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Ethylene Report

Investment risky in Russia as politics affect profits
Modern technology revitalized China's mature Jiuxi basin
New control system provides drilling automation
Study forecasts softer tanker market ahead

OIL&GAS JOURNAL®

July 16, 2007
Volume 105.27

ETHYLENE REPORT

REGULAR FEATURES

COVER

An operator operates a valve at Shell Chemical LP's Deer Park, Tex., chemicals manufacturing complex. One of the largest ethylene production plants in the US, the 1.4-million tonne/year Deer Park facility experienced a major upgrade in 2004. This year's ethylene survey showed a very small increase compared to past years. The increase of only 245,000 tonnes/year of capacity was one of the lowest addition rates in the past 20 years, according to this week's special report, which starts on p. 46. Photo reprinted with permission from Shell Chemicals Ltd.

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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PennWell, Houston office
1700 West Loop South, Suite 1000, Houston, TX 77027
Telephone 713.621.9720/Fax 713.963.6285/Web site www.ogjonline.com
Editor Bob Tippee, bobt@ogjonline.com
Chief Editor-Exploration G. Alan Petzet, alanp@ogjonline.com
Chief Technology Editor-LNG/Gas Processing Warren R. True, warrent@ogjonline.com
Production Editor Guntis Moritis, guntism@ogjonline.com
Drilling Editor Nina M. Rach, ninar@ogjonline.com
Refining/Petrochemical Editor David N. Nakamura, davidn@ogjonline.com
Pipeline Editor Christopher E. Smith, chriss@ogjonline.com
Senior Editor-Economics Marilyn Radler, marilynr@ogjonline.com
Senior Editor Steven Poruban, stevenp@ogjonline.com
Senior Associate Editor Judy R. Clark, judyrc@ogjonline.com
Senior Writer Sam Fletcher, samf@ogjonline.com
Senior Staff Writer Paula Dittrick, paulad@ogjonline.com
Survey Editor Leena Koottungal, lkoottungal@ogjonline.com
Associate Editor Angel White, angelw@pennwell.com
Editorial Assistant Linda Barzar, lbarzar@pennwell.com

Petroleum Group President Michael Silber, msilber@pennwell.com
Vice-President/Group Publisher Bill Wageneck, billw@pennwell.com
Vice-President/Custom Publishing Roy Markum, roym@pennwell.com

PennWell, Tulsa office
1421 S. Sheridan Rd., Tulsa, OK 74112
PO Box 1260, Tulsa, OK 74101
Telephone 918.835.3161 / Fax 918.832.9290
Presentation/Equipment Editor Jim Stilwell, jims@ogjonline.com
Associate Presentation Editor Michelle Gourd, michelleg@pennwell.com
Statistics Editor Laura Bell, laurab@ogjonline.com
Illustrators Alana Herron, Kermit Mulkins, Mike Reeder, Kay Wayne
Editorial Assistant Donna Barnett, donnab@ogjonline.com
Production Director Charlie Cole

London
Tel +44 (0)208.880.0800
International Editor Uchenna Izundu, uchennai@pennwell.com

Washington
Tel 703.963.7707
Washington Correspondent Nick Snow, nsnow@cox.net

Los Angeles
Tel 310.595.5657
Senior Correspondent Eric Watkins, hippalus@yahoo.com

OGJ News
Please submit press releases via e-mail to: news@ogjonline.com

Subscriber Service
P.O. Box 2002, Tulsa OK 74101
Tel 1.800.633.1656 / 918.831.9423 / Fax 918.831.9482
E-mail ogjsub@pennwell.com
Circulation Manager Tommie Grigg, tommieg@pennwell.com

PennWell Corporate Headquarters
1421 S. Sheridan Rd., Tulsa, OK 74112
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THE ENERGY AND CHEMICALS INDUSTRY CONVERGES ON KUWAIT IN 2007

Kuwait International Fair: Halls 5-6-7

Kuwait will proudly host the first World Energy & Chemicals Exhibition and Conference from 22 to 25 October 2007. Kuwait has great plans for future development and investment in its Oil- Gas- Chemical- and Power- Industries. It has already begun implementing this ambitious plan by doubling its oil production level, vastly increasing and modernizing its refining capacity and constructing the largest grass roots refinery in the world.

The Kuwait 2007 - Energy & Chemicals Exhibition and Conference will link investor companies with a variety of specialized companies providing services, support, technology, engineering, manufacturing, equipment, transport, as well as educational institutions, creating great value for all. This event will offer not only a professional exhibition, but an inspiring conference and an efficient matchmaking programme.

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BASRA INTERNATONAL FAIR

OGJ Newsletter

July 16, 2007

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General Interest — Quick Takes

Texas officials order abandoned rig removed

Texas Land Commissioner Jerry Patterson ordered the immediate removal of a derelict jack up, Zeus, that authorities say has long threatened to topple into the Freeport Ship Channel and spill toxic sludge.

The emergency order was the first under new authority to remove derelict structures from state waters. State lawmakers also authorized $2 million to enable immediate rig removal.

Zeus owner Sanship Inc. of Brownsville, Tex., remains liable for the rig's removal costs and any cleanup costs. Sanship also could be subject to fines, penalties, and fees, state officials said.

"We're getting on this right now—the courts can decide ultimately who foots the bill," Patterson said. "But the quicker this work is done, the better."

Already Zeus has begun leaking an oily mix into coastal waters, he said. But the greatest threat poised by the abandoned rig is its potential to collapse into the ship channel.

The US Coast Guard inspected the jack up and determined a hurricane or tornado could cause its collapse, consequently interrupting Brazosport, Tex., shipping activities. The Texas General Land Office is working with Port Freeport management, which will hire a contractor for the jack up removal and cleanup by using state funding.

Citgo found guilty of environmental charges

A federal jury in Corpus Christi, Tex., found Citgo Petroleum Corp. guilty of two felony criminal violations of the Clean Air Act but acquitted the Houston refiner-marketer on two other counts, the US Department of Justice and Citgo said in separate announcements June 27.

Citgo, a subsidiary of Petroleos de Venezuela SA (PDVSA), was found guilty of operating two large, open-air tanks without proper emissions controls at Citgo Refining & Chemicals Co.'s Corpus Christi East refinery. DOJ said Citgo used the tanks to separate oil from water without either a fixed roof, vented to a control device, or a floating roof. Separators upstream from the tanks never worked to remove oil from the waste water before oil entered the tanks, it said.

Citgo learned within months after the two tanks went into operation that the upstream oil-water separators did not work, and it used vacuum trucks to remove oil from the surface of water in the tanks for nearly 10 years instead of installing the proper control equipment to prevent emissions of benzene and other volatile organic compounds, DOJ said.

Citgo noted that it was acquitted of two other counts relating to the reporting of benzene in waste water streams during 2001-02 and said it plans to appeal the guilty verdicts.

US Environmental Protection Agency regulations do not require roofs on waste water equalization tanks and explicitly excluded such tanks from the requirement, the company said. It voluntarily began to construct such roofs in 2004 though it was not required to do so, it added.

"The charges absolutely do not involve any releases or spills to the environment," the company said. "Citgo is proud of its environmental record and is confident that the verdict on Counts 4 and 5 will be reversed on appeal. In fact, the waste water system of which the equalization tanks are a part has never had a permit violation on oil or grease since the tanks were built in 1994," the company said.

DOJ said a federal grand jury on Aug. 9, 2006, indicted Citgo and its environmental manager Philip Vrazel on the four CAA counts, one felony count of false statements, and five misdemeanor counts of the Migratory Bird Treaty Act, which were later severed. It said the court has not determined whether the government will be able to go forward on the false statements charge.

Brazil steps up ethanol, renewables production

Brazil's state-owned Petroleo Brasileiro SA (Petrobras) has identified $700 million in investments in biofuels and other renewables during 2007-11.

Petrobras Chief Executive Jose Sergio Gabrielli de Azevedo said much of the spending would be for pipelines, while a company spokeswoman said the firm is planning 3.5 million cu m/year of ethanol capacity for its pipelines and export vessels.

In February Petrobras signed a memorandum of understanding with Japan's Mitsui & Co. and Brazilian Construciones e Comercio Camargo Correa SA to study the construction of pipelines for exporting ethanol (OGJ Online, Feb. 28, 2007). And in March the Japan Bank for International Cooperation signed a memorandum of understanding to provide Petrobras with $8 billion to help it export the ethanol to Japan (OGJ Online, Mar. 6, 2007).

Brazil is the world's second-largest ethanol producer after the US and is the world's leading exporter of ethanol made from sugar cane.

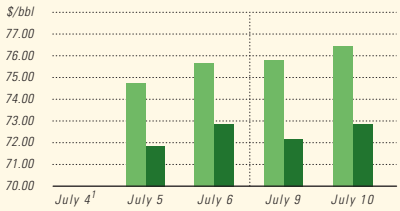
Answering environmentalists, Brazilian President Luiz Inacio Lula da Silva said in a national radio broadcast that his country's stepped-up ethanol trade would not destroy rainforests or harm the Amazon region. Lula said Amazon weather conditions are not favorable for sugar cane crops and that increased ethanol production would not prompt more jungle clearing.

Gas projects to create regional gas grid in UAE

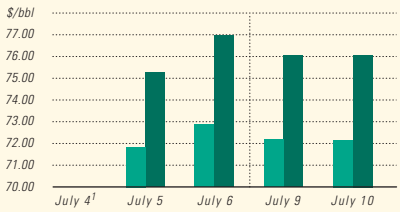
A regional gas grid is materializing in the Middle East with the completion of the Dolphin gas project in Qatar and the advancement of Shah sour gas field in Abu Dhabi.

Industry Scoreboard

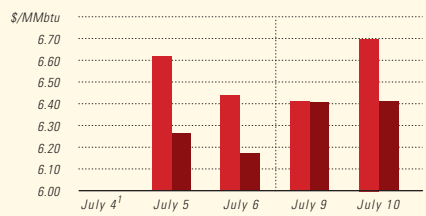
IPE BRENT / NYMEX LIGHT SWEET CRUDE



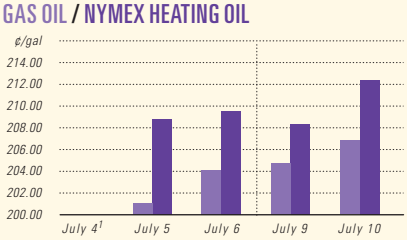
WTI CUSHING / BRENT SPOT



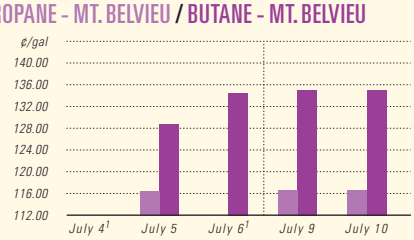
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



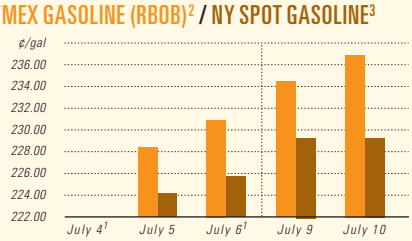
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



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



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

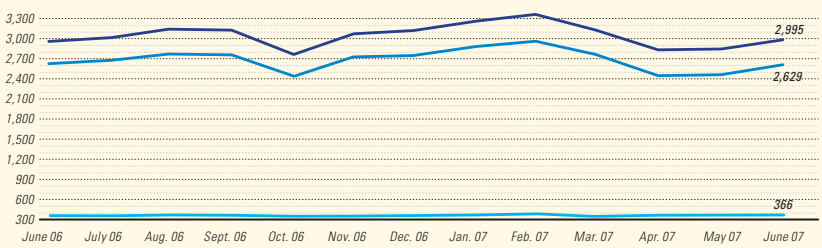
US INDUSTRY SCOREBOARD — 7/16

Latest week 6/29	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	9,553	9,440	1.2	9,216	9,096	1.3
Distillate	4,142	4,007	3.4	4,283	4,184	2.4
Jet fuel	1,674	1,702	–1.6	1,630	1,603	1.7
Residual	706	599	17.9	785	726	8.1
Other products	4,746	5,127	–7.4	4,847	4,832	0.3
TOTAL DEMAND	20,821	20,875	–0.3	20,761	20,436	1.6
Supply, 1,000 b/d						
Crude production	5,123	5,219	–1.8	5,175	5,081	1.9
NGL production[2]	2,423	2,000	21.2	2,336	2,141	9.1
Crude imports	10,553	10,681	–1.2	10,133	10,014	1.2
Product imports	3,665	3,462	5.9	3,571	3,556	0.4
Other supply[3]	1,001	1,043	–4.0	911	1,102	–17.3
TOTAL SUPPLY	22,765	22,405	1.6	22,126	21,894	1.1
Refining, 1,000 b/d						
Crude runs to stills	15,342	15,838	–3.1	15,095	15,047	0.3
Input to crude stills	15,551	16,171	–3.8	15,367	15,388	–0.1
% utilization	89.1	93.0	—	88.2	88.6	—

Latest week 6/29	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	354,042	350,891	3,151	341,301	12,741	3.7
Motor gasoline	204,433	202,582	1,851	213,077	–8,644	–4.1
Distillate	121,610	120,448	1,162	127,323	–5,713	–4.5
Jet fuel-kerosine	40,619	40,124	495	39,344	1,275	3.2
Residual	34,845	35,772	–927	42,405	–7,560	–17.8
Stock cover (days)[4]			Change, %		Change, %	
Crude	23.1	22.9	0.9	22.4	3.1	
Motor gasoline	21.4	21.2	0.9	22.5	–4.9	
Distillate	29.4	29.0	1.4	29.7	–1.0	
Propane	45.2	42.6	6.1	40.4	11.9	
Futures prices[5]			Change		Change	Change, %
Light sweet crude, $/bbl	69.25	68.77	0.48	71.50	–2.25	–3.1
Natural gas, $/MMbtu	6.83	7.42	–0.59	6.40	0.44	6.8

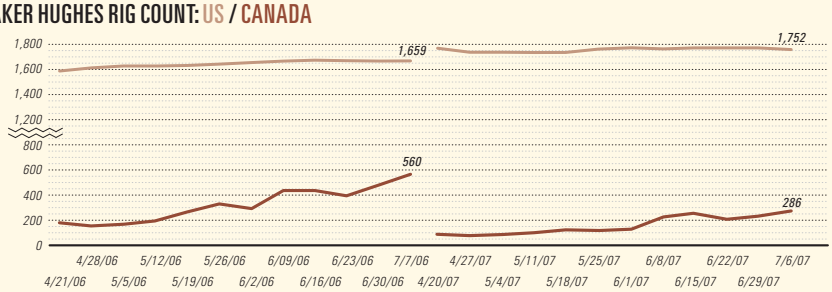
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average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

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



Note: Monthly average count

BAKER HUGHES RIG COUNT: US / CANADA



Note: End of week average count

The $3.5 billion Dolphin project, which includes a 370-km, 48-in. subsea gas export pipeline connecting Qatar with the UAE, is fully operational and delivering natural gas from its own production wells to customers in the UAE, said project partner Occidental Petroleum Corp.

The project enables gas from supergiant North field off Qatar to be transported to a processing plant in Ras Laffan and then to the Taweelah receiving facility in the UAE.

Additional deliveries to customers in Oman are expected to begin soon, Oxy said. Earlier reports said Qatar plans to export 200 MMcfd of gas to Oman starting in 2008 (OGJ Online, Mar. 8, 2007).

Initial production from the project is expected to ramp up by yearend, reaching nearly 2 bcfd.

For the Shah project, state-run Abu Dhabi National Oil Co. (ADNOC) has invited international oil companies Oxy, ConocoPhillips, ExxonMobil Corp., and Royal Dutch Shell PLC to submit revised bids to develop the onshore field's sour gas reserves. Revised bids reportedly are to be submitted by the end of August.

The initial tender in April called for plans to develop gas reserves in Shah and Bab fields at an estimated cost of $10 billion. After it failed to attract enough international interest due to the complexity of developing both fields together, ADNOC split the project.

A decision for bids for Bab field development has been delayed for several months.

Other companies that bid for the Shah development but were not selected to continue in the competition are BP PLC, Total SA, Japan Oil Development Co., and BASF subsidiary Wintershall AG. ✦

Exploration & Development — *Quick Takes*

Pioneer has fifth discovery, adds Tunisia girth

Pioneer Natural Resources Co., Dallas, which declared Tunisia a core area fairly recently, has notched a fifth discovery and is expanding its acreage position in the North African country.

The company plans to perforate and test Farrah, its fifth find on the Jenein Nord block in the Ghadames basin, in three intervals totaling 20 m starting in late August.

It will drill three more exploration wells on the block by the end of 2007 (see map, OGJ, July 2, 2007, p. 44). It will also acquire another 3D seismic survey adjacent to the five successful wells. Three exploration wells on adjacent nonoperated blocks are planned by yearend.

Pioneer's average net production from Tunisia is expected to rise to at least 5,400 b/d in 2007 and to more than 10,000 b/d in 2008. Output from Jenein Nord is to start late in the 2007 fourth quarter.

Meanwhile, Pioneer is acquiring a further 15% interest in the 1.2 million acre Anaguid Block from Anadarko Petroleum Corp. Pioneer will become operator with 60% interest, half of which is subject to a back-in right by Tunisia's state ETAP. ETAP has a 50% back-in right on Jenein Nord.

Following government approvals, expected in 60-90 days, Pioneer will shoot 3D seismic on Anaguid adjacent to the Jenein Nord and Adam blocks and expects to drill an Anaguid exploration well in 2008.

Statoil's Ballena gas well tested off Venezuela

Statoil ASA said it has tested gas at "significant" rates in one of two intervals in its Ballena well, which it recently completed on Block 4 of Plataforma Deltana off eastern Venezuela. However, the company is unsure if the find is commercial.

"Further evaluation of the results will be done in the coming months, with a decision dependent on the outcome of the last well, [Orca, in the three-well exploration campaign on the block]," said Thore E. Kristiansen, Statoil Venezuela's country president.

The Ballena well is the second well to be completed in the drilling program. Transocean Inc.'s Sovereign Explorer semisubmersible drilled the well in 350 m of water. No well has been drilled in deeper water off Venezuela to date, Statoil said.

The Sovereign Explorer is to be moved to the third well location.

The first well completed in exploration campaign on Block 4, Cocuina-2X, found dry gas in three intervals (OGJ Online, Jan. 8, 2007, Newsletter).

Interest holders in the license are Statoil (operator) 51% and Total SA 49%. PDVSA Gas has the option to participate with up to 35% ownership when commercial. ✦

Drilling & Production — *Quick Takes*

Turkey starts gas imports from Azerbaijan field

Turkey has started importing natural gas from Shah Deniz gas-condensate field in Azerbaijan via the South Caucasus Pipeline (SCP), said Statoil AS, commercial operator for that project.

Delivery was delayed by technical problems that the Shah Deniz partners encountered with production from the wells (OGJ Online, Jan. 23, 2007).

Turkey is importing varied amounts of gas depending on how much it nominates, a spokesman from BP PLC, technical operator of Shah Deniz, told OGJ. The field produces 8 million cu m/day of gas and 25,000 b/d of condensate from three wells. Another well will be brought on stream later this year, the spokesman said.

The SCP system transports gas from Shah Deniz field in the Azerbaijan sector of the Caspian Sea, through Georgia, and on to the Georgia-Turkey border. Following its commissioning, the pipeline was successfully tied-in with the Turkish pipeline system at the Georgia-Turkey border. Turkish gas firm Botas is responsible for transporting gas from the Turkish border through a new pipeline to the city of Erzurum.

BP expects to produce an average of 63,000 boe/d in 2007 from Shah Deniz. Plateau production from Stage 1 will be 8.6 billion cu m/year and approximately 30,000 b/d of condensate.

Gas output is expected to reach 12 billion cu m/year by 2012

during the project's second stage, and 20 billion cu m/year by 2015 during the third stage.

Production restored from P-50 FPSO off Brazil

Oil and gas production was restored July 7 from Petroleo Brasileiro SA's P-50 floating production, storage, and offloading unit in Albacora Leste field off Brazil following a July 4 fire that broke out on the vessel.

Following the fire, an undisclosed amount of oil and gas production was cut from the unit, which lies in the Campos basin about 120 km off Rio de Janeiro state. Production from the FPSO ramped back up to 160,000 b/d after restart. The unit is capable of processing 180,000 boe/d.

"Full production was retaken after the transformer room cleaning operation was wrapped-up and after all other platform systems were checked and determined as fully operational," Petrobras said.

The blaze erupted in the gas compressor transformers room, forcing the company to shut down production. No injuries or oil spills were reported.

Total may hike oil output from Gabon field

Total Gabon SA is investigating boosting production from Anguille oil field in Gabon, adding more than 100 million bbl of proved and probable reserves and 30,000 b/d of oil in the first half of the next decade. Currently the field produces 7,000-8,000 b/d of oil.

A Total spokeswoman declined to give any more details, adding that the company plans to take a final investment decision at the end of 2007 following an update of its convention of establishment agreement signed with Gabon. Total will operate in Gabon for another 25 years and the agreement defines, among other things, the legal and tax system governing Total Gabon's concessions, operating licenses, and crude transportation installations.

It covers 17 concessions and operating licenses representing an area of nearly 1,500 sq km and more than 60% of Total's share of output in Gabon (more than 50,000 b/d in 2006).

Total will invest $260 million in 2007 on appraising and redeveloping existing fields to improve recovery and slow down the fall in oil production.

Pride orders ultradeepwater drillship

Pride International Inc. has ordered a newbuild drillship with advanced and dual-activity capability for use in ultradeep water.

The $680 million drillship, to be built by Samsung Heavy Industries Co. Ltd. (SHI) at its shipyard in Geoje, South Korea, will be capable of drilling to a TVD of 40,000 ft in as much as 12,000 ft of water. The rig initially will be equipped for drilling in 8,000 ft of water, Pride said.

The rig, yet to be named, is slated for delivery in third quarter 2010.

It will have an SHI-proprietary hull design measuring 750 ft long, 140 ft wide, with a variable deck load of 20,000 tonnes. It also will feature dynamic-positioning station-keeping with DPS-3 certification, expanded drilling fluids capacity, a 1,000-ton top drive, and living quarters for 200 crew. ✦

Processing — *Quick Takes*

Coffeyville refinery recovering after flood

Coffeyville Resources LLC in Coffeyville, Kan., estimates that 1,700 bbl of crude oil and a small amount of oil from the refinery's sewer system were swept away by Verdigris River flood waters.

During June 30-July 1, heavy rains caused the Verdigris River to overflow its banks and protective levees, flooding Coffeyville. The river crested more than 10 ft above flood stage, setting a record for the river. About 2,000 citizens and more than 200 homes were affected.

The 100,000 b/cd refinery, under 4-6 ft of water on July 3, was shut down and evacuated. Workers were able to return to some administrative offices and warehouses on July 4 (OGJ, July 9, 2007, Newsletter).

Refinery management entered into an Administrative Order on Consent with the US Environmental Protection Agency to respond to the spill. The order describes Coffeyville's commitment to conduct a timely cleanup of oil-impacted areas.

EPA conducted monitoring for volatile organic compounds in flood waters in Coffeyville and downstream, but has not indicated the presence of these compounds at a "level of concern," refinery officials said.

Syria outlines plans for three refineries

Syria plans to build three refineries that would process a combined 350,000 b/d of oil, Syrian Oil Minister Eng. Sufian Al Alao told OGJ in London.

The first refinery, with a planned capacity of 70,000 b/d, is being built in Deir ez-Zor in eastern Syria in partnership with China National Petroleum Corp. The facility is expected to come on stream within the next 3 years. Investment is pegged at $1.2 billion.

Syria has signed a memorandum of understanding with Noor Financial Investment Co. from Kuwait for a second 70,000 b/d refinery in Deir ez-Zor, which also will cost $1.2 billion. It will be the first refinery in Syria to be developed and partly owned by private investors. Noor also plans to establish 50 retail outlets in Syria at an estimated cost of $100 million under its brand name.

Syria, Iran, and Venezuela also have agreed to build a 140,000 b/d refinery in the Homs, Syria, area, Al Alao said.

Syria is producing 400,000 b/d of oil, 50% of which is light oil and the other 50%, heavy oil. Gas production is 8-9 billion cu m/year. Omar Al Hamad, general manager of Syrian Petroleum Co., said SPC is trying to stem the fall in production by increasing recovery from fields it manages. "We have more than 13 contracts with companies, and we hope to get good results from these," he said. "We are compensating with gas," he added. SPC has called for bids by July 12 on seven onshore blocks covering 40,000 sq km.

About 24 companies have expressed interest in the acreage.

Syria has asked CNPC and Canada's Dublin International Petroleum Co. to improve production and recovery factors of Tisheen, Roudeh, and Kubibe oil fields under previous agreements. CNPC is

working on Kubibe field, which produces 11,000 b/d of oil and currently has a 20% recovery factor. Dublin is working on the other two, with heavy oil field Tisheen having a recovery rate of 16%. "Dublin is using steam injection for Tisheen," Al Hamad said.

Valero to pay fines, upgrade Delaware City refinery

Valero Energy Corp. agreed to pay $445,000 in penalties and spend $5.6 million on improvements and environmental projects at its 190,000 b/cd Delaware City, Del., refinery in a settlement over alleged air and water violations.

The Delaware Department of Natural Resources and Environmental Control (DNREC) announced the settlement on July 5. Valero acquired the high-conversion refinery of heavy, sour crude while acquiring Premcor Refining Group Inc. (OGJ, May 2, 2005, p 46).

A Delaware administrative order covers instances of alleged noncompliance with state air quality, hazardous waste, and water quality regulations from May 1, 2004, through Sept. 30, 2006. The water issues concern the refinery's wastewater treatment plant.

Most of the settlement involves problems with carbon monoxide boilers for the coker unit and the fluid catalytic cracking unit. Valero agreed to spend $4.5 million on boiler improvements and to conduct enhanced monitoring of nitrogen oxide emissions from two process heaters.

Valero also will spend $1.2 million to reroute hazardous hydrogen sulfide sulfur pit vapors into marketable sulfur. The company will spend $60,000 for a Fort Delaware power system, $40,000 for community yard waste sites, and $10,000 to improve fish habitats.

A company spokeswoman said Valero approached DNREC in an effort to resolve environmental issues lingering from previous owners. Premcor acquired the refinery from Motiva Enterprises LLC in 2004. ✦

Transportation — *Quick Takes*

TransCanada to expand Keystone oil pipeline

TransCanada Corp. has secured 155,000 b/d of additional long-term, firm capacity contracts on its planned 1,845-mile Keystone oil pipeline, enabling a 294-mile extension to Cushing, Okla., and facilitating plans to move forward with a further extension to the US Gulf Coast. The $1.7 billion (Can.) Keystone project will deliver oil from Alberta's growing oil sands regions to the US.

When the mainline enters service in late 2009, it will have an initial nominal capacity to transport 435,000 b/d of oil from Hardisty, Alta., to the US Midwest at Wood River and Patoka, Ill. The $445 million (Can.) expansion to Cushing includes construction of the lateral from the Nebraska-Kansas border to Cushing and installation of additional pump stations. Provided that all regulatory approvals are received, lateral construction could begin in early 2008 and operations start-up, in late 2010.

With the acquisition of the long-term contracts, which total 495,000 b/d, capacity of the system will be expanded to 590,000 b/d.

TransCanada received approval in February from Canada's National Energy Board to transfer a portion of its Canadian mainline gas transmission facilities to the Keystone pipeline subject to the approval of a facilities application to construct and operate Keystone's $664 million (Can.) Canadian facilities, which will consist of 371-km of oil pipeline, terminal facilities at Hardisty, Alta., and pump stations.

ESPO project on track, energy minister says

Russian Industry and Energy Minister Viktor Khristenko said there will be enough oil for the first phase of his country's East Siberia-Pacific Ocean (ESPO) pipeline project.

Khristenko said ESPO's Phase 1, expected to be complete by yearend 2008, envisages transportation of as much as 30 million tonnes/year of oil from Tayshet to Skovorodino, on the border with China, an amount equal to current supplies.

So far Russian pipeline monopoly OAO Transneft has built 940 km of the pipeline, whose total projected length is more than 4,770 km.

Khristenko said construction of the Chinese spur from Skovorodino would start after the completion of the project design work. Under the contract, the design work should end 208 days after the first payment from China, which was received in June.

With regard to the project's Phase 2, which will extend from Skovorodino to Russia's Pacific coast, Khristenko said 2007 would be "important" as a "significant number of auctions for new sections will be held this year."

Khristenko made the statements in Beijing where he is taking part in a meeting of the Russian-Chinese subcommittee on energy cooperation.

Holly, Sinclair to build Utah products pipeline

Holly Corp. and Sinclair Transportation Co. plan to jointly build a products pipeline that will extend from Salt Lake City to Las Vegas. The so-called UNEV Pipeline project includes the construction of associated terminal facilities in Cedar City, Utah, and northern Las Vegas.

The 430-mile, 12-in. line will cost about $300 million and have an initial capacity of 62,000 b/d, expandable to 120,000 b/d. It will serve refineries and shippers along its route and interconnect to the Pioneer Pipeline. The system is slated for completion by yearend 2008. ✦

Correction

The word "million" was inadvertently omitted in the following sentence in the article entitled, FX Energy drilling in Poland's Permian basin (OGJ, July 2, 2007, p. 45). The sentence should read: POGC spent €110 million on exploration in Poland in 2005, working in the Carpathians, Carpathian foothills, and Polish lowlands.

Letters

Oil in Arizona

In the article entitled "Ridgeway to delineate CO_2 field, eyes Permian EOR" (OGJ, May 28, 2007, p. 41), the statement was made that none of the 26 wells has encountered oil or natural gas, which is incorrect.

After the first round of delineation wells, the cores from the wells in Arizona were sent to the Arizona Geological Survey in Tucson. Since High Plains developed and sold the St. Johns Prospect to Ridgeway, I was interested in viewing those cores, which I did, and I noticed an oil-stained dolomite on one of those cores, which both Steve Rauzi (Arizona oil and gas administrator) and I observed. Therefore, oil was encountered in at least one of the wells that has been drilled to delineate the St. Johns discovery.

From a historical perspective, Ridgeway Arizona Oil Corp. was formed because oil and combustible gas were expected, based on the Tenneco and Mae Belcher wells, which both encountered oil in the Supai. Furthermore, the CO_2 and helium accumulation on the St. Johns anticline may be a gas cap with an oil rim. In any case, oil is present on the structure. Whether oil is present in commercial quantities remains to be seen.

Since the Supai dolomites have such high porosity, from 16% to 31% in the discovery well on the St. Johns anticline, the presence of oil in such a dolomite is important, not just as an "oil show" but as an oil show in a zone with excellent reservoir quality.

John B. Somers II
High Plains Petroleum Corp.
Boulder, Colo.

Calendar

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

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

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You can't have it all

David N. Nakamura
Refining/Petrochemical Editor

US drivers continue to harbor the notion that they can have it all: gasoline prices that won't affect their driving habits, less carbon dioxide emissions, and a broader menu of cleaner fuels. More paradoxically, they want energy self-sufficiency while opposing the construction of refineries. This is according to a survey conducted by RBC Capital Markets in conjunction with its annual energy conference last month.

The survey of 1,001 participants proves that US consumers remain uninformed about how the oil and gas industry really works. The online survey, conducted May 11-18, 2007, had a margin of error of ±4.1%.

Similar findings have emerged in other surveys recently (see p. 26 and OGJ, May 14, 2007, p. 68).

NIMBY lives

The "not in my backyard" (NIMBY) phenomenon is alive and kicking. According to the survey, 9 out of 10 respondents said the US must find ways to produce more domestic crude and rely less on imports; 8 of 10 said they were concerned about US energy self-sufficiency. However, most respondents oppose the construction of a refinery or other traditional energy plant in their city or town.

The survey report stated that, "84% of respondents opposed the construction of a refinery in their hometown, 83% opposed the construction or recommissioning of a nuclear power plant, and three out of four opposed the construction of a LNG facility in their city or town."

As has been stated often in this magazine, the last grassroots refinery was built in the US 30 years ago.

"It's a call for more public education," according to RBC Capital Markets analyst Kurt Hallead. "It's the only way for policy-makers to address a situation where everyone wants energy self-sufficiency but no new traditional energy plants."

Reliance on gasoline

The survey found that the respondents' first concern was the quality of life for the next generation. Interestingly, their concern about gasoline prices was greater than that of air quality and climate change.

Concern over gasoline prices was due to the fact that "three quarters of respondents said it would be impossible to live their life as it is today without owning a car." According to the survey, 78% said they were concerned about gasoline prices and if they could afford to drive; however, 67% said, "Americans are too concerned with how energy prices affect their wallets and are losing sight of protecting the environment."

The annual survey, compared with results from last year's survey, found that the respondents are more concerned about global warming and climate change. Of those polled, "68% said they were in favor of carbon dioxide regulations, even if it meant higher energy costs, and 67% said they would also pay more for cleaner fuels than pay less for fuels that pollute."

Regarding alternative energy sources, 87% said the US government should enact subsidies and incentives to encourage and reinforce their development. And although most were opposed to traditional energy plants, 6 in 10 said they would sanction a solar plant in their hometown, and 57% would endorse the construction of wind turbines.

Other highlights

Nearly three quarters (74%) of the respondents said that in the 2008 presidential election they would consider a candidate's position on energy issues when voting. This is an increase from 49% who said this in 2004.

The majority of respondents (57%) felt that the US would not "find a solution to its energy problems in your lifetime." This feeling was common even in the survey's respondents that were 18-24 years old—48% of them felt that no solution would be found in their lifetime.

Three-quarters of the respondents said companies adopting environmentally friendly and energy-efficient standards should receive a reduction in corporate taxes.

When polled, one third of SUV drivers said publicity about energy consumption and climate change had led them to reconsider the benefits of owning an SUV. Fully 58% of the SUV owners said they would try to buy a hybrid as their next car purchase; this number was nearly 70% for all respondents.

Of course, actions speak louder than words. ✦

Editorial

First of three parts

A dozen antitrust facts

Energy initiatives of the 110th Congress should alarm learned observers of the oil and gas industry. Proceeding from false assumptions, peevish impulses, and historical disregard, lawmakers soon may enact a series of mistakes certain to damage US interests and hurt consumers. But learned observers are beginning to speak out.

Two former officials of the US Federal Trade Commission, both now affiliated with the Washington, DC, office of the O'Melveny & Myers LLP law firm, have written a monograph addressing antitrust misconceptions that seem to be guiding Congress. Their work, "A Dozen Facts You Should Know about Antitrust and the Oil Industry," deserves wide attention.

One of the authors is Timothy J. Muris, chairman of the FTC during 2001-04. He's now a professor at the George Mason University School of Law and of counsel to O'Melveny & Myers. The other author is Richard G. Parker, a partner in the law firm who served as director of the FTC's Bureau of Competition in 1999-2001 and senior deputy director in 1998-99.

Muris and Parker are cochairs of the antitrust and competition practice at O'Melveny & Myers. They speak with authority and from the perspective of service to administrations from both major political parties. This space will summarize the facts they discuss in their monograph, four this week and four each July 23 and Aug. 6.

• *Fact 1: Economic learning and antitrust enforcement have evolved; we now know that big is no longer necessarily bad.*

The prevalent notion of the 1970s that "big is bad" has given way to modern antitrust analysis, which combines sophisticated economic theory with careful analysis of complex factual issues that arise in individual investigations. Modern analysis considers, for example, the number and sizes of firms in an industry, their behavior toward one another, the extent to which new entry or expansion of existing facilities has occurred or will likely do so, and whether historical behavior of the industry has been anticompetitive.

By these and other criteria, the US petroleum industry is highly competitive. Companies are small in relation to the industry's size, and many competitors populate each level of the business. Many firms have entered the business, particularly in refining and retailing. Mergers have lowered costs and increased innovation.

• *Fact 2: The antitrust authorities scrutinize the petroleum industry more closely than any other.*

Since 1973, the FTC has conducted well over 100 investigations examining every facet of the oil industry. It reviews proposed mergers and has challenged many of them, leading to divestitures, court injunctions, abandoned transactions, and conditions on future conduct. The commission also has investigated price increases following the Gulf Coast hurricanes of 2005, Shell's 2004 decision to close its Bakersfield, Calif., refinery, "zone pricing" and "red-lining" on the West Coast, and the 2000 gasoline price spike in the Midwest. It has found no evidence of collusion or market manipulation.

The FTC also reviews daily data on retail gasoline and diesel prices for 360 major cities and wholesale prices for 20 major urban areas. It has conducted several investigations of pricing anomalies but found no illegal conduct.

• *Fact 3: The American petroleum industry is not highly concentrated.*

Oil companies hold very small shares of world crude oil production and reserves; world concentration in crude oil and gas liquids has fallen since 1985. Recent mergers have had little effect on concentration, which remains low domestically and globally, in exploration and production. A 2006 FTC investigation determined concentration of the refining industry to be low. In most states, gasoline retailing is unconcentrated or moderately so. Hypermarkets and independent retailers have entered the market and become strong competitors.

Concentration is lower in the oil industry than in many other US industries.

• *Fact 4: Refiners have expanded domestic and global capacity significantly.*

Although grassroots construction of refineries has shifted to the Far East and Middle East, refining capacity has expanded at existing facilities in the US, where it grew by 12% during 1994-2004 while output of light products grew by 16%. More expansion is expected.

Next: Facts 5-8. ✦

Investment risky in Russia as politics affects profits

Cindy Hurst
US Army's Foreign Military Studies Office
Fort Leavenworth, Kan.

Increasing scrutiny this year of TNK-BP's Siberian natural gas assets and actions subsequently taken follow unsettling patterns of behavior in the way the Russian government has been running its gas business.

The government has reneged on a number of previously signed business agreements with various companies and threatened to halt multibillion-dollar, internationally sponsored operations after significant amounts of time and money had been invested in those projects.

Russia's Natural Resources Ministry, claiming that TNK-BP was not producing enough gas from massive Kovykta gas field in Eastern Siberia, threatened in late May to revoke the company's license to develop the field, which reportedly has estimated resources of 2 trillion cu m of gas in place (OGJ, June 4, 2007, p. 32). The move would create the need to rebid the field in a competition that Russia's state-controlled natural gas monopoly OAO Gazprom doubtless would win. Observers saw the move as part of a continuing move to return Russia's oil and gas deposits to state control.

In late June, TNK-BP (owned and managed jointly by BP PLC and Alfa Access Renova Group) announced an investment alliance with Gazprom for major long-term energy projects of at least $3 billion in cost or a swap of global assets. TNK-BP, the third largest oil company in Russia, agreed to sell to Gazprom a 50% interest in East Siberian Gas Co., which is building a regional gasification project, and to sell its 62.89% stake in OAO Rusia Petroleum OJSC, the company that holds the license for Kovykta field.

TNK-BP reportedly may purchase a 25% plus one share stake in Kovykta later at an independently verified market price once specific criteria have been met, the companies said (OGJ, July 9, 2007, p. 27).

This acquisition of the majority interest in Kovykta and other indicators point to the Kremlin's tightening grip on the strategic energy sector. These patterns of behavior indicate a potentially unstable business environment for international investors. The following two case studies demonstrate some of Russia's other seemingly underhanded tactics used in dealing with international consortiums in order to achieve its end goal of obtaining strategic control over the sector.

The Shtokman story

Shtokman gas field, discovered in 1988 in Russia's Barents Sea, is believed to have over 141 tcf of natural gas reserves, making it one of the largest gas fields in the world (Fig. 1).

In the early 1990s, test results from a feasibility study formed the basis for talks that would allow a group of five Western companies to participate in the field's development. In 1992, however, the foreign consortium was pushed out by the ZAO Rosshelf consortium, a Gazprom subsidiary that comprised 19 Russian companies mainly engaged in defense production.

According to Yevgenny Velikhov, vice-president of the Russian Academy of Sciences and chairman of Rosshelf, the consortium would provide greater employment in Russia. This was viewed as a key factor in Rosshelf's victory over the Western consortium. According to then-Russian President Boris Yeltsin, although the country's industrial policy favored Russian companies and groups, the consortium was encouraged to work with foreign companies and consultancies for their technical capabilities.

However, Russia was neither technologically nor financially prepared to take on such a project solo, and in August 1995 Gazprom and Rosshelf signed a letter of intent with Norsk Hydro of Norway, Conoco of the US, Neste Oy of Finland, and Total SA of France to evaluate the possible joint development of Shtokman field.

One challenge of the project was trying to figure out the logistics of trans-

The views expressed are those of the author's and do not necessarily represent the official policy or position of the US Department of the Army, Department of Defense, or the US government.

porting the gas to its destination. In January 1996, a St. Petersburg company designed a $600 million floating liquefaction plant, which offered a potential solution to the problem.[1] LNG would obviate the need for an underwater pipeline from Shtokman field through the Barents Sea.

Plans to build the LNG plant, however, never came to fruition. Instead, in March 2000, Rosshelf began developing plans for production and construction of a natural gas pipeline, rather than an LNG plant, with potential foreign partners. These plans included building a pipeline from the field via Murmansk to Vyborg on the Baltic, then on to Peenemunde in Germany. With such an undertaking the project would require great financial backing. By May 2000, Gazprom had still not established the ownership structure of the $20 billion Shtokman project.

Russian and Western partners shared an interest in developing Shtokman field. The gas was destined to be piped directly to Europe, satisfying the growing European demand for natural gas. Russia would benefit by increasing its business ventures with Europe.

In June 2003, Russia reconsidered the possibility of adding an LNG component to the Shtokman development project. This would allow Russia to direct supplies to the US via LNG tankers.

By May 2004, despite the 1995 letter of intent with Norsk Hydro, Conoco, Neste, and Total to evaluate the possibility of a joint development project, Gazprom had not yet made a firm commitment on which firms would actually participate in the consortium. Gazprom was in talks with ExxonMobil, ConocoPhillips, ChevronTexaco (to a lesser extent), and Royal Dutch Shell.

Because Shtokman was located 342 miles from shore, analysts anticipated that a number of technical innovations and solutions would be implemented in the effort. This would push up development costs and make the gas more expensive. As a result, some analysts were skeptical of the project's feasibility.

Shtokman field

Fig. 1

On June 20, 2005, Russia and Norway signed a number of agreements intended to finally pave the way for development of Shtokman field. France also signed a memorandum with Russia 8 days later, and in August 2005, Gazprom received bids from nine foreign companies to develop the field: ConocoPhillips, ExxonMobil, Norsk Hydro, Statoil, Mitsui, Sumitomo Corp., Shell, and Total. Gazprom ultimately planned to retain a 51% stake in the project and select two foreign companies to participate.

In September 2005, Gazprom shortlisted five companies—Chevron, ConocoPhillips, Norsk Hydro, Statoil, and Total. Gazprom planned to announce the two winners on Apr. 15, 2006. That announcement never came.

In June 2006, Gazprom began suggesting that it might not include US companies in the list of winners. According to Gazprom Chairman Alexei Miller, "I can assure you that Gazprom does not want to establish a pattern of selecting particular companies just because they come from a particular country."[2]

WTO leverage?

Analysts speculated that Russia might use the tender as leverage in its talks with the US over its entry into the World Trade Organization (WTO), which the Kremlin believed was being held up by Washington. After the Group of Eight leading economies summit in St. Petersburg ended in July 2006 with no breakthroughs made in Russia's talks with the US to join the WTO, Gazprom further pushed back the decision on who would win the project, while Russian President Vladimir Putin began hinting that the Norwegian companies had a good chance of being selected.[3]

The one saving grace for the US was that Russia required access to the American gas market. Norsk Hydro and Statoil had allegedly offered stakes in Norwegian fields and LNG gas export projects in their bids, while Conoco and Chevron allegedly offered stakes in US LNG terminals in their bids.[4]

Gazprom continued to hold back its announcement of the winners. Then, in September 2006, Putin reportedly told French and German leaders that Gazprom was considering shipping some LNG to European markets. While

these comments offered reassurances to Europe, it upped the stakes in an already strained relationship with the US, and analysts began speculating that US companies would be omitted from the list of winners.

Then, on Oct. 9, 2006, Gazprom stunned the gas industry by announcing that it would develop Shtokman alone, without any foreign partners, and ship the gas directly to Europe via pipelines rather than including an LNG component to export to North America. Any foreign firms wishing to participate in the project would have to do so as contractors rather than equity stakeholders.

Two months later Gazprom changed its decision yet again, reexamining the possibility of developing the project as an LNG export project. Not coincidentally, after the US and Russia reached a deal for the US to support Russia's WTO membership bid, Gazprom said that there was still a chance of opening the door to foreign companies as stakeholders. The final outcome of the project has yet to be determined as Russia changes its decisions. However, political undercurrents are apparent, especially when viewed side-by-side with events unfolding around other major gas fields, such as the Sakhalin-2 project.

The Sakhalin-2 story

The Sakhalin project, located along Sakhalin Island on the eastern coast of Russia, is a massive, multiphased project (Fig. 2). Phase 1, or Sakhalin-1, was first declared commercial in 2001 and began operations in October 2005. Sakhalin-2 will include the world's largest gas liquefaction plant and will draw upon two fields.

The first, Piltun-Astokhskoye (PA), is primarily a massive oil field, with some associated gas, in the northern waters off eastern Sakhalin Island. The second field, Lunskoye, is primarily a gas field about 90 miles south of PA.

On June 22, 1994, Russia and Marathon signed a production-sharing contract for the Sakhalin-2 project. On Dec. 4, 1994, the deal became official when Yeltsin signed the law covering production-sharing agreements (PSAs). Japan also signed on to be part of the consortium.

Problems with Sakhalin-2 were inherent from its initial stages. For example, the 1994 PSA law raised a few issues with Japan. One, of major concern to Japan, was the possibility of unilateral contract revamps by Russia that could include a declaration for the Russian government to take over fields "considered of strategic importance." This concerned Japan greatly because Japan viewed Sakhalin gas and oil as part of its energy security policy.

Japan also was concerned about a requirement to use Russian technology to build the LNG plant because it was Russia's first liquefaction plant, and the Russians had no experience with the technology required to complete the project successfully.[5] Despite these pitfalls, Japan hung on.

On Feb.11, 2000, Sakhalin Energy Investment Co. Ltd., operator of the Sakhalin-2 project, began seeking bids to construct the LNG plant. Consortium members at this time were Marathon 37.5%, Mitsui 25%, Mitsubishi 12.5%, and Shell 25%.[6] A few months later, Shell and Marathon signed a nonbinding letter of intent to transfer Marathon's 37.5% interest in the project to Shell, which gave Shell a controlling stake in the project.

Environmental issues

Russia's Natural Resources Ministry approved the Sakhalin-2 feasibility study in 2003, and construction on the LNG plant began. However, ecological organizations began accusing Sakhalin Energy of harming the environment, claiming the company's project was damaging the population of gray whales because the equipment was so close to their breeding grounds. Sakhalin Energy pointed out that it had spent $5 million since 1996 to ensure that the project did not hurt the whales. In March 2005, Sakhalin Energy rerouted the offshore pipelines to protect the whales.

In July 2005, Shell signed a major asset swap with Gazprom. The deal would cut Shell's stake and give Gazprom a stake of up to 25% in Sakhalin Energy in exchange for a 50% share of Gazprom's Zapolyarnoye gas field in West Siberia.[7] One week after the deal was announced, Shell reported that it had made a mistake in its previous calculation to construct and develop Sakhalin-2. Shell now increased the cost estimate by about $10 billion. This blunder caused Gazprom to pull out of the deal with Shell.

Russian state ecological experts ruled in favor of proceeding with construction of the Sakhalin-2 project. However, in August 2006, the Russian Natural Resources Ministry dealt a serious blow to Sakhalin Energy by seeking legal action to cancel the environmental license that permits construction. The ministry cited a high risk of mudslides that could cause water pollution, equipment destruction, or fatalities.[8]

A report by the Far East branch of the Russian Academy of Sciences claimed the "existing threat of oil and gas pipeline destruction is the result of unqualified project decisions taken by Sakhalin Energy." According to a Sakhalin Energy spokeswoman, however, the company had not received any previous notice on the environmental concerns from the Ministry. She further noted that Sakhalin Energy, having already been aware of potential risks associated with the construction of pipelines, had already taken into consideration construction solutions to prevent such damage from occurring.[9]

According to an environmental audit, only two minor infractions were cited.[10] The first involved a breach of limits set for the discharge of water from one of the production platforms. The fine for this infraction would not amount to more than $7,500. In the second violation, an audit conducted during March and November 2005 showed that the water near one of the floating storage units exceeded the maximum permissible concentration of oil products in the sea. This amount was deemed "close to negligible." Sakhalin Island had even experienced an earthquake with a

magnitude of 6.0 on the Richter scale, during which the Sakhalin-2 pipelines were nearly 90% complete, and there were no adverse effects, according to Sakhalin Energy.[11]

A few days later, the Natural Resources Ministry ordered Shell to stop work on the onshore pipelines and rework the design.[12] Then, during the first week of September 2006, the Ministry dealt another blow to Sakhalin Energy when it revoked the approval it had granted in 2003 to proceed with the project. At this point, the project was about 75% complete.[13]

The unfolding scenario had fingers pointing in opposite directions, with Russian officials describing their viewpoint as "pure business" and Western analysts accusing the Russian government of trying to force a halt to the project to defend its interests. Yuri Trutnev confirmed the Western assumption when he pointed out that Moscow had to "defend its interests" only after Shell last year doubled the project's expected costs to $20 billion.[14]

Because the Sakhalin-2 project cost suddenly and unexpectedly increased by $10 billion, the Russian government saw this as a financial blow. In addition, under the PSA law, the cost increase would delay and reduce payments to the Russian government. Suddenly, the Russian government felt it was being trampled upon by a consortium of foreign companies that were given extremely favorable terms under a PSA drawn up 12 years earlier.

Russia did not feel it was receiving its due share of financial gain in a timely manner. According to one source, as of September 2006, $18 billion had been invested in the three PSA projects—Sakhalin-1, Sakhalin-2, and Kharyaga, an oil exploration and production venture operated by Total in the northern Timan-Pechora region. Meanwhile, the state had received only $500 million in revenue.[15] One account described this amount as "laughable."

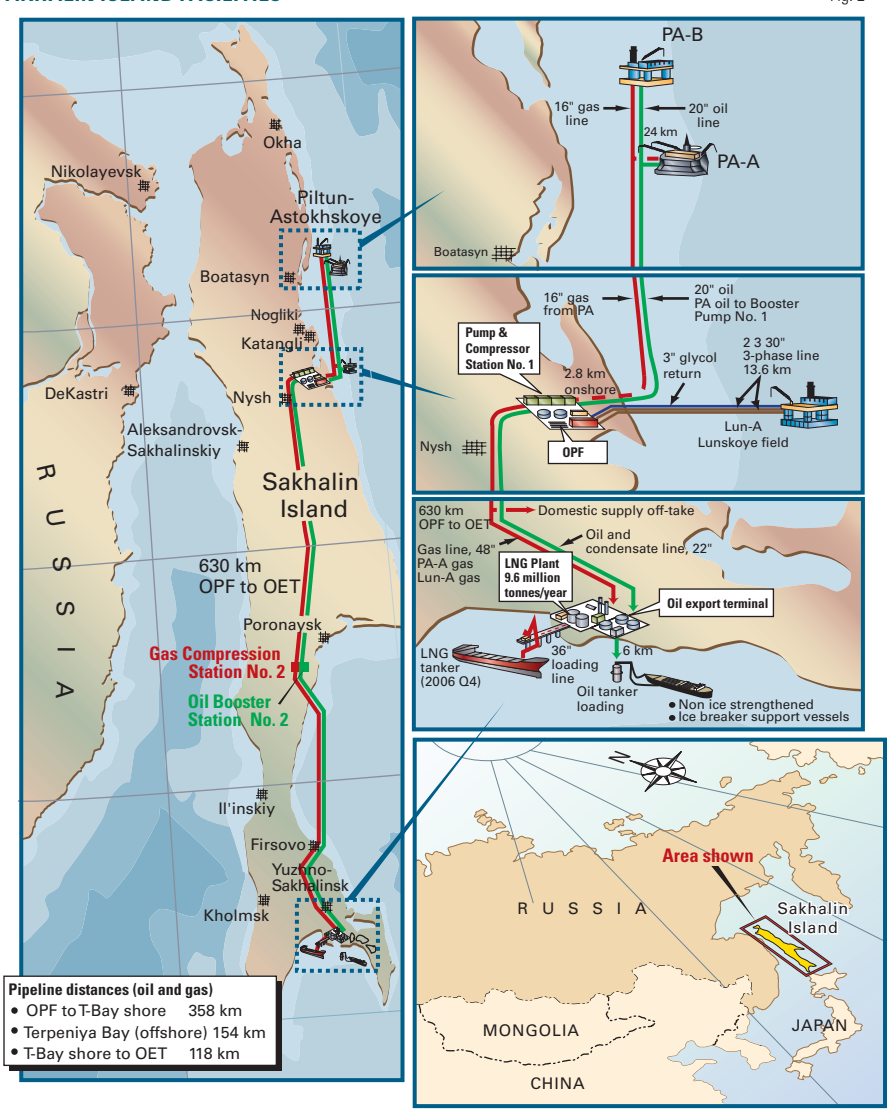
On Sept. 28, 2006, Oleg Mitvol, deputy head of Rosprirodnadzor, Russia's environmental watchdog, announced that environmental damage caused by the Sakhalin-2 project would cost Sakhalin Energy over $50 billion.[16] According to Mitvol, "The construction cannot go on. We must stop the project and start over again. We want criminal cases for every destroyed tree or damaged river. If criminal cases are opened for everything, the company will read the criminal code, come to its senses and stop the barbarian activity."[17] Mitvol denied he was taking on Shell to assist Gazprom in achieving its goal of gaining a share in the project. "I'm doing it for my daughter and for the future of Russia," he declared.[18]

Next, Natural Resources Minister Yuri Trutnev asked Rosprirodnadzor to submit details of the company's environmental violations to the prosecutor general's office within 2 weeks. The case could then be brought up to a criminal level status. According to Trutnev, the company violated at least five articles of the Russian criminal code.

While Sakhalin Energy tried to reach a solution, the project faced another environmental assault on Dec. 7. The Ministry suspended permits held by Starstroi, the main onshore contractor. This forced Sakhalin Energy to halt all

SAKHALIN ISLAND FACILITIES

Fig. 2



work near river crossings for breaches of water legislation.[19]

Shell succumbs

On Dec. 21, 2006, Shell succumbed to the environmental and judicial pressure. After Gazprom had waged war with Shell for over a year to gain control of the Sakhalin-2 LNG project, it finally succeeded. Shell's stake would be reduced to 27.5%, Mitsui's to 12.5%, and Mitsubishi's to 10%. Gazprom would now hold 50% plus one share in the company, making it the majority share owner and, therefore, bumping Shell from its position as controlling shareholder. Although Shell no longer has control over the project, it reportedly retains management and technical advisor status. Gazprom offered $7.45 billion in cash in the deal.

In what hardly seems a coincidence, the environmental issues disappeared once Gazprom became a shareholder. Russia swept the ecological shortcomings aside. According to Putin, all ecological issues can now be considered resolved. "I'm pleased that our environmental services and the investors have agreed on the way of resolving ecological problems," Putin said during a televised appearance.[20]

With Gazprom the majority stakeholder in Sakhalin-2, Russian authorities geared up attacks on new fronts. This time the attacks were on the TNK-BP's Kovykta project, in which Russia threatened to have the company's license revoked. Additionally, Russia threatened to cancel Total's Kharyaga project PSA. Finally, environmental authorities announced plans to "check up" on ExxonMobil's Sakhalin-1 project.[21]

The real issue behind Sakhalin-2 was cost overruns. The Russian government's lack of control over the project further exacerbated the problem. According to Andrew Neff, senior energy analyst with Global Insight, there may have been environmental violations—but not to the extent stated by the Russians.

In the long run, having Gazprom on the project may be better for Shell, although not ideal as was the original PSA deal, which is no longer an option. As of Sept. 6, 2006, the only options available were either to see the project stall, have the license revoked and lose the entire investment, or concede. At least the project will proceed, albeit less profitably.[22]

Strong foothold

Russia has an abundance of natural gas available and is just starting to come on board with the ability to develop and produce these resources. Western advanced technology, financial strength and high demand, coupled with Russia's lack of capital and exceptional reserves seem to make the two countries ideal partners. The Kremlin, however, clearly intends to expand and maintain a strong foothold in its energy sector. Russia's reneging on international deals creates a challenging and dangerous business environment for potential Western business partners.

As the number-one consumer of natural gas in the world and possessing only 3% of world reserves, the US needs to continue to diversify its sources of natural gas. The case studies described above are two examples that demonstrate the potential hazards of doing business in Russia. The Russian government stands firm in its desire to expand its monopoly on the natural gas sector and continues chiseling away at Western-dominated projects within its borders. In addition to the negative impacts stated in the case studies on those Western companies currently involved in these projects, Russia's growing monopoly comes with other potential side effects:

- *Increased political leverage.* As Russia's monopoly on natural gas grows, so too does its political strength. The Kremlin will undoubtedly be able to use its tightening grip over natural gas as political leverage over countries highly dependent on it for this resource.
- *A strengthening of its military.* Russia is using energy as a tool to restore its world-power status. No longer a military threat, Russia could use the monies earned from these development projects to revamp its military.
- *Unfair control over pricing.* Russia could opt at any time to increase its prices for natural gas during times of high demand. This not only would affect citizens of other countries but also could impact local economies or even global economies if the increases were substantial.

Future deals

Although Russian technology has been improving over time, it has yet to achieve the same capability as that of the Western majors. Knowing this, Western companies might still find future deals attractive. These companies need to be shrewd in their business dealings with Russia, keeping in mind that at any time the tide can turn and politics can play a key role in ousting them from part or all of a project. This could result in billions of dollars in lost revenues.

Russia still has many unexplored gas fields. Any Western company willing to participate in exploration of these fields should heed three warnings:

- First, companies must understand the differences between "Western capital laws" and "Kremlin socialist laws." At any time, like Shell, they could be forced into a costly compromise.
- Second, Western companies must be prepared for Russia to take advantage of capital and technology, some of which might even be proprietary, before Russia assumes the upper hand in a project.
- Finally, future Western investors must first be able to balance risk and reward. The risks are many.

Russia continues striving toward complete domination of its industry, which likely will one day exclude foreign companies altogether. For now, however, Russia will continue to include foreign companies as long as it needs the technology they bring. ✦

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The author

Cindy Hurst is a political-military research analyst with the US Army's Foreign Military Studies Office. Her research is centered on various energy issues. She is a lieutenant commander in the US Navy Reserve and currently is writing a book on potential implications of LNG.

IEA: Oil market to stay tight through 2012

The oil market, despite 4 years of elevated prices, will tighten further by 2012, predicts the International Energy Agency, Paris.

Spare production capacity among members of the Organization of Petroleum Exporting Countries will rise but remain "relatively constrained" until 2009 then fall to "minimal levels" by 2012 as demand growth remains strong, IEA says in its Medium-Term Oil Market Report published this month.

Although low spare capacity in OPEC implies high crude prices, and despite growing distillation capacity and biofuels supply, IEA expects refining margins to remain strong through 2012.

Using economic forecasts from the Organization for Economic Cooperation and Development (OECD) and International Monetary Fund, the agency assumes growth in global average gross domestic product of about 4.5%/year. That assumption yields oil demand growth of 2.2%/year.

If GDP grows only by 3.2%/year, oil demand growth slows to 1.7%/year, and the need for OPEC crude falls by about 2 million b/d in 2012, IEA says. "But this merely postpones by a year the point at which oil demand growth surpasses the growth in global oil capacity, in effect delaying the return of minimal spare capacity by only a few years unless the trend in upstream capacity growth changes."

Forecast highlights

Here are highlights of IEA's forecast for 2007-12:

Oil demand will increase to 95.82 million b/d in 2012 from an estimated 86.13 million b/d in 2007. Most of the growth will be in Asia and the Middle East, where demand will increase at nearly three times its rate of the industrialized countries of the OECD. The rapid-growth countries are approaching the income threshold of about $3,000/person at which consumers buy cars and energy-consuming goods, IEA notes.

Non-OPEC liquids supply will increase during the forecast period to 52.56 million b/d from 49.98 million

b/d, with the growth rate diminishing after 2009. Non-OPEC liquids supply includes crude, condensate, NGL, and biofuels.

- OPEC's production of NGL, which isn't subject to the group's production quotas, grows in the forecast period to 7.08 million b/d from 4.86 million b/d.
- The need for OPEC crude, which is subject to quotas, net of anticipated stock changes and balancing items, rises to 36.81 million b/d in 2012 from 34.4 million b/d in 2007.
- The calculated need for OPEC crude implies OPEC spare production capacity of 2.5 million b/d in 2007 (2.9% of global demand), 3.07 million b/d in 2008 (3.5%), 3.37 million b/d in 2009 (3.7%), 3.24 million b/d in 2010 (3.5%), 2.55 million b/d in 2011 (2.7%), and 1.55 million b/d in 2012 (1.6%).
- For OPEC production capacity, IEA assumes no net expansions in Iran, Iraq, and Venezuela and a negligible increase for Indonesia. It also assumes that 500,000 b/d of Nigerian capacity offline for the past year remains idle through the forecast period. IEA forecasts these increases: Saudi Arabia, 1.77 million b/d to 12.57 million b/d in 2012; the United Arab Emirates, 500,000 b/d to 3.38 million b/d; Angola, 500,000 b/d to 2.17 million b/d; Kuwait, 420,000 b/d to 3.06 million b/d; Nigeria, 370,000 b/d to 2.84 million b/d; Qatar, 210,000 b/d to 1.16 million b/d, Algeria, 190,000 b/d to 1.56 million b/d; and Libya, 170,000 b/d to 1.92 million b/d.
- Supply of automotive biofuels will reach 1.8 million b/d by 2012, compared with 900,000 b/d in 2006. The 2012 projection is 1.2 million b/d below the potential level of capacity additions. IEA cites rising prices of feedstocks, the lack of clear long-term mandates and subsidies in many countries, and food-fuel competition as reasons for the conservatism of its outlook.
- Crude distillation capacity will increase by 10.6 million b/d during the forecast period, of which 9.1 million b/d will be new capacity and 1.5 million b/d will be capacity creep resulting from upgrades of existing units. Expansion of existing refineries, mainly in Asia-Pacific and the US, will raise global capacity by 4 million b/d. New-build refineries will add 5.1 million b/d of capacity, mainly in the Middle East, China, and elsewhere in Asia, especially India. ✦

Senate panel told CSB needs more funding, authority

Nick Snow
Washington Correspondent

The US Chemical Safety and Hazard Investigation Board (CSB) needs more funding and authority if it is to be truly effective, witnesses told a US Senate subcommittee July 10. The federal agency has investigated 42 refining, chemical, and other plant accidents since its formation in 1990 but continues to meet resistance from local governments and other federal agencies in some cases, witnesses said.

"The board's work has led to more plant inspections, better protections for workers, and more attention to safety issues in corporate board rooms. But even though it prevents injuries and saves lives, the board needs more funding to investigate accidents," said Sen. Frank R. Lautenberg (D-NJ), chairman of the Environment and Public Works Committee's Transportation Safety, Infrastructure Security, and Water Quality subcommittee.

Lautenberg expressed concern that CSB encounters resistance from other government entities as it tries to do its work. He cited a case in which a local fire marshal in Danvers, Mass., blocked the board for nearly a week from investigating a chemical explosion at an ink manufacturing plant, during which time, "crucial evidence may have been lost," he said.

WATCHING GOVERNMENT

Nick Snow, Washington Correspondent

Survey reveals energy muddle

American Petroleum Institute officials have said for several years that the public doesn't understand how the oil and gas industry works. Now they have figures to back up their statements.

In a May 29-June 3 online survey of 1,333 Americans, Harris Interactive found that most US adults "have a fundamental lack of knowledge regarding energy supplies and demand, and the role of America's oil and natural gas companies," API said. "In fact, when presented with 20 multiple choice questions, on average more than 25% of respondents said they were 'not sure,' and in many cases people chose the response that is farthest from the correct answer."

Respondents overestimated US oil imports from the Middle East. When asked which country was the biggest foreign supplier, almost 60% chose Saudi Arabia, which actually is No. 6. Only one in 10 correctly chose Canada as the largest foreign supplier.

Perceived profits

Responses indicated that the public overestimates US oil and gas companies' profits and doesn't recognize their investments in emerging energy technologies. The survey found that 42% believed oil companies earned 16-20¢ on every dollar of gasoline sales during 2006. In fact, said API, the amount was 9.5¢, within a range (6-10¢) that only 14% chose.

Only 7% correctly said that US oil and gas companies invested almost $100 billion in emerging energy technologies in North America alone from 2000 through 2005. More than a third estimated less than $25 billion, the lowest possible choice.

The survey also indicated that the public overestimates the size of publicly traded oil companies relative to competitors owned by foreign governments. When asked what percentage of the world's largest oil firms are state-owned, only 2% knew that this describes all of the top 10 companies.

Most respondents also didn't know that ExxonMobil Corp., the largest US oil company, was not among the world's largest reserves holders. Thirty-six percent placed it among the world's three largest oil firms, API said.

Fossil fuels' role

Respondents also underestimated the role fossil fuels must play in meeting global energy demand in the next 25 years. Only 14% agreed with the International Energy Agency's estimate that fossil fuels will meet 81% of demand in 2030. Most respondents thought it would be 61% or less. Similarly, more of the survey's participants (34%) thought that renewable sources would account for 20% of total supplies in 2030. Only 5% agreed with the US Energy Information Administration's projection of less than 10%.

In a teleconference with reporters, API Pres. Red Cavaney explained that the trade association has been concerned that inaccurate information in legislative debates could lead to bad policies.

"The challenge for us is to communicate more broadly and meaningfully to help people understand their frustrations over energy. Some policy options have unintended consequences, particularly for an industry with high capital requirements and long lead times," he said. ✦

He noted that CSB has received the same annual appropriation for the last 3 fiscal years. CSB Chairwoman Carolyn W. Merritt said the agency, which has 40 staff members, has a $9 million budget and has requested $10.5 million for fiscal 2008. Budget limitations and a lack of qualified investigators have kept the agency from examining 10-15 accidents this year, she added.

Information limited

Merritt also indicated that CSB did not receive all the documents it sought from the Environmental Protection Agency and Occupational Safety and Health Administration while it investigated the March 2005 fire and explosion at BP America Inc.'s Texas City, Tex., refinery that killed 15 and injured about 180 people. "It directly impacted our evaluation," she said.

Deborah Dietrich, who directs the emergency management office within EPA's solid waste and emergency response office, countered that EPA "provided a great amount of information. We did not see how questions regarding the number of inspections were relevant."

Merritt testified, "We made recommendations to OSHA but did not make one to EPA because we did not have the information." In her written statement, she noted that the National Transportation Safety Board, in a 2002 report, said that both EPA and OSHA have few safety inspectors compared with the number of high-hazard chemical facilities—about 14,000—which federal regulations cover.

Supplanting EPA

Timothy R. Gablehouse, president of the National Association of SARA Title 3 Program Officials and chairman of the local emergency planning committee in Jefferson County, Colo., suggested that CSB is supplanting EPA as a major federal safety agency at oil refineries and chemical plants "even though EPA has regulatory ownership of both primary statutory programs that create the structure of these efforts."

CSB recommendations in the last few years have focused on local preparedness, the use of local emergency planning committees, and enhancing relationships within communities to prevent and prepare for accidents, Gablehouse said in his written statement. "Its adoption of video reconstruction to communicate the results of investigations also has been extremely beneficial to those at the local level," Gablehouse said.

Scott Berger, who directs the American Institute of Chemical Engineers' chemical process safety center in New York, said CSB's investigations enable companies, regulators, and workers to take necessary actions to avoid future accidents. He urged that CSB be adequately funded and staffed "to carry out in-depth incident investigations, capture the learning, and communicate that information to the industry, technical associations, regulators, and the public."

Merritt also urged the committee to compare CSB's statutory authority with that of NTSB, on which it was modeled. "The authority of CSB to preserve and determine the testing of evidence is much less explicit than the NTSB's authority," she said. "Last year, when the CSB proposed a procedural rule on evidence preservation at accident sites, some industry voices objected that Congress had never intended CSB to exercise such preservation authority." She said delayed investigations often result in important physical evidence being lost or destroyed. "Clarification of these issues by Congress would improve the quality and speed of CSB investigations," Merritt said in her written statement.

Other suggestions

Congress must make clear that no local, state or federal agency may block CSB access to the site of a chemical release, particularly during the early stages when physical evidence is most pristine and in the greatest peril, Merritt said. She also said it was important that CSB, EPA, and OSHA field teams have reasonable access to the other agencies' records and employees to conduct investigations.

"Congress could also consider providing a limited degree of statutory protection for CSB's own investigative records to prevent indiscriminate use in litigation and criminal prosecutions. The possible future use of information gathered by CSB in the courtroom can have a strong chilling impact on our ability to conduct our safety investigations and can detract from our independence," said Merritt, whose 5-year term as the CSB's chairwoman ends in August.

Berger said that AIChE and its chemical process safety center would like to see experienced chemical engineers named to replace the chairwoman and a board member whose terms are expiring. ✦

Biofuels pitfalls need more study, say conferees

Doris Leblond
OGJ Correspondent

Amid the current clamor for biofuels development came cautions from a number of speakers at the first International Biofuels Conference in Brussels July 5-6 that biofuels are "no panacea" and that potential drawbacks need to be identified and avoided.

Biofuels are being touted by many as an alternative to fossil fuels for transportation and for combating climate change, bolstering energy supply security, and benefiting farmers.

However, the European Union's External Relations Commissioner Benita Ferrero-Waldner, who organized the conference, warned, "We cannot afford to turn a blind eye to the potential drawbacks. We need to analyze them and avoid them."

Ferrero-Waldner said an analysis should be carried out at the international level because "the benefits and risks of developing biofuels on a grand-scale have to be tackled as part of an international agenda."

The consensus among the speakers was that no country—even the US—could deal alone with the challenges of climate change and energy security and that convergent international standards for biofuels should be developed in line with their global trading.

"Biofuel policy is not ultimately an industrial policy or an agricultural policy—it is an environmental policy, driven above all by the greenest outcomes," said EU Trade Commissioner Peter Mandelson.

"We do not usually think about the immense complexity of the infrastructure that supplies our energy," Mandelson said in an effort to temper what he called "an environmentally unsustainable stampede" towards biofuels production. "No industry works with a longer time horizon: It takes 5 years to build a pipeline, 10 years for a power station or refinery. So we must recognize the need for a stable regulatory framework, and for dependable signals from governments to guide investment and trade."

Promising that the EU's energy policy target of a 10% share of biofuels for transport by 2020—a nearly sevenfold increase—would be "binding," EU Energy Commissioner Andris Pielbags insisted that it also must be "sustainable." The directive giving legal backing to the policy will set minimum sustainability standards for both domestically produced and imported biofuels, he said, adding, "We must aim at the earliest possible entry into the market of 'second generation' biofuels," which are not food-related.

Claude Mandil, executive director of Paris-based International Energy Agency, told OGJ that the positive aspect of the

conference, which he cochaired, was that it showed a "passing from poetry to serious thinking."

While biofuels served to diversify motor fuels, speakers recognized that biofuels must be produced and consumed in a sustainable manner, taking care to maintain biodiversity, prevent adverse impacts on world food prices and availability, and ensure that its production does not require more energy than it provides. And he stressed the need for a consensus on reaching international biofuels standards.

Like other speakers, Mandil did not view biofuels as "a panacea" pointing out that, despite an impressive number of projects existing or planned, biofuels would not in the foreseeable future account for more than 5-10% of world transport consumption and will never replace oil. He further warned: "Oil-producing countries must not be worried to the extent of curtailing oil development."

Ferrero-Waldner said the initial conference was only a first step towards a "transparent and frank dialogue with all partners" in order to work towards a credible and sustainable international market and convergence in biofuels standards." ✦

UK's DTI revamped, renamed; Hutton picked to lead

Uchenna Izundu
International Editor

The UK Department of Trade and Industry (DTI) has been revamped and renamed the Department for Business, Enterprise, and Regulatory Reform (DBERR).

Gordon Brown, the new UK prime minister, appointed former Pensions Secretary John Hutton to lead the department. He succeeds Alistair Darling, who has become Chancellor of the Exchequer.

The DBERR will continue to handle energy policy. Oil and gas operators had worried that the department might be broken up and that energy policy would move to the Department for Environment and Rural Affairs, the increasing focus of which has been climate change.

There have been several changes over the past couple of years to the minister of the DTI, raising concerns among North Sea operators about consistency of policy and interest from the government in presenting a coherent energy strategy across all departments. Last November, energy policy became a cabinet level issue for the first time in more than a decade (OGJ Online, Nov. 14, 2007).

A spokeswoman for the Energy Institute told OGJ, "The key to any successful future energy policy is consistency and continuity beyond the parliamentary life cycle or indeed that of any public servant in office, and ideally in being a policy with cross-party support."

A DBERR spokesman said it was unclear who would assume the position of parliamentary undersecretary of state for energy.

Appointment welcomed

Industry bodies cautiously welcomed Hutton's appointment and stressed the importance of giving the department adequate resources to deal with the energy agenda, particularly as a large number of relatively small companies have applied for exploration licenses in the UK North Sea.

Richard Wilson, chairman of the Oil & Gas Independents Association, said: "We hope that Hutton will take an interest in PILOT [joint industry-government meetings], and we look forward to close relationships with him and meeting on a regular basis."

Oil & Gas UK said it looks forward to working with Hutton on maximizing recovery of the UK's oil and gas reserves.

Industry groups have campaigned strongly to ensure that the government maintains the UK's attractiveness to energy investment.

According to Jim Hannon, founding partner of North Sea consultancy Hannon & Westwood LLP, it is difficult to envisage any major financial changes in the oil industry under Brown's new regime, as he was previously the chancellor. Investors are being lured to the UKCS because of high oil prices, and exploration is at its most active since the 1980s. "The Treasury is, therefore, enjoying the best of both worlds: increased tax take and no adverse effect on exploration," Hannon said.

In its recent Energy White Paper, the government said oil and gas from the UK North Sea will remain important in meeting the country's energy needs but stressed that nuclear power may have a role in diversifying the energy mix (OGJ Online, June 23, 2007).

According to the paper, the oil and gas share of UK primary energy supply is expected to rise to 80% in 2020 from 70% in 2006. ✦

DOI issues Utah oil shale lease to OSEC

Nick Snow
Washington Correspondent

The US Department of the Interior issued a research, development, and demonstration (RD&D) lease June 28 to Oil Shale Exploration Co. LLC of Mobile, Ala., for 160 acres of public land in eastern Utah. An analysis determined that the project would have no significant environmental impacts.

The action will allow oil shale devel-

opment to continue on the site, which is administered by the Bureau of Land Management's eastern Utah office in Vernal. However, OSEC must submit a detailed operations plan for BLM's approval, and it also will be required to obtain all necessary federal, state, and local permits and make available to other companies researching oil shale development some shale from an existing supply at the site, BLM said.

It said OSEC plans to test an above-ground retorting process on shale from the White River Mine site south of Vernal. The company initially will conduct test retorts of existing shale stock at a facility in Canada to help determine the retorting process's feasibility, the chemical properties of synthetic crude products resulting from it, and whether spent shale will require isolation from the environment, according to BLM.

The lease has terms similar to five RD&D leases that DOI issued previously for acreage in western Colorado. It gives OSEC rights to develop oil shale on the tract for 10 years, with a possible extension of up to 5 years if the lessee shows diligent progress toward commercial production.

BLM said that RD&D lessees also may apply to convert each lease, plus 4,960 adjacent acres, to a 20-year commercial lease once commercial production levels are achieved and additional requirements are met. The agency said it would perform subsequent analyses under the National Environmental Policy Act on any proposed commercial operations on RD&D leases.

Selma Sierra, BLM's Utah state director, said the RD&D process benefits from support by the state government and local governments in Uintah and Duchesne counties. "The BLM will continue to facilitate communication and collaboration between local communities and companies working with shale from the White River Mine," she said.

BLM said that issuing the lease to OSEC completes action in its oil shale RD&D leasing program, which began in June 2005. The agency said it is continuing to lead development of a programmatic environmental impact statement supporting future commercial oil shale leasing on public land in Utah, Colorado, and Wyoming, as directed in the 2005 Energy Policy Act. ✦

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

An Argentine gas squeeze

Wracked by the need to boost its supplies of natural gas, Argentina is putting the screws to producers and certain consumers. Last week, Argentine President Nestor Kirchner justified his government's moves.

In fact, Kirchner used the word "crisis" to describe the shortages that have forced his government to ration gas for factories in order to guarantee enough energy to heat homes.

The government, which is also forcing factories to switch from gas to more-expensive diesel or fuel oil, says it has taken steps to boost capacity—a much needed decision in a land where oil refining is said to be running at 95% of capacity.

Election looms

Kirchner's cabinet chief, Alberto Fernandez, rationalized the decision to favor home heating over factories by saying, "We have to cut [gas supplies] where it hurts least." But hurts whom?

Kirchner, of course, who ahead of presidential elections just 4 months away, clearly does not want to upset the electorate by cutting home heating. None the less, by cutting supplies to factories, Kirchner will still hit the population as job cuts loom.

Kirchner has called carmakers a "backbone" of growth, and the industry is leading the increase in manufacturing output. Those assertions are backed by facts and figures that are indisputable.

Independent analysts say the growth in Argentina's industrial output—up 6.5% in the first quarter, year-on-year—is being driven primarily by the auto industry, where output is running almost a third higher than in 2006.

In May, for example, the output from the car industry was 40% higher than in May 2006, while for the first 5 months of 2006 output was 30% higher than for the first 5 months of 2006.

According to one analyst, the auto industry has hardly begun to take off since, in May, even after the massive jump in output, the industry is still running at just over 52% of its capacity. In a word, it is working at half-speed.

Tariffs fuel growth

While the economy is booming, that boom has been occasioned by Argentina's ultracheap energy tariffs, which have fueled 4 years of growth pegged at more than 8%. Kirchner says the country's dramatic growth has created bottlenecks—especially in the country's gas supply.

As a result, Kirchner has ordered the country's internal trade secretary, Guillermo Moreno, to squeeze more gas from the system. And the squeeze is on as Moreno is reported to have threatened energy companies with taking over their fields for 180 days if they fail to supply enough gas.

No less worrying, the government also fined Shell last week for what it says are insufficient diesel supplies. That's rich, since—due to Argentina's artificially low domestic tariffs—companies must import diesel at international prices while selling it at a loss in Argentina.

Of course, Kirchner wouldn't dream of raising tariffs—not in an election year. ✦

Bolivia vice-president assures Argentina to meet natural gas needs

Eric Watkins
Senior Correspondent

Bolivia Vice-President Alvaro Garcia Linera has given assurances that his country will make every effort to meet Argentina's rapidly increasing needs for natural gas. His statement came in an interview with Argentina's Clarin newspaper following a meeting with Argentina's President Néstor Kirchner.

Asked what the two men discussed, Linera said the main focus was on energy integration and strategic agreements between the two governments. "Right now," he said, "Bolivia sells Argentina between 4.7-7.5 million cu m/day of gas, and we have signed a contract so that starting in 2009 or 2010 we will gradually be delivering another 20 million cu m/day of gas. This is not only a supply issue, but a matter of building infrastructure, like the gas pipeline for which Argentina conducted the bidding procedure last week."

Asked if a concession could be withdrawn from a private company if it fails to meet its commitments, Linera said that the arrangement means that "Argentina will definitely have the gas that it has contracted for, no matter what." He said, "We are confident about this, based on how things are going after the agreement on the investment plans of the foreign companies that are operating in Bolivia. But for us as a government, the Argentine market is a strategic market and we are going to guarantee its supplies above all."

Linera noted that Kirchner was concerned about Argentina's current energy crisis, saying that he has "many plans" regarding it. Last week, Kirchner used the word "crisis" to describe the severe shortages that have forced his government to ration gas for factories to guarantee enough energy to heat homes.

"We have to cut [gas supplies] where it hurts least," Alberto Fernández, cabinet chief, acknowledged last month—a reference to the government's desire to avoid hitting domestic supplies four months before presidential elections.

Kirchner says the country's dramatic economic growth has created bottlenecks, a point underlined by Linera, who told Clarin, "The energy crisis exists throughout the entire continent, and it is related to the economic boom, which is more modest than the boom in China, but [which] is still significant. Economic growth means more energy. And the sustainability of that growth requires a process of increased integration and solidarity."

Last October Bolivia agreed to sell gas to Argentina that was worth more than $16 billion over the next 20 years, despite concerns that Bolivia's unstable political climate would hinder the scale of investment necessary to extract and transport the gas.

At the time, Kirchner signed an agreement with Morales to increase gas imports fourfold in a drive to ease Argentina's increasingly serious energy shortages. Argentina currently imports 7.7 million cu m/day, which, according to the agreement, will be increased to 27.7 million cu m/day by 2010.

Although Bolivia has the second-largest reserves of gas in South America, reports said a lack of infrastructure in the country means some $2-3 billion will have to be invested in exploration and development, while a further $1.2 billion will be needed to transport the gas, as existing pipelines are running at full capacity. ✦

Ecuador taking measures to increase oil production

Eric Watkins
Senior Correspondent

Ecuador is taking steps to boost the country's production of oil after output from state-run Petroecuador declined 14% during the first half of this year compared with the same period in 2006.

According to figures from the central bank, the decreased production of crude oil, which normally accounts for 40% of Ecuador's export earnings, has adversely affected the country's trade balance. The budget had forecast oil revenues of some $1.456 billion for 2007, but just $273 million has been realized so far.

International oil companies including Brazil's Petroleo Brasileiro SA (Petrobras), France's Perenco, and China's Andes Petroleum also have registered losses, partly attributable to strikes that have taken place in the country's Amazonian provinces.

The decrease is also partly due to natural decline at existing oil fields and to the lack of new project development, but industry observers also cite the absence of a clear government policy for the energy sector, with the first half of 2007 marked by clashes between the energy ministry and Petroecuador.

Ecuador President Rafael Correa has responded by dismissing Alberto Acosta as energy minister and dividing the energy ministry in two, appointing Jorge Albán as the new minister for oil and mines and Alecsey Mosquera as responsible for electrification and renewable energies.

Meanwhile, in a bid to shore up its faltering production, Petroecuador subsidiary Petroproduccion last week began drilling exploratory well Drago 1 in the Amazon's Shushufindi field.

According to official figures, Shushufindi field is the country's largest, with output reaching 8.92 million bbl during first half 2006, or about 9% of the country's total output.

Petroecuador said the Shushufindi drilling marks the inauguration of an intense program of exploration that Petroproduccion hopes will allow the identification and development of "indispensable" new reserves.

On July 3 Indonesia's PT Pertamina said it would present Petroecuador an offer to revive 100 closed oil wells in the Amazon region as well as develop Oglan field in Orellana province. Pertamina said the two sides had signed a confidentiality agreement regarding the projects.

Last February Pertamina said it hoped to sign contracts for six oil and gas projects in Ecuador, saying that the projects, to be developed in cooperation with Petroecuador, were expected to produce up to 300,000 b/d of oil.

At the time, Pertamina director Sukusen Soemarinda said one of the exploration projects was offshore and the rest onshore. Sukusen said the two sides signed a strategic alliance agreement covering the exploration and rehabilitation of the old wells in August 2006. ✦

CHINA THRUST BELT EXPLORATION—2

Modern technology revitalized China's mature Jiuxi basin

Wenzhi Zhao
Zecheng Wang
RIPED
Beijing

Jianjun Chen
Yongke Han
Yumen Oilfield Co.
Yumen, China

This is the second of two parts on oil and gas exploration in the Jiuxi basin in northwestern China.

Exploration started in the basin in 1938.

The basin has one of China's earliest commercial oil discoveries and is considered the cradle of the Chinese petroleum industry.

By the end of 2003, 540 exploratory wells had been drilled, with a density of 0.2 well/sq km. Six oil fields—Laojunmiao, Yaerxia, Shiyougou, Baiyanghe, Shanbei, and Qingxi—were discovered in succession. The reservoirs are Silurian, Cretaceous, and Tertiary. Discovered reserves are 148 million tons of oil, and the present production is 700,000 tons/year.

Oil exploration in basin came in three stages from 1932-82, 1983-96, and 1997-present.

Structure exploration stage

This stage lasted from 1932 until 1982.

As early as 1938, exploratory wells were drilled on the Laojunmiao anticline along the river valley on the foothills of the Qilian Mountains, which were surveyed at the surface by Mr. Sun Jianchu and others.

In August 1939, the Tertiary Laojunmiao oil field was discovered by drilling the Lao-1 exploratory well, kicking off petroleum exploration and development in the Jiuquan Region.

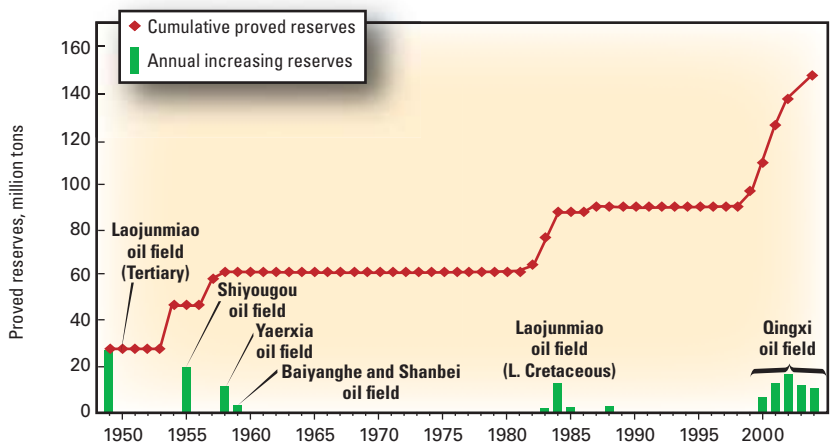
In 1949, cumulative proved reserves reached 27.66 million tons and production was 69,200 tons/year (Figs. 14 and 15). In the 1950s, exploration continued along the anticline belt and consequently, Yaerxia and Oil Gully Tertiary oil fields were found; and the Tertiary Baiyanghe and Shanbei oil fields were discovered in the Baiyanghe thrust belt in the northern part of the basin. At the end of 1959, cumulative proved reserves reached 61.61 million tons and production was 1.4 million tons/year, at its historical peak.

From the 1960s to the early 1980s, little prospecting progress was made. Two small pools were found in faulted Block 701 and 881 in the Cretaceous and Silurian basement in Laojunmiao and Yaerxia oil fields, with 26.86 million tons of reserves proved. This increased cumulative proved reserves by only 16.36 million tons. Thus, oil production fell sharply from 1.09 million tons in 1960 to 0.406 million tons in 1965. Thereafter, the annual production stayed around 0.40-0.60 million tons.

In this stage, exploration targets were traps configured by the uplifts and surface structures; and oil-bearing rocks were fractured Tertiary and partly Cretaceous and Silurian.

HOW JIUXI BASIN OIL RESERVES PROGRESSED

Fig. 14



Source depression stage

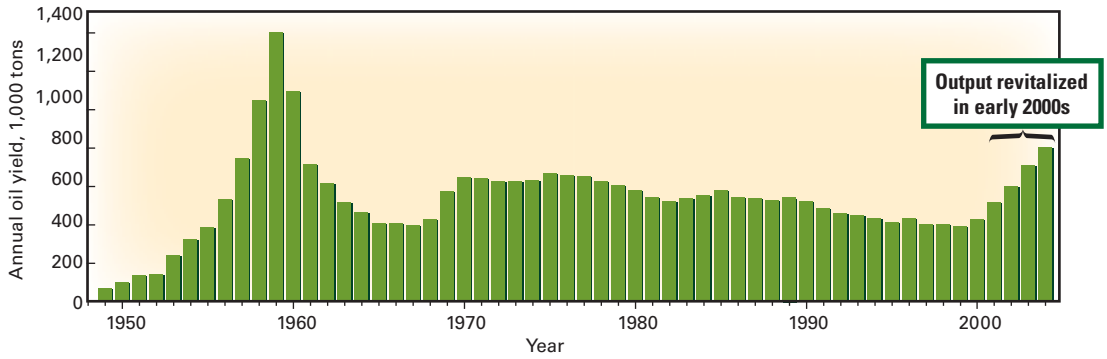
This exploration stage lasted from 1983 to 1996.

In the late 1970s, exploration on the uplift belt and Tertiary formations in the Jiuxi basin was unsuccessful, resulting in a steady decrease in reserves and low oil

production for a long time. The severe situation forced petroleum geologists to shift hydrocarbon prospecting from uplift areas to oil-source depressions with the idea of hydrocarbon kitchens controlling the oil reservoirs distribution.

HOW JIUXI BASIN OIL PRODUCTION RELATED TO EXPLORATION STAGES

Fig. 15



In 1983, the first well, Xican-1, was drilled in the Qingxi Depression to a depth of 4,570 m. It discovered more than 1,000 m of high-quality Lower Cretaceous source rocks. In addition, oil-bearing formations were discovered in the Lower Cretaceous lacustrine shaly siltstones and shaly dolomites.

Well-log interpretation identified two oil-bearing intervals, total 124 m thick; and a formation test produced oil at 7 cu m/day. Yumen Oilfield Co., in cooperation with GSI of the US, introduced digital seismic prospecting technology in 1985 and shot five lines totaling 209.46 km of 2D seismic survey along gullies at both southern and northern edges of the Jiuxi basin and identified large-scale overthrust faults at the northern edge of the Qilian Mountains.

However, it was uncertain whether Mesozoic strata and structures were present underneath the thrust fault due to poor seismic imaging. Until 1988, only three out of nine wells had low oil flow in the "synclinal" shaly dolomites in the Liugouzhuang area of the depression; and the 6 years of exploration in the Qingxi depression did not locate major discoveries. As a result, petroleum prospecting had been nearly suspended in the Jiuxi basin from 1989 to 1997.

The failure, however, did not defeat the confidence of Chinese geologists. From 1984 to 1986, Zhang Chuangan, Zhao Wenzhi, and others conducted detailed studies of the thrust belts in western China and pointed out that there are large thrust belts along the northern edge of the Qilian Mountains where great exploration potential exists on the basis of basin evolution.

The geologists of Yumen Oilfield Co. reevaluated the structures and gained practical understanding of the geological conditions and reservoir types in the thrust belt in the mountain front. The source rocks are rich and thick, with good potential of hydrocarbon generation and abundant hydrocarbon resources.

The Liugouzhuang and Kulongshan structures are located in the source kitchen area, having a fair oil accumulation condition as proved by three low oil flow wells. Reservoir rocks are highly heterogeneous and fractured. They also realized that formation damage is severe and reservoir protection must be strengthened during well completion, and a suite of well logging and stimulation techniques should be applied.

Mountain front stage

This exploration stage lasted from 1997 to the present.

In 1997, Yumen Oilfield Co. reactivated exploration in the Jiuxi basin. Seismic surveys resumed in hilly areas on the thrust belt at the northern edge of the Qilian Mountains, better defining the Kulongshan and Liugouzhuang structural belt.

In 1998, the Liu 102 well in the Liugouzhuang structure in the deep depression (Fig. 11) produced a 54 cu m/day commercial oil flow during formation test from the shaly dolomite of the Cretaceous Xiagou formation. Higher yield (126 cu m/day) was reached after acidizing.

A total of 105,000 tons of oil was produced in 2 years of trial production, and daily production had been above 140 tons/day with a tubing pressure at 5.6 MPa and a casing pressure at 7.6 MPa. The high pressure at high-yield level indicated a strong pressure drive.

Liu 102 was the first well at which production exceeded 100 tons/day in the Qingxi Depression and was the first well with high production discovered by Yumen Oilfield Co. for more than 10 years. It marked the beginning of exploration at the piedmont of the Qilian Mountains.

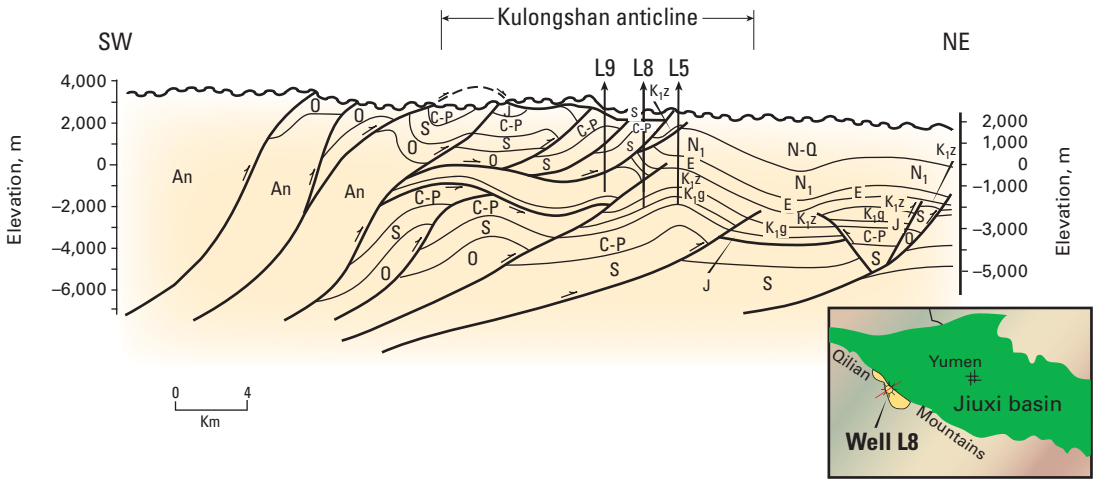
Furthermore, the L101 well encountered 207 m of total oil-bearing beds and produced 104 and 58 cu m/day of oil, respectively, after acidizing of two intervals in 1998.

Well L4 in the west of the Kulongshan structure produced 108 cu m/day of oil and an initial gas flow of 10,787 cu m/day from conglomerate reservoirs of the Xiagou formation in 1999. After acidizing, the initial production reached 253 cu m/day; and the production as of late 2006 was 86 cu m/day on a 5-mm choke with a tubing pressure at 9.8 MPa.

Well L4 proved that hydrocarbons accumulated in structural highs and, unlike the Liugouzhuang structure, the Kulongshan structure showed a new

STRUCTURES IN JIUXI BASIN'S KULONGSHAN NAPPE

Fig. 16



type of play in the sandy conglomerate reservoirs.

Further analysis of the Kulongshan structure indicates that structure is the main controlling factor (Fig. 12) and sandy conglomerates are fair reservoir rocks. Thus, exploration extended to the mountain front overthrust nappes.

In 2000, Well L8 was drilled at the Qilian Mountains where Silurian metamorphic rocks outcrop. At a depth of 1,325 m, the well penetrated through the Silurian and into the Cretaceous in the footwall of the nappe and encountered oil-bearing sandstones and conglomerates of the Xiagou formation.

Test production at the 4,056.9-4,148.3-m interval was 201 cu m/day of oil and 32,000 cu m/day of gas on a 5.5-mm choke with 19 MPa tubing pressure and 20 MPa casing pressure.

The L8 Well proved a large hydrocarbon accumulation in the Kulongshan structure at the footwall of thrust nappes in the Qilian Mountains. It was followed by a number of productive wells (>100 cu m/day each; Fig. 11).

By the end of 2004, proved reserves reached 57.5 million tons, possible reserves 28.07 million tons, and probable reserves 19.60 million tons. In Qingxi oil field, the proved reserves will likely exceed 100 million tons; and current production is 0.8 million tons/year.

Modern technology

Advanced and practical technology has played an important part in the successful exploration of Qingxi oil field.

Retrospectively, irrational selection and application of prospecting technology delayed the discovery of Qingxi oil field in the Qingxi Depression for 14 years.

Continuous summarization of exploration experiences for 6 years has gradually established four sets of matched prospecting technology suitable for the deep fractured complex reservoirs in the Kulongshan thrust belts, resulting in substantial prospecting performance.

The four sets of technology are seismic imaging and structural modeling, identification and evaluation of fractured reservoirs by imaging logging, near-balanced drilling and formation protection, and deep acidization, which are described in detail below.

Imaging and modeling

Geologists first established structural models based on field geological survey to further define the Kulongshan structure and recognized that the Kulongshan structural belt was a typical imbricate nappe (Fig. 16).

In 2000, seismic surveying in hilly areas was intensified and seismic imaging quality was greatly improved (Fig. 17), further confirming the existence of the Kulongshan structure.

In 2001, a 3D seismic survey was shot on the structure, better defining the deep Cretaceous structures at the footwall of the nappe.

Identification and evaluation

Rapid lateral facies changes in the Cretaceous posed a major technical challenge for reservoir identification and predication.

A set of approaches and procedures has been gradually established through practice to accurately identify fractured reservoirs.

First, FMI logs are used to accurately identify complex reservoir lithologies (Fig. 18).

Second, CMR nuclear magnetic log (NML) and dipole shear sonic imaging (DSI) data are used to estimate the opening, permeability, and effectiveness of microfractures.

Finally, an FTI technique was used to determine and accurately divide oil, gas, and water layers in reservoirs.

The oil and gas production in a well is related to the characteristics of fractured reservoirs, which can be interpreted from signatures of imaging logs. Moreover, fracture development is controlled by small-throw (20-60 m) reverse faulting. The 3D attributes of small reverse faults can be comprehensively interpreted on 3D seismic profiles.

Ultimately, the relationship among small reverse faults, fractured zone, and oil-bearing formations can be established. As a result, exploration focusing on fractured zones has been increasingly successful. For example, 10 out of 14 exploratory and production wells in the Well L4-L5 block have a high yield of 100 tons/day, three wells a medium

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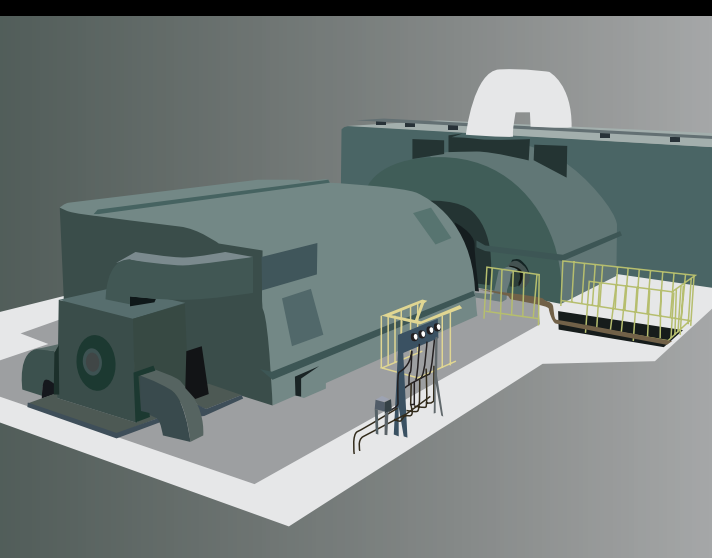

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yield, and one well a low yield, with a 100% success rate. The average production of these wells is 60 tons/day, with combined productivity of 320,000 tons/year.

Formation protection

Kulongshan reservoirs have high formation pressure gradients ranging from 1.20 to 1.36, and serious formation damage will occur when drilling fluid pressure exceeds the formation pressure by 0.03 in gradient, as indicated by experiments.

During the drilling, therefore, drilling fluid density is strictly controlled and not more than 0.02 higher than the formation pressure gradient; no barite powder is used for well control; and a formation protection agent is added before drilling through the producing intervals.

The near-balanced drilling and formation protection technology has minimized formation damage. For example, barite powder was added many times to control Well L2 at the structural high of Kulongshan when a well kick occurred at a depth of 4,016 m. As a result, the well has a low oil yield of 4.13 cu m/day on formation test.

On the other hand, Well L5, which was drilled 253 m from Well L2, encountered the same situation at a depth of 4,029 m. In this case, near-balanced drilling and formation protection technology were applied and, as a result, high oil production was obtained.

Reservoir stimulation

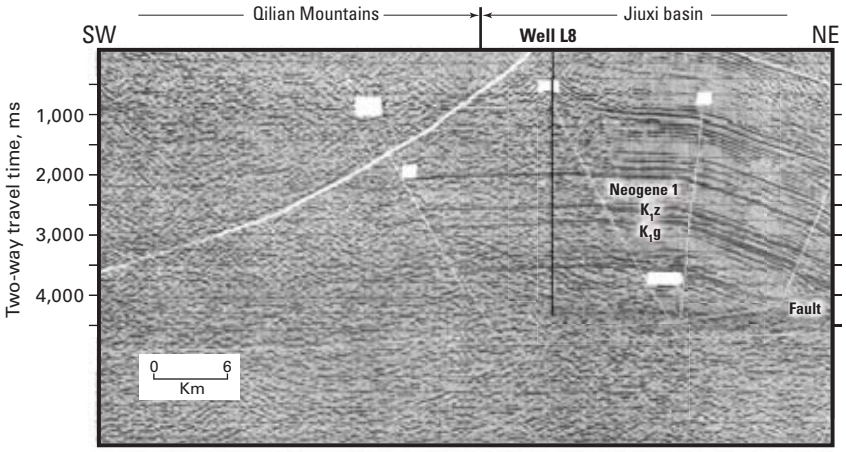
Deep acidization is necessary to free hydrocarbons from the fractured reservoirs in Qingxi oil field to the maximum extent in order to substantially enhance production.

Deep acidization technology for shaly dolomite and conglomerate reservoirs has been developed through many rounds of experiments and has achieved excellent results. The increased oil production that resulted from deep acidization accounts for 36% of total production in Qingxi oil field.

JIUXI BASIN SEISMIC SECTIONS

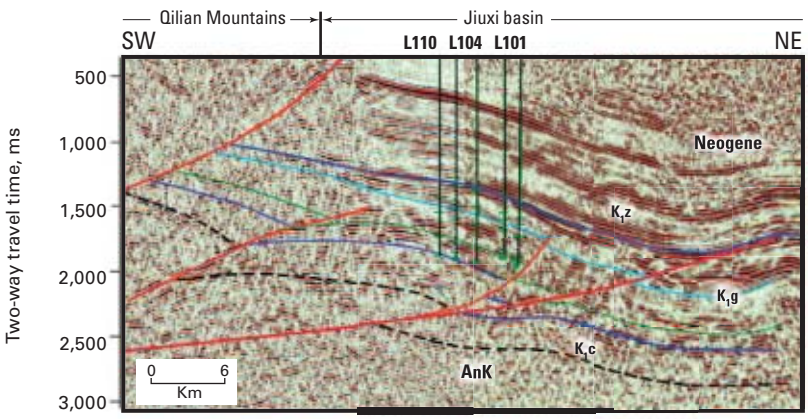
Fig. 17

2D QF-III profile of Qilian thrust nappes, subthrust anticline, and exploration targets



Processed by GSI, 1985.

3D prestack time migrated profile of Kulongshan nappe with structural and stratigraphic reinterpretation



See Fig. 16 for A, Fig. 11 for B. Fig. 3 explains stratigraphic symbols.
Source: Collected in 2003.

Lessons learned

The discovery of Qingxi oil field and the successful oil prospecting beneath the nappes of the Qilian Mountains have not only revitalized 60-year-old oil fields but also demonstrated the great exploration potential of the foreland thrust belts abundant in central and western China.

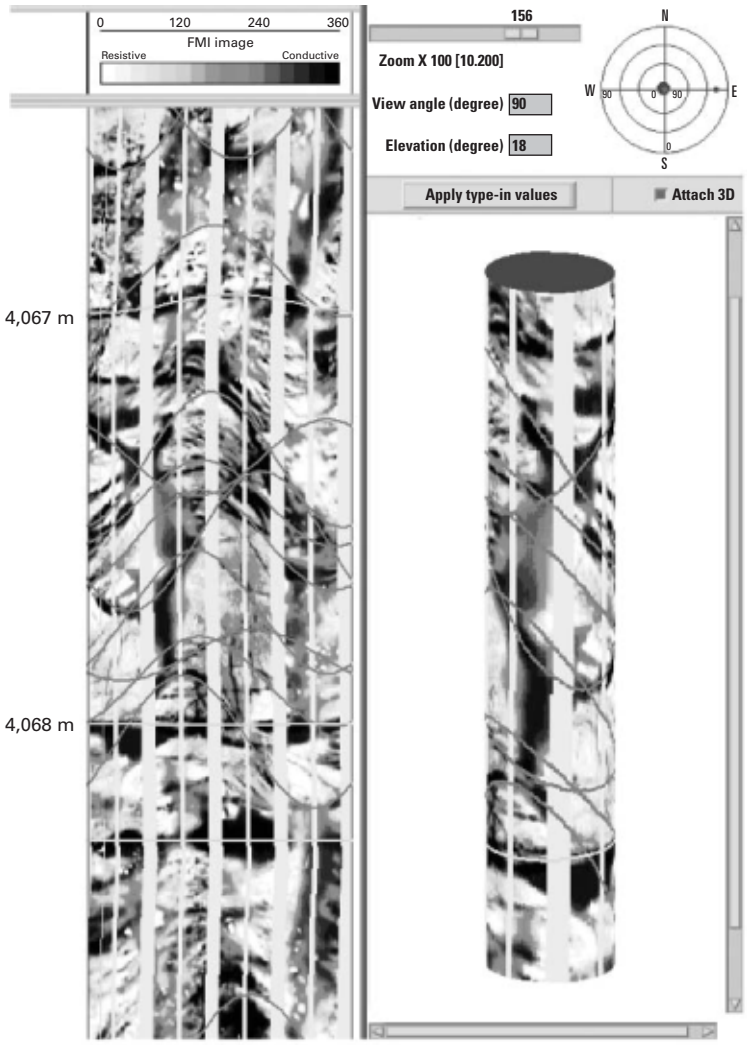
Strengthened seismic surveys in the piedmont thrust belt of the Jiuxi basin has discovered a number of favorable prospecting targets beneath the nappe, such as the Jinhaizi, Qingtoushan, and Jinfomiao structures, since the discovery of Qingxi oil field. The total trap area reaches nearly 200 sq km, and the prospective oil resources exceed 230 million tons. Future exploration will certainly add many more reserves.

The discovery of Qingxi oil field has inspired hydrocarbon exploration in thrust belts in central to western China. In only a few years, many large gas fields have been discovered in the Kuche foreland of the Tarim basin, including wells Kela 2, Dina 2, and Wushen 1, and the recoverable gas reserves have reached 581.9 bcm.

At the southern edge of the Junggar basin, Hutubi gas field and Huoerguosi oil and gas field have been discovered, with proved, probable, and possible hydrocarbon reserves exceeding 200

DENSE FRACTURES OF DOLOMITE IN XIAGOU FORMATION

Fig. 18



Gray lines on FMI log outline the fractures.

million tons of oil equivalent.

In the Longmenshan piedmont thrust belt in the Sichuan basin, Qiongxi gas field has been discovered with gas reserves reaching 37.2 bcm.

Also, productive oil and gas wells have been discovered in the northern thrust belt of the Tsaidam basin and the southwestern foreland thrust belt of the Tarim basin (Fig. 19). These discoveries indicate that the thrust belts in central and western China will become important regions for discovering large oil and gas fields in the future.

Recent Chinese evaluations indicate that the foreland basins in central and western China hold 4.1 billion tons of remaining recoverable oil and 6.99 bcm of gas, respectively, accounting for 18% and 45% of the total to-be-discovered oil and gas in China. Undoubtedly, overthrust belts are the key targets to discover hydrocarbon reserves in China in the future.

Acknowledgment

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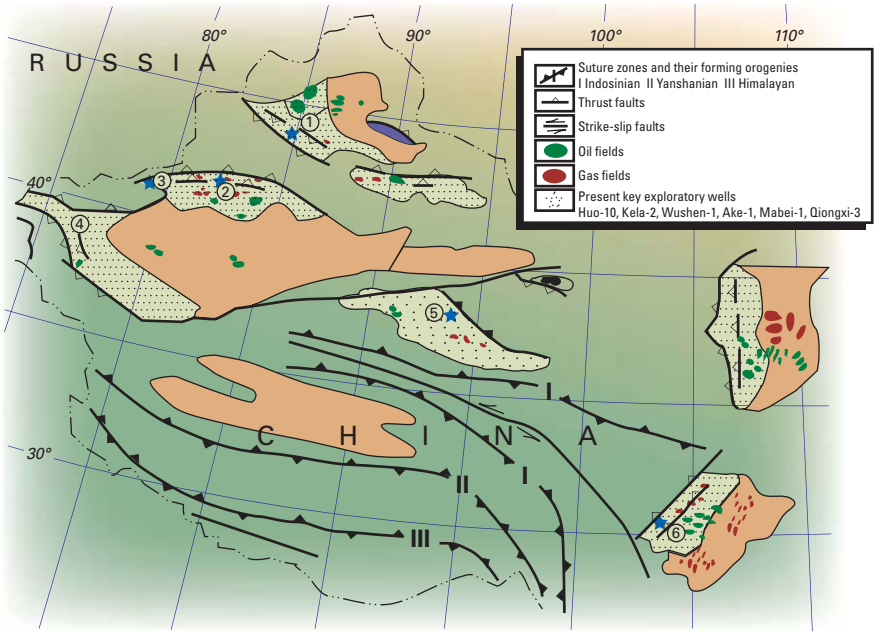
FORELAND BASINS AND THRUST BELTS IN WESTERN CHINA

Fig. 19



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Pakistan

The Dewan Group was to start production at 15-20 MMcfd in late June from two wells in Salsabil, formerly Rodho, gas-condensate field on the Safed Koh block in Pakistan.

The government approved an interim gas price of $2.81/MMbtu through Nov. 30, 2007, said Rally Energy Corp., Calgary. The price will be subject to an 11% quality discount due to carbon dioxide content until an amine plant is completed in the third quarter of 2007 (OGJ Online, Feb. 1, 2006).

Poland

Aurelian Oil & Gas PLC said its Polish subsidiary has drilled the Trzek-1 well on the Siekierki structure just east of Poznan, 150 miles west of Warsaw, to 3,650 m and is preparing to set 7-in. casing at the base of Zechstein before drilling toward 3,900 m in Permian Rotliegendes sandstone. Four wells recorded noncommercial gas shows on the large seismic anomaly in the 1970s.

New York

Northern Oil & Gas Inc., Wayzata, Minn., plans to acquire 10,000 net mineral acres in Yates County, NY, from an undisclosed seller.

Seismic studies associated with the acreage show a highly fractured fault system in the Ordovician Trenton-Black River formation as well as shallow exploration and development opportunities in the Silurian Queenstown-Medina sand and Devonian Marcellus shale.

New rig control system provides closed-loop drilling automation

Nina M. Rach
Drilling Editor

Continued innovation in modeling and algorithm development has led to new process control for the Cyberbase/SDI drilling command center. Collaboration between the International Research Institute of Stavanger AS (IRIS; formerly Rogaland Research) and National Oilwell Varco (NOV) in developing the Drilltronics system led to successful land rig tests in 2006 and to field tests off Norway later this year.

The general concept of the Drilltronics system is to monitor and control the drilling process using continuously updated models for better control, efficiency, and safety. Continuous diagnostic control allows early detection of emerging problems via a set of alarms. The Drilltronics system calculates drilling limits and enforces them in real-time.

Current automated functionalities include automated tripping and reaming control, automated and optimized pump-buildup control, automated well friction test (pick up/rotation/slack off), bit-load optimization (continuous drill-off), and stick slip prevention (Fig. 1). The Drilltronics system also provides diagnostics for hole cleaning, stuck pipe, pressure, pit volume, cuttings buildup, and torque and drag.

It is an "intelligent" system that takes drilling data and immediately optimizes performance with integrated controls, said Fionn Iversen, research advisor and project leader for Drilltronics development at IRIS; the system could "become an integral part of every drilling rig."

Cyberbase

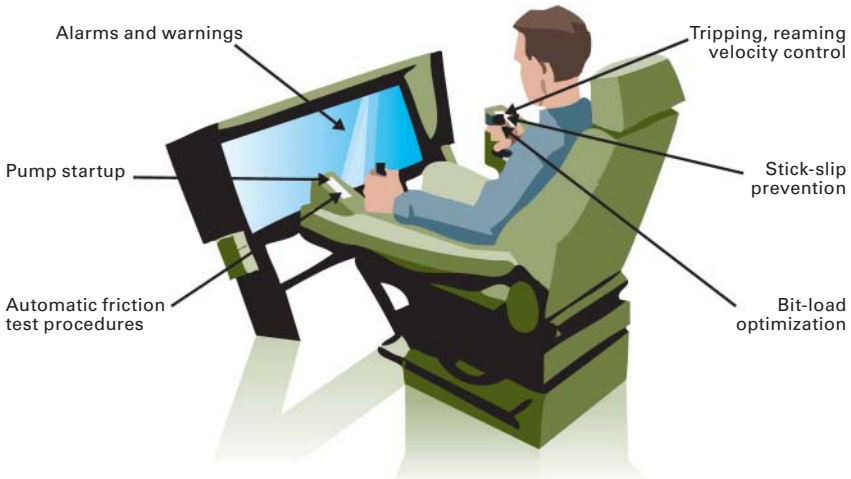
Drilltronics is designed to work with the current Cyberbase workstation systems.

The Cyberbase operator system was developed by Norway's Hitec ASA in the 1990s. Cyberbase is a drilling equipment command system enclosed in a driller's cabin on the drill floor. Cyberbase drillers' chairs include joysticks and keypads dynamically tied to a set of computer screens, replacing the older system of gauges, lights, and switches.

Hitec had also created an automated system for handling and joining drill pipe and casing, and it collaborated with National Oilwell Inc. in designing the active heave compensated drilling system, which integrated a state-of-the-art computer control system into the drawworks. ActiveHeave compensates

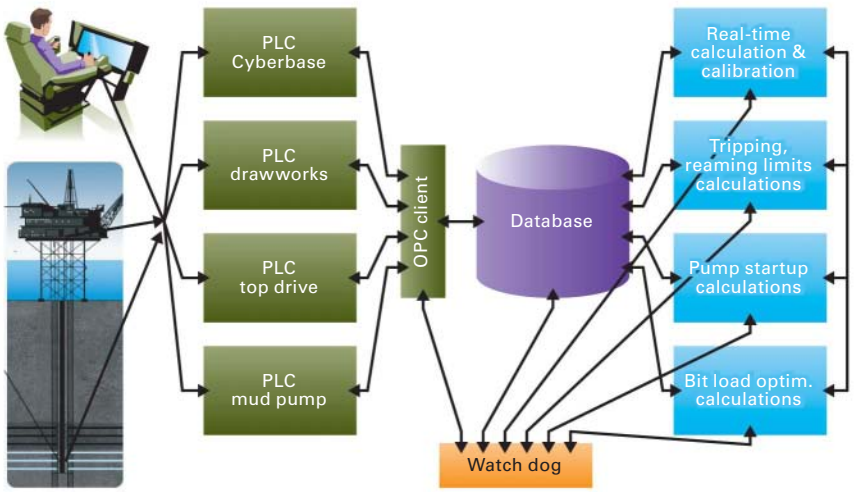
DRILLTRONICS FUNCTIONALITY

Fig. 1



DRILLTRONICS TOPOLOGY

Fig. 2



for the heaving motion caused by currents, wind, and waves a less-expensive alternative to a more costly passive-motion system.

National Oilwell acquired Hitec in 1999 in a $125-million stock transaction, enhancing its "capacity to provide integrated control systems."[1]

In July 2001, National Oilwell put the first completely automated oil drilling equipment into operation near Corpus Christi, Tex., on an electrically powered AC rig drilling for Pioneer Drilling Co. A second automated rig began working in September 2001.

NOV has continued to develop Cyberbase/SDI (smart drilling instrumentation) workstations and told OGJ that it has delivered more than 150 systems worldwide. Currently, there are three versions:

- CB3: Designed for cabins with thin floors (this version has no base); separate chair, PC, and monitors.
- CB4: Designed to be used on traditional drill floor layouts with the cabin on the drill floor level; screen in front.
- CB6: Designed to be used where the cabin is elevated or when it's necessary to have a line of sight downwards and a wide view to the side; split screens.

In 2006, NOV integrated Sniffer InfiniStream high-speed data logging technology from San Jose, Calif.-based Network General Corp. into Cyberbase. The new technology creates a "drilling flight recorder" that enables real-time, back-in-time, and historical analysis, and allows users to investigate operational anomalies.

New functions can be implemented and control of new machines can be performed remotely without additional hardware. New technology such as the Drilltronics system can be integrated into existing Cyberbase installations. In fact, the Drilltronics system is designed as a seamless retrofit into newbuild rigs with recent NOV Cyberbase control systems. Further development would probably be required to adapt Drilltronics for earlier generation and conventional rigs, according to NOV Stavenger's vice-pres. of operations, Jan Erik Rugland.

Drilltronics development

In 2001, Statoil supported a feasibility study on smart drilling systems that was conducted by Rogaland Research (now IRIS). The Drilltronics system went into development in 2002, supported by Statoil, ENI, and Chevron-Texaco. Demo 2000 work also included NOV sponsorship in the form of hardware and technical support (www.demo2000.no). ChevronTexaco pulled out of the project in 2004, but ENI and Statoil will remain involved through 2007 development, including upcoming testing on a Statoil platform rig in the Statfjord field, said Iversen.

Development of the Drilltronics system resulted from collaboration between IRIS and NOV staff, a "natural extension" of 20 years of cooperation, according to Iversen. The work is coordinated by IRIS, which currently has 13 staff assigned to the project. IRIS project staff includes physicists, mathematicians, and cyberneticians who have developed a good technical understanding of the drilling process, as well as competence in IT, required for integrating model control in the drilling control system. NOV has 6-7 staff participating.

The Drilltronics system has four major elements (Fig. 2):

- Programmable logic controllers to steer the rig machineries, acquire sensor data, and receive commands from the driller.
- A database to exchange data between the different components.
- A set of calculation modules that use the real-time data to estimate the current situation and provide safety margins for operating rig machineries.
- A graphical user interface monitoring drilling data and displaying model calculation results.

The four Drilltronics software components run on separate machines connected via a local area network. In the case of failure, "watch dog" functionality restarts the failing process, as shown in the system topology (Fig. 2).

Drilltronics software is built on open standards. OPC (open connectivity) standards are worldwide specifications (www.opcfoundation.org). There are now hundreds of OPC data access servers and clients.

There are four main automated control modules:

- Tripping and back reaming.
- Friction test (pickup, rotation, slackoff).
- Pump start-up and buildup.
- Bit load optimization (continuous drilloff).

Additionally, a stick-slip prevention module developed by NOV may be

included in future but was not tested at the Ullrigg onshore test rig, discussed below.

Process models

Two continuously updated process models form the basis of the control and diagnostic functionality of the Drilltronics system:

- A dynamic well flow model calculates pressure and temperature based on injected flow rate, drillstring movement, and thermal boundary data.
- A string mechanics model calculates string torque, drag, and mechanical friction factor based on surface load and torque measurements and input from the flow model.

The calculation modules are run on a calculation server separate from the Cyberbase/SDI system.

Testing

IRIS demonstrated the automated control functionality of the Drilltronics system at its Ullrigg Drilling and Well Center in Stavanger in 2006. The facility features an onshore, skidable drilling rig (Ullrigg) and seven wellbores (Fig. 3). Team members presented results of the full-scale testing at the American Assoc. of Drilling Engineers annual conference in April 2007 (www.aade.org).[2]

The experienced rig crew concluded that the new Drilltronics system was "useful and easy to use."[2]

The Drilltronics system was also tested passively in the North Sea. The team ran the system against active offshore drilling operations in 2006-07. Testing verified the models of calculated bottomhole pressure, standpipe pressure, and equivalent circulating density.

The Drilltronics system was tested at Ullrigg IRIS's test center in Stavanger (Fig. 3; photo from International Research Institute of Stavanger AS).

Applications

The Drilltronics system will be particularly useful in drilling situations that require precise well control, such as managed-pressure drilling, or anywhere it is difficult to remain within pressure limits.

Eric Cayeaux, research advisor at IRIS, told OGJ he envisions it being used where geopressure margins are narrow, such as depleted North Sea fields. "The movement of the drill pipe is important; you want smooth acceleration," he said.

NOV's project lead for Drilltronics, Morten Welmer, agreed it's a "good tool when well limits are tight, especially in combination with other technologies" such as MPD tools. Integrating different drilling systems is valuable, Welmer said.

While the drawworks actively control the drilling speed and the mud pumps adjust strokes and pressure, the new NOV stick-slip system module enables active control of the torque on the pipe through the top drive.

Cayeaux said it will be important to test the system on a floating rig, to work out the heave compensation calculations.

NOV's Rugland said that after the platform rig tests later this year, the team will test extended functionality of the system at the Ullrigg test site and also on offshore jack ups. He does not expect any tests on floating rigs until 2008 or later.

Future

Phase 2 testing of the Drilltronics system will be completed after a pilot demonstration in the Statfjord field off Norway in second-half 2007, according to Iversen.

Additionally, further development of tools and technologies such as WITSML and wired pipe may benefit Drilltronics interoperability.

Wellsite Information Transfer Standard Markup Language (WITSML) is developing into a standard, international protocol for wellsite data exchange (OGJ, Nov. 10, 2003, p. 49). Although it is used for transferring third-party drilling data, using WITSML for real-time active control does not seem viable, due to time delay. However, Iversen said there is no issue in using WITSML in passive monitoring or diagnostic real-time systems.

At an industry roundtable in December 2005, David A. Archer, president and chief executive officer of

the Petrotechnical Open Standards Consortium (POSC, www.posc.org; now Energistics; www.energistics.org), said "While there has been significant progress in industry communication standards, better use of technology is needed to enable integration and fast, effective data-sharing" (OGJ, Jan. 9, 2006, p. 29).

Downhole data transfer is generally discontinuous and the resolution is 30 sec to 1 min, but wired pipe offers better resolution, about 1 sec.[2] The increased resolution allows more frequent updates and better model calibration.

BP's John Thorogood, chief engineer for Elvary Neftegaz' Sakhalin exploration program, told OGJ that the Drill-tronics system is "potentially the single most powerful breakthrough piece of drilling technology I've seen for many years...[holding out] the possibility of creating a dramatic reduction in the risk of human-induced error leading to stuck pipe, downhole problems etc. [It's] probably the most revolutionary piece of technology since the top drive." ✦

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DAS stack arrays protect the main power generation site at the Kome central facility (Fig. 1). Photo from LEC.

Arrays prevent lightning strikes at production facilities

Guntis Moritis
Production Editor

An option available to petroleum producers for protecting facilities in high-lightning-risk areas is to install lightning-prevention arrays such as developed by Lightning Eliminators and Consultants Inc. (LEC), Boulder, Colo.

During the last 35 years, the company has developed lightning-strike prevention systems that various operators have installed in a variety of oil and gas facilities including upstream production, downstream refining, and offshore oil platforms. One recent example is the installation of the arrays in the Chad-Cameroon development project operated by Esso Exploration & Production Chad Inc., a unit of ExxonMobil Corp.

LEC says the zones of protection from their arrays provide continuous protection and replace lightning rods that can attract lightning and induce fields that pose a danger to electronic equipment.

Chad

The Chad-Cameroon development project currently includes five producing fields in the Doha basin in Chad: Kome, Bolobo, Nya, Maundoli, and Miandoum. Esso in 2006 began developing a sixth field, Maikeri, that will come on stream in 2007 and have about 20 producing wells. In 2006, the fields produced through 368 wells an average 155,000 bo/d, according to Esso in the project's 2006 annual report.

To export the crude, Esso transports the heavy 20.5 gravity Doha crude through a 663-mile pipeline through Cameroon to an offshore marine export terminal.

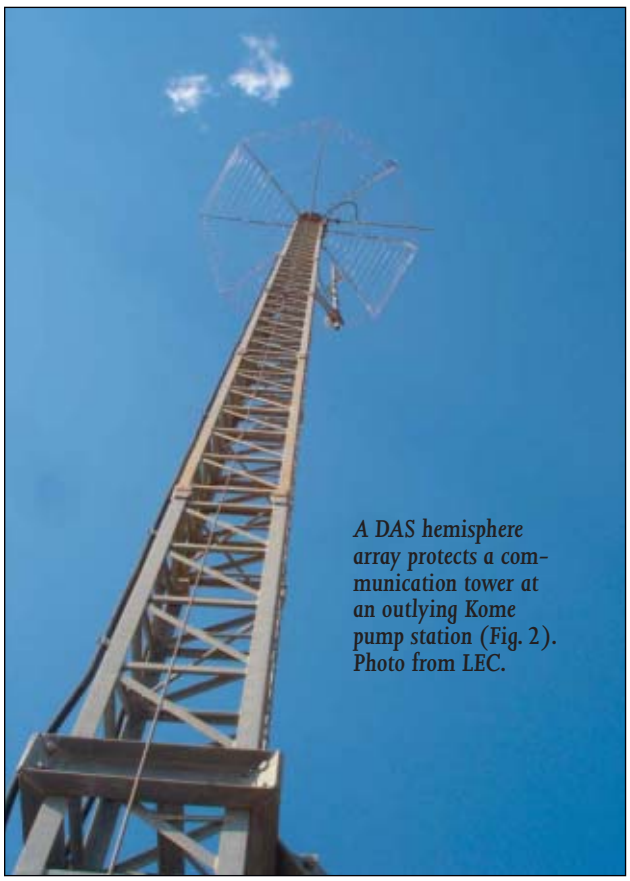
LEC says Chad has some of the most intense, most frequent lightning strikes in the world, with about two lightning storms a week from mid May to early October. An isokeraunic number indicates thunderstorn activity, with a 30 indicating average lightning activity of about 13.7 strikes/sq mile/year. It says the oil development area in Chad has an isokeraunic number of 120, indicating about 41 strikes/sq mile/year.

With the facilities covering about 1.25 sq miles, LEC would expect them to endure about 51 lightning strikes/year.

Arrays

To protect the Chad facilities, including the central processing site and outlying gathering sites, Esso installed various lightning protection arrays.

For the oil production operation, LEC custom engineered, designed, and



A DAS hemisphere array protects a communication tower at an outlying Kome pump station (Fig. 2). Photo from LEC.

deployed interconnected systems for strike prevention and low impedance grounding, utilizing its Dissipation Array System (DAS).

LEC describes DAS as a charge transfer technology that is a comprehensive, preventive solution for modern lightning protection. The system prevents strikes by continually lowering the voltage differential between the ground and charged storm clouds to well below lightning potential.

The company says DAS has proven to be a preventative solution for lightning protection, substantially cutting storm-induced voltages as compared to the unprotected surroundings, thus eliminating the lightning strike risk.

To protect about 1.25 sq miles of the Chad facilities, including the central site encompassing about 0.5 sq miles and three separate gathering sites encompassing about 0.25 sq miles each, LEC took into account factors such as each facility's location, size, shape, equipment, geography, and exposure to lightning activity.

To discharge structures of the voltage differential between the ground and charged storm clouds, it deployed DAS in various configurations across the protected sites. Stack arrays protect the turbine generators, which have protruding exhaust stacks (Fig. 1). U-bracket arrays protect buildings or structures with architectural or weight restrictions. Hemisphere arrays protect a telecom tower and high-mass lights used for nighttime illumination (Fig. 2).

While rim arrays prevent lightning strikes to floating roof storage tanks, the company deployed multiple retractable grounding assemblies (RGAs) to prevent arcing at the gap between the seal of the floating roof and the tank wall, caused by lightning storm and ground-current activity.

RGAs are devices that provide a direct connection to the tank roof from the tank wall with a wide, thick-braided wire cable wound on a heavy stainless steel reel, with tension held by spring loading. LEC says the path of impedance is kept to a practical minimum by the combination of the shortest path, wide braid, and constant tension.

In addition, an ultralow impedance grounding system transfers induced ground charges efficiently, since transient voltages such as lightning are affected by impedance while resistance pertains to DC voltage, according to LEC.

LEC says an appropriate number, sizing, and spacing of Chem-Rods, which use natural mineral chemicals to improve conductivity up to 10 fold more than traditional grounding rods, help reduce ground resistance with a target of less than 1 ohm. The company explains that reducing grounding impedance was important in Chad because the natural soil resistivity at various sites range from less than 30 ohms near a riverbank to more than 500 ohms on a sandy hill.

Since the installation more than 3 years ago, LEC says not a single lightning strike has hit the protected zones in Chad, and only once, when installers mistakenly put a closed-circuit television camera above a protected zone, did the facilities suffer a lightning strike, which destroyed the camera.

During the last 35 years, LEC says DAS installations, installed in thousands of locations in 55 countries, have accumulated more than 40,000 system-years of history with 99.85% no-strike performance. ✦

Global ethylene capacity increases slightly in 2006

David N. Nakamura
Refining/Petrochemical Editor

The global ethylene industry added only 245,100 tonnes/year (tpy) of capacity in 2006, a large decrease from the 2005 addition of 4.4 million tpy, according to the latest Oil & Gas Journal survey.

Capacity as of Jan. 1, 2007, was 117.6 million tpy, an increase from a worldwide capacity of 117.3 million tpy as of Jan. 1, 2006. This is an increase of only 0.2%.

The latest survey lists no new plants starting up in 2006. No capacity was removed from the survey due to idled or shutdown plants. All the additional capacity resulted from expansions and debottlenecking at existing sites.

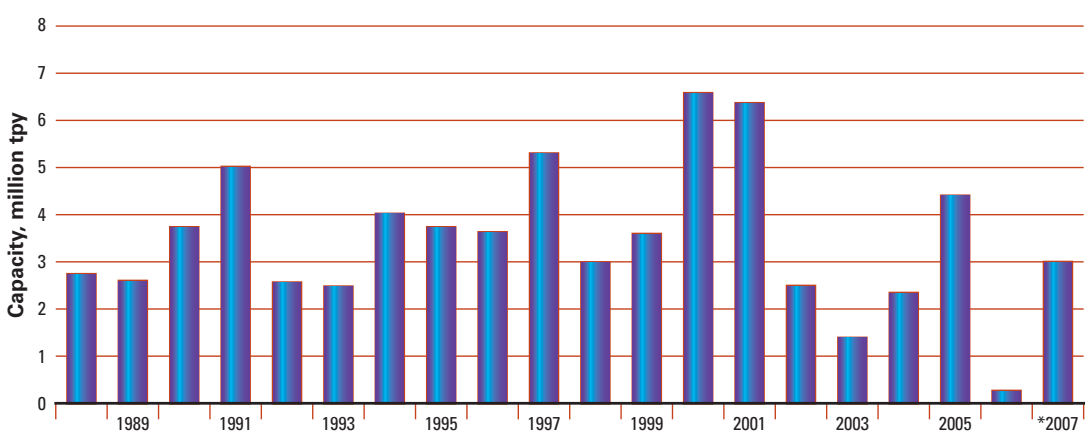
Fig. 1 shows that the capacity additions were the lowest in at least 20 years. Additions should increase in 2007 if all announced projects go online. Many projects expected to go online in 2006, especially in Iran, were delayed.

Fig. 2 shows that global operating rates fell in 2006 from a high of about 93% in 2004. This is still a significant rise from the operating levels in 2001-03, when rates ran less than 90% due to stagnant demand growth. Due to significant capacity slated to come online in 2007-11, operating rates should decrease.

Most future growth in ethylene capacity will occur in the Middle East and Asia due to feedstock advantages. North America and Western Europe will experience relatively flat capacity growth. North American capacity growth will continue

GLOBAL ETHYLENE CAPACITY ADDITIONS

Fig. 1



*Estimate
Sources: Chem Systems, White Plains, NY (1988-99 data). OGJ Energy Database (2000-07 data)

to be limited due to high natural gas costs.

New units

No new ethylene units appear in this year's survey. All additional capacity is the result of expansions at existing plants.

Regional review

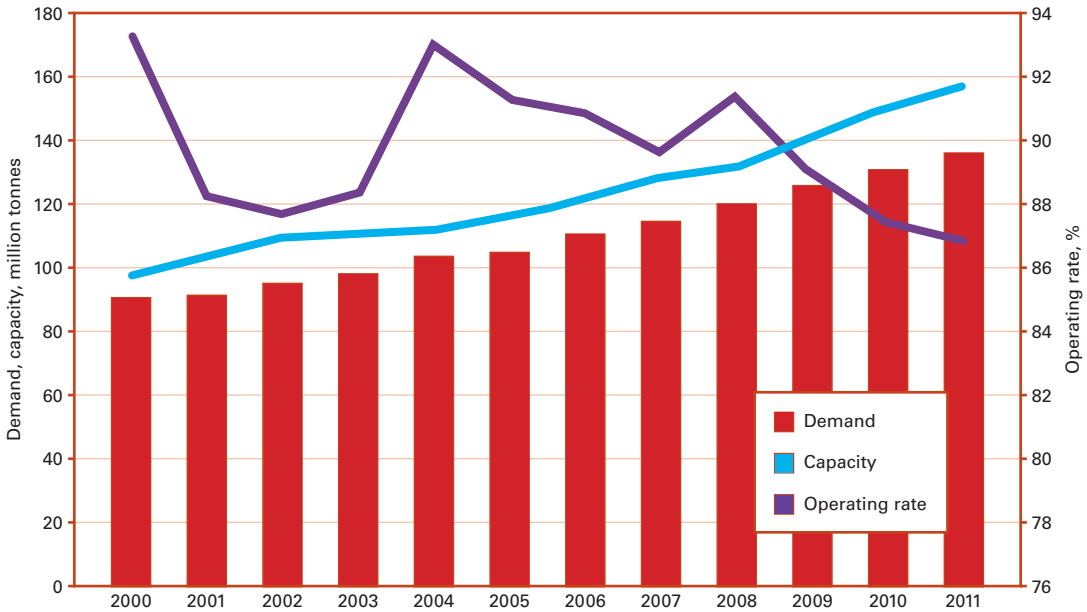
Table 1 shows rankings of the 10 largest ethylene production complexes in the world. Nova Chemical Corp.'s Joffre plant retains the top spot on the list. This list is exactly the same as last year's.

Table 2 ranks ethylene production capacity by region. North America added 145,100 tpy and South America added 80,000 tpy. Other regions showed very small changes.

On a percentage basis, South America and North America showed the most growth. South America showed the greatest increase (1.62%) due to additional capacity in Braskem SA's Camacari, Bahia, Brazil, plant. Canada constituted most of the increase for North America. Nova Chemicals Co. reported that the capacity of its Corunna, Ont., plant increased 113,000 tpy to 839,000 tpy.

ETHYLENE OPERATING RATE

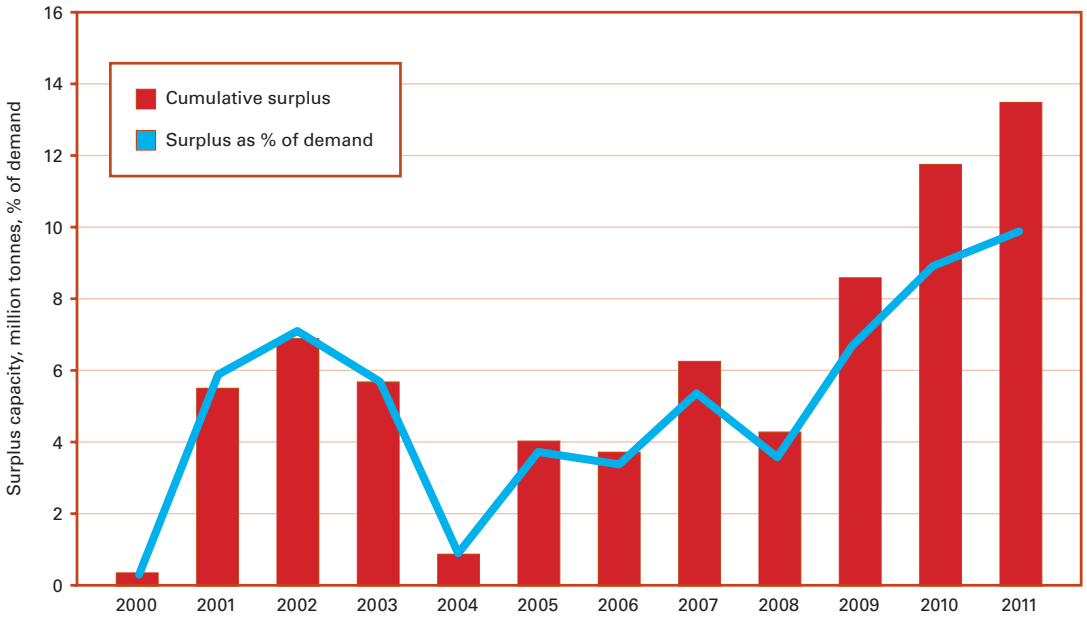
Fig. 2



Source: CMAI.

SURPLUS CAPACITY

Fig. 3



Source: CMAI.

Table 3 ranks ethylene production capacity by country. Canada showed the largest increase, followed by Brazil, for the reasons previously mentioned.

India showed the third largest increase, 40,000 tpy, due to additional capacity in Reliance Industries Ltd.'s Hazira, Gujarat, plant.

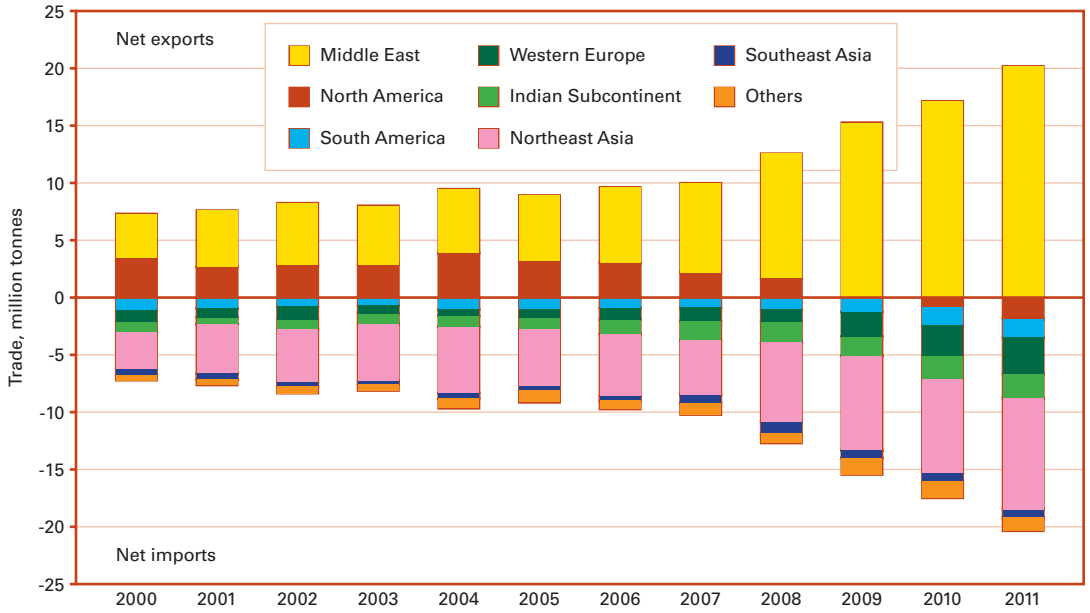
Smaller increases occurred in the US, Netherlands, Saudi Arabia, and Slovakia.

Closed, idled plants

Table 3 also shows that only three countries showed a net decrease in capacity: France, Germany, and Japan. Total decrease in these three countries

ETHYLENE TRADE

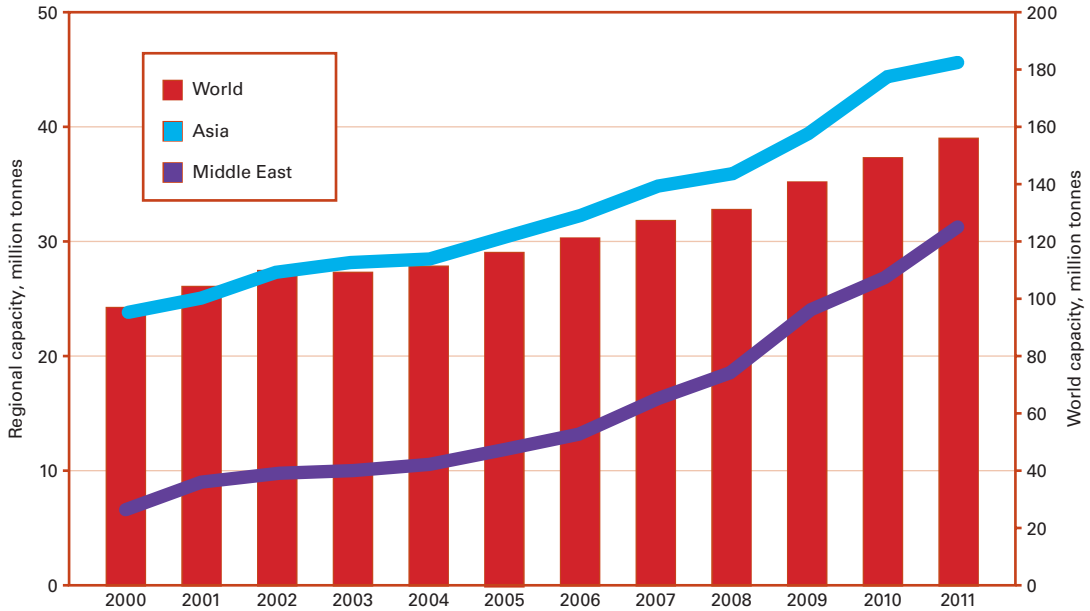
Fig. 4



Source: CMAI.

REGIONAL CAPACITY

Fig. 5



Source: CMAI.

was 55,000 tpy.

No plant in the world announced a complete shutdown; the capacity decreases were all due to partial shutdowns or companies restating ethylene capacity.

The most significant decline was in Japan. Sumitomo Chemical Co. Ltd. reported that its Chiba plant decreased capacity by 35,000 tpy to 380,000 tpy.

Ownership, name changes

There was one significant ownership change in 2006.

Saudi Basic Industries Corp. acquired Huntsman Corp.'s UK base chemicals and polymers business on Dec. 29, 2006, for $700 million. The purchase included Huntsman's 865,000-tpy ethylene plant in Wilton, UK. The acquisition increases SABIC's presence in Europe.

Table 4 lists the top 10 owners of ethylene capacity worldwide. There was one change to the company order. SABIC's acquisition moved it up to the third spot, overtaking Royal Dutch Shell PLC.

Other changes to this table in 2006 were slight changes in operating capacity.

Construction

Last year, OGJ forecast that 3.9 million tpy of new capacity would come online in 2006, based on responses to construction surveys. Of this, none actually started up.

As with last year's report, the main reason for this shortfall was that three major projects in Iran again have postponed their start-up dates. Last year, it looked as if three steam crackers (Olefins 7, 9, and 10) would start up in 2006. This did not occur, however; analysts believe that the plants could start up in 2007-08.

According to the latest OGJ construc-

tion data, 3.0 million tpy of new capacity is slated to come on stream in 2007 (Table 5).

The Marun plant is in Bandar Imam, Iran, and is part National Petrochemical Co's. Olefins 7 complex. The Jam (Olefins 10) and Arya Sasol (Olefins 9) steam crackers are both in Bandar Assaluyeh.

A large amount of capacity is to start up in 2008. More than 15 million tpy of capacity in 17 projects is to come online. Ten of the projects list capacities of more than 1 million tpy. All are in the Middle East except for one in China and one in Venezuela.

Global market

Ethylene markets were again healthy in 2006. Fig. 2 shows that worldwide operating rates were about 91%, a slight drop off from 2004-05, because there was surplus global capacity. Operating rates were high in 2004 when incremental demand surpassed capacity increases.

Fig. 3 shows surplus ethylene capacity. According to CMAI, Houston, the global market could become oversupplied by 2010. Their key assumptions are for average demand growth of 4.3%/year through 2011 and average capacity growth of 5.3%/year during the same period. A surplus capacity build of more than 12 million tpy or almost 10% of global ethylene demand is likely to lead to a severe downturn in ethylene industry profitability, says CMAI.

Fig. 4 shows that the Middle East producers will dominate the net equivalent ethylene trade in the future. This graph is for ethylene derivatives; ethylene monomer is too expensive and difficult to handle, therefore, regional trade is limited.

North America will become a net importer by 2009, according to CMAI. And the other regions will import even more ethylene derivatives.

CMAI forecasts that global ethylene capacity will increase by 35 million tpy during 2006-11 (Fig. 5), to a total

TOP 10 ETHYLENE COMPLEXES*

Table 1

	Company	Location	Capacity, tpy
1	Nova Chemicals Corp.	Joffre, Alta.	2,812,000
2	Arabian Petrochemical Co.	Jubail, Saudi Arabia	2,250,000
3	ExxonMobil Chemical Co.	Baytown, Tex.	2,197,000
4	ChevronPhillips Chemical Co.	Sweeny, Tex.	1,868,000
5	Dow Chemical Co.	Terneuzen, Netherlands	1,800,000
6	Ineos Olefins & Polymers	Chocolate Bayou, Tex.	1,752,000
7	Equistar Chemicals LP	Channelview, Tex.	1,750,000
8	Yanbu Petrochemical Co.	Yanbu, Saudi Arabia	1,705,000
9	Dow Chemical Co.	Freeport, Tex.	1,640,000
10	Shell Chemicals Ltd.	Norco, La.	1,556,000

*As of Jan. 1, 2007.

REGIONAL CAPACITY BREAKDOWN

Table 2

	Ethylene capacity, tpy		Change	
	Jan. 1, 2007	Jan. 1, 2006	tpy	%
Asia-Pacific	31,602,000	31,597,000	5,000	0.02
Eastern Europe	8,462,000	8,452,000	10,000	0.12
Middle East, Africa	12,367,000	12,357,000	10,000	0.08
North America	35,687,700	35,542,600	145,100	0.41
South America	5,018,500	4,938,500	80,000	1.62
Western Europe	24,438,000	24,443,000	–5,000	–0.02
Total capacity	117,575,200	117,330,100	245,100	0.21

NATIONAL ETHYLENE CAPACITIES

Table 3

Country	Jan. 1, 2007 Ethylene capacity, tpy	Jan. 1, 2006 Ethylene capacity, tpy	Change, tpy
Algeria	133,000	133,000	0
Argentina	838,500	838,500	0
Australia	532,000	532,000	0
Austria	500,000	500,000	0
Azerbaijan	330,000	330,000	0
Belarus	193,000	193,000	0
Belgium	2,180,000	2,180,000	0
Brazil	3,435,000	3,355,000	80,000
Bulgaria	400,000	400,000	0
Canada	5,531,000	5,418,000	113,000
Chile	45,000	45,000	0
China	6,988,000	6,988,000	0
China, Taiwan	2,421,000	2,421,000	0
Colombia	100,000	100,000	0
Croatia	90,000	90,000	0
Czech Republic	485,000	485,000	0
Egypt	300,000	300,000	0
Finland	330,000	330,000	0
France	3,373,000	3,383,000	–10,000
Germany	5,557,000	5,567,000	–10,000
Greece	20,000	20,000	0
Hungary	620,000	620,000	0
India	2,515,000	2,475,000	40,000
Indonesia	520,000	520,000	0
Iran	1,214,000	1,214,000	0
Israel	200,000	200,000	0
Italy	2,170,000	2,170,000	0
Japan	7,265,000	7,300,000	–35,000
Kazakhstan	130,000	130,000	0
Kuwait	800,000	800,000	0
Libya	350,000	350,000	0
Malaysia	1,649,000	1,649,000	0
Mexico	1,384,000	1,384,000	0
Netherlands	3,965,000	3,950,000	15,000
Nigeria	300,000	300,000	0
North Korea	60,000	60,000	0
Norway	550,000	550,000	0
Poland	700,000	700,000	0
Portugal	330,000	330,000	0
Qatar	1,030,000	1,030,000	0
Romania	844,000	844,000	0
Russia	3,670,000	3,670,000	0
Saudi Arabia	6,855,000	6,845,000	10,000
Serbia and Montenegro	200,000	200,000	0
Singapore	1,940,000	1,940,000	0
Slovakia	210,000	200,000	10,000
South Africa	585,000	585,000	0
South Korea	5,440,000	5,440,000	0
Spain	1,430,000	1,430,000	0
Sweden	625,000	625,000	0
Switzerland	33,000	33,000	0
Thailand	2,272,000	2,272,000	0
Turkey	520,000	520,000	0
Ukraine	450,000	450,000	0
UAE	600,000	600,000	0
United Kingdom	2,855,000	2,855,000	0
United States	28,772,700	28,740,600	32,100
Uzbekistan	140,000	140,000	0
Venezuela	600,000	600,000	0
Total	**117,575,200**	**117,330,100**	**245,100**

TOP 10 ETHYLENE PRODUCERS[1]

Table 4

	Company	No. of sites	Capacity, tpy: Of entire complexes	Capacity, tpy: With only company partial interests
1	Dow Chemical Co.	14	13,155,000	10,369,500
2	ExxonMobil Corp.	15	11,460,000	8,327,000
3	Saudi Basic Industries Corp.	7	8,985,000	7,182,500
4	Royal Dutch Shell PLC	10	8,945,000	6,821,000
5	Ineos	8	6,546,000	5,091,000
6	Lyondell Chemical Co. (Equistar Chemicals LP)	6	4,880,000	4,880,000
7	Sinopec	9	4,375,000	4,075,000
8	Chevron Phillips Chemical Co. LP[2]	4	3,956,000	3,701,000
9	Total AS	9	5,523,000	3,327,000
10	BASF AG	7	4,955,200	3,109,100

[1]As of Jan. 1, 2007. [2]Ownership: ChevronTexaco Corp. 50%, ConocoPhillips 50%.

of 156 million tpy. The graph shows that most expansions will occur in the Middle East and Asia. By 2011, CMAI predicts, ethylene capacity in Asia will exceed 45 million tpy with additions in China, Taiwan, Singapore, South Korea, and Thailand.

Ethylene capacity in the Middle East will approach 30 million tpy, which will place the region on level with North America's ethylene capacity, says CMAI. ✦

ETHYLENE EXPANSIONS, 2007-11

Table 5

Location	Company	2007	2008	2009	2010	2011
		Ethylene capacity, tpy				
Antwerp, Belgium	BASF Antwerpen NV		280,000			
Antwerp, Belgium	BASF Antwerpen NV	280,000				
Santo Andre, Sao Paulo, Brazil	Petroquimica Uniao SA		200,000			
Nanjing, China	BASF-YPC Co. Ltd.			750,000		
Fujian Province, China	Fujian Petrochemical Co. Ltd.		800,000			
Lanzhou, China	Lanzhou Petrochemical Co.		360,000			
Ningbo, China	PetroChina					1,200,000
Dushanzi, Xinjang, China	PetroChina Dushanzi Petrochemical Co.		1,000,000			
Maoming, Guangdong, China	Sinopec				320,000	
Quanzhou City, China	Sinopec					800,000
Ningbo, Zhejiang, China	Zhenhai Refining & Chemical Co. Ltd.				1,000,000	
Koln, Germany	Ineos		100,000			
Gelsenkirchen, Germany	BP Gelsenkirchen	90,000				
Burghausen, Germany	OMV Deutschland GMBH	150,000				
Dibrugarh, Assam, India	GAIL India Ltd.					220,000
Panipat, India	Indian Oil Co. Ltd.			800,000		
Dahej, India	Oil & Natural Gas Corp.				1,100,000	
Bandar Imam, Iran	Arvand Petrochemical Co.					1,000,000
Assaluyeh Bushehr, Iran	Arya Sasol Polymer Co.	1,000,000				
Ilam, Iran	Ilam Petrochemical Co.		318,000			
Assaluyeh Bushehr, Iran	Jam Petrochemical Co.	1,320,000				
Kharg Island, Iran	Kharg Petrochemical Co.		500,000			
Bandar Assaluyeh, Iran	Marun Petrochemical Co.		1,200,000			
Bandar Assaluyeh, Iran	Petrochemical Industries Dev. Mgmt. Co.			1,200,000		
Bandar Assaluyeh, Iran	Petrochemical Industries Dev. Mgmt. Co.			1,900,000		
Shuaiba, Kuwait	Petrochemical Industries Co., Dow Chemical Co.		850,000			
Sohar, Oman	Dow Chemical Co.			850,000		
Ras Laffan, Qatar	Qatar Chemical Co. Ltd., ChevronTexaco Corp., Total AS		1,300,000			
Ras Laffan, Qatar	Qatar Petroleum Co., ExxonMobil Corp.		1,600,000			
Mesaieed, Qatar	Qatar Petroleum Co., Honam Petrochemical Co.			900,000		
Al-Jubail, Saudi Arabia	Chevron Phillips Chemical Co. LLC	200,000				
Al-Jubail, Saudi Arabia	Eastern Petrochemical Co.		1,300,000			
Al-Jubail, Saudi Arabia	National Petrochemical Industrialization		1,008,000			
Rabigh, Saudi Arabia	Saudi Aramco, Sumitomo Chemical Co.		1,500,000			
Yanbu, Saudi Arabia	Saudi Basic Industries Corp.		1,300,000			
Al-Jubail, Saudi Arabia	Tasnee Petrochemicals		1,000,000			
Singapore	Shell Eastern Petroleum Ltd.				800,000	
Kaoshiung Linyuan, Taiwan	Chinese Petroleum Corp.					1,000,000
Map Ta Phut, Thailand	PTT Polyethylene Co. Ltd.			1,000,000		
Rayong, Thailand	Siam Cement PLC, Dow Chemical Co.				900,000	
Trinidad & Tobago	Westlake Chemical Corp.				570,000	
Ruwais, Abu Dhabi, UAE	Abu Dhabi Polymers Co. Ltd.				1,500,000	
Jose, Anzoategui, Venezuela	Pequiven		1,050,000			
Total		**3,040,000**	**15,386,000**	**7,400,000**	**6,190,000**	**4,220,000**

Source: Oil & Gas Journal construction survey

INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007

Leena Koottungal
Survey Editor

Capacities as of Jan. 1, 2007

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, % Ethane	Propane	Butane	Naphtha	Gas oil	Other
ALGERIA								
Sonatrach	Skikda	133,000						
Total Algeria		**133,000**						
ARGENTINA								
Dow Chemical Co.	Bahia Blanca (BB1)	275,000	100					
Dow Chemical Co.	Bahia Blanca (BB2)	490,000	100					
Huntsman Corp.	San Lorenzo	21,000		25		75		
Petrobras Energia	Puerto San Martin	32,500		100				
Petrobras Energia	San Lorenzo	20,000		100				
Total Argentina		**838,500**						
AUSTRALIA								
Huntsman Chemical Co. Australia Ltd.	Melbourne, Vic.	32,000	100					
Qenos Pty. Ltd.	Altona, Vic. #1	115,000	100					
Qenos Pty. Ltd.	Altona, Vic. #2	85,000	31	40	29			
Qenos Pty. Ltd.	Botany, NSW	300,000	100					
Total Australia		**532,000**						
AUSTRIA								
OMV AG	Schwechat	500,000	10	8	21	61		
Total Austria		**500,000**						
AZERBAIJAN								
Azerichimia	Sumgait	30,000						
Azerichimia	Sumgait	300,000						
Total Azerbaijan		**330,000**						
BELARUS								
Production Association Polymir	Novopolotsk	73,000						
Production Association Polymir	Novopolotsk	120,000						
Total Belarus		**193,000**						
BELGIUM								
BASF Antwerpen NV	Antwerp	800,000		5		95		
Benelux FAO	Antwerp	230,000	16	16	18	50		
Benelux FAO	Antwerp	580,000	16	16	18	50		
Benelux FAO	Antwerp	570,000	16	16	18	50		
Total Belgium		**2,180,000**						
BRAZIL								
Braskem SA	Camacari, Bahia	600,000	5			95		
Braskem SA	Camacari, Bahia	680,000				100		
Copesul	Triunfo, RS	685,000				100		
Copesul	Triunfo, RS	450,000				100		
Petroquimica Uniao SA	Santo Andre, Sao Paulo	500,000				100		
Rio Polimeros	Duque de Caxias	520,000						
Total Brazil		**3,435,000**						
BULGARIA								
Lukoil Neftochim Bourgas JSC	Bourgas	250,000	3.4		10	86.6		
Lukoil Neftochim Bourgas JSC	Bourgas	150,000				100		
Total Bulgaria		**400,000**						
CANADA								
Dow Chemical Co.	Ft. Sask., Alta.	1,285,000	100					
Imperial Oil Products & Chemicals	Sarnia, Ont.	300,000	33	33	34			
Nova Chemicals Corp.	Corunna, Ont.	839,002	10	20	20	40	10	
Nova Chemicals Corp.	Joffre, Alta. (E1)	725,624	95	5				
Nova Chemicals Corp.	Joffre, Alta. (E2)	816,327	100					
Nova Chemicals Corp.	Joffre, Alta. (E3)	1,269,841	100					
Petromont	Varennes, Que.	295,000		10	25	50	15	
Total Canada		**5,530,794**						
CHILE								
Petrox SA	Concepción	45,000	8		16	76		
Total Chile		**45,000**						
CHINA								
BASF-YPC Co. Ltd.	Nanjing	600,000						
China National Offshore Oil Co.	Daya Bay, Guangdong	800,000						
China National Offshore Oil Co.	Dushanzi	140,000						
China Petrochemical Industrial Corp.	Daqing	320,000						
Dalian Petrochemical Co.	Dalian	4,000						
Fushun Petrochemical Complex	Fushun	115,000						
Gaoqiao Petrochemical Co.	Gaoqiao	14,000						
Guangzhou Petrochemical Co.	Guangzhou	150,000						

INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007 (CONTINUED)

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, % Ethane	Propane	Butane	Naphtha	Gas oil	Other
Jilin Chemical Industrial Co. Ltd.	Jilin	700,000						
Lanzhou Chemical Industrial Co.	Lanzhou	240,000						
Panjin Gas Processing Plant	Panjin	130,000						
Sinopec	Beijing	660,000				30	70	
Sinopec	Caojing, Shanghai	145,000				30	70	
Sinopec	Caojing, Shanghai	700,000				60	40	
Sinopec	Guangzhou, Guandong	140,000				100		
Sinopec	Maoming, Guangdong	380,000				100		
Sinopec	Neijing	650,000				60	40	
Sinopec	Puyang, Henan	180,000				100		
Sinopec	Qilu	720,000				80	20	
Sinopec	Tianjin	200,000				100		
Total China		**6,988,000**						
CHINA, TAIWAN								
Chinese Petroleum Corp.	Kaohsiung Linyuan	422,000	100					
Chinese Petroleum Corp.	Linyuan	230,000	100					
Chinese Petroleum Corp.	Linyuan	419,000	100					
Formosa Petrochemical Corp.	Mailiao	450,000				100		
Formosa Petrochemical Corp.	Mailiao	900,000						
Total China, Taiwan		**2,421,000**						
COLOMBIA								
Empresa Colombiana de Petroleos	Barrancabermeja	100,000	80	20				
Total Colombia		**100,000**						
CROATIA								
Polimeri	Zagreb	90,000	100					
Total Croatia		**90,000**						
CZECH REPUBLIC								
Chemopetrol AS	Litvinov	485,000		2	6	50	2	Hydrowax-40
Total Czech Republic		**485,000**						
EGYPT								
Sidi Kerir Petrochemicals Co.	Alexandria	300,000	50	50				
Total Egypt		**300,000**						
FINLAND								
Borealis OY	Porvoo	330,000				100		
Total Finland		**330,000**						
FRANCE								
A. P. Feyzin	Feyzin	250,000				100		
ExxonMobil Corp.	Notre Dame de Gravenchon	400,000				100		
Naphthachimie	Lavera	740,000			50	50		
Polimeri Europa France SNC	Dunkerque	370,000	0.5	1.5	8	90		
Societe du Craqueur de L' Aubette SCA	Berre l'Etang	450,000			12	75	13	
Total Petrochemicals	Carling-St. Avold-Marienau	568,000				100		
Total Petrochemicals	Gonfreville l'Orcher	520,000				100		
Total Petrochemicals	Lacq (Snea plant)	75,000	100					
Total France		**3,373,000**						
GERMANY								
Basell Polyfine GMBH	Wesseling	738,000			10	90		
Basell Polyfine GMBH	Wesseling	305,000					100	
BASF AG	Ludwigshafen	620,000		5	5	90		
BP Gelsenkirchen	Gelsenkirchen	530,000		1	9	75	15	
BP Gelsenkirchen	Gelsenkirchen	440,000			9	74	17	
BP Koln	Dormagen	550,000				100		
BP Koln	Dormagen	544,000				100		
BP Munchsmunster	Münchsmünster	320,000	13	17	17	53		
Dow Chemical Co.	Bohlen	560,000				100		
OMV Deutschland GMBH	Burghausen, Bavaria	340,000	10	8	21	61		
Shell & DEA Oil GMBH	Heide	110,000			4	28	68	
Shell & DEA Oil GMBH	Wesseling	500,000				60	40	
Total Germany		**5,557,000**						
GREECE								
EKO Chemicals Co. AE	Thessaloniki	20,000				65		Ref. gas-35
Total Greece		**20,000**						
HUNGARY								
Tiszai Vegyi Kombinat Ltd.	Tiszaújváros	620,000		3-6	3-6	80-84	8-10	
Total Hungary		**620,000**						

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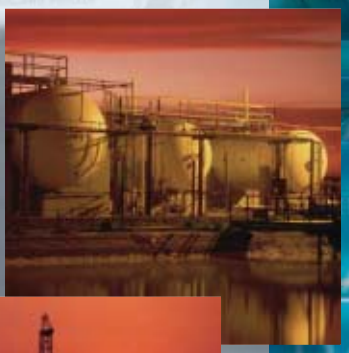

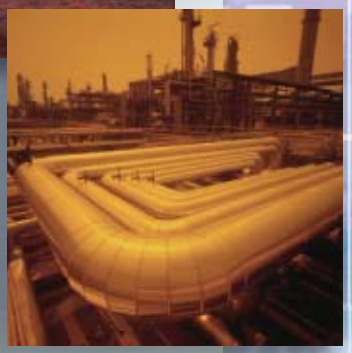

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Worldwide Gas Processing Survey — All gas processing plants worldwide with detailed information on capacities and location. Updated annually in July.
E1209 $395.00 US Current E1219C $1,195.00 US Historical, 1985 to current

International Ethylene Survey — Information on country, company, location, capacity, etc. Updated in March.
E1309 $350.00 US Current E1309C $1,050.00 US Historical, 1994 to current

LNG Worldwide — Facilities, Construction Projects, Statistics LNGINFO $395.00 US

Worldwide Construction Projects — List of planned construction products updated in May and November each year.

	Current	Historical 1996–Current
Refinery	E1340 $395.00 US	E1340C $1,495.00 US
Pipeline	E1342 $395.00 US	E1342C $1,495.00 US
Petrochemical	E1341 $395.00 US	E1341C $1,495.00 US
Gas Processing	E1344 $195.00 US	E1344C $ 795.00 US

U.S. Pipeline Study — There are 14 categories of operating and financial data on the liquids pipeline worksheet and 13 on the natural gas pipeline worksheet.
E1040 $545.00 US

Worldwide Survey of Line Pipe Mills — Detailed data on line pipe mills throughout the world, process, capacity, dimensions, etc.
PIPEMILL $695.00 US

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E1345 $395.00 US Current E1145C $1,695.00 US Historical 1989 to current

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Production Projects Worldwide — List of planned production mega-projects Location, Project Name, Year, Production Volume, Operator and Type
PRODPROJ $395.00 US

INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007 (CONTINUED)

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, % Ethane	Propane	Butane	Naphtha	Gas oil	Other
INDIA								
Gas Authority of India Ltd.	Pata, Uttar Pradesh	300,000						
Haldia Petrochemicals Ltd.	Haldia, West Bengal	520,000				100		
Indian Petrochemicals Corp. Ltd.	Baroda, Gujarat	130,000				100		
Indian Petrochemicals Corp. Ltd.	Gandhar, Gujarat	300,000	35-50	50-65				
Indian Petrochemicals Corp. Ltd.	Nagothane, Maharashtra	400,000	35-50	50-65				
National Organic Chemical Industries Ltd.	Thane, Maharashtra	75,000				100		
Reliance Industries Ltd.	Hazira, Gujarat	790,000				100		
Total India		**2,515,000**						
INDONESIA								
PT Chandra Asri	Cilegon, West Java	520,000						
Total Indonesia		**520,000**						
IRAN								
Amir Kabir Petrochemical Co.	Amir Kabir	520,000	24	4	12	58		2
Arak Petrochemical	Arak	247,000				100		
Bandar Imam Petrochemical Co.	Bandar Imam	311,000	20	3	10			67
Tabriz Petrochemical Co.	Tabriz	136,000	4	8	8	80		
Total Iran		**1,214,000**						
IRAQ								
Present status unknown		—						
Total Iraq		**—**						
ISRAEL								
Carmel Olefins Ltd.	Haifa	200,000		10	10	80		
Total Israel		**200,000**						
ITALY								
Polimeri Europa	Brindisi	440,000				100		
Polimeri Europa	Gela	245,000	25	5		70		
Polimeri Europa	Porto Marghera	490,000				100		
Polimeri Europa	Priolo	745,000	2		1	65	32	
Syndial	Porto Torres	250,000				70	30	
Total Italy		**2,170,000**						
JAPAN								
Asahikasei Chemicals Corp.	Kurasiki, Okayama	484,000				100		
Idemitsu Petrochemical Co. Ltd.	Chiba	374,000			2	98		
Idemitsu Petrochemical Co. Ltd.	Tokuyama	450,000				100		
Keiyo Ethylene	Ichihara, Chiba	768,000						
Maruzen Petrochemicals	Chiba	480,000						
Mitsubishi Chemical Corp.	Kashima (Unit 1)	375,000		10	20	55		NGL-15
Mitsubishi Chemical Corp.	Kashima (Unit 2)	453,000		10	20	55		NGL-15
Mitsubishi Chemical Corp.	Mizushima	450,000		5	5	80		NGL-10
Mitsui Chemicals Inc.	Ichihara, Chiba	553,000			10	90		
Mitsui Chemicals Inc.	Takaishi City, Osaka	450,000						
Nippon Petrochemical	Kawasaki	450,000						
Showa Denko KK	Oita	600,000				100		
Sumitomo Chemical Co. Ltd.	Chiba	380,000						
Tonen Chemical Corp.	Kawasaki	505,000				100		
Tosoh Corp.	Yokkaichi	493,000				100		
Total Japan		**7,265,000**						
KAZAKHSTAN								
Akpo	Aktau	100,000						
Government	Atyrau	30,000						
Total Kazakhstan		**130,000**						
KUWAIT								
Equate Petrochemical Co.	Shuaiba	800,000	100					
Total Kuwait		**800,000**						
LIBYA								
National Oil Co.	Ras Lanuf	350,000						
Total Libya		**350,000**						
MALAYSIA								
Ethylene Malaysia Sdn. Bhd.	Kertih	400,000	100					
Optimal Olefins Sdn. Bhd.	Kertih	600,000	100					
Titan Petrochemicals Sdn. Bhd.	Johor	400,000				100		
Titan Petrochemicals Sdn. Bhd.	Pasir Gudang	249,000				100		
Total Malaysia		**1,649,000**						
MEXICO								
Petroleós Mexicanos	La Cangrejera, Veracruz	600,000	100					
Petroleós Mexicanos	Morelos, Veracruz	600,000	100					

INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007 (CONTINUED)

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, % Ethane	Propane	Butane	Naphtha	Gas oil	Other
Petroleós Mexicanos	Pajaritos, Veracruz	184,000	100					
Total Mexico		**1,384,000**						
NETHERLANDS								
Dow Chemical Co.	Terneuzen (No. 1)	580,000		15		85		
Dow Chemical Co.	Terneuzen (No. 2)	585,000		15		85		
Dow Chemical Co.	Terneuzen (No. 3)	635,000				100		
SABIC Europe	Geleen (No. 3)	595,000						
SABIC Europe	Geleen (No. 4)	670,000						
Shell Nederland Chemie BV	Moerdijk	900,000				100		
Total Netherlands		**3,965,000**						
NIGERIA								
Eleme Petrochemical Co. Ltd.	Eleme River	300,000						NGL
Total Nigeria		**300,000**						
NORTH KOREA								
Namhung Youth Chemical Complex	Anju, South P'yong'an Province	60,000						
Total North Korea		**60,000**						
NORWAY								
Noretyl AS	Rafnes, Bamble	550,000	30	45	25			
Total Norway		**550,000**						
POLAND								
PKN Orlen SA	Plock	700,000		5	5	90		
Total Poland		**700,000**						
PORTUGAL								
Repsol YPF SA	Sines	330,000				100		
Total Portugal		**330,000**						
QATAR								
Qatar Petrochemical Co.	Mesaieed	530,000	100					
Q-Chem I	Mesaieed	500,000	80	20				
Total Qatar		**1,030,000**						
ROMANIA								
Petrom SA	Pitesti	200,000	11.1	7.9	4	77.1		
Petromidia SA	Navodari	200,000						
Petromidia SA	Constanta	224,000		10.7	5.0	54.7		Kero.-29.6
Petrotel SA	Teleajen	220,000						
Total Romania		**844,000**						
RUSSIA								
Angarskneftorgsintez	Angarsk, Siberia	60,000			5.2	89.2	5.6	
Angarskneftorgsintez	Angarsk, Siberia	240,000			5.2	89.2	5.6	
Nizhnekamskneftekhim	Nizhnekamsk	450,000						
Norsy		300,000				100		
Omskykauchuyk	Omsk, Siberia	90,000						
Orgsintez	Kazan	140,000						
Orgsintez	Kazan	100,000						
Orgsintez	Kazan	100,000						
Oriana		180,000						
Oxosyntez	Orsk	45,000						
Polimir		150,000				100		
Salavatneftorgsintez	Salavat	300,000						
Sibur Himprom		30,000						
Sibur-Neftechim	Nizhny Novgorod	300,000			20	80		
Sintezkauchuk		300,000						
Stavrapolpolymer	Prikumsk	350,000						
Tomsk PCC	Tomsk	300,000						
Uraorgsintes	Ufa	235,000						
Total Russia		**3,670,000**						
SAUDI ARABIA								
Al Jubail Petrochemical Co.	Jubail	800,000	50	50				
Arabian Petrochemical Co.	Jubail	800,000				100		
Arabian Petrochemical Co.	Jubail	800,000	50	50				
Arabian Petrochemical Co.	Jubail	650,000	100					
Jubail United Petrochemical Co.	Jubail	1,000,000						
Saudi Petrochemical Co.	Jubail	1,100,000	100					
Yanbu Petrochemical Co.	Yanbu	875,000	100					
Yanbu Petrochemical Co.	Yanbu	830,000	16	16	18	50		
Total Saudi Arabia		**6,855,000**						

INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007 (CONTINUED)

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, % Ethane	Propane	Butane	Naphtha	Gas oil	Other
SERBIA AND MONTENEGRO								
Chemi Industria	Pancevo	200,000						
Total Serbia and Montenegro		**200,000**						
SINGAPORE								
ExxonMobil Chemical Co.	Jurong Island	860,000				33	33	34
Petrochemical Corp. of Singapore Pte. Ltd.	Pulau Ayer Merbau	465,000				100		
Petrochemical Corp. of Singapore Pte. Ltd.	Pulau Ayer Merbau	615,000				100		
Total Singapore		**1,940,000**						
SLOVAKIA								
Slovnaft Petrochemicals	Bratislava	210,000		8-12	8-12	76-82		
Total Slovakia		**210,000**						
SOUTH AFRICA								
Sasol Polymers	Sasolburg	110,000	80	20				
Sasol Polymers	Secunda	475,000	75	5		20		
Total South Africa		**585,000**						
SOUTH KOREA								
Honam Petrochemical	Yeochun	700,000				100		
Korea Petrochemical Industries Co. Ltd.	Ulsan	320,000				100		
LG Daesan Petrochemical	Daesan	450,000				100		
LG Petrochemical Co. Ltd.	Yeosu City	760,000				100		
Lotte Daesan Petrochemical	Daesan	600,000				100		
Samsung General Chemicals	Daesan	630,000				100		
SK Corp.	Ulsan	545,000				100		
SK Corp.	Ulsan	185,000				100		
Yeochon	Yeochun	480,000				100		
Yeochon	Yeochun	420,000				100		
Yeochon	Yeochun	350,000				100		
Total South Korea		**5,440,000**						
SPAIN								
Dow Chemical Co.	Tarragona	580,000				100		
Repsol YPF SA	Puertollano	250,000						Ref. streams
Repsol YPF SA	Tarragona	600,000						
Total Spain		**1,430,000**						
SWEDEN								
Borealis AB	Stenungsund	625,000	40	20		40		
Total Sweden		**625,000**						
SWITZERLAND								
Lonza AG	Visp	33,000		24	56	20		
Total Switzerland		**33,000**						
THAILAND								
PTT Chemical	Map Ta Phut, Rayong	437,000	80	6				LPG-14
PTT Chemical	Map Ta Phut, Rayong	385,000	5	18	28	49		
PTT Chemical	Map Ta Phut, Rayong	350,000						
PTT Chemical	Map Ta Phut, Rayong	300,000	100					
Rayong Olefins Ltd.	Map Ta Phut, Rayong	800,000						LPG-60, NGL-40
Total Thailand		**2,272,000**						
TURKEY								
Petkim Petrochemicals Holding Co.	Aliaga, Izmir	520,000				100		
Total Turkey		**520,000**						
UKRAINE								
Chlorvinyl	Kalush	250,000					100	
TNK-BP	Lisichansk	200,000				100		
Total Ukraine		**450,000**						
UNITED ARAB EMIRATES								
Borouge Abu Dhabi Polymers Co. Ltd.	Ruwais, Abu Dhabi	600,000	100					
Total UAE		**600,000**						
UNITED KINGDOM								
BP PLC	Grangemouth	730,000				100		
BP PLC	Grangemouth	340,000				100		
ExxonMobil Chemical Co.	Fawley	120,000	9	8	8	25	25	25
ExxonMobil Chemical Co.	Mossmorran Fife	800,000	100					

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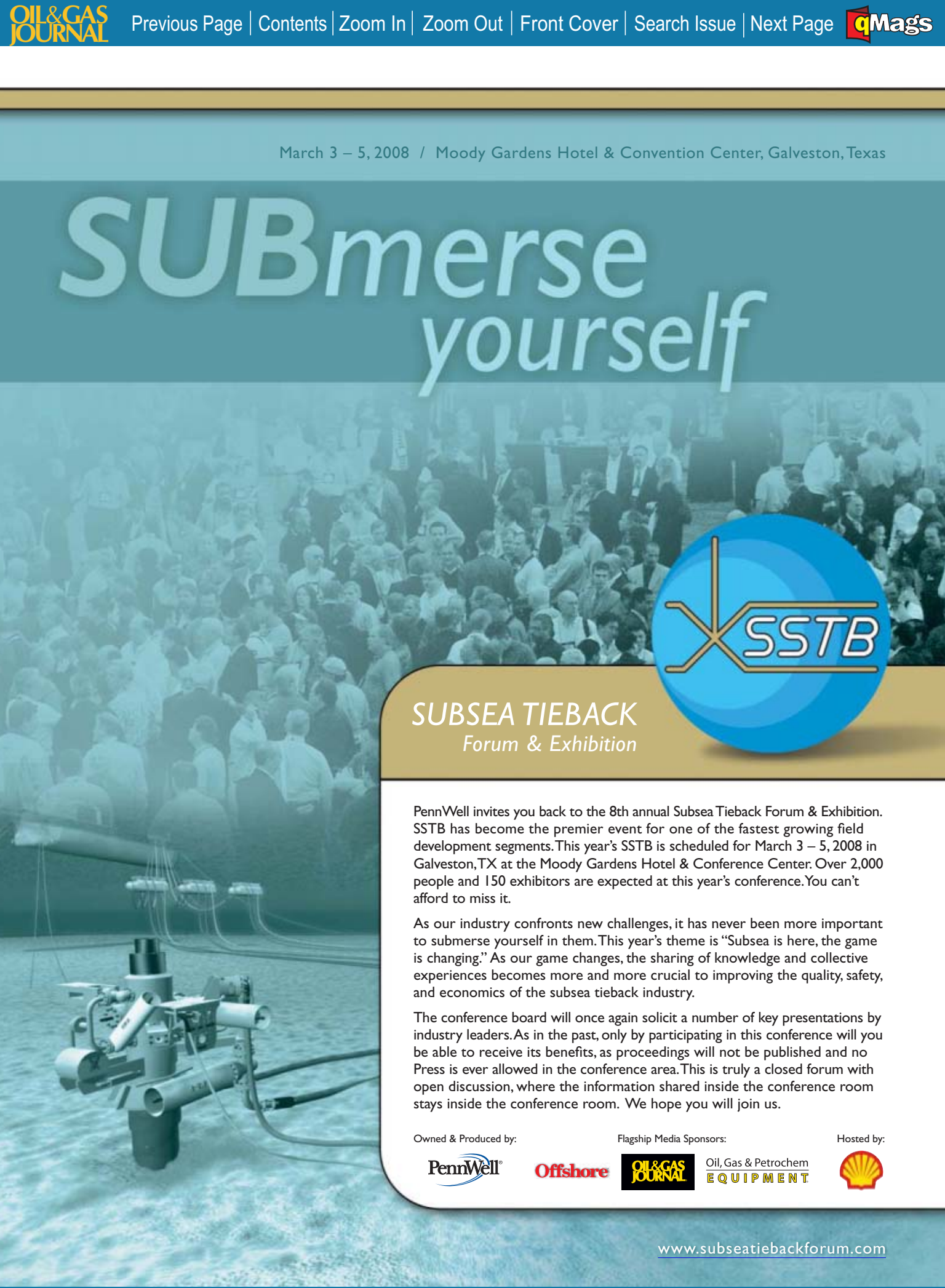

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INTERNATIONAL SURVEY OF ETHYLENE FROM STEAM CRACKERS—2007 (CONTINUED)

Company	Location	Total nameplate capacity, tonnes/year	Typical feedstock or feedstock mixture on which listed capacity is based, %					
			Ethane	Propane	Butane	Naphtha	Gas oil	Other
SABIC Europe	Wilton	865,000		12	10	78		
Total United Kingdom		**2,855,000**						
UNITED STATES								
BASF Fina Petrochemicals	Port Arthur, Tex.	830,000				100		
Chevron Phillips Chemical Co. LP	Cedar Bayou, Tex.	794,000	30	20	25	25		
Chevron Phillips Chemical Co. LP	Port Arthur, Tex.	794,000	70	25	5			
Chevron Phillips Chemical Co. LP	Sweeny, Tex.	923,000	38	37	25			
Chevron Phillips Chemical Co. LP	Sweeny, Tex.	673,000	75	25				
Chevron Phillips Chemical Co. LP	Sweeny, Tex.	272,000	85	15				
Dow Chemical Co.	Freeport (LHC 7), Tex.	630,000	50	50				
Dow Chemical Co.	Freeport (LHC 8), Tex.	1,010,000	10	20		70		
Dow Chemical Co.	Plaquemine (LHC 2), La.	520,000	75	25				
Dow Chemical Co.	Plaquemine (LHC 3), La.	740,000		70	10	20		
Dow Chemical Co.	Taft 1, La.	590,000	20	40		40		
Dow Chemical Co.	Taft 2, La.	410,000	20	40		40		
DuPont	Orange, Tex.	680,000	100					
Eastman Chemical Co.	Longview, Tex.	781,000	25	67	7	1		
Equistar Chemicals LP (Lyondell)	Channelview, Tex.	875,000	5			95		
Equistar Chemicals LP (Lyondell)	Channelview, Tex.	875,000	5			95		
Equistar Chemicals LP (Lyondell)	Chocolate Bayou, Tex.	544,000				100		
Equistar Chemicals LP (Lyondell)	Clinton, Iowa	476,000	80	20				
Equistar Chemicals LP (Lyondell)	Corpus Christi, Tex.	771,000	10	30		60		
Equistar Chemicals LP (Lyondell)	LaPorte, Tex.	789,000	60	20		20		
Equistar Chemicals LP (Lyondell)	Morris, Ill.	550,000	80	20				
ExxonMobil Chemical Co.	Baton Rouge, La.	975,000	9	8	8	25	25	25
ExxonMobil Chemical Co.	Baytown, Tex.	2,197,000	58	8	9	25		
ExxonMobil Chemical Co.	Beaumont, Tex.	816,000	8	8	9	75		
ExxonMobil Chemical Co.	Houston, Tex.	102,000						100
Formosa Plastics Corp. USA	Point Comfort, Tex.	816,000	45	15		40		
Formosa Plastics Corp. USA	Point Comfort, Tex.	725,000	45	15		40		
Huntsman Corp.	Odessa, Tex.	360,000						
Huntsman Corp.	Port Arthur, Tex.	635,000				60		LPG-40
Huntsman Corp.	Port Neches, Tex.	180,000						
INEOS Olefins and Polymers USA	Chocolate Bayou, Tex.	1,752,000	50	35		15		
Javelina Co.	Corpus Christi, Tex.	151,000						Ref. Gas-100
Sasol North America Inc.	Lake Charles, La.	453,515	100					
Shell Chemicals Ltd.	Deer Park, Tex.	1,406,000	15		5	50	30	
Shell Chemicals Ltd.	Norco, La.	900,000	5			35	60	
Shell Chemicals Ltd.	Norco, La.	656,000	45	5	5	45		
Sunoco Inc.	Marcus Hook, Pa.	225,000	100					
Westlake Petrochemicals Corp.	Calvert City, Ky.	195,000		100				
Westlake Petrochemicals Corp.	Sulphur #1, La.	567,000	100	30				
Westlake Petrochemicals Corp.	Sulphur #2, La.	522,000	70					
Williams Olefins	Geismar, La.	612,245	90	10				
Total United States		**28,772,760**						
UZBEKISTAN								
Uzbekneftegaz	Shurtan	140,000						
Total Uzbekistan		**140,000**						
VENEZUELA								
Pequiven-Petroquimica de Venezuela SA	El Tablazo, Zulia	250,000	30	70				
Pequiven-Petroquimica de Venezuela SA	El Tablazo, Zulia	350,000	100					
Total Venezuela		**600,000**						
TOTAL WORLD		**117,575,053**						

Study forecasts softer tanker market ahead

Christopher E. Smith
Pipeline Editor

Tanker market earnings for the half-year ended March 2007 were largely unchanged even while market rates eroded as the fleet expanded, leading to forecasts of softer market conditions ahead. Clarkson Research Services Ltd. detailed the reasons behind these market movements as well as offering forecasts of future market direction in its Spring 2007 "Shipping Market Outlook: A Half-Yearly Review of the Shipping Market."

According to Clarkson data, the tanker market, comprised of both modern and early 1990s VLCCs, modern Suezmax, modern Aframax, and both dirty and clean products carriers, averaged $34,025/day in earnings from September 2006 to March 2007, a 0.1% increase from the $33,984/day seen March-September 2006. A 24.8% increase in Aframax earnings, to $44,060/day, helped offset a more than 16% drop in VLCC earnings, which fell to $53,172 and $49,452/day for modern and early 1990s vessels, respectively (Table 1).

TANKER EARNINGS

Table 1

Vessel type	March-September 2006 ($/day)	September 2006-March 2007 ($/day)	Change, %
VLCC (modern)	63,541	53,172	–16.3
VLCC (early '90s)	59,185	49,452	–16.4
Suezmax (modern)	49,950	52,769	5.6
Aframax (modern)	35,300	44,060	24.8
Products (dirty)	31,016	31,737	2.3
Products (clean)	26,076	25,267	–3.1
Weighted average	33,984	34,025	0.1

Tanker rates also remained relatively strong, according to Clarkson, despite erosion seen over September-March, the only category to fall below the 1997-2006 10-year average being Suezmax spot rates.

As of Mar. 1, 2007, the tanker fleet of more than 10,000 deadweight-tonnes (dwt) had expanded by 85 vessels, with 161 new vessels delivered and 89 sold for scrap over the preceding 6 months.

This article will detail some of the other findings in a few of the numerous vessel categories covered twice each year by Clarkson in its Shipping Market Outlooks.

Market outlook

The interplay of a strong world economy and high oil prices shaped the tanker market for the 6 months ending Mar. 1, 2007, according to Clarkson. It cites the combination of lower-than-expected oil demand growth in 2006 (0.8 million b/d instead of 1.8 million b/d) and the fact that almost half of this growth occurred in non-importing regions such as Russia and the Middle East as having had a particularly bearish effect on the tanker industry.

Crude tankers of all categories lost ground against 10-year average rates over the 6 months, but ship values held up better, with a 5-year old Suezmax tanker actually increasing in value to $82.5 million from $77 million. The spot rate for 30,000-dwt clean product tankers also increased to $31,737/day from $29,171/day in the preceding 6 months. Rates for a 1-year time charter of the same vessel type, however, slipped to $23,500/day from $27,000/day, according to Clarkson.

Clarkson expects non-Middle East and Russian crude trade growth of 1 million b/d in 2007, juxtaposed against a 7.6% increase in the fleet in 2007, to 391.7 million dwt and an additional 8.1% increase in 2008. Either a blacklisting of single-hull tankers or a dramatic fall in rates, however, could limit net tonnage growth by increasing the scrap rate from Clarkson's baseline of 5 million dwt/year.

Sluggish and unpredictable demand, combined with rapid and predictable supply growth, continue to typify the tanker market, said Clarkson, with the largest variable being the timing of the replacement of the nondouble hull fleet. A rapid disappearance would tighten the market considerably, while a lingering phaseout will only add to the pressures created by general market conditions.

VLCC

On Mar. 1, 2007, the VLCC fleet consisted of 490 vessels of 143.5 million dwt. The orderbook of 177 vessels (54.2 million dwt) is enough to replace all current single-hull VLCCs and still increase the fleet by roughly 10%, according to Clarkson. Orders are forward-loaded, with 11.6 million dwt set for delivery in 2008 and 34.4 million dwt delivered in 2009 and beyond.

Clarkson described VLCC activity as muted during the 6 months ending Mar. 1, 2007, with average earnings for a 1990s-build vessel plunging to $48,389/day, compared to an average of $76,907/day for the same period 1 year earlier. This came despite the uptick seen between end-2006 and March 2007 (Table 2).

Weakness was also evident in the time-charter market, with 1-year rates for modern tonnage dropping to $51,000/day in February 2007 from a 2-year high of $70,000/day in September.

Clarkson sees the buildup of tonnage in this environment as bearish, with the market already weaker than it was just 2 years ago.

Suezmax

On Mar. 1, 2007, the Suezmax fleet consisted of 353 vessels of 53.2 million dwt. The orderbook of 19.7 million dwt is enough to replace all current single-hull Suezmax tankers and still expand the fleet by 18%, according to Clarkson.

Earnings for the 6 months ending Mar. 1, 2007, averaged $46.702/day, down 23% from the same period a year before. Time-charter rates for 1-year on a modern vessel dropped 13% from September 2006, while 3-year rates fell by 10% to $38,000/day.

Clarkson points to an orderbook that more than doubled between March 2006 and March 2007 and currently comprises 37% of the total fleet as bearish and expects rate behavior in the Suezmax market to mirror that of the VLCC sector.

Aframax

On Mar. 1, 2007, the Aframax fleet had increased to 72.5 million dwt. The orderbook of 28 million dwt is enough to replace all single hulls in the class and still expand the fleet by 19%, according to Clarkson.

Aframax earnings fell 16% over during the 6 months ending Mar. 1, 2007, to $42, 677/day. Time charter rates were relatively flat at $24,000/day for a 1-year period.

Clarkson sees the combination of a healthy supply and potentially lower demand as likely to lead to short and medium-term softness in the market.

Products

Clarkson ascribed the poor performance of the product tanker market for the 6 months ending Mar. 1, 2007, to above-normal temperatures in the northern hemisphere that dampened seasonal fuel consumption. Average earnings for dirty products carriers slipped 27% year-on-year to $31,505/day, with an even larger drop of 36%, to $24,979/day, seen in the clean market.

Even so, rates for both clean and dirty product tankers remained above 10-year averages, despite the $17,957/day fetched by clean products tankers in November 2006 ranking as the lowest monthly average recorded by Clarkson since fourth-quarter 2003.

On Mar. 1, 2007, the 10,000-80,000 dwt product tanker market stood at 97.5 million dwt, a 2.2% increase. With Clarkson expecting deliveries of 10.4 million dwt and demolition of 2.2 dwt, the product fleet is set to grow by 12% in 2007 (Figs. 1-2).

Clarkson, however, expects product-fleet expansion to accelerate to still

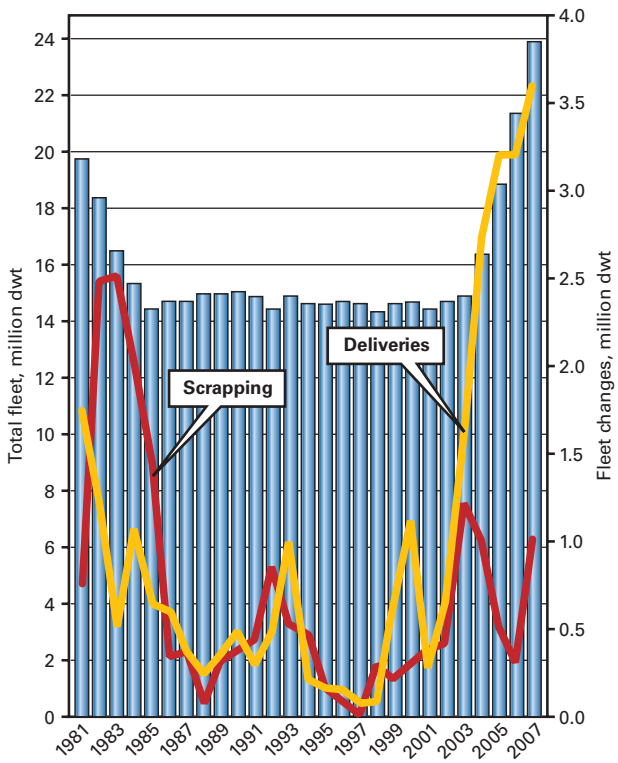
VLCC MARKET SUMMARY

Table 2

Worldscale rates	End 2006	March 2007	Change, %
AG-West	58	53	–8.6
AG-Far East	63	71	12.7
Med-UK	95	89	–6.3
Revenue, $/day			
Average spot earnings, early '90s	$40,004	$48,389	21
1-year time-charter rate, early '90s	$44,000	$41,000	–6.8
Asset values, $ million			
Newbuild price, 300,000 dwt	129	130	0.8
5-year old, 300,000 dwt	118	118	—
Tonnage supply, million dwt			
Fleet	142.3	143.5	0.9
Orderbook	53.5	54.2	1.2

PANAMAX FLEET DEVELOPMENT

Fig. 1



Source: Clarkson Research Services

higher levels. The current orderbook for 10,000-80,000 dwt vessels stands at 43.6 million dwt leading to what Clarkson describes as an astonishing 30% year-on-year expansion of the fleet once demolition is taken into account.

Clarkson sees the petroleum products tanker market as particularly exposed to the general weakening seen in the broader tanker market, the huge orderbook outweighing strong demand for products (led by China and India) and creating a structural weakness in the fleet which will mandate "significant demolition activity" for the sector to regain health.

Chemical

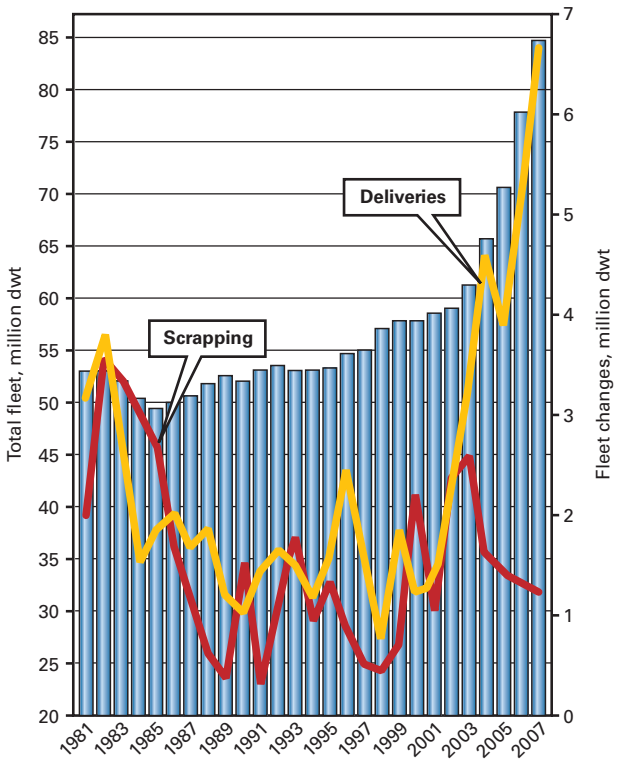
The end of 2006 saw spot freight rates for most chemical tankers routes standing well above 2005 levels, according to Clarkson. Rates for 5,000 tonnes Houston-Rotterdam rose 77%, with Houston-Far East rates increasing 32%. Rates from the Persian Gulf to the Far East for 15,000 tonnes rose 13%.

Rotterdam-US gulf rates fell 17% (5,000 tonnes). Clarkson ascribed both this and the increases seen ex-US gulf to the return of petrochemical production in the region following the hurricanes of 2005.

As with the other tanker segments, Clarkson sees fleet growth in chemicals outweighing demand growth, leading to potential declines in freight rates for the balance of 2007. It tempers this forecast, however, by noting increased Middle Eastern production, the growing demand for biofuels, and more stringent carriage regulations, all of which could have a bullish effect on the market.

HANDY FLEET DEVELOPMENT

Fig. 2



Source: Clarkson Research Services

LNG

Clarkson described the 6 months ending Mar. 1, 2007, as relatively quiet for the LNG carrier market, as the capacity expansions planned across the supply chain over the past 4 years began to come to fruition. Six vessels comprising 1.32 million cu m were ordered in the final 4 months of 2006, bringing the totals for the year to 36 orders and 6.93 million cu m. Nine orders of 2.07 million cu m were made in the first 2 months of 2007, according to Clarkson, bringing the total orderbook as of Mar. 1 to 145 vessels and 24.9 million cu m.

Qatar Gas Transport Co., according to Clarkson, placed the orders seen during the first 2 months of 2007, completing its newbuilding program and removing the biggest single purchaser in the recent LNG newbuild surge.

Charter rates at the end of 2006 were strong ($53,800-62,250/day), boosted at least in part by the tying up of multiple vessels for use as floating storage. A total of 17 different vessels were used as storage for at least part of the 6 months ending Mar. 1, 2007, according to Clarkson, as companies such as BG Group, Shell, Excelerate, Suez, and Kogas became more active in the arbitrage between spring and winter markets.

As these vessels become available, however, and newbuilds are added to the fleet, some in the market are predicting a downward trend, according to Clarkson. Clarkson says that the degree to which this is true depends a great deal on the timing of new LNG production capacity, with delays leading to an oversupply in the shipping market but the outlook becoming more positive if current project schedules are maintained. ✦

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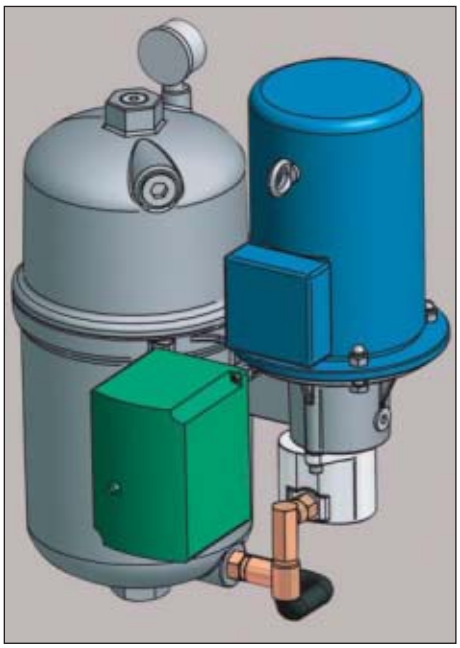

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Designed to accommodate a variety of flows, voltages, filtration requirements, and installations, self-contained units employ the maker's patented pleated filter media technology to remove contaminants. Systems install quickly on the outflow line from lubrication oil reservoirs. Easy to service, these systems can be isolated to facilitate filter changes and routine maintenance, the firm notes.

Systems are powered by 2 hp explosion-protected motors and equipped with 2 gpm or 5 gpm variable speed pumps. Vessels used on the systems have a 150 psi pressure rating and a 22 psi element bypass.

Source: **Kaydon Custom Filtration Corp.**, 1571 Lukken Industrial Drive West, LaGrange, GA 30240.

New unit helps prevent illegal oil discharge at sea

SmartSafe, a new plug-n-play, is a compact unit designed for fail-safe prevention of illegal oil discharge at sea.

The unit monitors and records all aspects of the discharge process in real-time: separator control, oil content output, and flow rate and cumulative flow through the discharge pipe. In this way it can anticipate any illegal discharge and deal with it by shutting off the overboard discharge valve if necessary.

To assist with regulatory compliance, at the end of the discharge process a batch record is printed containing all aspects of the discharge and any errors or inconsistencies that occurred during the process. As much as 2 years of discharge data can be stored and presented.

Data are stored within SmartSafe and can be played back graphically on its built-in screen.

Source: **Rivertrace Engineering Ltd.**, Unit p, Kingsfield Business Centre, Philanthropic Rd., Redhill, Surrey RH1 4DP, UK.

Services/Suppliers

Turner Mason & Co.

Dallas, has announced the appointments of John R. Auers, Thomas R. Hogan, and James W. Jones as senior vice-presidents. Charles L. Miller has been named vice-president.

Auers, who holds a BS degree in chemical engineering from the University of Nebraska, and an MBA from the University of Houston, will lead the firm's work in preparation of a 20-year forecast of crude and refined products prices and supply/demand balances worldwide.

Hogan manages the development and maintenance of eight worldwide regional refinery models and monitors supply patterns in worldwide refining centers. He also leads the firm's practice in fuels specifications and compliance. He earned a BS degree in chemical engineering from Michigan State University.

Jones leads assignments involving refinery process technology selection and design, independent engineer services, strategic capital investment studies, project management, and petroleum economics. He earned a BS degree and an MBA from the University of Texas.

Miller, who earned a BS degree in chemical engineering from Texas A&M University, leads the firm's gasoline program attestation practice.

Turner, Mason & Co. provides engineering and management consulting services for the petroleum and petrochemical industries.

EMS Group

Houston, has announced that Teri Elliott has joined the firm as director of strategic planning. Elliott previously served as director of marketing communications, membership, and program services for NACE International. She also had worked for Baker Petrolite Corp., where she directed a strategic planning team.

EMS Group provides a full range of operations and maintenance services to major pipeline operators, local distribution companies, and independent power, oil, and gas producers.

Enventure Global Technology LLC

Houston, has named Ray Ballantyne as president and CEO. Ballantyne worked for SCF Partners prior to joining Enventure. He had served more than 16 years with Baker Hughes, including service as president of Baker Hughes Inteq/Drilling Fluids.

Enventure Global Technology LLC is a leading global provider of solid expandable tubular solutions for the energy industry.

Roxar

Stavanger, has announced the sale of its flare metering and measurement business to Fluenta. Dag Johansen, previously Roxar sales director, will serve as managing director of Fluenta. Fluenta will use Roxar's production facilities in Bergen, Norway, until the end of 2007.

Fluenta is a leading provider of ultrasonic flare metering, headquartered in Bergen.

Roxar, provider of technology solutions to the upstream oil and gas industry, has offices in Europe, the Americas, Africa, CIS, Asia Pacific, and the Middle East.

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

Imports of crude and products

	Districts 1-4 6-29 2007	Districts 1-4 6-22 2007	District 5 6-29 2007	District 5 6-22 2007	Total US 6-29 2007	Total US 6-22 2007	Total US *6-30 2006
	1,000 b/d						
Total motor gasoline	1,276	1,036	116	76	1,392	1,112	1,271
Mo. gas. blending comp.	856	602	37	49	893	651	720
Distillate	303	213	10	1	313	214	257
Residual	251	291	0	86	251	377	208
Jet fuel-kerosine	134	105	159	125	293	230	263
Propane-propylene	130	160	7	2	130	160	104
Other	465	646	17	8	489	656	465
Total products	**3,415**	**3,053**	**346**	**347**	**3,761**	**3,400**	**3,288**
Total crude	**9,561**	**9,418**	**1,217**	**1,083**	**10,778**	**10,501**	**10,539**
Total imports	**12,976**	**12,471**	**1,563**	**1,430**	**14,539**	**13,901**	**13,827**

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

Purvin & Gertz LNG netbacks—July 6, 2007

Receiving terminal	Liquefaction plant: Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	6.16	4.40	5.36	4.30	4.99	5.34
Everett	5.18	3.11	4.80	3.21	3.68	5.47
Isle of Grain	3.25	1.28	2.75	1.19	1.82	2.73
Lake Charles	3.85	1.99	3.60	2.14	2.39	4.45
Sodegaura	4.77	6.67	4.98	6.60	5.94	4.24
Zeebrugge	5.57	3.60	5.05	3.52	4.15	5.07

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

Crude and product stocks

	Crude oil	Motor gasoline: Total	Motor gasoline: Blending comp.[1]	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual	Propane-propylene
	1,000 bbl						
PADD 1	16,079	52,875	23,861	10,694	44,383	15,072	3,672
PADD 2	71,731	49,137	15,494	6,566	29,667	1,219	17,188
PADD 3	193,010	65,780	28,983	13,718	32,626	13,042	21,490
PADD 4	14,526	6,063	1,811	531	2,864	335	[1]1,528
PADD 5	58,696	30,578	20,211	9,110	12,070	5,177	—
June 29, 2007	**354,042**	**204,433**	**90,360**	**40,619**	**121,610**	**34,845**	**43,878**
June 22, 2007	**350,891**	**202,582**	**89,982**	**40,124**	**120,448**	**35,772**	**41,954**
June 30, 2006[2]	**341,301**	**213,077**	**90,995**	**39,344**	**127,323**	**42,405**	**48,615**

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

Refinery report—June 29, 2007

District	Refinery operations: Gross inputs	Refinery operations: Crude oil inputs	Refinery output: Total motor gasoline	Refinery output: Jet fuel, kerosine	Refinery output: Fuel oils: Distillate	Refinery output: Fuel oils: Residual	Refinery output: Propane-propylene
	1,000 b/d						
PADD 1	1,520	1,528	1,966	98	454	107	67
PADD 2	3,316	3,311	2,231	192	959	63	229
PADD 3	7,619	7,543	3,304	761	1,923	308	705
PADD 4	594	588	312	27	176	13	[1]156
PADD 5	2,655	2,574	1,589	385	498	122	—
June 29, 2007	**15,704**	**15,544**	**9,402**	**1,463**	**4,010**	**613**	**1,157**
June 22, 2007	**15,618**	**15,430**	**9,342**	**1,430**	**3,990**	**628**	**1,109**
June 30, 2006[2]	**16,192**	**15,940**	**9,207**	**1,490**	**4,164**	**673**	**1,108**

[1]Includes PADD 5. [2]Revised.
Note: Operable capacity is 17.443 million b/d. Utilization rate is 90.0%.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Additional analysis of market trends is available through **OGJ Online**, *Oil & Gas Journal's* electronic information source, at http://www.ogjonline.com.

OIL&GAS JOURNAL online research center

OGJ crack spread

	*7-6-07	*7-7-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	91.17	96.13	–4.96	–5.2
Brent crude	74.02	73.49	0.53	0.7
Crack spread	17.15	22.65	–5.49	–24.3
FUTURES MARKET PRICES				
One month				
Product value	92.28	91.26	1.02	1.1
Light sweet crude	71.78	74.81	–3.03	–4.1
Crack spread	20.50	16.45	4.05	24.6
Six month				
Product value	86.42	87.31	–0.89	–1.0
Light sweet crude	72.70	77.47	–4.77	–6.2
Crack spread	13.73	9.84	3.88	39.5

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

OGJ GASOLINE PRICES

	Price ex tax 7-4-07	Pump price* 7-4-07	Pump price 7-5-06
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	260.4	300.1	293.0
Baltimore	255.1	297.0	300.1
Boston	248.2	290.1	294.1
Buffalo	240.4	300.5	303.8
Miami	251.5	301.8	306.9
Newark	252.3	285.2	292.0
New York	241.0	301.1	302.1
Norfolk	252.1	289.7	295.0
Philadelphia	252.5	303.2	308.0
Pittsburgh	241.3	292.0	292.7
Wash., DC	261.1	299.5	313.0
PAD I avg.	250.5	296.4	300.1
Chicago	265.4	316.3	324.9
Cleveland	224.4	270.8	284.9
Des Moines	253.6	294.0	272.9
Detroit	264.6	313.8	288.9
Indianapolis	257.9	302.9	282.0
Kansas City	253.8	289.8	272.9
Louisville	263.2	300.1	290.0
Memphis	253.7	293.5	284.8
Milwaukee	249.3	300.6	289.1
Minn.-St. Paul	240.8	281.2	280.1
Oklahoma City	247.5	282.9	265.0
Omaha	244.6	291.0	278.9
St. Louis	265.0	301.0	263.3
Tulsa	248.4	283.8	262.1
Wichita	251.3	294.7	271.0
PAD II avg.	252.2	294.4	280.7
Albuquerque	261.8	298.2	285.1
Birmingham	247.9	286.6	280.0
Dallas-Fort Worth	247.9	286.3	290.0
Houston	245.2	283.6	289.0
Little Rock	246.8	287.0	278.9
New Orleans	254.1	292.5	283.9
San Antonio	244.8	283.2	274.9
PAD III avg.	249.8	288.2	283.1
Cheyenne	259.1	291.5	274.8
Denver	271.3	311.7	294.7
Salt Lake City	270.7	313.6	299.7
PAD IV avg.	267.0	305.6	289.7
Los Angeles	254.5	313.0	338.7
Phoenix	265.2	302.6	310.7
Portland	267.6	310.9	305.0
San Diego	266.3	324.8	345.7
San Francisco	263.5	322.0	343.8
Seattle	249.6	302.0	322.0
PAD V avg.	261.1	312.6	327.7
Week's avg.	**253.7**	**297.3**	**222.0**
June avg.	**265.9**	**309.4**	**216.6**
May avg.	**264.1**	**307.6**	**214.1**
2007 to date	**224.6**	**268.2**	—
2006 to date	**213.9**	**257.0**	—

*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

	6-29-07 ¢/gal		6-29-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	223.00	New York Harbor	202.25
Gulf Coast	213.88	Gulf Coast	200.45
Los Angeles	222.88	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	204.53	ARA	198.89
Singapore	205.57	Singapore	194.29
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	233.00	New York Harbor	130.67
Gulf Coast	231.75	Gulf Coast	132.14
Los Angeles	236.88	Los Angeles	141.34
		ARA	120.99
		Singapore	135.56

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

BAKER HUGHES RIG COUNT

	7-6-07	7-7-06
Alabama	5	4
Alaska	9	8
Arkansas	48	24
California	35	34
Land	34	31
Offshore	1	3
Colorado	108	91
Florida	1	0
Illinois	0	0
Indiana	3	0
Kansas	8	15
Kentucky	8	6
Louisiana	181	189
N. Land	56	56
S. Inland waters	22	19
S. Land	33	34
Offshore	70	80
Maryland	1	0
Michigan	1	3
Mississippi	14	10
Montana	19	22
Nebraska	0	0
New Mexico	87	94
New York	5	6
North Dakota	35	30
Ohio	13	6
Oklahoma	191	183
Pennsylvania	11	17
South Dakota	3	1
Texas	825	738
Offshore	7	10
Inland waters	0	4
Dist. 1	23	22
Dist. 2	26	25
Dist. 3	67	63
Dist. 4	90	72
Dist. 5	174	132
Dist. 6	120	103
Dist. 7B	36	42
Dist. 7C	55	41
Dist. 8	106	92
Dist. 8A	27	28
Dist. 9	35	35
Dist. 10	59	69
Utah	37	42
West Virginia	25	27
Wyoming	71	105
Others—NV-3; TN-3; VA-1; WA-1	8	4
Total US	**1,752**	**1,659**
Total Canada	**286**	**560**
Grand total	**2,038**	**2,219**
Oil rigs	274	295
Gas rigs	1,473	1,359
Total offshore	79	94
Total cum. avg. YTD	**1,746**	**1,581**

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	7-6-07 Percent footage*	Rig count	7-7-06 Percent footage*
0-2,500	59	6.7	57	5.2
2,501-5,000	109	52.2	91	43.9
5,001-7,500	249	23.2	216	18.5
7,501-10,000	413	3.3	377	2.6
10,001-12,500	456	2.1	383	1.8
12,501-15,000	265	—	272	—
15,001-17,500	108	0.9	99	—
17,501-20,000	68	—	83	—
20,001-over	39	—	23	—
Total	**1,766**	**8.1**	**1,601**	**6.2**
INLAND	44		44	
LAND	1,655		1,479	
OFFSHORE	67		78	

*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]7-6-07 1,000 b/d	[2]7-7-06
(Crude oil and lease condensate)		
Alabama	19	20
Alaska	764	756
California	663	683
Colorado	50	61
Florida	7	6
Illinois	31	28
Kansas	94	98
Louisiana	1,357	1,339
Michigan	15	15
Mississippi	49	48
Montana	91	98
New Mexico	164	159
North Dakota	105	112
Oklahoma	164	171
Texas	1,327	1,352
Utah	45	47
Wyoming	144	126
All others	61	75
Total	**5,150**	**5,194**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	7-6-07
Alaska-North Slope 27°	56.11
South Louisiana Sweet	77.50
California-Kern River 13°	63.25
Lost Hills 30°	71.30
Southwest Wyoming Sweet	67.81
East Texas Sweet	68.75
West Texas Sour 34°	62.40
West Texas Intermediate	69.25
Oklahoma Sweet	69.25
Texas Upper Gulf Coast	66.00
Michigan Sour	62.25
Kansas Common	68.50
North Dakota Sweet	65.00

*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]	6-29-07
United Kingdom-Brent 38°	71.69
Russia-Urals 32°	68.01
Saudi Light 34°	66.16
Dubai Fateh 32°	66.17
Algeria Saharan 44°	72.24
Nigeria-Bonny Light 37°	73.56
Indonesia-Minas 34°	68.48
Venezuela-Tia Juana Light 31°	66.76
Mexico-Isthmus 33°	66.65
OPEC basket	68.57
Total OPEC[2]	68.02
Total non-OPEC[2]	67.63
Total world[2]	67.84
US imports[3]	65.51

[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]

	6-29-07	6-22-07 bcf	Change
Producing region	867	853	14
Consuming region east	1,278	1,224	54
Consuming region west	376	366	10
Total US	**2,521**	**2,443**	**78**
	Apr. 07	**Apr. 06**	**Change, %**
Total US[2]	**1,720**	**1,945**	**–11.6**

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

Statistics

International rig count

Region	June 2007 Land	June 2007 Off.	June 2007 Total	June 06 Total
WESTERN HEMISPHERE				
Argentina	86	—	86	81
Bolivia	3	—	3	4
Brazil	18	23	41	29
Canada	208	2	210	408
Chile	1	—	1	—
Colombia	38	—	38	22
Ecuador	12	—	12	10
Mexico	62	28	90	80
Peru	5	1	6	6
Trinidad	3	2	5	9
United States	1,692	79	1,771	1,665
Venezuela	63	19	82	84
Other	2	—	2	3
Subtotal	**2,192**	**154**	**2,346**	**2,402**
ASIA-PACIFIC				
Australia	10	12	22	25
Brunei	1	3	4	4
China-offshore	—	19	19	16
India	59	27	86	80
Indonesia	38	22	60	43
Japan	2	—	2	1
Malaysia	—	18	18	10
Myanmar	7	1	8	8
New Zealand	3	2	5	4
Papua New Guinea	3	—	3	2
Philippines	—	—	—	2
Taiwan	—	—	—	—
Thailand	2	6	8	9
Vietnam	—	9	9	10
Other	4	1	5	3
Subtotal	**129**	**120**	**249**	**217**
AFRICA				
Algeria	28	—	28	20
Angola	—	4	4	4
Congo	2	—	2	2
Gabon	—	2	2	2
Kenya	—	—	—	—
Libya	12	1	13	9
Nigeria	2	5	7	9
South Africa	—	—	—	—
Tunisia	2	2	4	—
Other	2	3	5	2
Subtotal	**48**	**17**	**65**	**48**
MIDDLE EAST				
Abu Dhabi	10	4	14	14
Dubai	2	—	2	2
Egypt	37	9	46	37
Iran	—	—	—	—
Iraq	—	—	—	—
Jordan	1	—	1	1
Kuwait	15	—	15	14
Oman	46	—	46	39
Pakistan	17	—	17	19
Qatar	2	12	14	11
Saudi Arabia	67	9	76	59
Sudan	—	—	—	—
Syria	21	—	21	22
Yemen	16	—	16	15
Other	1	—	1	2
Subtotal	**235**	**34**	**269**	**235**
EUROPE				
Croatia	—	—	—	1
Denmark	—	3	3	4
France	1	—	1	—
Germany	4	—	4	3
Hungary	2	—	2	4
Italy	2	—	2	3
Netherlands	1	3	4	5
Norway	—	13	13	19
Poland	2	—	2	2
Romania	2	—	2	2
Turkey	5	—	5	4
UK	1	22	23	27
Other	5	—	5	4
Subtotal	**25**	**41**	**66**	**78**
Total	**2,629**	**366**	**2,995**	**2,980**

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	292	2.45
Caribbean	Houston	Resid.	380	141	1.33
Caribbean	Houston	Resid.	500	131	1.23
N. Europe	New York	Dist.	200	281	3.76
N. Europe	Houston	Crude	400	173	3.39
W. Africa	Houston	Crude	910	115	2.49
Persian Gulf	Houston	Crude	1,900	65	2.61
W. Africa	N. Europe	Crude	910	112	1.80
Persian Gulf	N. Europe	Crude	1,900	65	1.90
Persian Gulf	Japan	Crude	1,750	68	1.62

*June 2007 average.
Source: Drewry Shipping Consultants Ltd. Data available in OGJ Online Research Center.

Waterborne Energy Inc. US LNG imports

Country	June 2007	May 2007	June 2006	Change from a year ago, %
	MMcf			
Algeria	11,300	24,760	2,800	303.6
Egypt	11,880	14,250	11,440	3.8
Equatorial Guinea	2,840	—	—	—
Nigeria	20,150	14,320	5,930	239.8
Qatar	5,760	2,930	—	—
Trinidad and Tobago	36,530	38,220	41,400	–11.8
Total	**88,460**	**94,750**	**61.570**	**43.7**

Source: Waterborne Energy Inc.
Data available in OGJ Online Research Center.

Baker Oil Tools workover rig count*

Region	June 2007	June 2006	Change, %
Gulf Coast	277	328	–15.5
Midcontinent	259	311	–16.7
Northeastern	90	88	2.3
Rocky Mountains	255	251	1.6
Southeastern	195	198	–1.5
West Texas	325	338	–3.8
Western	147	133	10.5
Total US	**1,548**	**1,647**	**–6.0**
Canada	486	760	–36.1
Total N. America	**2,034**	**2,407**	**–15.5**

*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

	May 2007	June 2007	May 2006	June 2006
	¢/gal			
Mont Belvieu	114.91	113.90	104.08	109.66
Conway	112.52	113.34	102.83	107.92
Northwest Europe	105.29	112.44	95.55	96.51

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					
June 2007						
Product revenues	94.96	87.43	93.20	93.27	82.89	77.61
Feedstock costs	–74.90	–72.22	–67.22	–63.52	–70.79	–70.69
Gross margin	20.06	15.21	25.98	29.75	12.10	6.92
Fixed costs	–2.05	–2.37	–2.31	–2.69	–2.31	–1.79
Variable costs	–2.18	–1.49	–1.94	–3.60	–2.56	–0.86
Cash operating margin	**15.83**	**11.35**	**21.73**	**23.46**	**7.23**	**4.27**
May 2007	22.84	14.74	34.25	31.04	8.81	4.30
YTD avg.	15.22	8.56	19.92	27.01	6.67	3.16
2006 avg.	12.49	6.01	14.99	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

May 2007	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	345.77	297.42	344.56	313.77
Taxes	59.92	38.40	62.79	51.98
Wholesale price	278.24	248.81	269.10	251.75
Spot price	270.94	234.20	252.91	233.57
Retail margin	7.87	10.21	12.67	10.04
Wholesale margin	7.30	14.61	16.19	18.18
Gross marketing margin	**15.17**	**24.82**	**28.86**	**28.22**
April 2007	6.79	14.66	15.78	21.71
YTD avg.	18.54	16.92	16.30	26.21
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: Margins include ethanol blending in all markets.

Muse, Stancil & Co. ethylene margins

	Ethane	Propane	Naphtha
	¢/lb ethylene		
June 2007			
Product revenues	55.75	95.65	115.53
Feedstock costs	–30.44	–64.84	–104.23
Gross margin	25.31	30.81	11.30
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–5.64	–6.67	–9.00
Cash operating margin	**14.29**	**17.78**	**–4.89**
May 2007	12.88	16.61	–9.22
YTD avg.	13.75	15.87	–8.75
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

June 2007	Gulf Coast	Mid-continent
	$/Mcf	
Gross revenue		
Gas	7.18	5.78
Liquids	1.20	3.45
Gas purchase cost	8.00	7.75
Operating costs	0.07	0.15
Cash operating margin	**0.32**	**1.33**
May 2007	0.33	1.29
YTD avg.	0.23	0.90
2006 avg.	0.26	0.97
2005 avg.	–0.06	0.25
2004 avg.	0.07	0.33
Breakeven producer payment % of liquids	71%	60%

Source: Muse, Stancil & Co. See OGJ, May 21, 2001, p. 54.
Data available in OGJ Online Research Center.

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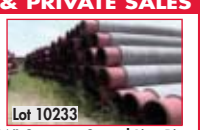
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Poison ivy seen as thriving on carbon dioxide

As if rising sea levels and malaria plagues weren't frightening enough, the world has another malign effect of global warming over which to panic: poison ivy.

News media recently reported a Duke University study showing that rising concentrations of carbon dioxide accelerate growth of the obnoxious vine through aerial fertilization. Worse, they increase potency of the substance that causes itchy rashes.

The Editor's Perspective

by Bob Tippee, Editor

Until now, supporters of aggressive warming prevention have scoffed at suggestions that CO_2 enrichment of the atmosphere might promote plant growth. Their political agenda treats CO_2 as a thoroughgoing scourge and resists hints of potential benefits.

But aerial fertilization suits that agenda when the main beneficiary is a plant nobody likes.

The Duke study controlled CO_2 levels in an experimental plot of a North Carolina forest. At rising levels, poison ivy grew faster and nastier. As another reason to fear global warming, the results became news.

As usual, however, things aren't that simple.

A study by Ronald Londre and Stefan Schnitzer of the University of Wisconsin-Milwaukee examined 45 years of data from 14 deciduous forests in southern Wisconsin to test the hypothesis that warming and CO_2 enrichment should push lianas—woody vines such as poison ivy—toward Earth's poles. In that study liana growth decreased in forest interiors, with the decline accelerating as a function of distance from forest edges.

"Our findings suggest that forest fragmentation, not climate change, is likely resulting in the increase in liana abundance in northern deciduous temperate forests and that lianas may further increase in abundance and impact if the severity of forest fragmentation intensifies," the researchers said.

CO_2 Science, an online magazine published by the Center for the Study of Carbon Dioxide and Global Change—which opposes aggressive prevention—opined on July 4 that the warming and increased CO_2 fertilization of the Londre and Schnitzer study period accelerated tree growth in forest interiors enough to deprive lianas of light.

If so, poison ivy would seem not to be the only plant able to benefit from rising CO_2 levels. But the implications for, say, global food supply are hardly frightening. They probably won't make the news.

(Online July 6, 2007; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

OPEC spare productive capacity 'diminished'

Increasing global demand for crude and natural production declines have diminished the excess productive capacity of the Organization of Petroleum Exporting Countries and its power to manipulate oil prices, said analysts J. Marshall Adkins and Collin Gerry in the Houston office of Raymond James & Associates Inc.

Saudi Arabia, OPEC's biggest oil producer, plans to raise its production capacity to 12.5 million b/d by 2012 from 10.5 million b/d currently. "For the record, we don't think the magnitude of this increase is attainable," said Adkins and Gerry in a July 9 report. "The more relevant issue is that declining productivity and political instability of other OPEC member nations are likely to mute any success that Saudi Arabia has with increasing OPEC's productive capacity," they said.

Potential OPEC production increases are offset by five member countries that are facing either permanent production declines or structural constraints, they said. "Over the past 40 years, OPEC has historically had a cushion of anywhere between 4-16 million b/d, excluding certain geopolitical events (which occurred mainly in the 1970s)," Raymond James reported. That gave the cartel its control of oil markets. "Today, OPEC's excess capacity has all but disappeared," the analysts said.

In October 2006, when domestic and international oil inventories were at relatively high levels and increasing, OPEC announced a two-part production cut that would take some 1.7 million b/d of crude off the market. In aggregate, the cartel successfully implemented more than half of the proposed cuts, between 1-1.2 million b/d with roughly half of that attributed to Saudi Arabia. "However, this may be somewhat misleading. Looking at the production trends over the past year, it appears that at least a third of the decline in OPEC production has been involuntary in nature," said Adkins and Gerry.

OPEC production now is 1.9 million b/d below its peak in October 2005. "It appears that nearly half of this decline is attributable to involuntary cuts" by Indonesia, Iran, Nigeria, and Venezuela, said the Raymond James analysts. The aggregate production of these four countries, "which constitutes 30% of total OPEC production, was declining well before the cartel initiated its official cuts," analysts said.

National breakdowns

Oil prices surged to 10-month highs July 6 as militants in Nigeria ended a month-long truce with an attack on a well site and the kidnapping of a 3-year-old British girl. The child was grabbed by gunmen July 5 as she was being dropped off at school in Port Harcourt by her father, an employee in the petroleum industry. She was released apparently unharmed July 8, but three foreign workers were abducted. More than 200 foreigners, mostly oil workers or members of their families, have been kidnapped in Nigeria since January 2006. Nearly all were subsequently released or freed by government soldiers.

"Because of these internal problems, Nigeria has been forced to shut in as much as 800,000–1 million b/d of production, and it now produces about 2 million b/d. We don't expect peace to break out in this country anytime soon. In fact, the recent escalation of kidnappings (particularly from offshore operations) is likely to drive more operators and service companies away from the region," said Adkins and Gerry.

Venezuela's access to foreign capital and technology has diminished rapidly in the last few years because of President Hugo Chavez's drive to again nationalize the country's petroleum resources. "Since early 2005, Venezuela's production has gradually and consistently declined from the 2.8 million b/d range to closer to 2.3 million b/d, which is a decline of 15% in just over 2 years. Without outside investment or know-how, that decline is likely to get worse before it gets better," the analysts said.

The political climate in Iraq and Iran is not conducive for foreign investment. Politics and sabotage have prevented Iraq from obtaining its pre-war production levels. US companies are prohibited from doing business in Iran, and many Europeans are afraid to make major investments. "Iran's production has been stagnating near the 3.9 million b/d level for 2½ years now. Without access to foreign capital, and more importantly, foreign technology and infrastructure, the prospect of increasing production meaningfully higher remains unlikely," analysts said.

"Indonesia's production stagnated for most of the 1990s until it began a permanent decline in 2000 from the 1.7 million b/d level to the current level of approximately 800,000 b/d. In fact, Indonesia is struggling to maintain its status as a net exporter of oil, as it now imports almost as much or more than it produces," Adkins and Gerry said.

(Online July 9, 2007; author's e-mail: samf@ogjonline.com)

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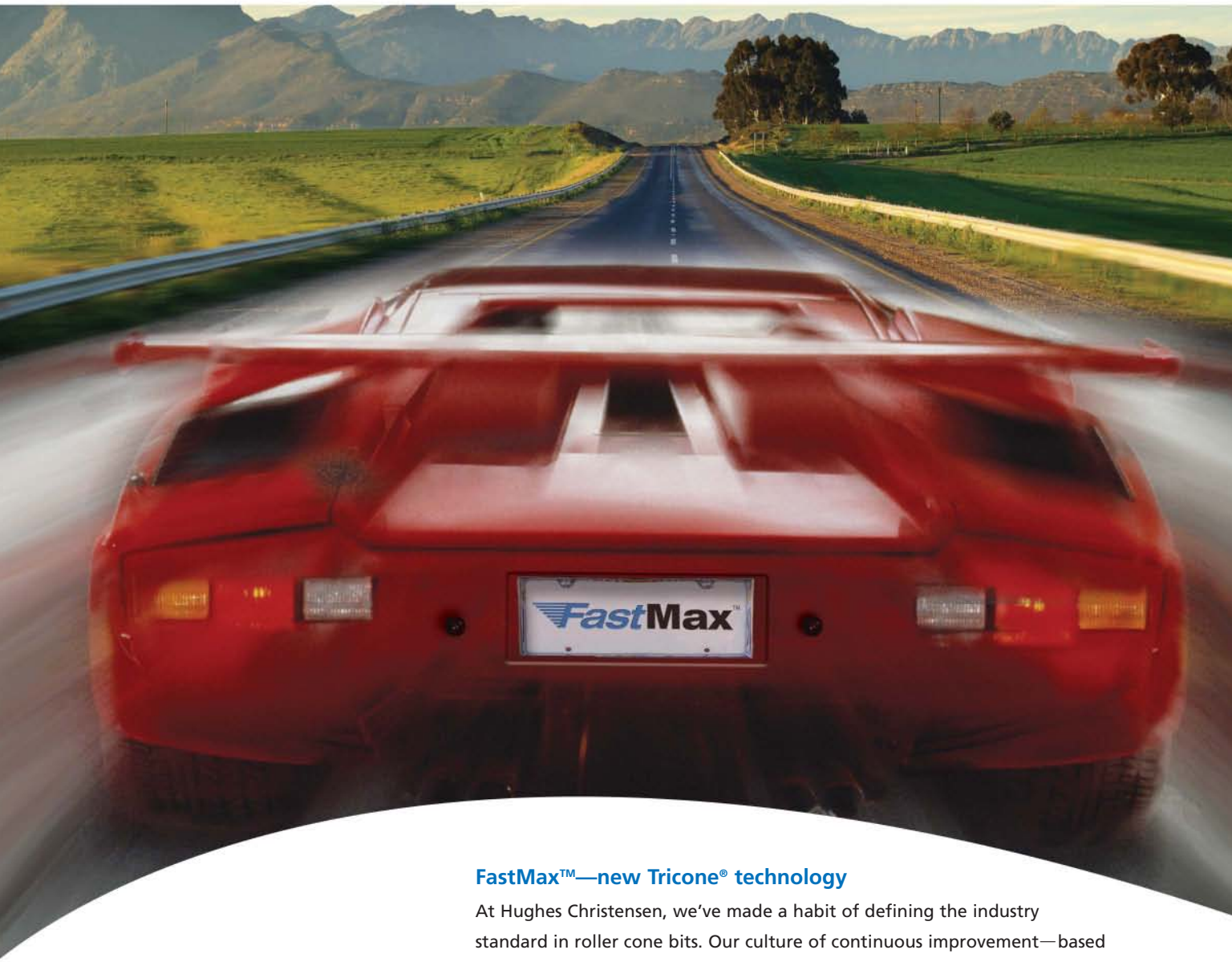

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