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com. 26-28.

AUGUST

Coal-Gen Conference, Milwaukee, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwell.com. 1-3.

✦Diesel Engine-Efficiency and Emissions Research (DEER) Conference, Detroit, (540) 937-1739, e-mail: kim@cemamerica.com, website: www1.eere.energy.gov/vehiclesandfuels/resources/conferences/deer/index.html. 12-16.

Rocky Mountain Natural Gas Strategy Conference & Investment Form, Denver, (303) 861-0362, (303) 861-0373 (fax), e-mail: cogaconference@aol.com, website: www.coga.org. 13-15.

American Chemical Society National Meeting & Exposition, Boston, (202) 872-4600, (202) 872-4615 (fax), e-mail: natlmtgs@acs.org, website: www.acs.org. 19-23.

NAPE Summer Expo, Houston, (817) 847-7700, (817) 847-7703 (fax), e-mail: nape@landman.org, website: www.napeonline.com. 23-24.

IADC Well Control of the Americas Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax); e-mail: info@iadc.org, website: www.iadc.org. 28-29.

SEPTEMBER

Brasil Subsea Conference & Exhibition, Rio de Janeiro, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwellpetroleumgroup.com. 1.

SPE/EAGE Reservoir Characterization and Simulation Conference, Muscat, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 3-5.

Power-Gen Asia Conference, Bangkok, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwell.com. 4-6.

Offshore Europe Oil & Gas Conference and Exhibition, Aberdeen, +44 (0) 208 439 8890, +44 (0) 208 439 8897 (fax), e-mail: oe2007@spearhead.co.uk, website: www.offshore-europe.co.uk. 4-7.

Black Sea Oil & Gas Summit, Istanbul, +90 312 454 00 00-1412, +90 312 454 00 01, e-mail: bsogs2007@flaptour.com.tr, website: www.bsogs2007.org. 5-6.

✦Iraq Petroleum Conference, Dubai, +44 (0)20 7978 0075, +44 (0)20 7978 0099 (fax) website: www.thecwcgroup.com. 8-10.

Corrosion Solutions Conference, Sunriver, Ore., (541) 926-4211, ext. 6280, website: www.corrosionconference.com. 9-13.

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

SPE Asia Pacific Health Safety Security Environment Conference, Bangkok, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 10-12.

Turbomachinery Symposium, Houston, (979) 845-7417 (979) 845-1835 (fax), e-mail: turbo@turbo-lab.tamu.edu, website: http://turbolab.tamu.edu. 10-13.

Oil Sands Trade Show & Conference, Fort McMurray, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 11-12.

AAPG Annual Eastern Meeting, Lexington, (859) 257-5500, ext. 173, website: www.esaapg07.org. 16-18.

United States Association for Energy Economics/IAEE North American Conference, Houston, (216) 464-2785, (216) 464-2768 (fax), website: www.usaee.org. 16-19.

Russia & CIS Petrochemicals & Gas Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conference@EuroPetro.com, website: www.europetro.com. 17-18.

API Fall Refining and Equipment Standards Meeting, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 17-19.

Russia & CIS Refining Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conference@EuroPetro.com, website: www.europetro.com. 19-20.

IOGCC Annual Meeting, New Orleans, (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.

Calendar

state.ok.us, website: www.iogcc.state.ok.us. 23-25.

Society of Exploration Geophysicists (SEG) Annual Meeting, San Antonio, (918) 497-5500, (918) 497-5557 (fax), e-mail: web@seg.org, website: www.seg.org. 23-28.

Russia & CIS Petrochemicals Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 25-26.

Annual Engineering & Construction Contracting Association Conference, Colorado Springs, Colo., (877) 484-3322, (713) 877-8130 (fax), e-mail: registration@ecc-association.org, website: www.ecc-association.org. 27-28.

Russia & CIS Refining Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 27-28.

OCTOBER

IPLOCA Convention, Sydney, +41 22 306 0230, e-mail: info@iploca.com, website: www.iploca.com. 1-5.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 2-4.

Rio Pipeline Conference and Exposition, Rio de Janeiro, +55 21 2121 9080, e-mail: eventos@ibp.org.br, website: www.ibp.org.br. 2-4.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 2-4.

GPA Rocky Mountain Annual Meeting, Denver, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 3.

✦Regional Deep Water Offshore West Africa Exploration & Production Conference & Exhibition, Luanda, +31 (0)26 3653444, +31 (0)26 3653446 (fax), e-mail: g.kreeft@energywise.nl, website: www.dowac.com. 3-6.

IFP Symposium The Capture and Geological Storage of CO2, Paris, +33 1 47 52 70 96 (fax), e-mail: patricia.fulgoni@ifp.fr, website: www.ifp.fr. 4-5.

IPAA OGIS West, San Francisco, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 7-9.

Annual European Autumn Gas Conference, Düsseldorf, +44 (0)20 8241 1912, +44 (0)20 8940 6211 (fax), e-mail: info@theeagc.com, website: www.theeagc.com. 9-10.

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

NPRA Q&A and Technology Forum, Austin, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 9-12.

Deep Offshore Technology (DOT) International Conference & Exhibition, Stavanger, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepoffshoretechnology.com. 10-12.

International Bottom of the Barrel Technology Conference & Exhibition, Athens, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 11-12.

ERTC Petrochemical Conference, Brussels, 44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 15-17.

Oil Shale Symposium, Golden, Colo., (303) 384-2235, e-mail: jboak@mines.edu, website: www.mines.edu/outreach/cont_ed/oilshale. 15-19.

GPA Houston Annual Meeting, Kingwood, Tex., (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 16.

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

PIRA New York Annual Conference, New York, 212-686-6808, 212-686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 18-19.

IPAA Annual Meeting, New Orleans, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 22-24.

SPE/IADC Middle East Drilling and Technology Conference, Cairo, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 22-24.

World Energy & Chemical Exhibition and Conference, Kuwait City, +32 2 474 8264, +32 2 474 8397 (fax), e-mail: d.boon@bruexpo.be, website: www.wecec-kuwait.com. 22-25.

Louisiana Gulf Coast Oil Exposition (LAGCOE), Lafayette, (337) 235-4055, (337) 237-1030 (fax), website: www.lagcoe.com. 23-25.

Pipeline Simulation Interest Group Annual Meeting, Calgary, Alta, (713) 420-5938, (713) 420-5957 (fax), e-mail: info@psig.org, website: www.psig.org. 24-26.

GSA Annual Meeting, Denver, (303) 357-1000, (303) 357-1070 (fax), e-mail: gsaservice@geosociety.org, website: www.geosociety.org. 28-31.

Asia Pacific Oil and Gas Conference and Exhibition, Jakarta, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. Oct. 30-Nov. 1.

Chem Show, New York City, (203) 221-9232, ext. 14, (203) 221-9260 (fax), e-mail: mstevens@iecshows.com, website: www.chemshow.com. Oct. 30-Nov. 1.

✦Methane to Markets Partnership Expo, Beijing, (202) 343-9683, e-mail: asg@methanetomarkets.org, website: www.methanetomarkets.org/expo. Oct. 30-Nov. 1.

NOVEMBER

IADC Annual Meeting, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 1-2.

Deepwater Operations Conference & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepwateroperations.com. 6-8.

IPAA Annual Meeting, San Antonio, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 7-9.

SPE Annual Technical Conference and Exhibition, Anaheim, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 11-14.

World Energy Congress, Rome, +39 06 8091051, +39 06 80910533 (fax), e-mail: info@micromegas.it, website: www.micromegas.it. 11-15.

API/NPRA Fall Operating Practices Symposium, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 13.

Houston Energy Financial Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.accessanalyst.net. 13-15.

Australian Society of Exploration Geophysicists International Geophysical Conference & Exhibition, Perth, (08) 9427 0838, (08) 9427 0839 (fax), e-mail: secretary@aseg.org.au, website: www.aseg.org.au. 18-22.

ERTC Annual Meeting, Barcelona, 44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 19-21.

IADC International Well Control Conference & Exhibition, Singapore, (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 28-29.

DECEMBER

International Oil and Gas Industry Exhibition & Conference, Suntec, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: osea@oesallworld.com, website: www.allworldexhibitions.com. 2-5.

Middle East Nondestructive Testing Conference & Exhibition, Bahrain, +973 17 729819, +973 17 729819 (fax), e-mail: bseng@batelco.com.bh, website: www.mohandis.org. 2-5.

International Petroleum Technology Conference, Dubai, +971 4 390 3540, +971 4 366 4648 (fax), e-mail: iptc@iptcnet.org, website: www.iptcnet.org. 4-6.

IADC Drilling Gulf of Mexico Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 5-6.

Oil & Gas Maintenance & Technology Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 9-13.

Pipeline Rehabilitation & Maintenance Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 9-13.

PIRA Understanding Global Oil Markets Conference, New York, 212-686-6808, 212-686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com10-11.

2008

JANUARY

Middle East Petrotech Conference and Exhibition, Bahrain, +60 3 4041 0311, +60 3 4043 7241 (fax), e-mail: mep@oesallworld.com, website: www.allworldexhibitions.com/oil. 14-16.

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

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

MARCH

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

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

Offshore Asia Conference & Exhibition, Kuala Lumpur, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.offshoreasiaevent.com. 18-20.

Middle East Geosciences Conference and Exhibition, Bahrain, +60 3 4041 0311, +60 3 4043 7241 (fax), e-mail: geo@oesallworld.com, website: www.allworldexhibitions.com/oil. 24-26.

MAY

IOGCC Midyear Meeting, Calgary, Alta., (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.state.ok.us, website: www.iogcc.state.ok.us. 2-5.

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

JUNE

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

AUGUST

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

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A Mideast processing tilt

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

New data for Oil & Gas Journal's exclusive Worldwide Gas Processing report (beginning on p. 50) show, among other trends, that Middle East gas processing is solidly in third place among the world's regions, behind the US and Canada.

Indeed, Middle East processing is the key reason 2006 gas processing outside the US and Canada continued for the second year running to capture more than 50% of world capacity.

A recent review of the region's petroleum sectors for 2006 shows that liquids processing is also surging and for the same reason: confidence that higher oil prices are here to stay.

Expanding capacities

Earlier this year, Nancy Yamaguchi of FACTS Inc.'s Singapore office circulated a Middle East analysis for 2006. A new oil-price band of $50-60/bbl, she said, is pushing ahead exploration and development in the region to the tune of 3 million b/d of new crude and condensate production in 2005-10.

This production growth will push every refining country in the region—Saudi Arabia, Iran, Kuwait, Bahrain, Iraq, Oman, UAE, Qatar, and Yemen—to expand hydrocarbon processing capacity. Most have already taken advantage of healthy margins not only to expand charge capacities but also to improve product quality, she said.

By 2010, Saudi Arabia will still lead all countries with 10.2 million b/d of the region's 25.6 million b/d production, up from 9.3 million b/d and 22.6 million b/d, respectively, in 2005.

Responding to its hot gasoline market, Iran leads the region in gasoline imports and plans to make its Bandar Abbas refinery a major center for condensate splitting, bringing on 360,000 b/d of splitting capacity by 2010 to be paired with catalytic reforming and isomerization to boost gasoline output.

Qatar, Yamaguchi reported, is also expanding condensate splitting capacity. This effort advances in tandem with its gas-to-liquids projects and in line with wider regional plans to ramp up naphtha exports to petrochemical manufacturers in Europe and the US.

Her analysis revealed that condensate runs for the entire gulf are likely to surpass 600,000 b/d this year and exceed 1 million b/d in 2010. Crude runs will reach about 5.3 million b/d in 2007 and rise to nearly 7 million by 2010.

Demand growth in the region will accelerate in 2006-10 to average more than 6.5%/year. By 2010, demand for oil products will reach 6.7 million b/d and in 2012 approach more than 7 million b/d. Of interest to gas processors is Yamaguchi's partial explanation of what is behind this demand growth: "Among the main drivers of this rapid growth will be LPG and naphtha," she said, for which double-digit growth from a small base is likely.

Growth rates for LPG, naphtha, and gasoline will lead regional demand patterns. And LPG and naphtha can come from natural gas processing as well as crude oil processing. Hence, the growth shown in OGJ's numbers for 2006.

LPG exports in 2006-12, said Yamaguchi, will hold steady near 900,000 b/d; naphtha exports will grow to more than 1 million b/d by the end of the period.

While much has been made by other observers of the growth of naphtha exports, she believes the real export leader will be middle distillates. In 2007, such exports will be about 800,000 b/d but will grow to 1.4 million b/d by 2010 and to more than 2.1 million b/d by 2012.

Pushing this growth in large measure will be Qatar's GTL projects. Its Oryx project (Qatar Petroleum Co. 51% and Sasol Ltd. 49%) produced its first volumes in January (OGJ Online, Jan. 31, 2007). The Pearl project is due on line in 2010-11; the ExxonMobil plant is due in 2011.

Mideast ascendancy

Accustomed to being a market setter in crude oil trade, countries of the Middle East are clearly expanding their presence and importance in other hydrocarbon movements. That fact may or may not comfort those concerned about supply balances in world markets. But the trend is inexorable.

As OGJ's numbers continue to show and FACTS's analysis supports, the world's processing center has tilted toward the Middle East. The region, both as producer and as market, increasingly is acting as a fulcrum for trade patterns to the West as well as the East.✦

Editorial

The wrong energy fix

Minor tweaks won't fix the Energy Policy Act of 2005 (EPACT). But no one believes HR 2337 is really about fixing flawed energy law.

The bill, approved last week by the House Natural Resources Committee, would repeal a few of EPACT's minor triumphs. The oil and gas measures deal with processing fees for drilling permits, categorical exclusions from environmental statutes, royalty-in-kind payments to the federal government, federal offshore audits, split-estate issues on federal leases, various fees, regulation of produced water, and leasing of oil shale and tar sands acreage. They all would bruise oil and gas companies.

That the law would contradict US interests in the development of domestic energy supply is inexcusable. Worse, HR 2337 and the politics behind it perpetuate a baffling American refusal to face facts on energy. But the big battles over the biggest US energy issues already were lost.

Chipping away

The US had energy problems even before Congress lurched into action on the subject. The country leads the world in consumption, which grows steadily. It imports oil and gas at increasing rates while refusing to allow exploration of promising federal acreage. Its refining capacity doesn't expand in step with oil demand, operates at stressful rates, and grapples with increasingly complex product specifications. And while air quality has improved greatly, public concern about greenhouse gases is intense.

EPACT, developed as "comprehensive energy legislation," at best chipped away at those problems. It mostly doled out favors to producers of a variety of energy forms, most of them uneconomic without subsidies and unlikely ever to add greatly to supply. Overall, it reinstituted fuel choice by the state and shoved agriculture to the center of energy policy. It took no major step toward expanding oil and gas leasing of federal land, choosing only the half-step of opening a small part of the Eastern Gulf of Mexico. And it undermined its own efforts to encourage refinery construction by injecting, with its enthusiasm for ethanol and other such folly, deadly new uncertainty into decisions about refining investments.

The best and wholly improbable fix for EPACT is repeal. Sure, that would overturn minor gains the oil and gas scored in the monstrous bill. But those advances are in jeopardy in a hostile Congress. Against real US energy needs, a bill that mandates ethanol in gasoline and doesn't meaningfully broaden oil and gas leasing of federal land cannot be called comprehensive or constructive.

EPACT repeal won't happen, of course. Congress would never confess to a mistake so colossal. With HR 2337, the House has simply set about to fix what Democrats newly in control depict as the EPACT mistakes of their Republican predecessors, meaning measures that in any way benefit oil and gas companies.

Energy politics in the US has degenerated into this kind of mindless grope for revenge against popular demons: oil companies and the Organization of Petroleum Exporting Countries. So fixing EPACT comes to mean not rationalizing the venal ethanol mandate or expanding oil and gas leasing but punishing the oil industry. Such demagoguery plays well to the angry and unthinking crowd. But it limits oil and gas supply and in other ways costs people money.

Uninformed spite

The Senate seems determined to make comparable mistakes for like reasons. It began discussion last week of a legislative package unveiled in May that would, among other things, make "price-gouging" a crime. The debate included a glittering illustration of the uninformed spite propelling these bills. A proposal to encourage refinery construction, said Sen. Barbara Boxer (D-Calif.), would be "a total taxpayer give-away to the oil industry." She then complained that, in the less than 2 years since EPACT accelerated capital recovery for projects that add refining capacity, no new refinery has opened in the US.

Americans need a large supply of cheap energy. They won't get that from the biofuels, wind, or solar industries. They won't get it from an oil and gas industry hamstrung by vindictive policy. And they won't get it from politicians who exploit popular misunderstanding to the detriment of national interests. ✦

Refining props up earnings as upstream results weaken

Marilyn Radler
Senior Editor-Economics

Laura Bell
Statistics Editor

First-quarter 2007 earnings for a sample of companies were mixed, as service and supply firms fared much better than oil and gas producers and refiners based in the US and Canada.

Refining margins boosted the results of refiners and integrated firms in the sample, while many US producers reported net losses for the first 3 months of this year.

Production volumes for some companies moved higher from a year earlier, but oil and gas realizations were lower.

Prices, margins

The front-month futures closing price for crude oil on the New York Mercantile Exchange averaged $58.25/bbl during the first quarter of 2007, down 8% from the first quarter of last year.

Average natural gas prices also declined from a year earlier. In the recent quarter, the front-month NYMEX closing price averaged $7.18/MMbtu, down from an average of $7.84/MMbtu in the first 3 months of 2006.

For refiners the cash margin on the West Coast averaged $25.18/bbl during the recent quarter. This compares with an average of $23.92/bbl during the first quarter of last year and $15.53/bbl in the first period of 2005, according to Muse, Stancil & Co. Meanwhile, average refining margins were mildly weaker for US East Coast and US Gulf Coast refiners during first-quarter 2007 than they were a year earlier.

US operators, refiners

A sample of 128 oil and gas producers and refiners collectively recorded a 2.4% decline in earnings for the first quarter, and their combined revenues fell 6%. In this group 44 companies, mostly exploration and production firms, reported net losses for the quarter.

Most of the integrated firms in the group and independent refiners reported improved earnings.

As a result of strong margins and high throughput rates, Valero Energy Corp. posted a 35% increase in earnings for the first quarter as compared to results a year earlier. The refiner's revenues, however, were down 6%.

Valero said it benefited from the January commissioning of the expanded crude unit at its Port Arthur, Tex., refinery, which increased overall throughput capacity by 30,000 b/d to 325,000 b/d of sour crude oil.

Holly Corp. reported net income for the first quarter of $67.5 million, up 44% from a year earlier. Revenues were up 17%. On Mar. 31, 2006, Holly sold its refinery in Great Falls, Mont.

Holly said the positive effects of processing improvements completed at its two refineries last summer, strong gasoline and diesel crack spreads, and strong industry-wide refinery margins propelled its earnings over those of the 2006 first quarter.

Marathon Oil Corp. reported a 9% first-quarter earnings decline from a year ago. While income from Marathon's refining, marketing, and transportation segment grew to $345 million from $319 million, the company's income from upstream operations was down 17% from a year earlier at $385 million.

Chevron Corp., ConocoPhillips, and ExxonMobil Corp. each reported reduced revenues but stronger net income for the recent quarter as compared with the first quarter of 2006.

ExxonMobil attributed its results to higher refining, marketing, and chemical margins, which were partly offset by a decrease in oil and gas realizations. While liquids production was slightly higher, ExxonMobil's gas production declined nearly 10% from a year earlier.

Chevron's downstream profits increased $1 billion, due mainly to a $700 million gain on sale of refining assets in Europe. Upstream earnings declined $550 million on lower average oil and gas prices, Chevron reported.

ConocoPhillips's refining and marketing net income was $1.1 billion in

US OIL AND GAS FIRMS' FIRST QUARTER 2007 REVENUES, EARNINGS

Table 1

	Revenues		Net income	
	1st quarter			
	2007	2006	2007	2006
	Million $			
Abraxas Petroleum Corp.	11.7	13.3	(0.7)	1.2
Adams Resources & Energy Inc.	3.4	4.6	(0.5)	2.8
Altex Industries Inc.[1]	0.1	2.4	(0.1)	2.0
American Oil & Gas Inc.	0.4	1.6	(0.7)	2.5
Anadarko Petroleum Corp.	2,683.0	1,701.0	105.0	661.0
Apache Corp.	1,997.3	1,999.1	492.9	660.9
Apache Offshore Investment Partnership	1.9	3.4	1.3	2.5
Arena Resources Inc.	16.7	10.4	5.7	3.6
Aspen Exploration Corp.[2]	1.5	1.6	0.4	0.4
ATP Oil & Gas Corp.	148.4	45.8	27.4	(3.0)
Aurora Oil & Gas Corp.	6.3	5.6	(0.7)	(0.9)
Belden & Blake Corp.	29.6	44.8	(23.3)	5.4
Berry Petroleum Co.	117.5	117.6	18.9	23.3
Bill Barrett Corp.	98.4	98.9	22.1	14.2
Black Hills Corp.	25.8	25.2	3.6	5.4
Blue Dolphin Energy Co.	0.9	1.1	(0.3)	0.1
Brigham Exploration Co.	25.2	25.7	1.9	5.9
Cabot Oil & Gas Corp.	191.6	214.8	48.5	53.2
Callon Petroleum Co.	45.8	45.9	5.8	12.8
Cano Petroleum Inc.[2]	6.4	5.4	(2.2)	(1.1)
Carrizo Oil & Gas Inc.	23.0	22.3	(2.5)	6.7
Challenger Minerals Inc.	9.6	16.6	2.1	8.2
Cheniere Energy Inc.	(1.3)	0.4	(34.6)	(15.8)
Chesapeake Energy Corp.	1,589.0	2,044.0	258.0	624.0
Chevron Corp.	48,227.0	54,624.0	4,715.0	3,996.0
Cimarex Energy Co.	306.9	335.3	64.6	110.2
Clayton Williams Energy Inc.	72.4	63.4	(12.3)	3.4
Comstock Resources Inc.	146.3	132.0	12.6	29.6
ConocoPhillips	42,867.0	47,927.0	3,546.0	3,291.0
Contango Oil & Gas Co.[2]	5.6	0.3	0.2	0.9
Credo Petroleum Corp.[3]	4.1	4.4	1.4	1.7
Crimson Exploration Inc.	4.5	5.1	(1.6)	1.4
Cross Timbers Royalty Trust	4.7	7.2	4.5	7.1
Cubic Energy Inc.[2]	0.1	0.1	(1.9)	(1.2)
Daleco Resources Corp.[1]	0.3	0.6	(0.7)	(0.4)
Delta Petroleum Corp.	42.5	37.0	(18.7)	13.8
Denbury Resources Inc.	174.0	178.9	16.6	43.8
Devon Energy Corp.	2,473.0	2,500.0	651.0	700.0
Dominion Exploration & Production	709.0	940.0	138.0	230.0
Dorchester Minerals Ltd.	14.7	19.3	9.1	13.1
Double Eagle Petroleum Co.	4.9	4.6	0.2	0.8
DTE Gas & Oil Co.	28.0	22.0	2.0	1.0
Dune Energy Inc.	3.0	1.4	(7.9)	(2.0)
Edge Petroleum Corp.	22.9	35.0	(5.8)	6.9
El Paso Corp.	1,022.0	1,337.0	629.0	356.0
Encore Acquisition Co.	130.5	148.0	(29.4)	17.9
Energen Resources Corp.	194.0	169.5	105.3	88.5
Energy Partners Ltd.	108.6	109.5	3.7	14.8
EOG Resources Inc.	875.2	1,084.5	217.7	426.7
Equitable Supply	125.3	122.4	54.9	72.0
Evolution Petroleum Corp.[2]	1.0	0.9	(0.5)	(0.6)
Exploration Co.	11.2	16.1	(1.9)	1.3
ExxonMobil Corp.	87,223.0	88,980.0	9,280.0	8,400.0
Fidelity Exploration & Production Co.	118.6	128.4	30.6	41.3
FieldPoint Petroleum Corp.	0.9	1.1	0.1	0.4
Forest Oil Corp.	182.6	221.4	6.9	3.7
Frontier Oil Corp.	1,047.9	1,012.2	74.7	57.4
FX Energy Inc.	4.2	1.3	(2.6)	(4.2)
Galaxy Energy Corp.	0.2	0.4	(3.8)	(5.8)
Gasco Energy Inc.	6.4	7.3	(0.2)	(0.2)
GeoResources Inc.	1.5	2.2	0.2	0.5
GMX Resources Inc.	13.3	6.7	3.8	2.1
Goodrich Petroleum Corp.	23.5	14.8	1.0	11.6
Gulfport Energy Corp.	20.5	4.5	7.3	2.8
Hallador Petroleum Co.	4.1	0.8	(0.8)	0.1
Harken Energy Corp.	5.8	10.1	0.4	(1.8)

US OIL AND GAS FIRMS' FIRST QUARTER 2007 REVENUES, EARNINGS (CONTINUED)

	Revenues		Net income	
	1st quarter			
	2007	2006	2007	2006
	Million $			
Helix Energy Solutions Group Inc.	396.1	291.6	56.8	56.2
Hess Corp.	7,374.0	7,466.0	370.0	699.0
Holly Corp.	928.4	793.3	67.5	46.8
Houston American Energy Corp.	1.2	0.7	(0.0)	(0.0)
Houston Exploration Co.	103.8	177.6	9.9	29.8
Infinity Energy Resouces Inc.	2.1	2.4	(3.8)	(11.3)
LL&E Royalty Trust	0.7	0.4	0.5	0.0
Marathon Oil Corp.	13,002.0	16,539.0	717.0	784.0
McMoRan Exploration Co.	51.7	39.7	(14.5)	(13.1)
Meridian Resource Corp.	50.5	57.5	1.7	7.3
Mexco Energy Corp.[4]	0.7	1.3	0.1	0.4
Miller Petroleum Inc.[5]	0.2	0.4	(0.5)	(1.6)
Murphy Oil Corp.	3,434.9	2,991.3	110.6	116.0
New Century Energy Corp.	3.0	3.3	(2.2)	(2.3)
Newfield Exploration Co.	440.0	431.0	(96.0)	149.0
NGAS Resources Inc.	17.9	27.3	(0.3)	0.6
Noble Energy Inc.	742.5	712.0	211.8	226.1
Oakridge Energy Inc.[6]	0.3	0.4	(0.1)	(0.1)
Occidental Petroleum Corp.	4,704.0	4,453.0	1,212.0	1,231.0
Panhandle Royalty Co.[1]	8.1	8.7	(0.2)	2.7
Parallel Petroleum Corp.	23.1	20.5	(0.1)	1.6
Penn Virginia Corp.	186.3	200.9	4.4	24.1
Permian Basin Royalty Trust	13.9	19.0	13.6	18.7
Petrohawk Energy Corp.	209.2	103.0	(19.4)	32.9
Petrol Oil & Gas Inc.	1.6	1.2	(1.8)	(1.8)
PetroQuest Energy Inc.	64.0	48.4	10.8	9.1
Pioneer Natural Resources Co.	406.1	392.5	29.6	543.2
Pioneer Oil & Gas[1]	5.2	0.5	2.8	0.2
Plains Exploration & Production Co.	224.7	251.6	20.6	(51.7)
Pogo Producing Co.	351.4	373.5	(21.2)	67.5
PrimeEnergy Corp.	28.7	22.8	3.2	4.0
Pyramid Oil Co.	0.9	0.9	0.1	0.3
Quest Resource Inc.	27.3	12.3	(3.3)	8.7
Questar Corp.	872.1	911.4	151.1	137.2
Quicksilver Resources Inc.	116.6	99.7	22.9	27.5
Range Resources Corp.	152.8	179.2	73.1	55.7
Reserve Petroleum Co.	2.9	2.4	1.4	1.0
Royale Energy Inc.	2.5	7.4	(0.9)	0.7
Sabine Royalty Trust	12.9	18.0	12.3	17.4
San Juan Basin Royalty Trust	24.6	51.0	24.0	50.5
Seneca Resources Corp.[1]	92.6	88.7	19.8	25.8
Southwestern Energy Co.	284.7	226.7	51.0	58.4
Spindletop Oil & Gas Co.	1.4	1.6	0.2	0.5
St. Mary Land & Exploration Co.	221.1	194.4	40.0	50.5
Stone Energy Corp.	184.5	164.3	10.5	24.0
Sunoco Inc.	9,305.0	8,593.0	175.0	79.0
Swift Energy Co.	141.1	136.2	27.6	37.3
Tengasco Inc.	1.8	2.1	(0.2)	0.3
Teton Energy Corp.	1.1	0.4	(1.8)	(1.3)
Texas Vanguard Oil Co.	1.8	1.9	0.5	0.6
Toreador Resources Corp.	8.7	10.7	(8.8)	3.1
Tri-Valley Corp.	1.6	0.4	(2.3)	(3.1)
Ultra Petroleum	176.5	151.8	66.6	67.5
Unit Corp.	277.3	282.8	64.5	74.9
United Heritage Corp.[2]	0.3	0.2	(0.6)	(0.4)
Valero Energy Corp.	19,698.0	20,927.0	1,144.0	849.0
W&T Offshore Inc.	246.5	156.9	13.0	55.8
Warren Resources Inc.	11.0	9.8	0.5	0.9
Westside Energy Corp.	0.9	0.4	(2.5)	(1.5)
Whiting Petroleum Corp.	159.9	180.6	10.7	33.0
Williams Cos. Inc.	482.7	356.0	182.8	142.6
XTO Energy Inc.	1,169.0	1,215.0	383.0	467.0
Total	**257,907.4**	**274,329.9**	**24,979.8**	**25,596.8**

[1]2nd quarter. [2]3rd quarter. [3]1st quarter Jan. 31. [4]3rd quarter Dec. 31. [5]3rd quarter Jan. 31. [6]4th quarter Feb. 28.

the first quarter, up from $390 million in the first quarter of 2006. E&P net income was $2.3 billion, down from $2.55 billion a year earlier. The decrease from the first quarter of 2006 primarily was due to lower commodity prices, higher taxes, and higher operating costs.

ConocoPhillips said the decline in upstream earnings was partially offset by the current-year net benefit from asset rationalization efforts and higher production volumes. The increase in volumes reflected the inclusion of Burlington Resources Inc.'s results following the merger, partially offset by normal field decline and production cuts mandated by the Organization of Petroleum

Exporting Countries.

Service, supply firms

A group of service and supply companies had a combined 46% jump in first-quarter earnings from the first 3 months of 2006. Total revenues for this sample of 28 firms climbed 25%.

Almost all of these companies reported gains in earnings from a year ago, and none incurred a loss for the quarter.

Weatherford International Inc. reported a 39% gain in net income for the first quarter of 2007 to $281.6 million, the largest quarterly earnings in the company's history.

While the company improved on revenues in each geographical region in which it operates, the largest year-on-year increase in earnings for the first quarter was for its operations in the Middle East, North Africa, and Asia. First-quarter revenues of $395 million in this region were 44% higher than a year earlier but 4% lower than the preceding quarter.

Weatherford said this region's performance reflected sequential improvements in its wireline, reentry, drilling tools, and underbalanced service lines. But seasonal declines in completion, artificial lift, and other product shipments more than offset these increases.

Parker Drilling Co. posted net income of $30 million for the recent quarter, up from $11.5 million a year earlier.

The company said its deep-drilling barge day rates in the Gulf of Mexico reached record levels, averaging $51,600/day during the first quarter of this year, up 37% from a year earlier. The average utilization of Parker Drilling's land rigs outside the US for the first quarter of this year was 66%, down from 84% in the first quarter of last year.

BJ Services Co. reported a 7% decline in earnings for the quarter ended Mar. 31, 2007, as compared with the same 2006 quarter. Chairman and Chief Executive Officer Bill Stewart said the results did not meet the company's projections due to pricing declines in the US, lower activity and pricing declines in Canada, and project delays in its pressure pumping markets outside the US and Canada.

"In response to market softness in Canada, we have taken corrective action to reduce personnel to a level more reflective of expected drilling activity. We have also identified excess pressure pumping equipment in this market that is currently being deployed to select markets internationally," Stewart said.

Canadian companies

A sample of oil and gas producers, refiners, and transmission companies in Canada posted a combined 2.3% gain in earnings for the first quarter. These 15 firms' collective revenues climbed 3.7% from the first quarter of 2006.

Only three companies in this sample reported net losses for the quarter, while Canadian Natural Resources Ltd., Petro-Canada, and Talisman Energy Inc. posted surges in earnings from a year earlier.

Canadian Natural Resources recorded net income for the first quarter of $269 million (Can.), up from $57 million a year earlier as production of oil, gas, and natural gas liquids climbed.

The company reported that gas production was up from a year ago following a full quarter of additional gas production from the Anadarko Canada Corp. acquisition completed in November 2006, along with a successful gas drilling program during the winter.

EnCana Corp. posted reduced quarterly earnings year-on-year. Net income for the quarter ended Mar. 31, 2007,

SERVICE-SUPPLY COMPANIES' FIRST QUARTER 2007 REVENUES, EARNINGS

Table 2

	— Revenues —		– Net income –	
	1st quarter			
	2007	2006	2007	2006
	Million $			
Allis-Chalmers Energy Inc.	135.9	47.9	12.2	4.4
Baker Hughes Inc.	2,472.8	2,062.0	374.7	339.2
BJ Services Co.[1]	1,186.6	1,078.8	188.9	203.5
Cameron International Corp.	997.1	829.7	101.0	56.0
Core Laboratories	155.7	137.3	25.3	16.1
Diamond Offshore Drilling Inc.	608.2	447.7	224.2	145.3
Foster Wheeler Ltd.	1,152.1	645.8	114.8	14.6
Global Industries Ltd.	277.0	246.3	54.5	18.8
GlobalSantaFe Corp.	903.5	679.4	347.4	162.9
Grant Prideco Inc.	496.5	414.4	131.5	92.4
Grey Wolf Inc.	242.0	222.9	58.6	54.2
Halliburton Co.	3,422.0	2,938.0	552.0	488.0
Helmerich & Payne Inc.	373.6	293.3	106.9	64.6
Hornbeck Offshore Services Inc.	68.1	61.1	17.5	14.9
Lone Star Technologies Inc.	311.0	350.9	9.2	41.3
Nabors Industries Inc.	1,301.8	1,182.2	262.2	256.8
Noble Corp.	646.4	461.9	250.3	145.2
Oceaneering International Inc.	344.0	289.5	33.2	25.5
Parker Drilling Co.	151.3	147.3	30.0	11.5
Patterson-UTI Energy Inc.	547.5	600.1	115.8	159.3
Pride International	712.0	566.9	101.7	70.5
Rowan Cos. Inc.	467.7	308.1	86.4	59.1
RPC Inc.	171.0	136.0	28.0	24.9
Schlumberger Ltd.	5,464.4	4,239.0	1,180.8	722.5
Smith International Inc.	2,107.7	1,682.1	160.2	107.2
Superior Energy Services Inc.	362.9	222.5	64.0	32.2
Transocean Inc.	1,328.0	817.0	553.0	206.0
Weatherford International Inc.	1,852.3	1,536.0	281.6	203.3
Total	**28,259.1**	**22,644.1**	**5,465.9**	**3,740.2**

[1]2nd quarter.

CANADIAN OIL AND GAS FIRMS' FIRST QUARTER 2007 REVENUES, EARNINGS

Table 3

	— Revenues —		— Net income —	
	1st quarter			
	2007	2006	2007	2006
	Million $ (Can.)			
Bow Valley Energy Ltd.	6.9	7.8	(8.4)	0.7
Canadian Natural Resources Ltd.	3,118.0	2,668.0	269.0	57.0
Enbridge Inc.	3,358.2	3,346.7	228.7	192.6
EnCana Corp.	5,114.7	5,502.1	573.0	1,699.5
Gentry Resources Ltd.	15.7	17.7	0.2	1.9
Heritage Oil Corp.	1.3	2.4	(9.2)	(0.5)
Husky Energy Inc.	3,244.0	3,104.0	650.0	524.0
Imperial Oil Ltd.	5,934.0	5,818.0	774.0	591.0
Ivanhoe Energy Inc.	10.7	11.3	(7.5)	(6.2)
Nexen Inc.	1,388.0	1,406.0	121.0	(83.0)
Penn West Energy Trust	582.4	433.9	96.3	144.4
Petro-Canada	4,841.0	4,188.0	590.0	206.0
Suncor Energy Inc.	3,951.0	3,858.0	551.0	713.0
Talisman Energy Inc.	1,948.0	2,227.0	520.0	197.0
TransCanada Corp.	2,249.0	1,894.0	265.0	273.0
Total	**35,762.9**	**34,484.9**	**4,613.1**	**4,510.4**

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was $497 million, down from $1.47 billion a year earlier. Earnings were hurt by a $423 million unrealized after-tax loss due to mark-to-market accounting of commodity price hedges.

EnCana created an integrated oil sands enterprise with ConocoPhillips composed of two businesses, one upstream and one downstream. This equal partnership became effective Jan. 2, 2007 (OGJ, Nov. 20, 2006, p. 36).

Also during the first quarter, EnCana completed the sale of its Chad assets for about $203 million, resulting in a $59 million gain. ✦

Themes emerge as Congress works on separate energy bills

Nick Snow
Washington Correspondent

Legislative activity at the US Capitol on June 13 centered on the full Senate's debate of the Democratic leadership's energy legislation and the House Natural Resource Committee's approval by 26 to 22 votes of a bill with several provisions that directly affect oil and gas producers and federal regulators.

Republicans at each end of the Capitol said Democrats' energy proposals would do nothing to increase domestic supplies. Democrats responded that it was more important to increase incentives for fossil fuel alternatives than to continue what some members consider giveaways to the oil and gas industry.

The bill, HR 2337, which will be reported to the House floor with a favorable recommendation, would preserve the 2005 Energy Policy Act's (EPACT) requirement for BLM to complete onshore drilling permit requests, but it would extend the deadline to 90 from 30 days. Chairman Nick J. Rahall (D-W.Va.) supported the change, which emerged during the first day of markup on June 6 (see related story, p. 27).

Critics speak out

Groups representing domestic oil and gas producers immediately criticized the bill that emerged. "One has to wonder why members of Congress would vote for legislation that will decrease domestic supplies of oil and gas at a time when consumers are already suffering from high prices," said Marc W. Smith, executive director of the Independent Petroleum Association of Mountain States in Denver.

"At a time when American consumers are bracing for record-high summer energy costs, why is Congress passing legislation that will ultimately increase their financial hardships by strangling American energy supplies?" questioned Barry Russell, president of the Independent Petroleum Association of America in Washington, DC. "There are still members of Congress who fail to recognize that energy legislation designed to limit American access to American energy will ultimately deplete supplies and boost consumer energy prices."

Efforts to substantially change the bill failed. The main attempt was an amendment by Rep. Stevan Pearce (R-NM) to strike all of Titles I and II, which contain most of the oil and gas provisions and which Rahall called "a killer amendment" that "would kill the entire bill." It was defeated by 27 to 21 votes.

More-specific amendments also did not pass. The committee rejected one by Rep. Bill Sali (R-Idaho) to strike Titles I and II if the US Energy Secretary determines that they would increase domestic energy prices by 25 to 17 votes. It also defeated, by 26 to 22 votes, a proposal by Rep. Chris Cannon (R-Utah) to delete Section 104 of HR 2337, which would repeal EPACT's provision dealing with federal oil shale and tar sand resource leasing and development.

"The potential for oil shale development in Utah to vastly decrease our dependence on foreign oil makes this bill not only bad policy, but bad for national security. Environmental hysteria never lit one light bulb or heated one home, and with [gasoline] prices at more than $3/gal, now is not the time to be turning off the spigots from promising resources," Cannon said in a June 13 statement.

House Republican leaders beyond the committee leveled a broadside against the bill on June 12. The new House Energy Action Team (HEAT), working through the office of Minority Whip Roy Blunt (R-Mo.), said that HR 2337's provisions would discourage development of domestic resources and increase reliance on imports.

Senate activity

In the Senate, debate continued on the legislative package which Democratic leaders announced on May 23. The bill aims to make oil product price manipulation a federal crime, mandate more efficient government offices and motor fleets, increase biofuel supplies, and bring other alternative fuels to market more quickly.

Discussion quickly centered on an amendment proposed by Sen. James Inhofe (R-Okla.) to provide additional incentives to build new US refineries, which he said the Democrats have failed to address. "Americans are starving for affordable energy, and the majority's bill tells them to go on a diet," he said on June 12.

Sen. Barbara Boxer (D-Calif.), who succeeded Inhofe as chair of the Environment and Public Works Committee following the 2006 election, immediately called his proposal "a total taxpayer giveaway to the oil industry." She said, "It would short-cut many environmental laws which protect our families." Not one oil company has opened a new US refinery since EPACT and its incentives became law, she said.

Other Republicans expressed support for Inhofe's amendment as debate continued on June 13. Mel Martinez of Florida said that the overall bill does

WATCHING GOVERNMENT

Nick Snow, Washington Correspondent

Hot gasoline fuels hearing

When US Rep. Dennis J. Kucinich (D-Ohio), who chairs the House Oversight and Government Reform Committee's Domestic Policy Subcommittee, announced that he would hold a hearing on gasoline prices, I was skeptical. The event would follow gasoline price hearings by two other House committees. I thought Kucinich and the subcommittee's staff couldn't add anything new.

I was wrong. They could, and they did.

The June 8 hearing's title—Hot Fuel: Big Oil's Double Standard for Measuring Gasoline—came from a staff report which predicted that US consumers will pay a premium of approximately $1.5 billion on gasoline this summer.

Warmer temperatures make gasoline expand by volume but not by weight. Since the 1920s, the oil industry has considered this and used a 60° F. standard to measure wholesale gasoline transactions.

"But the oil industry does not adjust for temperature in retail sales to customers. As a result, consumers pay a premium when temperatures exceed 60°, as they do during the summer," the report said. Assuming that thermal expansion will amount to 513.8 million gal this summer, the report arrived at the $1.5 billion estimate.

Used in Canada

"Existing technology can adjust for thermal expansion at the retail level with a technology known as automatic temperature compensation, or ATC. It's already being used in Canada, but not in the United States, where summer temperatures are higher," Kucinich said.

He said the National Conference on Weights and Measures will consider, at its annual meeting in July, a resolution to encourage gasoline retailers to install ATC devices. The conference's chairman, Mike Cleary of the California Department of Food and Agriculture, testified that a model law for states to consider will be discussed.

Cleary said he has not taken a position on the issue but has established a steering committee to study technical questions raised by gasoline's thermal expansion at the retail level "as I believe this work will need to be done regardless of the vote in July."

Industry responses

Oil industry groups questioned whether this is necessary. "There's already a vast organizational structure nationally and in each state to assure every consumer gets a fair measurement of any product," said Prentiss Searles, a downstream marketing associate at the American Petroleum Institute, during a June 11 teleconference.

At the hearing, R. Timothy Columbus, general counsel for the National Association of Convenience Stores and the Society of Independent Gasoline Marketers of America, said retrofits would cost each retailer an average $8,000.

"This dispute has virtually nothing to do with the integrated oil companies. These companies own, much less than operate, less than 10% of the retail outlets in this country. This is all about independent retailers," Columbus said.

US Rep. Darrell E. Issa (R-Calif.), the subcommittee's chief minority member, was much more critical. He called the proceedings "political theater" and a "farce of a hearing." ✦

nothing to remove barriers to building new oil refineries in the US. "We have not built a new one in this country for over 30 years because of burdensome regulations," he said, adding that the bill's attempt to make gasoline price manipulation a federal crime also is misguided.

"The price at the pump is affected by both a lack of refining capacity and a surplus of regulations on the fuels that are produced," said Mike Enzi of Wyoming. "Unless we get rid of this refinery constriction, we're going to face gasoline shortages twice a year, starting immediately."

But Maria Cantwell (D-Wash.), who has led efforts on the Senate side to make oil market manipulation a federal crime, agreed with Boxer that Inhofe's amendment would throw out important environmental requirements. Besides, said Cantwell, progress on increasing motor fuel production capacity is being made because in the last 4 years, 40 new alternative plants have been built or are awaiting permits.

The Senate defeated Inhofe's amendment by 52 to 43 votes at midday June 13. It then turned its attention to a proposal by Energy and Natural Resources Committee Chairman Jeff Bingaman (R-NM) to require electric utilities to get at least 15% of the power they sell from renewable sources by 2020.

Among other benefits, said Bingaman, this would reduce pressure on natural gas to generate electricity and reduce gas prices in the process. ✦

Energy reform bill approved by US House committee

Nick Snow
Washington Correspondent

On June 13 the US House Natural Resources Committee approved HR 2337, the energy reform bill proposed by NRC Chairman Nick J. Rahall (D-W.Va.), after less than a week of markup sessions. NRC members began the measure's markup on June 7 and expectations were at the time for a long, drawn-out session.

On June 8, NRC members returned the second day to consider minority amendments that would strike major portions of the measure after debating relatively minor changes the first day.

The bill arrived at markup with Rahall's own massive amendment, which he said was designed to address concerns raised following HR 2337's introduction on May 16.

Rahall's amendments

Among provisions involving oil and gas, Rahall's amendment substituted a $1,700 onshore drilling permit processing fee that the administration of President George W. Bush had proposed, but that the 2005 Energy Policy Act (EPACT) had removed. HR 2337 originally did not specify an amount.

Instead of completely repealing categorical exclusions from the National Environmental Policy Act for some oil and gas activities that EPACT authorized, the amended bill allowed this if it followed guidelines set by the Western Governors Association to protect

API lists concerns about House, Senate energy bills

Nick Snow
Washington Correspondent

American Petroleum Institute officials expressed concern that provisions before the 110th US Congress could effectively reduce available oil and gas supplies and harm US consumers.

"In a nutshell, I'm worried that much of the possible legislation simply could repeat the mistakes of the 1970s and '80s," chief economist Jon C. Felmy told reporters in a June 11 teleconference that included other officials from API's upstream, downstream, and tax departments.

Specifically, Felmy said calls to increase taxes on oil companies in a manner similar to the Windfall Profit Tax of the early 1980s would lower domestic production and move investments overseas. Felmy also criticized bills aimed at combating alleged price-gouging, which he characterized as vaguely written, indirect reintroductions of price controls. He also questioned efforts to dramatically increase alternative fuel development mandates.

His remarks came at the beginning of a week in which the full Senate is scheduled to consider a major energy legislation package and the House Natural Resources Committee concludes its markup of a bill that would effectively repeal parts of the 2005 Energy Policy Act (EPACT) and impose restrictions on produced water management, royalty in-kind payments, and other activities.

"Most of the proposals we see have the unintended consequence of reducing supplies and hurting consumers," Felmy said.

Mark Kibbe, API senior tax policy analyst, urged caution in reconsidering incentives in EPACT that were designed to increase domestic production and refining capacity. Efforts to repeal Section 199 of that law could raise $7-12 billion in revenues for the US Treasury Department but would have the equivalent effect of a 3% increase in the corporate tax rate for oil producers, he said.

As for calls in the House to accept a proposal from the administration of President George W. Bush for onshore producers to pay $1,700 for each drilling permit application that the US Bureau of Land Management processes, Doug Morris, API upstream group director, said, "Any additional fees imposed on drilling would have a negative effect on production."

Felmy added, "The costs of investing in the United States have increased dramatically to around $40/bbl to produce oil from an offshore well."

API officials also warned that mandating goals for specific fuel alternatives could cost consumers money. "We support a realistic alternative fuels standard with periodic economic and technology reviews, and possible preemption of often confusing and contradictory state mandates," said Bob Greco, API downstream group director.

In response to a question about adding clean coal and oil shale to technology development incentives, Felmy said, "We feel there's a role for all technologies going forward. Coal-to-liquids technology has been around for decades, but it deserves consideration equal to cellulosic ethanol. The devil is in the details on how much to spend on each of these technologies."

But the officials' main concern apparently was preserving incentives contained in EPACT. "Let's not step backward from good energy policies of 2 years ago," Felmy said.

wildlife habitat and migration corridors in developed fields. It also contained a clarification that oil and gas activities exempted from environmental review by categorical exclusions follow Council for Environmental Quality regulations.

Rahall's amendment also proposed changing the original bill's produced water provision requiring replacement of water resources from federal lands by specifying "replacement or remediation" instead. This would give operators more flexibility in addressing water concerns, Rahall said. The amendment also would require lessees to submit a water management plan with their drilling permit applications instead of when the US Bureau of Land Management issues a lease, as specified in the original bill.

The amendment's biggest single change was an apparently complete rewrite of the bill's section dealing with wind energy. Minor changes also were proposed in the energy corridor, solar, and renewable energy provisions.

Left unchanged were sections that would repeal oil shale lease development authorized by EPACT, limit oil royalty in-kind payments to refilling the Strategic Petroleum Reserve, require the US Minerals Management Service to conduct at least 550 audits yearly by 2009, significantly increase surface landholders' rights and compensation in split-estate situations on federal leases, and raise onshore oil and gas reclamation fees and bonds.

The original bill and Rahall's amendment both aimed to roll back EPACT's requirement that BLM issued decisions on onshore drilling permit applications within 30 days. In the single bit of business directly involving oil and gas during the first day of HR 2337's markup, however, the committee adopted by voice vote an amendment by Rep. Jim Costa (D-Calif.) to keep the requirement but extend BLM's response deadline to 90 days.

Following approval by the committee, the only significant change to the Rahall amendment affecting oil and gas was the preservation of the requirement for the US BLM to meet a deadline on processing onshore drilling permit applications. This was extended to 90 from 30 days.

The provision imposing the Bush administration's proposed $1,700/permit processing fee on producers remained intact as did the provision delaying implementation of EPACT's oil shale leasing provision.

Critical responses

Republican committee members expressed their displeasure with the bill in their opening statements during the first day of markup.

"Not only does it negatively affect the oil and natural gas production that is occurring on less than 1% of the lands owned by the American people, it hurts some of our best alternatives like wind power. It hurts other alternative energies by heaping more government red tape on top of the piles that already exist," said Chief Minority Member Don Young (R-Alas.).

"We can see that energy prices are already high and headed higher," said Stevan Pearce (R-NM). "The projections show 20-30% increases in energy costs related to natural gas. These rising costs drive $22 billion projects right out of America, costing us jobs and other opportunities for economic development," he said.

The committee's minority also distributed letters from the American Petroleum Institute, the National Association of Manufacturers, the American Chemistry Council, and the US Chamber of Commerce opposing oil and gas and other provisions in the bill. It also presented a 15-page letter from Deputy US Sec. of the Interior P. Lynn Scarlet recommending deletions or amendments.

Some Democrats on the committee also remained critical. Noting that Rahall's amendment contained some important changes, Dan Boren (Okla.) said, "I know that we can't drill our way out of higher energy costs, but we should use the resources we have. This bill would slow that process down."

Others were complimentary. "This bill will be part of a larger energy package that will include other bills before it reaches the floor," said George Miller (Calif.). "But it considers climate impacts, something that has never happened before in energy legislation before this committee. That's an important change," he said.

Neil Abercrombie (Ha.) said, "We're working today as we received news that Turkish troops moved into northern Iraq in what that government said was a minor action. I find it hard to believe that invading another country is ever minor, and can only wonder what this will do to oil prices."

Rahall reiterated that federal energy reforms are needed. "It makes no sense that the American taxpayer foots the bill for processing drilling permit applications. It makes no sense that Americans don't get their fair share of revenues from resources produced from public lands," he maintained. ✦

ACCF: Price-gouging legislation could be costly

Paula Dittrick
Senior Staff Writer

Legislation calling for price controls on gasoline could have counterproductive and costly consequences if passed by US Congress, a spokeswoman for the American Council for Capital Formation told reporters in Houston June 13.

"If price controls like current legislative proposals had been in effect in 2005 during Hurricanes Katrina and Rita, losses to households and business would have totaled $1.9 billion," said Margo Thorning, ACCF senior vice-pres-

ident and chief economist.

Thorning cited the results of an ACCF-commissioned study entitled "Potential Effects of Proposed Price-gouging Legislation on the Cost and Severity of Supply Interruptions." Consultant CRA International Inc. of Washington, DC, prepared that study.

Thorning said price controls on refined products discourage refining expansion and discourage energy investment. Several pieces of legislation are being discussed on the subject of price-gouging. A US House bill proposed by Rep. Bart Stupak (D-Mich.) would make "price-gouging" a criminal offense.

Stupak's bill outlines that during an emergency declared by the US president, it would be illegal for anyone to sell oil products at a price that was "unconscionably excessive" and that indicated the seller was "taking unfair advantage of the circumstances related to an energy emergency to increase prices unreasonably" (OGJ, June 4, 2007, p. 28.)

In the US Senate, Sen. Maria Cantwell (D-Wash.) added a price-gouging amendment to legislation that would raise Corporate Average Fuel Economy (OGJ, May 14, 2007, p. 27.)

Hurricane scenarios

Thorning said price controls are likely to exacerbate potential gasoline shortages during hurricanes. The CRA study reported how estimated total welfare loss from imposing price controls would have totaled $1.9 billion for September-October 2005.

"Additionally, under price controls, losses would have been much more localized in the regions that lost supplies, like Louisiana and Mississippi because there would have been no incentive to increase imports (of either crude oil or refined products)," the report said.

Thorning said price controls can worsen shortages by reducing supplies available to consumers. In addition, the overall post-crisis economic losses increase when consumers find themselves waiting in long lines for gasoline instead of working, she said.

"Imposing criminal charges for price increases would discourage suppliers from seeking replacement supplies (which might cost more), therefore limiting consumers' access to gasoline supply," Thorning said.

The expectation of price controls tends to discourage US refinery investment, resulting in tight capacity at all times, she added.

"This type of legislation will have exactly the opposite effect that was intended," Thorning said. "This type of legislation will tend to make supply shrink."

She cited gasoline price controls of the 1970-80s, noting that those controls did not work. Instead, she believes

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Sea terrorists threaten oil

Even as increased demand strains supplies of crude oil and natural gas around the world, seaborne terrorism continues to pose a major threat of disruption to international deliveries.

Consider again the threat to the Straits of Malacca, which—according to Malaysia's police chief—remains vulnerable to a terrorist strike that would send political and economic shock waves worldwide.

At an ocean security conference last week, Inspector General of Police Musa Hassan told law and shipping officials from more than 30 countries that militants could storm a ship, hijack one carrying hazardous material, or use a vessel as a weapon to hit port and land facilities.

Maritime terrorism is a "threat which is real and possible that is lurking in the straits," Musa said. "The straits must be kept open and safe, and the prime responsibility is with the three littoral states of Indonesia, Malaysia, and Singapore."

Continued fears

Musa said there are continued fears that terrorists could try to commandeer a ship transporting LPG for a suicide mission and that an attack in the straits could cut the oil supply chain from Middle Eastern producers to East Asian consumers.

"The use of a ship as a weapon in the manner of the [Sept. 11, 2001] attacks is a troubling scenario," Musa said. "It would mean rerouting the vessels, which would lead to the skyrocketing of freight and insurance rates and which will lead to a devastating global economic impact."

Is he talking through his hat? While pirate attacks may be down, terrorist attacks come out of the blue, and the world's waterways are vulnerable. Even the highly vaunted US Navy cannot single-handedly protect them—even if other nations agreed.

That's the view of the US Navy admiral, nominated by President George W. Bush to serve as chairman of the Joint Chiefs of Staff, who has called for the creation of global naval partnerships to deal with emerging threats around the world.

Naval alliance

With many of the US Navy's 276 ships tied up in Afghanistan and Iraq, Adm. Michael Mullen said the US cannot unilaterally secure international seaways and that the Navy faces a "very challenging time."

He has suggested a 1,000-ship naval alliance with US allies that would be based in ports around the world to respond to crises, saying, "Nobody can do it alone."

Against that view is the attitude of Rear Adm. Agus Suhartono, chief of Indonesia's naval western fleet, who says authorities have no specific information of any terrorist plot targeting the Straits of Malacca.

As a result, he and others like him decline to consider the need for any international naval alliance to protect the straits. Such attitudes may do much to serve nationalistic pride, but they afford very little solace to the world economy as represented by the 200 or so ships that hazard the ill-protected waterway each day. ✦

that existing laws already prevent market manipulation by refiners.

The Federal Trade Commission has investigated gasoline market performance during numerous supply interruptions, including the Katrina disruption. FTC never has concluded market manipulation was behind any gasoline price increase. ✦

BP: World oil demand growth rate weakened in 2006

Uchenna Izundu
International Editor

Global demand for oil in 2006 saw its weakest growth rate since 2001, at 0.7% or half the average for the past decade, according to BP PLC's Statistical Review of World Energy 2007, released by the company June 12.

The main factor behind the slowdown, the report said, was that oil consumption of Organization for Economic Cooperation and Development member countries fell by 400,000 b/d in 2006—the first decline in more than 20 years, due largely to high oil prices.

Global oil production increased by 0.4% to 81.7 million b/d, but weak oil demand meant that the Organization of Petroleum Exporting Countries reduced production late in 2006 for the first time in nearly 2 years. "For the year as a whole, OPEC increased its production by an average 130,000 b/d to 34.2 million b/d," BP said.

Russia, Azerbaijan, and Canada produced the most oil outside of OPEC members. Russia alone increased oil production by an additional 200,000 b/d. Outside of OPEC, output was up some 300,000 b/d in 2006, though this rise was less than half the 10-year average. Oil production fell in the UK for the seventh year consecutively and in the US for the sixth year in a row.

However, global natural gas consumption increased by 2.5% in 2006,

driven by demand growth in Russia and China. BP's review showed that gas demand fell in the US and Europe. Europe experienced high prices and warmer-than-normal weather. "Russian gas demand, almost as large as the total consumed by the whole Asia-Pacific region, increased by some 7% in 2006, accounting for 40% of the global increase," BP said.

China consumed 55.6 billion cu m of gas in 2006, which was a 20% rise on 2005. Russia was an important gas producer in 2006 and contributed to the 3% rise in global gas production. The US also staged a recovery following the severe hurricane damage in 2005.

For the second year in a row, world energy growth slowed, rising by 2.4%, down from 3.2% in 2005. BP attributed the trend to high energy prices. ✦

CSB blames unsafe work practices for oil field blast

Nick Snow
Washington Correspondent

Unsafe work practices caused a 2006 fire and explosion in a Mississippi oil field that killed four employees of a contractor and seriously injured a fifth employee, the US Chemical Safety Board concluded in a recently released investigation.

CSB recommended that the Occupational Safety and Health Administration increase inspections of the region's oil and gas production facilities. CSB's report also called on the Mississippi Oil and Gas Board (MOGB) to identify—and refer to OSHA—any potentially unsafe health and safety conditions observed during inspections of well sites and drilling operations.

The four employees worked for Stringer's Oilfield Services and were completing piping connections between tanks in the Partridge-Raleigh oil field on June 5, 2006, when welding sparks ignited vapor that was venting from one of the tanks, CSB said.

It said two workers and a foreman had climbed on top of the tanks and placed a ladder between two of the tanks to serve as a makeshift scaffold. A welder attached his safety harness to the top of one of the tanks and positioned himself on a ladder so he could connect piping to both tanks. To do this, he had to weld a pipe-fitting onto one tank's side before attaching a short length of pipe to the fitting and to a nearby, open-ended pipe on an adjacent tank.

Flammable hydrocarbon vapor venting through the open-ended pipe ignited almost immediately, according to the report. The fire flashed back into the tanks, creating internal pressure which caused their tops to blow off. The explosion killed the workers and foreman, while the worker's safety harness saved his life, it indicated.

Unsafe practices

CSB cited using the ladder as a makeshift scaffolding and not capping the open pipe before welding as unsafe work practices and the causes of the accident.

It also criticized the welder's inserting a lit oxy-acetylene torch into the tank's hatch and then into an open nozzle on the tank's opposite side as unsafe, although this did not cause the accident. A flammable gas detector should be used instead, the report said.

"While recognized to be dangerous, this practice is common in oil field operations and even has a name—flashing," said lead investigator Johnnie Banks. He said neither the contractor nor the oil field operator required hot-work permits to perform welding on the tanks.

CSB found that Stringer's lacked hot-work safety procedures and did not implement guidelines from American Petroleum Institute Standard 2009, "Safe Welding, Cutting, and Hot-Work Practices in the Petroleum and Petrochemical Industries," in preparing and conducting welding on the day of the accident.

Stringer's and Partridge-Raleigh also did not adhere to OSHA requirements addressing safe welding practices, CSB said. It recommended that the two companies implement such practices immediately.

CSB also urged MOGB to establish a program to identify and report unsafe oil field practices to OSHA, and called on OSHA's office in Jackson, Miss., to implement a local emphasis program to inspect oil and gas extraction operations.

OSHA had not inspected Partridge-Raleigh or Stringer's for 3 years before the accident or conducted planned inspections of any of Mississippi's nearly 6,000 oil fields in the preceding 5 years, although inspections did occur following accidents or employee complaints, according to CSB. It added that following the explosion, OSHA cited Stringer's for 13 serious safety violations. ✦

BLM authorizes natural gas wells on Colorado's Roan Plateau

Paula Dittrick
Senior Staff Writer

The US Bureau of Land Management authorized the drilling of as many as 1,570 natural gas wells over 20 years on part of the Roan Plateau in western Colorado. The area involves federal land within the Piceance basin.

BLM indicated it probably will be at least 6 months before any leases are offered.

The decision issued by the Glenwood Springs, Colo., BLM field office covers 70% of the 73,602 acres of the Roan. A final decision on the remaining 30%, which includes scenic and environmentally sensitive areas, is expected later this year following conclusion of a public comment period.

A 1997 law transferred much of the Roan Plateau from the former Naval Oil Shale Reserve to the US Department of Energy. The transfer act directed BLM to lease the area for petroleum resource development and to complete a resource management plan.

The act did not make a distinction between lands on top or below the plateau, BLM said on its web site. Much debate about oil and gas development there has focused on protecting the top, but some critical wildlife habitat is found below the rim.

Currently, there is no drilling on BLM-administered lands on top of Roan Plateau. As of August 2006, 31 wells existed on private lands on top of the plateau. Within the 53,805 acres of the Roan Plateau planning area on top of the plateau, more than 19,000 acres are private lands, BLM statistics said.

Environmentalist groups oppose oil and gas drilling on top of the plateau. Steve Smith, regional director for the Four Corners States office of the Wilderness Society, suggested BLM should have worked longer with Colorado state officials before making a decision.

"There is no rush to lease the Roan Plateau given the large number of leases already controlled by the oil and gas companies and the many additional BLM acres in Colorado available for leasing," Smith said.

Jamie Connell, Glenwood Springs BLM field manager, said the plan was developed with significant help from cooperating agencies, including the Colorado Department of Natural Resources (CDNR), Garfield and Rio Blanco counties, and the towns of Parachute, Glenwood Springs, and Rifle.

"The innovative approach we are taking for tightly controlled energy development on top of the plateau comes from a proposal submitted by [CDNR]," Connell said.

The decision authorizes a highly restrictive approach to oil and gas development on top of the plateau, Connell said. Development there will be conducted in a staged, ridge-by-ridge approach, with well pads no closer than one-half mile apart. Surface disturbance on top is limited to 1% of the total acres at any one time. ✦

WCSB STRUCTURAL DOMAINS—3

Six domains characterize W. Canada structured belt

J.H.N. Wennekers
Consulting Geologist
Calgary

This is the third of four parts on the formation of the structured belt in western Canada that encompasses the Rocky Mountains, Foothills, and the western structured portion of the Plains of Western Alberta and Northeast British Columbia.

Many geoscientists accept that multiple-thrust structures are formed by one thrust having been overridden by a younger one. Detailed structural analyses demonstrate the reverse to be true.

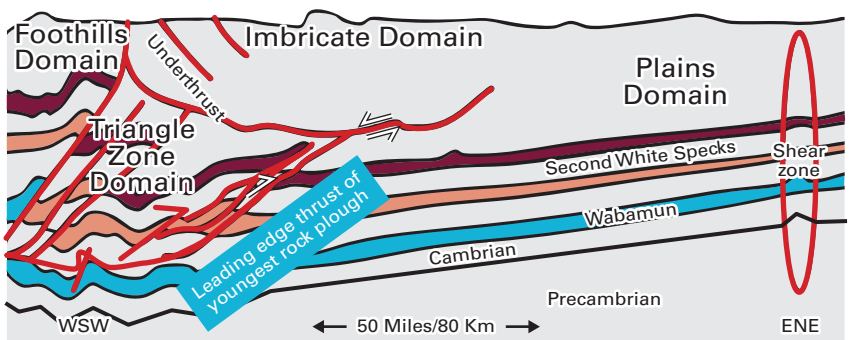
Exploration/structural domains

Regional surface and subsurface data and seismic sections define six exploration/structural domains (Figs. 6 and 7). These domains are distinctly different in structural style.

The domains are, from W to E, the Thrust (divided in the Main Range, Front Range, and Foothills), Tri-

FROZEN FINAL EAST ADVANCE OF THRUST BELT

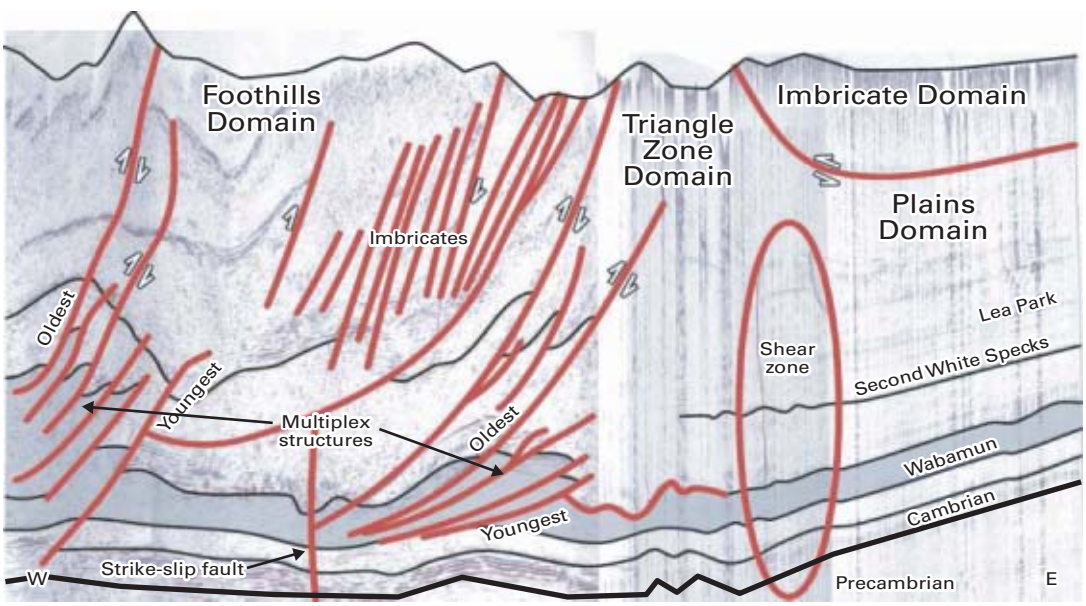
ST 1



See Fig. 6 for location.

LARGE COMPLEX MULTIPLEX THRUSTS WEST OF TRIANGLE ZONE VERSUS UNDISTURBED STRATA TO EAST

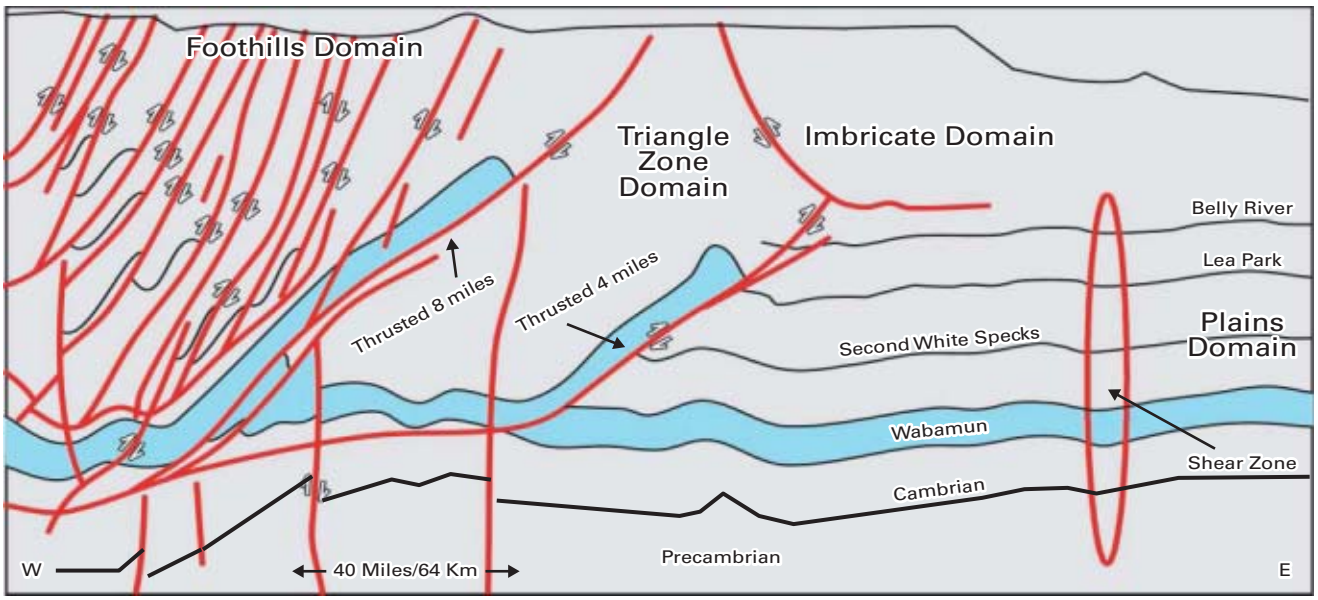
ST 2



See Fig. 6 for location.
Source: Olympic Seismic Inc.

MAGNIFICENT SET OF NORTH-STRIKING LEADING EDGE THRUSTS WITH COMBINED 12 MILES' SHORTENING

ST 3

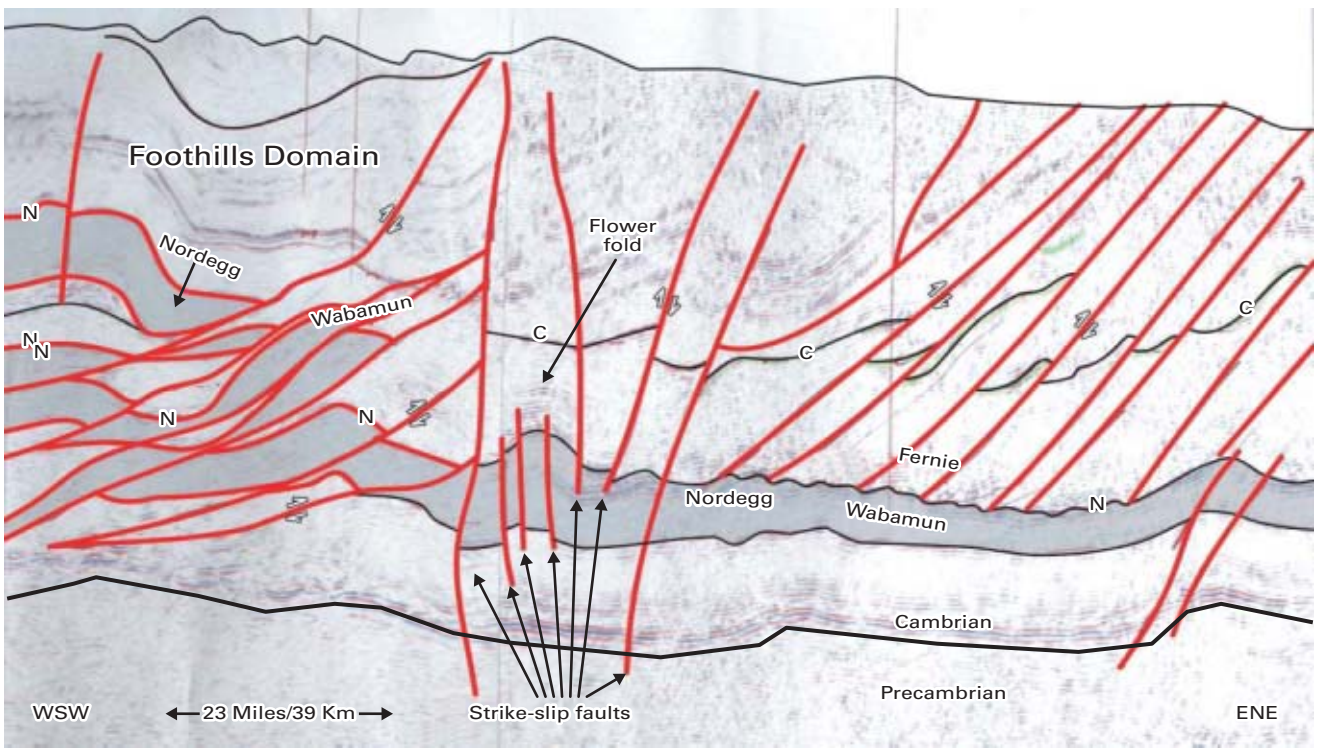


See Fig. 6 for location.
Source: Olympic Seismic Inc.

angle Zone, Imbricate, Strike-Slip, and Plains domains. Then in the north is the Liard/Mackenzie Gravity Slide Fold Belt. Seismic transects ST 1-15 support the definition of these domains and are included in this part of the article. Each domain is described briefly in the following section and in greater detail in Part 4.

MANY PALEOZOIC CARBONATE REPEATS WEST OF STRIKE-SLIP FAULTS AND NUMEROUS MESOZOIC SILICICLASTIC REPEATS TO EAST

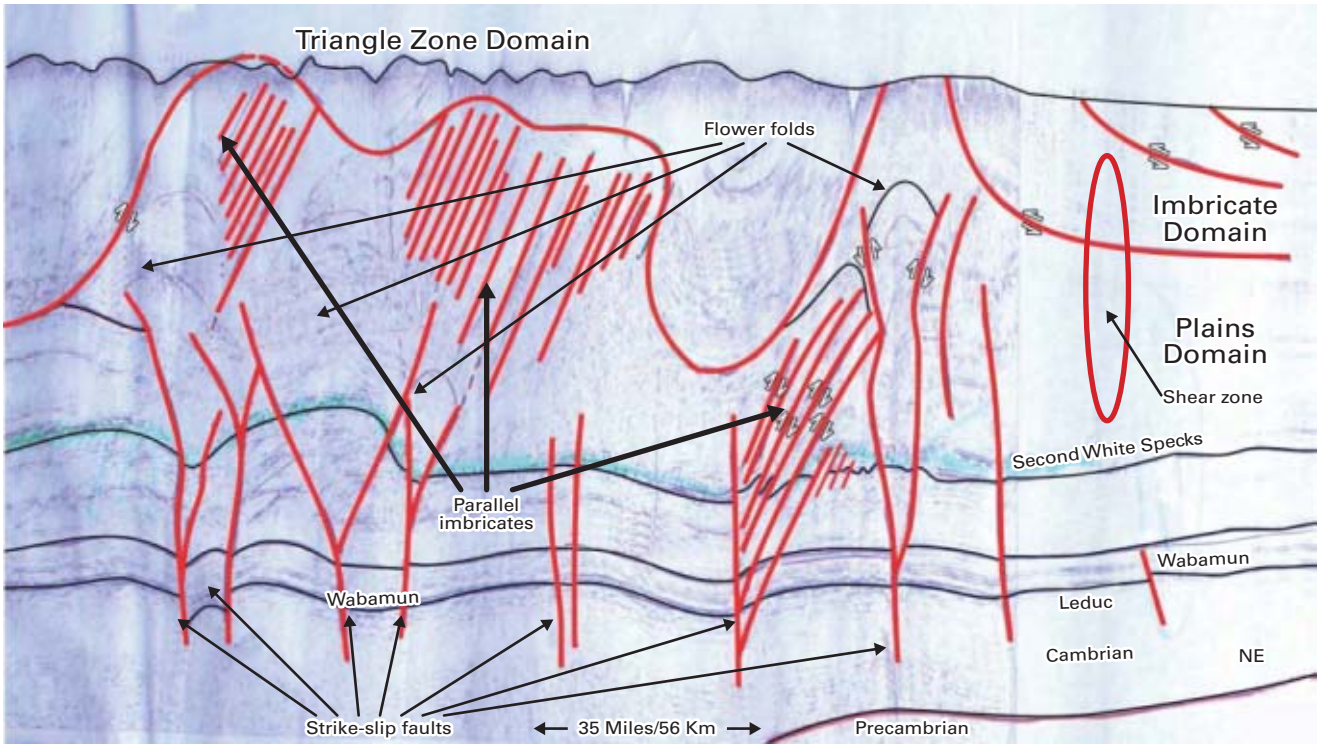
ST 4



See Fig. 6 for location. N = Nordegg; C = Cardston.
Source: Olympic Seismic Inc.

NUMEROUS FLOWER FOLDS IN TRIANGLE ZONE AND COMPLEX MULTIPLE STRIKE-SLIP FAULT OVERPRINTS

ST 5



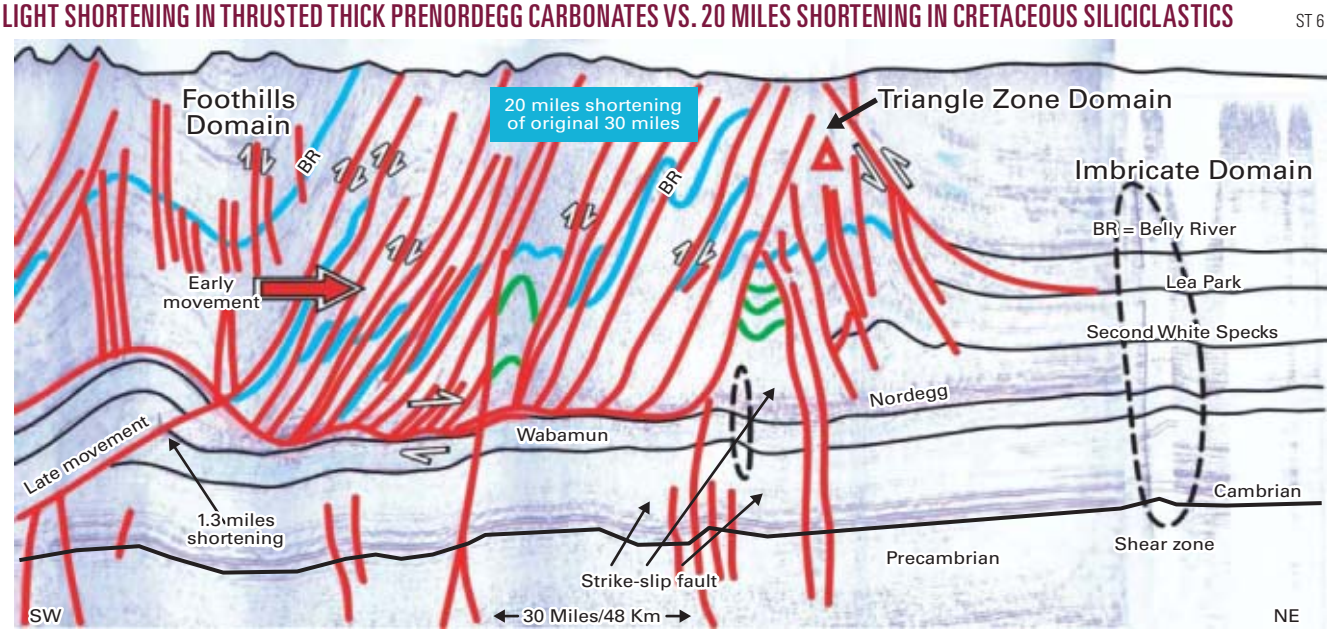
See Fig. 6 for location.
Source: Olympic Seismic Inc.

The Liard/Mackenzie Gravity Slide Fold Belt is a massive Laramide regional gravity slide. It is characterized by a series of long (100+ miles) and narrow anticlines and broad synclines, in places disrupted by strike-slip faulting.

The Thrust Domain is characterized by multitudes of updip, E-directed large and small shingled thrusts/imbricates

SLIGHT SHORTENING IN THRUSTED THICK PRENORDEGG CARBONATES VS. 20 MILES SHORTENING IN CRETACEOUS SILICICLASTICS

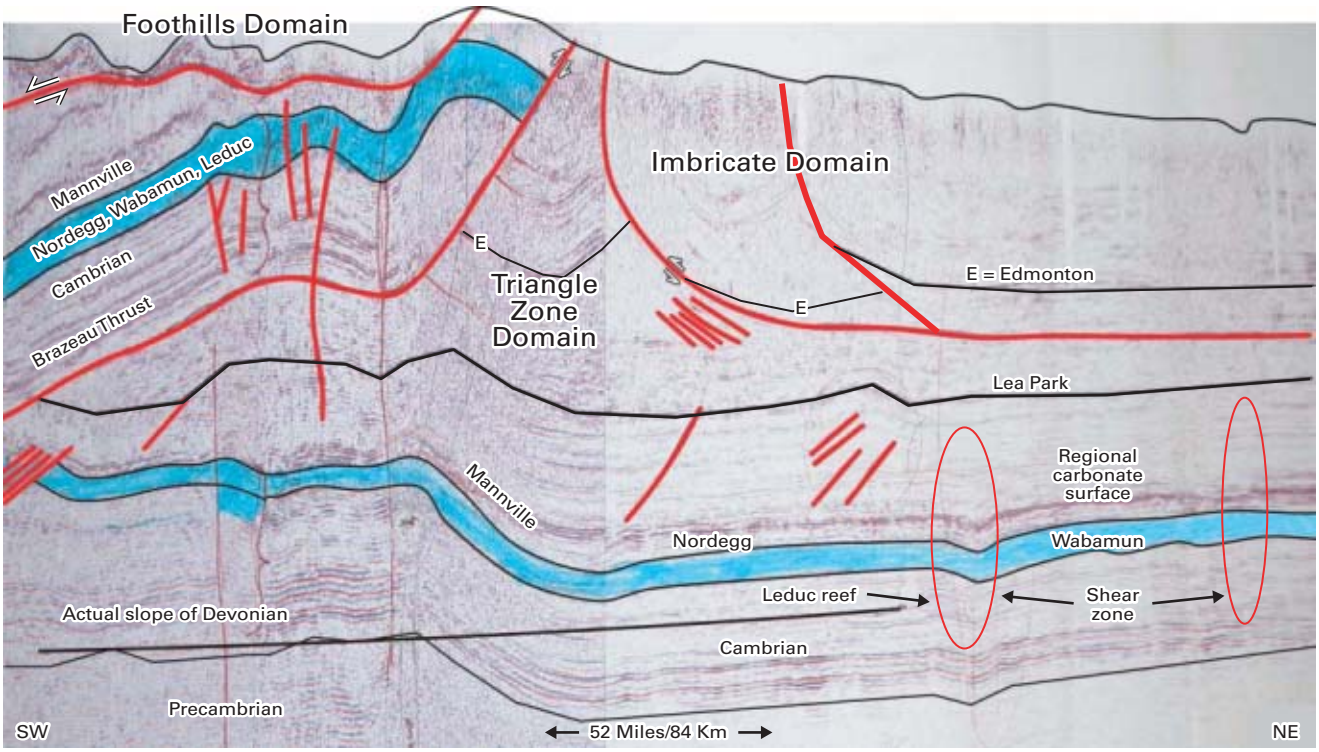
ST 6



See Fig. 6 for location.
Source: Olympic Seismic Inc.

THICK CARBONATES IN BRAZEAU THRUST CAUSE PULL-UP OF REGIONAL CARBONATE SURFACE

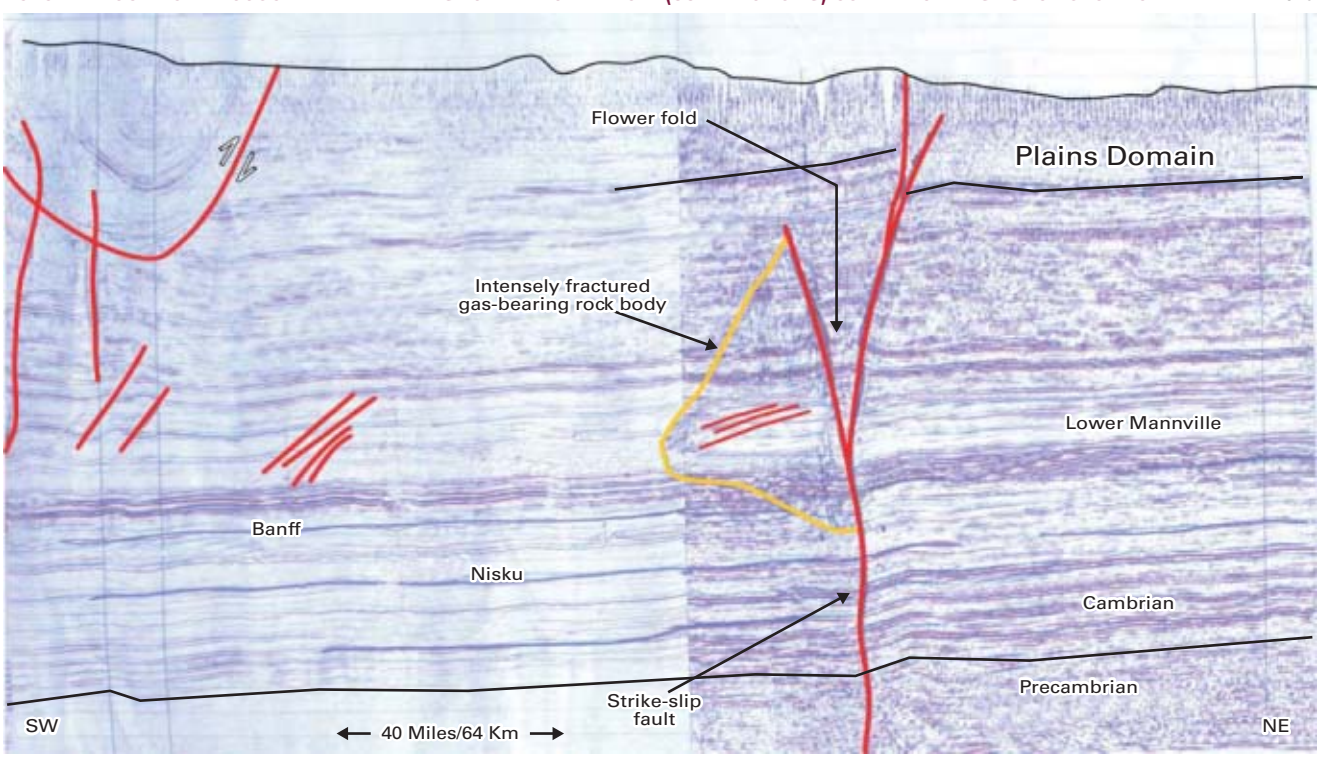
ST 7



See Fig. 6 for location.
Source: Olympic Seismic Inc.

FRACTURED ROCK BODY ASSOCIATED WITH LARGE STRIKE-SLIP FAULT (80 MILES LONG) CONTAINS LARGE GAS VOLUMES

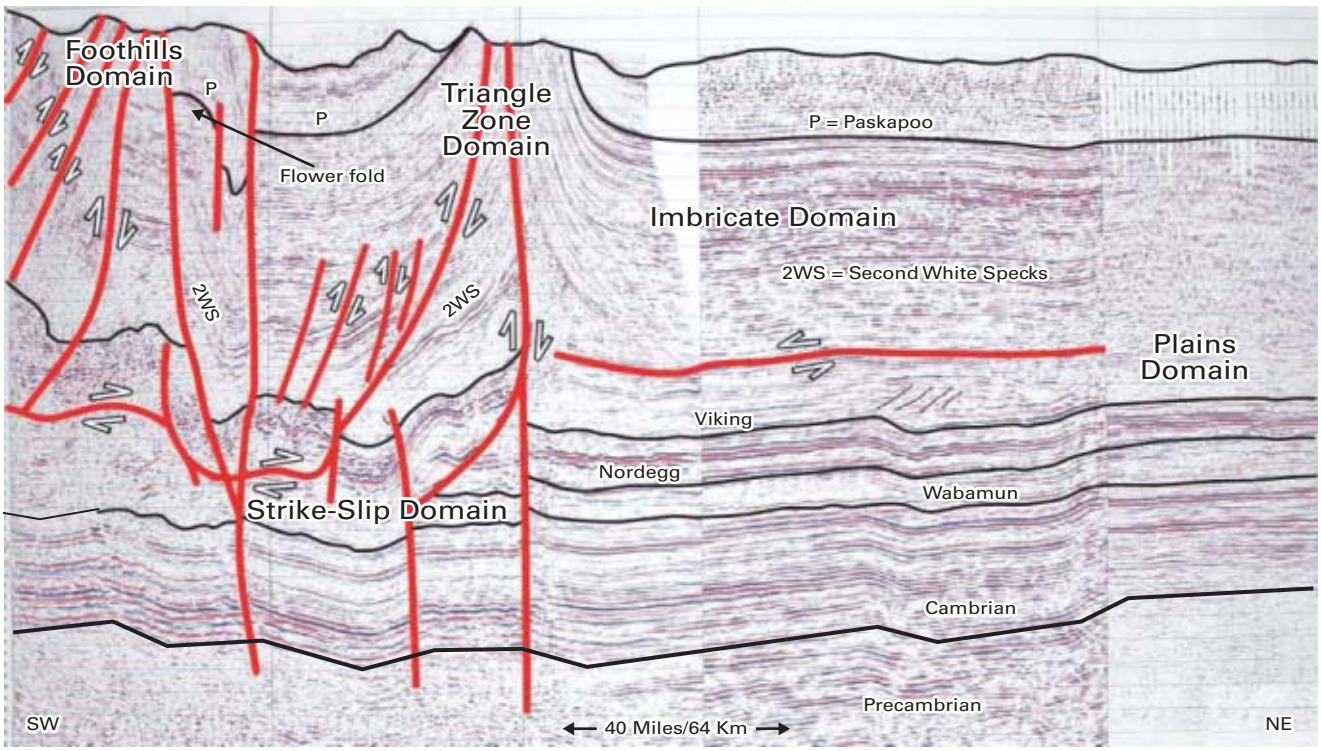
ST 8



See Fig. 6 for location.
Source: Olympic Seismic Inc.

EAST MOVEMENT OF THRUST BELT PUSHED STRATA IN BOTH TRIANGLE ZONE AND IMBRICATE DOMAINS INTO VERTICAL POSITION

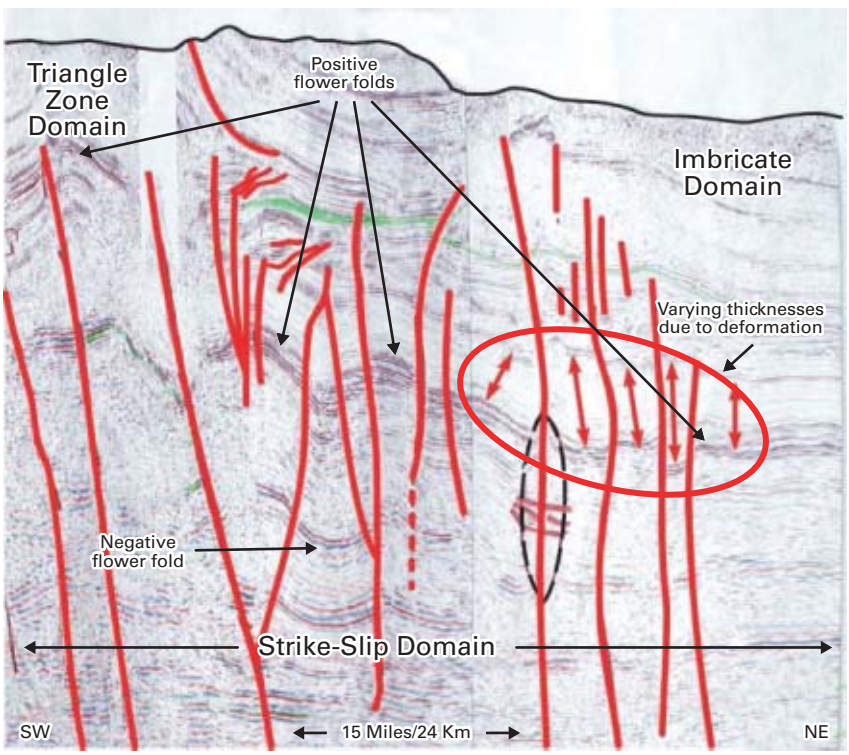
ST 9



See Fig. 6 for location.
Source: Olympic Seismic Inc.

STRIKE-SLIP PRODUCED FAULTS, FLOWER FOLDS, AND RAPID THICKNESS CHANGES

ST 10



See Fig. 7 for location.
Source: Olympic Seismic Inc.

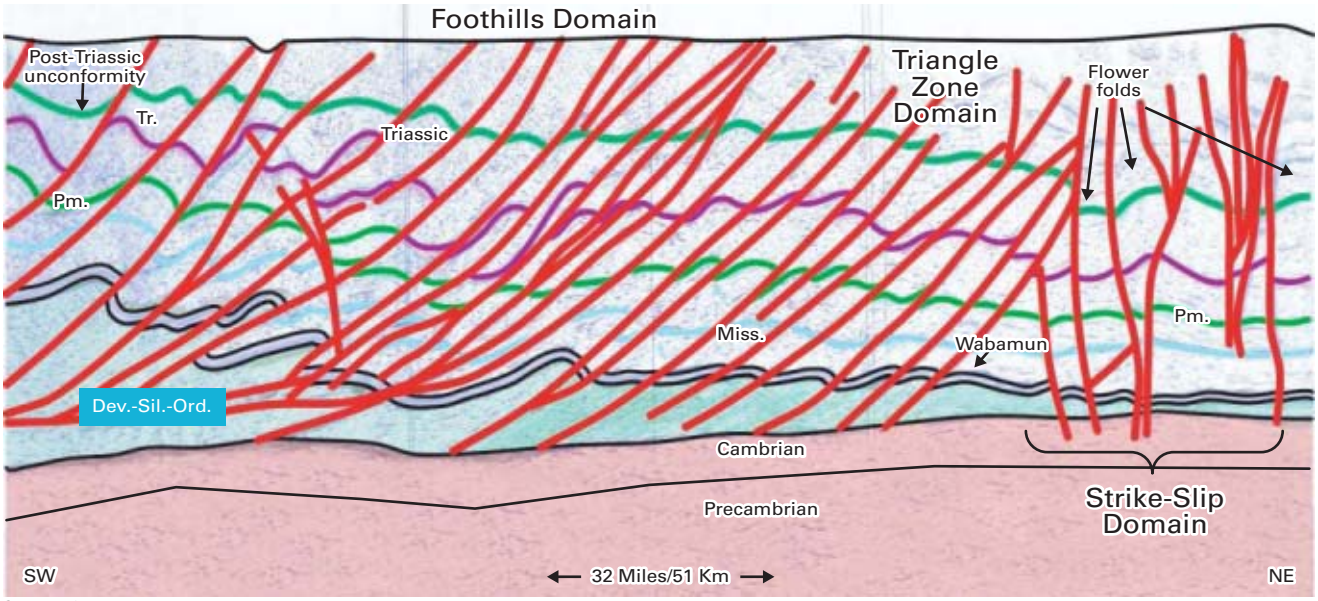
and rollovers. Published work further divides it in three domains: The Main Range, limited east by the Pipestone Pass Thrust; the Front Range, bounded E by the McConnell Thrust; and adjacent to this the Foothills Domain.

Adjacent and E of the Foothills Domain lies the Triangle Zone Domain bounded in the W by thrusts in the Foothills and in the E by an E-dipping

A little known fact is that many anticlines and four-way closed thrusted anticlines contain vertical shear zones perpendicular to their hingelines that are conduits for gas generated in the deeper parts of the structured belt.

ABSENCE OF THICK DEEPER CARBONATE SECTION FACILITATED THE FORMATION OF ABUNDANT PARALLEL THRUSTS

ST 11

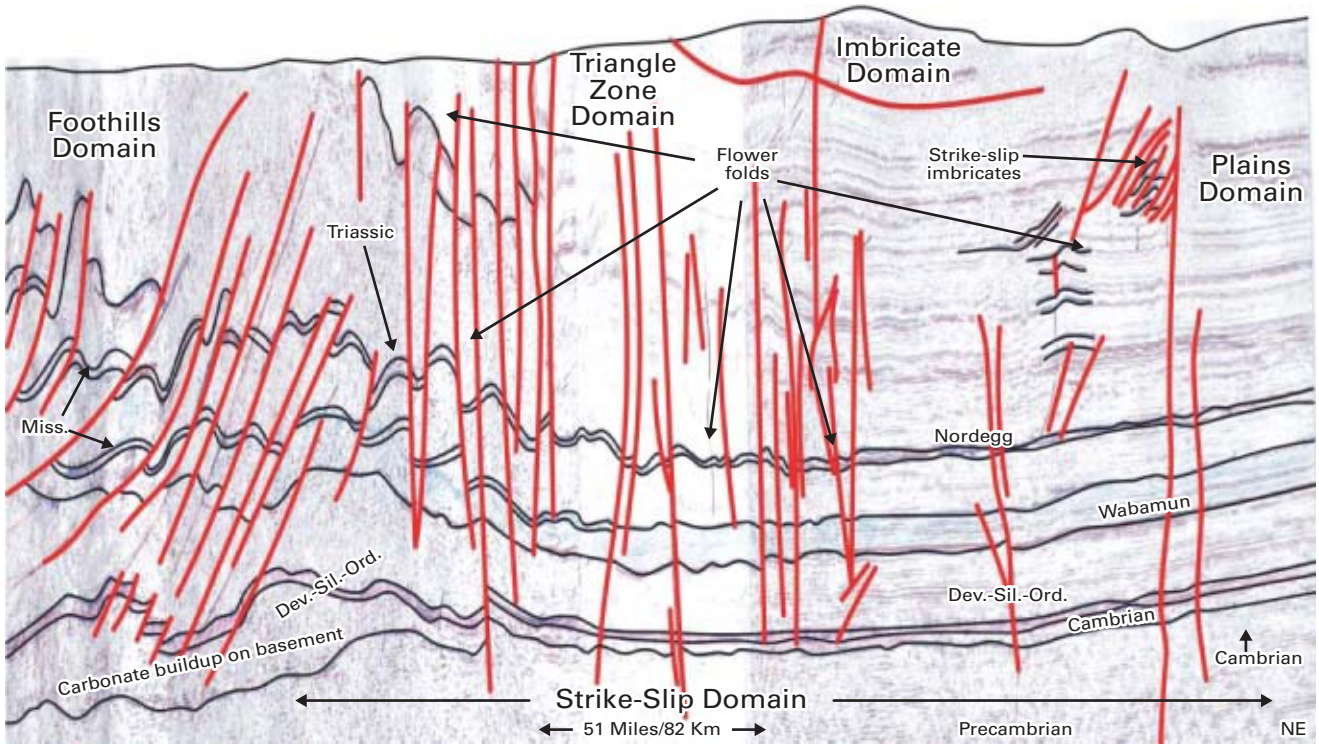


See Fig. 7 for location.
Source: Olympic Seismic Inc.

basal bounding underthrust of the Imbricate Domain. In places, this domain contains series of vertical to semivertical strike-slip faults and abundant flower structures. It is the front wedge of a huge body of shortened (60-100 miles) sedimentary cover that was thrust ("rock ploughed," Fig. 11) E over the basement. Simultaneously, it ploughed

MULTIPLE THRUSTS AND STRUCTURAL THICKENING IN WEST AND STRIKE-SLIP FAULTING IN CENTER AND EAST

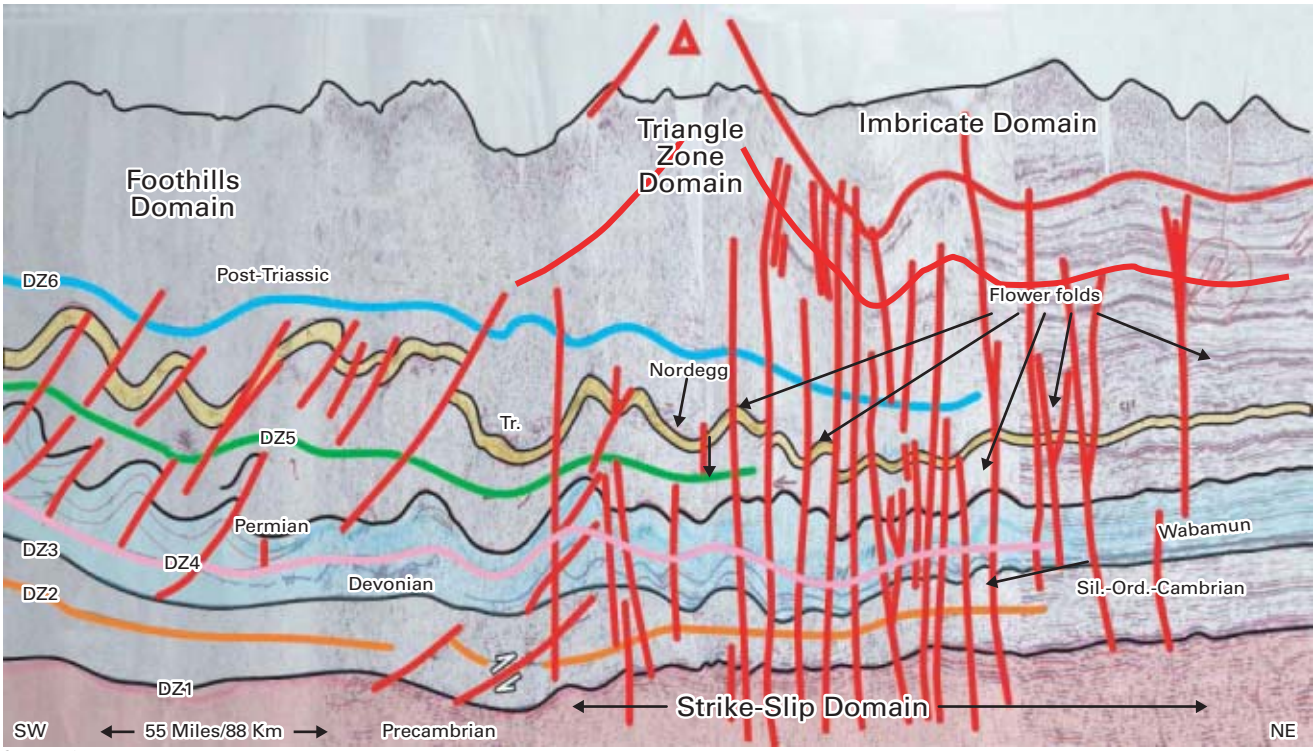
ST 12



See Fig. 7 for location.
Source: Olympic Seismic Inc.

COMPLEX STRUCTURAL SETTING WITH NW AND NE SUBHORIZONTAL MOVEMENTS IN SIX DETACHMENT ZONES

ST 13



See Fig. 7 for location. DZ = detachment zone.
Source: Olympic Seismic Inc.

E with a W-dipping leading edge thrust into and underthrusted the shallower, softer Plains sedimentary section.

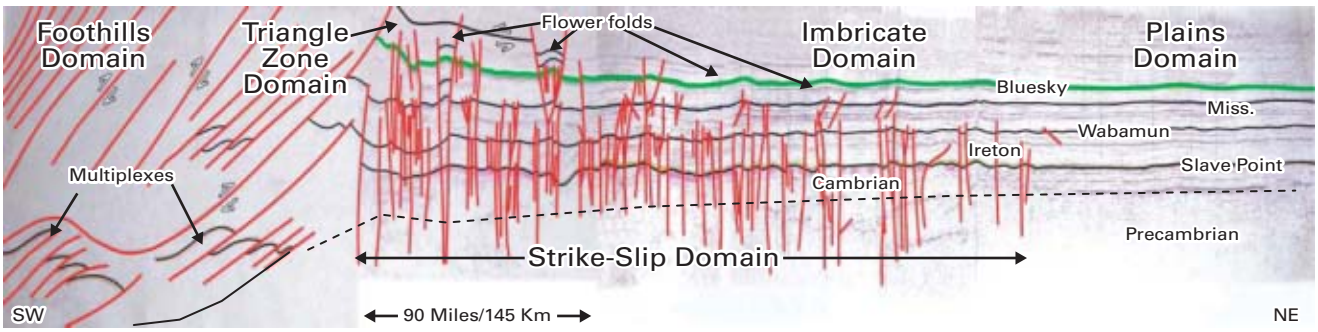
Bordering the Triangle Zone Domain is the Imbricate Domain. It is characterized by a major E-dipping basal underthrust, westerly directed updip thrusts, small imbricates, and rollovers. Farther E lies the Plains Domain, characterized by gently W-dipping strata that dip beneath both Imbricate and Triangle Zone domains.

Structures trend parallel in a general NW direction, with some N-trending and W-trending stretches, in the five westernmost domains. The Strike-Slip Domain comes in from the N from underneath the Liard/Mackenzie Gravity Slide Fold Belt, in the Northwest Territories. It intersects at low angle the western Plains and both the Triangle Zone Domain and easternmost portion of the Thrust Domain. It cuts through the Deep Basin and contains numerous strike-slip faults with positive flower folds that contain abundant gas fields. Many fault blocks were skewed E due to continued pressure and thrusting from the W. It is divided into a N-S domain and a NW-SE domain.

Most structures were formed by a dynamic combination of E-thrusting

NUMEROUS SLAVE POINT ANOMALIES CONTAIN HYDROCARBON ACCUMULATIONS IN THE STRIKE-SLIP DOMAIN

ST 14



See Fig. 7 for location.
Source: Olympic Seismic Inc.

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INTENSE STRIKE-SLIP FAULTING GUIDED HYDROCARBONS INTO NUMEROUS FLOWER FOLD TRAPS

ST 15

See Fig. 7 for location.
Source: Olympic Seismic Inc.

and NW-SE and N-S strike-slip faulting (compression/gravity sliding and shear), in the structured belt. It created a multitude of complex structures.

Next: Conclusion—The six domains and their subareas are described in greater detail. ✦

Argentina

La Pampa Province awarded the Gobernador Ayala III exploration concession in the Neuquen basin to Petro Andina Resources Inc., private Calgary firm.

The 82,800-acre block, adjacent to the south boundary of company operated CNQ-7/A area, brings Petro Andina's land position in the Centenario Trend to 285,000 net acres.

Petro Andina signed an agreement with Argentina's state Enarsa and another Argentina company under which Petro Andina is operator with 70% working interest and the other parties share the other 30%.

Petro Andina mapped an extension of its El Corcobo Norte field onto GAIII and plans to drill as many as 10 appraisal and exploration wells on the new block in 2007 and shoot a 3D seismic survey in the fourth quarter. The 2-year work commitment totals 25 wells.

Kazakhstan

Arawak Energy Corp., Anguilla, British West Indies, plans to acquire retroactive to Jan. 1, 2007, Saigak Investments BV, which owns 40% of mostly developed Saigak oil field in the Aktyubinsk area of western Kazakhstan.

Seller is Vitol BV, which owns Saigak Investments. Vitol holds 38.15% of Arawak through Rosco SA.

Maersk Oil Kazakhstan Gmbh operates Saigak field, at which four wells produce 3,500 b/d of sweet, 33-37° gravity oil from 14.6 million bbl of original recoverable reserves from multiple formations at 2,000 m. The oil is exported.

The field contract, signed in 1992, is valid until 2017 with possible extensions.

Production is expected to drop at 15%/year the next 5 years without investment, but later optimizations may arrest the decline.

Tanzania

Tanzanian authorities approved farmout by Aminex PLC, Dublin, of a 25% interest in the 1,400 sq km Nyuni-East Songo Songo PSA area in the Indian Ocean off Tanzania.

RAK Gas, incorporated in the United Arab Emirate of Ras al Khaimah, will pay 37.5% of the cost of two wells on the block to earn the 25% interest. RAK Gas has other exploration and production efforts under way in Tanzania.

Post-farmout interests are Aminex's Ndovu Resources Ltd., operator, 39%, Key Petroleum Ltd., RAK Gas 25%, East Africa Exploration Co. Ltd. 10%, and Bounty Oil & Gas Ltd. 6%.

The Caroil-6 rig is to drill two wells back to back on the block this year, the first of which is to be a directional well from Killiwani Island 1 km southwest of Songo Songo Island.

BHP Billiton's Neptune platform sails out to gulf

Nina M. Rach
Drilling Editor

BHP Billiton Petroleum Inc. launched the hull for the Neptune tension-leg platform (TLP) on May 19, 2007. After a 5-day sail it reached location at Green Canyon Block 613.

J. Michael Yeager, BHP Billiton's group president-energy, said "The Neptune sail away is an important milestone for BHP Billiton as it marks the beginning of installation for the company's first operated standalone, deepwater production facility in the Gulf of Mexico."

The Gulf of Mexico is on the verge of becoming a very significant producing area for the company. In addition to Neptune, BHP Billiton has the Genghis Khan, Atlantis (nonoperated) and Shenzi projects in development in the Atwater fold belt region of the deepwater Gulf of Mexico, Yeager noted.

In June 2005, the company and its partners sanctioned $850 million for development of Neptune. Despite the horrendous hurricane season experienced on the Gulf Coast later that year, the project remains on schedule for first production by yearend 2007, though costs are under review.

Neptune field consists of Atwater Blocks 573, 574, 575, 617, and 618, about 120 miles off Louisiana. Water depths range 4,200-6,500 ft, and the TLP production facility will be in about 4,250 ft, above the Sigsbee escarpment.

BHP Billiton is designated operator of the field with a 35% interest. Partners include Marathon Oil Co. (30%), Woodside Energy (USA) Inc. (20%), a subsidiary of Woodside Petroleum Ltd., and Maxus (US) Exploration (15%), a subsidiary of Repsol YPF.

The single-column Atlantia SeaStar TLP can process as much as 50,000 bo/d and 50 MMcfd of natural gas from wet-tree production wells.

"The field holds 100-150 MMboe recoverable reserves, and first oil is expected by yearend," said Nigel Smith, BHP Billiton's president of development for the petroleum group.

Construction

In 2005, BHP Billiton and its Neptune partners awarded an engineering, procurement, construction, and management (EPCM) contract to design and build a SeaStar TLP to Atlantia Offshore Ltd. (now SBM Atlantia). Atlantia received the contract after completing a frontend engineering and design study for a wet-tree TLP for the Neptune prospect. Atlantia is responsible for the complete TLP, including hull and topsides facilities and commissioning assistance.

Atlantia hired Signal International LLC to build the Neptune TLP hull.

Signal International Vice-Pres. Joe Roche told OGJ that this is the first TLP hull built by Signal; peak number of people on this project was about 500 (Fig. 1).

Signal ordered steel in June 2005 and began the hull fabrication work in fourth-quarter 2005 at its Orange, Tex. facility, which has 450,000 sq ft of covered area. The yard has been used extensively to construct offshore drilling and production units. In 2004, the drilling equipment module for a large Gulf of Mexico spar was built and as-

The Neptune SeaStar monocolumn tension-leg platform hull has been under construction in the Signal International dry dock yard, Port Arthur, Tex. (Fig. 1; photo from BHP Billiton Petroleum Americas Inc.).

The Neptune TLP steel hull rode at 14½ ft draft for its sea tow (Fig. 2, photo by Nina M. Rach).

sembled at Signal's yards at Orange and Port Arthur, Tex.

The six TLP tendons were built by Gulf Marine Fabricators.

Atlantia's Houston-based sister company, SBM-Imodco, designed the Neptune topside facilities, which are scheduled to be launched from Houma, La., by late June. Mating of the hull and topsides will be done about a week later.

The Neptune TLP will join four existing SeaStar TLPs in the Gulf of Mexico. Of the previous four, three accommodate wet-tree production and one supports dry trees.

Installation

The Neptune TLP was floated off Signal International's World War II-vintage mobile dry dock in Port Arthur a few days before the sail away at a 14½-ft draft (Fig. 2).

The winds and weather were favorable on May 19, blowing about 5 mph. "Perfect towing conditions," said a representative from Otto Candies LLC. No cold fronts were forecast and it was too early for tropical storms.

One main tug, the Kelly Candies, and two assist tugs took the TLP from the dock, through the channel to the Sabine Pass sea buoy on the first day at 2 knots/hr on a flood tide (Fig. 3). Once in open water, the tug could pull at 3½ knots for another 4 days travel to location in Green Canyon.

Heerema Marine Contractor's largest deepwater construction vessel (DCV) Thialf had preinstalled the piles and was installing the tendons at the time the hull left the dock.

After the hull installation commences, it will take about 5 days to position the tendons, ballast, lock off on the tendons, and pump water to create top tension.

Heerema's DCV Balder will pick up and hang the steel catenary risers for gas and oil export and two field flow lines; the Thialf will use its dual cranes to mate the topsides and hull.

Neptune production will flow to the Mardi Gras pipeline system. Enbridge owns and operates the 26-27 miles of lateral lines, laid by Allseas in January-February 2007. The jumpers will be installed June-August, BHP Billiton's Smith told OGJ. Neptune's oil will flow to the Caesar trunkline and gas to the Cleopatra trunkline.

TLPs

Neptune is the 23rd TLP worldwide, according to Mustang Engineering. It joins 14 TLPs already installed in the Gulf of Mexico.

There are three TLPs in the North Sea: two off Norway, and one decommissioned off the UK. Four TLPs have been installed off Africa: Kizomba A and

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The Kelly Candies tows the Neptune SeaStar hull away from Port Arthur (Fig. 3, photo by Nina M. Rach).

B off Angola, and Okume E (Oveng) and Okume F off Equatorial Guinea. The West Seno A TLP was installed in the Makassar Strait, off eastern Java.

Conoco installed the world's first TLP in the UK North Sea's Hutton field in July 1984, a six-column conventional semisubmersible design that could process 120,000 bo/d and 10 MMcfd in 482 ft water depth (now retired; OGJ, Nov. 5, 2001). Five years later, in July 1989, Conoco installed the world's second TLP at the Jolliet field in the Gulf of Mexico. The Jolliet TLP has a four-column hull, the most common TLP hull design (17 of 23).

Most TLPs have steel hulls, 12 or 16 tendons attached to the four hull columns, and dry trees. The Heidrun TLP, installed in the Norwegian North Sea in June 1995, is the first and so far only, concrete hull.

Twenty years after Hutton, in August 2004, Conoco set a depth record, installing an extended-leg TLP in the Gulf of Mexico's Magnolia field in 4,674 ft water depth (OGJ, Nov 22, 2004, p. 50).

The single-column monohull design (Atlantia SeaStar) was adopted by Eni in August 1998, when it installed the first of the five SeaStars over the Morpeth field, in the Gulf of Mexico. The SeaStar TLP design has six tendons arranged in a 3x2 pattern; production is from wet-tree wells.

The other SeaStar TLPs are Eni's Allegheny (installed August 1999), Chevron's Typhoon (June 2001), Total E&P USA's Matterhorn (July 2003), and now Neptune (June 2007).

BHP Billiton's Dennis McLaughlin, project director for Neptune, told OGJ that the Neptune team set the robust design criteria for the TLP in 2004, following Hurricane Ivan, and they met all ABS, Coast Guard, and US Minerals Management Service code standards. "The industry is constantly adjusting criteria as it learns," he said.

Then the Typhoon SeaStar TLP was heavily damaged during Hurricane Rita in 2005.

McLaughlin said that BHP Billiton, a 50% partner with operator ChevronTexaco, participated in all forensic activities related to that incident.

The Neptune team used independent third-party checks of all engineering and design processes, as well as comprehensive model testing at a wave tank in the Netherlands. McLaughlin told OGJ that Neptune's design is considerably different from preceding installations of the SeaStar TLP. It will be the first deepwater facility that reflects lessons learned from the 2004-05 hurricane seasons.

Neptune SeaStar tension-leg platform

Payload (deck, facilities, risers)	8,000 tons
Displacement	27,000 tons
Tendons	Six, 36-in. diameter
Main column dimensions	76-ft diameter x 128-ft height
Pontoon dimensions	176-ft radius x 48-ft height
Draft	98 ft
Deck dimensions	120 x 110 ft, three levels
Main Contractors:	
SBM Atlantia, Houston	Hull, topsides - design and supply
Signal International LLC, Orange, Tex.	Hull fabrication
Gulf Island Fabrication, Houma, La.	Topsides fabrications
Gulf Marine Fabricators, Ingleside, Tex.	Tendon and pile fabrication
Heerema Marine Contractors, Houston	Offshore installation

Neptune field development

The field was discovered in 1995–the first discovery in the western Atwater foldbelt. The Neptune-2 appraisal well was drilled in 1997. BHP Billiton took over as operator in 2002 and drilled four appraisal wells and two sidetracks, including:

- Neptune-3, 2002, 120 ft net pay.
- Neptune-5, 2003, 500 ft net pay.
- Neptune-7, 2004, 114 ft net pay.

In 2004, BHP Billiton signed a 2-year contract to drill in the Gulf of Mexico with the GlobalSantaFe Development Driller 1 semisubmersible. In April 2006, the company extended the contract 4 more years, to 2010. The DD1 began drilling the seven production wells in June 2006. All topholes were predrilled.

Well completion procedures will be similar to those used at Atlantis, said Smith, including frac packs. "And we're learning a lot from our nonoperated interests," he said.

BHP Billiton plans subsea completions for the seven Neptune wells at four drill centers in the currently sanctioned southern part of the Neptune field. Two of the drill centers have single wells, another has two wells, and the fourth has three wells and a manifold. The company planned for additional drill centers along the north flow line, installing three inline sleds.

The 8-in. nominal diameter flowlines are insulated with 4-in.-thick GSPU (glass syntactic polyurethane) but are not heated. They were installed by Technip.

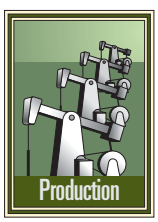
Cameron and Aker Kvaerner are the main subsea suppliers on the Neptune project.

After Neptune, the DD1 may undertake drilling at the nearby Shenzi field, Smith told OGJ.

"We have a tremendous amount of activity in the deepwater Gulf of Mexico at this time," said Yeager. "Also, with operated projects in Western Australia, Pakistan, and Trinidad continuing to progress, we are about to significantly change BHP Billiton Petroleum." ✦

The Ice Maiden is an icebreaker converted to a dynamically positioned flotel for use during offshore construction (Fig. 1).

Dynamically positioned monohull flotel under construction



The Ice Maiden will be the first dynamically positioned multisupport construction vessel capable of working anywhere in the world, according to the vessel owner C&M Group.

Formerly the vessel was the 14,000-tonne Russian class icebreaker MV Paardeberg. The 167 m long vessel has a 23-m beam, two 25-tonne capacity cranes, and a helideck with refueling facilities for EH101 helicopters. Built in 1991, C&M purchased the vessel in December 2006.

The $100 million vessel conversion is taking place at the Atlantic Marine Shipyard in Mobile, Ala. The yard currently is installing new topsides with accommodations for 400 people in single rooms (Fig. 1).

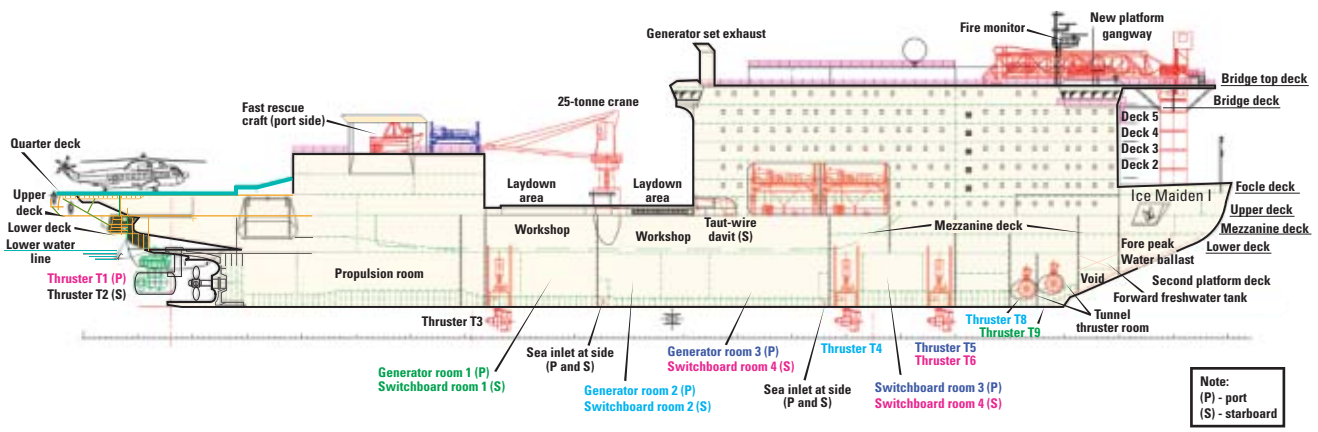
C&M says the vessel will be the first monohull flotel to work in the North Sea when it goes on charter later this year, and it expects the vessel with its icebreaking capabilities will also find work in areas such as above the Arctic Circle and off Sakhalin Island. With its 450-mm thick hull, vessel specifications indicate that the vessel can cut through 1.2-m thick ice plus 0.2-m thick snow at 1.5 knots.

C&M notes that the vessel provides highly sophisticated communications, fiber optics, digital closed-circuit television, passenger on-board control systems, and special low-temperature cabling.

For dynamic positioning, the vessel will have three sets of thrusters: two 3-Mw azimuths, four 2-Mw azimuths nonretractable, and two 1.4-Mw tunnel (Fig. 2). ✦

THRUSTER LOCATIONS

Fig. 2



Mideast leads global growth; shift from US, Canada holds

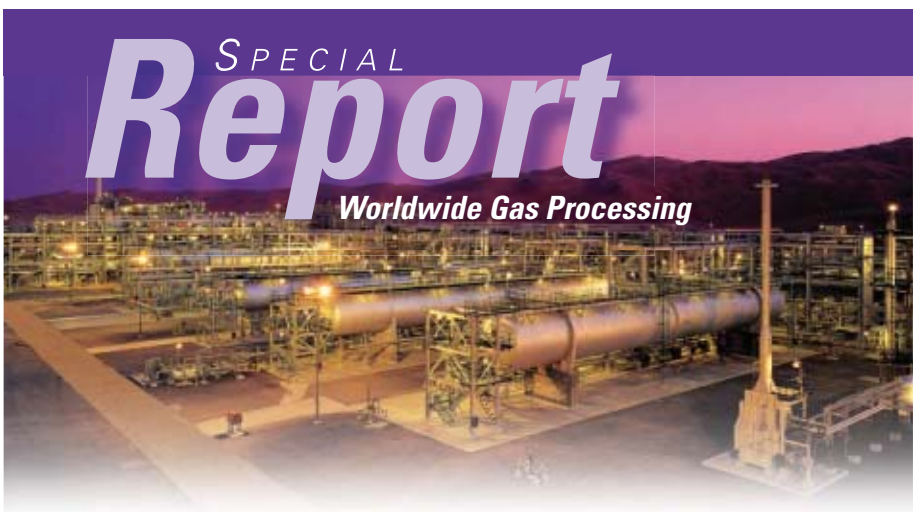
Warren R. True
Chief Technology Editor—LNG/Gas Processing

Worldwide natural gas production in 2006 increased by less than 2%, with production in major gas processing countries US and Canada advancing by 0.3% and 0.9%, respectively (OGJ, Mar. 12, 2007, p. 62).

It is little wonder, then, that gas processing capacity in the US was essentially flat and in Canada fell nearly 6% from 2005 (Table 1).

For the entire world, new data for Middle East processing, primarily in Iran, corrected and raised earlier Oil & Gas Journal worldwide totals. Gas production for the region, however, showed a drop of nearly 150 bcf, reflecting flat processing capacities for the region's gas plants.

Worldwide, natural gas processing capacities outside the US and Canada continued to outpace capacities in the world's two largest gas processing countries, a trend that emerged last year for 2005 data. For 2006, gas-plant capacities in the US and Canada reached slightly less than 50% of world capacity for the second year in a row. That trend was pushed by plants' capacities in the US dropping by nearly 6%, while Canada's plants increased capacities by only 0.58%.



Highlights

During 2006, natural gas production increased in all the world's regions except for the Middle East, OGJ numbers show. But in aggregate, the increases were smaller than seen between 2004 and 2005 (OGJ, June 18, 2006, p. 54). Nonetheless, the tip in gas processing capacity to regions outside the US and Canada that became evident in 2005 remained in 2006.

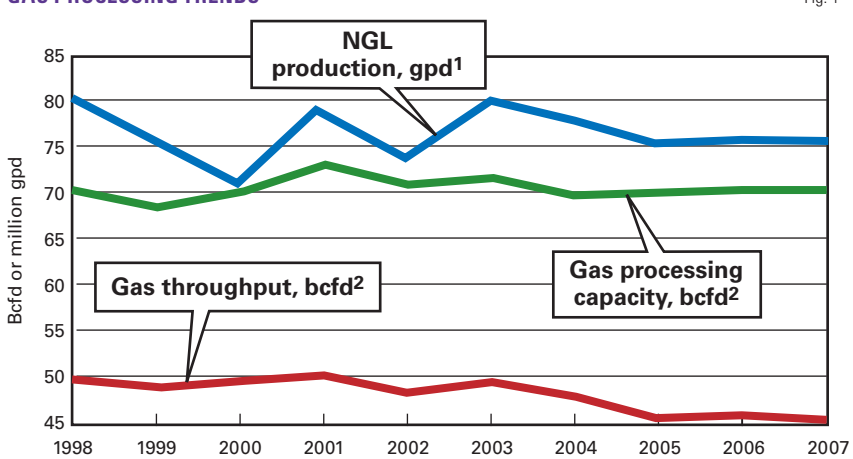
Much of the new gas production in 2006 went to feed new LNG production capacity in Nigeria and Australia. In 2006, Qatar surpassed Indonesia and Malaysia to become the world's leading exporter of LNG.

2007 will see yet more LNG capacity come online requiring yet more natural gas capacity: More than 22.5 million tpy of liquefaction capacity will start up this year, pushing world liquefaction capacity up by about 12% to more than 184 million tonnes/year.

New figures available for Canadian NGL production forced an adjustment in 2006 numbers and helped push US and Candian NGL production for the year up to 38.7% of the world totals from slightly more than 33% in 2005,

US GAS PROCESSING TRENDS

Fig. 1



[1]Based on a 12-month average for previous year. [2]As of Jan. 1 of each year.

off from more than 34% in 2004, more than 40% in 2003, and 42% in 2002.

Middle East liquids production nonetheless outpaced the US and should continue to grow as countries in the region, especially Saudi Arabia, focus their production activities on more gas and more feedstock for petrochemical production in the region and the Far East.

Adding Mexican data to those for the US and Canada (removing Mexico for the exercise from the Latin America column) reveals that North America holds:

- Only 51.3% of the world's capacity, down from barely 52% for 2005, from more than 53% for 2004, from 52% in 2003, and off from 54% in 2002 and 55% in 2001.
- 46.9% of the world's NGL production, under the revised, corrected numbers OGJ has obtained for Canadian production.

The Grasslands natural gas processing plant in McKenzie County, ND, is undergoing a $30 million expansion that will increase capacity by about 60% to 100 MMcfd. This plant is owned and operated by Bear Paw Energy LLC, a wholly owned subsidiary of Oneok Partners LP and is the partnership's largest natural gas plant in the Williston basin. (photograph from Oneok Partners by Rick Ayre)

As expected in last year's report, Canadian natural gas production did rebound somewhat in 2006, responding to demand from the country's rapidly growing heavy-oil production and greater Lower 48 demand. Mexico's production also continued to rise by more than 190 bcf in 2006

On Jan. 1, 2007, OGJ data show that US gas processing capacity stood at slightly more than 70 bcfd, essentially flat compared with both 2005 and 2004; throughput in 2006 also was flat, averaging a bit more than 45.5 MMcfd, from the 2005 average of more than 46 bcfd; and NGL production, nearly 75,500 gpd, from more than 76 million gpd (Fig. 1), again essentially flat compared with 2005 and 2004.

Fig. 2 shows pricing differentials in the US between LPG—the most widely traded NGL on the world market—and crude oil for the first trading day of each month in 2006. The chart shows the historically normal relationship between LPG and crude oil continued throughout 2006. (An accompanying article, beginning on p. 56, discusses international trade in LPG and ethane and the NGL production implications from the growing LNG trade.)

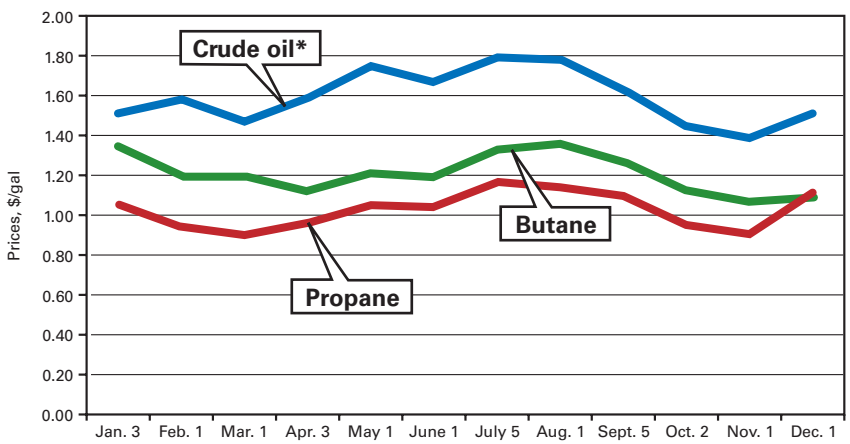
Sources

Oil & Gas Journal's exclusive, plant-by-plant, worldwide gas processing survey and its international survey of petroleum-derived sulfur recovery provide industry activity figures.

Canadian data are based on information from Alberta's Energy and Utilities Board that reflect actual figures for gas that moved through the province's plants and are reported monthly to the AEUB. For 2000 for the first time, OGJ took these data for all of Alberta and compiled annual figures and thereby created a new baseline for data comparisons thenceforth.

In addition to AEUB figures for Alberta and to operator responses to its annual survey, OGJ has supplemented its Canadian data with information from the British Columbia Ministry of Employment & Investment's Engineering and Operations Branch and the Sas-

US LPG DIFFERENTIAL, PRICE TRENDS: 2006 Fig. 2



*WTI-Cushing.
Source: Oil & Gas Journal

OGJ subscribers can download, free of charge, the 2007 Worldwide Gas Processing Survey tables at www.ogjonline.com: Click on Resource Center, Surveys, OGJ Subscriber Surveys, then Worldwide Gas Processing, and choose from the list below June 18, 2007. To purchase spreadsheets of the survey data, please go to http://www.ogj.com/resource-center/orc_survey.cfm or email orcinfo@pennwell.com.

katchewan Ministry of Energy & Mines.

Gas processing capacity outside Canada and the US as 2007 began stood at 126.2 MMcfd, nearly dead level with capacity for 2005, and up from nearly 115.5 bcfd in 2004; throughput outside Canada and the US for 2006 averaged barely 80 bcfd, down from more than 81 bcfd for 2005, and up from nearly 74 bcfd in 2004; and NGL production in 2006 outside the US and Canada averaged 170 million gpd, down from a 2005 production of more than 201million gpd, and near the 2004 pace of more than 166.5 million gpd.

The current state of gas plant construction in the world appears in Table 2, based on OGJ's worldwide construction surveys. Table 3 ranks the world's major natural gas reserves by country at the start of 2007; Table 4, the world's top natural gas producing countries for 2006; and Table 5, the world's leading NGL producers.

WORLDWIDE GAS PROCESSING ROUNDUP

Table 1

Region	[1]2005	[2]2006	Change	Change, %
US				
Gas capacity, MMcfd	69,815.4	70,218.2	402.8	0.6
Gas throughput, MMcfd	45,685.3	45,537.4	–147.9	–0.3
NGL production, 1,000 gpd	75,609.5	75,468.2	–141.3	–0.2
Proved reserves, bcf	192,513.0	204,385.0	11,872.0	6.2
CANADA				
Gas capacity, MMcfd	56,218.5	52,900.8	–3,317.7	–5.9
Gas throughput, MMcfd	32,364.7	29,515.9	–2,848.8	–8.8
NGL production, 1,000 gpd	25,564.1	32,330.9	6,766.8	26.5
Proved reserves, bcf	56,577.0	57,946.0	1,369.0	2.4
WESTERN EUROPE				
Gas capacity, MMcfd	24,375.0	24,349.0	–26.0	–0.1
Gas throughput, MMcfd	9,812.2	9,466.7	–345.5	–3.5
NGL production, 1,000 gpd	9,834.6	9,484.0	–350.6	–3.6
Proved reserves, bcf	186,555.0	168,349.0	–18,206.0	–9.8
EASTERN EUROPE				
Gas capacity, MMcfd	2,796.0	2,796.0	—	—
Gas throughput, MMcfd	1,426.5	1,426.5	—	—
NGL production, 1,000 gpd	10,142.4	10,142.4	—	—
Proved reserves, bcf	1,966,790.0	2,026,753.0	59,963.0	3.0
LATIN AMERICA				
Gas capacity, MMcfd	18,448.2	18,448.2	—	—
Gas throughput, MMcfd	13,635.5	12,475.3	–1,160.2	–8.5
NGL production, 1,000 gpd	28,043.5	24,096.4	–3,947.1	–14.1
Proved reserves, bcf	266,823.0	255,302.0	–11,521.0	–4.3
MIDDLE EAST				
Gas capacity, MMcfd	27,917.0	38,404.2	10,487.2	37.6
Gas throughput, MMcfd	19,733.0	26,898.0	7,165.0	36.3
NGL production, 1,000 gpd	72,161.1	84,358.4	12,197.3	16.9
Proved reserves, bcf	2,565,400.0	2,566,038.0	638.0	—
AFRICA				
Gas capacity, MMcfd	17,254.2	17,254.2	—	—
Gas throughput, MMcfd	9,642.4	9,642.4	—	—
NGL production, 1,000 gpd	16,777.3	16,777.3	—	—
Proved reserves, bcf	485,841.0	484,433.0	–1,408.0	–0.3
ASIA-PACIFIC				
Gas capacity, MMcfd	25,004.2	24,960.2	–44.0	–0.2
Gas throughput, MMcfd	20,253.5	20,173.6	–79.9	–0.4
NGL production, 1,000 gpd	25,741.8	25,764.7	22.9	0.1
Proved reserves, bcf	391,645.0	419,487.0	27,842.0	7.1
TOTALS, excl. US				
Gas capacity, MMcfd	172,013.1	179,112.6	7,099.5	4.1
Gas throughput, MMcfd	106,867.8	109,598.4	2,730.6	2.6
NGL production, 1,000 gpd	188,264.8	202,954.1	14,689.3	7.8
Proved reserves, bcf	5,919,631.0	5,978,308.0	58,677.0	1.0
TOTALS, incl. US				
Gas capacity, MMcfd	241,828.5	249,330.8	7,502.3	3.1
Gas throughput, MMcfd	152,553.1	155,135.8	2,582.7	1.7
NGL production, 1,000 gpd	263,874.3	278,422.3	14,548.0	5.5
Proved reserves, bcf	6,112,144.0	6,182,693.0	70,549.0	1.2

[1]Proved gas reserve totals for 2005 are as of Jan.1, 2006 (OGJ, Dec. 19, 2005, p. 24). [2]Proved gas reserve totals for 2006 are as of Jan.1, 2007 (OGJ, Dec. 18, 2006, p. 22).

Activity

What follows is a series of shapshots of gas processing events in the last 15 months.

Europe and elsewhere

In Europe, Statoil ASA, on behalf of state-owned Gassco AS, hired Vetco Aibel to design, build, and install a gas compressor and a condensate train at the Kollsnes gas processing plant near Bergen, Norway (cover photograph).

The 790-million kroner contract extends through the second half of 2008. The Kollsnes plant processes gas from Troll, Kvitebjørn, and Visund fields and moves it through four pipeline systems to continental Europe.

These installations, capable of handling 143 million standard cu m/day of gas, are owned by Gassled and operated by Gassco, with Statoil as the technical service provider.

Elsewhere last year, state-owned Uzbekneftegaz began to build a $63.6-million LPG unit at its gas processing subsidiary Shurtanneftegaz in the Kashkadarya region of Uzbekistan.

Shurtanneftegaz, one of three gas processing companies in Uzbekneftegaz, processes 11 billion cu m/year of gas.

After three stages of construction, the plant will produce 175,000 tonnes/

WORLDWIDE GAS PLANT CONSTRUCTION*

Table 2

Country	2007	2006
Africa	2	2
Asia-Pacific	1	5
Canada	—	—
Eastern Europe	1	3
Middle East	2	7
Latin America	2	4
US	7	4
Western Europe	—	9
Total	**15**	**34**

*Includes new plants, expansions, and modifications scheduled for completion in the year listed. 2007 data are from OGJ, Apr. 16, 2007. 2006 data are from OGJ, Apr. 24, 2006.

year of propane-butane mix by 2010. The first stage of construction was to be completed by yearend 2006; the unit will reach a capacity of 45,000 tonnes/year.

Uzbekneftegaz said it plans several projects to increase LPG production at the Mubarek gas processing plant and the Shurtan gas production complex.

In Africa, Khalda Petroleum Co. hired Petrofac of London to design and construct a fourth gas-conditioning train at Salam on the Khalda Concession in the western desert of Egypt, according to Apache Corp. Khalda is a joint venture of Apache and Egyptian General Petroleum Corp.

The fourth train and an earlier approved third train will increase total conditioning capacity for production from Apache's Jurassic gas reserves to 710 MMcfd of gas and 66,000 b/d of condensate.

Each train will be able to process 100 MMcfd of sales gas and 14,000 b/d of sales condensate. The expansions target completion by late 2008.

In Asia, Oil & Natural Gas Corp. of India hired Toyo Engineering Corp. in a ¥20-billion job to build an NGL extraction plant at Dahej in Gujarat state. Due for start-up in 2008, the plant will extract liquids for use as petrochemical feedstock from LNG from Petronet LNG Ltd.'s nearby 5 million tonne/year terminal.

In January 2006, Petronet awarded a ¥30-billion contract to a joint venture of Toyo Engineering Corp., Ishikawajima-Harima Heavy Industries Co., Itochu Corp., and Mitsui & Co. to double capacity of the Dahej LNG terminal.

WORLD'S MAJOR GAS RESERVES

Table 3

Country	Est. proved reserves, tcf	Share, %
Russia	1,680.0	27.8
Iran	974.0	16.1
Qatar	910.5	15.1
Saudi Arabia	239.5	4.0
US	204.4	3.4
Abu Dhabi	198.5	3.3
Nigeria	181.9	3.0
Algeria	161.7	2.7
Venezuela	152.4	2.5
Iraq	112.0	1.9
Kazakhstan	100.0	1.7
Turkmenistan	100.0	1.7
Indonesia	97.8	1.6
Norway	82.3	1.4
China	80.0	1.3
Malaysia	75.0	1.2
Uzbekistan	65.0	1.1
Egypt	58.5	1.0
Canada	57.9	1.0
Kuwait	54.5	0.9
Libya	52.7	0.9
Netherlands	50.0	0.8
Ukraine	39.0	0.6
Australia	30.4	0.5
Oman	30.0	0.5
UK	17.0	0.3
Argentina	16.1	0.3
Subtotal	**5,821.1**	**96.4**
Others	219.1	3.6
Total	**6,040.2**	**100.0**

Source: OGJ, Dec. 18, 2006, p. 22

Elsewhere in Asia, Natural Gas Development Co., a unit of Canadian firm InterOil, Merrill Lynch Commodities, and Clarion Finanz AG, agreed with the government of Papua New Guinea to develop a gas processing plant and gas liquefaction plant.

InterOil, which owns the 32,500-b/d Papua New Guinea refinery in Port Moresby and conducts onshore exploration in the country, has secured a $130 million nonconvertible credit facility, $30 million of which is for the gas projects.

The LNG proposal is for a plant capable of producing as much as 5 million tonnes/year.

North America

In the US last year, Crosstex Energy announced it would invest $130 million to expand its Parker County, Tex., processing plants and gathering systems and build a third plant by yearend 2007. Two other plants are part of a $55 million investing by Crosstex and have total processing capacity of 85 MMcfd.

WORLD'S 20 TOP GAS PRODUCING COUNTRIES: 2006

Table 4

Country	Production, bcf	Share, %
Russia/FSU	27,870.0	29.5
US	19,341.0	20.5
Canada	6,057.9	6.4
Algeria	3,287.0	3.5
Iran	3,213.0	3.4
Norway	3,094.2	3.3
Netherlands	2,955.0	3.1
UK	2,938.7	3.1
Indonesia	2,254.0	2.4
Saudi Arabia	2,094.0	2.2
China	2,088.3	2.2
Mexico	1,955.5	2.1
Malaysia	1,683.0	1.8
Argentina	1,601.0	1.7
UAE	1,570.0	1.7
Pakistan	1,405.5	1.5
Qatar	1,377.0	1.5
Australia	1,368.5	1.4
Venezuela	979.0	1.0
India	947.9	1.0
Top 20 total	**88,080.5**	**93.3**
Other	6,333.6	6.7
Total	**94,414.1**	**100.0**

Source: OGJ, Mar. 12, 2007, p. 62

With capacity expansions and the new plant, Crosstex will increase its total processing capacity in Parker County by up to 285 MMcfd.

Earlier this year, Williams announced it had completed and started up the final 200-MMcfd of a second cryogenic unit at its Cameron Meadows gas plant in southern Louisiana. Full design capacity is 500 Mcfd.

The plant was knocked out by Hurricane Rita in Sept 2005. The first of the plant's two cryogenic processing units came on line in February 2006, making available up to 300 Mcfd.

Total price tag for reconstruction was $35-40 million, according to the company. Early last year in Wyoming, Enterprise Products Partners LP subsidiary Enterprise Gas Processing LLC had bought the Pioneer silica gel natural gas processing plant near Opal from a unit of TEPPCO Partners LP. Purchase price was $38 million.

In the deal, Enterprise purchased TEPPCO's rights to process natural gas from Jonah and Pinedale fields in southwest Wyoming.

Anticipating greater gas production from Jonah and Pinedale fields, Enterprise embarked on construction to double the gas plant's processing capacity to 600 MMcfd from 300 MMcfd.

WORLD'S TOP 10 NGL PRODUCING COUNTRIES: 2006

Table 5

Country	Production, bcf	Share, %
US	75,468.2	27.8
Saudi Arabia	37,044.0	13.7
Canada	32,330.9	11.9
Mexico	22,922.0	8.4
Kuwait	18,684.8	6.9
Australia	10,902.3	4.0
Russia/FSU	9,127.9	3.4
UAE	8,978.6	3.3
Venezuela	7,312.9	2.7
India	6,534.5	2.4
Norway	6,201.2	2.3
Top 10 subtotal	**235,507.2**	**86.8**
Rest of world	35,844.9	13.2
Total worldwide	**271,352.2**	**100.0**

This work joined work on a 650-MMcfd cryogenic natural gas processing plant next to the silica gel plant. Expansion of the silica gel plant was completed last year; the new cryogenic plant is to be in service by fourth-quarter 2007. Earlier, Enterprise had said that, at full capacity, the cryogenic plant would have the flexibility to switch from conditioning mode to full recovery, able to recover 2,500-30,000 b/d of NGL.

NGL from the new cryogenic processing plant will move through Enterprise's Mid-America Pipeline and Seminole Pipeline systems that extend from the Rockies to the Texas Gulf Coast and will be fractionated at Enterprise's fractionators in Hobbs, Tex., also under construction, or at the partnership's complex in Mont Belvieu.

Offshore, Enterprise Products Partners LP, Houston, and Atwater Valley Producers Group have teamed up to increase the processing capacity at the Independence Hub platform in the eastern deepwater Gulf of Mexico by 150 MMcfd to 1 bcfd.

The deep-draft semisubmersible platform was floated out last year to its site on Mississippi Canyon Block 920 in 8,000 ft of water, where it will process gas from 10 fields.

The $28-million expansion project includes increasing, by the same amount, the transportation capacity of the Independence Trail natural gas pipeline, which will transport the gas to the Tennessee Gas Pipeline system in West Delta Block 68.

In Canada, Inter Pipeline Fund, Canada, invested C$36 million to increase ethane production at the Empress V plant, where Inter Pipeline is half owner. The work will hike ethane production by about 45%, or 7,000 b/d. Construction began earlier this year with first volumes coming second-quarter 2008.

In Mexico, Pemex announced in early 2007 that it will build two new gas plants for production form the Burgos basin in northeastern Mexico. Investment will reach $276 million. Building the plants will be by a joint venture of Mexico's Empresas Ica and Fluor Corp. called ICA Fluor. The first plant is due on stream by June 2008; the second in Oct 2008. Each plant will process 200 MMcfd, raising output capacity at the Reynosa complex to 1.2 bcfd.

Sulfur production

Worldwide refining and natural gas processing's production of petroleum-derived sulfur in 2006 continued to slide, to 84.2 million tonnes/day from slightly less than 85 million tpd in 2005 and from just more than 85 million tpd in 2004. Capacity increased slightly to 178.5 million tpd from slightly more than 178 million tpd in 2005.

Canada and the US continued to dominate last year with 46.9% of processing capacity, a slip from 47% in 2005, and 48.6% of actual production, from 49% for 2005. Both figures continue a decline from 2004.

Canada produced 23.3 million tpd in 2006, nearly even with 23.4 million tpd in 2005, down slightly from 2004. US production in 2006 continued to slip, to more than 17.6 million tpd from slightly more than 18.5 tpd in 2005.

Canada last continued to account for less than 24% of the overall total capacity and more than 27.6% of production, nearly even with 27.5% in 2005. ✦

WORLDWIDE GAS PROCESSING

Leena Koottungal, Survey Editor

Capacities as of Jan. 1, 2007, and average production

Country	No. plants	MMcfd: Gas capacity	MMcfd: Gas throughput	Production, 1,000 gpd (average based on the past 12 months): Ethane	Propane	Iso-butane	Normal or unsplit butane	LPG mix	Raw NGL mix	Debut. natural gasoline	Other	Total products
Algeria	4	5,335.2	4,268.2	–	–	–	–	632.8	–	–	5,449.2	6,082.0
Angola	2	200.0	137.0	–	–	–	–	–	199.0	–	–	199.0
Argentina	14	4,885.3	3,076.0	712.0	654.7	–	414.0	–	7.0	493.2	–	2,280.9
Australia	5	4,340.5	3,183.5	2,500.0	710.0	–	1,034.9	–	1,894.0	345.0	4,418.4	10,902.3
Austria	2	86.0	80.5	–	–	–	–	–	–	58.6	76.0	134.6
Azerbaijan	1	–	–	–	–	–	–	–	–	–	–	–
Bahrain	1	280.0	260.0	–	118.4	112.5	–	–	–	204.9	–	435.8
Bangladesh	4	140.0	83.4	–	–	–	–	–	–	–	41.9	41.9
Bolivia	12	882.8	622.4	–	–	–	–	171.0	238.0	132.4	383.0	924.4
Brazil	15	1,083.4	370.3	–	–	–	–	669.8	101.6	108.0	1.6	881.0
Brunei	2	1,182.0	967.4	52.2	9.1	–	–	–	–	290.0	–	351.3
Canada	952	52,900.8	29,515.9	7,495.4	1,104.5	–	829.9	781.1	11,733.9	3,161.3	7,224.7	32,330.9
Chile	2	477.0	381.6	–	39.6	12.9	14.3	–	185.0	19.3	–	271.1
Colombia	7	333.0	247.3	76.5	58.0	–	63.0	88.8	27.0	63.0	–	376.3
Denmark	1	933.0	680.0	–	–	–	–	–	–	–	–	–
Ecuador	2	41.0	20.5	–	–	–	–	97.1	–	37.3	–	134.4
Egypt	19	4,510.0	2,133.0	–	–	–	–	1,379.6	–	–	1,671.3	3,050.9
Equatorial Guinea	1	870.0	170.0	–	–	–	–	102.8	–	–	36.7	139.5
France	1	570.0	563.0	–	139.0	–	132.0	–	–	27.00	–	541.0
Hungary	8	1,137.4	461.0	–	71.0	38.8	40.7	139.8	–	71.3	228.3	589.9
India	11	3,691.9	2,945.1	–	227.8	–	–	3,939.7	768.2	714.3	884.5	6,534.5
Indonesia	13	7,972.3	7,089.7	–	625.1	–	304.4	305.3	1,521.9	–	1,965.1	4,721.8
Iran	22	17,142.0	10,509.0	–	–	–	–	–	3,726.9	–	9,190.6	12,917.5
Iraq	4	2,081.0	1,550.0	–	–	–	–	7.3	–	2.2	–	9.5
Italy	20	5,175.0	1,495.0	–	–	–	–	–	–	25.8	–	25.8
Kazakhstan	4	155.0	10.0	–	–	–	–	296.0	35.9	–	0.6	332.5
Kuwait	4	1,752.2	1,033.0	2,355.6	3,684.1	–	2,627.3	8,595.8	–	1,422.0	–	18,684.8
Libya	9	4,897.0	2,567.0	–	273.0	294.0	126.0	37.8	1,749.0	567.0	551.0	3,597.8
Malaysia	5	4,250.0	3,400.0	–	23.2	–	28.2	–	–	57.0	–	108.4
Mexico	8	4,879.0	2,803.0	2,344.5	–	–	–	4,640.0	13,414.4	–	2,523.1	22,922.0
Mozambique	1	–	–	–	–	–	–	–	–	–	–	–
Myanmar	1	24.0	–	–	17.0	26.2	–	–	–	4.7	–	47.9
Netherlands	2	725.0	315.0	–	–	–	–	–	–	–	230.5	230.5
New Zealand	3	944.5	495.8	–	4.0	–	6.5	274.3	–	17.2	803.2	1,105.2
Nigeria	4	1,268.0	228.0	–	–	–	–	–	3,415.1	–	84.0	3,499.1
Norway	4	3,150.0	530.8	–	2,596.7	586.7	1,452.7	–	175.4	1,389.7	–	6,201.2
Oman	8	826.0	309.4	–	–	–	–	–	202.0	43.0	–	245.0
Pakistan	12	1,195.0	858.7	–	–	–	–	53.8	64.9	–	9.1	127.8
Peru	4	545.7	298.2	–	–	–	–	14.9	1,399.0	–	12.8	1,426.7
Poland	1	55.0	–	–	–	–	–	33.6	–	–	16.8	50.4
Qatar	2	1,010.0	220.0	1,397.0	1,681.0	–	1,103.0	–	1,618.7	122.0	–	5,921.7
Russia	24	1,405.6	925.5	563.7	–	–	709.7	6,559.9	–	1,056.8	237.8	9,127.9
Saudi Arabia	10	10,040.0	8,496.0	–	–	–	–	–	24,234.0	–	12,810.0	37,044.0
Serbia and Montenegro	1	43.0	30.0	–	11.3	6.0	8.4	–	–	16.0	–	41.7
Syria	1	450.0	–	–	–	–	–	507.0	–	–	–	507.0
Thailand	5	1,070.0	1,030.0	1.6	–	–	–	557.0	49.1	84.0	–	691.7
Trinidad & Tobago	3	1,394.0	1,101.0	–	290.3	88.6	99.3	–	–	195.0	–	673.2
Tunisia	1	174.0	139.2	–	–	–	–	–	–	–	209.0	209.0
Ukraine	1	–	–	–	–	–	–	–	–	–	–	–
United Arab Emirates	9	3,923.0	3,295.6	–	792.5	–	612.0	–	374.9	–	7,199.2	8,978.6
United Kingdom	11	13,796.0	5,882.9	–	–	–	–	–	877.0	1,572.5	36.0	2,485.5
United States	571	70,218.2	45,537.4	11,940.1	10,022.9	1,846.4	3,625.5	185.9	41,091.7	4,153.5	2,602.2	75,468.2
Uzbekistan	2	–	–	–	–	–	–	–	–	–	–	–
Venezuela	14	3,927.0	3,555.0	–	–	–	–	–	7,312.9	–	–	7,312.9
Vietnam	1	150.0	120.0	–	281.0	–	188.0	495.0	–	–	167.9	1,131.9
Yemen	4	1,760.0	1,645.0	–	–	–	–	903.0	676.2	–	–	1,579.2
Total, excl. US	**1,284**	**180,058.6**	**110,098.9**	**17,498.5**	**13,411.3**	**1,165.7**	**9,794.3**	**31,283.2**	**76,001.0**	**12,543.4**	**56,462.3**	**218,159.8**
World total	**1,855**	**250,276.8**	**155,636.3**	**29,438.6**	**23,434.2**	**3,012.1**	**13,419.9**	**31,469.1**	**117,092.6**	**16,697.0**	**59,064.5**	**293,628.0**
Canada												
Alberta	889	46,230.6	24,649.2	7,108.7	933.7	–	515.0	102.2	10,865.6	2,593.1	7,222.0	29,340.4
British Columbia	34	5,681.4	4,337.2	295.0	112.7	–	302.6	565.0	66.0	537.8	–	1,879.1
Northwest Territories	2	219.9	28.3	–	–	–	–	–	–	–	–	–
Nova Scotia	2	600.0	366.0	–	–	–	–	–	765.0	–	–	765.0
Ontario	1	–	–	–	–	–	–	–	–	–	–	–
Saskatchewan	24	168.9	135.2	91.7	58.1	–	12.3	113.9	37.3	30.4	2.7	346.4
Total Canada	**952**	**52,900.7**	**29,515.9**	**7,495.4**	**1,104.5**	**–**	**829.9**	**781.1**	**11,733.9**	**3,161.3**	**7,224.7**	**32,330.9**
United States												
Alabama	14	1,363.0	470.3	–	130.2	–	83.4	–	195.5	55.6	150.0	614.7
Alaska	5	9,525.0	9,298.0	–	1.2	–	–	–	168.4	–	0.6	170.2
Arkansas	5	873.8	507.4	–	–	–	–	–	27.1	–	–	27.1
California	31	1,118.2	841.8	–	385.2	50.6	167.5	53.5	74.9	263.9	98.8	1,094.4
Colorado	41	1,482.7	1,199.7	417.2	475.3	57.3	177.1	8.7	886.4	168.7	170.2	2,360.9
Florida	1	32.0	4.0	–	–	–	–	–	41.0	–	–	41.0
Illinois	1	2,100.0	1,426.0	1,440.0	655.0	127.0	159.0	–	2,940.0	75.0	–	5,396.0
Kansas	13	2,908.5	1,221.2	–	279.3	37.9	87.4	–	1,873.2	84.6	260.3	2,622.7
Kentucky	4	120.0	106.1	–	–	–	–	–	153.5	–	–	153.5
Louisiana	72	18,675.3	9,607.3	1,592.4	1,288.0	396.3	307.1	–	6,324.5	568.9	345.6	10,822.7
Michigan	22	1,549.4	625.7	–	5.6	–	3.0	2.6	476.5	1.5	9.8	499.0
Mississippi	4	1,603.4	760.1	–	–	–	–	–	1,119.2	–	–	1,119.2
Montana	5	16.4	10.8	–	20.1	–	12.8	–	7.5	16.7	–	57.1
Nebraska	1	10.0	8.0	–	–	–	–	–	2.0	–	–	2.0
New Mexico	26	3,262.0	2,491.6	2,132.0	1,289.1	207.8	497.0	–	1,389.2	562.1	318.6	6,395.8
North Dakota	7	202.5	166.8	–	263.4	16.1	136.5	–	43.2	133.4	13.7	606.3
Ohio	4	25.0	10.0	0.1	2.8	0.8	1.9	–	8.2	–	2.3	16.1
Oklahoma	56	3,415.5	2,267.9	620.5	427.4	52.4	162.0	56.9	5,801.2	181.0	24.9	7,326.3
Pennsylvania	8	43.0	32.5	–	26.0	–	14.8	–	4.1	7.8	6.5	59.2
Tennessee	2	8.0	1.5	–	–	–	–	–	–	–	–	–
Texas	187	15,462.3	10,878.5	4,922.9	3,676.2	756.5	1,275.4	64.2	17,215.8	1,547.0	728.4	30,186.4
Utah	14	531.0	243.2	–	21.6	–	24.0	–	253.0	12.1	9.8	320.5
West Virginia	8	585.0	304.0	250.9	176.0	30.3	86.2	–	378.0	65.5	–	986.9
Wisconsin	1	–	–	–	–	–	–	–	–	–	–	–
Wyoming	39	5,306.2	3,055.0	564.1	900.5	113.4	430.4	–	1,709.3	409.7	462.8	4,590.2
Total US	**571**	**70,218.2**	**45,537.4**	**11,940.1**	**10,022.9**	**1,846.4**	**3,625.5**	**185.9**	**41,091.7**	**4,153.5**	**2,602.3**	**75,468.2**

Source of Alberta data: Alberta Energy and Utilities Board, data series ST50, ST13A. Source of British Columbia data: Government of British Columbia, Ministry of Energy and Mines, www.em.gov.ba.ca. Source for Saskatchewan data: Saskatchewan Industry and Resources, tel. (306) 787-2596.

Global markets facing adjustment to surge in LPG supply

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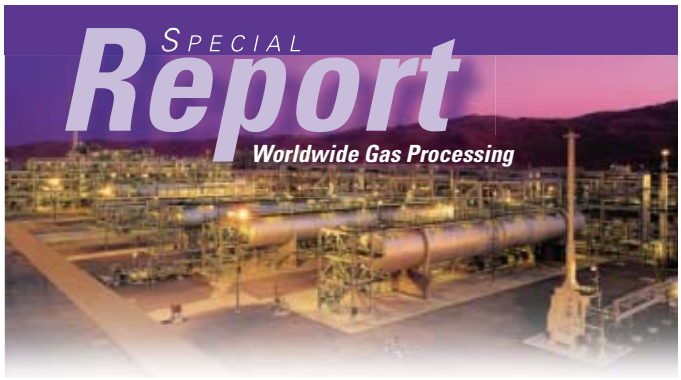


LPG production is rising in nearly every region of the world.

2006 global demand was about 227 million tonnes (7.3 million b/d), up 3.6% from 2005. This increase compares to an average demand growth of about 2.2%/year 2000-05. LPG production and exports have ramped up, associated with higher crude oil and LNG production rates.

Because LPG is a by-product of oil and gas production, LPG production is unlikely to be reduced, despite a surge in supply and a probable reduction in LPG prices relative to crude.

Meanwhile, LPG demand has also increased around the globe, but more slowly. About half of total LPG demand comes from the residential-commercial market for heating and cooking. Within limits, base demand that consists of residential-commercial demand and a significant fraction of other LPG demand is relatively insensitive to price. Consequently, LPG supply in excess of this base demand will need to be consumed by the more elastic demand coming mainly from petrochemical plants or stored for later consumption when the market adjusts.

During the past 3 years, the LPG market has moved from demand-driven to supply-driven. A global LPG supply surplus is building even while crude oil and petroleum product prices are strong. This has affected LPG price relationships. Global LPG markets are experiencing high absolute LPG price levels, which are supported by high crude oil and natural gas prices, but recent LPG prices have also been relatively weak compared to crude.

Markets for LPG market substitutes such as ethane, light naphtha, and certain fuels will also be affected by the LPG supply surge. For example, most propane and butane in raw gas streams will be separated from LNG upon liquefaction. Significant amounts of ethane, however, will often be left in the LNG when there is no local demand.

At regasification, this ethane associated with LNG will be less expensive to separate because the refrigeration cost is already paid. On the US Gulf Coast, both ethane produced from LNG streams and LPG imported for use in the petrochemical plants will likely put downward pressure on gas processing margins.

Global supply

In 2006, global supplies of LPG rose to about 227 million tonnes from 199 million tonnes in 2000. Thus, supplies increased by about 2.4%/year. Purvin & Gertz expects supplies will reach about 260 million tonnes by 2010 (Fig. 2).

Changes in sources

Natural gas processing continues to be the largest source of LPG supply, accounting for nearly 60% of total worldwide production during the last 10 years. Refineries accounted for nearly all of the remaining production. Other sources account for less than 0.5% of worldwide LPG production.

A fundamental change in the market, however, will occur during the next few years as LPG is recovered from LNG, either as part of new natural gas liquefaction plants or at regasification terminals. The growth in LNG facilities around the world will unlock previously stranded gas supplies and increase LPG production accordingly.

Not all LNG projects will result in increased LPG supplies, however, because some markets can utilize LNG that includes the contained LPG. With many projects, however, extraction of the LPG components will be necessary before liquefaction of the gas stream.

Regional comparisons

Regional LPG production has shown some notable shifts during the last decade.

In 1990, LPG produced in regions east of the Suez Canal ("East of Suez") totaled slightly less than 30% of world total. By 2000, East of Suez's share of total production had risen to about

Ethane varies by region

Ethane is seldom transported in ships from one region to another due to the high costs of shipping cryogenic products and a general lack of petrochemical demand beyond indigenous supplies. Despite that difficulty, ethane is an extremely important component of the global petrochemical industry.

Nearly all ethane is extracted from natural gas. Its physical properties are between those of methane and propane. Methane is the main component of natural gas, and much of the ethane can either be left in the gas or extracted from it along with the LPG.

Whether to recover ethane generally depends on the economics of extracting it from the produced natural gas. If ethane is to be recovered, its price must be higher than its extraction and purification costs, including its gas-based heating value.

Analyses by Purvin & Gertz' strategic partner, Chemical Market Associates Inc. (CMAI), Houston, show that ethane was used to produce almost 31 million tonnes of ethylene in 2006, or about 28% of the 110 million tonnes of ethylene produced during the year. Despite this very large market, ethane's use is extensive in only a few regions of the world, primarily the Middle East and North America.

Regional ethane use

The largest regional use of ethane occurs in the US and Canada, which account for about half of all the ethane consumed in the world. In the US, ethane supplies are adequate to cover industry needs, as significant amounts of ethane are still not recovered from natural gas processing.

The Canadian petrochemical industry uses ethane extensively in Western Canada, while the eastern Canadian industry uses a wider variety of feedstocks. With ethane production declining in Western Canada, propane has been used to supplement that production. Longer term, additional gas supplies from the Mackenzie Delta, Alaska, or both should help supplement current ethane supplies.

Latin America (primarily Mexico and Argentina) produced almost 40% of its ethylene from ethane. Ethane consumption in Western Europe accounted for about 9% of that region's total ethylene production.

Lastly, the Middle East has become a significant component of the global ethane market. About two-thirds of the ethylene produced in the region is derived from ethane. Thus, the Middle East uses about a quarter of the total world's consumption of ethane. As new ethylene plants appear in several countries in the region, the Middle East's share of the ethane market should grow to about 45% by 2010.

Additional ethane will need to be extracted from natural gas to satisfy global consumption for petrochemical production. Ethane demand could rise to around 50 million tonnes by the end of the decade. Most of this expected increase would occur in the Middle East.

35%, and Purvin & Gertz estimates that more than 40% of the world's LPG supplies will come from East of Suez by 2010.

On a percentage basis, production increases have been particularly high in the Commonwealth of Independent States (CIS), where supply increased by nearly 14% to about 12.6 million tonnes in 2006 from 6.8 million tonnes in 2000.

Other regions that grew quickly on a percentage basis in the same period include the Far East, Oceania, the Middle East, the Indian subcontinent, and Latin America, which each saw growth of 4-5%.

Since 2000, total global LPG production has increased by more than 28 million tonnes. On an absolute production basis, the largest supply increase came from the Middle East, which increased by 8.7 million tonnes to about 43.3 million tonnes in 2006 from a relatively large base of 34.6 million tonnes in 2000.

Thus, the Middle East accounted for almost a third of the world increase in LPG production so far in this century. As noted previously, the CIS region had an increase of about 5.7 million tonnes. The Far East and Latin America each had increases of about 5.1 million tonnes. Although the Indian subcontinent and Oceania had large increases on a percentage basis, their contributions on an absolute basis were much smaller because they started from a smaller production base in 2000.

Middle East

The Middle East has experienced the highest growth in LPG production since 2000 despite consecutive production decreases there in 2001 and 2002. Iraq had a dramatic LPG production decrease in 2003 due to the war, but the overall impact on the region was relatively small since Iraq's production was less than 5% of the Middle East region.

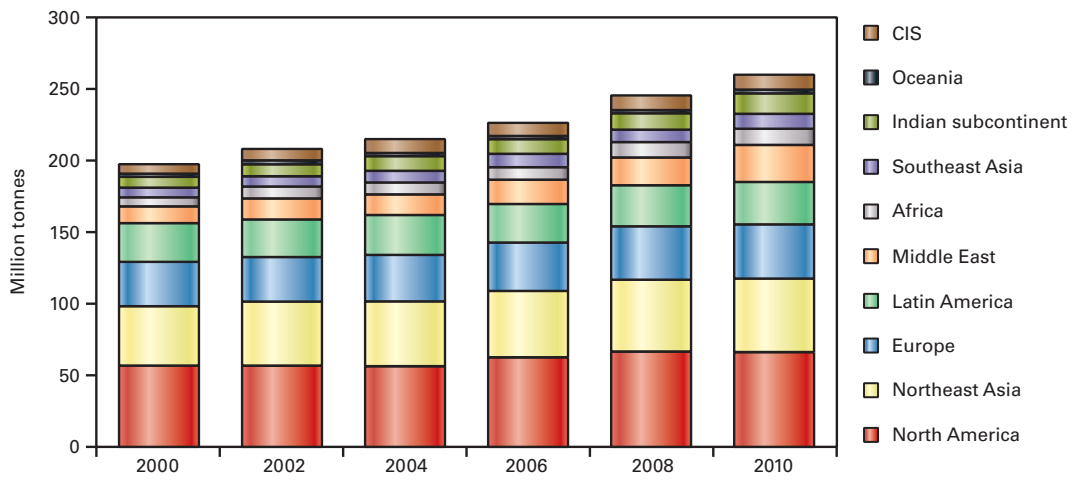
The Middle East has historically provided much of the LPG that is consumed in Asia, and this trade pattern will likely continue for the foreseeable future.

Increased crude oil production in the Middle East during the last few years has caused an increase in associated-gas production in the region. The corresponding increase in LPG production has freed up some supplies for export. The largest increase in production, however, came from the gas processing industry in the Middle East. Refineries produce only 11% of the region's total LPG supplies.

Saudi Arabia remains the largest LPG producer in the region with about half of the Middle East's production. But Saudi Arabia has gradually been losing some share of the region's production to Iran, Qatar, and the UAE. During the

WORLD LPG DEMAND

Fig. 1



next several years, we expect that LPG production will increase in Saudi Arabia, Iran, Qatar, and the UAE.

All of these countries continue to develop existing and new gas reserves. The continued growth in worldwide demand for LNG will also drive expansion of gas processing in the Middle East. By 2010, LPG production in the region will likely exceed 58 million tonnes.

North America

Despite production growth in the Middle East, North America remained the largest regional producer of LPG in 2006. The region's LPG production declined, however, by 2.4 million tonnes/year 2000-06. North America is unlikely to lose its dominant position on the supply side in the foreseeable future.

Although a large amount of production in the prolific Gulf of Mexico region was knocked off line for several months during 2005 by two major hurricanes, that does not account for the overall decline. Production in North America had peaked in 2000 at more than 59 million tonnes but then declined to less than 55 million tonnes by 2003. Since 2003, production has increased except for 2005.

Purvin & Gertz expects LPG production in North America will grow to about 58 million tonnes in 2007 but then decline slightly through the end of the decade. Gas processing provides slightly more than 60% of the LPG production in the region.

Far East

The increase in Far East production of LPG 2000-06 was driven largely by increased production from refineries in China. Production in Korea and Taiwan also increased, but the increases were dwarfed by the increases in China. All of the production in the region comes from refineries, as there is no appreciable gas processing.

In the future, Purvin & Gertz expects that refinery production of LPG will increase, especially in China, where new refineries and refinery expansions are planned to accommodate the growing Chinese economy and growing demand for transportation fuels.

Africa

In Africa, LPG production rose to 16.6 million tonnes in 2006 from 14.5 million tonnes in 2000, a growth of 2.3%/year. The net increase in production 2000-06 was driven by increases in Nigeria and Angola, which offset a decline in Algeria. Purvin & Gertz expects that LPG production will continue to expand in Africa. Particularly large absolute production increases are likely from Nigeria and Algeria, with significant contributions from Egypt, Libya, and Equatorial Guinea as well.

On Africa's west coast, increases in crude oil production and in gas processing capacity since 2000 pushed Nigeria's LPG production up by more than 1 million tonnes. In the past, a large portion of Nigeria's natural gas production, along with the entrained LPG, was flared. This practice has been decreasing, as gas is now being processed to recover the LPG.

Additions to LNG liquefaction capacity have also increased the overall recovery of LPG from produced gas in Nigeria. LPG production in Nigeria will likely increase to more than 4 million tonnes by 2010. Civil unrest in the country may become the largest impediment to increased production. Other countries in West Africa that produce and export LPG include Angola, the Congo, and Equatorial Guinea.

On the northern coast of Africa, Algeria, Egypt, and Libya are significant LPG producers. Algeria is still the world's second largest LPG exporter after Saudi Arabia.

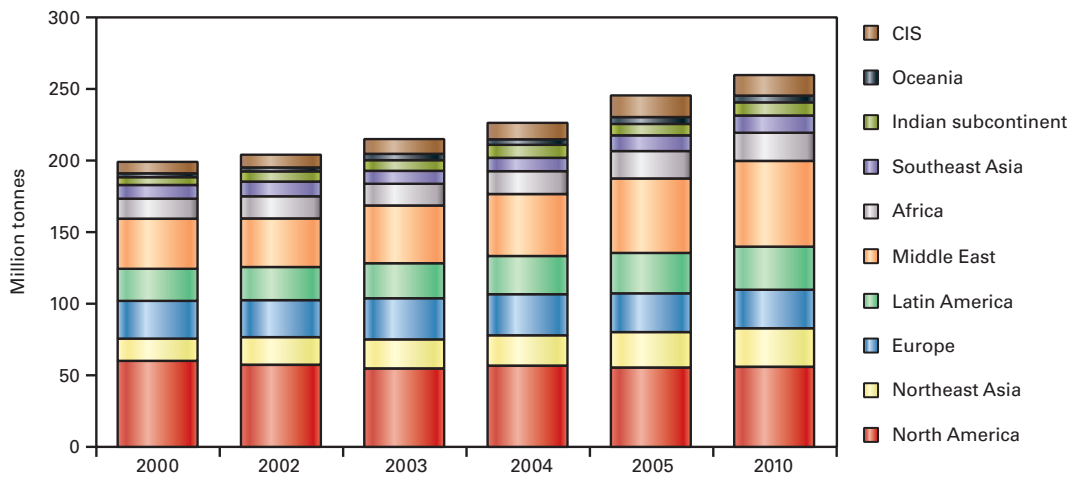
Algeria produced about half of the total for Africa in 2006. Egypt produced 11% of African supply in 2006 but remains a net importer of LPG to meet high domestic demand. Libya is also a fairly large producer of LPG, and its production should reach about 1.4 million tonnes by 2010.

Latin America

LPG production in the Caribbean and Latin America rose to more than 26 million tonnes in 2006. This production was less than in the Middle East and North America but higher than in the Far East.

WORLD LPG SUPPLY

Fig. 2



Within the region, Mexico, Brazil, Venezuela, and Argentina are the largest producers of LPG, together accounting for more than 80% of the 2006 LPG production in the region. Gas processing in the region accounts for more than 60% of LPG production, a percentage that will grow in the future.

Several countries in Latin America have plans for new and expanded gas liquefaction that will add to the regional LPG supply. Purvin & Gertz expects total LPG production in the region will rise to slightly more than 30 million tonnes by 2010. Venezuela is likely to have the largest supply growth in the future as several new projects are brought on line. Peru, which began production from the Camisea field in 2004, should grow by almost 0.8 million tonnes as well.

Indian subcontinent

Production on the Indian subcontinent rose to 7.9 million tonnes in 2006 from only 6.3 million tonnes in 2000. India dominates the region's LPG supply, with around 95% of production. Much of the growth has resulted from additional crude oil refining capacity that was added in the late 1990s.

More than two-thirds of regional LPG production comes from refineries, which is a wide departure from the world average. By 2010, regional production will likely increase to around 9 million tonnes.

Southeast Asia; Oceania

In Southeast Asia, about 56% of LPG is produced from gas processing, and the balance from refineries. The largest suppliers in the region are Indonesia, Thailand, and Malaysia, with Thailand being the largest producer at around 38% of regional production.

Indonesia has struggled to maintain LPG production at historic levels, due mainly to declining gas production at Bontang and Arun.

The Arun LNG plant was shut down by civil unrest in the area, and LPG exports from Arun were discontinued several years ago. Gas volumes at Bontang continue to decline. Although additional LNG projects are under way, natural gas feeding some of the newer projects is relatively dry and unlikely to yield much LPG.

Purvin & Gertz expects that regional LPG production in Southeast Asia will increase by about 1.9 million tonnes between 2006 and 2010. This estimate assumes some growth in regional gas processing. Also, there are plans for a grassroots refinery in Vietnam, but this project is unlikely to add significant LPG volumes until at least 2009.

In nearby Oceania, LPG production increased to 4.4 million tonnes in 2006 from 3.4 million tonnes in 2000. Oceania experienced growth of almost 5%/year during this period, but the absolute volumes are small in comparison with overall worldwide supply. Regional production will continue to expand gradually.

Europe; CIS

Northern Europe is a large but mature producing region. LPG supplies have grown by about 1.2%/year since 2000, including a 1.1% decline in 2006. Production from the North Sea represents a significant portion of regional production, but refineries in the region provide nearly half of the region's total LPG supplies. We expect that regional supplies will be flat to slightly reduced through the end of the decade. Increased refinery supplies of LPG should help offset declining North Sea supplies.

In contrast, the neighboring CIS region is experiencing a strong increase in supply. In 2006, the CIS region produced 12.6 million tonnes of LPG, which represents nearly a 14% /year increase since 2000. This growth occurred mainly as a result of additional gas processing in several countries.

LPG demand growth

Total global demand for LPG was slightly more than 227 million tonnes in 2006. Purvin & Gertz estimates that the market will grow to about 236 million tonnes in 2007 and reach more than 260 million tonnes by 2010. Thus, demand will likely grow by a total of about 32% compared with demand of 198 million tonnes in 2000 (Fig. 1).

Although total global growth for

LNG, liquids projects to push LPG into markets

Future global production of LPG will be greatly affected by the additional natural gas produced in conjunction with liquefaction projects. New projects and expansions have been announced or planned for Qatar, Nigeria, Angola, Indonesia, Russia, Norway, and several other countries. These projects may add a large increment of LPG supply to the world markets during the next 5 years.

The most notable projects are in Qatar, with development of several new LNG trains associated with the North Field, the world's largest nonassociated gas field. Recoverable reserves in the field are estimated to be as much as 900 tcf of natural gas, representing about 20% of the world's proven gas reserves.

If these LNG production projects are developed on their current timeframes, Qatar's production could soar to more than 8 million tonnes of LPG by 2010 from only 1.4 million tonnes in 2000. Iran has plans to develop natural gas projects associated with the portions of the same gas field that fall within its national waters. LPG supplies from Iran will likely increase by more than 50% as the South Pars field is developed. Some of the additional LPG will be used in petrochemical projects that are being developed in conjunction with the gas production and processing facilities.

Expansion projects in Nigeria will also increase LPG production. Additions to the Escravos and Oso gas liquids projects should add to LPG production by 2010, and the Olokola and Brass LNG projects should continue to ramp up LPG production. For both Nigeria and Iran, however, instability threatens the continued development of these projects.

Along with the additional LPG derived from natural gas liquefaction around the world, more LPG production will also come from existing and new gas processing and refinery projects.

Purvin & Gertz expects that LPG supplies during 2006-10 will expand more rapidly than in the first half of the decade. Total global LPG supply will likely reach 260 million tonnes by 2010, up from 227 million tonnes in 2006.

LPG since 2000 averaged 2.5%/year, growth rates in individual geographic regions have varied significantly. The highest growth in base demand (i.e., outside the price-sensitive petrochemical industry) has occurred in developing regions of the world. In the more mature economies of Western Europe and North America, LPG base demand increased much more slowly than the global average.

Demand growth in 2006 continued to be high in the Middle East, Africa, the CIS, Southeast Asia, and the Indian subcontinent. Much of this demand growth resulted from rising consumption by the residential-commercial sector. Demand growth in the Middle East primarily, however, resulted from the region's expansion of its petrochemical sector.

Asia, Oceania

The total Asian market—the Far East, Southeast Asia, and Indian subcontinent—overtook North America as the largest LPG consuming market in the world in 2001. LPG demand in Asia totaled about 66 million tonnes in 2006. For comparison, the North American market was about 62 million tonnes in 2006.

LPG demand in Asia has increased by an average 3.6%/year since 2000. Nearly 70% of total demand in the region is for use in the residential-commercial sector. It is interesting to note that South Korea is the world's largest consumer of LPG for automobile fuel; at a 2006 consumption of about 4.2 million tonnes of LPG, however, this application still represents a relatively small contribution to the total Asian market demand.

Almost all of the demand growth for LPG in Asia is in the residential-commercial sector. This region includes more than 3.5 billion people, or almost 56% of the world's total population. Continued economic growth in this region will result in additional consumption of LPG, although more slowly than during the last 10 years. Per-capita consumption of LPG in this region will likely increase significantly in the future.

Within the region, Japan and China are the largest consumers of LPG. China's total demand surpassed that of Japan in 2004. In 2006, demand in Chi-

na totaled about 19.0 million tonnes, while Japan's total was 18.2 million tonnes.

Growth in Chinese demand for LPG was very strong at about 20%/year throughout the 1990s but has slowed to 6.7%/year since 2000, with 2006 growth of only about 2%. Chinese demand has been dampened by high prices relative to alternatives for cooking and heating. Purvin & Gertz expects that Chinese demand will continue to grow but not at rates seen in the 1990s.

In contrast, Japanese demand growth was 0.4%/year during the 1990s and has been negative at -0.6%/year since 2000. Japan's mature market will exhibit only modest demand growth.

The LPG market in Southeast Asia is much smaller than the Far East but generally growing faster. The Far East market was more than six times the size of the Southeast Asian market in 2000, but the ratio has since narrowed to less than 5.5. Some of the Southeast Asian markets have exhibited strong growth rates and are becoming more important regional players in the LPG trade.

The region has experienced total LPG demand growth of greater than 5%/year since 2000. Total LPG demand in the region grew to about 8.7 million tonnes in 2006 from 6.6 million tonnes in 2000.

Much of the demand in the region is concentrated in Malaysia and Thailand, both of which have mature LPG markets with high penetration in the residential-commercial markets. Together, these two countries represent 60% of the total demand in the region.

Most countries in Southeast Asia, with the notable exception of Singapore, have experienced reasonably high growth rates during the last 10 years. More than 70% of the regional consumption is in the residential-commercial sector. Purvin & Gertz expects that growth in this sector will continue through the rest of the decade at more than 5%/year.

With almost 10%/year of growth expected, Vietnam will likely exhibit the highest growth rate of any country in the region through 2010.

The LPG markets in the Indian subcontinent continue to exhibit strong potential growth. In 2006, total demand rose to about 11.2 million tonnes from only 7.2 million tonnes in 2000. This increase represents growth of more than 9%/year. Almost all of this demand is concentrated in India, which accounts for more than 90% of the total LPG consumption on the subcontinent.

Compared with Asia, LPG demand in nearby Oceania is very low at only 2.1 million tonnes in 2006. Australia dominates the regional market with total consumption of 1.9 million tonnes. One unique aspect of the Australian market is the very high use of LPG as auto fuel, an end-use sector that accounts for about 60% of the total use in the country.

Middle East

In the Middle East, LPG demand is a notable exception to most regions that consume large amounts of LPG in the residential-commercial sectors. Demand in the Middle East has increasingly been heavily influenced by the petrochemical sector's use of LPG as a feedstock.

Before 1994, the chemicals sector consumed less than 10% of total LPG demand in the region. In 2006 chemicals comprised about 45% of total demand, and by 2010 that figure will likely rise to 60% or more of total LPG demand as new projects come on stream.

Saudi Arabia has been a major contributor to the use of the LPG for chemicals production and currently accounts for about 45% of total LPG consumption in the Middle East. In 2006, regional demand for LPG totaled about 16.2 million tonnes, and Saudi Arabia accounted for about 7.3 million tonnes. Petrochemical feedstock demand currently accounts for almost 80% of the total demand in Saudi Arabia.

Demand for LPG in Saudi Arabia will likely jump sharply 2008-09 as the next series of chemical manufacturing facilities come into production. Demand growth in the residential-commercial sector should remain relatively steady, with moderate growth during the next few years.

Iran is the next largest consumer of LPG in the Middle East, accounting for slightly more than 20% of regional demand. Demand growth in Iran has averaged almost 8%/year since 2000. Petrochemical use of LPG in the country will increase dramatically after 2010, pushed by expanded production from the South Pars field.

Europe

LPG demand has increased rapidly in some countries of Eastern Europe. Due to the collapse of the former Soviet Union, many of the newly formed republics experienced severe economic downturns during 1990-95. Since 1995, however, many of these countries have enjoyed strong economic growth, which has driven up LPG demand accordingly.

From 1995 to 2005, demand in many of the countries of Eastern Europe increased at more than 7%/year. Although this demand growth is strong in percentage terms, the absolute increases in LPG volumes were less impressive, mainly because these countries were starting from fairly low consumption bases.

In Northern Europe, there is no single, dominant LPG-consuming country. The UK and Ireland comprise the largest consumer of LPG and currently account for 4.0 million tonnes of regional consumption that totaled about 17.8 million tonnes in 2006. Scandinavia consumed about 3.2 million tonnes of LPG in 2006, and Germany used about 2.8 million tonnes. The Netherlands and Poland consumed a little more than 2.5 million tonnes of LPG each.

Total base demand in Northern Europe has grown only slowly to 13.2 million tonnes in 2006 from 12.0 million tonnes in 2000. Price-sensitive consumption for ethylene production, however, has more than doubled to 4.6 million tonnes in 2006 from 2.0 million tonnes in 2000. Purvin & Gertz expects price-sensitive demand to grow

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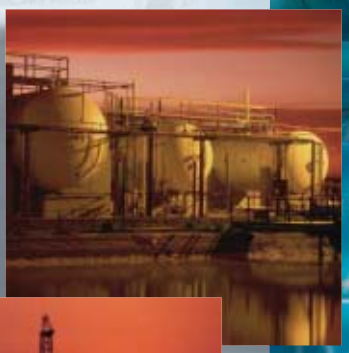

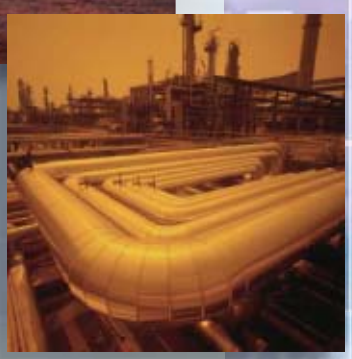

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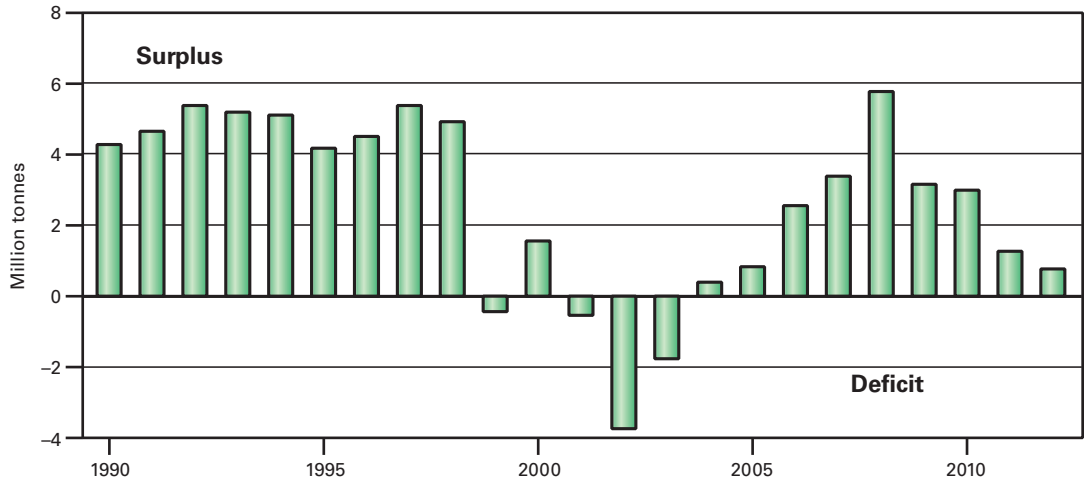
EAST OF SUEZ LPG TRADE

Fig. 3



rapidly for the next few years to more than 5 million tonnes in 2010 as global production of LPG rises faster than base demand.

Within Northern Europe, autofuel use in Poland has exhibited extremely strong growth during the past 10 years and accounted for the bulk of growth in the country's LPG market. As in many other countries where autogas represents a significant component of LPG demand, Poland's autogas consumption of about 1.9 million tonnes/year is driven by the fuel tax structure. In the absence of increased incentives, autogas growth in Poland should slow.

In southern or Mediterranean Europe, growth patterns for LPG have been quite different than in the north. The countries that make up this region include Spain, Italy, France, Turkey, Bulgaria, Romania, and the Balkan states. Most of these markets are very mature, and the petrochemical sector does not make up a large component of demand. Consequently, the region is not expected to show strong growth.

Demand in southern Europe peaked at 17.2 million tonnes in 2000 and declined to 15.3 million tonnes in 2003. Demand rebounded to about 16.2 million tonnes in 2006 but is not expected to surpass 2000 levels by the end of the decade.

In 1990-98 in the CIS region (Russia and the republics of the former Soviet Union, except the Baltic states), demand steadily declined due to weak economic conditions. In recent years, however, growth has returned to these markets. Since 2000, LPG demand in the CIS has grown at rates exceeding 10%/year.

In 2006, demand in the CIS totaled about 9.7 million tonnes. Russia accounts for the largest portion of the regional demand, consuming more than 80% of the LPG. Within Russia, the residential-commercial sector uses slightly less than half of the total, and petrochemical consumption of LPG accounts for almost 40%. LPG demand in the CIS will likely rise to about 10.6 million tonnes in 2010.

Africa

LPG markets have grown rapidly in Africa. Demand for the entire region has grown at 6.7%/year since 2000. In 2006, total LPG demand rose to 9.8 million tpy. Almost all the consumption in Africa is in the residential-commercial sector.

Egypt is the largest consuming country, accounting for about a third of regional consumption. Algeria and Morocco are also large regional consumers of LPG. Regional demand will likely increase to 11.8 million tonnes by 2010.

Latin America

Within Latin America, a large market for LPG, about 80% of the LPG is consumed in the residential-commercial sector. Mexico and Brazil account for almost 60% of LPG consumption. Starting in 2000, LPG demand in Latin America declined to a low of about 25.7 million tonnes in 2003. Much of the contraction occurred in Brazil and Mexico due to a combination of economic factors and penetration into the market by natural gas. Latin American demand has since rebounded to more than 27 million tonnes in 2006. Purvin & Gertz expects that demand will grow to nearly 30 million tonnes by 2010.

Mexico continues to have the highest per-capita use of LPG in the residential market of any country in the world. Four out of five households in the country use LPG as cooking fuel. Mexico consumed about 9.6 million tonnes of LPG in 2006—about 50% more than in Brazil.

North America

The North American market is one of the largest in the world and is quite mature. North American base demand for LPG grew at less than the world average in 2006. The US petrochemical industry, however, relies heavily on LPG as a primary feedstock, and petrochemicals LPG demand was robust in 2006. Total LPG demand—including price-sensitive demand—grew at about 5.8%.

Unique in the North American market is its ability to accommodate a large amount of price-sensitive demand. The US Gulf Coast has considerable underground storage, ample marine terminals, and a large petrochemical industry that has wide feedstock flexibility. These

attributes allow the US Gulf Coast to consume large amounts of LPG when the price is right.

Consequently, when global supply of LPG exceeds base demand, the US Gulf Coast is often the superior outlet for the excess supply because the LPG can be cracked as feedstock or stored until prices improve.

Base demand in North America has grown at only 0.4%/year since 2000. Even with the price-sensitive demand included, the growth rate was only 1.2%/year. This small percentage growth rate, however, masks the absolute demand increase due to the large size of the market. Total LPG consumption in the North American market increased by 4.3 million tonnes 2000-06. For comparison, by itself, this increase is twice the size of the total LPG consumption in Oceania in 2006.

Because North America is a very mature market, Purvin & Gertz does not expect base demand to grow appreciably in the region. Base demand growth should average only about 1%/year through 2010. Demand by the price-sensitive market, however, should expand rapidly until the surplus peaks, likely in 2008.

After the peak of the surplus, price-sensitive demand will decline but should remain relatively high for several years as the petrochemical industry takes advantage of low-cost global supplies. Total LPG demand, including the price-sensitive demand, will likely average nearly 4%/year growth through 2008, and then to decline through the end of the decade as global base demand catches up with the new production.

Trade patterns

An interesting shift in global LPG trade patterns occurred in the late 1990s. Between 1995 and 2000, LPG demand in the East of Suez region increased by about 17.3 million tpy. During this same period, supplies in the region increased by only 15 million tonnes/year. Although these changes seem subtle, the overall LPG supply-demand balance East of Suez shifted from a surplus of supplies to a deficit (Fig. 3). Conversely, West of Suez experienced an equal but opposite shift in its LPG supply-demand balance.

These relative changes in regional supply-demand balances affected world LPG trade patterns. The Far East continues to be the largest LPG importing region in the world. Additional consumption of LPG to produce petrochemicals in some of the exporting countries in the Middle East, however, has reduced LPG available for export. Therefore, in recent years the Far East has had to import LPG from increasingly diverse sources to meet the demand of the region. As a result, imports into the Far East have come from West and North Africa and even from the North Sea.

The US continues to be the primary swing destination or supplier of LPG to the global market. The US has a large capacity to store LPG during times of excess global supplies and can also supply LPG from storage to other regions when their supplies are tight. Furthermore, the US petrochemical industry can consume large amounts of LPG when prices are attractive relative to other possible feedstocks.

Our analysis indicates that the increase in global LPG supplies will outpace the increase in base demand during the next couple of years. Therefore, discretionary consumption of LPG as a feedstock for petrochemical production (price-sensitive demand) will need to increase. Total global price-sensitive demand will likely increase by as much as 6-7 million tonnes/year 2006-08.

As base demand increases to take up more of the surplus, the price-sensitive demand should decline somewhat by the end of the decade. At the peak of the surplus, about half of the increase is likely to come to the United States Gulf Coast with the balance to Western Europe and the Far East. ✦

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Method determines axial force in subsea pipelines

Alexander Aynbinder
Houston

A new method allows for determination of axial force on subsea pipelines within the context of DNV-RP-F105-2006, expanding the scope of current recommended practices and benefiting both project economics and safety.

Existing recommended practices for free span analysis do not address how to determine axial force in subsea pipelines, except for theoretical simplified conditions of axially completely unrestrained or totally restrained pipe. As a result, the designer often uses the totally restrained value to be conservative.

Axial force plays an especially important role in pipelines operated at higher pressures and temperatures. HPHT conditions result in a higher axial force and through this higher longitudinal stresses, which affect allowable free span lengths. Determination of actual axial force therefore affects the economics of a pipeline project.

Effective axial force governs static analysis, including determination of stresses and natural frequency. It depends on operating parameters such as pressure, temperature, pipeline deflection, and soil restriction.

Seabed unevenness, change of seabed topology, strudel scours, and artificial supports required for existing pipeline crossings can all lead to free spans in subsea pipelines. Assessment of free span requires structural (static) analysis.

This article provides guidance within the development of DNV RP-F105-2006 for assessment of pipeline free spans based on design criteria.

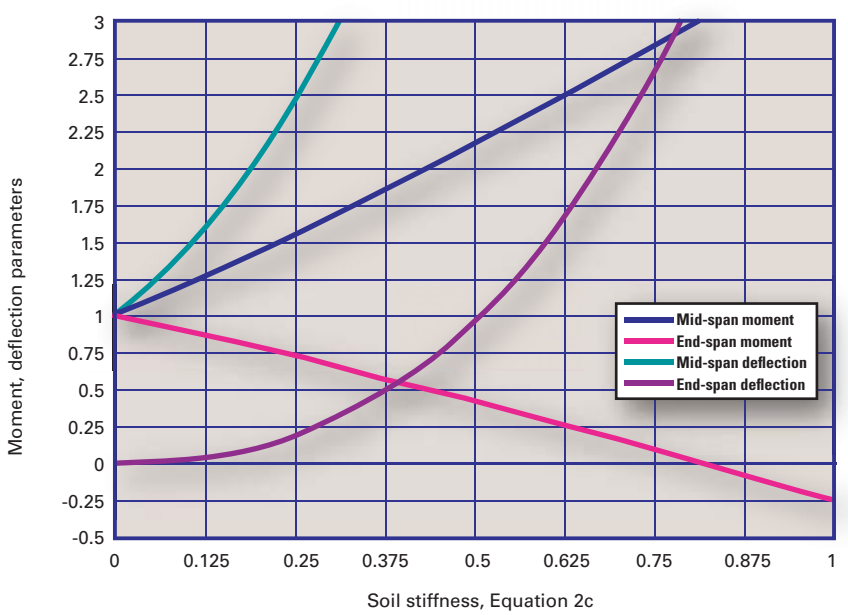
Background

For a single span, an analytical solution procedure to estimate axial forces caused by high pressure and high temperature differentials considers pipeline longitudinal movement (sliding) and transverse deflection.[1] It also considers the soil resistance at the shoulder of the span, nonlinear relations between strain and deflection, and the thermoelasticity relationship between strain and load effects.

A displacement balance equation for

SOIL STIFFNESS INFLUENCE

Fig. 1



Equations

Transverse load:

$$EI\frac{d^4v_1}{dx^4} - q = 0; \quad (1a)$$

$$EI\frac{d^4v_2}{dx^4} + K_v v_2 = 0 \quad (1b)$$

$$v_1 = \frac{ql^4}{24EI}\xi^4 + C_1\frac{\xi^3}{3} + C_2\frac{\xi^2}{2} + C_3\xi + C_4 \quad (2a)$$

$$v_2 = e^{\xi/\varphi}(A_1\cos\xi/\varphi + A_2\sin\xi/\varphi) + e^{-\xi/\varphi}(A_4\cos\xi/\varphi + A_3\sin\xi/\varphi) \quad (2b)$$

Where: $l = L/2; \xi = x/l; \varphi = \sqrt[4]{4EI/K_v l^4}$ (2c)

$$C_1 = \frac{ql}{EI}; C_2 = \frac{ql^2}{6EI}\frac{2-3\varphi^2}{1+\varphi}; C_3 = \frac{ql^3}{6EI}\frac{\varphi(2+3\varphi)}{1+\varphi};$$

$$C_4 = \frac{ql^4}{12EI}\frac{\varphi^2(3\varphi^2+6\varphi+2)}{1+\varphi}; A_1 = C_4;$$

$$A_2 = \frac{ql^4}{12EI}\frac{\varphi^2(3\varphi^2-2)}{1+\varphi}; A_3 = A_4 = 0 \quad (3)$$

$$M_1 = \frac{qL^2}{24}\overline{M}_1; M_0 = -\frac{qL^2}{12}\overline{M}_0; f_1 = \frac{qL^4}{384EI}\overline{f}_1 \quad (4)$$

Where:

$$\overline{M}_1 = \frac{3\varphi^2+3\varphi+1}{1+\varphi}; \overline{M}_0 = \frac{2-3\varphi^2}{2(1+\varphi)}; \overline{f}_1 = \frac{6\varphi^4+12\varphi^3+10\varphi^2+5\varphi+1}{1+\varphi}$$

Axial load:

$$v_{1,(0)} = f_1\sin^2\pi x/L \quad 0 \le x \le L; \quad v_{2,(0)} = 0 \quad -\infty < x < 0 \quad (5)$$

$$EI\frac{d^4v_1}{dx^4} + S_e\frac{d^2v_1}{dx^2} = -S_c\frac{d^2v_{1,(0)}}{dx^2} \quad (6a)$$

$$EI\frac{d^4v_2}{dx^4} + S_e\frac{d^2v_2}{dx^2} + K_v v_2 = 0 \quad (6b)$$

Where: $S_e = p_i A_i - p_e A_e - N_{tr}$ (6c)

$$\overline{v}_1 = \varsigma_1\frac{m^2}{1-m^2}\left[\frac{N}{\lambda}\left(\sin m\pi\xi - \frac{2\sin^2\frac{m\pi\xi}{2}}{\tan m\pi} + \frac{1}{N}\right) + \sin^2\frac{\pi\xi}{2}\right] \quad (7a)$$

$$\overline{v}_2 = \varsigma_1\frac{m^2}{1-m^2}\frac{e^{\alpha\xi}}{\lambda}\left(\cos\beta\xi + \frac{\alpha}{\beta}\sin\beta\xi\right) \quad (7b)$$

Where:

$\overline{v} = v/i; \xi = x/l; \zeta_1 = f_1/i; i = \sqrt{I/F}; N = \sqrt{(1-n)/n};$

$\lambda = m^2(N^2 + 2N/\tan m\pi - 1); H = n/m^2 \quad \alpha = \frac{m\pi}{2}\sqrt{\frac{1-n}{n}}; \beta = \frac{m\pi}{2}\sqrt{\frac{1+n}{n}}$

$m^2 = S_e/P_E = S_e L^2/(4\pi^2 EI); n = S_e/P_{cr,k} = S_e/(2\sqrt{EIK_v})$

$$M_{1,s} = \frac{4\pi^2 EI}{L^2}\frac{f_1}{2}\frac{m^2}{1-m^2}\overline{M}_{1,s} \quad (8a)$$

$$M_{0,s} = \frac{4\pi^2 EI}{L^2}\frac{f_1}{2}\frac{m^2}{1-m^2}\overline{M}_{0,s} \quad (8b)$$

$$f_{1,s} = f_1\frac{m^2}{1-m^2}\overline{f}_{1,s} \quad (8c)$$

Where:

$\overline{M}_{0,s} = m^2(N^2-1)/\lambda \quad \overline{M}_{1,s} = 1 + \frac{2m^2 N}{\lambda\sin m\pi}$

$$\overline{f}_{1,s} = 1 + \frac{1 + N\tan\frac{m\pi}{2}}{\lambda}$$

Axial force determination:

$$u_{1,0} + u_{2,0} = 0 \quad (9)$$

$$\varepsilon_x = \frac{du_1}{dx} + \frac{1}{2}\left[\frac{d(v+v_0)}{dx}\right]^2 - \frac{1}{2}\left(\frac{dv_0}{dx}\right)^2 \quad (10)$$

$$\varepsilon_x = \frac{N_{tr}}{E\,A_s} - v\frac{\sigma_h}{E} + \alpha(T_o - T_i) \quad \sigma_h = \frac{(p_i - p_e)D}{2t} \quad (11)$$

$$\frac{d^2u_2}{dx^2} - \gamma^2 u_2 = 0 \quad \gamma = \sqrt{\frac{K_x}{E\,A_s}} \quad (12)$$

$$u_{1,0} = -\int_0^1 \frac{du_1}{dx}dx \quad (13)$$

$$u_{2,0} = \frac{S_e}{E\,A_s\,\gamma} \quad (14)$$

$$m^2 = m^2_{p,T} - \frac{\delta}{1 + 1/\gamma l} \quad (15)$$

$$m^2 = S_e/P_E; m^2_{p,T} = [\alpha(T_o - T_i)E + (0.5 - v)\sigma_h]A_s/P_E \quad (16a)$$

$$\delta = \frac{S_1^2}{2\pi^2}\int_0^1\left\{\left[\frac{d(\overline{v}_1 + \overline{v}_0)}{d\xi}\right]^2 - \left(\frac{d\overline{v}_0}{d\xi}\right)^2\right\}d\xi \quad (16b)$$

$$\delta_f = \frac{S_1^2}{16}\left[\frac{1}{(1-m^2)^2} - 1\right] \quad (17)$$

$$N_{tr} = m^2 P_E - 0.5\sigma_h A_s \quad (18)$$

$$\omega_s = \omega_o\sqrt{\frac{1-m^2}{\overline{f}_{1,s}}} \quad \text{where:} \quad \omega_o = \frac{3.56}{L^2}\sqrt{\frac{EI}{m_{ef}f_1}} \quad (19)$$

the shoulder and the free span tie-in point yields the effective axial force. The bending moment caused by the transverse load and axial force adjusts the geometrical nonlinearity.

The proposed method allows the determination of stress parameters required by DNV-RP-F105, including the fundamental natural frequency. This article presents the calculation procedure using MathCAD software and an example with input and detailed output data.

Results are comparable to finite-element-method results for similar boundary conditions and assumptions.

The proposed method provides an economic design solution and enhances the reliability of the pipeline.

Basic assumption

This article's basic assumptions coincide with the realistic characterization of the cross-sectional behavior of a pipeline.[1] The equations' bending stiffness coincides with that of concrete coated steel pipe.

This article, however, does not consider changes in the concrete-coated pipe's bending stiffness caused by bending moments (OGJ, June 19, 2006, p. 53) and assumes the steel pipe's material linearity (OGJ, June 22, 1998, p. 72). Linear transverse and longitudinal stiffness modeled pipe-soil interaction. Recommended practice may determine the values of the concrete-coated pipe's stiffness and the soil stiffness.[1]

Soil resistance and relaxation due to pipeline displacement determine the effective axial force caused by pressure and temperature differentials. Timoshenko's method addressed so-called geometrical stiffness, governed by the effective axial force.[2] The determination of pipeline configuration due to transverse load (submerged weight of the pipe in vertical direction or drag loading in horizontal direction) provides the basis for this method, prior to analyzing the pipeline with initial displacement due to lateral force.

Transverse load

Equation 1 provides classical equilibrium in terms of transverse displacement (v) for the free span (subscript 1) and the shoulder (subscript 2), based on the soil resistance model assumption (see accompanying equation box). The

solutions of these differential equations (Equation 2) include eight arbitrary constants determined from two shoulder boundary conditions, four free span and shoulder conditions of conjunction, and two midspan symmetrical conditions. Equation 3 presents the eight determined constants.

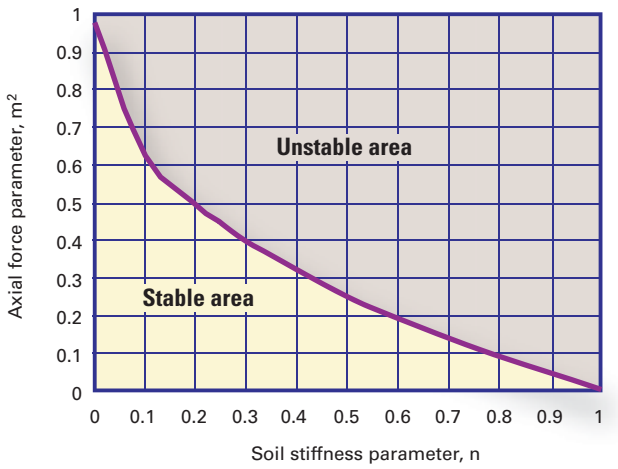
Equation 4 shows the bending moments (M) and deflections (f) at the middle ($\zeta = 1$) and ends ($\zeta = 0$) of the span, based on Equation 2 and the values of constants in Equation 3.

These equations for bending moments and deflection used the known formulas for a single pipeline span with both fixed ends multiplied by soil stiffness parameters.

Fig. 1 illustrates the relationship of moments and deflection parameters with vertical soil stiffness parameter φ. The solution for bending moments and deflections for fixed ends ($\varphi = 0$) agrees with the ordinary solution. The bending moment at the span ends, which is twice as large as the midspan moment for the fixed-end condition, uses a soil-stiffness reduction, while the moment at the midspan increases with soil stiffness reduction, and may be greater than that at the end-span.

STABLE, UNSTABLE AREAS

Fig. 2



Axial load

The combined effect of transverse and axial loads may lend itself to interpretation as a pipeline with initial deflection caused by transverse load exposure only to axial force. Equation 5 describes the initial configuration of free span pipelines with satisfactory accuracy for engineering purposes.

Equation 6 presents the equilibrium equations for the free span with initial deflection and the shoulder with resistance soil model due to effective axial force. Equation 6c describes the effective axial force, which is positive in compression.

After determination of the arbitrary constants from the boundary conditions, the solutions of the above differential equations (Equation 7) describe the deflection of the free span and the shoulder. Equation 7 uses dimensionless parameters of the effective axial force; the ratio of the effective axial force to the Euler critical buckling force for the pipeline with fixed ends and to the critical buckling load for the infinite pipeline with linear soil stiffness.

As follows from Equation 7, the value of parameter $\lambda = 0$ defines buckling.

Fig. 2 represents the area of stable equilibrium.

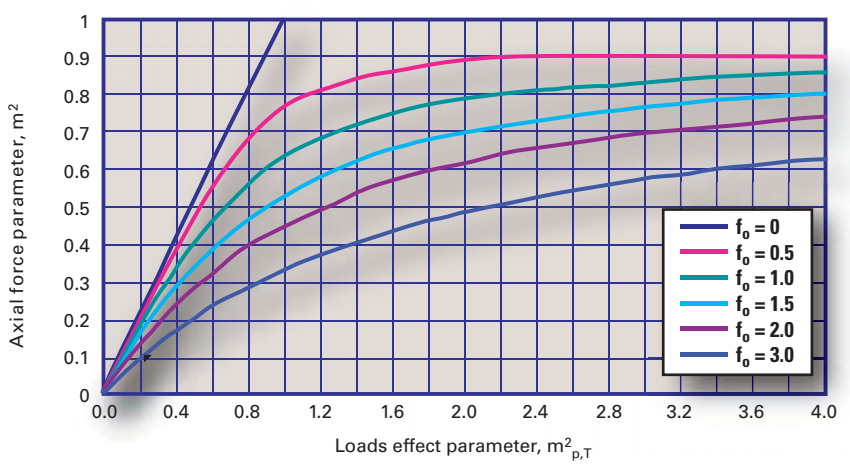
Since a value of zero for parameter n defines the fully fixed ends, the soil stiffness is reduced as n increases from zero, reducing the critical force along with it.

Equation 8 defines bending moments M and deflections f at the middle ($\zeta = 1$) and ends ($\zeta = 0$) of the span. Equation 8 stems from Equation 7 which describes the pipeline deflections. These equations also represent the known formulas for a single pipeline span with both fixed ends multiplied by soil stiffness parameters.

The bending moment at midspan, caused by the compressive effective axial force, increases with soil stiffness reduction. The bending moments at the span ends diminish if this axial force is less than the Euler critical force for a span with both fixed ends, but increase if the axial force is more than the Euler force for the same soil stiffness.

AXIAL FORCE DETERMINATION, FIXED ENDS

Fig. 3

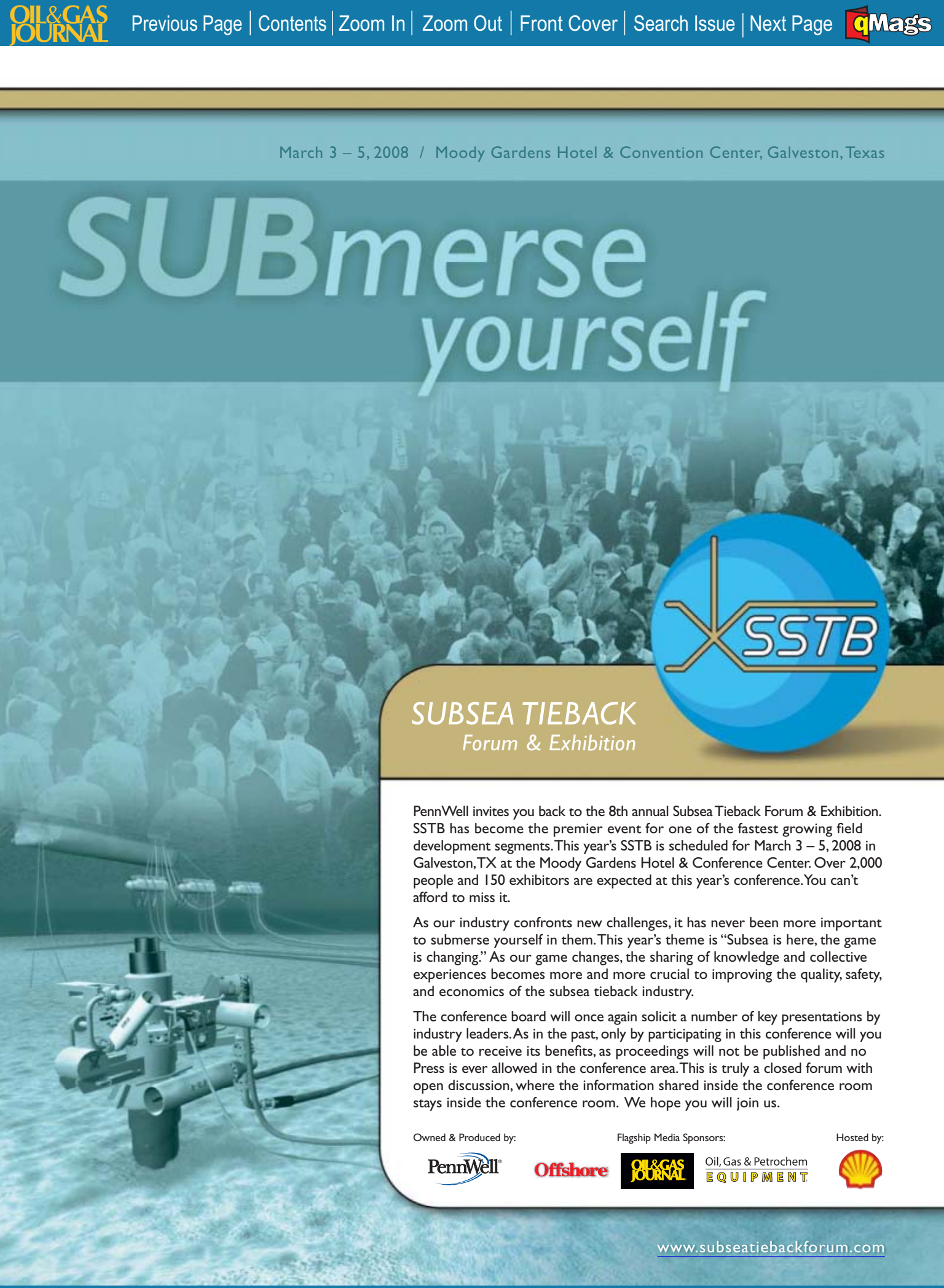


Force determination

The effective axial force equals the true steel-wall axial force with correction for the effect of internal and external pressures shown in Equation

March 3 – 5, 2008 / Moody Gardens Hotel & Convention Center, Galveston, Texas

SUBmerse yourself



SSTB

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PennWell invites you back to the 8th annual Subsea Tieback Forum & Exhibition. SSTB has become the premier event for one of the fastest growing field development segments. This year's SSTB is scheduled for March 3 – 5, 2008 in Galveston, TX at the Moody Gardens Hotel & Conference Center. Over 2,000 people and 150 exhibitors are expected at this year's conference. You can't afford to miss it.

As our industry confronts new challenges, it has never been more important to submerse yourself in them. This year's theme is "Subsea is here, the game is changing." As our game changes, the sharing of knowledge and collective experiences becomes more and more crucial to improving the quality, safety, and economics of the subsea tieback industry.

The conference board will once again solicit a number of key presentations by industry leaders. As in the past, only by participating in this conference will you be able to receive its benefits, as proceedings will not be published and no Press is ever allowed in the conference area. This is truly a closed forum with open discussion, where the information shared inside the conference room stays inside the conference room. We hope you will join us.

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STRUCTURAL STRESS ANALYSIS, FREE-SPANNING PIPELINES

Table 1

INPUT			
Pipe, OD	D	0.273	m
Pipe, WT	t	0.015	m
Steel, modulus of elasticity	E	2.07×10^{11}	Pa
Steel, Poisson's ratio	v	0.3	–
Specified minimum yield	S_y	4.48×10^{8}	Pa
Temperature expansion coefficient	α	1.12×10^{-5}	1/°C.
Internal pressure	p_i	1.586×10^{7}	Pa
External pressure	p_e	4×10^{6}	Pa
Operating temperature	T_o	90	°C.
Installation temperature	T_i	15	°C.
Transverse load	q	4.85×10^{3}	Newton/m
Concrete, coating thickness	t_c	0.025	m
Concrete, strength	f_{cn}	20	Newton/mm²
Slippage coefficient	k_c	0.25	–
Soil stiffness, transverse	K_v	6.2×10^{5}	Pa
Soil stiffness, longitudinal	K_x	1.3×10^{6}	Pa
Effective mass	m_{ef}	1.24×10^{3}	kg/m
Free span length	L	24	M
OUTPUT			
Concrete, stiffening effect	CSF	0.103	–
Composite pipe, bending stiffness	EI	2.32×10^{7}	Newton × m²
Transverse load			
Soil transverse stiffness parameter	φ	0.291	–
Midspan:			
Bending moment, parameter	$M_{1,p}$	1.649	–
Bending moment	M_1	1.92×10^{5}	Newton × m
Parameter of deflection	$f_{1,p}$	1.835	–
Deflection	f_1	0.511	m

OUTPUT (CONT.)			
Span ends:			
Bending moment, parameter	$M_{o,p}$	0.676	–
Bending moment	M_o	-1.57×10^{5}	Newton × m
Parameter of deflection	$f_{o,p}$	0.263	–
Deflection	$f_{o,p}$	0.095	m
Axial force			
Soil axial stiffness parameter	γl	0.273	–
Soil-pipe stiffness	H	0.21	–
Loads effect, parameter	$m^2_{p,T}$	1.556	–
Axial force relaxation, parameter	δ	7.089	–
Effective axial force, parameter	m^2	0.191	–
True steel wall axial force	N_{tr}	$-5.98 \times 10_5$	Newton
Midspan:			
Bending moment, parameter	$M_{1,sp}$	1.249	–
Bending moment	$M_{1,s}$	1.92×10^{4}	Newton
Span ends:			
Bending moment, parameter	$M_{o,sp}$	0.852	–
Bending moment	$M_{o,s}$	-1.35×10^{6}	Newton
Results			
Midspan bending moment	M_{1t}	2.11×10^{5}	Newton × m
End-span bending moment:	M_{ot}	-1.9×10^{5}	Newton × m
Midspan deflection	f_{1t}	5.45×10^{-1}	m
End-span deflection	f_{ot}	9.8×10^{-2}	m
Hoop stress	σ_h	1.08×10^{8}	Pa
Maximum longitudinal stress	$\sigma_{l,max}$	2.35×10^{8}	Pa
Minimum longitudinal stress	$\sigma_{l,min}$	-3.33×10^{8}	Pa
Maximum Mises combined stress	σ_{com}	3.98×10^{8}	Pa
Fundamental frequency	ω	0.371	hz

6c. The unknown true steel-wall axial force depends primarily on temperature differentials and pressure that can be determined from the continuity equation of the longitudinal displacement at the end of span described by Equation 9.

The nonlinear relation between the strain, displacement, and deflection (Equation 10) and the thermoelasticity relationship between strain and load effects (Equation 11) can determine longitudinal displacement at the ends of the span from the free-span portion. The equilibrium condition of the shoulder line with soil stiffness in the longitudinal direction K_x (Equation 12) can determine the longitudinal displacement of the shoulder ends.

Calculating displacement components in Equation 9 in accordance with Equations 13 and 14 allows rewriting it as Equation 15. Solving nonlinear Equation 15 allows determination of the parameter of effective axial force, m.

MathCAD can solve this essentially nonlinear equation. MathCAD software provides for the numerical integration required to solve Equation 15.

The special case when both ends of a free span are fully fixed can illustrate the fundamental features of Equation 15. Equation 17 shows the integral in Equation 16 written in closed form.

Fig. 3, based on Equations 15 and 17, shows the parameter of axial force for a free span with fixed ends vs. the pressure and temperature differential. This result plays an important role in qualitative assessment. Axial force caused by pressure and temperature effects cannot exceed the critical force of the span with initial deflection, the ratio of axial force to critical force (m^2) tending to one.

Solving Equation 15 also allows determination of the fundamental natural frequency taking boundary conditions into account.

Ratios of natural frequencies in pipelines with different boundary conditions are proportional to the square roots of their corresponding static deflections. Equation 19, therefore, determines the fundamental natural frequency adjusted for the axial force, which in turn is based on the classical solution for pipelines with fixed ends as well as the parameters of deflection for a free span shown in Equations 4 and 8c.

Design application

The described method can determine free-span structural analysis parameters such as bending moments, axial force, deflections, and the fundamental natural frequency required by DNV-RP-F-105. Data for a typical 10-in. offshore high pressure-high temperature (2,300 psig, 180° F.) pipeline illustrate the application of this new method.

Table 1 presents results of calculations (output) performed by the MathCAD program developed for this condition. MathCAD's ability to conduct the numerical integration required for the calculation procedure led to its selection.

DNV-RP-F-105 paragraph 6.2.5 provides the basis for calculating the stiffening effect of the concrete coating,[1] with the soil transverse and axial stiffness parameters calculated according to Equations 2c and 12.

Equation 4 then provides the basis for calculating the bending moments and deflections at the ends and midspan due to transverse load. Nonlinear Equation 15 then calculates the effective axial force using the deflection from transverse and axial loads according to Equation 7, the axial force relaxation

according to Equation 16b, and load effect parameter according to Equation 16a. Equation 19 determines the true steel-wall axial force once the parameter of effective axial force is known.

Total bending moments determine maximum-minimum longitudinal stresses due to the transverse load according to Equation 4 and axial load according to Equation 8, as well as the true steel wall axial force according to Equation 19.

The Von Mises combined stress, which considers longitudinal and hoop stresses (according to Equation 11), may act as one of the criteria for allowable free span assessment. Effective axial force determines the fundamental natural frequency (first Eigen frequency) according to Equation 19, which also considers boundary conditions.

The proposed method can be applied to the provisions of the DNV Codes and allows inclusion of stress analyses required for free span assessments of HPHT pipelines. ✦

References

1. DNV-RP-F105 "Free Spanning Pipelines," Det Norske Veritas, p. 45, 2006.

2. S. Timoshenko, "Strength of Materials," New York: Kriegas, Huntington, p. 247, 1976.

The author

Alexander Aynbinder (Alexander_Aynbinder@yahoo.com) is a research engineer and scientist. The companies he has worked for include J. Ray McDermott, Gulf Interstate Engineering, and Fluor Daniel. Before immigrating to the US (1990), Aynbinder was a lead research scientist in the Russian State Research Institute for Pipeline Construction (VNIIST). He is a graduate of the Moscow Civil Engineering University and received a PhD in civil engineering (1977) from the Central Research Institute of Civil Structures in Moscow. Aynbinder's major research interest is stress analysis of offshore-onshore pipeline-piping systems.

Equipment/Software/Literature

New corrosion inhibitor helps well production

New Clean N Cor cleaning and corrosion inhibitor treatment program is designed to protect and maximize production from oil fields with oil sludge deposition challenges.

The program incorporates hands-on technical expertise with advanced chemistry and in-field monitoring to provide a comprehensive treatment solution that removes sludge deposits from inner pipe walls and filter equipment and then prevents aggressive corrosion from taking place.

In one user's water injection system, the firm notes, this level of sludge removal translated to 75% more water being injected, resulting in increased oil production and an 800% return on investment. Once the sludge had been removed, Clean N Cor prevented it from readsorbing and then protected the pipe surface by providing a film that acted as a barrier to corrosive fluids. The required dosage to maintain an acceptably low corrosion rate was nearly 20% lower than the dosage required for conventional corrosion inhibitors, the firm says.

Source: **Nalco Co., Energy Services Div.**, 7705 Highway 90-A, Sugar Land, TX 77478.

Mobile rotary rig handles deep-hole drilling

Here's the RD20 truck-mounted rotary, deep-hole drilling rig designed specifically for oil, gas, and coalbed methane wells.

Mounted on a 380 hp, five-axle, 10 ft by 6 ft tridem carrier with manually controlled lockers on all three rear axles, it is designed to reach most locations under its own power. The separate truck engine and drive train are designed to move the rig down the road at standard highway speeds and provide power for off-road maneuverability.

From the time the RD20 arrives on location, it typically can be rigged up and drilling in 1 to 3 hr, the firm says. It has a 755 hp engine and available air-on-board.

Converting the rig for mud service is designed to take less than 15 min. With the firm's disconnect box, the compressor can be turned off from the power train, saving fuel and wear.

The patented two-cylinder carriage feed system and hydraulic top-head drive are designed to deliver 120,000 lbf ft (533.7 kN) of pullback and 30,000 lbf ft (133.5 kN) pulldown force. The drill pipe and casing are handled with the rotary head, eliminating the need for a large drawworks and spinner. The torque limit control is designed to allow precise torque settings that match pipe and casing requirements. When a joint is torqued to specification, the rotary head automatically stops.

Source: **Atlas Copco Drilling Solutions LLC**, Box 462288, Garland, TX 75046-2288.

Services/Suppliers

RBG Ltd.

Aberdeen, has announced the appointment of Tadg Slattery as chief operating officer.

Slattery

Slattery came to Aberdeen in 1976 to work for AOC International. Following AOC's purchase by Brown & Root, he became vice-president of merged organizations. He spent the last two years as KBR's senior vice-president of business in Algeria.

RBG Ltd. is a leading life-of-field services contractor, providing asset integrity support, integrated maintenance, modification, engineering support, and resource services to the global oil, gas, and petrochemicals industry.

3M Oil & Gas

Houston, has announced a customer center in Houston. The facility includes laboratory, meeting, and demonstration space. The center will serve as a pipeline for customers to team with technical experts on 3M's applications, with specific focus on drilling fluids, low-density cement, liquid filtration, and pipe insulation.

Scott Hanson, global oil & gas exploration & production business development manager, will head the customer center. Hanson holds a bachelor's degree in civil and environmental engineering from the University of Wisconsin-Madison, a master's degree in engineering management and an MBA from Northwestern University.

3M Oil & Gas business has operations in more than 30 countries, and supplies products used in virtually every aspect of the industry.

Ixsea

Paris, has announced a new subsidiary in Hannover, Germany, and appointed Arne Hoof as sales manager in the new office. Ixsea GmbH is led by managing director Maarten van Beelen.

Hoof holds an engineering diploma in geodesy from the University of Hannover, and a certificate of academic proficiency in hydrographic surveying from the University of New Brunswick, Canada.

Ixsea provides marine navigation, positioning, and imagery systems and solutions for customers in a variety of industries. The company won first prize in the 2006 offshore oil and gas industry innovation awards by the French trade association GEP for its Shadows synthetic aperture sonar system.

Swain Meter Co.

Mt. Pleasant, Mich., has promoted Dave Courtright to business development coordinator. Courtright has been with the company for 12 years.

Swain Meter Co., founded in 1965, is a leading provider of meters that measure direct current on conductors. The company's meters are utilized around the world in the gas and oil production and storage industries.

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Extracted from a recent survey[1], the following are verbatim responses to, "Tell us how useful Oil & Gas Journal is to you and how you use it in your job."

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"Extremely useful. Of all trade publications, this is the one we rely on."

"Oil & Gas Journal is my connection to the industry."

"I would not be without it!"

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

API IMPORTS OF CRUDE AND PRODUCTS

	Districts 1-4		District 5		Total US		
	6-8 2007	[1]6-1 2007	6-8 2007	[1]6-1 2007	6-8 2007	[1]6-1 2007	6-9 2006
	1,000 b/d						
Total motor gasoline	483	391	107	134	590	525	472
Mo. gas. blending comp.	720	633	34	32	754	665	962
Distillate[2]	171	188	22	69	193	257	326
Residual	165	220	37	49	202	269	579
Jet fuel-kerosine	43	61	122	112	165	173	130
LPG	231	326	3	3	234	329	316
Unfinished oils	670	687	15	141	685	828	430
Other	371	596	—	—	371	596	491
Total products	**2,854**	**3,102**	**340**	**540**	**3,194**	**3,642**	**3,706**
Canadian crude	1,728	1,455	261	194	1,989	1,649	1,854
Other foreign	7,448	6,716	882	1,038	8,330	7,754	8,858
Total crude	**9,176**	**8,171**	**1,143**	**1,232**	**10,319**	**9,403**	**10,712**
Total imports	**12,030**	**11,273**	**1,483**	**1,772**	**13,513**	**13,045**	**14,418**

[1]Revised. [2]Includes No. 4 fuel oil.
Source: American Petroleum Institute.
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

	*6-8-07	*6-9-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	87.18	85.95	1.23	1.4
Brent crude	71.12	68.08	3.04	4.5
Crack spread	16.06	17.87	–1.81	–10.1
FUTURES MARKET PRICES				
One month				
Product value	88.07	88.02	0.05	0.1
Light sweet crude	65.89	71.58	–5.69	–7.9
Crack spread	22.18	16.44	5.74	34.9
Six month				
Product value	82.26	84.57	–2.31	–2.7
Light sweet crude	69.33	74.59	–5.25	–7.0
Crack spread	12.92	9.98	2.94	29.5

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

PURVIN & GERTZ LNG NETBACKS—JUNE 8, 2007

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMBtu					
Barcelona	6.79	4.22	5.40	4.13	4.78	5.38
Everett	6.38	4.34	6.01	4.43	4.90	6.70
Isle of Grain	2.58	0.72	2.03	0.63	1.22	2.09
Lake Charles	5.06	3.25	4.81	3.40	3.61	5.69
Sodegaura	4.66	6.48	4.87	6.42	5.79	4.17
Zeebrugge	5.46	3.47	4.85	3.41	3.98	4.87

Definitions, see OGJ Apr. 9, 2007, p. 57. Source: Purvin & Gertz Inc. 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						
PAD I	14,647	49,706	23,264	10,713	42,444	14,915	8,501
PAD II	75,640	48,748	16,412	7,491	30,164	1,122	12,925
PAD III	185,404	68,749	27,872	12,185	32,693	13,139	43,880
PAD IV	13,799	6,185	1,992	553	3,278	256	2,871
PAD V	[1]58,667	32,015	21,728	10,245	13,578	5,911	21,531
June 8, 2007	**[1]348,157**	**205,403**	**91,268**	**41,187**	**122,157**	**35,343**	**89,708**
June 1, 2007[3]	**346,436**	**208,541**	**92,541**	**41,488**	**124,867**	**35,526**	**90,504**
June 9, 2006	**348,035**	**213,884**	**92,882**	**40,148**	**121,509**	**42,614**	**94,121**

[1]Included in total motor gasoline. [2]Includes 7.620 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—JUNE 8, 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	3,602	1,411	1,441	1,618	89.1	1,865	102	529	123
App. Dist. 1	121	92	95	95	100.0	52	—	36	—
Dist. 1 total	**3,723**	**1,503**	**1,536**	**1,713**	**89.7**	**1,917**	**102**	**565**	**123**
Ind., Ill., Ky.	2,243	2,105	2,143	2,355	91.0	1,255	92	560	28
Minn., Wis., Dak.	410	395	399	442	90.3	330	38	115	9
Okla., Kan., Mo.	954	670	683	786	86.9	510	18	276	6
Dist. 2 total	**3,607**	**3,170**	**3,225**	**3,583**	**90.0**	**2,095**	**148**	**951**	**43**
Inland Texas	782	432	456	647	70.5	421	29	151	7
Texas Gulf Coast	3,972	3,194	3,308	4,031	82.1	1,308	330	843	132
La. Gulf Coast	3,292	3,046	3,047	3,264	93.4	1,177	350	702	123
N. La. and Ark.	228	172	190	215	88.4	114	6	46	5
New Mexico	161	107	107	113	94.7	155	3	37	1
Dist. 3 total	**8,435**	**6,951**	**7,108**	**8,270**	**86.0**	**3,175**	**718**	**1,779**	**268**
Dist. 4 total	**614**	**523**	**526**	**596**	**88.3**	**273**	**30**	**157**	**13**
Dist. 5 total	**2,946**	**2,396**	**2,664**	**3,173**	**84.0**	**1,651**	**502**	**534**	**184**
June 8, 2007	**19,325**	**14,543**	**15,059**	**17,335**	**86.9**	**9,111**	**1,500**	**3,986**	**631**
June 1, 2007*	**19,375**	**15,048**	**15,542**	**17,335**	**89.7**	**9,381**	**1,511**	**4,302**	**669**
June 9, 2006	**17,921**	**15,877**	**16,228**	**17,115**	**94.8**	**9,278**	**1,500**	**4,145**	**665**

*Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

OGJ GASOLINE PRICES

	Price ex tax 6-6-07	Pump price* 6-6-07	Pump price 6-7-06
		¢/gal	
(Approx. prices for self-service unleaded gasoline)			
Atlanta	269.3	309.0	288.4
Baltimore	265.2	307.1	296.4
Boston	259.6	301.5	290.8
Buffalo	249.1	309.2	294.4
Miami	271.1	321.4	299.4
Newark	258.1	291.0	287.4
New York	253.8	313.9	299.9
Norfolk	260.3	297.9	289.8
Philadelphia	262.3	313.0	303.4
Pittsburgh	249.3	300.0	283.1
Wash., DC	276.6	315.0	307.4
PAD I avg.	261.3	307.2	294.6
Chicago	318.7	369.6	318.7
Cleveland	270.0	316.4	279.2
Des Moines	274.0	314.4	266.1
Detroit	277.1	326.3	282.1
Indianapolis	282.3	327.3	276.8
Kansas City	278.3	314.3	266.0
Louisville	280.6	317.5	285.0
Memphis	263.2	303.0	276.4
Milwaukee	274.0	325.0	286.1
Minn.-St. Paul	280.8	321.2	277.4
Oklahoma City	270.1	305.5	259.7
Omaha	266.0	312.4	273.4
St. Louis	274.9	310.9	264.8
Tulsa	268.1	303.5	259.1
Wichita	266.9	310.3	266.1
PAD II avg.	276.4	318.6	275.8
Albuquerque	298.8	335.2	282.7
Birmingham	261.8	300.5	275.6
Dallas-Fort Worth	257.5	295.9	285.5
Houston	258.2	296.6	285.4
Little Rock	259.2	299.4	272.1
New Orleans	265.8	304.2	277.6
San Antonio	264.0	302.4	268.2
PAD III avg.	268.5	304.9	278.1
Cheyenne	272.0	304.4	266.3
Denver	288.9	329.3	282.9
Salt Lake City	279.9	322.8	288.9
PAD IV avg.	280.3	318.9	279.4
Los Angeles	281.0	339.5	329.1
Phoenix	271.4	308.8	300.1
Portland	279.0	322.3	300.4
San Diego	283.9	342.4	335.4
San Francisco	304.7	363.2	336.1
Seattle	284.1	336.5	317.4
PAD V avg.	284.0	335.5	319.7
Week's avg.	**272.2**	**315.7**	**287.7**
May avg.	**264.1**	**307.6**	**288.5**
Apr. avg.	**234.7**	**278.3**	**270.5**
2007 to date	**218.2**	**261.8**	—
2006 to date	**210.0**	**252.9**	—

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

REFINED PRODUCT PRICES

	6-1-07 ¢/gal		6-1-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	222.38	New York Harbor	192.40
Gulf Coast	224.00	Gulf Coast	197.05
Los Angeles	227.00	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	205.23	ARA	191.21
Singapore	203.38	Singapore	189.17
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	230.50	New York Harbor	124.71
Gulf Coast	234.00	Gulf Coast	127.38
Los Angeles	239.00	Los Angeles	141.34
		ARA	111.57
		Singapore	125.62

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

BAKER HUGHES RIG COUNT

	6-8-07	6-9-06
Alabama	6	5
Alaska	9	9
Arkansas	43	22
California	32	29
Land	31	24
Offshore	1	5
Colorado	102	90
Florida	1	0
Illinois	0	0
Indiana	1	0
Kansas	13	8
Kentucky	8	6
Louisiana	171	199
N. Land	52	63
S. Inland waters	21	20
S. Land	30	37
Offshore	68	79
Maryland	0	0
Michigan	0	2
Mississippi	16	9
Montana	19	25
Nebraska	0	0
New Mexico	77	95
New York	5	5
North Dakota	37	31
Ohio	13	6
Oklahoma	188	182
Pennsylvania	13	17
South Dakota	4	1
Texas	840	749
Offshore	9	12
Inland waters	0	5
Dist. 1	18	23
Dist. 2	29	21
Dist. 3	60	68
Dist. 4	91	78
Dist. 5	174	131
Dist. 6	123	110
Dist. 7B	36	41
Dist. 7C	55	35
Dist. 8	114	92
Dist. 8A	27	31
Dist. 9	39	35
Dist. 10	65	67
Utah	38	43
West Virginia	35	25
Wyoming	79	100
Others—NV-3; TN-3; VA-3; WA-1	10	3
Total US	**1,760**	**1,661**
Total Canada	**226**	**443**
Grand total	**1,986**	**2,104**
Oil rigs	291	281
Gas rigs	1,465	1,376
Total offshore	79	97
Total cum. avg. YTD	**1,742**	**1,566**

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

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

SMITH RIG COUNT

Proposed depth, ft	Rig count	6-8-07 Percent footage*	Rig count	6-9-06 Percent footage*
0-2,500	71	7.0	55	1.8
2,501-5,000	112	55.3	89	46.0
5,001-7,500	252	23.8	237	15.6
7,501-10,000	391	3.0	359	3.3
10,001-12,500	449	2.0	375	2.4
12,501-15,000	280	—	268	0.3
15,001-17,500	113	0.8	114	—
17,501-20,000	70	—	80	—
20,001-over	41	—	21	—
Total	**1,779**	**8.3**	**1,598**	**6.3**
INLAND	45		44	
LAND	1,664		1,485	
OFFSHORE	70		69	

*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]6-8-07	[2]6-9-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	19	19
Alaska	782	793
California	672	688
Colorado	50	62
Florida	6	7
Illinois	33	28
Kansas	95	100
Louisiana	1,367	1,269
Michigan	15	16
Mississippi	49	48
Montana	93	97
New Mexico	166	161
North Dakota	107	111
Oklahoma	165	172
Texas	1,324	1,330
Utah	46	48
Wyoming	144	127
All others	61	69
Total	**5,194**	**5,145**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	6-8-07
Alaska-North Slope 27°	56.11
South Louisiana Sweet	68.25
California-Kern River 13°	55.20
Lost Hills 30°	62.95
Southwest Wyoming Sweet	60.76
East Texas Sweet	60.75
West Texas Sour 34°	54.50
West Texas Intermediate	61.25
Oklahoma Sweet	61.25
Texas Upper Gulf Coast	58.00
Michigan Sour	54.25
Kansas Common	60.25
North Dakota Sweet	57.00

*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]	6-1-07
United Kingdom-Brent 38°	68.91
Russia-Urals 32°	65.31
Saudi Light 34°	64.56
Dubai Fateh 32°	65.38
Algeria Saharan 44°	70.82
Nigeria-Bonny Light 37°	71.04
Indonesia-Minas 34°	68.83
Venezuela-Tia Juana Light 31°	62.36
Mexico-Isthmus 33°	62.25
OPEC basket	66.46
Total OPEC[2]	65.88
Total non-OPEC[2]	64.76
Total world[2]	65.37
US imports[3]	62.10

[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]

	6-1-07	5-25-07	Change
		Bcf	
Producing region	796	768	28
Consuming region east	1,036	970	66
Consuming region west	331	315	16
Total US	**2,163**	**2,053**	**110**
	Mar. 07	**Mar. 06**	**Change, %**
Total US[2]	**1,603**	**1,692**	**–5.3**

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

Statistics

International rig count

Region	May 2007 Land	May 2007 Off.	May 2007 Total	May 06 Total
WESTERN HEMISPHERE				
Argentina	87	—	87	82
Bolivia	3	—	3	3
Brazil	18	24	42	32
Canada	105	2	107	240
Chile	—	—	—	—
Colombia	33	—	33	22
Ecuador	9	—	9	11
Mexico	59	29	88	89
Peru	4	—	4	7
Trinidad	3	2	5	4
United States	1,671	77	1,748	1,635
Venezuela	60	18	78	82
Other	1	—	1	1
Subtotal	**2,053**	**152**	**2,205**	**2,208**
ASIA-PACIFIC				
Australia	12	10	22	20
Brunei	1	3	4	3
China-offshore	—	18	18	16
India	54	27	81	80
Indonesia	37	21	58	42
Japan	2	0	2	1
Malaysia	—	18	18	14
Myanmar	7	1	8	9
New Zealand	3	2	5	6
Papua New Guinea	3	—	3	3
Philippines	—	—	—	2
Taiwan	—	—	—	—
Thailand	1	7	8	11
Vietnam	1	8	9	11
Other	4	1	5	4
Subtotal	**125**	**116**	**241**	**222**
AFRICA				
Algeria	25	—	25	20
Angola	—	4	4	3
Congo	1	1	2	1
Gabon	—	2	2	3
Kenya	—	—	—	—
Libya	12	—	12	9
Nigeria	2	5	7	9
South Africa	—	—	—	1
Tunisia	1	1	2	2
Other	3	3	6	2
Subtotal	**44**	**16**	**60**	**50**
MIDDLE EAST				
Abu Dhabi	10	4	14	14
Dubai	1	—	1	2
Egypt	34	11	45	35
Iran**	—	—	—	—
Iraq*	—	—	—	—
Jordan	1	—	1	1
Kuwait	12	—	12	12
Oman	48	—	48	37
Pakistan	19	—	19	16
Qatar	3	10	13	10
Saudi Arabia	72	6	78	62
Sudan**	—	—	—	—
Syria	21	—	21	22
Yemen	15	—	15	16
Other	1	—	1	2
Subtotal	**237**	**31**	**268**	**229**
EUROPE				
Croatia	1	—	1	2
Denmark	—	3	3	5
France	1	—	1	1
Germany	4	—	4	4
Hungary	2	—	2	4
Italy	4	1	5	3
Netherlands	1	4	5	6
Norway	—	22	22	20
Poland	2	—	2	2
Romania	2	—	2	2
Turkey	5	—	5	4
UK	1	30	31	29
Other	5	0	5	4
Subtotal	**28**	**60**	**88**	**86**
Total	**2,487**	**375**	**2,862**	**2,795**

Definitions, see OGJ Sept. 18, 2006, p. 42
Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

Oil import freight costs*

Source	Discharge	Cargo	Cargo size, 1,000 bbl	Freight (Spot rate) worldscale	$/bbl
Caribbean	New York	Dist.	200	277	2.33
Caribbean	Houston	Resid.	380	174	1.63
Caribbean	Houston	Resid.	500	159	1.49
N. Europe	New York	Dist.	200	408	5.45
N. Europe	Houston	Crude	400	205	4.02
W. Africa	Houston	Crude	910	112	2.44
Persian Gulf	Houston	Crude	1,900	67	2.72
W. Africa	N. Europe	Crude	910	109	1.75
Persian Gulf	N. Europe	Crude	1,900	74	2.16
Persian Gulf	Japan	Crude	1,750	87	2.08

*May 2007 average.
Source: Drewry Shipping Consultants Ltd.
Data available in OGJ Online Research Center.

US LNG imports

Country	Mar. 2007	Feb. 2007	Mar. 2006	Change from a year ago, %
	MMcf			
Algeria	8,686	—	3,019	187.7
Brunei	—	—	—	—
Malaysia	—	—	—	—
Nigeria	9,085	5,743	—	—
Oman	—	—	—	—
Qatar	—	—	—	—
Trinidad and Tobago	54,295	32,581	30,209	79.7
Others	14,782	5,777	—	—
Total	**86,848**	**44,101**	**33,228**	**161.4**

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

Baker oil tools workover rig count*

Region	May 2007	May 2006	Change, %
Gulf Coast	275	318	–13.5
Midcontinent	282	314	–10.2
Northeastern	84	90	–6.7
Rocky Mountains	241	252	–4.4
Southeastern	197	210	–6.2
West Texas	332	335	–0.9
Western	146	138	5.8
Total US	**1,557**	**1,657**	**–6.0**
Canada	400	526	–24.0
Total N. America	**1,957**	**2,183**	**–10.4**

*Wells over 1,500 ft deep and tubing out of the wellbore. Excludes rigs on rod jobs. Definitions, see OGJ Sept. 18, 2006, p. 42. Source: Baker Hughes Inc. Data available in OGJ Online Research Center.

Propane prices

	Apr. 2007	May 2007	Apr. 2006	May 2006
	¢/gal			
Mont Belvieu	110.83	114.91	101.61	104.08
Conway	107.93	112.52	101.55	102.83
Northwest Europe	103.47	105.29	102.01	95.55

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

Muse, Stancil & Co. refining margins

	US Gulf Coast	US East Coast	US Mid-west	US West Coast	North-west Europe	South-east Asia
	$/bbl					
May 2007						
Product revenues	97.53	87.81	102.29	97.27	81.23	77.45
Feedstock costs	–70.49	–69.23	–63.83	–59.99	–67.64	–70.52
Gross margin	27.04	18.58	38.46	37.28	13.59	6.93
Fixed costs	–2.05	–2.37	–2.30	–2.69	–2.30	–1.79
Variable costs	–2.15	–1.47	–1.91	–3.55	–2.48	–0.84
Cash operating margin	**22.84**	**14.74**	**34.25**	**31.04**	**8.81**	**4.30**
April 2007	20.38	10.32	24.86	31.98	6.89	3.03
YTD avg.	15.10	8.00	19.56	27.72	6.56	2.94
2006 avg.	12.49	6.01	15.00	23.72	5.88	1.06
2005 avg.	12.53	6.98	12.31	20.55	5.51	1.52
2004 avg.	6.16	3.70	6.64	11.76	5.08	1.83

Source: Muse, Stancil & Co. See OGJ, Jan. 15, 2001, p. 46.
Data available in OGJ Online Research Center.

Muse, Stancil & Co. gasoline marketing margins

April 2007	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	292.51	274.63	330.64	288.32
Taxes	56.28	38.40	61.77	50.85
Wholesale price	234.13	231.86	263.80	229.71
Spot price	229.68	221.57	253.09	215.76
Retail margin	2.34	4.37	5.07	7.76
Wholesale margin	4.45	10.29	10.71	13.95
Gross marketing margin	**6.79**	**14.66**	**15.78**	**21.71**
March 2007	18.11	7.71	7.32	18.58
YTD avg.	19.39	14.95	13.17	25.71
2006 avg.	19.74	20.34	18.03	27.90
2005 avg.	19.77	16.26	20.39	27.13
2004 avg.	22.49	17.49	23.61	30.38

*The wholesale price shown for Chicago is the RFG price utilized for the wholesale margin. The Chicago retail margin includes a weighted average of RFG and conventional wholesale purchases.
Source: Muse, Stancil & Co. See OGJ, Oct. 15, 2001, p. 46.
Data available in OGJ Online Research Center.
Note: Effective April 2003, Los Angeles margins include ethanol blending.

Muse, Stancil & Co. ethylene margins

	Ethane	Propane	Naphtha
	¢/lb ethylene		
May 2007			
Product revenues	54.49	94.88	115.43
Feedstock costs	–30.69	–65.36	–108.62
Gross margin	23.80	29.52	6.81
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–5.54	–6.55	–8.84
Cash operating margin	**12.88**	**16.61**	**–9.22**
April 2007	11.64	13.83	–24.12
YTD avg.	13.64	15.48	–9.52
2006 avg.	19.55	22.53	1.77
2005 avg.	14.43	20.68	1.28
2004 avg.	9.00	12.03	0.51

Source: Muse, Stancil & Co. See OGJ, Sept. 16, 2002, p. 46.
Data available in OGJ Online Research Center.

Muse, Stancil & Co. US gas processing margins

May 2007	Gulf Coast	Mid-continent
	$/Mcf	
Gross revenue		
Gas	7.34	6.03
Liquids	1.22	3.50
Gas purchase cost	8.17	8.09
Operating costs	0.07	0.15
Cash operating margin	**0.33**	**1.29**
April 2007	0.26	0.96
YTD avg.	0.21	0.81
2006 avg.	0.26	0.97
2005 avg.	–0.06	0.25
2004 avg.	0.07	0.33
Breakeven producer payment % of liquids	71%	62%

Source: Muse, Stancil & Co. See OGJ, May 21, 2001, p. 54.
Data available in OGJ Online Research Center.

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Restrained oil investment seen in biofuel push

When the head of the Organization of Petroleum Exporting Countries warns that a global rush toward biofuels might push oil prices "through the roof," is he issuing a calculated threat or a serious warning?

According to a June 5 report in the Financial Times of London, OPEC Sec. Gen. Abdalla El-Badri said OPEC members might trim their investment plans in response

The Editor's Perspective

by Bob Tippee, Editor

to efforts by industrial countries to raise production of biofuels.

OPEC's most important exporters face huge investment requirements as rising global consumption and limits on production elsewhere raise demand for their crude.

Their problem is determining how much to invest now in order to meet demand years from now, which requires knowing what demand will be, which is impossible.

The difficulty is of course complicated when governments of the largest consuming countries orient policy to using less OPEC oil and more of costly alternatives.

Claude Mandil, head of the International Energy Agency, was quick to point out that the biofuels contribution to total energy supply will remain small and that requirements for OPEC oil will continue to grow.

He should know. But he doesn't have to risk the hundreds of billions of dollars that the world needs OPEC members to invest in production capacity if energy needs are to be met a decade or two from now.

A seemingly unrelated but similar threat—or warning, as the case may be—cannot have raised the confidence of OPEC's investors.

The statement came June 7 from Charlie Drevna, executive vice-president of the National Petrochemical & Refiners Association, at a US House subcommittee hearing on alternative fuels.

"The domestic refining industry is likely to look upon rapidly rising ethanol and other biofuels requirements in the coming years as adding significantly more risk to investments in capacity expansions," he said. In the past year, he noted, projections of US refining-capacity additions during 2006-10 have fallen to "well below 1 million b/d" from 1.5 million b/d.

OPEC members know from painful experience that US refiners don't buy crude they can't process.

Manipulative threats or serious warnings? Check this space 25 years from now.

(Online June 8, 2007; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

Good year for independent refiners

Although the summer season of gasoline demand in the US has barely started, Eitan Bernstein of Friedman, Billings, Ramsey & Co. Inc., Arlington, Va., said, "It already looks like 2007 will be the best year yet for the independent refiners."

As of the first week of June, he said, "US refining margin indicators have averaged 37% above comparable year-ago levels and, with gasoline inventories near record lows, rising demand, and ongoing supply constraints, we believe that the current high refining margin environment is likely to continue with any unexpected supply disruptions producing price spikes. Additionally, it is important to note that the issues that contributed to the current supply situation (i.e., rising demand, an aging refinery fleet, more stringent environmental regulations, and a stretched labor force) suggest that the broader upward trend in refining margins may continue longer than most investors expect."

Gasoline inventories will likely remain low through the summer, said Bernstein. "US gasoline inventories have fallen by nearly 15% over the past few months and are now 5% below comparable prior-year levels. This is due to a combination of strong domestic consumption growth (plus 1.7% year-to-date), a heavier-than-normal spring maintenance season, and a decline from last year's record import levels. While inventories have recently begun rising, they remain well below comparable year-ago levels and will likely stay low through the summer."

He said US gasoline inventories would have to increase a total of 9 million bbl over the next 3 months to catch up to 2006 levels by the end of summer. "However, over the past 3 years, gasoline inventories have fallen by an average of 10 million bbl during the summer months, with the best year having shown no change in inventories and the worst year having experienced a 27 million bbl drop, as a very active Gulf of Mexico hurricane season materially reduced production," Bernstein said.

The US Energy Information Administration reported a larger-than-expected jump in commercial US gasoline stocks, up 3.5 million bbl to 201.5 million bbl in the week ended June 1, the latest period available before deadline. That "marked the fifth straight rise in US gasoline inventories; however, the sluggish return and string of refinery maintenance issues, combined with strong gasoline demand, has left gasoline inventories significantly below the 5-year average," said analysts in the Houston office of Raymond James & Associates Inc.

Interest rates

Despite some earlier bullish indicators, crude futures prices suffered a moderate loss in the week ended June 8 as investors' concerns that higher interest rates could slow economic growth triggered a slump across the commodities markets in the last trading session.

Crude prices rallied earlier in the week as Cyclone Gonu threatened Middle East oil supplies, reports circulated of a Turkish invasion of Iraq, and officials of the Organization of Petroleum Exporting Countries again said they would react only to supply and demand fundamentals, not high oil prices. "In the end, there has been so far no report of Gonu-linked damages to oil installations, Turkey did not invade Iraq, and the OPEC statement is a repeat of what they have been saying for more than a year," said Olivier Jakob, managing director of Petromatrix GMBH, Zug, Switzerland.

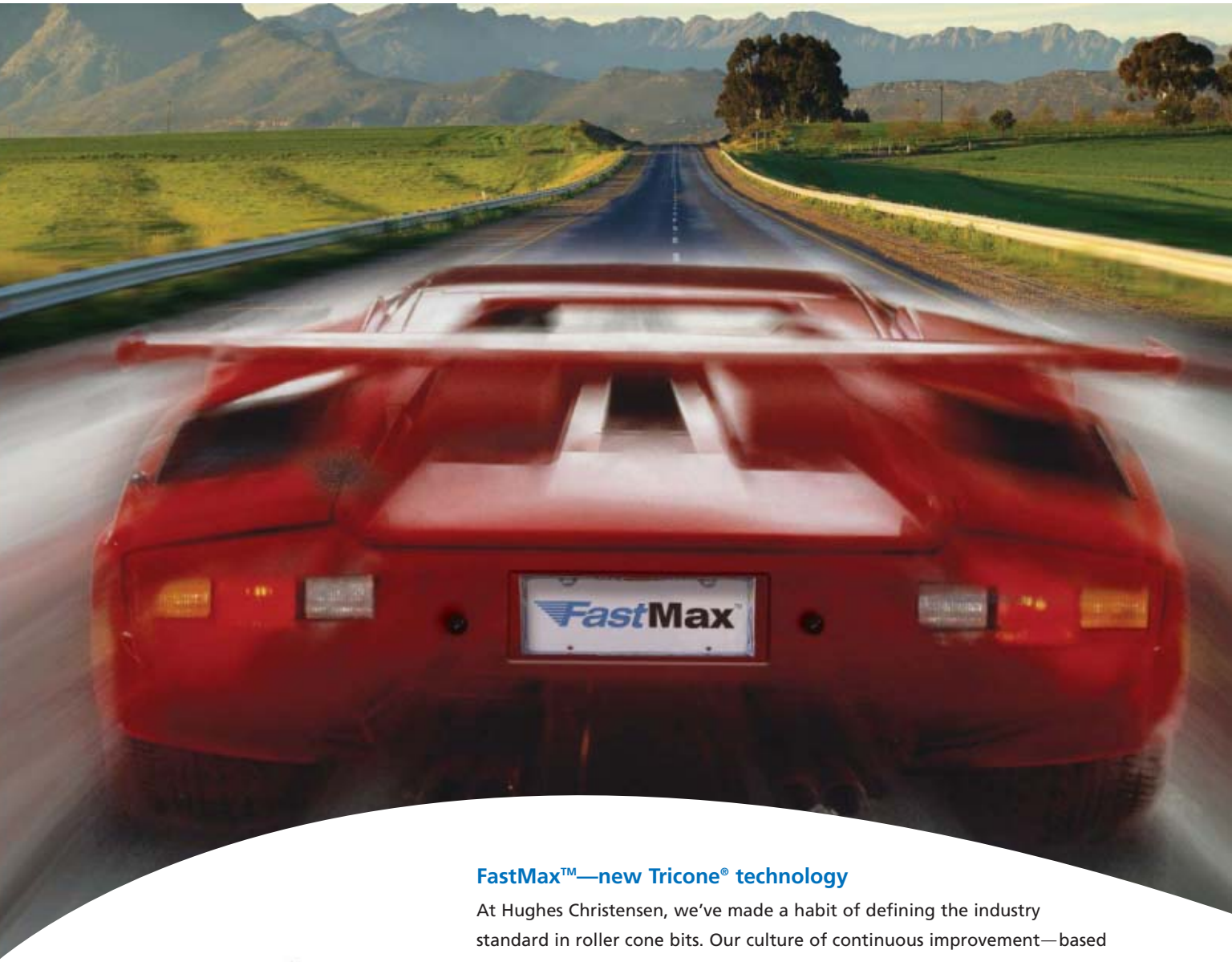
However, he said, "The market is in a phase of reacting to bullish items and discounting their nonconfirmation. As long as it stays in that mode it will find further supporting items such as strikes in Nigeria or Brazil but will need at one stage some confirmation of the disruption premium it is adding to the flat price."

Such confirmation was not forthcoming as Oman's only oil terminal resumed operations June 8 after being closed for 3 days by the dissipating Cyclone Gonu. But a price decline on June 8 was tempered in early trading "by news that Norway's mature oil fields reduced their monthly production by 7.4%, a downward trend that we expect to continue," said Raymond James analysts.

The July contract for benchmark US light, sweet crudes escalated by $1.13 to $66.21/bbl June 4 on the New York Mercantile Exchange. Cyclone Gonu churned through the Arabian Sea with the force of a Category 5 hurricane, potentially threatening shipments of a fifth of the world's oil through the nearby Strait of Hormuz. The contract dropped 60¢/bbl in profit-taking on June 5. But it recouped 35¢/bbl in the next session and gained 97¢ to $66.93/bbl June 7, the highest front closing price in more than a month on NYMEX. On June 8, however, it fell $2.17 to $64.76/bbl, down 32¢/bbl for that week.

(Online June 11, 2007; author's e-mail: samf@ogjonline.com

The New Meaning of FAST



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