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HSE Report

High oil prices spawn political Dutch disease in the Kremlin
World giant oil discoveries seem not to be at an end
US propane production falling short of full-recovery volumes

OIL&GAS JOURNAL®

Nov. 6, 2006
Volume 104.41

HSE Report

Regular Features

Cover

Students battle simulated process-plant fires as part of extensive training at the Brayton Fire Training Field at the Texas Engineering Extension Service, College Station. TEEX is one of the best-equipped and staffed facilities in the US for such training, according to one of the articles in Oil & Gas Journal's exclusive HSE Report that begins on p. 37. Another article reports on a US government survey of off site commercial disposal practices, methods, and costs in major oil and gas producing states; a third reports on a plan to lower automotive accident rates and associated losses for a service company's Qatar oil field operations. (Photograph from TEEX)

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General Interest — Quick Takes

Shell platforms siege ended in Niger Delta

Nigerian villagers who took over three Royal Dutch Shell PLC oil platforms in the Niger Delta Oct. 25 agreed to end their siege and allow operations to resume.

Shell said members of the Kula community living near the Ekulama 1, Ekulama 2, and Belema oil pumping stations invaded the facilities, accusing Shell of failing to meet the terms of an agreement to provide them aid.

The villagers were persuaded to leave the facilities after intervention by the Rivers State government in charge of the area. Shell officials also confirmed that an agreement was reached with the protesters to quit the facilities.

Shell said the company planned to reopen the platforms immediately following the departure of the villagers. The spokesman said no hostages had been taken.

ExxonMobil, CNPC ink Sakhalin-1 gas preaccord

ExxonMobil Corp. has signed a preliminary agreement on principles with China National Petroleum Corp. (CNPC) for the supply of natural gas from the Russian Sakhalin-1 project.

An ExxonMobil spokesman said the agreement, which defines the obligations of both parties and the principles of price formation, calls for gas to be delivered to northeastern China, but he did not identify the quantities involved, pricing, or when deliveries would begin.

The deal resulted from a November 2004 memorandum of understanding, and the representative said the preliminary document is expected to lead to an official agreement.

Earlier, ExxonMobil said it is ready to deliver 8 billion cu m/year of gas to China.

Currently, gas is delivered in small amounts, as much as 1 billion cu m, to enterprises in Russia's Khabarovsk territory.

Sakhalin-2 status decision due in late November

Russia's Natural Resources Minister Yuri Trutnev said Nov. 1 that a final decision on the future of the Sakhalin-2 project likely will be made jointly with the Cabinet later in November, possibly in the third week.

Trutnev told journalists his ministry was prepared to give the project's operator Sakhalin Energy Co. an extra week to present a plan outlining efforts to correct what he called "the ecological abuse" discovered by the government's recent inspection of the site.

In late October, Trutnev said construction on several sections of the Sakhalin-2 onshore pipeline system had to be halted for environmental legislation violations (OGJ Online, Oct. 25, 2006).

Putin seeks EU energy demand security

Russian President Vladimir Putin has hardened doubts that he'll ratify the Energy Charter on cooperation with Europe, which his country entered 10 years ago.

At a press conference after an informal dinner with the heads of the 25 European Union states in Lahti, Finland, Putin called for changes to parts of the charter involving access to gas and oil pipelines. He voiced concern about spot deliveries.

Putin said he wants Russia to become integral to the European gas market and advocated interdependence between his country and the EU as the only way to secure "demand security."

Russia raised alarms in Europe about supply security last winter when it curtailed deliveries to Ukraine, a transit country for pipeline supplies to Europe, in a price dispute.

"Russia is more dependent on the EU today than the other way around," Putin said.

On Russia's decision to develop Shtokman gas-condensate field in the Barents Sea alone, Putin said, "Gazprom had analyzed the proposals of foreign companies and decided it was not happy with them. But it does not mean Russia rejects cooperation with foreign partners (OGJ, Oct. 16, 2006, p. 20)." He said foreign companies could be involved as "coexecutives, to solve management issues as well as technical implementation."

FERC streamlines rules on gas from LNG

The US Federal Energy Regulatory Commission broadened its rules on natural gas projects eligible to proceed without a specific, case-by-case FERC authorization.

On Oct. 19, FERC approved a final rule expanding blanket certificate eligibility for projects at storage facilities, pipelines, and facilities to transport gas from LNG receiving terminals.

Blanket certificates are granted to companies already having FERC project approval. These certificates allow companies to improve or upgrade facilities or build new facilities without case-by-case certificate authorization.

The latest ruling raised the cost limits for blanket certificate projects to $9.6 million from $8.2 million for automatic authorizations and to $27.4 million from $22.7 million for prior-notice projects, which require FERC review.

Argentina, Boliva sign natural gas accord

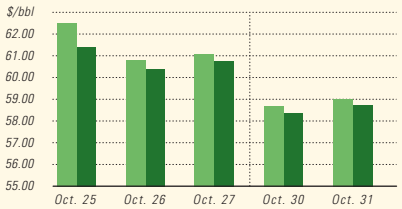
Argentine President Nestor Kirchner and Bolivia President Evo Morales on Oct. 19 signed a natural gas accord calling for $1 billion worth of investments to increase the flow of Bolivian gas into Argentina.

The 20-year accord signed in Santa Cruz, Bolivia, calls for Argentina to receive 27.7 million cu m/day of Bolivian gas by 2010.

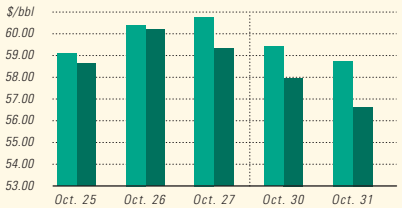
Argentina already held contracts to import 7.7 million cu m/day, although current shipments average 4.5 million cu m/day, said Bolivia's state-owned Yacimientos Petroliferos Fiscales Bolivianos. ✦

Industry Scoreboard

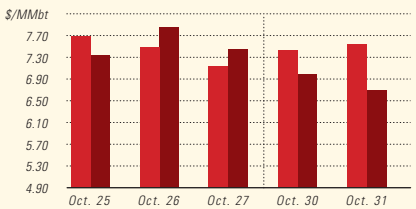
IPE BRENT / NYMEX LIGHT SWEET CRUDE



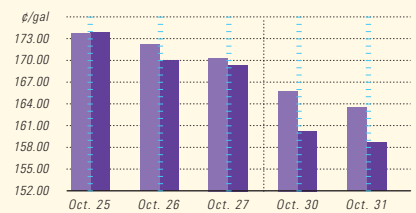
WTI CUSHING / BRENT SPOT



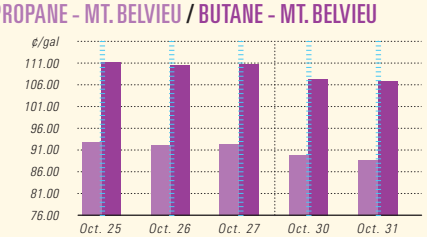
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



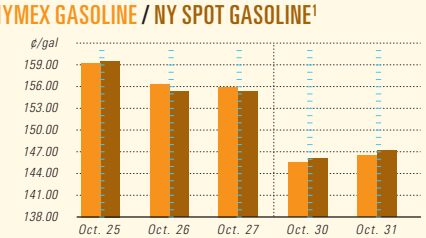
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



NYMEX GASOLINE / NY SPOT GASOLINE[1]



[1]Nonoxygenated regular unleaded.

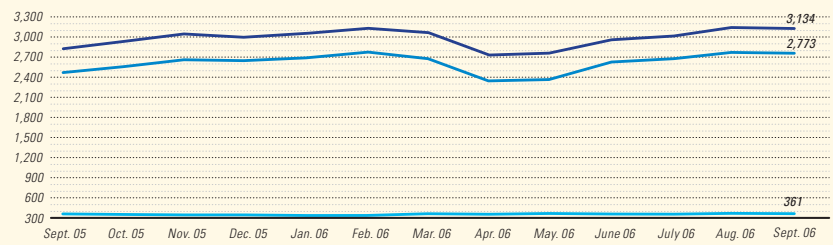
US INDUSTRY SCOREBOARD — 11/6

Latest week 10/27	4 wk. average	4 wk. avg. year ago[1]	Change, %	YTD average[1]	YTD avg. year ago[1]	Change, %
Demand, 1,000 b/d						
Motor gasoline	10,531	9,009	16.9	9,832	9,115	7.9
Distillate	4,410	4,073	8.3	4,139	4,096	1.0
Jet fuel	1,619	1,615	0.2	1,602	1,619	–1.0
Residual	492	978	–49.7	740	899	–17.7
Other products	5,078	4,506	12.7	4,942	4,863	1.6
TOTAL DEMAND	22,129	20,180	9.7	21,255	20,593	3.2
Supply, 1,000 b/d						
Crude production	5,209	4,247	22.6	5,111	5,175	–1.2
NGL production	2,399	1,534	56.4	2,227	1,745	27.6
Crude imports	10,450	9,369	11.5	10,263	9,996	2.7
Product imports	3,294	4,659	–29.3	3,465	3,437	0.8
Other supply[2]	1,132	1,080	4.8	1,091	1,252	–12.9
TOTAL SUPPLY	22,484	20,889	7.6	22,157	21,605	2.6
Refining, 1,000 b/d						
Crude runs to stills	15,083	13,658	10.4	15,159	15,239	–0.5
Input to crude stills	15,621	13,998	11.6	15,585	15,526	0.4
% utilization	90.1	81.7	—	90.6	90.7	—

Latest week 10/27	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	334,112	330,634	3,478	321,781	12,331	3.8
Motor gasoline	203,785	206,943	–3,158	198,969	4,816	2.4
Distillate	143,088	143,833	–745	126,396	16,692	13.2
Jet fuel	41,154	40,581	573	36,730	4,424	12.0
Residual	43,831	43,363	468	35,138	8,693	24.7
Futures prices[3]						
Light sweet crude, $/bbl	60.47	57.98	2.49	61.15	–0.68	–1.1
Natural gas, $/MMbtu	7.26	6.81	0.45	13.65	–6.39	–46.8

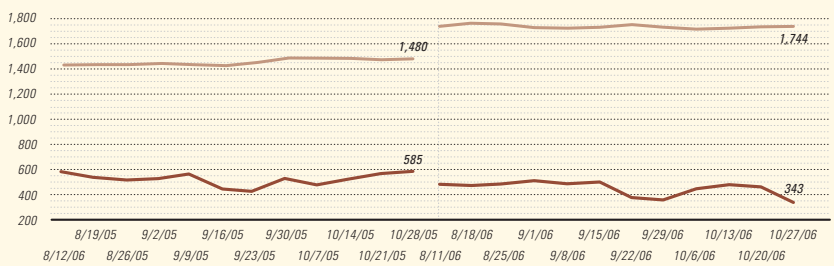
[1]Based on revised figures. [2]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil.
[3]Weekly average of daily closing futures prices.

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



Note: Monthly average count

BAKER HUGHES RIG COUNT: US / CANADA



Note: End of week average count

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Spar planned for Perdido fields in deep gulf

Shell Offshore Inc. and partners will install a production spar in what Shell says will be a world record water depth to develop three oil fields along the Perdido fold belt in the Gulf of Mexico.

It will moor the regional direct-vertical-access spar in 8,000 ft of water to handle production from Great White, Tobago, and Silvertip fields in the Alaminos Canyon area (see map, OGJ, Sept. 25, 2006, p. 36). Production from other fields in the region can be tied in as processing capacity becomes available.

The spar will be able to handle production of 100,000 b/d of oil and 200 MMscfd of gas, expected to begin "at the turn of the decade," according to Shell. It will have subsea lifting or boosting to move produced fluids from the seafloor to topsides.

The common processing hub, on Alaminos Canyon Block 857 near the Great White discovery, will have a drilling and completion rig and will gather, process, and transport production from wet trees as far away as 30 miles. Pipelines from the facility will connect to undisclosed locations in Texas.

The area has water depths of 7,500-10,000 ft and a rugged seabed. Marvin Odum, Shell executive vice-president, EP Americas, said the project will initiate production from the gulf's Lower Tertiary play.

Shell will operate the hub, called Perdido Regional Host, with a 35% interest. Other interests are Chevron Corp., 37.5%, and BP PLC, 27.5%.

Shell also operates the fields identified for development, none of which have had production tests. The reservoirs have temperatures of 150-200° F. and pressures of 5,000-9,000 psi. They produce oil of 20-40° gravity.

Shell has drilled five wells in Great White field, discovered in 2002 by a well that reached 14,405 ft TVD in 8,009 ft of water. The most recent Great White well was spudded in March 2004.

Shell holds 33.34% interest in Great White, which is on Alaminos Canyon Blocks 812, 813, 814, 857, 900, and 901. Chevron and BP hold 33.33% each.

Tobago field lies in 9,600 ft of water on Alaminos Canyon 859. Unocal Corp. discovered it in 2004 with a well that reached 18,510 ft TD (OGJ, May 10, 2004, Newsletter). A sidetrack reached 18,425 ft. Tobago interests are Shell 32.5%, Chevron 57.5%, and Nexen 10%.

Chevron made the Silvertip discovery on Alaminos Canyon Block 815 with the AC 815 No. 1 well, drilled to 14,778 ft TD in 9,200 ft of water in August 2004. Chevron holds 60% and Shell, 40%.

Aramco lets FEED contract for Manifa field

Saudi Aramco has let a front-end engineering and design (FEED) and project management services contract to two units of Foster Wheeler Ltd. for development of offshore Manifa oil and gas field. The field will produce 900,000 b/d of Arab Heavy crude (OGJ, Oct. 16, 2006, Newsletter).

Foster Wheeler Energy Ltd. and Foster Wheeler Arabia Ltd. will conduct FEED for the onshore central processing facility and the expansion of gas facilities at Khursaniyah; detailed design support; purchasing assistance for long-lead items; coordination of the FEED development work performed by subcontractors for other elements of the program, including the offshore facilities; and development of the bid package for the invitation to bid for engineering, procurement, and construction of the onshore facilities.

Completion of the FEED is expected in third quarter 2007. Further details of the contract were not disclosed.

The Manifa Arabian Heavy Crude project includes development of giant offshore Manifa field, construction of gas-oil separation plants and crude stabilization units and separators, as well as the expansion of the Khursaniyah Gas Plant to process the associated sour gas. The project is scheduled for completion in mid-2011.

BP has 11th oil strike on Angola Block 31

BP Exploration (Angola) PLC and state-owned Sonangol have discovered oil for the 11th time in ultradeepwater Block 31 off Angola.

The GlobalSantaFe Corp. Jack Ryan drillship drilled the Titania well in 2,152 m of water 23 km northwest of the Hebe oil discovery, announced in the fourth quarter of 2005.

Titania reached a TD of 5,339 m below sea level, penetrating Oligo-Miocene sands. It's Block 31's second subsalt discovery.

Titania flowed on test at the rate of 2,045 b/d through a $^{20}/_{64}$-in. choke.

A BP spokesman told OGJ that a front-end engineering and design contract might be let by yearend for development of Block 31's first four discoveries, which are in the northeast part. "We don't know when production would begin," he added.

The other seven discoveries, including Titania, are in the southeast part of the block. BP is considering development options.

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

BP is the operator with a 26.67% interest. Other interests are Sonangol 20%, Esso Exploration & Production Angola (Block 31) Ltd. 25%, Statoil Angola AS 13.33%, Marathon International Petroleum Angola Block 31 Ltd. 10%, and TEPA (Block 31) Ltd., a subsidiary of Total SA, 5%.

RWE Dea makes oil find in Libya

Germany's RWE Dea AG made an oil discovery with its A1-NC 193 well drilled in Libya's Sirte basin 500 km southeast of Tripoli.

The well, drilled to 4,214 ft with the Arab Drilling & Workover Co. Adwoc Rig 2, intersected the Paleocene Dahra formation and, on test, flowed 35° gravity oil at 410 b/d through a $^{32}/_{64}$-in. choke.

The A1-NC-193 well is the first in a 10-well minimum drilling campaign in six RWE Dea licenses—NC 193, 194, 195, 196, 197, and 198. The drilling program, which will use as many as three drilling rigs, follows a comprehensive seismic acquisition campaign in which 3,200 line-km of 2D and 2,400 sq km of 3D data were acquired in the identified licenses.

The rig is being moved to drill the next location—B1-NC 193.

Energen, Chesapeake eye Alabama gas shales

Energen Corp., Birmingham, Ala., sold to Chesapeake Energy Corp., Oklahoma City, a 50% interest in its lease position in various shale plays in Alabama for cash and a carried drilling interest.

The two companies also agreed to form an area of mutual interest to focus on the further exploration and development of the shale plays throughout Alabama.

Energen Resources received $75 million cash from Chesapeake for half interest in Energen's existing 200,000 net acre shale lease position. Chesapeake will pay the first $15 million of Energen's share of drilling costs.

The companies will partner 50-50 on new lease acquisitions, development, and operations in the AMI for at least the next 10 years.

Energen said it is Alabama's largest producer of onshore gas, has extensive knowledge of coalbed methane and other tight formations, and has extensive geological expertise in the state.

Chesapeake said the deal "accomplishes our goal of building a significant leasehold position in every major shale play east of the Rockies."

The Oklahoma City company owns 4.25 million net acres of prospective shale leasehold onshore in the US, which it believes is industry's largest shale leasehold position.

Barnett shale play to grow in Arlington

Two Fort Worth independent operators reached agreement with the city council of Arlington, Tex., on lease terms covering acreage under Lake Arlington and other tracts in the vicinity.

The agreement with Quicksilver Resources Inc. and private Marshall R. Young Oil Co. call for the city to receive a 27.7% royalty and $11,777/acre bonus payment.

The lease covers 1,442.6 net acres of city-owned minerals under Lake Arlington, which overlies 2,250 surface acres in Tarrant County between Fort Worth and Arlington.

When added to acreage the companies previously acquired, Quicksilver and Young will hold 4,800 net acres at 75% average net revenue interest and $5,400/acre average bonus. The acreage could provide as many as 75 development locations that Quicksilver said enhance its plans "for increasing natural gas production and reserves from the Barnett shale in the Fort Worth basin."

Quicksilver will operate the lease and own 75% working interest. The city adopted a gas drilling and production ordinance on Dec. 20, 2005. ✦

Drilling & Production — *Quick Takes*

Contractors work to stem mud flow in East Java

Santos Ltd. reported that Boots & Coots International Well Control Inc. has started drilling a relief well near the Banja-Panji-1 gas well in Sidoarjo, East Java.

Mud began flowing on May 29 about 200 m from the Banjaa Panji 1 well, drilled to 2,833 m. The mud continues to flow at an estimated 100,000 cu m/day.

The mud flow, which involves hydrogen sulfide, has inundated at least eight villages, displaced thousands of villagers, ruined crops, and cut off roads.

Banjar Panji 1 targets Miocene Kujung formation reefal carbonates on the eastern margin of Wunut gas field, which produces from Pleistocene volcaniclastic sand.

The underground blowout occurred at about 2,700 m, just above a high-pressure water zone. A total of 1,000 acres reportedly was under several meters of mud.

A group of international contractors, including Boots & Coots, spudded a relief well about 500 m south-southwest of the Banjar Panji. A second relief well is planned from the north-northwest.

Santos refuses to discuss the possible cause of the well's blowout because of an investigation being conducted by BPMigas, Indonesia's oil and gas regulator.

Well operator Lapindo Brantas Inc. initially blamed the mud flow on an earthquake in central Java, but the National Disaster Study Centre reported the earthquake barely affected east Java.

Lapindo estimates the total costs for drilling relief wells and mud management to be $180 million, which "includes assumptions and may require further adjustment when estimates relating to the cost of long-term mud disposal options, proposed cost of infrastructure relocation, and costs relating to unrealized third-party claims are known," Lapindo said in a statement.

"With the [mud] flow continuing, the complexity of the event, and the dynamic nature of the ongoing work, it is not possible to accurately estimate a total rectification cost at this time," the company said.

Lapindo has 50% interest in the Brantas production-sharing contract. Partners are PT Medco E&P Brantas, with 32% interest, and Santos Brantas Pty. Ltd., 18% interest.

Statoil begins production via new subsea template

Statoil ASA on Oct. 18 began production from one of the two wells tied in to the subsea K Template recently installed in Norne oil field in the Norwegian Sea.

The four-slot seabed K template is a typical subsea satellite development tied in to existing infrastructure (OGJ, July 18, 2005, p. 42).

Terje Overvik, executive vice-president for exploration and production Norway, said production from the new subsea template will prolong the field's life and help Statoil achieve its production target of 1 million boe/d until 2015 from the Norwegian continental shelf.

With the 750 million kroner investment in the Norne improved recovery project, which includes installation of the K template and the drilling and completion of two wells, Statoil expects to recover 10 million bbl of oil.

Production from the other well, which is to be commissioned by Transocean Inc.'s Transocean Arctic semisubmersible drilling rig, is expected to begin at the end of the same month.

The field's development solution allows for the drilling of yet two more wells from the K template. ✦

Processing — *Quick Takes*

Lurgi building 31 biodiesel plants worldwide

Lurgi AG reports that it currently is engineering and building 31 biodiesel plants with total capacity of more than 4.2 million tonnes/year.

The company, a global leader in biodiesel plant construction, received orders for seven plants during the third quarter.

Those plants, in Argentina, Malaysia, France, and Indonesia, will have individual capacities of 100,000-250,000 tonnes/year. Their feedstocks will be rapeseed, soybean, and palm oil, depending on location.

Chevron, UC Davis team up in biofuels research

Chevron Technology Ventures LLC plans to provide as much as $25 million to scientists and engineers at the University of California, Davis, to develop technology for converting cellulosic biomass into transportation fuels.

The 5-year program, which calls for research in biochemical and thermochemical conversion, seeks to develop commercially viable processes for the production of transportation fuels from forest and agricultural residues, municipal solid waste, and other renewable resources, said parent company Chevron Corp. The joint research effort will coordinate with the California Biomass Collaborative (CBC) to focus on California's renewable feedstocks such as rice straw, an agricultural waste.

It also proposes a demonstration facility to test the commercial readiness of the technologies.

Research will focus on four areas:

- Understanding existing California biofuel feedstock characteristics.
- Developing additional feedstocks optimized for such features as drought tolerance, minimal land requirements, harvesting technology.
- Production of cellulosic biofuels.
- Design and construction of a demonstration facility for biochemical and thermochemical production processes.

Chevron taps Praxair for large hydrogen plant

Chevron Products Co. has completed an agreement with Praxair Inc. for a hydrogen plant at its 240,000-b/d Richmond, Calif., refinery that the technology provider says will be the largest it has ever built.

Praxair, Danbury, Conn., will use reformer technology and engineering and construction services of Lurgi AG for the two-train, 260-MMcfd complex.

Lurgi has engineered and built more than 25 hydrogen plants worldwide and more than 100 steam reforming units for the production of hydrogen, carbon monoxide, or synthesis gas.

The Richmond hydrogen plant is due on stream in 2008. Praxair will operate the facility. It will build a pipeline network to connect the plant with the Chevron refinery and other refineries in northern California. ✦

Transportation — *Quick Takes*

Mexico's Altamira LNG terminal starts up

The Altamira LNG regasification terminal near Tampico, Mexico, began commercial operations late last month, reports Total SA, a 25% stakeholder in the two companies involved in the project.

Terminal de LNG de Altamira, which owns and operates the terminal, is a joint venture of Shell 50%, Mitsui 25%, and Total 25% (OGJ Online, Aug. 28, 2006).

Gas del Litoral, the marketing arm for the project owned 75% by Shell and 25% by Total, has signed a 15-year contract with Mexican electric utility Comisión Federal de Electricidad to supply 5 billion cu m/year of gas from the terminal.

Dana Gas group plans Karachi LNG terminal

A consortium of Dana Gas, Single Buoy Moorings (SBM), and Granada Group has signed a memorandum of understanding to develop a 3.5 million tonne/year LNG terminal in Pakistan at Karachi's Port Qasim.

Dana Gas is a regional gas company based in Sharjah. It has plans to develop a network of LNG terminals, mainly in the Middle East and North Africa, and "to tap the LNG value chain, including LNG trading activities." The company said the consortium is holding talks with major LNG producers, which it did not name.

Dana Gas has signed a cooperation agreement with SBM under which Dana would focus on LNG marketing and SBM on the supply and operation of LNG floating storage and regasification terminals.

"The newly formed alliance will initially target LNG terminal projects in Pakistan, Lebanon and Kuwait," Dana said.

Dana Gas started business in July 2005 as "a regional, private-sector natural gas resource enterprise," affiliated with Crescent Petroleum of Sharjah.

Its Sajaa Gas PLC unit (SajGas) operates a 600 MMscfd gas treatment plant completed in November 2005 in the Sajaa area of Sharjah.

Another unit, United Gas Transmissions Co. Ltd. (UGTC), will operate a gas receiving platform connected to Crescent facilities in offshore Mubarak gas field and an 80-km, 30-in. gas pipeline from the receiving platform to SajGas facilities onshore for sweetening. The platform and pipeline are under construction.

UGTC plans a pipeline to transport sweet gas in Sharjah and has an agreement to build, own, and operate a common-user gas pipeline from Sajaa to the Sharjah Hamriya Free Zone.

ETNG starts service via new pipeline lateral

East Tennessee Natural Gas LLC (ETNG), a unit of Duke Energy Gas Transmission, has placed into service its 32-mile Jewell Ridge pipeline, which will transport up to 235 MMcfd of natural gas from the Appalachian basin to the US Southeast.

The 20-in. lateral, from a compressor station northwest of Richlands, Va., connects the western Virginia operations of CNX Gas Co. LLC via the existing Cardinal States Gathering System in Tazewell County, to ETNG's mainline near Marion in Smyth County. It also will interconnect with the Williams Cos. Inc. Transco interstate pipeline at Cascade Creek, NC. ✦

Calendar

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

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AAPG International Conference and Exhibition, San Juan, (918) 584-2555, (918) 560-2694 (fax), e-mail: postmaster@aapg.org, website: www.aapg.org. 4-7.

AAPG International Conference & Exhibition, Perth, (918) 584-2555, (918) 560-2694 (fax), e-mail: postmaster@aapg.org, website: www.aapg.org. 5-8.

Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC), Abu Dhabi, +971 2 4446900, +971 2 4446135 (fax), e-mail: adipec@adnec.ae, website: www.adipec.com. 5-8.

Purvin & Gertz Latin America LPG Seminar, Panama City, (713) 236-0318, (713) 331-4000 (fax), website: www.purvingertz.com/seminars. 6-9.

Oil Depletion Conference, London, +44 (0) 20 7467 7100, +44 (0) 20 7255 1472, e-mail: info@energyinst.org.uk, website: www.energyinst.org.uk. 7.

IADC International Well Control Conference & Exhibition, Abu Dhabi, (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 7-8.

Annual Petroleum Exhibition & Conference of Mexico, Villahermosa, (713) 529-1616, (713) 821-1169 (fax), e-mail: sales@ieimail.com, website: www.oilonline.com/mexico. 7-9.

International Marine Gas CNG Standards Forum, St. John's, Newf., (709) 754-9880, (709) 754-9881 (fax), e-mail: info@cmcng.com, website: www.cmcng.com. 7-9.

International Petroleum & Petrochemical Exhibition, Beijing, (301) 493-5500, (301) 493-5705 (fax), e-mail: stout@ejkrause.com, website: www.ejkcn.com/ippe06/ippe06.htm. 7-10.

✦IADC Contracts & Risk Management Conference, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: info@iadc.org, website: www.iadc.org. 8-9.

✦Independent Liquid Terminals Association Annual Meeting, Seattle, (202) 842-9200, (202) 326-8660 (fax), e-mail: info@ilta.org, website: www.ilta.org. 8-10.

GPA North Texas Annual Meeting, Dallas, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 9.

AIChE Annual Meeting, San Francisco, (212) 591-7338, (212) 591-8894 (fax), e-mail: meetmail@aiche.org, website: www.aiche.org. 12-17.

ERTC Annual Meeting, Paris, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 13-15.

IADC/SPE Asia Pacific Drilling Technology Conference, Bangkok, (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 13-15.

Gulf Coast Well Control Conference, Houston, (979) 845-7081, (979) 458-1844 (fax), e-mail: kharli@pe.tamu.edu, website: http://WellCTRL.org. 15-16.

Annual Unconventional Gas Conference, Calgary, Alta., (403) 218-7721, (403) 920-0054, e-mail: info@csug.ca, website: www.csug.ca. 15-17.

European Biofuels Forum, Warsaw, 0044 20 7067 1800, 0044 20 7430 9513 (fax), e-mail: c.taylor@theenergyexchange.co.uk, website: www.wraconferences.com/wra112overview.html. 21-22.

PETEX Conference & Exhibition, Olympia, London, +44 (0)20 7408 2000, +44 (0)20 7408 2050 (fax), e-mail: petex@pesgb.org.uk, website: www.pesgb.org.uk. 21-23.

International Symposium on Protective Coatings, Bombay, 022-25767891, 022-25723480 (fax), e-mail: khanna@iitb.ac.in. 24-26.

Petrochem Arabia Conference, Dubai, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 26-27.

✦Process Industry Maintenance Summit, Antwerp, 44 207 368 9579, 44 207 368 9401 (fax), e-mail: kate.warren@wbr.co.uk, website: www.wbr.co.uk/maintenanceeurope/index.html. 27-30.

Marine transfer gear evolves

Bob Tippee
Editor

If you've never ridden a crane-hoisted rope basket from one place to another, you probably haven't spent much time on offshore oil and gas equipment. It's the offshore industry's main way of moving people onto and off of installations where helicopters don't do the job.

The procedure is straightforward: put one foot on the flotation ring, one on the deck, and clutch ropes; step fully aboard at lift-off; continue clutching ropes as the crane lifts basket and souls on board up and out over the water then down onto the target deck.

The adventure ends too soon for some, too late for others. Few riders need to be told twice about that rope-clutching business.

First ride

In some places, a first "Billy Pugh" ride is a rite of passage. Billy Pugh Co., Corpus Christi, Tex., makes most of the rope baskets used for crane personnel transfers and has 6,000-7,000 of them in use worldwide.

Recently, new transfer devices have appeared on platform and rig decks. The evolution comes as the industry takes a new look at the safety of worker transfers.

"Every year, Billy Pugh personnel nets are involved in millions (we roughly estimate 3-4 million) of offshore personnel transfers (all over the world) with VERY few mishaps or accidents," says the Billy Pugh web site.

Yet hard numbers don't exist. The reason may be that there are relatively few serious incidents to count. Still, a Billy Pugh competitor sees a data void.

Philip Strong, managing director of Reflex Marine Ltd., Aberdeen, considers crane transfers of offshore workers "relatively safe." But he worries about varying standards and a lack of information on transfer activity and accidents.

The aviation business, he notes, operates by strict standards and collects data on helicopter transfers of offshore workers. No such systematic data exist for crane transfers.

From a record search, Reflex Marine assembled global information on about 60 crane-transfer incidents associated with 36 injuries and 4 deaths. Of those incidents, most of which occurred within the past 10 years, 21% involved lateral impact and falling, 25% falling, 13% trip and entanglement, 25% heavy landing, 12% the deck crew, and 4% immersion.

"Most of it is fairly intuitive—except the large number of incidents during pick up, which surprises a lot of people," Strong says. The fatalities resulted from falls.

Strong thinks some transfer incidents escape industry notice because boat owners, rather than oil companies, report them as marine accidents. He advocates centralized collation of data, along with improved monitoring of marine operations, better understanding of risk, and uniform standards.

Reflex Marine has developed a transfer capsule called the Frog, of which nearly 300 units are in use worldwide. Instead of standing and holding onto a collapsible rope net, Frog riders strap into seats, three at a time, inside a rigid, triangular pyramid frame with open sides. Unlike that of the rope basket, the Frog's bottom has springs for hard landings.

Paul Liberato, president of Billy Pugh since 1989, acknowledges the sparseness of numbers on crane-transfer incidents. He doubts, however, that the data ever will be as complete as those covering helicopter transfers, where accidents tend to be catastrophic.

In the last 3-4 years, Liberato says, industry interest in the safety of offshore personnel transfers has increased.

"It's really becoming a priority," he notes. "We need to be serious about it."

Liberato thinks accidents may have increased along with interest because of a recent surge in the number of inexperienced offshore workers.

New basket

Billy Pugh has introduced a collapsible carrier that provides some of the protection of rigid frames such as the Frog. Called the X-904, the new device allows riders to stand and hold onto ropes. But it adds protection against falling objects with an overhead shield and against side impacts with outer cables that stiffen when tension is applied to a central pole. Riders attach themselves to the X-904 with quick-release safety clips. The bottom has springs.

Billy Pugh wanted its follow-on design to "look and perform much like a personnel net" because offshore workers "like the current personnel net and don't want to change." The web site points out, however, that many large oil companies are trying to reduce the human factor in safety management.

Without question, the human factor figures prominently in any system—whatever its safety record—whose defining feature is the need to hold on for dear life. ✦

Editorial

Energy and US elections

Yes, Nancy Pelosi has argued for a windfall profit tax on oil companies. Yes, that position reflects misunderstanding of US energy needs. And, yes, the California Democrat will become speaker if her party wins control of the House of Representatives in this week's general election. But no, Democratic takeover of the House and, maybe, Senate wouldn't mean ruin for US energy.

Republicans have controlled the House since 1995 and the Senate most of the time since then. They've controlled the White House since 2001. Has Congress approved leasing of the Arctic National Wildlife Refuge coastal plain? No. Has it dismantled hurdles to leasing of the Outer Continental Shelf off the East and West Coasts and in the Gulf of Mexico off Florida? No. Although proposals have come and go, there's still no leasing. So Republicans have dominated US politics to varying degrees for a decade but haven't managed to implement either of the two most important steps the US government can take on energy supply.

Supply steps?

It hasn't been all bad with Republicans. There have been some improvements to taxation of domestic producers and to leasing and permitting of onshore federal acreage. And the Republican administration has tried to clarify the confusion into which its predecessor threw refiners by retrospectively reinterpreting the Clean Air Act's New Source Review program.

But the need for big energy-supply steps and the inescapably large involvement of hydrocarbons should have become clear. With one qualified exception, no such step has been taken.

The exception is passage of the Deepwater Royalty Relief Act of 1995, which fostered an industry that now represents the principal growth area for US oil and gas supply. While enactment came after Republicans claimed Congress, the political work got done before the power change. Without the sponsorship of former Democratic Sen. J. Bennett Johnston of Louisiana and support—which took a while to materialize—of the Democratic Clinton administration, this most important energy-supply move since price decontrol wouldn't have occurred.

Republicans can claim no such triumph of their own. In fact, under the Republicans, energy policy has degenerated into a competition for taxpayer funding of marginal energy forms.

Bush has set the regrettable tone for this with his optimistic push for hydrogen vehicle fuel, declaration that his country is addicted to oil, and repeated calls to move the US away from oil. Sensible Republicans in the congressional leadership could have given these ambitions helpful perspective by asking how much it all might cost. But House Speaker Dennis Hastert of Illinois and Senate Majority Bill Frist of Tennessee have been too busy calling, hand-in-hand with their Democratic colleagues, for investigations into gasoline "price-gouging."

With energy, Republicans have renounced markets. They have abandoned the only ideological platform from which they can do legitimate battle with the state-centered energy fantasies normally associated with the other party. So energy policy has become a catalog of political wishes, marketed under the delusion of energy independence.

Democratic takeover of at least the House would help clarify beliefs about what's sensible and what's not in energy policy. And it would force the oil and gas industry, acting in self-defense, to withdraw from the cannibalistic power cycle of political incumbency and embrace a new constituency.

The industry's constituency should be energy consumers. As has been argued here before, that group gets little attention when politicians and regulators begin promoting—which means throwing public money at—exotic fuels for gauzy reasons. When this happens, consumers, who also are taxpayers, get stuck with sneaky bills for hopeless energy programs.

Limiting damage

The oil and gas industry can limit the damage by making consumer interests its political priority. It should support no energy proposal and accept no political compromise that raises private or public costs without producing certain and measurable benefit. Consumer protection is a void in modern energy politics. Filling it represents an opportunity.

So here's a practice question: If Pelosi becomes speaker of the House, why should energy consumers resist the proposal she probably will make for a windfall profit tax on oil? ✦

Intoxicated by high oil prices: Political Dutch disease afflicting the Kremlin

Vladimir Shlapentokh
Michigan State University
East Lansing, Mich.

There were two leaders in Soviet history who were strongly influenced by specific national achievements. For Joseph Stalin, it was the victory over Nazi Germany in 1945 and the first test of a nuclear bomb in 1949. For Nikita Khrushchev, success came with the launch of Sputnik in 1957 and the first human space flight by Yuri Gagarin in 1961.

Encouraged by these accomplishments, both leaders turned a blind eye to the country's economic weaknesses and brazenly defied the US and its allies. The triumphs also boosted the moods of the ruling elite and the majority of the population. During these periods, the country as a whole enjoyed a heightened level of confidence and a sense of ideological and military superiority over the US.

The euphoria generated by the Soviet army's victory over Germany explained why, despite Western resistance, Stalin was emboldened to take control of Eastern Europe in 1946-47, triggering the Cold War. The same assertiveness fueled the dangerous Berlin crisis in 1948 when American and Soviet tanks squared off. A few years later in June 1950, Stalin encouraged or at least permitted Kim Il-sung to trigger a "hot war" in Korea.

After Stalin's death in 1953, members of his Politburo, who had watched helplessly as the country moved toward a major conflict in the last years of Stalin's rule, signaled to the West that the USSR was willing to coexist peacefully with the US. Then, at the 20th Party Congress, Khrushchev announced that a war between the communist and capitalist worlds was not inevitable. He also criticized Stalin's obsession with the military industry and his disregard for the miserable state of the Soviet economy and standard of living.

Khrushchev, however, would later follow Stalin's lead. The launch of Sputnik I, the world's first artificial satellite, in 1957 explained why, despite Russia's weak economy, he challenged the US by installing missile bases in Cuba in 1961, setting the world on the brink of nuclear war. As in Stalin's case, as soon as the members of the Politburo ousted Khrushchev in 1964, they criticized his foreign and economic policies.

There were no major Soviet achievements during Leonid Brezhnev's regime that could fuel a special sense of national pride and self-confidence. Although Brezhnev's Kremlin also pursued a risky policy with the invasion of Afghanistan in 1979, it was modest compared with the crises in Berlin and Cuba and did not directly challenge the US military, as in the two previous cases.

Putin's Kremlin

Until the last 2 years, it appeared that Vladimir Putin's Kremlin also would have little to boast about in terms of economic achievements. Much of the economic growth during this period was based, not on advancements in technology or industry, as was the case in Soviet Russia, but on the growing world demand for and price of oil.

In 2006, oil and gas made up 71% of Russia's total exports. All prognoses about the future of the Russian economy were based on forecasts of the price of oil. Experts have ascribed the slackening of economic growth in the last 2 years to the decline in the rate of oil industry growth, which declined to 2.5% in 2006 from 11% in 2003.

What is more, nobody wanted to celebrate the fact that in 2005 the country had finally reached the volume of national income and standard of

living that had existed in 1991. There was some growth in real income in the country, but the population was mostly dissatisfied with the standard of living. According to data released in May from Moscow's nongovernmental public opinion-market research firm Levada Analytical Center, half the population saw "poverty and social inequality" as major national problems, and almost as many did not believe that "the leadership can improve life in the country in the near future."

Recently "deindustrialization"—the decline of industries based on contemporary technology—became a key subject in the discussion on Russia's economic future. The term was used by Russian Alliance of Entrepreneurs Chairman Alexander Shokhin and several other major Russian business people, as well as by foreign experts.[1]

Businesses and individuals increasingly have refused to buy Russian durable goods. As famous Russian economist Nikolai Petrakov suggested in June: "Everything in Russia—roads, communication, and big enterprises—was built in Soviet times." Petrakov also suggested that the obsolescence of industrial equipment is growing. Roughly 50% of Russia's air industry equipment is obsolete, as is about 70% of its oil industry infrastructure.

Igor Gorynin, another highly regarded expert and a member of the Russian Academy of Sciences, wrote: "In the sphere of technological innovations, Russia is catastrophically behind developed nations and uncompetitive in international markets." In addition, the country's agricultural industry has stagnated, and food imports during 2000-05 more than doubled. And, although the Russian state itself has diminished its foreign debt, corporations, including oil and gas companies, increased their financial obligations to foreigners by more than six times.

By the end of Putin's first term, the mood in the Kremlin was subdued. Although the Kremlin could boast about some sort of political stabilization—local governors, presidents of non-Russian republics, and oligarchs stopped intervening in national politics—the arbitrariness of officials and the level of crime and corruption increased. Of course, Putin could not praise his achievements in supporting democracy in Russia. With Moscow's evident shift toward authoritarian rule, Putin tried to persuade the world and his own population to accept labels such as "sovereign democracy" or "special Russian democracy."

> "Russia has only 3% of the world's population but controls 34% of the world's gas and 13% of its oil resources...The Kremlin now directly controls one third of the country's oil production."

Despite the promise to restore the country's geopolitical status and the promotion of an ideology that praised the state as a supreme value, as in Soviet times, Putin's foreign policy was quite modest. While covertly encouraging anti-Americanism, Putin was relatively friendly toward the US, particularly in the period after 9/11. At the same time, with the series of color revolutions; Russian influence in the post-Soviet space fell apart.

Status changer

Then, almost suddenly in late 2005, Putin's confidence blossomed. The price of oil had been increasing throughout Putin's presidency, but in 2005 he seemingly concluded that the torrent of petrodollars had reached a level that could radically change Russia's status in the world. Indeed, in connection with the summit in St. Petersburg, a pro-Kremlin Russian newspaper, Rossiiskie Vesti, proudly noted that Russia has only 3% of the world's population but controls 34% of the world's gas and 13% of its oil resources.

Discussing how Putin had used the high price of oil to consolidate his power, former President Boris Yeltsin publicly lamented that oil prices during his presidency had been much lower, suggesting that he could have avoided many problems had the price of oil been higher.

The rise in oil prices is responsible, at least partially, for the Kremlin's decision to take direct control of the country's major energy companies. As suggested by a pro-Kremlin journalist, "Vladimir Putin slowly but steadily centralized the key branches of the economy." Although monopoly gas producer OAO Gasprom remained a state company even at the peak of privatization, the state only recently took over most oil companies. The Kremlin now directly controls one third of the country's oil production.

The Kremlin's management over this major asset differs from state ownership in the Soviet past, when most companies were considered units of the Ministry of Fuel. The general secretary could not benefit personally from the Soviet oil industry. Today, however, the sway over this industry essentially represents the semiprivate ownership of a narrow group of people at the top of power. As suggested by authoritative Moscow newspaper Novaya Gazeta, eight people—seven Kremlin officials and the president—control "assets in companies that are equivalent to three Russian national budgets, while the owners of these companies are so loyal that they are ready to give almost everything to the Kremlin."[2]

Russia's "Stability Fund," which currently contains windfall oil revenues over $27/bbl, accounted for 44% of the national budget, further supporting Putin's personal optimism. However, despite the appeals of many experts and the public at large, Putin has refused to allocate funds to modernize the economy and infrastructure. Instead, he keeps the money in foreign banks as a strong guarantee against economic or political losses. It was used in part to

repay foreign debts in 2006.

As noted by Russian media, an unprecedented combination of developments—the rise in the price of oil and the consolidation of personal control over the fuel industry—has boosted the Russian president's self-confidence enormously, and his new mood may influence his decisions in domestic and foreign policy.[3] On Dec. 22, 2005, at the meeting of the Russian Security Council, Putin proclaimed that Russia is back on top and playing a key role on the world stage.

At that moment, Putin's oil pride spread to the ruling class. The idea that Russia could now dictate its will to the world, or at least to European countries, to say nothing of former Soviet republics such as Ukraine, Georgia, and Belorussia, became a major slogan in Kremlin's propaganda, just as victory in war and Sputnik had been the centerpieces of Stalin's and Khrushchev's propaganda, respectively. The dynamics of Putin's terminology in his annual addresses to the Federal Assembly were remarkable. By the time Putin started his second term in 2005, the number of references to energy had increased by three times compared with 2004 and by six times a year later.

With the price of a barrel of oil above $70, Putin suggested that the issue of energy lead the agenda at the G-8 Summit in St. Petersburg July 15-17. As ironically suggested by an independent Russian journalist, Russian television station Ekho Moskvy aired the summit as a show with one actor: the Russian president. Much of the media presented the summit as Putin's total triumph and the world's recognition of Russia's leading role.

Public confidence

The Kremlin's confidence has spread to the general population. As Russian journalist Elmar Murtazaev noted, "the opinion that oil will remain expensive forever or for a very long time has become more and more popular in Russia."

And Dmitrii Butrin, in the reputable Russian newspaper Kommersant Daily, suggested that Russia should be compared, not with Nigeria, but with Kuwait. In the near future, Russian oil revenues will allow Moscow to pay for the education of all students in the finest Western universities, increase the salaries of state officials, and give children allowances, he suggested. The author was certain that the Russians would gladly accept the Kuwaiti style of life, even if it brings lower levels of entrepreneurial activity and greater governmental control over information.

> Natalia Narochnitskaia, vice-chairman of the State Duma's committee on international relations, "saw the 'energy card' as an instrument that would allow Russia to be a great power again and release it from its inferiority complex."

Another journalist, Dmitrii Ladygin, promised that in a few years each Russian citizen would receive $1,000/month. Russian media saw the developments in the Middle East as a sign that the price of oil would only increase.

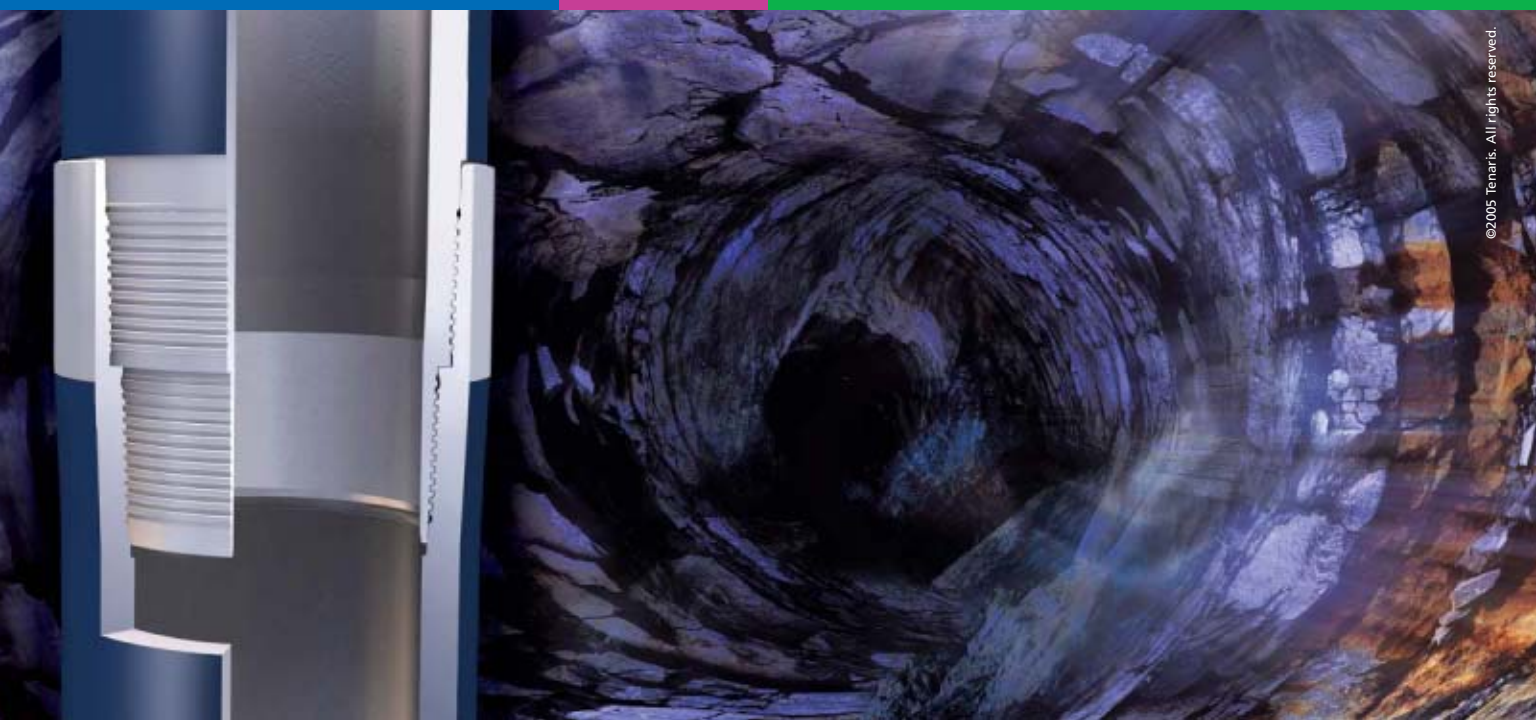
The power of oil became a major source of inspiration for Russian imperial and nationalistic feelings. Dmitry Medvedev, the first deputy prime minister and possible heir to Putin, in a rare political interview in July, devoted two thirds of the interview to describing how oil and gas had strengthened the country. Mikhail Margelov, chairman of the Duma's foreign committee, plainly declared that "gas, oil, and electricity are diplomatic weapons ... a sword in the scabbard."

One of the best known ideologues of Russian nationalism, the vice-chairman of the State Duma's committee on international relations Natalia Narochnitskaia, saw the "energy card" as an instrument that would allow Russia to be a great power again and release it from its inferiority complex. Inspired by the new perspective, Narochnitskaia suggested that Russia could serve as a model for the world.[4] The author of an article in Komsomolskaia Pravda declared, "Russia is becoming an energy empire" and said it has returned to "great politics through the pipeline." Some Russian authors contend that the aggressive policy of the US against Russia is dictated exclusively by the desire to take control of the country's oil resources.

Obsessed with the restoration of the Russian empire, the notorious nationalist Alexander Prokhanov talked about oil as the main strategic resource of the 21st Century and praised Venezuelan President Hugo Chavez, a "Russian friend," whose policy is also based on oil.[5] As a typical element of the political landscape, a member of the St. Petersburg legislature rudely rejected attempts to criticize the regular murders of nonwhite foreigners in the city by claiming that, with the price of oil at $80/bbl, the Russians can do what they please. Among the 80 legislators, only one publicly denounced those comments.

A content analysis of 50 national newspapers produced remarkable results: Between February and July, 2005, the press mentioned "oil" in 7,285 articles and mentioned "gas" in 8,313 articles, while other important subjects were mentioned less often, including "inflation" (3,565 articles), "corruption" (3,354 articles), and "crime" (1,569 articles).

With the idea that oil has provided them with an advantage over their enemies, Russian nationalists are inebriated with thoughts of revenge. In their dreams, they see the US crawling before the Russian oil giant, begging for a few drops of oil. With almost sadistic pleasure, some Russian journalists, such as Evgenii Anisimov from Komsomol'skaia Pravda, suggested that because of Russia's new role as a supplier of en-



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TenarisConnections

ergy, "Europe is scared," and "her resources of energy are close to exhaustion."

It is not surprising that, under the impact of the Kremlin's "oil propaganda," the Russians were glad to see Moscow force Ukraine to accept, at the end of 2005, a four-fold increase in the price of gas. The absolute majority of the Russian public—80% in the country as a whole and 94% in Moscow and St. Petersburg—unequivocally supported the Kremlin's position in the December 2005 gas conflict.

"Dutch disease can have serious economic consequences as a country becomes increasingly dependent on the raw materials sector. A sudden fall in the price of the raw materials could bring an economic collapse."

Dutch disease

As suggested by many economists, Dutch disease—a country's excessive dependence on the export of raw materials—can have serious economic consequences as a country becomes increasingly dependent on that raw materials sector. Other branches of the economy, such as manufacturing, often decline because of the concentration of such resources as oil or gold, as happened in 16th century Spain. A sudden fall in the price of the raw materials could bring an economic collapse.

Seemingly, the Russian leaders, like their colleagues in Venezuela and Iran, see the world through the prism of oil revenues. It goes without saying that one of the first victims of the political Dutch disease is democracy.

However, an even more dangerous consequence of the political Dutch disease is the leader's loss of a sober assessment of reality. Under the impact of their technological achievements, both Stalin and Khrushchev, with their skewed visions of reality, moved the country closer to a major war. Putin's euphoria over oil prices may not be as great as his predecessors' enthusiasm, but his aggressiveness in foreign policy in general, and toward the US and Russia's neighbors in particular, has clearly increased since 2005. The shift occurred in late 2005 when Moscow brandished its gas weapon against Ukraine and indirectly against Europe. Russia's foreign policy has hardened (despite some cooperative gestures toward the West) and influenced several international conflicts, including issues surrounding North Korea, Iran, and the Middle East.

The conspicuous demonstrations in July of friendship with Venezuela's Chavez, another political leader inebriated by oil revenues, and the readiness to sell him weapons despite American protests were clear signals of unfriendliness toward the US. Russian media treated Moscow's attitudes toward Chavez as an obvious demonstration of disregard toward American concerns.

Dmitry Medvedev's proposal to make the ruble fully convertible in an attempt to renew the currency's international status was another result of the country's oil fever. Medvedev talked contemptuously about "the financial irresponsibility of the United States," citing the country's growing national deficit. He also denounced the International Monetary Fund's attempt to promote market reforms, forgetting that only a few years ago Russia had scrounged for credits from this bank.

Oil fever has not infected all Russians. The level of enthusiasm among the general public and particularly among experts does not match the levels observed after Sputnik and cosmonaut Gagarin were launched into space, to say nothing of the excitement after the 1945 war victory. Among the most persistent critics of the oil frenzy is Egor Gaidar who suggested that the leadership's oil delirium and its disregard for the instability of oil prices were dangerous to the country. Several independent politicians and journalists have seconded Gaidar's critique of the Kremlin's "hydrocarbon doctrine," demonstrating concern for the "time bomb in our political system."

Concerned about the Kremlin's "muddled vision of the world," some independent minds in Russia, such as Dmitry Muratov, the editor of Novaya Gazeta, insisted: "The intellect of the government changes inversely with the price of oil."[6] Leonid Radzikhovsky, a famous liberal journalist, wrote about the inverse correlation between the level of democracy and the price of oil. What is more, even Vladislav Surkov, until now the Kremlin's leading ideologue challenging Medvedev, in a struggle for influence over Putin, suggested that, with gas as its only basis, the Russian economy would inevitably reveal its fake prosperity in the "post-hydrocarbon era."

"[A] dangerous consequence of political Dutch disease is the leader's loss of a sober assessment of reality. Putin's aggressiveness in foreign policy... toward the US and Russia's neighbors in particular, has clearly increased since 2005."

Russia is not the only country in the world that is obsessed with oil. Every country, in one way or another, is preoccupied with oil. While the US, Europe, China, and India are concerned about fuel supply and the adverse influence of high oil prices on the economy and standard of living, several countries, including Russia, have turned their oil resources into weapons for achieving their domestic and foreign goals. As the experiences of Stalin and Khrushchev showed, Russian leaders sometimes overstretch the potential of their advantages and

lose a sober perspective of reality.

Mesmerized by his clout, Putin may accept "the invitation" of the Russians to stay in power after 2008. Today, 51% of the Russians would vote for him if he decided to try for a third term, which he promised not to do. In the foreign arena, Putin has already shown less willingness to cooperate with the West and the US in particular. His foreign policy may harden even more. However, it is unlikely that Moscow will demonstrate direct hostility toward the West in the near future.

The post-Soviet space is another story, however. The idea that oil will allow Russia to take control over Ukraine, Georgia, and Belorussia is deeply engrained in the minds of Kremlin politicians. We can expect an exacerbation of the political developments in the post-Soviet space, which will undoubtedly complicate relations with the West.

Aside from the damage to Russia's international relations, the oil delirium is more problematic to the country's long-term national interests. The overconfidence in oil revenues may lead to a decline in the spirit of entrepreneurship, to a refusal to modernize industry, or even to an acceptance of deindustrialization. The obsession with high oil prices explains why the Kremlin sees few obstacles to the country's continued move toward an authoritative regime. It also explains the Kremlin's conspicuous disregard for the growing problem of corruption in society. With the vision of the Russian leadership blurred, it may become increasingly insensitive to various destructive tendencies in the country. The impact of the price of oil on political decision-making in Russia is crucially important to the world and should be closely monitored.

Acknowledgment

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Federal probe cites budget cuts for BP plant blast

Nick Snow
Washington Correspondent

Years of budget reductions contributed to conditions leading up to the Mar. 23, 2005, explosion at BP America Inc.'s 460,000-b/d Texas City, Tex., refinery, which killed 15 workers and injured 180 others, the US Chemical Safety Board said Oct. 30.

Investigators also found that BP was aware of problems at the facility but implemented reforms aimed at improving compliance with procedures and reducing occupational injuries while ignoring potentially catastrophic safety risks, the CSB said as it released preliminary findings of its investigation.

It was the first significant update of the board's investigation since Oct. 27, 2005, when the first set of findings was released at a public meeting of Texas City residents and refinery employees. The CSB scheduled an additional news conference for Oct. 31 in Houston but said it probably would not issue a final report before March 2007 because the investigation is so complex.

"Unsafe and antiquated equipment designs were left in place, and unacceptable deficiencies in preventive maintenance were tolerated," CSB Chairman Carolyn W. Merritt said.

Previously, the board indicated that the equipment involved in the explosion of an isomerization unit was of an obsolete design that had been phased out at most other refineries and that supervisors at the Texas City plant knew key instruments did not work or were unreliable (OGJ, Nov. 21, 2005, p. 32).

BP spokesman Ronnie Chappell said

- More than one billion people on earth do not have a safe supply of water.

- The water needed to produce one automobile is seven times more than one person drinks in their lifetime.

- The water needed to refine one day of our world's oil consumption is 3,000 times the volume of the English Channel.

Who is... taking care of the world's water®?

the company agrees with the CSB's conclusions that the accident could have been prevented. He said the findings of its own investigation are generally consistent with those of the CSB's inquiry (OGJ, Jan. 23, 2006, p. 51).

"We do not understand the basis for some of the comments made by the CSB," he said by e-mail on Oct. 31. "We have and will continue to discuss our concerns with the board. We are not going to comment publicly on the statement of the CSB until the board issues a final written report that we hope will explain in more detail the basis for some of their preliminary findings."

Budget cuts

Stringent budget cuts across BP PLC's worldwide operations caused safety at the Texas City refinery to deteriorate, Merritt said. "BP implemented a 25% cut on fixed costs from 1998 to 2000 that adversely impacted maintenance expenditures and infrastructure at the refinery," she said.

Maintenance spending had fallen through the 1990s when Amoco Corp. owned the refinery, according to Merritt. Additional cuts were imposed after BP acquired Amoco, she said.

"Every successful corporation must contain its costs. But at an aging facility like Texas City, it is not responsible to cut budgets related to safety and maintenance without thoroughly examining the impact on the risk of a catastrophic accident," she maintained.

CSB found that, by 2002, an internal BP report had identified cost reductions as a contributor to eroding infrastructure at the refinery that would take a large investment to correct.

These findings were corroborated in a 2005 survey of the refinery's safety culture known as the Telos study just prior to the accident, the federal investigators found. They said the survey's interview with the refinery's manager identified a history of reduced budgets and a culture of "things not getting fixed."

Merritt said: "The refinery manager was not alone in this candid assessment. Large majorities of the survey respondents reported significant maintenance backlogs that were harming safety. Disturbingly, most employees agreed that 'production and budget compliance gets recognized before anything else at Texas City.'"

Economic pressures were apparent in many decisions that contributed to the explosion, the CSB said. In 2002, the refinery undertook an environmental initiative known as Clean Streams, which led to plans to eliminate the isomerization unit blowdown drum involved in the March 2005 explosion.

"To economize, a decision was made not to replace the blowdown drum with a flare system," said Don Holmstrom, CSB lead investigator. "The refinery did not conduct federally required safety reviews that likely would have taken into account BP's own existing policy recommending the elimination of blowdown drums."

A required study of the isomerization unit's relief valve system was never completed, although the need was first identified in 1993, the CSB added.

It also found that the refinery's central training staff was reduced from 30 employees in 1997 to 8 in 2004, and the training department budget was cut in half from 1998 to 2004. Trainers also were given other duties so that some spent little time actually training other employees, it said. The isomerization trainer spent only 5% of his time on training, the CSB said.

The control board operations staff also was shrunk, and workloads were increased, the investigators found. Four open-process safety coordinator positions for the isomerization and other area units were not filled prior to the explosion, the CSB said. Its earlier preliminary findings cited operator fatigue and a lack of effective training and supervision.

Culture problems

Chappell said BP's own investigation, which acknowledges that the company was aware of infrastructure and safety culture problems at the refinery before the explosion and fire, found that the problems were "many years in the making."

It also notes that BP was working to address the problems before the accident by spending more money on operations, maintenance, and plant integrity and through efforts to reduce the number of workplace accidents and injuries, Chappell said.

The company held discussions of previous fatal accidents at the refinery and put in place a new "control of work" audit team to ensure compliance with safety rules during maintenance and other activities at the plant, he added.

Chappell said that while BP achieved a 70% reduction in workplace injury rates at Texas City, the CSB's investigators "determined these efforts were not sufficient because they focused on personal safety rather than process safety." He said the lower workplace injury rates led the company "to believe that conditions at the refinery were improving."

He also said BP's own investigation did not identify previous budget decisions or lack of expenditures as a critical factor or immediate cause of the accident.

"Indeed, the [BP] report points out that maintenance and turnaround spending in the years prior to the incident had increased as Texas City staff addressed the safety and plant integrity issues of greatest concern. Maintenance spending had increased 40% over the previous 5 years and was higher than the industry average per barrel of throughput," Chappell said.

He said BP is eliminating the use of blowdown stacks in heavier-than-air light hydrocarbon service and will eliminate their use at Texas City when it recommissions the refinery and at other BP facilities in the US by 2008.

The company also has adopted a new engineering technical practice governing the use of temporary buildings in refineries and other plants and has moved more than 200 such buildings out of the Texas City refinery or emptied and locked them, he said. ✦

Congressional panel says OPEC manipulates oil prices

Nick Snow
Washington Correspondent

The Organization of Petroleum Exporting Countries, whose members regularly call for stable oil markets, actually has been the greatest source of recent price volatility, a US congressional committee charged on Oct. 31.

"OPEC is anything but blameless in the oil price surge of the last 2 years. The cartel is the single greatest cause of market instability as it fans market fears with intermittent quota and output cuts to extend the price surge," the Joint Economic Committee said in a research report.

It said OPEC has exploited worldwide oil demand growth, which has been driven largely by improving Asian economies since 2003. China's crude oil consumption alone has increased by 1.76 million b/d in the last 3 years as of 2006's second quarter, it indicated, citing the US Energy Information Administration data.

"In response, OPEC abandoned its price range of $22-28/bbl and allowed the price to nearly triple from the midpoint of the range it set in March 2000. The price increase has resulted in a cumulative increment to the cartel's oil revenues of about $720 billion over 3 years," JEC's report said.

It said that as the price for OPEC's crude decreased from a peak of $72.68/bbl on Aug. 8 to $55/bbl on Oct. 20, the cartel announced that it would cut output by 1.2 million b/d effective Nov. 1, with possible further reductions to follow.

"The market did not anticipate the price rise, but OPEC's reaction to the increase clearly indicates its active support of higher prices," the report said.

It said that OPEC had held back about 2 million b/d of production in December 2003 to protect the $22-28/bbl price band. "In the face of rising demand, OPEC activated its idle capacity sparingly and even cut output intermittently when the price began to recede," the report continued.

Undeveloped reserves

The cartel eventually ran into capacity constraints and eventually suspended its quotas, according to JEC. But it also holds enormous oil reserves, which it keeps undeveloped, it added.

"In the entire Persian Gulf region,

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

China parries price claims

The Chinese are becoming defensive over claims that they are responsible for the rising cost of crude oil. Indeed, they recently trotted out a senior official to deny the claims.

Ma Kai, Director of China's National Development and Reform Commission (NDRC), commented on the subject in Qiushi magazine, a publication of the Communist Party.

"The argument saying China's surging demand for oil is a key factor in driving up oil prices is groundless. China will never pose a threat to global energy security," Ma Kai wrote.

He said China's net oil imports accounted for 5.5% of global trade volume in 2005, compared with the US's 25% and Japan's 10%.

Consumption falls

Ma Kai also pointed out that Chinese imports and consumption fell in 2005 but that spot prices soared by more than 40% the same year for West Texas Intermediate, IPE Brent, and Dubai crudes.

He noted that in 2005 China's net oil imports were 136.17 million tonnes, which was 7.56 million tonnes less than in 2004—a strong year for imports—or an overall decrease of 5.3%.

If Chinese demand were driving the market, Ma Kai said, then "the global oil price should have dropped in 2005 instead of continuing to surge."

One really wonders who could be making such accusations against China. After all, most people understand that in a world of tight supply and high demand, oil prices—like the price of cocoa or soybeans—will climb.

But it would be disingenuous of anyone to say that Chinese demand has not contributed to the higher prices. That's something Ma Kai needed to address.

Demand increases

Evidence of that demand emerged last week when more than 40 African heads of state were in Beijing for the China-Africa forum. Of the 40 states, four of them—Angola, Sudan, Congo-Brazzaville, and Equatorial Guinea—were among the top 10 oil exporters to China in 2005.

Altogether, China imported 38.34 million tonnes of crude oil from Africa in 2005, accounting for 30% of its oil imports, another NRDC official said at a mid-October press conference on the forthcoming Sino-African cooperation forum.

Zhang Yuqing, deputy head of the NRDC's energy department, said that by the end of 2005, China had invested in 27 major oil and natural gas projects in 14 African countries, including Sudan, Algeria, Angola, and Nigeria.

At the same time, Zhang noted that, according to official figures, China imported 126.82 million tonnes of crude oil in 2005, while its imports in the first 8 months of 2006 reached 95.80 million tonnes, up 15.3% on the previous year.

His figures don't exactly match those of Ma Kai, especially the 15.3% increase of imports for 2006. While that 15.3% alone may not be enough to increase world prices, it certainly is a contributing factor. One wonders if Ma Kai saw it. That's just a thought, of course. ✦

only about 2,000 exploration wells have been drilled since the inception of its activity, compared to more than 1 million in the United States. Saudi Arabia has just over 1,500 producing wells compared to more than 560,000 in the United States," it said, citing figures from a 2006 book, The Age of Oil, by Leonard Maugeri.

The JEC said OPEC's cost per barrel is about one third to one fifth of the price range it had set and one ninth to one eighteenth of the recent price peak. One of its earlier reports placed crude production costs at less than $5/bbl in the Persian Gulf and less than $9/bbl in the rest of the cartel.

"Thus, increased Asian oil demand had been met by OPEC's manipulation of its short-run pumping capacity and scores of oil reserves kept locked away in the ground. While investment in capacity expansion is now under way, the cartel's renewed decision to cut production when the price has barely fallen below $60[/bbl] demonstrates its intent to exploit the market further," the congressional committee said.

The report estimated that in 2006, OPEC's total oil revenues will approach $600 billion, up from $200 million/year before 2003.

"Even assuming that OPEC was surprised by increased Asian oil demand and initially hesitant to view the increase as permanent, the cartel has had plenty of time to exercise market leadership. Instead, OPEC refuses to endorse a long-term price band and seeks to extract as much revenue from the market as feasible," it declared.

Rep. Jim Saxton (R-NJ) chairs JEC, with Sen. Robert F. Bennett (R-Utah) as vice-chair. ✦

Hofmeister: US needs broad-based energy strategy

Nick Snow
Washington Correspondent

Shell Oil Co. Pres. John D. Hofmeister called for a broadly based US energy strategy that pursues every option from increased access to potential oil and gas resources to increasing energy efficiency and developing alternate fuels.

"For the short term, we must have responsible access to more domestic resources, and we must have streamlined regulatory requirements that will allow us to deliver new projects much faster," he told the National Press Club. "For the longer term, however, we must continue to develop new technologies such as those we are currently using to help extract more oil and gas from existing wells and those we are developing to tap unconventional sources such as oil shale in Colorado and oil sands in Canada."

He said that, unlike other major oil companies that dropped their oil shale programs in the early 1980s, Shell Oil has remained active and is currently trying to develop an in-situ process. This may include freeze-wall technology, which would freeze and contain produced water underground (OGJ, July 10, 2006, p. 18).

"We believe we'll be ready to make an oil shale investment decision in the next 3-4 years," Hofmeister said.

Royal Dutch Shell PLC's US subsidiary also is investing in coal gasification research and LNG terminals.

The company has interests in LNG terminals at Cove Point, Md., and Elba Island, Ga., and would like to do more, he said. It also is involved in overseas liquefaction projects.

Cellulosic ethanol

Shell also is a "major investor" in cellulosic ethanol, which Hofmeister called "an excellent way to extend this country's fuel market."

Use of corn stalks and switch-grass instead of corn and sugar to make ethanol appeals to Shell Oil because "if we are being blamed already for high oil and gas prices, are we ready to be blamed for higher food prices too?"

Although E-85 fuel—an 85-15 ethanol-gasoline mix—gets 25% fewer miles per gallon than gasoline, he said, "We are investing in it."

Noting General Motors Corp. and Shell Oil's hydrogen vehicle partner-

WATCHING GOVERNMENT

Nick Snow, Washington Correspondent

If Democrats win control...

An Oct. 16 letter from Independent Petroleum Association of America Pres. Barry Russell to producers who are not IPAA members did not mince words.

"Your business and the entire industry are under attack from antidevelopment groups, federal regulators, policymakers, and the news media!" it began. Then it neatly summarized five ways in which federal laws and regulations affecting US producers could change unless producers speak out.

Several possible changes will become likelier if control of the US House or Senate moves to the Democrats in the Nov. 7 elections. So I asked IPAA's Vice-Pres. of Government Relations Lee O. Fuller for details, starting with a possible reimposition of the crude oil windfall profits tax (WPT).

"We've seen about 15 or more bills introduced," he replied. "Many came when prices were high, with anger directed at big oil companies. But if revenues became involved, it would affect independents directly because most big oil companies' revenues come from outside the United States."

Fuller added that in the House Ways and Means Committee, where such a bill would originate, "clearly there's a big difference when the chairman comes from New York City." Charles B. Rangel of New York is the committee's chief minority member.

In the Senate, Max Baucus of Montana would become chairman of the Finance Committee, where a WPT bill probably would land if the Democrats won control. Fuller said IPAA has worked well with him before.

Key differences

In fact, several producing-state Democrats led key congressional committees before control swung to the Republicans in 1994. There are key differences now, Fuller told me: First, more lawmakers from producing states are in the GOP. Second, the Democrats' leaders aren't from producing states and are less inclined to be sympathetic.

Third, "We've seen the Republican and Democratic agendas set by leadership caucuses instead of committees." This gives oil and gas interests less chance to explain their case.

"There are several centrist Democrats we've worked with on some issues, but many of them are new," he said. Others with whom IPAA has worked draw their primary support from nonoil and gas sources which command more attention.

There's also the possible repeal of tax provisions covering intangible drilling and development costs, geological and geophysical expenditures, enhanced oil recovery, and percentage depletion—particularly to finance research and development of nonoil and gas alternative fuels, Fuller said.

'The whole strategy'

"It can be particularly troublesome if someone believes the only way to accomplish this is by penalizing oil and gas. We also think that efforts to get more oil and gas domestically ought to be part of the whole strategy," he told me.

Fuller said IPAA members at the group's recent annual meeting were apprehensive about the election's impact on Congress. "They continue to find opportunities to produce oil and gas. They also see that barriers need to be overcome." ✦

ship, Hofmeister said hydrogen can become a commercial fuel for vans and trucks in 5-10 years.

He also emphasized conservation and energy efficiency. "We should teach our children energy efficiency so they grow up and design more efficient buildings and motor vehicles," he said. "If they don't, this mobility we have enjoyed for the last 50 years cannot be sustained." ✦

ExxonMobil offers Alaska development dispute resolution

ExxonMobil Corp. proposed to pay the state of Alaska $20 million and to relinquish 20,000 acres to resolve unmet obligations to develop the 106,200 acre Point Thomson Unit (PTU) gas-condensate leaseholding on Alaska's North Slope.

ExxonMobil, which is operator, estimates PTU has reserves of more than 8 tcf of gas and 200 million bbl of condensate and oil (OGJ, Nov. 26, 2001, Newsletter). Alaska state documents say 25 lessees hold working interest in PTU, consisting of 45 state oil and gas leases.

There is no PTU production yet because lessees are still trying to determine if they can commercially produce the gas and condensate. Companies suggest such production cannot begin unless a gas pipeline will be built from the North Slope to the Lower 48.

The pipeline remains uncertain because the Alaska Legislature in special sessions repeatedly refused to approve a pipeline contract that Gov. Frank Murkowski negotiated with North Slope oil and gas producers.

The Alaska Department of Natural Resources in 2001 approved a development plan calling for PTU production by 2008. In October 2005, the DNR Division of Oil and Gas rejected ExxonMobil's development plan, placing the company in default of its earlier agreement with the state. ✦

World giant oil discoveries seem not to be at an end

The world has continued to discover giant oil fields, says a report by the Centre for Global Energy Studies, London.

The finding torpedoes several holdings by the advocates of "peak oil": that the industry has not been finding enough oil, has been relying on too few aging oil fields, and has not been discovering new giants.

CGES compiled figures that show 17 giant oil discoveries in the 1950s, 29 in the 1960s, 24 in the 1970s, 15 in the 1980s, and 11 in the 1990s. Four of the fields found in recent decades are supergiants, CGES points out.

Nevertheless, it reports that 20% of global oil production comes from the world's largest 14 fields and that the large fields found in the 1990s produce only one-tenth of the oil produced by 36 giant fields discovered more than 40 years ago.

CGES counted 15 giant discoveries in the 1990s (Table 1). Four of these are in deep water off Angola, and two are onshore in Iran.

The four relatively recent supergiant discoveries are Cantarell off Mexico, Tengiz and Kashagan in Kazakhstan, and Azadegan in Iran.

Politics and bureaucratic red tape are preventing the speedy development of Iran's Azadegan and Darkhovin fields, CGES noted, and Kashagan, discovered in 2000, has not been developed because of quarrels over who would act as operator. With Italy's Eni now chosen, Kashagan still isn't scheduled to start producing until 2010.

A CGES list of large oil fields set to come on stream in 2007-20 (Table 2) excludes the emerging prospects of the Gulf of Mexico Lower Tertiary Trend (see map, OGJ, Sept. 25, 2006, p. 36). Twelve confirmed Lower Tertiary discoveries are thought to contain 3-15 billion bbl of recoverable reserves.

Output of 415,000 b/d at Mexico's Ku Maloob Zaap field in the gulf is expected to climb to 800,000 b/d by 2010, partly offsetting Cantarell's decline.

It is not correct to say that large discoveries are becoming scarce, CGES said.

Large fields discovered since 1976 are expected to have supplied 60% of the 19.5 million b/d of incremental demand in 1976-2010, it calculated.

"Another Saudi Arabian Ghawar field (over 90 billion bbl of recoverable oil) or a Kuwaiti Burgan (over 60 billion bbl) may not have been discovered, but the world has found many giant, and some mammoth, fields that add up to a massive amount of oil," CGES said. ✦

1990s DISCOVERIES

Table 1

Discovery year	Field	Peak output, 1,000 b/d
1991	Vankorskoye (Russia)	280
1992	Norne (Norway)	150
1993	Darkhovin (Iran)	200
1993	Cupiagua (Colombia)	200
1994	Ourhoud (Algeria)	230
1994	Caratinga (Brazil)	200
1996	Bonga (Nigeria)	250
1995	Hassi Berkine S. (Algeria)	230
1996	Girassol (Angola)	250
1997	Dalia (Angola)	230
1998	Kizomba A (Angola)[1]	200
1998	Kizomba B (Angola)[2]	250
1999	Agbami (Nigeria)	230
1999	Azadegan (Iran)	400
1999	Grane (Norway)	210
Total		**3,510**

[1]The Kizomba A project combines Chocalho and Hungo fields. [2]The Kizomba B project combines Dikanza and Kissanje fields.
Source: CGES et al.

EXPECTED FIELD START-UPS

Table 2

Year of peak output	Field	Peak output, 1,000 b/d
2007	Buzzard (UK)	180
2007	Roncador (Brazil)	180
2008	Atlantis (US)	200
2008	Greater Plutonio (Angola)[1]	200
2008	Kizomba C (Angola)[2]	200
2008	Tahiti (US)	125
2009	Thunder Horse (US)	250
2009	Valhall redevelopment (Norway)	150
2009	Urugua (Brazil)	150
2009	Kizomba D (Angola)[3]	125
2009	Frade (Brazil)	100
2010	Ku Maloob Zaap (Mexico)	800
2010	Yadavaran (Iran)	300
2010	Vankorskoye (Russia)	280
2013	Verkhnechonsk (Russia)	200
2020	Kashagan (Kazakhstan)	1,200
Total		**4,640**

[1]Greater Plutonio project combines Galio, Cromio, Paladio, Plutonio, Cobalto, and Platina fields. [2]Kizomba C project combines Mondo, Saxi, and Batuque fields. [3]Kizomba D project combines output from other Block 15 discoveries.
Source: CGES et al.

Arkansas Fayetteville gas production rising, two deeper shales explored

Gross production from Southwestern Energy Co.'s wells in the eastern Arkoma basin Fayetteville shale play has grown to 70 MMcfd and looks to attain 100 MMcfd by the end of 2006, the company said.

The Houston operator is obtaining better frac results and adding capital spending, rigs, and completion crews in the play, which it extended 6 miles northeast in the third quarter and 20 miles to the east into White County in the second quarter.

The company expects to have effectively tested a substantial portion of its Fayetteville shale acreage by the end of 2006, and it is drilling and completing its first wells in the deeper Moorefield and Chattanooga shales. Southwestern holds 887,000 net acres, including 125,000 net acres held by conventional production.

Its 2006 operations have involved eight counties centered on Cleburne, Conway, Faulkner, Van Buren, and White counties.

Southwestern's Fayetteville production totaled 3.8 bcf in the third quarter, up from 1.8 bcf in the second quarter.

Fayetteville operations

Southwestern boosted capital outlays 11% to $925 million, with the increase of almost $95 million totally attributable to the Fayetteville shale play.

The company attributed the increase to the frac changes, higher service costs, more wells operated by others, and the previously reported purchases of customized land rigs.

The yearend rig count is expected to be 19, up from 14 at present and 10 on July 31.

Through Oct. 19, 2006, Southwestern had drilled and completed 128 Fayetteville wells, of which 76 are designated horizontal (71 producing), in 25 pilot areas. It was drilling or completing 97 other wells, including 46 drilled through the vertical section with two smaller rigs.

The company had 27 wells awaiting completion and planned to add three completion crews to the two already working by Mar. 31, 2006.

Moving away from nitrogen foam frac jobs since earlier this year, the company had performed 49 slickwater or crosslinked gel frac jobs through Oct. 19 on horizontal wells then on production. The 49 wells averaged initial flow rates of 1.7 MMcfd.

Forty-two wells that had been on production 30 days averaged 1.5 MMcfd, and 23 wells averaged 1.4 MMcfd after 90 days. The recently completed slickwater frac wells cost $2.2 million/well to drill, frac, and complete.

The company's average horizontal well goes to 3,700 ft true vertical depth, and the lateral takes 10-15 days to drill and averages 2,350 ft.

Hefley 1-12-H, the 20-mile east extension well in White County, went on line in late August at 1.6 MMcfd. Six miles to its northwest, Johnson 1-16-H cut 486 ft of gross Fayetteville pay and is returning frac fluid. The 6-mile northeast extension, Nicholson 1-16-H in the Hammerhead pilot area, cut 562 ft of gross Fayetteville pay.

Two deeper shales

Southwestern is completing its first horizontal well in the Moorefield shale, in which it holds 130,000 net undeveloped acres that could be prospective.

The Arkansas Oil & Gas Commission approved statewide field rules in the third quarter designating Fayetteville, Moorefield, and Chattanooga shales as unconventional sources of supply. Each drilling unit consists of 640 acres, and as many as 16 wells are permitted per unit for each formation.

Southwestern expects drainage from its horizontal wells to be less than 80 acres/well based on existing microseismic data and reservoir simulation modeling.

Carter 2-35-H, the company's first horizontal Moorefield well, found 221 ft of gross Fayetteville shale pay and an estimated 85 ft of gross Moorefield shale pay based on the offsetting vertical well.

The company in February 2006 said it had tested gas from two vertical Moorefield and Chattanooga wells. It is evaluating possible future Chattanooga horizontal development. ✦

Bangladesh

Three state energy companies will develop Begumganj gas field onshore 110 miles southeast of Dhaka, press reports said.

The field, discovered in 1977, has proved reserves of 32 bcf but is thought to have a potential about 12 times that amount with further drilling (see map, OGJ, Apr. 22, 2002, p. 48).

Undertaking the $45 million development are Bangladesh Petroleum Exploration & Production Co. Ltd. (Bapex), Bangladesh Gas Fields Co. Ltd., and Sylhet Gas Fields.

Colombia

Pacific Stratus Energy Ltd., Toronto, reported a possible gas discovery on the 97,279-acre La Creciente block in the Lower Magdalena basin in Sucre Department 100 miles south of Cartagena, Colombia.

The 100% owned La Creciente-1 well went to TD 11,557 ft and encountered gas shows across a gross 642 ft in the Tertiary Cienaga de Oro formation. The company planned to deepen to 11,600 ft, run logs, and conduct tests.

The well is on Pacific Stratus's Prospect A west of Guepaje gas field,

Assessing the Financial

Opportunities and Operational Challenges

INDEPENDENT OPERATORS FORUM

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Independent operators are playing a vital role in oil and gas exploration and production, and their increased participation in the international E&P arena has created information needs particular to that group.

However, there are as many financial opportunities challenges as there are technical challenges for independent operators. The savvy operator needs to know how to assess the turbulent waters of international oil and gas exploration, what to look out for, and where to go for the best advice.

At PennWell's Independent Operators Forum, executives, managers, and decision-makers from small to mid-size independent operators, investors, financial institutions, and law firms from around the world gather to exchange information, experiences, plans and forecasts. Subject matter runs from innovative redevelopment concepts to project financing, from new technologies to decommissioning and abandonment liabilities. Leading experts in the field will address each of these topics.

If you are involved in international exploration and production, you need to know the latest information on both these technical challenges and want to know about the financial opportunities. The Independent Operators Forum brings the best minds in the business together for two days of strategic information and real-life solutions. Make your plans now to be there.

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which has produced 92 bcf of gas from Cienaga de Oro since discovery in 1992. The Guepaje-Corozal gas pipeline with more than 45 MMcfd of spare capacity crosses Prospect A.

Falkland Islands

Superimposing 2D seismic data and controlled source electromagnetic surveys have rendered drillable the Ernest, formerly J1, prospect on North Falkland basin License PL024 in the South Atlantic, said Rockhopper Exploration PLC, London.

Ernest is an independent four-way dip closed structure in 160 m of water 100 km from the islands. Areal extent is 2,880 acres, and it is possible to map a larger, somewhat more risky closure around it, the company said.

The surveys also identified a number of encouraging leads on PL023 and PL024, where a 3D seismic survey was to start in late October.

Faroe Islands

No commercial oil or gas volumes were proven at the Brugdan 6104/21-1 well in License 006 in the Atlantic south of the Faroe Islands, said operator Statoil.

The well, drilled to TD 4,201 m in 480 m of water, found only traces of gas. It did reveal useful knowledge about drilling in volcanic subbasalt rock that will be helpful in future exploration off the Faroes, Statoil said.

Brugdan is 70 km northwest of Chevron Corp.-operated Rosebank oil field, a 2004 discovery under development in which Statoil has a 30% interest.

The Faroe authorities plan a third licensing round for autumn 2007.

After applying to drill deeper than the originally planned 3,780 m, Statoil had to abandon the well early due to technical problems.

Participants in the well are Statoil 27.15%, DONG 21.91%, Anadarko Petroleum Corp. 13%, Shell-Enterprise Oil 12.47%, Hess Corp. 11.09%, BG Group 10.31%, Faroe Petroleum 4.04%, and Atlantic Petroleum 0.03%.

Morocco

A group led by the Heyco Maroc affiliate of Harvey E. Yates Co., Roswell, NM, planned to spud the Menadra-1 wildcat on the Moulay Bousselham permit onshore in northern Morocco at the end of October 2006.

Projected to 1,620 m, the well will test a thrusted anticlinal structure tentatively assigned as Cretaceous in age. It is predicted to penetrate a thrust plane and test the unknown stratigraphy of the subthrust section, said 36% interest holder Stratic Energy Corp., Calgary.

Regional oil-source correlations along trend indicate a mixed Jurassic and Silurian source for hydrocarbons.

"The structural position along strike from the abandoned Ain Hamra shallow oil field and the presence of an active seep provides confidence that an active and oil prone source is present," Stratic said.

Working interests are Heyco 39% and US Enercorp Maroc 25%.

Pakistan

Jura Energy Corp., Calgary, said its joint venture with local partner, Petroleum Exploration (Pvt.) Ltd., signed a seismic data acquisition contract with the Oil & Gas Engineering Co. of the Sichuan Petroleum Administration (SPA) to explore for oil and gas in various parts of Sindh Province.

SPA will acquire 600 line-km of 2D seismic data on five exploration licenses, Mirpur Mathelo, Kandra (Lower Goru), Salam, Badin IV North, and Badin IV South, and the Kandra (SML) development lease.

All of the blocks are in the Middle and Lower Indus gas basin. Jura holds 37.5 to 50% participating interest in each block.

SPA will mobilize its crew from China to Pakistan within 60 days, and all seismic surveys have been estimated to be completed within 8-12 months from the contract award.

Gulf of Mexico

Petsec Energy Ltd., Sydney, reported a gas discovery at the first well of a three-well program in Gulf of Mexico federal waters south of Mobile Bay.

Operated by Royal Exploration Co., private Corpus Christi independent, the Mobile Block 951-1 well in 67 ft of water went to TD 3,050 ft MD and cut 18 ft of net gas pay. It was being cased and will be suspended for future completion and tie-in to production facilities (OGJ Online, Oct. 10, 2006).

The program's second well is to spud at the end of October on adjoining Mobile Block 950. Reserves target is 4-8 bcfe, Petsec said.

Oregon

Brownstone Ventures Inc., Toronto, plans to buy a 2% participating interest from Savant Resources LLC, private Denver independent, in 366,973 net acres in the Columbia River basin in Oregon for $1.7 million.

Savant owns rights and interests in and to an undivided 75% interest in the leasehold that runs for 10 years, making Brownstone's interest 1.5%.

Savant and Brownstone will enter into an area of mutual interest agreement that expires on June 30, 2009, covering the area that surrounds the Columbia River basin project.

EnCana Corp., Calgary, is drilling and evaluating three planned 14,000-ft wells in Grant and Yakima counties, Washington. They are the Anderville Farms-1, Anderson 11-5, and the upcoming Brown-7.

The wells represent a significant industry commitment to establish commercial natural gas production in the expanding Pacific Northwest and West Coast energy markets, Brownstone said.

DOE funds new study on US off site commercial disposal of E&P waste

Markus G. Puder
John A. Veil
Argonne National Laboratory
Washington, DC

A new government study provides a unique, national survey of off site commercial disposal practices, methods, and costs in the major oil and gas producing states of the US.

In September 2006, Argonne National Laboratory published the report, "Off site Commercial Disposal of Oil and Gas Exploration and Production Waste: Availability, Options, and Costs." The study was sponsored by the US Department of Energy (DOE) Office of Fossil Energy and National Energy Technology Laboratory.

In addition to identifying commercial disposal facilities for exploration and production (E&P) wastes, the report provides data on methods and costs. The study, along with a searchable database containing records for more than 200 facilities, can be accessed through the website of the Argonne's environmental science division (www.evs.anl.gov).

Backdrop

Commercial disposal facilities are off site businesses that accept and manage E&P wastes for a fee. Typically, they are independent of oil and gas companies.

Commercial disposal facilities charge for a variety of services, including disposal and management of waste, transportation, cleaning of vehicles and tanks, disposal of wash water, and, in some cases, laboratory analysis. They use various methods for waste disposal and management.

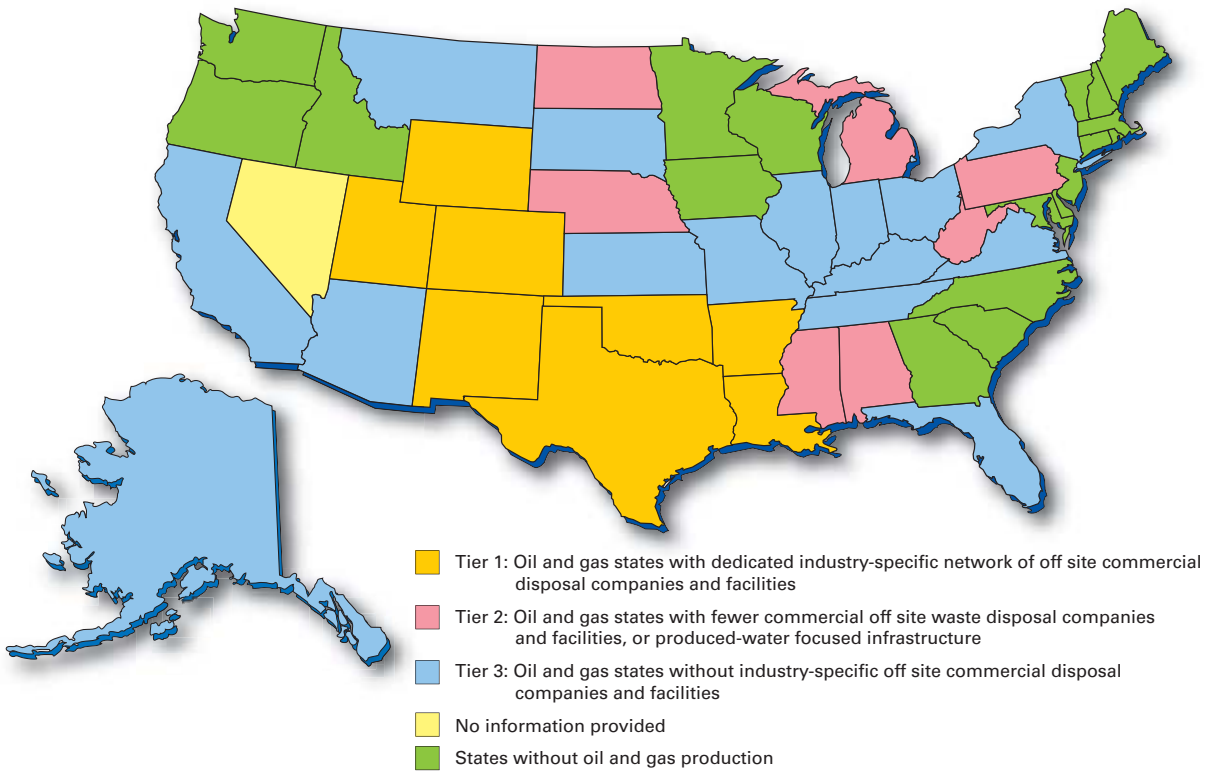
In the US, most E&P wastes generated at onshore oil and gas wells are disposed of or otherwise managed at the well site. Under certain circumstances, operators will select off site management options. Some types of wastes are not suitable for on site management because of locations in sensitive environments. Likewise, some types of offshore drilling wastes cannot be discharged. Hence, they are either injected underground at the platform (which is not yet common in most parts of the US) or they are hauled back to shore for disposal.

What are the types and volumes of E&P wastes going to commercial disposal? According to a survey published by the American Petroleum Institute (API) in 2000, the onshore E&P segment of the US oil and gas industry generated 18.1 billion bbl of E&P wastes—149 million bbl of drilling waste, 21 million bbl of associated wastes (including completion fluids), and 17,911 million bbl of produced water during 1995.

The API survey reported that 3% (3 million bbl) of drilling wastes and about 15% (3.1 million bbl) of associated wastes were managed at off

COMMERCIAL DISPOSAL FACILITES

Fig. 1



site commercial disposal facilities. The API study did not include data on the large market segment of Gulf of Mexico offshore waste materials hauled back to shore for further management.

Oil and gas companies use commercial disposal facilities for various reasons. Compliance with all applicable regulatory requirements is paramount. Several major federal laws govern waste materials and management activities:

- Resource Conservation and Recovery Act (RCRA) governs generation, transportation, storage, treatment, and disposal of solid and hazardous wastes–unless excluded or exempted.
- Clean Water Act (CWA) governs surface discharge of pollutants.
- Safe Drinking Water Act (SDWA) governs underground injection of fluids and slurries.

Federal laws and regulations generally establish minimum federal standards, while states have the lead role in the regulation of E&P and general industrial waste disposal. Most states (except California) follow the federal exemption of E&P wastes from federal hazardous waste management requirements.

Programs for regulating E&P waste management vary from state to state, reflecting the geological, climatological, ecological, topographic, economic, geographic, and age differences among oil and gas drilling and production sites across the country. In this light, a regulatory agency may not allow on site disposal for a certain type of drilling waste or a specific location within its jurisdiction.

Examples of wastes not appropriate for on site disposal include saltwater muds and very oily cuttings. Examples of sensitive environments not suitable for on site burial or land application include areas with high seasonal water tables, marshy environments, and tundra.

A second reason for sending waste to commercial facilities involves cost-effectiveness. If an operator has a relatively small volume of waste, it may make sense to send it off site rather than constructing, operating, and closing an on site facility.

Another conceivable motivation is that some operators may not want the responsibility of managing their waste and prefer to send the waste to a third party. Although this practice appears to shift the burden of responsibility and liability to the third party, the generator may still be faced with liability under the US Superfund law.

It is therefore crucial to review the business practices and compliance history of an off site commercial disposal company to minimize the risk of future liability.

Data collection occurred in two phases. In the first phase, state oil and gas regulatory officials were contacted to determine whether their agency maintained a list of permitted commercial disposal companies dedicated to oil and gas E&P waste. In the second phase, representatives of individual commercial disposal companies were inter-

The situation

North Sea storms often prevented the Platform Supply Vessel (PSV) from sitting alongside this operator's rig for taking on spent mud and cuttings. The operator wanted a contingency plan for the bulk storage of fluids and interfaces while carrying out well displacements to and from oil-base mud, especially during bad weather.

North Sea:

CLEANCUT ISO-PUMP units provide temporary mud storage; save valuable rig time in heavy seas

The solution and results

Already onboard the rig were eight CLEANCUT* ISO-PUMP* units, used for temporary bulk storage of Oil-Base Mud (OBM) drill cuttings prior to transferring them to the PSV for transport to the onshore treatment plant. M-I SWACO* helped configure a system that would allow OBM to be transferred to the ISO-PUMP system for temporary storage prior to the well being displaced, and then pumped back to the pits. Now the operator could keep the extra fluid onboard during displacement and then continue drilling with no downtime.

While drilling the very first well, adverse weather was forecast, and the ISO-PUMP units temporarily stored 642 bbl of oil-base mud. Without this extra capacity, there would have been insufficient mud on the rig for drilling to recommence. Over the first two wells, 1,782 bbl of oil-base mud were successfully stored within the ISO-PUMP units prior to being transferred to the PSV. In the completion phase of the second well, the rig was able to carry out the displacement of the well from OBM to brine without the PSV alongside the rig, as had been the case in previous wells. The ISO-PUMP units provided the extra capacity to allow the displacement to be carried out in one complete operation during adverse weather conditions.

See for yourself how M-I SWACO Drilling Waste Management prevents costly problems for operators worldwide.

This success story is just one of hundreds where our drilling waste management people, equipment, processes and services prevent serious problems for operators every day. Your M-I SWACO representative can tell you more about our complete suite of drilling waste management capabilities.

"The use of the ISO-PUMP system was a big success, allowing us to displace to OBM at a time when we would otherwise have been shut down due to adverse weather. The operator was more than pleased with the outcome."

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DATA RECORDS SORTED BY WASTE MANAGEMENT METHOD—LAND APPLICATION

Table 1

Waste type	Disposal fee	State	Facility
Contaminated soils	$10.00/cu yard	NM	Loco Hills Landfarm LLC
	$10.00-12.00/cu yard	NM	Saunders Landfarm LLC
	$100.00/ton	UT	LaPoint Recycle and Storage
	$12.00/bbl	NM	T-N-T Environmental Inc.
	$14.00/cu yard	NM	C & C Landfarm Inc.
	$14.00/cu yard	NM	Gandy Marley Inc.
	$14.00/cu yard	NM	Jay Dan Landfarm LLC
	$14.00-22.00/ cu yard	NM	Environmental Plus
	$17.00/cu yard	NM	Contract Environmental Services Inc.
	$18.00/cu yard	NM	Goo Yea Corp. - Goo Yea Landfarm Inc.
	$18.00/cu yard	NM	Goo Yea Corp. - Rhino Oilfield Disposal Inc.
	$25.00/cu yard	NM	Controlled Recovery Inc.
	$55.00/ton	WY	Sweetwater County Solid Waste Disposal District #1
	$7.50/cu yard	UT	A-1 Tank Rental and Brine Svs. Inc.
OBMs and cuttings	$100.00/ton	UT	LaPoint Recycle and Storage
	$12.00/bbl	NM	T-N-T Environmental Inc.
	$17.00-34.00/cu yard	NM	Contract Environmental Services Inc.
	$18.00/cu yard-18.00/bbl	NM	Envirotech Inc.
	$20.00/cu yard	NM	JFJ Landfarm Inc.
	$25.00/cu yard	NM	Controlled Recovery Inc.
	$4.00/bbl	UT	MC & MC Disposal
	$55.00/ton	WY	Sweetwater County Solid Waste Disposal District #1
	$7.50/cu yard	UT	A-1 Tank Rental and Brine Svs. Inc.
Produced water	$0.30-$0.40/bbl	AR	Comer Mining Corp.
	$100.00/ton	UT	LaPoint Recycle and Storage
	$18.00/bbl	NM	Envirotech Inc.
	$25.00/cu yard	NM	Controlled Recovery Inc.
Tank bottoms	$100.00/ton	UT	LaPoint Recycle and Storage
	$18.00/cu yard-18.00/bbl	NM	Envirotech Inc.
	$34.00/cu yard	NM	Contract Environmental Services Inc.
	$4.00/bbl	UT	MC & MC Disposal
	$55.00/ton	WY	Sweetwater County Solid Waste Disposal District #1
	$7.50/cu yard	UT	A-1 Tank Rental and Brine Svs. Inc.
WBMs and cuttings	$0.50/bbl	AR	Fugo Services
	$1.00-1.25/bbl	AR	Comer Mining Corp.
	$1.75/bbl	AR	Eastern Tank Service
	$100.00/ton	UT	LaPoint Recycle and Storage
	$12.00/bbl	NM	T-N-T Environmental Inc.
	$17.00/cu yard	NM	Contract Environmental Services Inc.
	$18.00/cu yard	NM	Envirotech Inc.
	$18.00/cu yard-18.00/bbl	NM	Envirotech Inc.
	$2.00/bbl	AR	Property Transfer Corp.
	$20.00/cu yard	NM	JFJ Landfarm Inc.
	$25.00/cu yard	NM	Controlled Recovery Inc.
	$4.00/bbl	UT	MC & MC Disposal
	$55.00/ton	WY	Sweetwater County Solid Waste Disposal District #1
	$7.50/cu yard	UT	A-1 Tank Rental and Brine Svs. Inc.
	$7.50/cu yard-2.50/bbl	TX	Basic Energy Services - Jefferson
	$7.50/cu yard-2.50/bbl	TX	Basic Energy Services - Jackson

viewed to determine disposal methods and costs.

State agencies were very helpful in providing their data, to the extent available. Of 31 oil and gas producing states, 30 responded; 1 declined.

In general, most of the companies identified in the first phase willingly lent their assistance. Some cited competitive pressures and business confidentiality as primary reasons for providing cost ranges rather than snapshot figures. A few companies declined to partake in the study because they did not want to share any information with third parties.

Available facilities

States hosting off site commercial disposal companies and facilities can be divided into three basic tiers:

- Tier 1: Eight states with a dedicated, industry-specific network of off site commercial disposal companies and facilities: Arkansas, Colorado, Louisiana, New Mexico, Oklahoma, Texas, Utah, and Wyoming.
- Tier 2: Seven states with fewer off site commercial disposal companies or a produced-water-focused infrastructure of commercial disposal companies and facilities: Alabama, Michigan, Mississippi, North Dakota, Nebraska, Pennsylvania, and West Virginia.
- Tier 3: Fifteen states without industry-specific off site commercial disposal facilities or disposal companies: Alaska, Arizona, California, Florida, Illinois, Indiana, Kansas, Kentucky, Missouri, Montana, New York, Ohio, Tennessee, South Dakota, and Virginia.

Fig. 1 shows Tier 1 as a south-southwestern and mountain state zone.

Disposal methods

Bioremediation, also known as biological treatment or "biotreatment," uses microorganisms to degrade hydrocarbon-contaminated waste biologically into nontoxic residues. Wastes are mixed with bulking agents (such as wood chips, straw, rice hulls, or husks) to increase porosity and aeration potential for biological degradation. Higher temperatures elevate metabolism of bacteria. Produced water and naturally occurring radioactive material (NORM) are not managed through bioremediation. The survey found only a few bioremediation facilities.

Landfills are used to dispose of large volumes of municipal, industrial, and hazardous wastes. Wastes suitable for burial are generally limited to solid or semisolid, low salt, low-hydrocarbon content inert materials. In certain locations, landfills accept E&P wastes only and would hence be considered monofills for E&P wastes.

Landfilling can present a very significant off site management option in states where an infrastructure of dedicated commercial disposal facilities is unavailable. Many landfills, especially those operated by large national companies, have solidification capabilities.

Burial in pits presents a traditional method of drilling-waste management. In the course of most US onshore drilling operations, the cuttings that are

EXAMPLE OF DATA RECORDS SORTED BY WASTE TYPE—OBMS AND CUTTINGS

Table 2

Disposal type, fee	State	Facility
Bioremediation		
$20.00/cu yard	NM	JFJ Landfarm Inc.
$40.00/bbl	MT	PetroComp
$50.00-120.00/cu yard	WY	Newpark Environmental Services
Burial (landfill)		
$12.75/bbl	TX	US Liquids of Louisiana LP-Galveston (Transfer)
$14.00-42.00/ton	NM	Lea Land Inc.
$15.00-22.00/bbl	ND	Dishon Disposal Inc.-Dishon Landfill
$15.00-30.00/ton	ND	Prairie Disposal Inc.-Krenz Landfill
$15.00-50.00/ton	OH	American Landfill Inc.
$16.00/cu yard	NM	Gandy Marley Inc.
$16.00-65.00/ton	OH	Countywide Landfill and Landfill Gas Processing Plant
$18.00/ton ton	OH	Waste Management Inc.-Coshoc-Landfill
$18.00/ton	OH	Waste Management Inc.-Mahoning Landfill
$18.00/ton	OH	Waste Management Inc.-Suburban Landfill
$18.00/cu yard	NM	Controlled Recovery Inc.
$18.00/cu yard	NM	Sundance Services Inc.
$2.50-$28.00/ton	CO	Clean Harbors Environmental Services-Deer Trail LLC
$20.00-30.00/ton	MS	MacLand Disposal Center
$28.75/ton	WV	Allied Waste Management Inc.-Sycamore Landfill
$30.00-60.00/ton	WV	Waste Management Inc.-Northwestern Landfill
$32.00/ton	AL	BFI Timberlands Sanitary Landfill
$35.00-80.00/ton	ND	Indian Hills Disposal Inc.-Indian Hill Landfill
$38.00/ton	MS	Waste Management-Central Landfill
$38.00-128.00/ton	MS	Waste Management Inc.-Pecan Grove Sanitary Recycling and Disposal
$38.00-75.00/ton	WV	Waste Management Inc.-Meadow fill Landfill
$56.00/ton	KY	Allied Waste Management-Green Valley Landfill General Partnership
$6.67-8.50/bbl	TX	US Liquids of Louisiana LP-Zapata (Direct)
$65.00-70.00/ton	CA	Waste Management Inc.-McKittrick Facility
$68.00-80.00/drum	UT	Clean Harbors Environmental Services-Grassy Mountain Landfill
$7.71-9.25/bbl	TX	US Liquids of Louisiana LP -Rincon (Direct)
$70.00/ton	AL	Waste Management Inc.-Chastang Landfill
Burial (pit)		
$17.00/bbl	WY	High Plains Resources Inc.-Parkman Reservoir
$2.00-8.00/bbl	WY	Jim's Water Service-McBeth Pits
$30.00/cu yard	TX	J. Moss Investments Inc.-Bustamante Facility
$8.00/bbl	UT	Brennan Bottom Disposal
Cavern		
$2.00-7.00/bbl	TX	Coastal Caverns Inc.
$3.50/bbl	TX	Wasson Solid Waste Disposal System LLC
$5.00-10.00/bbl	TX	Newpark Environmental Services-Permian Basin-Andrews (Direct)
$5.00-10.00/bbl	TX	Newpark Environmental Services-Permian Basin-Big Spring (Direct)
$5.00-10.00/bbl	TX	Newpark Environmental Services-Permian Basin-Fort Stockton (Direct)
$5.00-10.00/bbl	TX	Newpark Environmental Services -Permian Basin-Plains (Direct)
$6.00/bbl	TX	Taylor Disposal Operating Inc. Caverns 1 & 2
$6.00-15.00/bbl	TX	CCS Energy Services LLC-Kiva (Direct)
$6.00-15.00/bbl	TX	CCS Energy Services LLC-Moss Bluff (Direct)
Evaporation		
$8.50/bbl	WY	Piney Company
$8.50/bbl	WY	R&G Inc.
$8.50/bbl	WY	Waste Inc.Injection (solids)
$5.00-10.00/bbl	TX	Newpark Environmental Services-Farnett (Direct)
$5.00-10.00/bbl	TX	Newpark Environmental Services-Port Arthur (Direct)
$5.50-10.50/bbl	LA	Newpark Environmental Services-Cameron (Transfer)
$5.50-10.50/bbl	LA	Newpark Environmental Services-Fourchon I (Transfer)
$5.50-$10.50/bbl	LA	Newpark EnvironmentalServices-Fourchon II (Transfer)
$5.50-10.50/bbl	LA	Newpark Environmental Services-Intercoastal City (Transfer)
$5.50-10.50/bbl	LA	Newpark EnvironmentalServices-Morgan City (Transfer)
$5.50-10.50/bbl	LA	Newpark Environmental Services-Venice (Transfer)
$5.50-10.50/bbl	TX	Newpark Environmental Services Galveston (Transfer)
$5.50-10.50/bbl	TX	Newpark Environmental Services-Ingleside (Transfer)
Land application		
$100.00/ton	UT	LaPoint Recycle and Storage
$12.00/bbl	NM	T-N-T Environmental Inc.
$17.00-34.00/yard	NM	Contract Environmental Services Inc.
$18.00/cu yard-18.00/bbl	NM	Envirotech Inc.
$20.00/cu yard	NM	JFJ Landfarm Inc.
$25.00/cu yard	NM	Controlled Recovery Inc.
$4.00/bbl	UT	MC & MC Disposal
$55.00/ton	WY	Sweetwater County Solid Waste Disposal District #1
$7.50/cu yard	UT	A-1 Tank Rental and Brine Services Inc.
Recycling		
$16.00/bbl	OK	DRD Waste TreatmentSolutions
$5.00/bbl	CA	Envirocycle
Thermal treatment		
$0.19/lb ($0.14-0.40/lb)	NE	Clean Harbors Environmental Services-Kimball Facility
$0.45/lb	TX	Clean Harbors Environmental Services-Deer Park LP
$100.00/drum	FL	Rinker Materials Environmental Services
Treatment		
$11.50/bbl	LA	US Liquids of Louisiana LP-Bate man Island (Direct)
$11.50/bbl	LA	US Liquids of Louisiana LP-Berwick (Transfer)
$11.50/bbl	LA	US Liquids of Louisiana LP-Bourg (Direct)
$12.75/bbl	LA	US Liquids of Louisiana LP-Cameron (Transfer)
$12.75/bbl	LA	US Liquids of Louisiana LP-Fourchon (Transfer)
$12.75/bbl	LA	US Liquids of Louisiana LP-Intercoastal City (Transfer)
$12.75/bbl	LA	US Liquids of Louisiana LP-Venice (Transfer)
$6.00-15.00/bbl	LA	CCS Energy Services LLC-Cameron (Transfer)
$6.00-15.00/bbl	LA	CCS Energy Services LLC-Fourchon (Transfer)
$6.00-15.00/bbl	LA	CCS Energy Services LLC-Intercoastal City (Transfer)
$6.00-15.00/bbl	LA	CCS Energy Services LLC-Morgan City (Direct)
$6.00-15.00/bbl	LA	CCS Energy Services LLC-Venice (Transfer)
$9.00/bbl	TX	Eco Mud Disposal-Alice Facility
$9.50/bbl	LA	US Liquids of Louisiana LP-Elm Grove (Direct)
$9.50-14.50/bbl	AL	CCS Energy Services LLC

separated out by the shale shaker are sent to a "reserve" pit near the drill rig. Commercial pit operations seem on the retreat, however, as indicated by the number of companies that seemed to have stopped operating, as well as the comments made by some respondents. Commercial pit disposal is still reported in western and southwestern parts of the country.

Caverns used for oil field waste disposal are created by solution mining in salt formations. Caverns are appropriate for E&P wastes because they can readily accept wastes that contain excessive

EXAMPLE OF DATA RECORDS SORTED BY STATE—NEW MEXICO

Table 3

Disposal company	Type of waste	Type of disposal	Disposal Fee
Basin Disposal Inc.	Produced water	Injection	$0.88/bbl
C & C Landfarm Inc.	Contaminated soils	Land application	$14.00/cu yard
Chaparral Service Inc.	Produced water	Injection	$0.40/bbl
Chaparral Service Inc.	Tank bottoms	Transportation	No cost provided
Contract Environmental Services Inc.			
	Contaminated soils	Land application	$17.00/cu yard
	OBMs, cuttings	Land application	$17.00-34.00/cu yard
	Tank bottoms	Land application	$34.00/cu yard
	WBMs, cuttings	Land application	$17.00/cu yard
Controlled Recovery Inc.			
	Contaminated soils	Burial (landfill)	$18.00/cu yard
	Contaminated soils	Land application	$25.00/cu yard
	OBMs, cuttings	Burial (landfill)	$18.00/cu yard
	OBMs, cuttings	Land application	$25.00/cu yard
	Produced water	Burial (landfill)	$18.00/cu yard
	Produced water	Land application	$25.00/cu yard
	Tank bottoms	Recycling	$5.00/bbl
	WBMs, cuttings	Burial (landfill)	$18.00/cu yard
	WBMs, cuttings	Land application	$25.00/cu yard
Environmental Plus	Contaminated soils	Land application	$14.00-22.00/cu yard
Envirotech Inc.			
	OBMs, cuttings	Land application	$18.00/cu yard-18.00/bbl
	Produced water	Land application	$18.00/bbl
	Tank bottoms	Land application	$18.00/cu yard-18.00/bbl
	WBMs, cuttings	Land application	$18.00/cu yard
	WBMs, cuttings	Land application	$18.00/cu yard-18.00/bbl
Gandy Marley Inc.			
	Contaminated soils	Land application	$14.00/cu yard
	OBMs, cuttings	Burial (landfill)	$16.00/cu yard
	Produced water	Injection	$0.60/bbl
	Tank bottoms	Recycling	$3.75/bbl
	WBMs, cuttings	Burial (landfill)	$16.00/cu yard
Goo Yea Corp.-Goo Yea Landfarm Inc.	Contaminated soils	Land application	$18.00/cu yard
Goo Yea Corp.-Rhino Oilfield Disposal Inc.	Contaminated soils	Land application	$18.00/cu yard
Jay Dan Landfarm LLC	Contaminated soils	Land application	$14.00/cu yard
JFJ Landfarm Inc.			
	Contaminated soils	Bioremediation	$20.00/cu yard
	OBMs, cuttings	Bioremediation	$20.00/cu yard
	OBMs, cuttings	Land application	$20.00/cu yard
	Tank bottoms	Bioremediation	$20.00/cu yard
	WBMs, cuttings	Bioremediation	$20.00/cu yard
	WBMs, cuttings	Land application	$20.00/cu yard
Jim's Water Service of New Mexico	Produced water	Transportation	Fee is charged for disposal only
Lea Land Inc.	Contaminated soils	Burial (landfill)	$14.00-42.00/ton
	OBMs, cuttings	Burial (landfill)	$14.00-42.00/ton
	WBMs, cuttings	Burial (landfill)	$14.00-42.00/ton
Loco Hills Landfarm LLC	Contaminated soils	Land application	$10.00/cu yard
Loco Hills Water Disposal	Produced water	Evaporation	$0.60/bbl
O K Hot Oil Service Inc.	Produced water	Injection	$0.50/bbl
Saunders Landfarm LLC	Contaminated soils	Land application	$10.00-12.00/cu yard
Sundance Services Inc.			
	Contaminated soils	Burial (landfill)	$18.00/cu yard
	OBMs, cuttings	Burial (landfill)	$18.00/cu yard
	Tank bottoms	Burial (landfill)	$18.00/cu yard
	WBMs, cuttings	Burial (landfill)	$18.00/cu yard
	Produced water	Evaporation	$0.40/bbl
T-N-T Environmental Inc.			
	Contaminated soils	Land application	$12.00/bbl
	OBMs, cuttings	Land application	$12.00/bbl
	Produced water	Evaporation	$0.78/bbl
	WBMs, cuttings	Land application	$12.00/bbl

levels of solids. The survey found that all cavern disposal is in Texas, although one company plans to open one in Louisiana. All waste streams are amenable to being managed by cavern disposal. One company accepts NORM.

Discharge into a surface water body under a national pollutant discharge elimination system (NPDES) permit or into a publicly owned treatment works (POTW) is occasionally used for treating and disposing produced water.

Evaporation can be used to dispose oil and gas E&P wastes in semi-arid regions of the western and southwestern US. Successful use of the technique requires that evaporation exceed the total influent to the evaporation system (including precipitation). The main evaporation technology involves the use of surface ponds.

Injection is a process in which liquids (mainly produced water) are pumped into a well and injected into porous, subsurface rock or sand formations. The fluids can include water, wastewater, or water mixed with chemicals. Oil field practices across the US have established underground injection as a viable alternative method for the disposal of these types of industrial wastes. The variant of solids injection is offered for all waste streams by one of the big commercial companies operating in Louisiana.

Land application or land farming involves the controlled and repeated application of wastes to the soil surface and use of microorganisms in the soil to biodegrade hydrocarbon constituents naturally, dilute and attenuate metals, and transform and assimilate waste constituents. It is offered in the western and southwestern parts of the country.

Recycling turns materials that would otherwise become waste into valuable resources. It is mainly offered in the case of tank bottoms reclamation.

Thermal treatments (incineration and thermal desorption) use high temperatures to reclaim or destroy hydrocarbon-contaminated material. This technology is the most efficient

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SUMMARY OF E&P WASTE DISPOSAL COSTS, $/BBL

Table 4

Method	Contaminated soils	OBMs, cuttings	Produced water	Tank bottoms	WBMs, cuttings	NORM
Bioremediation*	—	40	—	40	40	—
Burial, landfill*	6.67-22	6.67-22	15-22	10.50-22	2.61-22	—
Burial, pit*	1-8	2-17	0.35-4	5-17	1-17	—
Salt cavern	2-15	2-15	0.30-10	2-15	2-15	150-300
Surface discharge*	—	—	0.75-3.50	—	—	—
Evaporation*	8.50	8.50	0.40-84	0.85	0.85-20	—
Injection*	—	—	0.30-10	—	0.50	—
Solids injection	5-10.50	5-10.50	5.50-10.50	5-10.50	5-10.50	150-300
Land application	12	4-18	0.30-18	4-18	0.50-12	—
Recycling*	—	5-16	5	3.75-5	5	—
Thermal treatment*	—	—	—	—	—	—

*Blank cells indicate no costs are available in $/bbl.

treatment for destroying organics. Moreover, it reduces the volume and mobility of inorganics such as metals and salts.

Waste streams high in hydrocarbons, such as oil-based muds (OBMs), are candidates for thermal treatment technology.

Other treatment technologies involve the use of cells, solidification and stabilization, and separation.

Disposal costs

Most disposal company representatives characterized their disposal fee schedules as approximate figures. The figures represent a snapshot for the survey window between October 2005 and April 2006. Thus, these costs may not reflect the actual costs that would be charged to specific customers at a given point in time.

In general, the reported disposal costs vary significantly, depending on the disposal method, the host state of the disposal operations, and the degree of competition in the area. Argonne's report presents disposal costs by waste management method and by waste stream; data can also be sorted by state:

- Disposal costs by waste management method. Table 1 shows data records sorted by waste management method—here, land application. Argonne's report found that land application is a management method used in Arkansas (4 companies), New Mexico (12 companies), Texas (1 company), Utah (3 companies), and Wyoming (1 company).
- Disposal methods and costs by waste stream. Table 2 shows data records sorted by waste stream—here, OBMs and cuttings. Overall reported costs for disposal of OBMs and cuttings vary significantly by disposal method. Burial in landfills represents a significant disposal option for OBMs and cuttings. Land application is mainly offered in New Mexico (five companies) but also in Utah (two companies) and Wyoming (one company).

OBMs and cuttings are treated in Louisiana and Alabama (one company) and Texas (one company). Solids injection of OBMs and cuttings is undertaken by one company in Louisiana and Texas. Cavern disposal is a competitive option for OBMs and cuttings in Texas (five companies). Evaporation of OBMs and cuttings is offered in Wyoming (three companies). Burial in commercial pits, bioremediation, and recycling of OBMs and cuttings are not widely reported. Thermal treatment represents a more expensive disposal option for OBMs and cuttings.

- Disposal methods and costs by state. Table 3 shows data records sorted by state—here, New Mexico. The state oil and gas agency shared the names of 28 approved commercial disposal facilities. Most of the listed companies provided survey information. Land farming, land filling, and treatment and recycling were the prevalent disposal techniques. Costs ranged from $0.40/bbl to $18.00/bbl.
- Cost summary. Table 4 summarizes costs for all waste-management methods, all waste streams, and all states. Table 4 shows costs expressed as $/bbl. Some companies reported costs in other units; these are not repeated in Table 4.

Transportation, incidental costs

Although disposal costs are important to an operator when choosing a commercial waste disposal company, transportation and other costs weigh heavily in the final decision. Because transportation costs typically increase proportionately with distance or time from the well site to the disposal site, economic incentives exist for operators to send their wastes to disposal facilities within a reasonably short distance. Generally, operators will not be inclined to transport waste more than 50 to 75 miles, unless no other alternatives are available.

The three large disposal companies in Louisiana and Texas have established an extensive network of transfer stations along the Gulf Coast to reduce the distance that operators must transport their waste and to accommodate offshore wastes hauled back to shore. Most transportation services are offered at $55/hr to $175/hr.

Companies may also offer to contract out the transportation component. Distance, job sizes, pre-existing and long-term relationships, and surging oil prices are important factors for calculating case-specific transportation fees. Disposal companies offer trucking and roll-off service.

In cases where business is generated from offshore, companies offer barges. Hopper barges have a capacity of 6,500 bbl and are rented on a per-day or per-bbl basis.

Other issues include:

- Cleaning fees, which vary widely for trucks, boats, and containers.
- Testing–in many cases, facilities conduct laboratory tests to protect themselves.
- Paper trail–waste generators are

required to fill out paperwork concerning the waste materials.

Cost ranges

Argonne's report provides current information covering off site commercial disposal facilities. The disposal methods used across the country include bioremediation, burial, cavern, discharge, evaporation, injection, land application, recycling, thermal treatment, and treatment.

The summary cost ranges by waste type, presented below, include only per barrel cost. In nearly all cases, most costs fall within a narrower band. Multiple disposal methods are used for each type of waste. By far the most common commercial disposal method for produced water is injection.

- Contaminated soil disposal costs range from $1/bbl to $22/bbl.
- NORM disposal costs range from $150/bbl to $300/bbl. Some municipal landfills charge lower tipping fees for wastes with low levels of NORM.
- Oil-based muds and cuttings disposal costs range from $2/bbl to $40/bbl.
- Produced-water injection costs range from $0.30/bbl to $10.00/bbl but in most cases do not even reach $1.00/bbl.
- Tank-bottom disposal costs range from $0.85/bbl to $40/bbl.
- Water-based muds and cuttings disposal costs range from $0.50/bbl to $40/bbl.

When wastes are sent off site for regulatory, economic, or other reasons, operators closely examine the total cost. The most significant decision factors include actual disposal fees and transportation costs.

Acknowledgments

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Risk-based driving plan lowers accident losses

Juan Carlos Lopez
Derek Tate
Schlumberger Oilfield Services
Sugar Land, Tex.

A site-specific, risk-based improvement plan for driving lowered the automotive accidents rates and associated losses for a service company's Qatar oil field operations.

In the first 2 years of the plan, all performance indicators including the automotive accident rate and associated losses were the lowest in the past 4 years.

Problem identification

Driving accidents are a leading cause of fatalities in the oil and gas industry. Industry approaches to driving-accident prevention traditionally have involved policies and standards, defensive driving training, maintenance systems, journey management procedures, and performance monitoring.

Mitigation measures generally have focused on seat-belt use, vehicle condition, rollover-protection devices, air bags, braking systems, and emergency response plans. These measures usually control risk until the program reaches a performance plateau level.

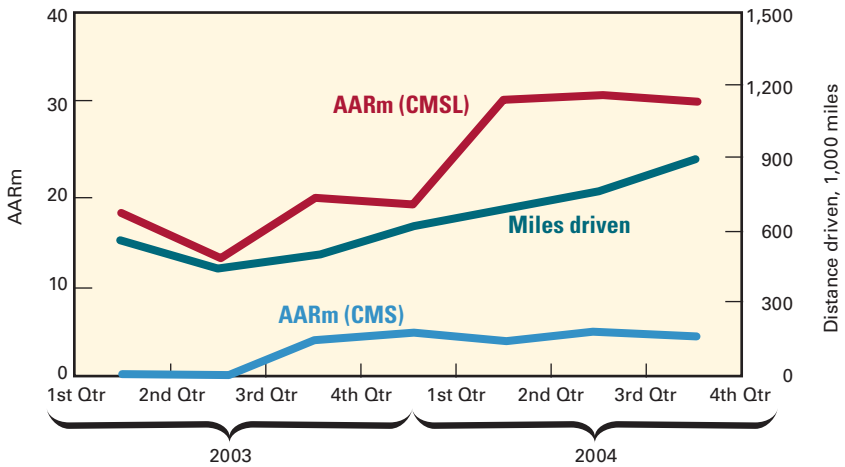
To move toward zero-loss from vehicular events, management must critically analyze risk factors of a specific location and tailor plans further to reduce risk to acceptable levels.

Key to the site-specific plan addresses the attitude of the drivers. Experience has proven the value of generic preventive and mitigation measures. In the Qatar oil field operation, however, traditional risk-prevention measures were

Based on a presentation to the SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production, Abu Dhabi, Apr. 2-4, 2006.

PERFORMANCE PRIOR TO PLAN

Fig. 1



RISK MATRIX PRIOR TO PLAN

Fig. 2

–25 to –20	Black	Nonoperable: Evacuate the zone and or area/country
–16 to –10	Red	Untolerable: Do not take this risk.
–9 to –5	Yellow	Undesirable: Demonstrate ALARP before proceeding.
–4 to –2	Green	Acceptable: Proceed carefully, with continuous improvement.
–1	Blue	Negligible: Safe to proceed

		Improbable 1	Unlikely 2	Possible 3	Likely 4	Probable 5
		Likelihood →				
Light	–1	–1 1L	–2 2L	–3 3L	–4 4L	–5 5L
Serious	–2	–2 1S	–4 2S	–6 3S	–8 4S	–10 5S
Major	–3	–3 1M	–6 2M	–9 3M	–12 4M	–15 5M
Catastrophic	–4	–4 1C	–8 2C	–12 3C	–16 4C	–20 5C
Multicatastrophic	–5	–5 1MC	–10 2MC	–15 3MC	–20 4MC	–25 5MC

Severity ↓

White arrow indicates decreasing risk

ineffective for controlling driving risk and achieving zero-loss performance. Several crashes and high-potential accidents occurred during a short time period.

In this particular case, even with the main requirements of the company's driving standard implemented, the location's performance was unacceptable to local management.

Driving performance indicators typically relate the number of accidents normalized by distance driven or the number of vehicles or drivers. The industry widely uses the automotive accident (or crash) rate in miles (AARm), which this study also uses.

AARm = No. of accidents/1 million miles driven

This indicator measures all accidents, or crashes, including those with high severity classified as catastrophic, major, or serious (CMS) and may include also the ones classified as light (L). The miles driven are usually the cumulative running average of the previous 12 months to represent trends better.

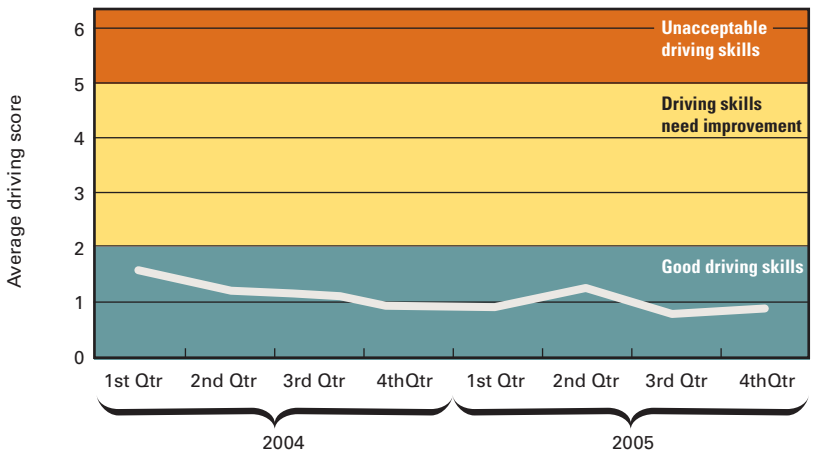
At this location, driving performance had deteriorated between January 2003 and September 2004, resulting in 2 major and 4 serious automotive accidents, as well as 9 and 21 light crashes in 2003 and the first three quarters of 2004, respectively.

Fortunately, no catastrophic events or personal injuries resulted from these accidents because of the previously described mitigation measures in place, along with low speeds controlled by driving monitors.

The area had a concurrent and dramatic increase in miles driven mainly attributed to growing activity levels. The miles driven had increased with a 2003 average of 600,000 miles/year increasing to 1.1 million in third-quarter 2004 (Fig. 1). About five serious or major crashes/million miles driven occurred, which increased to nearly 30 crashes/million miles when in-

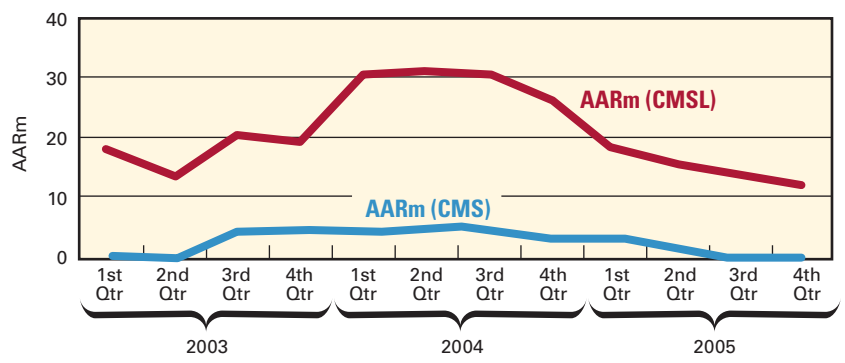
IMPROVEMENT FROM PLAN

Fig. 3



PERFORMANCE AFTER PLAN

Fig. 4



cluding light crashes.

Worldwide experience has shown that whenever a location is facing this trend, the probability of having a fatality increases considerably unless management takes steps to control the root causes.

The unacceptable performance coupled with the exposure increase represented a challenge. Schlumberger's local management realized that, despite the preventive measures in place, the risk associated with driving was not controlled fully and that they had to carry out a proper root-cause analysis and devise an effective remedial work plan.

Management assigned a loss-prevention team to prepare a risk-based improvement plan to seek innovative solutions while taking into account both operational and personal needs better to ensure long-term sustained improvement. The loss-prevention team was a representative employee group whose focus was to:

- Assess the initial risk.
- Create a set of driver considerations.
- Identify common root causes.
- Generate a proposal for an action plan.
- Assess the residual risk to verify effectiveness.

Initial risk assessment

The risk-based improvement plan began with an initial risk assessment based on the location's crash history (frequency and severity) and the risk-control measures in place at the time. The loss-prevention team first conducted a hazard analysis and risk-control exercise that identified the current preventive and mitigation measures and further actions needed to improve the critical situation faced.

Because no major, serious, or high-potential accidents involved heavy transportation, the team focused on light vehicles, most of which were rentals in good condition and in compliance with the corporate standard.

To assess initial risk, the team applied a corporate risk matrix (Fig. 2) with the following worst-case scenario:

"A major accident, such as a rollover, causing severe injuries to more than one passenger. No death is considered because of the mitigation measures in place."

The initial risk-assessment results were:

- Likelihood—Likely; occurs a few times/month at most locations. In 2004, an average of two vehicular accidents/month occurred.
- Potential severity—Major; six CMS and three light crashes occurred during the last 2 years. Mitigation measures reduced the severity and prevented injuries.
- Initial risk—Intolerable; do not take this risk.

Driver considerations

The team analyzed driving profiles, fleet movement trends, and the needs and preferences of the drivers, employees, and expatriate families with a survey that provided key conclusions for the loss-prevention team to formulate improvement actions.

Categories in the accident profile for driver type included manager, engineer, staff, field employee, and professional driver.

The data showed that the professional drivers had accidents in lower numbers and potential severity than any other type of driver. It also found that they generally have better concentration and thus improved practical application

expected behavior.

The survey included the distribution of miles driven by the hour of the day and vehicle occupancy, finding that most driving involved a single occupant traveling to and from work during peak hours. This increased exposure unnecessarily.

Improvement actions considered a driver's type of work because some jobs such as operations and marketing required flexibility and mobility for day-to-day relations with clients and suppliers. Personal considerations also were factored in to support employee morale.

One finding was that the poor local public transportation system restricted employee mobility and jeopardized morale, both of singles and those with families.

Developing and implementing the plan included active interaction with all involved, including expatriate family members, to seek employee feedback further to reduce risk, gain driver buy-in to improve behavior; and ensure management commitment to provide needed resources.

Incident root causes

An in-depth analysis of the near-misses and actual accidents determined common root causes, with three main factors found:

1. External factors of the local driving environment.
2. Driver attitudes and skills.
3. Large exposure because of miles driven.

This country had increasing accident rates and auto fatalities. For example, in 2004, the fatality rate/10,000 vehicles was 8.9, compared to 2.0 in the US and 1.5 in the UK. Since 2002, auto accident deaths have increased steadily, with local authorities reporting a 15% increase compared to the previous 3 years.

The situation will likely worsen with projects under development. Also, the country's most common intersection is a roundabout where about 60% of the accidents involving company vehicles had occurred in the previous 2 years.

During the same period, third parties caused three of the six CMS company crashes.

Investigations (2003-05) indicated that, in this location, 70% of the accidents were attributed to driver lack of skill as a personal factor. The data showed that company drivers lacked a mature crash-free attitude and neglected to apply defensive driving principles in about half the accidents.

While drivers could recite readily the principles, the gap was with their willingness to apply them. Moreover, instructors did not effectively address this behavioral issue.

Before 2004, all driving instructors were field operators and foremen who dedicated only part of their time to defensive-driving training and practical "commentary drives." With the increased activity, training lacked the personal commitment to address behavior as well as basic knowledge of driving skills.

The survey clearly showed that drivers as the only occupants drove 75% of the miles, with about 30% of the miles being driven to and from work during peak hours. This meant that drivers were unnecessarily exposing themselves.

In this location, the number of miles driven increased to 1.2 million in 2005 from 600,000 in 2003. Options were needed to reduce the miles driven.

RISK MATRIX AFTER PLAN

Fig. 5

–25 to –20	Black	Nonoperable: Evacuate the zone and or area/country
–16 to –10	Red	Untolerable: Do not take this risk.
–9 to –5	Yellow	Undesirable: Demonstrate ALARP before proceeding.
–4 to –2	Green	Acceptable: Proceed carefully, with continuous improvement.
–1	Blue	Negligible: Safe to proceed

Severity	Improbable 1	Unlikely 2	Possible 3	Likely 4	Probable 5
	Likelihood →				
Light –1	–1 1L	–2 2L	–3 3L	–4 4L	–5 5L
Serious –2	–2 1S	–4 2S	–6 3S	–8 4S	–10 5S
Major –3	–3 1M	–6 2M	–9 3M	–12 4M	–15 5M
Catastrophic –4	–4 1C	–8 2C	–12 3C	–16 4C	–20 5C
Multicatastrophic –5	–5 1MC	–10 2MC	–15 3MC	–20 4MC	–25 5MC

White arrow indicates decreasing risk

Devised plan

The analysis led to a plan with the following five "must have" elements.

1. Management commitment: Managers lead plan implementation and oversee enforcement.
2. Risk reduction (likelihood): Initiate monthly tracking, reduce exposure (miles driven), and increase professional driver use.
3. Addressing employee and driver behavior: Recognize good performance and apply accountability concept. Emphasize the importance of attitude in training sessions, commentary drives, and employee and driver meetings. To support morale, consider public transportation limitations.
4. Operational needs accommodations: Revaluate actions to avoid negative impact on activities.
5. Segment-specific needs accommodations: Allow individual business segments to develop tailored plans.

Reference 1 includes the specific actions taken and a detailed description of the management-approved action plan presented to the work force. Most of the action items focused on reducing exposure and improving driver behavior and skills.

The main indicator of driver performance used was the driving score taken from the driver improvement monitor. An equation calculates the score by combining three factors:

1. Top speed factor (TSF) that includes maximum speed and cumulative time greater than the set speed limit.
2. Harsh acceleration factor (HAF), or the acceleration greater than a set threshold divided by miles driven.
3. Harsh deceleration factor (HDF), or the braking greater than the speed limit divided by the miles driven.

$$\text{Driver score} = \text{TFS} + \text{HAF} + \text{HDF}$$

The analysis normalizes the scoring into three categories of skill level:

1. Green driver: Score between 0 and 2, good skills.
2. Yellow driver: Score between 2 and 5, requires direction for continuing improvement.
3. Red driver: Score greater than 5, requires immediate coaching and improvement.

The lower the score, the better the driver's performance, with the average score used to assess trends for different areas. This location achieved a sustained improvement from an average score of 1.75 in first-quarter 2004 to 0.9 in last-quarter 2005 (Fig. 3). Since October 2004, management has presented regular awards to the best drivers as well as enforcing accountability for drivers with poor performance.

The AARm depicted in Fig. 4 is the main lagging performance indicator for both CMS and CMSL accidents during 2004 and 2005. No CMS accidents occurred during the last 15 months of the study.

The AARm (CMSL) trend, also improved, falling by 2006 to a lower level than in the previous 4 years.

Using the same worst-case scenario as in the initial risk evaluation, described previously, the residual risk (Fig. 5) is as follows:

- Likelihood—Possible; will occur a few times/year in most areas. The plan has achieved good results, with no CMS accidents occurring in the past year and reduced light accident numbers and potential severity for most. Moreover, driver performance and reduced exposure improved by 20%.
- Potential severity—Major; maintained mainly because of the environmental factors.
- Residual risk—Undesirable; demonstrate risk to be ALARP, "as low as reasonably practicable," before proceeding.

Future plans

This risk-based improvement plan effectively demonstrated that factors causing accidents can be determined and specific actions addressing their root causes can be defined. Management commitment, however, is needed to provide the resources and to gain work-force buy-in. Without this element, a plan is destined to fail.

The management team will continue to review the plan, define specific actions and outline initiatives to sustain the performance achievements, and further improve the risk control measures for the long term. ✦

Reference

1. Lopez, J.C., Tate, D., and Lane, K., "Risk-Based Driving Improvement Plan (Beyond Traditional Approaches), Paper No. SPE 98523, SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, Abu Dhabi, Apr. 2-4, 2006.

The authors

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SECOND-THIRD QUARTERS 2006

US propane production falling short of full-recovery volumes

Dan Lippe
Petral Worldwide Inc.
Houston

Since January 2006, US gas plants have enjoyed record high profit margins. Furthermore, propane prices in all regional markets have been strong enough to encourage refineries to maximize sales into the merchant market.

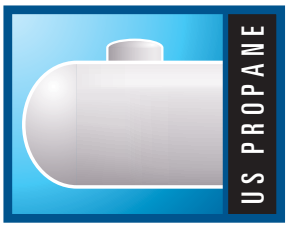
Despite these economic incentives, gas-plant production (even after adjusting for ongoing problems in Louisiana) and net production from refineries failed to reach their historic full-recovery volumes.

During 2000-02, US producers and consumers could count on 900,000-925,000 b/d propane production from gas plants and refineries, when gas plants operated at full recovery. Since 2002, however, "full recovery" gradually declined but the decline went largely unnoticed because a variety of economic and weather-related factors held production below the historic full-recovery volumes.

Propane supply

Before 2005, full propane production (gas-plant production plus net refinery production) for the US was estimated at 900,000-925,000 b/d. Propane production in the US was in this range about 75% of the time during 2000-02.

Propane production has not averaged 900,000 b/d or more since second-quarter 2002. During 2003-05, full-recovery production declined and is now estimated to be 850,000-875,000 b/d.



Total propane production averaged 803,000 b/d in second-quarter 2006 and was an estimated 805,000-815,000 b/d in third-quarter 2006.

Gas plants

Historically, at full recovery, gas-plant production would normally average 545,000-560,000 b/d. In second-quarter 2006, however, propane production from gas plants averaged only 501,000 b/d, or 45,000-60,000 b/d below full recovery. Production in second-quarter 2006 increased 13,000 b/d from first-quarter 2006 but was 22,000 b/d lower than year-earlier volumes.

Although production in Louisiana had not recovered from losses due to Hurricane Katrina, these losses had narrowed to about 20,000 b/d in second-quarter 2006. Gas-plant production in third-quarter 2006 was an estimated 500,000-515,000 b/d—again below demonstrated historic full-recovery production.

US Energy Information Administration (EIA) statistics for Petroleum Administration for Defense District (PADD) III provide details for five subregions. Gas-plant propane production in the Texas Gulf Coast subregion (Texas Railroad Districts 1, 2, and 3) averaged only 30,000-32,000 b/d during 2003 through second-quarter of 2006, or 12,000-14,000 b/d lower than the historic peak of 44,000 b/d (first-quarter 2000).

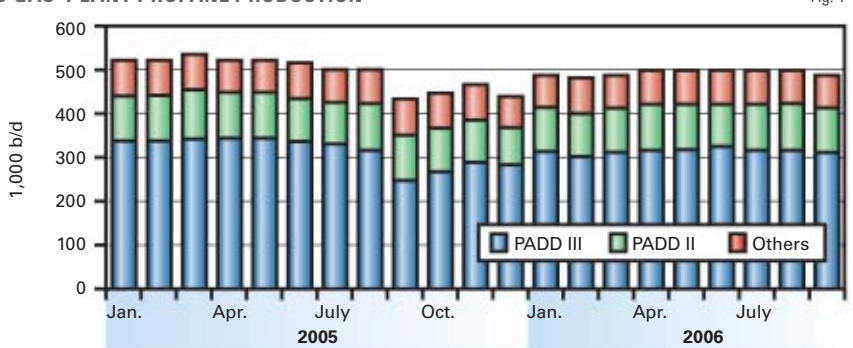
Similarly, gas-plant production in PADD IV (Rocky Mountains) averaged only 55,000-57,000 b/d during first and second quarters 2006 vs. the historic maximum of 64,000 b/d (first-quarter 2003).

The decline in full-recovery production in these two regions reduced the gas processing industry's full-recovery production by about 20,000 b/d.

Based on the emerging trend, we forecast gas-plant production to average 495,000-505,000 b/d during fourth-

US GAS-PLANT PROPANE PRODUCTION

Fig. 1



Source: US Energy Information Administration

quarter 2006 and 530,000-540,000 b/d during first-quarter 2007. The forecast accounts for the Louisiana gas processing industry's continued recovery.

Fig. 1 illustrates trends in propane production from gas plants.

Refineries

Historically, full-recovery propane production from refineries was about 370,000-380,000 b/d. Net production from refineries was most recently at this level in second-quarter 2001. Since 2001, however, net production from refineries has never been higher than 340,000-360,000 b/d and was most recently at this level in second-quarter 2005.

In second-quarter 2006, net propane production from refineries averaged only 301,000 b/d—despite very strong economic incentives to maximize purchases of natural gas and minimize the use of propane in refinery fuel systems. Notably, net propane production from refineries in PADD I and PADD III failed to rebound to historic full-recovery volumes in second-quarter 2006.

Production in PADD I in the second-quarter 2006 averaged only 26,000 b/d and was 7,000 b/d below year-earlier volumes. Production in PADD III in second-quarter 2006 averaged only 144,000 b/d and was 32,000 b/d lower than year-earlier volumes.

Fuel switching

Net propane production from refineries in PADD I typically averaged 30-35,000 b/d before the surge in natural gas prices in fourth-quarter 2005. Net propane production declined to 25,000 b/d in fourth-quarter 2005 and averaged only 22,000 b/d in the first-quarter 2006.

In second-quarter 2006, however, net propane production increased to 26,000 b/d. Refineries in PADD I experienced the full impact of the sharp spike in natural gas prices following Hurricane Katrina and were logical candidates for fuel switching. The decline in merchant sales of propane from refineries in PADD I was fully reasonable.

Furthermore, a lag of 3-6 months is also reasonable before the effects of fuel switching and adjustments to refinery fuel systems are fully reversed. Net propane production from refineries in PADD I is likely to be 5,000-10,000 b/d higher in fourth-quarter 2006 compared with fourth-quarter 2005.

Net propane production from refineries in PADD III typically averaged 165,000-175,000 b/d before fourth-quarter 2005. In first-quarter 2006, net propane production averaged only 132,000 b/d but increased to 144,000 b/d in second-quarter 2006. Even though almost every refinery in PADD III had returned to full production and normal operations, net propane production remained 20,000-30,000 b/d below prehurricane levels.

The average net production in second-quarter 2006, however, was skewed by an unusual decline in June. In April and May 2006, net production in PADD III averaged 154,000 b/d, or only 10,000-20,000 b/d below prehurricane volumes. Net propane production will continue to recover to full prehurricane volumes during third and fourth quarters 2006.

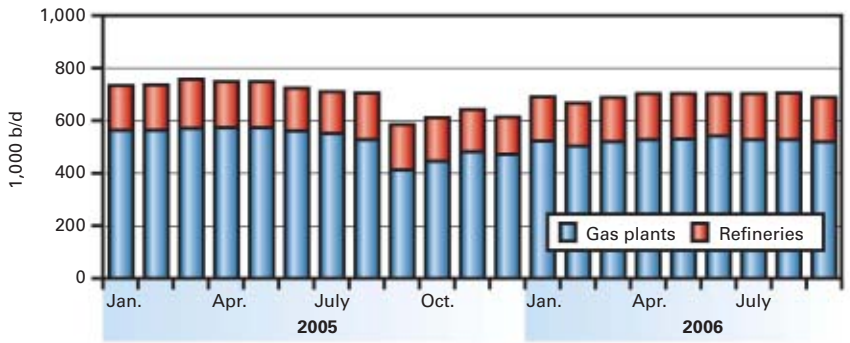
Heating-season outlook

We expect propane supply from refineries to average 300,000-320,000 b/d in fourth-quarter 2006 and 325,000-350,000 b/d in first-quarter 2007. Recovery and reversal of fuel switching could occur faster and net propane production in fourth-quarter 2006 may be as high as 330,000-340,000 b/d.

Fig. 2 illustrates trends in total propane production (gas plants and refineries).

TOTAL US PROPANE PRODUCTION

Fig. 2



Source: US Energy Information Administration.

Imports

In second-quarter 2006, total propane imports into the US averaged 204,000 b/d. Imports were 22,000 b/d higher than in second-quarter 2005 but were 15,000 b/d lower than in first-quarter 2006. The decline in imports in second-quarter 2006 was consistent with normal seasonal trends.

Significantly, waterborne shipments to terminals on the East Coast and Gulf Coast posted a year-to-year increase of 32,000 b/d in second-quarter 2006, but shipments from Canada declined by 10,000 b/d.

Imports into the US during third-quarter 2006 were an estimated 200,000-210,000 b/d, or about the same as in 2005. Based on normal seasonal patterns, total imports into the US will increase to 210,000-220,000 b/d in fourth-quarter 2006 and 220,000-230,000 b/d in first-quarter 2007.

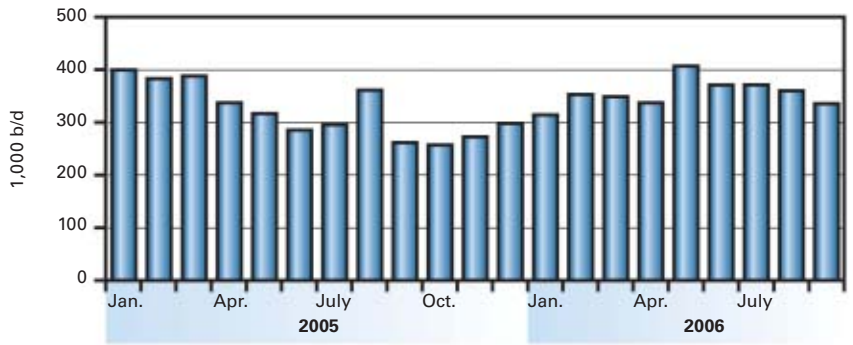
Imports in fourth-quarter 2006 will be about 115,000-125,000 b/d lower than in fourth-quarter 2005. The surge of waterborne shipments in the aftermath of hurricanes Katrina and Rita pushed the volume of imports in fourth-quarter 2005 abnormally high.

Overall trends

Apr. 1 marks the beginning of the inventory accumulation season for US. Inventories in primary storage increased by 19.7 million bbl during second-quarter 2006, an increase equal to the historic

US ETHYLENE FEEDSTOCK DEMAND FOR PROPANE

Fig. 3



Source: Petral Consulting Co.

average but 6.1 million bbl less than in second-quarter 2005.

Based on weekly reports from EIA, propane inventories increased by 20 million bbl during third-quarter 2006.

The increase in inventories during second and third quarters 2006 totaled 39-40 million bbl. The total increase in inventories was about 2 million bbl higher than the historic average but was 2 million bbl lower than in 2005.

Because inventories on Apr. 1 were almost 3 million bbl higher than year-earlier levels, this year's inventory level on Oct. 1 will be equal to the year-earlier level. In 2005, however, inventories continued to build through November and into early December due to the surge in waterborne imports.

This year, inventories will follow normal seasonal patterns. This year's peak of 70 million bbl was about 2 million bbl lower than the peak of 72.5 million bbl in 2005 (Table 1).

During a typical winter, propane markets withdraw 40-44 million bbl of inventory from primary storage. With 70 million bbl of propane in primary storage, a normal inventory withdrawal during the winter heating season will reduce product in storage to about 26-30 million bbl on Apr. 1, 2007. Typically, inventories decline to a seasonal minimum of 26-27 million bbl.

Fig. 3 illustrates trends in propane inventory.

US PROPANE INVENTORIES

Table 1

Month	PADD II	PADD III	Other regions	US total
	Million bbl			
October 2005	24.2	39.2	8.1	71.5
November	23.9	40.4	8.2	72.5
December	18.1	33.0	6.2	57.4
January 2006	15.6	27.0	5.56	48.2
February	12.4	19.2	4.67	36.2
March	11.2	15.6	3.21	30.0
April	14.6	16.4	4.16	35.2
May	17.8	19.2	5.10	42.2
June	20.7	22.5	6.44	49.6
July*	23.0	28.5	7.45	59.0
August*	25.5	31.6	8.25	65.3
September*	27.2	33.3	8.95	69.5

*Estimates based on EIA weekly survey data.

Regional inventory trends

Propane inventory in primary storage in PADD II totaled 11.2 million bbl at the end of March 2006. Inventory in PADD II was 2.3 million bbl higher than the 3-year average and 2.7 million bbl higher than at the end of March 2005. By the end of September 2006, inventory in primary storage in PADD II had increased to a peak of about 26 million bbl. Inventory in PADD II on Oct. 1 was 2.2 million bbl higher than the 3-year average and almost 3 million bbl higher than on Oct. 1, 2005.

Based on normal withdrawals of supply from primary storage (16-18 million bbl) during the winter heating season, inventory in PADD II will decline to a seasonal low of 9-11 million bbl at the end of March 2007.

Propane inventory in primary storage in PADD III totaled 15.5 million bbl at the end of March 2006 and was 0.4 million bbl higher than the 3-year average but 0.4 million bbl lower than in 2005. The inventory build during second-quarter 2006 totaled only 7 million bbl and was unusually weak compared with the 3-year average of 11.5 million bbl.

During third-quarter 2006, the inventory build totaled about 11 million bbl compared with the 3-year average of 9 million bbl. On Oct. 1, inventory in primary storage in PADD II had reached a peak of 36 million bbl. The 2006 peak for PADD III was 2.6 million bbl lower than in 2005. Furthermore, inventories in PADD III in 2005 continued to build during October and November. Unless inventories continue to increase during November, the 2006 inventory peak was about 4 million bbl lower than in 2005.

From a seasonal low of 4.5 million bbl at the end of March 2006, propane inventories in Canada increased by 6.2 million bbl. The increase during the second quarter was about equal to the 5-year average but was 2.4 million bbl more than in 2005. Inventories in Canada continued to build during the third quarter and reached a peak of 14 million bbl on Oct. 1. The 2006 inventory peak in Canada was 3.4 million bbl higher than in 2005 and 0.7 million bbl higher than the 5-year average.

Propane consumption

Ethylene producers have the demonstrated capability to swing feedstock demand for propane to a high of 425,000 b/d from a low of 200,000 b/d. The ethylene industry's feedstock flexibility helps counterbalance the seasonality of propane consumption in the residential-commercial sector.

During second-quarter 2006, feedstock demand for propane averaged 375,000 b/d and propane's share of fresh feed averaged 22%. During second-quarter 2006, propane's share of fresh feed reached a record high of 24.5% (May). Feedstock demand for propane had not averaged 370,000 b/d or more since second-quarter 1999, and propane's share of total fresh feed in second-quarter

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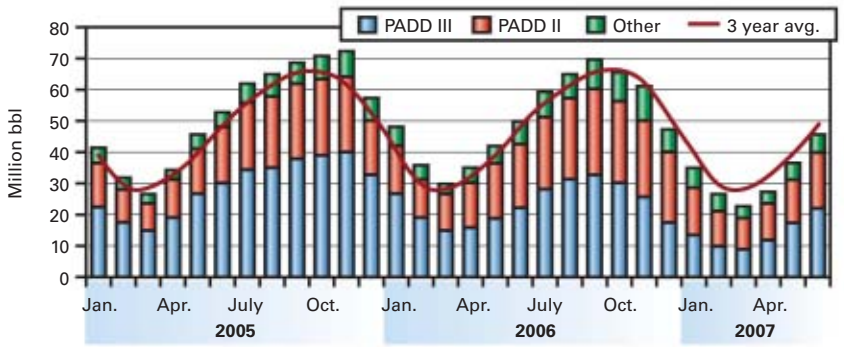
US PROPANE INVENTORY

Fig. 4



Source: US Energy Information Administration.

ETHYLENE FEEDSTOCK DEMAND FOR PROPANE

Table 2

Month	Feedstock consumption, 1,000 b/d	Fresh feed, %
October 2005	259.6	20.7
November	273.5	17.4
December	298.3	18.2
January 2006	315.3	19.2
February	358.9	23.1
March	355.1	21.8
April	340.2	21.1
May	412.1	24.5
June	373.9	21.1
July	370.6	20.9
August	363.7	21.6
September*	355.0	21.0

*Forecast.
Source: Petral olefin plant survey.

1999 was 22.3%. During 1996-2005, propane's share of fresh feed was equal to or exceeded 23% only 6.7% of the time.

In third-quarter 2006, feedstock demand for propane was 360,000-370,000 b/d and propane's share of total fresh feed was 21- 22% (Table 2).

Ethylene plants will operate at 88-92% of capacity rates during fourth-quarter 2006 and first-quarter 2007. Total feedstock demand will average 1.65-1.75 million b/d. On the basis of the strong seasonal pattern in feedstock demand, propane consumption in the ethylene-feedstock market will average 300,000-325,000 b/d in fourth-quarter 2006 and 325,000-350,000 b/d in first-quarter 2007. Fig. 4 illustrates historic trends in ethylene feedstock demand.

Retail demand

Retail propane end uses include sales to residential-commercial, motor fuel, agriculture, and industrial sectors. Consumption in the residential-commercial sector usually accounts for 50-70% of total retail demand during second and third quarters and 70-80% of total retail demand during the winter heating season. Sales into the various retail end-use sectors are determined annually by the American Petroleum Institute on the industry's behalf. Petral Consulting Co. used heating-degree-day statistics to develop estimates of monthly consumption in the residential-commercial and agriculture sectors.

Propane demand in the residential-commercial sector (space heating, cooking, and water heating) tracked normal seasonal patterns and declined during second and third-quarter 2006. Demand averaged 270,000-300,000 b/d in second-quarter 2006 and 100,000-115,000 b/d in third-quarter 2006. These volumes represent actual propane consumption, not 100% of retail sales.

In addition to estimated consumption, a small percentage of customers in the residential-commercial sector began to refill their storage tanks in May. More customers in the residential-commercial sector began to refill their storage tanks during third-quarter 2006. The estimated transfers of propane to secondary or tertiary storage averaged 200,000-225,000 b/d during third-quarter 2006. Propane transfers into secondary or tertiary storage during third-quarter 2006 were 40,000-150,000 b/d below volumes transferred to secondary or tertiary storage during 2001-05.

Based on estimated actual consumption in the residential-commercial sector and consumption in the motor fuel, agriculture, and industrial sectors, propane sales into retail end-use markets averaged 350,000-375,000 b/d in second-quarter 2006 and 150,000-175,000 b/d in third-quarter 2006.

Including transfers to secondary or tertiary storage, total propane sales into the retail markets were 350,000-400,000 b/d in third-quarter 2006. In 2005, total retail propane sales plus transfers to secondary or tertiary storage averaged 490,000 b/d.

Residential-commercial propane demand began to increase during September-October and will reach peak consumption during December-January. Based on average heating-degree days for the previous 10 years, residential-commercial propane consumption in all retail end uses will be 750,000-800,000 b/d in fourth-quarter 2006 and 975,000-1.1 million b/d in first-quarter 2007. Residential-commercial demand will average 1.1-1.2 million b/d during December through February.

Total propane demand in all retail end-use sectors will average 925,000-975,000 b/d during fourth-quarter 2006 and 1.2-1.3 million b/d during first-quarter 2007. Forecasts for retail propane demand during winter 2006-07 are 50,000-100,000 b/d higher than in the winter 2005-06. During winter 2005-06, heating-degree days in the East Coast and Midcontinent were 6-7% below the 1994-2004 average. Forecasts are based on the 10-year average number of heating-degree days.

Pricing, economics

Propane prices in Mont Belvieu averaged 93.2¢/gal in March 2006. During second-quarter 2006, Mont Belvieu prices rode the coattails of the strong rally in WTI prices. Spot propane prices increased to 109.7¢/gal in June, or 17.8% higher than in March. Propane prices in Mont Belvieu rose to 116.3¢/gal in July but declined to 113.7¢/gal in August and 103¢/gal in September.

During second-quarter 2006, the ratio of propane to WTI averaged 62.8%. The propane-WTI ratio during 2002-04 averaged 70.8% during second and

third quarters. This comparison indicates that propane prices were weaker during second and third-quarter 2006 vs. the historic average. The propane-WTI ratio was also weaker than in second-quarter 2005. In third-quarter 2006, the propane-WTI ratio increased to 66.2%—still weaker than the historic average but stronger than in third-quarter 2005 (64.6%).

From the perspective of influences on supply-demand balances, ethylene feedstock price-value relationships are more important than WTI price ratios. In the second quarter, propane prices in Mont Belvieu averaged only 0.8¢/gal less than average substitution values vs. ethane and natural gasoline.

In third-quarter 2006, propane prices in Mont Belvieu averaged 3.3¢/gal higher than average substitution values vs. ethane and natural gasoline. These comparisons indicate that propane in Mont Belvieu was fairly priced in second-quarter 2006. Prices in the third-quarter 2006 were somewhat stronger but remained within the normal variability in price-value relationships.

Spot prices, 2006-07 heating season

WTI prices will average $58-62/bbl during fourth-quarter 2006. Spot propane prices in Mont Belvieu will average 94-102¢/gal during fourth-quarter 2006—or 68-70% of WTI. Spot propane prices in Mont Belvieu will increase to 100-110¢/gal during January and February 2007 but will decline to 95-100¢/gal in March—if WTI prices rebound from the fourth-quarter 2006 slump.

In the ethylene feedstock market, trends in propane's feedstock parity value vs. ethane will be a much more bullish influence than was true in fourth-quarter 2005 and first-quarter 2006. In particular, ethane inventories are much tighter than they were during fourth-quarter 2005. Spot ethane prices in Mont Belvieu will be relatively strong during fourth-quarter 2005. The expected strength in ethane prices will have a bullish influence on spot propane prices in Mont Belvieu during fourth-quarter 2006. Taking this factor into consideration, spot propane prices in Mont Belvieu may be as high as 105-110¢/gal during fourth-quarter 2006 and first-quarter 2007.

Finally, there are emerging indications that the 3-year rally in WTI prices has run its course. WTI may continue to decline in fourth-quarter 2006 (to $55-58/bbl). In a more bearish crude oil price environment, propane prices in Mont Belvieu during fourth-quarter 2006 are likely to average 88-92¢/gal during fourth-quarter 2006 and first-quarter 2007. ✦

NELSON-FARRAR COST INDEXES

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

	1962	1980	2003	2004	2005	July 2005	June 2006	July 2006
Pumps, compressors, etc.	222.5	777.3	1,540.2	1,581.5	1,685.5	1,687.7	1,751.1	1,751.1
Electrical machinery	189.5	394.7	522.0	516.9	513.6	514.6	522.3	523.2
Internal-comb. engines	183.4	512.6	911.7	919.4	931.1	928.5	958.8	961.9
Instruments	214.8	587.3	1,076.8	1,087.6	1,108.0	1,112.8	1,156.9	1,173.4
Heat exchangers	183.6	618.7	732.7	863.8	1,072.3	1,079.2	1,179.4	1,179.4
Misc. equip. average	198.8	578.1	956.7	993.8	1,062.1	1,064.6	1,113.7	1,117.8
Materials component	205.9	629.2	933.8	1,112.7	1,179.8	1,132.2	1,289.1	1,309.4
Labor component	258.8	951.9	2,228.1	2,314.2	2,411.6	2,398.3	2,479.3	2,480.7
Refinery (Inflation) Index	237.6	822.8	1,710.4	1,833.6	1,918.8	1,891.9	2,003.2	2,012.2

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

	1962	1980	2003	2004	2005	July 2005	June 2006	July 2006
Fuel cost	100.9	810.5	934.8	971.9	1,360.2	1,336.7	1,583.8	1,579.7
Labor cost	93.9	200.5	200.8	191.8	201.9	192.7	191.5	199.0
Wages	123.9	439.9	971.8	984.0	1,007.4	988.7	990.4	999.0
Productivity	131.8	226.3	485.4	513.3	501.1	513.2	517.0	502.1
Invest., maint., etc.	121.7	324.8	643.0	686.7	716.0	705.9	741.9	745.2
Chemical costs	96.7	229.2	237.7	268.2	310.5	300.4	372.2	376.0
Operating indexes								
Refinery	103.7	312.7	464.7	486.7	542.1	531.2	575.3	579.5
*Process units**	103.6	457.5	612.5	638.1	787.2	772.7	871.5	873.4

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

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

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

The author

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Companies must carefully choose training for industrial fire fighting

Gordon Lohmeyer
Texas Engineering Extension Service
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Today's oil and gas industry focuses mainly on production. After all, without production, refining, transportation, and distribution of fossil fuels, the industry comes to a halt.

But there is another factor that must be considered: How to guard against a fire. A significant fire event can affect how the supply and distribution chain functions. Considerations must encompass how to protect people, the environment, surrounding communities, and company assets.

Working with flammable materials, either as part of day-to-day operations or as an emergency response, is always risky; mistakes may be sudden and complications and hazards can be masked.

Once a problem emerges, the dangers to health, property, and life can escalate rapidly. Even the newest and best-equipped facility is vulnerable to a potential fire. There is no better defense against fire than to plan, staff, and train a response team.

The need for specialized fire emergency-response training is so great that companies that manufacture, transport, store, or otherwise handle hazardous substances in the US are required by the Occupational Safety and Health Administration (OSHA) to train their employees to detailed standards.

Several training options and credentialing or accreditation factors may come into play. The difficulty faced by industrial and emergency services personnel is to sort through applicable standards and available training curricula and determine the levels of training employees need.

Understanding the different levels of training is crucial. Handling hazardous materials and responding to incidents require a variety of personnel responsibilities. People must understand that their response role is limited by the level of training they've received. In short, they must operate within and according to their levels of training and competencies.

One facility that leads in providing both emergency-response training and technical expertise to prepare responders for potential emergency is the Texas Engineering Extension Service (TEEX), Brayton Fire Training Field, College Station, Tex. It is one of the best equipped and staffed facilities in the US for such training; several unique facets of the training facility will be discussed later.

Emergency brigades

Four options are available when evaluating fire protection:

- Mass evacuation: Train only to report fires via the 911 system.
- Train only selected personnel for incipient fires; i.e., fire extinguisher use or use of hand lines of 125 gpm or less; no "turnout" (i.e., standard fire-fighting) gear.
- Train everyone for incipient fires.
- Train an emergency-response team for response in all areas of facility.

In most industrial settings, the last

option is exercised for what should be obvious reasons.

Industrial emergency-response brigades or teams are groups of employees who are knowledgeable, trained, and skilled sufficiently to perform basic fire fighting. The size of the emergency organization depends on the type of brigade, number of employees working in a facility, size of the facility, number and type of hazards, and availability of emergency equipment on site.

The brigade can consist of volunteers or assigned personnel. The trend in the industry is toward volunteer brigades with few paid members. The brigade should have members from every work shift and department.

This latter factor is important during emergencies when affected areas or equipment such as tanks, process lines, and towers must be quickly identified. A brigade with a member whose daily job involves working in a given area makes it much easier to identify isolation points and obtain product-specific information.

Employers who choose to have an industrial fire brigade are mandated by the Occupational Safety and Health Administration (OSHA; 29 CFR1910.156) to prepare and maintain a statement or written policy that establishes the existence of an industrial fire brigade. This document will outline employee responsibilities and actions during emergencies.

A basic organizational structure must be site specific and assign responsibilities to functional positions. This will help establish operational limitations for brigade members. The organizational statement will show how the brigade fits into the company's emergency-response plan and the limits to the brigade's responsibilities.

Another important function of the organizational statement is to describe the relationship between the industrial fire brigade and other response organizations, including municipalities, mutual-aid organizations, and contractors.

Transportation emergencies involving railcar and highway containers are designed to simulate situations that could occur during the movement phase of the production process. Fire and spill problems include open dome fires, overfills, line leaks, or separations. Both liquid hydrocarbon spills and propane leaks add to the complexity of the extinguishment.

Regulatory factors

How companies go about protecting assets will vary from site to site and company to company. A company must decide the how, what, when, and where of its fire-fighting plan.

The main factors behind fire-brigade training can be found in OSHA 29 Code of Federal Regulations (CFR) 1910.156, which requires annual hands-on training on the duties brigades are expected to perform and the hazards they may encounter.

This training includes live-fire training. If the company produces, distributes, stores, or processes flammable liquids, the brigade would be required to train with a flammable liquid. The same holds true for flammable gases. It would be inappropriate to use hay, wood, or other less volatile fuel sources for training.

The same holds true if teams will be expected to carry out search and rescue and interior fire fighting. These are all considerations in fire-training plan.

Three National Fire Protection Association (NFPA) standards support 29CFR1910.156:

- NFPA 600—Standard for Industrial Fire Brigades.
- NFPA 1081—Standard for Industrial Fire Brigade Member Professional Qualifications (Interior/Exterior).

NFPA 1081 ensures basic firefighting needs are covered; i.e., life safety issues. This standard is then broken out into chapters (incipient, interior, exterior, and leadership). Seen as a "road map" of best practices, NFPA 1081 is designed to ensure minimum training requirements and uniformity.

- NFPA 1041—Standard for Fire Instructor Certification. This standard assists in the development of skills that are necessary for instruction of adults.

Companies must train emergency responders to perform required tasks as set forth under the companies' emergency action plans. An EAP must describe in detail how the company will respond to the specific hazards and the protocols that will be followed. It is critical that fire brigades train with the guidelines set forth under the EAP and

This multilevel prop simulates a chemical operations fire to teach techniques and coordination necessary when more than one type of extinguishing agent is used on multilevel chemical structural fires. Multiple hose lines (due to use of water and foam for fire control), personal protection, and knowledge of fuel-valve isolation are taught and demonstrated.

learn to operate within these guidelines. There is no room to "free lance" on an emergency scene.

Only qualified personnel should be used for this training. Such personnel can be found in several locations, including accredited fire-training centers. The training chosen for the brigade must be performance-based with hands-on activities. These activities need to be based upon job-performance requirements of specific disciplines, such as exterior or interior fire fighting.

Other excellent tools to measure the effectiveness of training exercises are postincident critiques and notes taken during debriefings. Both of these tools provide effective measures of training effectiveness and help determine future training needs.

Response-team training

There are several training considerations once a fire brigade has been established, including:

- What will be an appropriate size of the brigade?
- In what shifts or times will the brigade respond?
- To what level will the teams be trained?
- How, when, and where will this training occur?
- What is the expected outcome of this training?
- What duties will the members be expected to perform (interior, exterior, leadership)?
- To what hazards will the team respond?

Training relies upon three factors: type, amount, and frequency. These questions must be thoroughly discussed with management. One caution must be emphasized: If the decision is to train on live burns twice a year, this commitment must be kept because company management will establish a written policy outlining employee responsibilities and actions to be taken during emergencies.

This decision will dictate the type of training program that must be established to ensure the employees are properly trained in the duties expected of them. This requirement is spelled out in OSHA 29CFR1910.120.

The functional elements of the brigade are further outlined in NFPA 600 and 1081, which detail expected functions of a brigade and discuss organizational duties.

The current trend in emergency-response training programs is certification-based training. Certification means that an individual has been tested by an accredited examining agency against a body of clearly delineated material and found to meet or exceed the minimum standard.

Certification provides the individual with the opportunity to test skills and knowledge against peers from all types of fire departments and fire-service agencies. Examinations are based on widely available NFPA standards; in the case of industrial fire training, this means following NFPA 600, 1041, and 1081 guidelines.

Among the more popular and technically sound approaches to certification-based training is the National Board on Fire Service Professional Qualifications (NPQS), commonly referred to as ProBoard. Another popular organization is the International Fire Service Accreditation Congress (IFSAC).

ProBoard operates under the direction of a board of directors from national fire-service organizations. It issues accreditation to those agencies that test to approved fire-service standards. Accredited agencies are responsible for conducting certification-based training and testing and issuing certification to individuals who successfully complete the testing and skills demonstration process.

Today, accreditation is issued for certification in 67 levels of 16 standards of competencies related to the fire service. Individuals may become certified in as many disciplines as they desire.

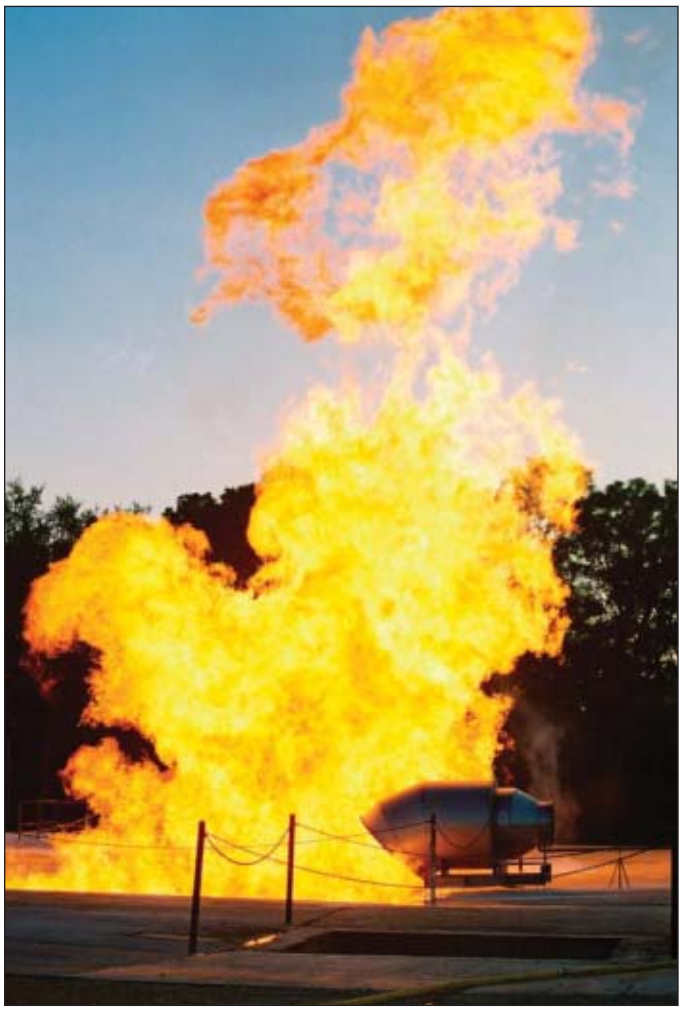
Fire brigades are improved in a variety of ways by having nationally certified members. First, the respect, reputation, and prestige of such professional organizations will expand in proportion to the number of its certified members. These brigades will have officers and

civilian professionals whose credibility is unquestionable.

Second, a brigade's training program will improve as higher goals are secured through the acceptance of the standards. As a result, such training programs will be able to measure themselves as part of a national fire-training system.

Third, training programs that adopt ProBoard certification will minimize the inconsistencies that span other hazardous-material training approaches. When employees are training to a certain level of competency under ProBoard guidelines, they have clearly defined missions and tasks to follow.

NFPA 1081 addresses exterior, interior, and leadership disciplines. This provides a clear pathway once companies have determined to what fire hazards and locations they are going to require brigades to respond. Professional standards are particularly important in high-risk industries such as the fire service and other response organizations.



Since 1987, TEEX is one of the few locations in the US where students can learn about the properties of LNG and how it burns, as well as receive hands-on practice with techniques proven to extinguish an LNG fire.

The widespread adoption of the accreditation and certification offered by ProBoard will go far toward ensuring that this trend continues to the benefit of everyone involved. Certification from a nationally accredited agency is a statement of success for any response organization.

Training-service providers

Regardless of who is selected as training provider, a company must ensure that a few fundamental needs are met.

Start by looking at the safety aspects of the facility. These include not only safe training but the facility's condition maintenance. All must promote the safety for the team.

Then, consider what type of accreditation, certification, or professional creditability the training provider offers. The provider must not be some "fly-by-night" outfit. No matter how good the training records, there is always the possibility of needing to go to the service provider for records or proof of training: "Is my service provider going to be in business next year or even 10 years from now?"

TEEX

Training providers vary from small companies to the largest fire-training service provider in the world. Both are capable of providing fire-based training to its clients. The largest and most diverse fire-training field in the world is the Brayton Fire Training Field, part of the Texas Engineering Extension Service (TEEX) in College Station, Tex.

TEEX offers training that's realistic, large-scale, and hands-on. Brayton's 132 specific training stations offer emergency responders instruction not only in fire-fighting, but also in rescue, emergency medical services, hazardous materials, pipeline emergencies, marine, LNG fire fighting, aircraft fire fighting, and emergency management.

Located adjacent to the Texas A&M University campus, the 120-acre facility attracts more than 45,000 emergency responders from all 50 US states and more than 45 countries each year.

The Brayton Field builds upon a long legacy of TEEX's fire training services. In 1929, the State Firemen's and Fire Marshal's Association of Texas selected Texas A&M for a permanent fire school, with the first annual school a year later attracting 196 fire fighters from 76 Texas cities and towns for 2 days of drills and ground practice.

The success of the first school prompted the Texas Legislature in 1931 officially to recognize the A&M fire school as an "imperative public necessity." Under direction of Col. H.R. Brayton, a chemistry professor, the annual fire-training schools quickly outgrew the A&M campus and nearby Hensel Park in College Station.

In 1960, TEEX took 26 acres of dusty scrub brush west of the A&M campus and constructed the present Brayton Fire Training Field. The 1960s saw unprecedented demand for TEEX's fire-fighter training, particularly for industrial brigades and Spanish-speaking fire fighters. During the 1970s and

TEEX has completed a 2,300-ft belowground pipeline with multiple aboveground connections to train emergency responders to manage and mitigate pipeline emergencies. The project, which can leak both liquid and gas, was constructed with input from the world's leading pipeline industry representatives.

1980s, TEEX experienced new records in annual school enrollment as Brayton quadrupled in size to its current 120 acres.

Today, full-scale props ranging from aircraft fuselages to oil refineries, training, and instructors combine at the Brayton Fire Training Field to form the world's largest and most comprehensive institute for emergency-response training. The combination props and NFPA ProBoard certification classes fits into the category of a "qualified" service provider.

Training measurements

The need to quantify the money spent on training vs. the benefits received holds for any new process put into place or other cost-saving measures implemented. The value of emergency response-team training—in terms of traditional return-on-investment analysis—is sometimes difficult to measure because, until an event, the teams are just good insurance to have around.

Companies need to have the most qualified, best trained teams that are seldom if ever used. With no emergency events or business interruptions, they can continue producing products and making money. Emergency teams plan and train for potential emergencies but do not staff for worst-case scenarios. Surely the impact of an emergency event can be reduced and production can commence by having a well-trained and equipped fire brigade on site.

Many companies cannot rely on mutual-aid agreements, municipal fire departments, or third-party contractors solely to be the front line of defense. Fire events are often fast acting, thus the need to train employees to some level of competency.

Impacts from a fire event may be devastating to a small to medium-sized company; it has the potential of putting such companies out of business. The same holds true for large companies.

If a company has too many fire-related emergencies, regulatory agencies can make it very difficult for that facility to continue to operate. A company needs to look at all aspects of cost benefits derived from training a fire brigade, not just initial startup costs.

The cost savings of staffing a brigade are indirect, thus making them difficult to quantify. Some factors that need exploring are cost savings that could be measured by reduction in insurance premiums, reduced unit down time due to fast actions taken by a team, and increased awareness of potential problems.

New developments

Two new training disciplines are going to be hot topics for years to come: liquefied natural gas (LNG) fire fighting and pipeline emergencies.

LNG terminal instillation along the Gulf Coast will increase substantially over the next few years. Companies will have to train and respond to an entirely new set of hazards presented by LNG emergencies including extinguishment techniques, technologies, and media.

The LNG program available at TEEX aims at frontline emergency fire supervisors and responders, LNG project coordinators, and facility managers who may be faced with an escape of LNG vapor or liquid, although the chances of such an occurrence are low. Students have come from across the US, and Puerto Rico, Trinidad & Tobago, Spain, South Korea, Puerto Rico, Indonesia, UK, Netherlands, France, and Qatar to take advantage of the LNG emergency-response training available at TEEX.

In 2004, with the support of one of the world's largest energy companies, BP PLC, TEEX began upgrading the LNG training area and curriculum. The existing LNG training prop was removed and a four-phased construction project began. The final touches on the LNG facility upgrade were completed in April 2006 (OGJ, Aug. 28, 2006, p. 15).

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TEEX has also announced the offering of a new pipeline-emergencies course. The course is held in cooperation with the US Department of Transportation and the National Association of State Fire Marshals. This course relied heavily upon recognized industry leaders in the pipeline business for course development and prop design.

These industry representatives deal daily with pipeline operations and response and are in tune with the pipeline industries' constantly growing infrastructure. It is the goal of this course to provide emergency responders, local officials, command staff, and other potentially involved parties with the knowledge and tools to manage and mitigate pipeline emergencies successfully.

The pipeline-emergencies course is designed in a modular format. The entire course consists of a 40-hr program that addresses pipeline awareness (8 hr), pipeline operations (16 hr), and pipeline-emergency response (16 hr). During the awareness module of this course, regulatory factors will be addressed as well as causes of pipeline incidents, prevention of pipeline emergencies, and team-based exercise.

The second module of this course is designed to inform participants about both gas and liquid pipeline operations. This includes both transmission and distribution systems and addresses below and aboveground equipment. Also covered in this section are pipeline safety programs, inspection, mapping systems, equipment identification, pipeline markings, and many other critical factors involved in pipeline operations.

The third and final module of this course covers pipeline emergency response. Participants will use the Incident Command System (ICS) operating under guidelines of the National Incident Management System (NIMS), develop Incident Action Plans, manage resources and manpower, and—above all—bring all this knowledge together during responses with real-world pipeline training props.

The TEEX pipeline project consists of a 2,300-ft belowground pipeline with multiple aboveground connections where training props have been constructed. There are seven aboveground stand-alone pipeline training props designed to enhance the responders' abilities to deal with emergencies they may encounter during daily activities.

These training props have the ability to leak both liquid and gas. This flexibility to have material-specific leaks is a very important in the training for potential emergencies and products.

These training props consist of metering stations, dewatering tanks, pig launching and receiving stations, mainline closures, creek crossing, and a soon-to-be-constructed multiuse chemical complex with a truck-loading terminal. These props aid in developing both recognition skills that pipeline responders must posses and response endeavors to pipeline emergencies.

Pipeline-response training is a much-needed training tool that will be useful, especially considering the age of the nation's pipelines. ✦

The author

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API IMPORTS OF CRUDE AND PRODUCTS

	Districts 1-4		District 5		Total US		
	10-20 2006	[1]10-13 2006	10-20 2006	[1]10-13 2006	10-20 2006	[1]10-13 2006	10-21 2005
	1,000 b/d						
Total motor gasoline	355	376	18	65	373	441	468
Mo. gas. blending comp.	665	498	25	26	690	524	550
Distillate[2]	237	246	13	57	250	303	287
Residual	294	198	25	21	319	219	596
Jet fuel-kerosine	102	143	152	114	254	257	129
LPG	327	345	0	0	327	345	295
Unfinished oils	439	570	80	74	519	644	196
Other	592	434	8	11	600	445	639
Total products	**3,011**	**2,810**	**321**	**368**	**3,332**	**3,178**	**3,160**
Canadian crude	1,324	1,687	227	117	1,551	1,804	1,456
Other foreign	7,026	7,853	1,038	1,326	8,064	9,179	7,973
Total crude	**8,350**	**9,540**	**1,265**	**1,443**	**9,615**	**10,983**	**9,429**
Total imports	**11,361**	**12,350**	**1,586**	**1,811**	**12,947**	**14,161**	**12,589**

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

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

OIL&GAS JOURNAL online research center

OGJ CRACK SPREAD

	*10-20-06	*10-21-05	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	66.50	72.71	–6.21	–8.5
Brent crude	57.47	57.66	–0.19	–0.3
Crack spread	9.04	13.97	–4.93	–35.3
FUTURES MARKET PRICES				
One month				
Product value	67.11	74.88	–7.77	–10.4
Light sweet crude	58.37	61.12	–3.75	–6.0
Crack spread	8.74	12.76	–4.02	–31.5
Six month				
Product value	76.10	77.88	–1.77	–2.3
Light sweet crude	64.61	61.60	3.01	4.9
Crack spread	11.49	16.28	–4.78	–29.4

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

API CRUDE AND PRODUCT STOCKS

	Crude oil	Motor gasoline		Jet fuel	Fuel oils		Unfinished oils
		Total	Blending comp.[2]	Kerosine	Distillate	Residual	
	1,000 bbl						
PAD I	16,734	55,786	26,363	10,404	67,731	18,044	8,611
PAD II	66,401	51,330	16,233	7,282	25,466	2,180	15,230
PAD III	175,401	64,740	27,804	12,816	35,911	16,809	43,902
PAD IV	14,527	5,898	1,708	555	2,232	404	3,177
PAD V	[1]57,571	29,189	21,648	9,524	12,493	5,926	20,383
Oct. 20, 2006	**[1]330,634**	**206,943**	**93,756**	**40,581**	**143,833**	**43,363**	**91,303**
Oct. 13, 2006[3]	**334,288**	**209,205**	**94,176**	**41,312**	**144,421**	**42,090**	**91,574**
Oct. 21, 2005	**323,299**	**195,004**	**65,545**	**37,693**	**124,316**	**33,794**	**88,905**

[1]Includes 5.555 million bbl of Alaskan crude in transit by water. [2]Included in total motor gasoline. [3]Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

API REFINERY REPORT—OCT. 20, 2006

District	REFINERY OPERATIONS					REFINERY OUTPUT			
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	Percent operated	Total motor gasoline	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual
	1,000 b/d					1,000 b/d			
East Coast	2,928	1,419	1,431	1,618	88.4	1,813	80	546	103
App. Dist. 1	93	85	87	95	91.6	3	0	26	1
Dist. 1 total	**3,021**	**1,504**	**1,518**	**1,713**	**88.6**	**1,816**	**80**	**572**	**104**
Ind., Ill., Ky.	2,139	2,053	2,070	2,355	87.9	1,105	139	537	51
Minn., Wis., Dak.	405	392	392	442	88.7	308	25	103	8
Okla., Kan., Mo.	860	728	732	786	93.1	457	33	261	7
Dist. 2 total	**3,404**	**3,173**	**2,194**	**3,583**	**89.1**	**1,870**	**197**	**901**	**66**
Inland Texas	910	612	625	647	96.6	451	61	168	7
Texas Gulf Coast	4,050	3,576	3,669	4,031	91.0	1,345	330	1,024	169
La. Gulf Coast	3,104	2,836	3,033	3,264	92.9	1,263	341	807	118
N. La. and Ark.	219	187	203	215	94.4	95	9	49	3
New Mexico	151	99	99	113	87.6	108	0	29	0
Dist. 3 total	**8,434**	**7,310**	**7,629**	**8,270**	**92.3**	**3,262**	**741**	**2,077**	**297**
Dist. 4 total	**640**	**521**	**524**	**596**	**87.9**	**278**	**21**	**168**	**18**
Dist. 5 total	**2,655**	**2,438**	**2,640**	**3,173**	**83.2**	**1,691**	**371**	**525**	**151**
Oct. 20, 2006	**18,154**	**14,946**	**15,505**	**17,335**	**89.4**	**8,917**	**1,410**	**4,243**	**636**
Oct. 13, 2006*	**18,348**	**14,987**	**15,547**	**17,335**	**89.7**	**9,066**	**1,423**	**4,082**	**533**
Oct. 21, 2005	**15,327**	**13,501**	**13,838**	**17,115**	**80.9**	**8,208**	**1,332**	**3,665**	**560**

*Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

Statistics

OGJ GASOLINE PRICES

	Price ex tax 10-18-06	Pump price* 10-18-06	Pump price 10-19-05
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	163.3	207.1	284.9
Baltimore	173.2	215.1	266.1
Boston	184.8	226.7	259.2
Buffalo	164.0	231.9	278.0
Miami	180.5	230.8	277.5
Newark	193.8	226.7	260.1
New York	172.8	240.7	278.7
Norfolk	175.4	213.4	276.3
Philadelphia	181.1	231.8	272.4
Pittsburgh	179.9	230.6	267.2
Wash., DC	196.4	234.8	295.5
PAD I avg.	178.7	226.3	274.2
Chicago	184.7	239.8	271.3
Cleveland	166.6	213.0	249.5
Des Moines	161.9	202.0	242.6
Detroit	171.1	224.0	249.8
Indianapolis	165.0	214.0	244.3
Kansas City	174.0	210.0	239.5
Louisville	170.1	207.0	251.1
Memphis	179.5	219.3	260.0
Milwaukee	175.4	226.7	270.8
Minn.-St. Paul	179.6	220.0	242.1
Oklahoma City	172.6	208.0	234.5
Omaha	174.6	220.0	241.1
St. Louis	180.2	216.2	270.7
Tulsa	169.6	205.0	233.3
Wichita	169.6	213.0	234.4
PAD II avg.	173.0	215.9	249.0
Albuquerque	184.2	220.6	269.0
Birmingham	172.3	211.0	278.3
Dallas-Fort Worth	167.6	206.0	274.3
Houston	171.6	210.0	282.9
Little Rock	173.8	214.0	257.1
New Orleans	186.1	224.5	NA
San Antonio	182.9	221.3	256.2
PAD III avg.	176.9	215.3	269.6
Cheyenne	213.7	246.1	262.1
Denver	210.9	251.3	263.7
Salt Lake City	213.6	256.5	269.4
PAD IV avg.	212.7	251.3	265.1
Los Angeles	200.4	261.0	293.4
Phoenix	206.2	243.6	276.5
Portland	217.7	261.0	256.1
San Diego	204.4	265.0	288.4
San Francisco	215.4	276.0	287.7
Seattle	221.6	271.0	276.9
PAD V avg.	211.0	262.9	279.8
Week's avg.	**183.4**	**227.8**	**258.2**
Sept. avg.	**208.9**	**253.3**	**282.5**
Aug. avg.	**252.4**	**296.7**	**250.2**
2006 to date	**219.4**	**263.0**	—
2005 to date	**180.9**	**222.9**	—

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

REFINED PRODUCT PRICES

	10-13-06 ¢/gal		10-13-06 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	148.55	New York Harbor	166.21
Gulf Coast	150.45	Gulf Coast	167.21
Los Angeles	164.50	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	139.68	ARA	174.57
Singapore	146.43	Singapore	169.93
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	149.50	New York Harbor	88.69
Gulf Coast	148.00	Gulf Coast	88.10
Los Angeles	172.25	Los Angeles	114.02
		ARA	99.69
		Singapore	105.64

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

BAKER HUGHES RIG COUNT

	10-20-06	10-21-05
Alabama	5	5
Alaska	6	8
Arkansas	25	14
California	34	24
Land	31	20
Offshore	3	4
Colorado	93	87
Florida	0	2
Illinois	0	0
Indiana	0	0
Kansas	11	7
Kentucky	13	7
Louisiana	191	177
N. Land	58	51
S. Inland waters	18	19
S. Land	45	33
Offshore	70	74
Maryland	1	0
Michigan	1	2
Mississippi	14	10
Montana	17	23
Nebraska	0	0
New Mexico	88	97
New York	8	2
North Dakota	37	24
Ohio	9	9
Oklahoma	186	154
Pennsylvania	15	14
South Dakota	1	3
Texas	799	666
Offshore	15	9
Inland waters	3	2
Dist. 1	20	15
Dist. 2	31	32
Dist. 3	53	67
Dist. 4	94	73
Dist. 5	130	114
Dist. 6	120	104
Dist. 7B	47	21
Dist. 7C	40	37
Dist. 8	99	71
Dist. 8A	26	23
Dist. 9	46	34
Dist. 10	75	64
Utah	48	25
West Virginia	30	25
Wyoming	100	84
Others—HI-1; ID-1; NV-2; OR-1; TN-1; WA-1	7	5
Total US	**1,739**	**1,474**
Total Canada	**455**	**567**
Grand total	**2,194**	**2,041**
Oil rigs	310	216
Gas rigs	1,422	1,253
Total offshore	95	88
Total cum. avg. YTD	**1,635**	**1,361**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 46.

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

SMITH RIG COUNT

Proposed depth, ft	Rig count	10-20-06 Percent footage*	Rig count	10-21-05 Percent footage*
0-2,500	48	—	28	—
2,501-5,000	91	48.3	64	34.3
5,001-7,500	226	18.1	149	21.4
7,501-10,000	414	2.8	324	5.2
10,001-12,500	444	2.2	305	1.9
12,501-15,000	249	0.4	287	0.3
15,001-17,500	118	—	118	—
17,501-20,000	70	—	52	—
20,001-over	31	—	18	—
Total	**1,691**	**6.3**	**1,345**	**5.7**
INLAND	40		34	
LAND	1,585		1,269	
OFFSHORE	66		42	

*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]10-20-06	[2]10-21-05
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	18	22
Alaska	758	850
California	700	698
Colorado	57	60
Florida	6	7
Illinois	28	28
Kansas	92	93
Louisiana	1,360	643
Michigan	15	16
Mississippi	51	47
Montana	91	96
New Mexico	163	165
North Dakota	103	102
Oklahoma	171	172
Texas	1,347	1,183
Utah	45	48
Wyoming	140	143
All others	67	73
Total	**5,212**	**4,446**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	10-20-06
Alaska-North Slope 27°	66.06
South Louisiana Sweet	52.50
California-Kern River 13°	44.95
Lost Hills 30°	52.35
Wyoming Sweet	57.07
East Texas Sweet	57.39
West Texas Sour 34°	44.75
West Texas Intermediate	53.50
Oklahoma Sweet	53.50
Texas Upper Gulf Coast	50.25
Michigan Sour	46.50
Kansas Common	52.25
North Dakota Sweet	44.00

*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]	10-13-06
United Kingdom-Brent 38°	57.79
Russia-Urals 32°	54.65
Saudi Light 34°	54.07
Dubai Fateh 32°	56.19
Algeria Saharan 44°	59.41
Nigeria-Bonny Light 37°	60.59
Indonesia-Minas 34°	56.15
Venezuela-Tia Juana Light 31°	52.59
Mexico-Isthmus 33°	52.48
OPEC basket	55.93
Total OPEC[2]	55.22
Total non-OPEC[2]	52.71
Total world[2]	53.72
US imports[3]	51.78

[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]

	10-13-06	10-6-06	Change
	Bcf		
Producing region	997	979	18
Consuming region east	1,981	1,951	30
Consuming region west	464	459	5
Total US	**3,442**	**3,389**	**53**
	July 06	**July 05**	**Change, %**
Total US[2]	**2,779**	**2,450**	**13.4**

[1]Working gas. [2]At end of period.
Note: Current data not available.
Source: Energy Information Administration
Data available in OGJ Online Research Center

API IMPORTS OF CRUDE AND PRODUCTS

	Districts 1-4		District 5		Total US		
	10-27 2006	[1]10-20 2006	10-27 2006	[1]10-20 2006	10-27 2006	[1]10-20 2006	10-28 2005
	1,000 b/d						
Total motor gasoline	447	355	108	18	555	373	533
Mo. gas. blending comp.	900	665	58	25	958	690	597
Distillate[2]	427	237	14	13	441	250	304
Residual	137	294	16	25	153	319	597
Jet fuel-kerosine	128	102	51	152	179	254	101
LPG	446	327	0	0	446	327	292
Unfinished oils	408	439	56	80	464	519	325
Other	446	592	16	8	462	600	463
Total products	**3,339**	**3,011**	**319**	**321**	**3,658**	**3,332**	**3,212**
Canadian crude	1,357	1,324	164	227	1,521	1,551	1,974
Other foreign	7,195	7,026	782	1,038	7,977	8,064	7,548
Total crude	**8,552**	**8,350**	**946**	**1,265**	**9,498**	**9,615**	**9,522**
Total imports	**11,891**	**11,361**	**1,265**	**1,586**	**13,156**	**12,947**	**12,734**

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

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

OIL&GAS JOURNAL online research center

OGJ CRACK SPREAD

	*10-27-06	*10-28-05	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	67.70	69.23	–1.53	–2.2
Brent crude	57.91	58.83	–0.92	–1.6
Crack spread	9.78	10.90	–1.12	–10.3
FUTURES MARKET PRICES				
One month				
Product value	67.47	71.55	–4.08	–5.7
Light sweet crude	60.13	61.15	–1.02	–1.7
Crack spread	7.34	10.41	–3.07	–29.5
Six month				
Product value	75.78	76.79	–1.01	–1.3
Light sweet crude	64.87	62.17	2.70	4.3
Crack spread	10.92	14.62	–3.70	–25.3

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

API CRUDE AND PRODUCT STOCKS

	Crude oil	Motor gasoline		Jet fuel	Fuel oils		Unfinished oils
		Total	Blending comp.[2]	Kerosine	Distillate	Residual	
	1,000 bbl						
PAD I	14,216	53,290	25,611	10,360	68,208	18,387	8,704
PAD II	67,722	50,925	16,733	7,000	25,935	2,227	15,373
PAD III	179,433	65,470	27,594	13,457	35,206	16,673	43,012
PAD IV	14,826	5,684	1,733	614	2,296	421	3,387
PAD V	[1]57,915	28,416	20,892	9,723	11,443	6,123	20,215
Oct. 27, 2006	**[1]334,112**	**203,785**	**92,563**	**41,154**	**143,088**	**43,831**	**90,691**
Oct. 20, 2006[3]	**330,634**	**206,943**	**93,756**	**40,581**	**143,833**	**43,363**	**91,303**
Oct. 28, 2005	**321,781**	**198,969**	**66,979**	**36,730**	**126,396**	**35,138**	**88,730**

[1]Includes 7.045 million bbl of Alaskan crude in transit by water. [2]Included in total motor gasoline. [3]Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

API REFINERY REPORT—OCT. 27, 2006

	REFINERY OPERATIONS					REFINERY OUTPUT			
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	Percent operated	Total motor gasoline	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual
	1,000 b/d					1,000 b/d			
East Coast	3,164	1,538	1,553	1,618	96.0	1,913	121	601	118
App. Dist. 1	103	95	95	95	100.0	7	0	30	1
Dist. 1 total	**3,267**	**1,633**	**1,648**	**1,713**	**96.2**	**1,920**	**121**	**631**	**119**
Ind., Ill., Ky.	2,157	2,050	2,058	2,355	87.4	1,118	152	499	41
Minn., Wis., Dak.	411	403	404	442	91.4	297	33	110	7
Okla., Kan., Mo.	830	728	731	786	93.0	424	22	263	5
Dist. 2 total	**3,398**	**3,181**	**3,193**	**3,583**	**89.1**	**1,839**	**207**	**872**	**53**
Inland Texas	881	572	584	647	90.3	436	59	165	6
Texas Gulf Coast	4,249	3,542	2,688	4,031	91.5	1,477	334	1,028	168
La. Gulf Coast	3,349	3,075	3,252	3,264	99.6	1,214	354	799	84
N. La. and Ark.	222	190	192	215	89.3	76	8	51	4
New Mexico	162	99	99	113	87.6	83	2	30	0
Dist. 3 total	**8,863**	**7,478**	**7,815**	**8,270**	**94.5**	**3,286**	**757**	**2,073**	**262**
Dist. 4 total	**659**	**568**	**570**	**596**	**95.6**	**295**	**24**	**169**	**17**
Dist. 5 total	**2,525**	**2,266**	**2,460**	**2,173**	**77.5**	**1,674**	**365**	**497**	**129**
Oct. 27, 2006	**18,712**	**15,126**	**15,686**	**17,335**	**90.5**	**9,014**	**1,474**	**4,242**	**580**
Oct. 20, 2006*	**18,154**	**14,946**	**15,505**	**17,335**	**89.4**	**8,917**	**1,410**	**4,243**	**636**
Oct. 28, 2005	**15,534**	**13,776**	**14,096**	**17,115**	**82.4**	**8,370**	**1,344**	**3,790**	**539**

*Revised.
Source: American Petroleum Institute.
Data available in OGJ Online Research Center.

Statistics

OGJ GASOLINE PRICES

	Price ex tax 10-25-06	Pump price* 10-25-06	Pump price 10-26-05
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	163.3	203.0	278.9
Baltimore	169.1	211.0	258.0
Boston	180.9	222.8	249.0
Buffalo	167.8	227.9	266.6
Miami	176.6	226.9	268.4
Newark	189.9	222.8	253.3
New York	176.7	236.8	270.8
Norfolk	172.8	210.4	272.0
Philadelphia	172.2	227.9	264.7
Pittsburgh	176.1	226.8	256.3
Wash., DC	192.5	230.9	295.5
PAD I avg.	176.6	222.5	266.7
Chicago	182.3	233.2	269.7
Cleveland	166.5	212.9	247.1
Des Moines	161.5	201.9	240.8
Detroit	174.7	223.9	248.5
Indianapolis	168.9	213.9	242.0
Kansas City	173.9	209.9	237.8
Louisville	170.0	206.9	249.6
Memphis	179.2	219.0	258.6
Milwaukee	171.5	222.8	269.5
Minn.-St. Paul	179.5	219.9	240.6
Oklahoma City	172.5	207.9	232.1
Omaha	173.5	219.9	237.6
St. Louis	180.0	216.0	270.2
Tulsa	169.5	204.9	231.0
Wichita	169.5	212.9	231.4
PAD II avg.	172.9	215.1	247.1
Albuquerque	183.1	219.5	263.6
Birmingham	172.2	210.9	272.0
Dallas-Fort Worth	167.5	205.9	264.7
Houston	171.5	209.9	274.2
Little Rock	173.7	213.9	249.6
New Orleans	180.4	218.8	NA
San Antonio	176.6	215.0	252.3
PAD III avg.	175.0	213.4	262.8
Cheyenne	200.2	232.6	260.6
Denver	197.3	237.7	261.8
Salt Lake City	198.5	241.4	268.4
PAD IV avg.	198.7	237.3	263.6
Los Angeles	195.8	254.3	293.1
Phoenix	203.1	240.5	274.8
Portland	210.3	253.6	254.6
San Diego	203.1	261.6	286.7
San Francisco	214.1	272.6	286.5
Seattle	211.2	263.6	276.2
PAD V avg.	206.3	257.7	278.7
Week's avg.	**180.8**	**224.4**	**254.3**
Oct. avg.	**183.8**	**228.0**	**263.9**
Sept. avg.	**208.9**	**253.3**	**282.5**
2006 to date	**218.5**	**262.1**	—
2005 to date	**181.6**	**223.6**	—

*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

	10-20-06 ¢/gal		10-20-06 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	147.20	New York Harbor	164.78
Gulf Coast	149.45	Gulf Coast	163.78
Los Angeles	156.40	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	137.96	ARA	169.93
Singapore	150.55	Singapore	170.10
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	150.40	New York Harbor	95.55
Gulf Coast	147.65	Gulf Coast	88.69
Los Angeles	164.15	Los Angeles	114.02
		ARA	90.84
		Singapore	105.70

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

BAKER HUGHES RIG COUNT

	10-27-06	10-28-05
Alabama	5	5
Alaska	7	8
Arkansas	26	14
California	34	31
Land	31	26
Offshore	3	5
Colorado	92	86
Florida	0	2
Illinois	0	0
Indiana	0	0
Kansas	11	7
Kentucky	14	7
Louisiana	192	176
N. Land	59	50
S. Inland waters	19	19
S. Land	43	34
Offshore	71	73
Maryland	0	0
Michigan	3	2
Mississippi	14	10
Montana	17	24
Nebraska	0	0
New Mexico	89	92
New York	9	4
North Dakota	38	22
Ohio	8	9
Oklahoma	187	153
Pennsylvania	14	13
South Dakota	1	3
Texas	801	665
Offshore	15	8
Inland waters	3	2
Dist. 1	21	15
Dist. 2	30	33
Dist. 3	51	66
Dist. 4	94	71
Dist. 5	131	111
Dist. 6	126	102
Dist. 7B	51	21
Dist. 7C	41	37
Dist. 8	96	75
Dist. 8A	22	24
Dist. 9	44	35
Dist. 10	76	65
Utah	45	28
West Virginia	30	26
Wyoming	101	88
Others—HI-1; NV-2; OR-1; TN-1; WA-1	6	5
Total US	**1,744**	**1,480**
Total Canada	**343**	**585**
Grand total	**2,087**	**2,065**
Oil rigs	310	227
Gas rigs	1,422	1,247
Total offshore	95	87
Total cum. avg. YTD	**1,635**	**1,363**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 46.

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

SMITH RIG COUNT

Proposed depth, ft	Rig count	10-27-06 Percent footage*	Rig count	10-28-05 Percent footage*
0-2,500	47	2.1	24	—
2,501-5,000	92	50.0	69	33.3
5,001-7,500	229	16.1	148	22.2
7,501-10,000	405	2.7	327	5.1
10,001-12,500	443	2.2	306	2.2
12,501-15,000	245	0.8	283	0.3
15,001-17,500	113	—	125	—
17,501-20,000	72	—	50	—
20,001-over	32	—	17	—
Total	**1,678**	**6.3**	**1,349**	**6.0**
INLAND	36		32	
LAND	1,578		1,276	
OFFSHORE	64		41	

*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]10-27-06	[2]10-28-05
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	18	22
Alaska	762	862
California	702	699
Colorado	57	63
Florida	6	7
Illinois	29	27
Kansas	94	93
Louisiana	1,371	695
Michigan	15	16
Mississippi	51	50
Montana	91	96
New Mexico	164	167
North Dakota	104	103
Oklahoma	174	172
Texas	1,353	1,199
Utah	45	48
Wyoming	141	143
All others	67	72
Total	**5,244**	**4,534**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	10-27-06
Alaska-North Slope 27°	66.06
South Louisiana Sweet	56.25
California-Kern River 13°	48.85
Lost Hills 30°	55.40
Wyoming Sweet	61.00
East Texas Sweet	59.33
West Texas Sour 34°	48.50
West Texas Intermediate	57.25
Oklahoma Sweet	57.25
Texas Upper Gulf Coast	54.00
Michigan Sour	50.25
Kansas Common	56.25
North Dakota Sweet	47.75

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.

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

WORLD CRUDE PRICES

$/bbl[1]	10-20-06
United Kingdom-Brent 38°	57.67
Russia-Urals 32°	54.49
Saudi Light 34°	54.78
Dubai Fateh 32°	56.58
Algeria Saharan 44°	59.74
Nigeria-Bonny Light 37°	61.07
Indonesia-Minas 34°	54.41
Venezuela-Tia Juana Light 31°	52.34
Mexico-Isthmus 33°	52.23
OPEC basket	55.88
Total OPEC[2]	55.63
Total non-OPEC[2]	52.67
Total world[2]	53.86
US imports[3]	51.87

[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]

	10-20-06	10-13-06	Change
	Bcf		
Producing region	1,004	997	7
Consuming region east	1,990	1,981	9
Consuming region west	467	464	3
Total US	**3,461**	**3,442**	**19**
	July 06	**July 05**	**Change, %**
Total US[2]	**2,779**	**2,450**	**13.4**

[1]Working gas. [2]At end of period.
Note: Current data not available.
Source: Energy Information Administration
Data available in OGJ Online Research Center

PACE REFINING MARGINS

	Aug. 2006	Sept. 2006	Oct. 2006	Oct. 2005	Change 2006 vs. 2005	Change, % 2006 vs. 2005
	$/bbl					
US Gulf Coast						
West Texas Sour	14.85	8.16	10.76	26.61	–15.85	–59.6
Composite US Gulf Refinery	16.11	8.10	10.02	23.67	–13.65	–57.7
Arabian Light	15.10	7.37	10.71	23.78	–13.07	–55.0
Bonny Light	8.62	2.36	2.79	22.48	–19.69	–87.6
US PADD II						
Chicago (WTI)	18.75	6.39	8.79	23.05	–14.26	–61.9
US East Coast						
NY Harbor (Arab Med)	9.43	3.07	6.37	12.14	–5.78	–47.6
East Coast Comp-RFG	12.12	4.74	6.58	15.60	–9.05	–58.0
US West Coast						
Los Angeles (ANS)	15.64	9.43	12.19	18.51	–6.32	–34.1
NW Europe						
Rotterdam (Brent)	2.03	1.94	2.93	6.79	–3.86	–56.9
Mediterranean						
Italy (Urals)	9.78	6.71	7.31	10.95	–3.64	–33.2
Far East						
Singapore (Dubai)	0.04	–0.50	0.22	6.00	–5.77	–96.3

. Source: Jacobs Consultancy Inc.
Data available in OGJ Online Research Center.

US NATURAL GAS BALANCE DEMAND/SUPPLY SCOREBOARD

	July 2006	June 2006	July 2005	July 2006-2005 change	Total YTD 2006	Total YTD 2005	YTD 2006-2005 change
	bcf						
DEMAND							
Consumption	1,812	1,570	1,678	134	13,024	13,439	–415
Addition to storage	305	373	351	–46	1,724	1,687	37
Exports	61	62	55	6	416	501	–85
Canada	23	24	18	5	187	264	–77
Mexico	32	32	30	2	190	200	–10
LNG	6	6	7	–1	39	37	2
Total demand	**2,178**	**2,005**	**2,084**	**94**	**15,164**	**15,627**	**–463**
SUPPLY							
Production (dry gas)	1,549	1,508	1,559	–10	10,757	10,885	–128
Supplemental gas	6	5	6	0	40	40	0
Storage withdrawal	144	62	95	49	1,724	2,998	–1,274
Imports	364	339	384	–20	2,414	2,497	–83
Canada	306	277	331	–25	2,054	2,129	–75
Mexico	0	0	0	—	3	1	2
LNG	58	62	53	5	357	367	–10
Total supply	**2,063**	**1,914**	**2,044**	**19**	**14,935**	**16,420**	**–1,485**

NATURAL GAS IN UNDERGROUND STORAGE

	July 2006	June 2006	May 2006	July 2005	Change
	bcf				
Base gas	4,214	4,216	4,202	4,203	11
Working gas	2,779	2,617	2,310	2,450	329
Total gas	**6,993**	**6,833**	**6,512**	**6,653**	**340**

Source: DOE Monthly Energy Review.
Data available in OGJ Online Research Center.

WORLDWIDE NGL PRODUCTION

	July 2006	June 2006	7 month average Production 2006	7 month average Production 2005	Change vs. previous year Volume	Change vs. previous year %
	1,000 b/d					
Brazil	91	85	85	74	11	14.5
Canada	659	644	687	668	19	2.9
Mexico	449	436	439	432	7	1.6
United States	1,755	1,753	1,720	1,825	–105	–5.8
Venezuela	200	200	200	200	—	—
Other Western Hemisphere	178	176	172	153	19	12.4
Western Hemisphere	**3,332**	**3,294**	**3,302**	**3,351**	**–49**	**–1.5**
Norway	296	237	284	267	17	6.5
United Kingdom	126	146	155	179	–24	–13.6
Other Western Europe	19	19	20	23	–3	–14.8
Western Europe	**440**	**402**	**458**	**468**	**–10**	**–2.2**
Russia	420	410	393	486	–93	–19.1
Other FSU	160	160	160	160	—	—
Other Eastern Europe	15	16	17	18	–1	–4.6
Eastern Europe	**595**	**586**	**570**	**664**	**–94**	**–14.1**
Algeria	295	295	295	295	—	—
Egypt	65	65	65	65	—	—
Libya	60	60	60	60	—	—
Other Africa	193	195	189	167	22	13.0
Africa	**613**	**615**	**609**	**587**	**22**	**3.7**
Saudi Arabia	1,490	1,480	1,473	1,460	13	0.9
United Arab Emirates	400	400	400	400	—	—
Other Middle East	670	670	670	571	99	17.3
Middle East	**2,560**	**2,550**	**2,543**	**2,431**	**112**	**4.6**
Australia	90	85	80	81	–1	–0.8
China	180	180	180	180	—	—
India	40	43	43	44	–1	–3.2
Other Asia-Pacific	220	218	220	218	2	0.8
Asia-Pacific	**530**	**526**	**523**	**523**	**—**	**—**
TOTAL WORLD	**8,070**	**7,973**	**8,005**	**8,025**	**–20**	**–0.3**

Totals may not add due to rounding.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

OXYGENATES

	Aug. 2006	July 2006	Change	YTD 2006	YTD 2005	Change
	1,000 bbl					
Fuel ethanol						
Production	10,185	9,804	381	74,002	59,841	14,161
Stocks	9,160	7,727	1,433	9,160	5,246	3,914
MTBE						
Production	3,022	3,103	–81	23,659	33,072	–36,182
Stocks	1,759	2,100	–341	1,759	2,751	–992

Source: DOE Petroleum Supply Monthly.
Data available in OGJ Online Research Center.

US COOLING DEGREE DAYS

	Sept. 2006	Sept. 2005	Normal	2006 % change from normal	Total degree days Jan. 1 through Sept. 30 2006	2005	Normal	% change from normal
New England	16	64	22	–27.3	527	627	417	26.4
Middle Atlantic	34	134	59	–42.4	773	957	651	18.7
East North Central	26	127	60	–56.7	746	940	700	6.6
West North Central	50	165	87	–42.5	1,114	1,121	916	21.6
South Atlantic	254	334	259	–1.9	1,908	1,907	1,756	8.7
East South Central	203	300	209	–2.9	1,732	1,708	1,486	16.6
West South Central	340	493	345	–1.4	2,667	2,563	2,274	17.3
Mountain	167	209	167	—	1,462	1,385	1,184	23.5
Pacific	138	106	125	10.4	880	719	663	32.7
US average*	**143**	**220**	**155**	**–7.7**	**1,323**	**1,343**	**1,141**	**16.0**

*Excludes Alaska and Hawaii.
Source: DOE Monthly Energy Review.
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2. Study of the available well data, geophysical data, petrophysical, geochemical, temperature, porosity/permeability, lithology, pressure and heat flow data
3. Construction of a geological/structural model of the basin
4. Estimation of the source rock potential of the basin and possible generative depressions
5. Determination of the burial history, depth, timing of oil/gas generation
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8. Construction of petroleum system model
9. Preparation and submission of report on the study carried out.

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1. Organization profile and set-up with resume of personnel proposed for the study
2. Plan with details for executing scope of work
3. Software/hardware available for the modeling
4. Write-up on similar projects executed
5. Details of participating organizations in case of consortium
6. Balance Sheet of last two years.

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California oil tax would fund energy spending

"Senseless" half describes a ballot initiative on which Californians will vote in November calling for a tax on oil to pay for state-sponsored energy.

The aim of the Clean Alternative Energy Act is to accumulate $4 billion for 10 years of spending on programs to replace oil.

The money would come from a tax on oil production, the rate of which would vary with the price of crude. At $10-25/bbl, the rate would be 1.5% of the gross value of oil. The top rate, 6%, would apply when the crude price exceeded $60/bbl.

Proponents of the initiative, known as Proposition 87, include former President Bill Clinton, former Vice-President Al Gore, movie stars, and wealthy Hollywood executive Stephen Bing, who is reported to have contributed $40 million to the glitz blitz.

Prop 87's supporters say the measure would cut oil use, improve the environment, and make oil companies pay for clean energy.

They betray their shallow understanding of the issues by including in Prop 87 a prohibition against pass-through of the oil tax to consumers. They don't say how a tax on raw material is supposed to not find its way to consumers of the finished product. But this is the land of fantasy and deception, after all.

In the real world, Prop 87 would cut oil production in California, raise imports, and squander proceeds of the production tax on a political beauty contest among uneconomic fuels. It would yield little in the way of useful energy; only markets can do that. By putting large amounts of money up for grabs outside the reach of market discipline and beyond the limits of popular understanding, it also would invite corruption.

Among US states, California ranks first in gasoline consumption and third in distillate use, mostly diesel. If a majority of Californians really want to stop using oil, nothing is stopping them.

To do so by way of a punishing tax on oil production would be beyond senseless, however. In view of the measure's effect on producers of something for which Californians display a consistently strong need, it also would be hypocritical.

(Online Oct. 20, 2006; author's e-mail: bobt@ogjonline.com)

The Editor's Perspective

by Bob Tippee, Editor

Market Journal

by Sam Fletcher, Senior Writer

Reaction slow to OPEC cut

Energy markets were slow to show confidence that members of the Organization of Petroleum Exporting Countries would follow through on an agreement to reduce production by Nov. 1.

The November contract for benchmark US crudes gained 85¢ to $58.50/bbl Oct. 19 in New York as Saudi Arabia endorsed a counterseasonal proposal to reduce production by 1 million b/d at the group's meeting in Qatar. But it expired at a 16-month low of $56.82/bbl Oct. 20 after OPEC voted to cut actual production by 1.2 million b/d to 26.3 million b/d, well below the 28 million b/d ceiling set 2 years ago.

Cold weather and a bigger-than-expected reduction of US petroleum inventories helped boost the new front-month crude contract to $60.75/bbl on the New York Mercantile Exchange by Oct. 27, however.

Analysts in the Houston office of Raymond James & Associates Inc. said OPEC likely would curtail only 765,000 b/d in its effort to keep oil prices above $60/bbl on NYMEX. Saudi Arabia immediately agreed to cut 380,000 b/d. Iran subsequently agreed to throttle back by 176,000 b/d, while UAE officials notified customers of a 5% reduction.

"We believe that the Saudis did not like the way this cut was more or less imposed by Nigeria and Venezuela without preliminary discussion with the other members, probably expecting to make good deals by forcing the organization to announce a cut based on official quotas," said analysts at the Societe Generale corporate investment-banking group. "After all, both Nigeria and Venezuela have long been producing less than their official quotas: 120,000 b/d less for Nigeria and 680,000 b/d less for Venezuela. Therefore, if OPEC decided on pro-rata quota cuts totaling 1 million b/d, Nigeria and Venezuela could each have complied with its new official quota by maintaining production and not cutting a single barrel."

With the OPEC basket at $55.53/bbl on Oct. 27, members still have strong incentive to produce at high levels, said Rick Mueller, senior analyst at Energy Security Analysis Inc., Boston. "Beyond the potential public relations nightmare of cutting output in the face of high prices, there is a strong economic incentive for countries to maximize their revenue while prices remain strong," Mueller said. However, he expects the Saudis "will act quickly to raise production to snuff out any sharp price spike."

At the Centre for Global Energy Studies, London, analysts thought it "questionable whether prices are low enough to persuade OPEC's African members to cut production while demand for their light, sweet crudes remains robust." The OPEC agreement lacks "explicit starting points for individual output cuts" necessary for "real credibility," said CGES analysts. "The quota system—at least in its present form—is dead," they concluded. "Quotas were a useful system to adopt when OPEC was attempting to manage the market during a period of high excess production capacity, but they have little relevance at a time when most member-countries are producing at or close to capacity."

Weather moves prices

The new December front-month contract for benchmark US sweet, light crudes lost 52¢ to $58.81/bbl Oct. 23 on NYMEX but rebounded to $59.35/bbl Oct. 24 as US forecasts of cold weather triggered speculation of reduced heating oil inventories. It jumped to $61.40/bbl Oct. 25 when the Energy Information Administration reported US crude inventories plunged by 3.3 million bbl to 332.3 million bbl in the week ended Oct. 20. US oil imports fell 936,000 b/d to 9.5 million b/d with the Louisiana Offshore Oil Port—the largest US oil importing facility—closed for 3 days during that week. US gasoline stocks fell by 2.8 million bbl to 207.4 million bbl, while distillate fuel inventories declined by 1.4 million bbl to 144 million bbl. It was "the biggest weekly decline in petroleum inventories since the week that Hurricane Katrina made landfall [in Louisiana Aug. 29, 2005], flying in the face of expected increases for oil and gasoline," Raymond James analysts said.

Olivier Jakob, managing director of Petromatrix GMBH, Zug, Switzerland, said crude prices essentially bottomed out in October and would likely climb for the rest of this year. "We expect volatility to remain as we are still in the shoulder period where the winter demand is not fully set in and there is still strong disagreement in the market over the impact of the OPEC oil cuts," he said.

Benchmark US crudes "will next pass above $70/bbl long before they pass below $50/bbl. However, we suspect that it will not be a particularly linear journey, and it may yet take a while," said Paul Horsnell at Barclays Capital Inc., London.

(Online Oct. 30, 2006; author's e-mail: samf@ogjonline.com)

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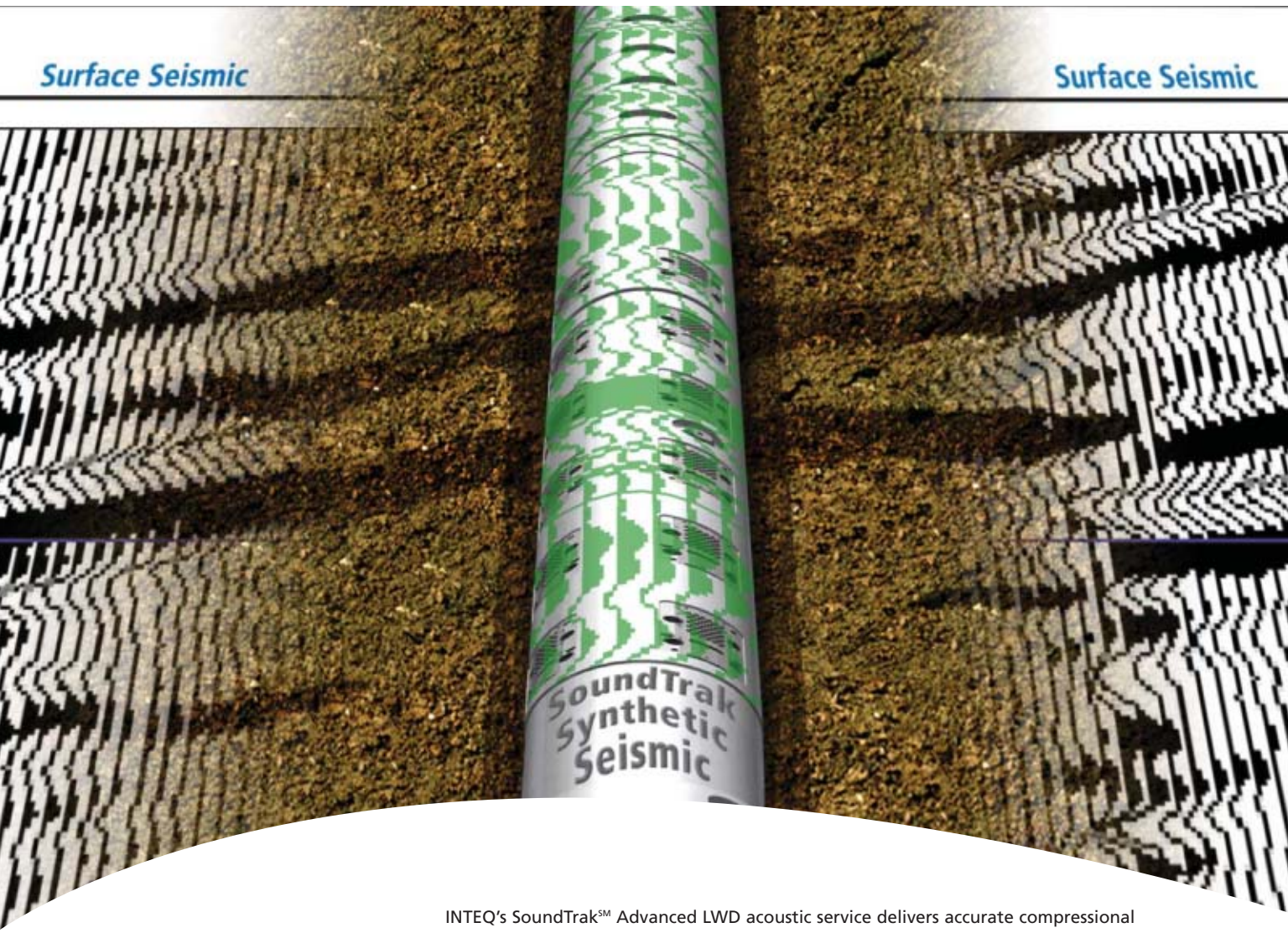

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OIL&GAS JOURNAL Offshore OIL&GAS FINANCIAL JOURNAL

E&P industry utilizes every available tactic for recruitment and retention of scarce employees

The global oil and gas industry is facing a severe shortage of employees, today and in the future. David Preng with Preng & Associates Energy Search Specialists, notes that more than 154,000 employees will be required by the worldwide oil and gas industry by 2020. He says there are more than 121,000 people in the industry presently, so it would seem that "only" 33,000 additional employees will be required during the next 14 years.

That's not exactly correct, according to Preng. About 51,000 of today's 121,000 workers will retire by 2020 based upon current age, leaving less than half the required 154,000 workers and resulting in more than 83,000 new professionals needed by 2020.

The severe shortage becomes even more apparent, according to Preng, when examining the number of petroleum engineering and related sciences graduates available by 2020. There will be an estimated 51,750 English speaking graduates by 2020, according to Preng, but that still leaves a shortfall of new hires of nearly 32,000.

During a recent presentation about HR trends in the E&P industry, he noted that company tactics to help alleviate that shortfall include industry promotion, scholarships and internships. Recruiting and retention tactics aimed at experienced professionals include increased compensation, retention bonuses, perks and other programs.

E&P companies today are aware of similar figures and have already established and implemented recruiting and retention strategies. Many oil and gas companies are increasing their ranks of engineers via intern programs, hiring a vast majority of graduating seniors that have been fortunate enough to have been through various companies' internship programs, some for multiple years with the same company.

Dominion E&P, for example, says it hires 80–90% of graduating seniors that have been in its intern programs. Schlumberger says it has little problem meeting its required engineers in North America mainly because of its intern program. Baker Hughes has had a successful internship program for many years that includes participation of many of its international locations as well as the U.S. These companies also recruit mid-career professionals when necessary, depending upon the level of position to be filled.

Scorpion Offshore, which is in the position of having to hire crews for its five new rigs under construction, is utilizing an online recruitment service that will cull through the responses to its recruitment advertisements and then present the best qualified candidates to Scorpion for additional screening and then interviews.

While there are thousands of website-based recruiting services around the world, many that claim millions of available jobs in virtually every occupation, it is an advantage to anyone in the oil and gas industry, employers and job seekers alike, to register with industry specific online services that understand the industry and can offer more than just a portal to post resumes and job openings. ◊

— Jerry Greenberg, Managing Editor

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Annual Compensation	201,600
Less Annual Cost of Living Expenses, Estimated	-111,804
Annual Net Earnings	*89,796*
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Drilling Foreman, age 43, married, 2 children, US$ Payroll

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Total Annual Compensation	228,580
Less Annual Cost of Living Expenses, Estimated (Housing, Food, Transporation, Medical Insurance, etc.)	-58,656
First-Year Discretionary Income	*169,924*

	After Five Years	After Ten Years	After Fifteen Years
Total Compensation (With average salary merit increases)	1,324,477	2,738,828	**5,683,811**
Savings Plan Balance (Company matching contribution of 9%)	77,366	205,016	**409,069**
Retirement Plan Balance	136,669	499,533	**1,064,441**
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Dominion E&P's internship program helps ease future labor shortages

"There is a severe labor shortage across all segments of our industry," Duane Radtke emphasized. Radtke, President and CEO of Dominion E&P in Houston, explained that small independents, majors, large service companies and drilling contractors are all facing the same issues and challenges. When asked if the industry is making progress in alleviating the labor shortage in the future by encouraging new students to study the geosciences with the aim of entering the industry, he answers, "Personally, I think we are not."

However, Radtke is encouraged by a few of the signs he is seeing. For example, more young people are entering universities to study the geosciences, encouraged by high school counselors and university professors. And not all are students from families with oilfield backgrounds.

"A lot of our new hires in 2005 and 2006 were from families with older brothers or fathers in the industry, as you would expect," Radtke said, "but we are beginning to see more young adults and professionals whose backgrounds are not from oil and gas families.

Dominion E&P provides college interns hands-on experience, both onshore and offshore.

"That is a very good trend," he continued, "because the word is spreading that this is a great industry with great chances for advancement."

Additionally, he is beginning to see this change across all of the disciplines in which Dominion is interested, geologists, geophysicists and engineers. The onshore segment of the industry is one of the most active presently but the company is seeing interest in all of the support systems as well.

Competition is fierce among companies for fewer experienced people. The majors, small and large independents, service companies and contractors historically had not needed to approach colleges and universities to attract talent. Now, however, virtually all companies are being forced to take that tactic as the present work force continues to age, with a majority reaching retirement age during the next five years or so.

Radtke noted that the leading edge of the Baby Boom generation turns 60 years old in 2006, and as they retire, so do their years of experience and expertise in the industry. On the flip side is the so-called "Generation Y", the teens, college students and twenty-somethings, with too few interested in becoming professionals in the petroleum industry.

Industry fundamentals will remain strong

Dominion believes there will be a great deal of stability in the oil and gas marketplace going forward. "Prices may vary but I don't think anybody sees anything that will keep the fundamentals for natural gas below $5 or $6," Radtke said. "We are going to have a long period of stability."

He also believes that LNG is an important part of the energy solution but in many ways it is merely a band-aid. "MacKenzie Delta gas is at least five years away and Arctic gas is at least 10 years away.

"During the next five to 10 years, what we have here in North America is what's going to make the difference," he continued. "The petroleum engineering side is obviously the core discipline that goes along with that."

Dominion emphasizes the technology surrounding the oil and gas industry today when it notes some of the misperceptions of the younger generation. One of those misperceptions is that the industry is not high tech enough for the younger generation the industry hopes to attract.

"That couldn't be further from the truth," Radtke contends.

"If it wasn't for technology, I don't think we could have survived the way we have," he said. "We have fewer people handling more data and more wells strictly due to the advances in technology."

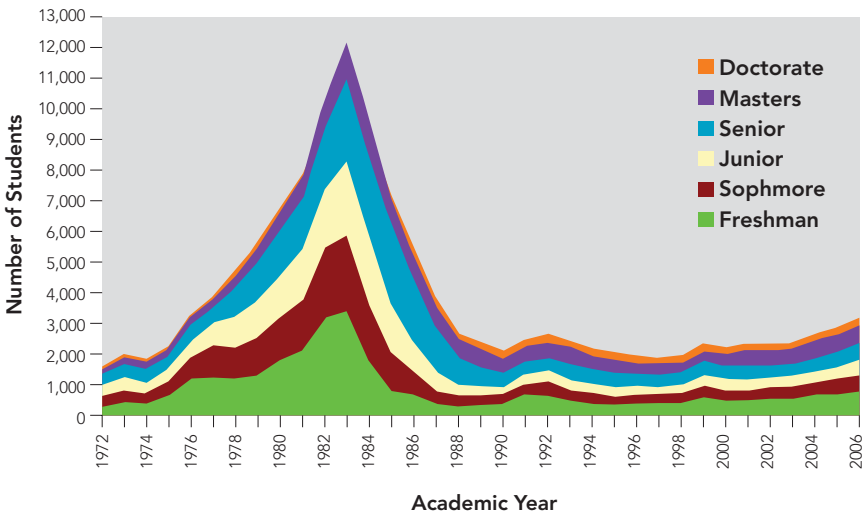
Many younger people view the industry and petroleum engineering as a very narrow discipline. Again, that is far from the truth, he noted. Dominion works with younger people about the business side of the industry as well as engineering.

Another challenge is that many people consider oil and gas to be a dirty industry, less glamorous than other professions. Talk with some of the students at colleges and universities and there are issues about the use of fossil fuels versus conservation. "Those are important issues," Radtke said.

"I tell them that they have made great points, why don't you come in and help us solve the problem? It's easy to be on the outside and talk about the problems. Come in and be a part of the solution.

"On a macro basis we have so many things that are coming together and have come together during the past few years that provide young people with a tremendous opportunity and a tremendous challenge," Radtke said.

Graph 1—U.S. Petroleum Engineering Enrollment



The Society of Petroleum Engineers (SPE) surveyed all universities granting petroleum engineering degrees in the United States.

Graph 1 shows the total number of students enrolled in petroleum engineering programs. *Data courtesy of Dr. Lloyd R. Heinze, Texas Tech and SPE*

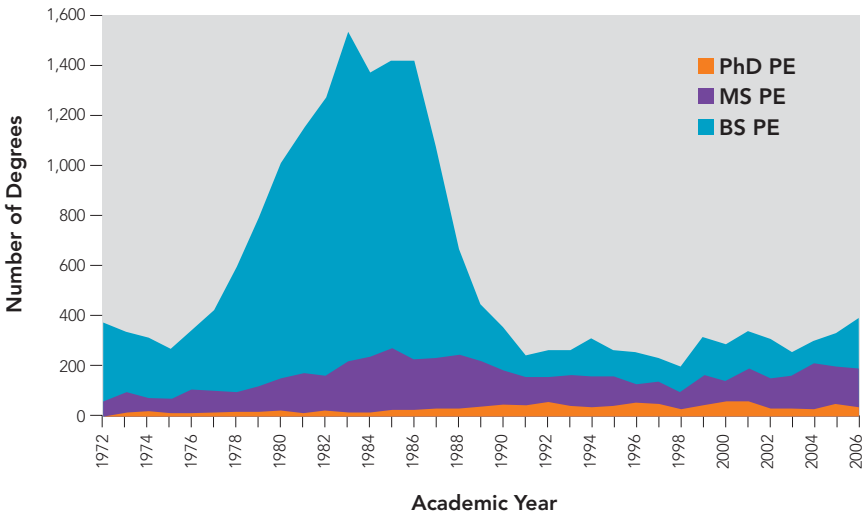
Recruitment strategies pay off

Dominion utilizes a variety of recruiting and retention strategies that result in not only attracting and retaining experienced industry employees but new hires as well. The programs also help reduce turnover. They include internships, mentoring, and recruiting and retaining people from outside the E&P business but who have engineering skills and experience from other areas of the energy

industry. Additionally, the company utilizes the services of headhunters and employment agencies to locate experienced workers in the U.S. market as well as developing channels to find qualified employees internationally, including personal contacts.

One program Dominion uses to help ensure that it will have bright young professionals in the future is its intern program, which the company has expanded dramatically. The company has relationships with 14 colleges and universities in seven states that offer a variety of energy-related undergraduate and graduate degrees. The company has expanded its program by launching a recruitment initiative that reaches to the high school level to identify the industry's future work force and encourage them to examine and investigate the oil and gas business.

Graph 2—Petroleum Degrees Granted in the U.S.



Graph 2 tracks the numbers of petroleum engineering degrees granted at each academic level.

Schools surveyed include the University of Texas, Texas A&M University, Texas Tech, the Colorado School of Mines, Oklahoma University, Louisiana State University, Montana Tech, the University of Tulsa, the University of Louisiana at Lafayette, Marietta College, West Virginia University, Pennsylvania State University, the University of Missouri at Rolla, the New Mexico Institute of Mining and Technology, the University of Alaska, the University of Kansas and the University of South Carolina. *Data courtesy of Dr. Lloyd R. Heinze, Texas Tech and SPE*

The company had 54 interns during the summer of 2006. Historically, about 80% of the interns in their senior year were offered employment at Dominion.

"Eighty percent is a remarkable figure," Radtke said, "but we try to have a culture here that they are part of building something and not just generating numbers in an office. And that is the approach we take with our interns as well as our young engineers and geologists."

Dominion's interns are placed in projects where they receive hands-on experience and where they can recommend field and development projects, "real programs where they have a sense of participation rather than just working for the summer," Radtke explained.

"It's expensive to have an intern program, but we believe we have paid for that program by the incremental oil and gas that we found from the hands-on work that they do."

Interns at Dominion are primarily undergraduate students, however, there are a few graduate students as well. The program includes college freshmen students and in some cases students are chosen and nurtured while they are in high school.

For example, Dominion was alerted to three students by their high school advisors that they were interested in the industry, although they had not previously been exposed to the business. Dominion followed through, worked with them and now they are working toward petroleum engineering degrees at the Colorado School of Mines, University of Oklahoma and University of Houston.

"We went to their schools, worked with them, and now we have some outstanding young people interested in the industry," Radtke said.

Reaching even further, a grant program sponsored by the Dominion Foundation works to strengthen math and science education in grades K-12 in

public schools in Texas and five other states where the company operates.

Additionally, Dominion encourages its multi-year interns to work with the company's different business segments. This results in the interns experiencing the different programs and people and to become more comfortable with the company's overall operations should they eventually receive an offer from the company.

Other recruiting programs

Dominion's recruiting efforts cover the entire gambit, from newspaper and magazine advertisements, posting job openings internally, headhunters and other agencies, and friends of present employees. In one case, a geophysicist in Indonesia that Radtke had known and worked with previously was interested in coming to the U.S. Dominion helped work out the logistics for the person to work in the U.S. "He is a top notch geophysicist with a lot of deepwater experience," Radtke said.

Attracting professionals with several years of experience in the industry could become a zero sum game in some ways. The company finds people from majors who want to work for Dominion due to the smaller size of the company, although Dominion is one of the larger independents with a CAPEX budget of nearly $2 billion.

The company is one of the most active onshore drillers and one of the premiere deepwater operators in the Gulf of Mexico, enabling the company to offer a diversity of opportunities. As a result, numerous employees at Dominion formerly worked for large majors.

Dominion also increased its participation in technical conferences such as the Offshore Technology Conference (OTC) and other technical symposiums. They provide a mechanism not only for presenting technical papers but also provide exposure and a forum to present advice and expertise to the industry generally, resulting in higher awareness by other operators and partners.

Additionally, Dominion seeks engineers from other disciplines although not necessarily from other industries. As an integrated company, Dominion has ready access to a great talent pool from which to recruit and retain employees that may not have direct E&P experience but have a solid engineering background from other areas of the energy industry.

"We have looked at mechanical engineers that can move over to the E&P side to work on designing facilities," Radtke explained, "as well as chemical engineers and occasionally a mining engineer."

Mentoring interns and young professionals

Dominion's interns are also mentored by seasoned professionals in the company. A number of the company's senior professionals work with the interns in the program, providing guidance and experience for projects on which the interns are involved. The mentors help coordinate the project and the interns review the project with the mentors while exchanging ideas.

"It is important that we choose the right mentors for the interns," Radtke noted. "If you have a mentor who is 60 years old working with someone who is 20 years old, they have to be able to relate to the young people. That is very important.

"For us, we not only look at the technical expertise but the personalities as well to work with young people."

In addition to using present Dominion employees as mentors, the company has given thought to seeking retired industry personnel that might be interested in providing some time, a week per month, for example, for mentoring. They could include people who have retired from other companies as well as from Dominion.

"I think the industry is moving toward that type of solution to fill in mentors," Radtke said.

Retention incentives reduce turnover

In the present tight labor market, companies are doing almost everything to retain its brightest employees. Retention begins with an overall competitive salary and benefits package, including a 401K program offered by Dominion. "You certainly have to have the competitive salaries and some kind of retention package occasionally," Radtke said.

"Salaries will increase and there will be people attracted to companies for that," he continued. "It's going to be a larger part of our management problem each year going forward."

One way to retain employees is to structure an incentive program that is not front-end loaded but tied more to the longevity and/or performance of the employee. If an employee is at the company in two or three years, for example, he or she would receive an additional incentive or bonus.

Dominion E&P provides a diversity of opportunities for its interns.

Radtke talks to the interns and young professionals at Dominion to encourage and reinforce their decisions not only to be a part of the industry but to be with Dominion E&P as well. He mentions that they couldn't be entering the industry at a more opportune time, with great opportunities for advancement professionally and personally.

"Technology advancements of the industry have been tremendous, and, notwithstanding a lot of things people read," Radtke said, "we have a tremendous environmental and safety record."

Part of the industry's challenge is to impart that message and attract more young people to the industry. But Radtke does see a positive change over the past few years in the number of students taking an interest in the oil and gas industry.

"It will be fascinating to have this same conversation in two or three years if we continue to see the improvements," he concluded. ◊

Schlumberger is well positioned for attracting new hires

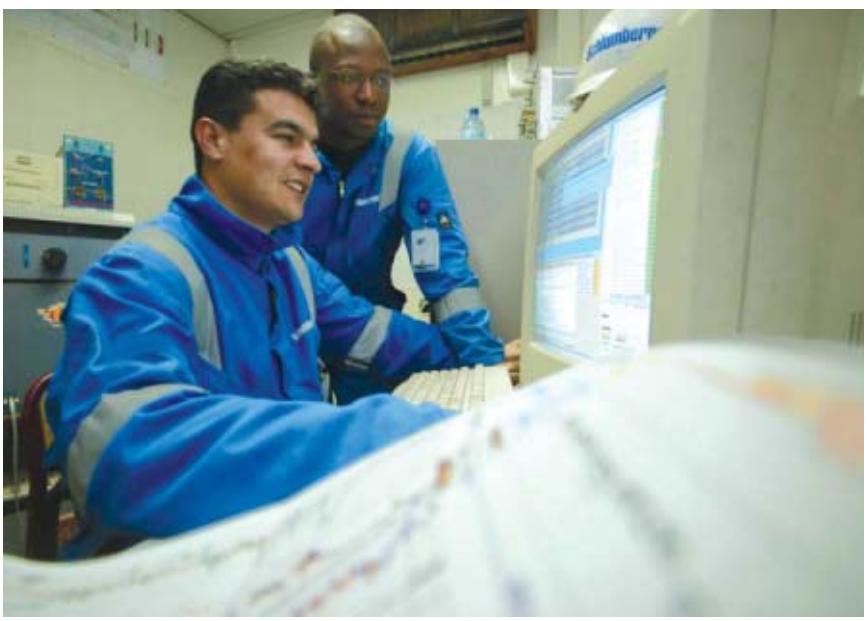
Schlumberger is focused and well positioned in its quest to fill its required engineering positions presently and in the future. The company has had a commitment to recruiting the best people for many years, and believes that is one of the most important functions that make the company successful.

"It leaves a huge lasting impression on the organization for years to come," said Gabriel Alcoser, North American Human Resources Manager for Schlumberger.

"That is why we are extremely focused and dedicated to doing the best possible job in recruiting."

For the most part, Schlumberger hires its engineers as new graduates from colleges and universities, with some select positions filled from the talent pool of mid-career engineers. Mid-career professionals are hired on a limited basis depending upon the expertise they possess and the company's requirements.

"Mid-career level professionals are limited in number," Alcoser explained. "We certainly value our mid-career hires and we are looking to add them in different functions."



For the most part, Schlumberger hires its engineers as new graduates from colleges and universities.

However, Alcoser estimates that between 80-90% of the company's new hires are recent university or college graduates.

"As such, nearly everyone starts straight out of a university and usually through a field engineer or R&D position," he said. "We certainly value the experience (of mid-career employees) but primarily Schlumberger promotes from within."

Recruiting at universities fills Schlumberger's positions

Schlumberger has relationships with and visits numerous universities in the U.S. during its recruiting efforts. "It's all about having a presence at the universities and communicating our message to the students," Alcoser said, "and educating them about Schlumberger and the opportunities we have to offer."

While the company offers certain scholarships, the primary method for reaching students and establishing long-term relationships with the universities is through internships. This not only results in some of the brightest students interning for the company, but it also continues to build the foundation and relationships the company has with the various universities and professors.

While not giving away any hard figures, Alcoser said that the company "does extremely well" in converting interns to new hires.

Schlumberger is focused and well positioned in its quest to fill its required engineering positions presently and in the future.

Also attracting new hires, as well as some mid-career professionals, is a competitive wage environment in the industry, particularly for engineering and hard sciences (geology and physics, for example) backgrounds. The company believes it offers competitive salaries but also says it's the career opportunities that go along with the competitive salaries that attract new hires.

"Certainly compensation plays a major role, but it is also about ensuring the students understand all of the different aspects that we can offer them," Alcoser said.

Training, career path development go hand-in-hand

Once a student is offered a position with Schlumberger he or she begins a multi-year training program leading to a career path. When a new hire completes the 30 to 36 month structured career development plan, depending upon the segment or service they are entering, they will possess the level of expertise for that particular service. Schlumberger trains its new hires internally in its schools worldwide.

Schlumberger trains its new hires internally in its schools worldwide.

Additionally, the company utilizes mentors for its interns and new hires to assure that the interns and new employees are provided the necessary support at the district level, according to Alcoser.

Generally an employee with a four-year degree in an engineering program who wants to become a field engineer will begin their careers working for a client at the wellsite, delivering a particular service. "The engineer is given enormous responsibility and autonomy early on in their career," Alcoser said. "It is extremely appealing to many of our prospective employees."

The engineers would work in the field for several years until they reach a certain level of expertise. At that time, they would have opportunities to move within different company functions and segments as well as various geographic locations.

"The engineer's future is based upon his performance, and that really appeals to and challenges the individual to make the future what they can," Alcoser explained.

Educational background for various positions

The academic background of Schlumberger's new hires depends, of course, on the type of positions the company needs to fill. For example, with field engineers, the company requires at least a four-year degree. The actual curriculum studies can vary as long as it leans toward engineering and the hard sciences. However, whether the student has a mechanical, chemical or other background doesn't matter as much to Schlumberger as the company will provide its own training in preparation for the individual to succeed in his endeavor.

Between 80–90% of Schlumberger's new hires are recent university or college graduates.

The company also has positions in its research and development area, which will generally require a Masters or Ph. D. These new hires will usually be working in the company's research setting, developing new technologies to be implemented in the field.

Schlumberger also hires what it calls field specialists that work in the district level. They remain in the field longer than field engineers in order to provide additional continuity. The company usually hires qualified individuals with a two-year technical degree to fill those positions. ◊

Scorpion Offshore has certain advantages in hiring the right people

"We are in a time where the growing demand for people is clearly going to outstrip the current supply," said Travis G. Fitts, Jr., Vice President, Human Resources, Health, Safety & Environment for Scorpion Offshore in Houston. Scorpion, officially formed in April 2005 with five state-of-the-art jackup drilling rigs under construction or on order in Brownsville, Texas, is in somewhat of a unique position by having to acquire complete rigs crews for its new rigs right out of the box.

"We realize that in order to satisfy the long-term requirements of the company we are not going to be able to continue to go out into the market and selectively recruit the people that we need and want," Fitts explained. "We are going to very quickly have to shift our short term recruitment initiative into a longer term people development commitment.

"I believe the current industry standard for required experience is going to have to be shortened," he continued. "If it is not, then we are not going to be able to satisfy future demand."

The company is marketing all of its rigs in international areas, which presents international labor issues and challenges.

One of five Scorpion Offshore Jackups under construction, the Scorpion Courageous will be delivered in 2007.

Recruiting from the drilling industry

As a start-up company, Scorpion will be forced to recruit from the existing labor market to establish its own employee foundation. The company says it will be extremely selective regarding the people it brings into the organization, realizing that this will be its best opportunity to establish its core culture going forward.

The company says it should be able to satisfy part of its requirements for people through recruitment from other industries with similar maintenance skill sets (mechanical, electrical, hydraulic and maritime). For the drill crew compliment, however, it's a zero sum gain. "There are a finite number of people with drilling industry experience, not enough to satisfy the future demand from the current supply," Fitts explained.

Scorpion will require around 80 people per rig, resulting in approximately 400 rig hands for its initial five rigs. Approximately 25% of the new rig crews are going

to require drilling experience to fill the positions of Offshore Installation Manager (OIM), Toolpusher, Driller, Assistant Driller, etc. Unlike Scorpion's efforts to fill maintenance discipline positions, there is no other industry that the company can turn to in order to fill the senior level drill crew positions. The company emphasizes that it must find the right people in the beginning to perpetuate its commitment to safety, personnel development, operational excellence, and client satisfaction.

"There are many industries that we can draw from to bring in the required skill sets and then teach them our systems," he said, "but that's not possible on the drilling side of the business. There are no industries with similar skill sets to draw from.

"The land rig business is booming as well and they are in the same boat as ourselves. We are all fishing from the same pond," Fitts concluded.

Attracting and recruiting the right people

The company will utilize the services of Rigzone.com's online employment system in order to receive resumes. Scorpion will establish a site at the online service's website to post openings and positions available in order to communicate them to the industry. While Scorpion will advertise and market via other publications and media, the online service will be its primary means of identifying possible candidates for filling positions.

The online service, in conjunction with third party consultant Performance Enhancement Group, will sift the responses through various filters to assess potential candidates and provide Scorpion with the best of the potential employees. Scorpion will make final selections from the culled list and invite them to their Houston office for interviewing and further screening.

Scorpion will also post ads and positions on its own website and through its advertising efforts in trade press and other venues. However, those advertisements for employment will direct the potential candidate to the online service as the first step in the lengthy hiring process.

"The requirement for people is an industry issue" Fitts said, "not just a Scorpion issue. If Scorpion does not have the right opportunity for someone who is interested in the offshore drilling industry, perhaps they can fill a requirement for one of our competitors."

While the company will not directly recruit from high schools, it does have hopes of being able to draw from them. The company will require a minimum of a high school graduate or GED, preferably someone who has some heavy industry background or experience, as well as people with a technical degree from a junior college. Scorpion also hopes to establish relationships with several technical schools for its longer term entry-level positions.

Recruitment will likely take place outside the contract drilling industry as well. Former military personnel could be a good source for persons with technical experience. Other potential candidates could include someone who has worked in mechanical, hydraulics, or electrical positions on ships or other vessels. Maritime academy graduates are also good potential employees.

"Certainly salary is one way to draw interest from prospective employees," said Anthony Gallegos, Scorpion's Vice President, Business Development. "However, if salary is the primary motivation for someone coming into an organization, then that person may not be the best fit for Scorpion."

Gallegos noted that there appears to be less interest today in careers offshore

compared to 25 or 30 years ago. In order to draw attention to careers in the industry, the industry will need to address the "premium" a worker receives for entering the business (relative to other occupational options).

"Work in our industry requires much of people and often includes hardships and sacrifices," Gallegos said. "We cannot expect to attract and retain people if we provide compensation and benefits that are on par with what they can earn while working near home and not enduring sacrifices and hardships."

Higher wages should draw more people to the industry. "Our ability to grow as an organization and satisfy the requirement for people will be a function of where we draw the people from, their commitment and ability to learn, and how quickly we can mentor and develop their competence and ability to take on increasing levels of responsibility," Fitts said.

Training, development will reduce turnover

While the company would prefer that potential employees possess certain training certifications prior to joining the company, some of the requirements are company specific, with training to be conducted to certain Scorpion requirements.

The company sees itself as fortunate to have the luxury of being able to train its crews prior to the new rigs' delivery from the shipyard. This not only includes training for rig operations but also orientation about the company, its safety expectations and culture. Senior management will visit the rig construction site and participate in the orientation/training sessions with the new crews to assure those messages are communicated clearly.

Scorpion Offshore estimates it will require 400 new employees to crew its five rigs under construction.

Scorpion intends to utilize third party training and schools for certain rig operations and technical training. These will likely include rig moving, well control, mechanical and electrical specific training as well as certain marine licensing requirements.

To a large degree, Scorpion's success in training and development is dependent on their ability to select the right people who are capable of coaching, mentoring, and developing other crew members. This is particularly true for international operations where non-supervisory rig hands have not been processed through Scorpion's screening procedures.

"Much like the rest of the industry, we will use third party contractors internationally for our non-supervisory entry level positions," Fitts said. "That shouldn't present a problem as long as we have the right supervisors that are able to communicate our expectations to them and provide training and develop competence to an acceptable level.

"We believe we can do that through our training and development process incorporating our on-the-job training program."

Offering careers is only one retention tool

The quick answer to retaining employees is to have a competitive compensation and benefit package. "More importantly, the key to success is to focus on people and their development," Fitts explained.

"If all we are doing is providing more money than another company, we would be passively recruiting people," he continued. "I would much rather actively recruit people to join the company that want a career and not just a job.

"If you find people that want a career they are going to be less likely to leave the company as long as we fulfill our commitment to them with regards to training, development and advancement opportunities," Fitts concluded.

Internationally, rig supervisors will have a responsibility to bring national rig hands to the company's standard from a technical and HSE standpoint but they should also work on developing their career as far as moving to the next level of responsibility on the rig.

"If we begin expanding our fleet and operations in those (international) areas, we want to be able to promote and develop from within," Fitts said.

As a new company, Scorpion believes it will be able to provide new crew members with a great number of opportunities. And as long as the company provides the training and resources to meet career ambitions, and the company is competitive from a compensation standpoint, employees should be motivated to stay with the company.

"We think that personnel development, which we know we will have to have in order to be successful, is also going to act as a great incentive for retaining people if we get it right, and we will get it right," Fitts emphasized. ◊

El Paso Corporation provides natural gas and related energy products in a safe, efficient, and dependable manner. We own North America's premiere natural gas pipeline system and one of the country's largest independent natural gas producers. Headquartered in Houston, Texas, with locations across the country, we're traded on the New York Stock Exchange under the symbol EP.

As a professional, you have a choice in where you work. We'd like to invite you to consider El Paso Corporation as a career option. As the nation's largest natural gas pipeline company and one of the country's largest independent exploration and production companies, we're actively building new energy infrastructure across the United States. We combine the stability of a company grounded on a $32-billion asset base with billions of dollars of identified growth opportunities.

El Paso Exploration & Production Company is one of North America's largest independent natural gas producers. We operate in high-quality basins across the United States—from the Gulf of Mexico to the slopes of the Rocky Mountains—and in prolific basins offshore Brazil. We have a five-year drilling inventory and extensive natural gas and oil reserves. During 2006, we expect to deliver even more growth.

Career Opportunities

Visit our website at www.elpaso.com/careers to learn more about current opportunities for the following professionals:

- Drilling Engineers
- Production Engineers
- Reservoir Engineers
- Engineering Techs
- Landmen
- Geologists
- Geophysicists
- Geo Techs

Benefits

As you'd expect from one of the nation's premier natural gas companies, we also provide a competitive salary and benefits package, including:

- Pay for Performance Program
- Medical/Dental/Vision Insurance
- Educational Assistance Plan
- Employee Assistance Program
- Life Insurance/AD&D
- Transportation Subsidy
- Fitness Center Subsidies
- Credit Union
- Retirement Savings Plan with Company Matching
- Pension Plan
- Paid Time Off Bank
- Disability Plans

Interested?

Visit **elpaso.com/careers** to discover why El Paso Corporation is the place to work, the neighbor to have, and the company to own.

elpaso

El Paso Corporation is an Equal Opportunity and Affirmative Action Employer, M/F/D/V

Recent graduates, professionals fulfill Baker Hughes' engineering requirements

Baker Hughes recruits recent university graduates and mid-career professionals to bring engineering talent into the company. Extensive training and development programs, as well as varied job assignments, are part of the company's strategy to provide career advancement opportunities and retain top performing employees.

University programs include internships, research programs

University recruiting at Baker Hughes not only includes traditional campus interviews and participation in career fairs, but also involves significant programs to build relationships with technical colleges and universities in 30 countries around the world.

The company sponsors internships, scholarships and endowments as well as partnering with the universities to conduct industry-related research projects. The research projects provide students with an opportunity to study their technical discipline while also conducting research on elements of the E&P business.

"You can't have a strong university program based entirely on summer internships," said Diana Rose-Schilling, Human Resources Manager for Baker Hughes in Houston. "For the remainder of the year we want to be sure they are getting experience that would be beneficial to the industry and Baker Hughes.

"Assuring they have a background in the industry and some research project experience will only help them as they begin their career," she added.

The company works with engineering professors and college deans at several universities to support industry-related research projects. Baker Hughes suggests project topics that would be mutually beneficial to the company, the students and the universities, and then meets with the faculty to discuss putting the research project into the curriculum.

In addition to working with engineering departments at U.S. universities, the company partners with universities in Europe, Russia, Asia, the Middle East, Africa and Latin America to develop local engineering talent in major oil and gas producing regions.

In 2006, Baker Hughes sponsored 365 internships for students from universities in the U.S., Canada, Venezuela, Brazil, Norway, Ecuador, the U.K., Germany and Nigeria. The company is currently creating an internship program in the Middle East. Students typically intern in countries where they are attending college.

During the internship each student works with a mentor, who ensures that the intern has the opportunity to work with experienced service company personnel and helps guide the student during the work and research program.

Engineering design interns work primarily with the company's technology developers and work on research projects where they apply what they have learned in the classroom.

Interns at the company's field locations learn about and work with various drilling, logging and completion technologies and can assist during operations at the well site.

Opportunities for mid-career engineers

Baker Hughes also recruits mid-career engineers and scientists with backgrounds in mechanical, electrical, chemical, reservoir and petroleum engineering, as well as geology and petrophysics.

"We offer these technical experts the opportunity to develop and apply advanced technology," Rose-Schilling says. "They also are attracted by the opportunity to perform work assignments throughout the world.

Students from Michigan Tech enjoy a photo opportunity on the annual Baker Hughes Michigan Tech Field Tour Day.

"The company has increased its efforts to attract technical professionals in the Eastern Hemisphere to support growing activity there."

Investment in training and development

New and mid-career employees benefit from the company's substantial investment in training and employee development programs. Baker Hughes delivers technical training at major education centers in the U.S., Europe and Latin America. A new training complex is being built in Dubai to serve as the company's education hub for the Eastern Hemisphere. The company also offers more than 3,000 courses on its online training resource.

Baker Hughes engineers also develop their career through non-technical instruction, including its new Cornerstone Program that prepares qualified men and women for management and leadership positions. Baker Hughes also empowers its employees to continue their education, according to Rose-Schilling. This could include certifications or advanced degrees, supported by the company's tuition reimbursement program.

Perhaps the most important aspect of career development at Baker Hughes is the opportunity to take on new job assignments in different functions, different operating divisions, and different countries. "Young engineers can learn a lot with a variety of challenging assignments," Rose-Schilling said, "and they can advance quickly."

"This is a key factor in retaining employees," she continued. "Employees who see opportunities for advancement are more likely to stay with Baker Hughes."

Corporate culture fosters employee retention

Baker Hughes works to provide a competitive compensation package including salaries, benefits and incentive pay. "Just as important as compensation," Rose-Schilling said, "is a corporate culture that values employees and encourages their development. Our corporate culture is based on shared core values and the belief that every employee can make a difference.

"Our CEO and COO are committed to the people in our organization," she said. "We believe that valuing our employees, providing growth opportunities, and recognizing their contributions are important ways to make them want to stay with the company." ◊

PennEnergyJOBS aids job seekers and employers

There are literally hundreds if not thousands of online job banks and recruiting services that cover virtually any and all occupations. Many of these online services are considered to be generalist job sites which provide employer job listings worldwide and for virtually all occupations, from burger flippers to petroleum engineers. One online job board boasted more than 2 million jobs available across virtually all occupational categories. Additionally, most state and local governments in the U.S. also operate their own employment sites online.

One problem with such vast online job sites is that they require the job seeker to cull through thousands of jobs in numerous industries in order to find the right one for them. For example, someone seeking an accounting position might be overwhelmed by the amount of opportunities available around the world listed on some of the websites. Spending time on generalist job boards is not a very productive approach to managing one's career.

Industry specific online services for career management

Industry specific online job boards, often referred to as niche job boards, tend to focus on only one industry rather than trying to be everything to everyone. Niche job boards typically provide better services and information to manage a career and stay abreast of new job opportunities and career issues in the specific industry that it serves. They also have a deeper understanding of their industry than a generalist job board, and as such can tailor their services and provide better research, database and career information to their target audience.

"Employers are constantly faced with a significant challenge of finding good, qualified talent," said Jamie Matlin, Director of Recruitment advertising for PennEnergyJOBS, a niche job board specifically for the energy industry. "It is this common issue that is fueling the recruitment industries' need to develop better recruitment tools.

"One of our core advantages is the size and demographics of the PennWell readership, which enables PennEnergyJOBS to reach a large audience of both industry employers and job seekers," he said. "It is our three-pronged approach of online, in-person and in-print that sets us apart from our competitors.

"We are focused around career management and development," he continued, and emphasized that even if a professional is not actively seeking a job presently, it is still strategic from a career management perspective to have a profile and resume online.

PennEnergyJOBS serves petroleum employers and professionals by providing an exchange and information service that includes job postings, resume searching, advertising, electronic newsletters, targeted email campaigns and career fairs. The service is free for industry professionals and allows them to search through thousands of jobs, post their resumes (with various levels of discretion) and apply to opportunities that interest them with a click of the mouse. Industry professionals can also stay current with the latest job postings by setting up job alerts that provide instant notification through email when new positions become available. The number of job postings by employers varies between 2,000 and 3,000 worldwide.

PennEnergyJOBS' targeted industry segments in the petroleum industry include:

- Drilling;
- Exploration;
- Gas processing;
- Petrochemicals;
- Pipelines and transportation;
- Production;
- Refining.

Job seekers can search positions offered

Job seekers can enter the website and search for job openings in the various industry segments, post their resume and profile online and apply to job postings online directly to the employers seeking personnel. The service sees itself as a medium that facilitates the resume submission process to the employers.

If the job seeker wishes, his or her contact information can be blocked on their resume to offer the highest levels of discretion in their job search. In this case, if a prospective employer is interested in the candidate, the employer would contact them through the PennEnergyJOBS system via email. It is then up to the job seeker to decide whether he wants to reply back to the employer. This prevents someone's present employer from knowing that he is actively or passively seeking another job.

Job seekers can locate positions within desired areas, for example, within a certain radius of the job site or office. Job seekers can also search for postings by job categories and work type, including full or part time or contract work. The database can also be searched chronologically by the date of the job posting and whether the job was posted directly by the employer or a staffing firm, among other filters. Search results are first displayed by relevancy to the search and then in chronological order by the most recent job posting.

Job seekers can also set up email job alerts whereby they can be notified immediately when a new job is posted that meets their criteria, eliminating the need to search through the database on a daily or weekly basis. The alerts can be set up to be sent daily, weekly or monthly. When a new job is posted that meets the seekers' criteria, he or she will automatically be alerted by an email that contains the job title, the company posting the new job opening, the

location and a link that takes the job seeker to view the entire job posting if he is interested.

The link brings the job seeker to the PennEnergyJOBS website. If the person's resume is already posted to the system, all the job seeker need do if he is interested in the job opening is to click the apply button.

Significant system features

The PennEnergyJOBS' advanced search capabilities contain several features that aid in the employers' or job seekers' search. The software enabling the searches uses matching technology to search for similar words. For example, an employer may be seeking a Professional Engineer, so his search will seek candidates by those specific words as well as "PE". This matching technology is also available for the job seeker. Additionally, the software builds on this intelligent database and continually adds synonyms.

PennEnergyJOBS is also fully compliant with the latest ruling put forth by the Office of Federal Contract Compliance Program (OFCCP) pertaining to the definition of an online candidate. The system facilitates the entire process of tracking and retaining resumes that were considered or viewed by the employer. The OFCCP compliance capability in the system's software tracks all searches by an employer and retains copies of the resumes resulting from the searches. At any given time, according to Matlin, PennEnergyJOBS can provide member employers with the documentation required to prove compliance with OFCCP standards as they relate to being an Equal Opportunity Employer (EOE). ◊

Job Listings

Employment opportunities provided by PennEnergyJOBS. For full job descriptions or to apply for these opportunities, visit www.PennEnergyJobs.com and search for the specific listing by job title or company name.

Accounting/Finance

Many exciting opportunities with Nexen Petroleum USA Inc!
Nexen, Inc.
Dallas, TX 75251

Accountant
Think Resources, Inc
Madison, WI

Accountant
Think Resources, Inc
Lincoln, NE

Accountant
Think Resources, Inc
Hartford, CT

Accountant
Think Resources, Inc
Austin, TX

Accountant
Think Resources, Inc
Jefferson, MO

Business Analyst
Chevron
San Ramon, CA

Director
Think Resources, Inc
Multiple Locations

Financial Accountant
Canadian Natural Resources Limited
Calgary, AB Canada

Non-Op Accountant
Canadian Natural Resources Limited
Calgary, AB Canada

Operations Accountant
Canadian Natural Resources Limited
Calgary, AB Canada

Operations Accountant, Capital Accounting
Canadian Natural Resources Limited
Calgary, AB Canada

Payables Accountant
Canadian Natural Resources Limited
Calgary, AB Canada

Production and Revenue Accountant, Heavy Oil
Canadian Natural Resources Limited
Calgary, AB Canada

Property Accountant, Medium Oil
Canadian Natural Resources Limited
Calgary, AB Canada

Property Accountant, Training & Development
Canadian Natural Resources Limited
Calgary, AB Canada

Royalty Administration Accountant
Canadian Natural Resources Limited
Calgary, AB Canada

Senior Technical Accountant
BP
Warrenville, IL

Staff Assistant-Accounting
BP
Durango, CO

Supervisor, Property Accounting: Saskatchewan
Canadian Natural Resources Limited
Calgary, AB Canada

Accounting Financial Analyst
Chevron
San Ramon, CA

Credit Analyst
BP
Wayne, NJ

Financial Analyst
Chevron
Multiple Locations

Financial Analyst — New Business
Canadian Natural Resources Limited
Calgary, AB Canada

Lease Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Quality Systems Auditor ISO 9001
G.A.S. Unlimited, Inc
Houston, TX

Senior Financial Analyst
BP
Warrenville, IL

Excise Tax Analyst
BP
Houston, TX

Controller
Think Resources, Inc
Multiple Locations

Cost Accounting Analyst
Canadian Natural Resources Limited
Calgary, AB Canada

Cost Analyst
G.A.S. Unlimited, Inc
Houston, TX

Cost Estimator(s)
Canadian Natural Resources Limited
Calgary, AB Canada

Estimator
Think Resources, Inc
Multiple Locations

Estimators
G.A.S. Unlimited, Inc
Houston, TX

Accounting Services Procurement Analyst
BP
Lisle, IL

Sr. Cost Control
G.A.S. Unlimited, Inc
Houston, TX

Administrative/Clerical

Admin Assistant
G.A.S. Unlimited, Inc
Houston, TX

Administrative Assistant
BP
Anchorage, AK

Administrative Assistant
Canadian Natural Resources Limited
Calgary, AB Canada

Administrative Assistant
Chevron
Multiple Locations

Administrative Assistant ñ Relocation and Housing — Contract
Canadian Natural Resources Limited
Calgary, AB Canada

Analyst
Think Resources, Inc
Multiple Locations

Capital Project Contracts Advisors
Chevron
Houston, TX

Clerk
BP
Linden, NJ

Contract Performance Manager
Think Resources, Inc
Multiple Locations

Contracts Administrator
Think Resources, Inc
Multiple Locations

Group Real Estate Coordinator
BP
Warrenville, IL

HSSE Compliance Administrative Assistant
BP
Texas City, TX

Office Assistant
Chevron
Rangely, CO

Program Office Manager
BP
Naperville, IL

Project Controls Manager
Think Resources, Inc
Multiple Locations

Project Secretary
G.A.S. Unlimited, Inc
Houston, TX

Safety Clerk
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Senior Administrativbe Services Specialist
Chevron
Salt Lake, UT

Shift Supervisor
Think Resources, Inc
Multiple Locations

Sr. Administrative Assistant
G.A.S. Unlimited, Inc
Houston, TX

Staff Assistant
BP
Ulysses, KS

Supervisor, Warehouse
Chevron
Port Arthur, TX

Agreements Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Business Operations/ Management

Air Specialist
Chevron
Richmond, CA

Application Analyst
Chevron
Houston, TX

Application Support Manager
BP
Warrenville, IL

Auditor
BP
Warrenville, IL

Business Analyst
BP
Houston, TX

Business Analyst
G.A.S. Unlimited, Inc
Houston, TX

BW Business Analyst
Chevron
Houston, TX

Change Management Consultant
Chevron
San Ramon, CA

Coordinator, O&M, Critical Systems
Chevron
Concord, CA

CS I/E Support Supervisor
Chevron
Malongo, Not in list

Damage Prevention Specialist (OM&D)
BP
Houston, TX

Data Management Technology Consultant
Chevron
Houston, TX

Development Geologist
Chevron
Multiple Locations

Environmental Coordinator
BP
Texas City, TX

ERP Program Management Office
Chevron
Concord, CA

Field Digital Infrastructure Operations Consultant
BP
Houston, TX

Finance Manager
Think Resources, Inc
Columbia, SC

Health, Safety and Environmental Process Safety Management Training Administrator
BP
North Slope, AK

HES Business Planning Analyst
Chevron
San Ramon, CA

Lubrication Business Manager
Chevron
Houston, TX

Manager, IBPS Production Support and Resource Coordinator
Chevron
San Ramon, CA

Market Risk Specialist
BP
Warrenville, IL

Negotiating Landman
Canadian Natural Resources Limited
Calgary, AB Canada

Operational Excellence Champion Deepwater
Chevron
Houston, TX

Operations Specialist
Chevron
Houston, TX

Performance Delivery Leader
BP
Naperville, IL

Petrophysicist
Subsurface Consultants & Associates, LLC
Houston/Galleria, TX

Physical Operations Business Analyst
BP
Warrenville, IL

Planning & Reporting Services Technical Analyst
BP
Naperville, IL

Procurement and Supply Chain (PSCM) Specialist
BP
Houston, TX

Product Adaption Formulator
Chevron
Richmond, CA

Program Management Office Consultant
Chevron
San Ramon, CA

Purchasing Agent
Think Resources, Inc
Alpharetta, GA

Refinery Operator
Chevron
Richmond, CA

Refining Performance Leader
BP
Naperville, IL

Regional Manager, Office Design & Construction
BP
Houston, TX

Remedy Developer
Canadian Natural Resources Limited
Calgary, AB Canada

Resource Planning Manager
BP
Houston, TX

Safety Manager
Think Resources, Inc
Multiple Locations

SAP Production/Revenue Expert
BP
Houston, TX

SAP Security Analyst
Chevron
Concord, CA

www.PennEnergyJobs.com

Job Listings

SIT/Refurbishment Supervisor
FMC Technologies
Houston, TX

Sr. Procurement Supply Chain Management Specialist or Procurement Supply Chain Mgmt. Team Leader
BP
Anchorage, AK

Strategic Sourcing Leader
FMC Technologies
Houston, TX

Supplier Value Realization Manager* (Concord or San Ramon, California)
Chevron
Concord, CA

Systems Administrator
Think Resources, Inc
Phoenix, AZ

Technical Specialist
Think Resources, Inc
Austin, TX

Well Data Analyst
Chevron
Lafayette, LA

Environmental Midstream General Manager — Pipeline/Terminals
Energy Recruiters (ERI)
TX

Chief Operations Officer — Oil & Gas Company
Ignis Petroleum Group, Inc.
Dallas, TX 75201

Refining and Consulting Division Positions
Solomon Associates

Chief Technology Office (CTO) Consultant
BP
Warrenville, IL

Natural Gas & Liquids (NGL) Inventory Analyst
BP
Houston, TX

Buyer
G.A.S. Unlimited, Inc
Corpus Christi, TX

Planner/Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Procurement Manager
G.A.S. Unlimited, Inc
Pasadena, TX

Procurement Specialist
Think Resources, Inc
Multiple Locations

Project Procurement Manager
Chevron
Houston, TX

Senior Procurement Buyer/Expeditor
G.A.S. Unlimited, Inc
Houston, TX

Senior Project Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Sourcing Manager
G.A.S. Unlimited, Inc
Centennial, CO

Exploration & Production Project Manager
Ziff Energy Group
Calgary, Canada

Computers — IT/Systems

DCT Integration Manager
BP
Naperville, IL

DeskTop Support Analyst
Chevron
Houston, TX

Digital & Communications Technology Integration Specialist
BP
Naperville, IL

E&S Assistant
Chevron
New Orleans, LA

Firmware Engineer/Developer
G.A.S. Unlimited, Inc
Houston, TX

HES Performance Analyst
Chevron
San Ramon, CA

IMS Analyst Requisition
G.A.S. Unlimited, Inc
Houston, TX

IT Infrastructure Support Analyst
Chevron
San Ramon, CA

SAP Basis Administrator
Chevron
Concord, CA

Technical Support
Think Resources, Inc
Multiple Locations

Automation Specialist — Controls Eng
G.A.S. Unlimited, Inc
Houston, TX

Bitumen Production(BP) Mechanical Planner/Scheduler (Contract Position)
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Business Systems Analyst Document Management
Canadian Natural Resources Limited
Calgary, AB Canada

Commissioning Coordinator
Canadian Natural Resources Limited
Calgary, AB Canada

Communications Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Database Administrator
Think Resources, Inc
Multiple Locations

Document Control Technician
Canadian Natural Resources Limited
Calgary, AB Canada

Earth Modeling Specialist
Chevron
Bakersfield, CA

Electrical Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Gocad Support Specialist
Chevron
Houston, TX

Hardware Support Analyst
Canadian Natural Resources Limited
Calgary, AB Canada

Honeywell Programming
G.A.S. Unlimited, Inc
Houston, TX

Horizon Corporate Services Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

I&E Specialist
Chevron
Kermit, TX

Instrumentation Technician
BP
North Slope, AK

Lead Hand Technician
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

SAP BW Systems Analyst
Chevron
Houston, TX

Software Engineer
Think Resources, Inc
St. Paul, MN

Training Coordinator
Canadian Natural Resources Limited
Calgary, AB Canada

Well Database Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Software Deployment Specialist
Schlumberger
Houston, TX

Business Analyst (PRISM Trainer)
Canadian Natural Resources Limited
Calgary, AB Canada

Network Administrator
Think Resources, Inc
Charlotte Amalie, VI Virgin Islands (USA)

Network Analyst (VOIP)
Canadian Natural Resources Limited
Calgary, AB Canada

SAP Information Technology Professional
Chevron
Concord, CA

Systems Security Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Software Development
Halliburton
Houston, TX

Sr. Software Developer
Halliburton
Houston, TX

Construction & Facilities

Construction Manager — Froth Treatment
Canadian Natural Resources Limited
Calgary, AB Canada

Coordinator, Buildings
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Electrical Team Leader — Maintenance
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Maintenance Planner — Electrical & Instrumentation
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Maintenance Planner - Mechanical
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Engineering/Construction Team Leader
Williams
Houston, TX

Materials Manager
TIC Holdings, Inc @ PennEnergyJOBS
Career Fair
FL

Project Engineer
TIC Holdings, Inc @ PennEnergyJOBS
Career Fair
Coshocton, OH

Scheduler
TIC Holdings, Inc @ PennEnergyJOBS
Career Fair
Bakersfield, CA

Plant Specialist
Chevron
Odessa, TX

Plant Layout Designer
G.A.S. Unlimited, Inc
Houston, TX

Plant Manager
Think Resources, Inc
Boston, MA

Land Technician
Chesapeake Energy
Oklahoma City, OK

Education/Training

Trainer
Think Resources, Inc
Multiple Locations

Training Specialist
BP
Oregon, OH

Operations Training Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Commercial/Technical Training Advisor
BP
Warrenville, IL

Training Coordinator
BP
Oregon, OH

Training Coordinator
G.A.S. Unlimited, Inc
Houston, TX

Engineering & Design

Electrical Designer
Think Resources, Inc
Multiple Locations

Electrical Drafter
Think Resources, Inc
Multiple Locations

Advisor, Decision Analysis
Chevron
San Ramon, CA

Aerospace Engineer
Think Resources, Inc
Harrisburg, PA

Analyzer Engineer
Chevron
El Segundo, CA

Application Engineer
Think Resources, Inc
Multiple Locations

Area Geologist
Canadian Natural Resources Limited
Calgary, AB Canada

Area Project Manager/Project Engineer
BP
Carson, CA

Area Section Supervisor
Chevron
Los Angeles, CA

Art Field Technical Service
Chevron
Houston, TX

Asset Consultant- Upstream
Chevron
Houston, TX

Asset Consultant
Chevron
Houston, TX

Asset Manager
Think Resources, Inc
Austin, TX

Assistant Construction Manager — Primary Upgrading
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Assistant Project Manager — CoGeneration
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Associate Process Engineer/Process Engineer/Senior Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Auditor
Chevron
San Ramon, CA

Automation Engineer
BP
Anchorage, AK

Automotive Engineer
BP
Naperville, IL

Black Belt
FMC Technologies
Houston, TX

Boiler Engineer
Think Resources, Inc
Multiple Locations

Business Analysis Process Owner
Chevron
San Ramon, CA

Business Analyst
Think Resources, Inc
Boston, MA

Business Process Analyst
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Job Listings

Business System Analyst — Projects
Canadian Natural Resources Limited
Calgary, AB Canada

Buyer
Think Resources, Inc
Multiple Locations

Buyer/Expeditor
G.A.S. Unlimited, Inc
Pasadena, TX

Buyer/Planner I/III
FMC Technologies
Houston, TX

Cad Manager
Think Resources, Inc
Sacramento, CA

Chemical Engineer
G.A.S. Unlimited, Inc
New Orleans, LA

Chemical Engineer
Think Resources, Inc
Multiple Locations

Chemist
Think Resources, Inc
Multiple Locations

Civil Drafter
Think Resources, Inc
Alpharetta, GA

Civil Engineer
Chevron
Los Angeles, CA

Civil Engineer
G.A.S. Unlimited, Inc
Houston, TX

Civil Engineer
Think Resources, Inc
Multiple Locations

Civil Opportunities
G.A.S. Unlimited, Inc
Corpus Christi, TX

Civil/Structural Engineer
G.A.S. Unlimited, Inc
Hitchcock, TX

Civil/Structural Engineers
G.A.S. Unlimited, Inc
Houston, TX

Civil/Structural Engineers
G.A.S. Unlimited, Inc
Pasadena, TX

Civil/Structural Engineers
Chevron
Houston, TX

Clerk
Think Resources, Inc
Sacramento, CA

Commissioning Engineer
Think Resources, Inc
Toronto, AB Canada

Completion Engineer
Chevron
Multiple Locations

Completions Engineer
BP
US

Completions Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Completions Superintendent
Canadian Natural Resources Limited
Calgary, AB Canada

Completions Technologist
Canadian Natural Resources Limited
Calgary, AB Canada

Compression Engineers
G.A.S. Unlimited, Inc
Houston, TX

Construction Engineer
Think Resources, Inc
Multiple Locations

Construction Manager
Think Resources, Inc
Multiple Locations

Construction Manager — Ccr Projects
Chevron
Houston, TX

Construction Manager
Chevron
Richmond, CA

Consultant
Think Resources, Inc
Multiple Locations

Control Room Operator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Control Room Operator
Think Resources, Inc
Multiple Locations

Control Room Operator — Utilities & Offsites
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Control Systems Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Control Systems Engineers
G.A.S. Unlimited, Inc
Houston, TX

Control Systems Engineers
G.A.S. Unlimited, Inc
Sugar Land, TX

Control Systems Engineers
G.A.S. Unlimited, Inc
Deer Park, TX

Controls Engineer
Think Resources, Inc
Multiple Locations

Controls Engineer
G.A.S. Unlimited, Inc

Corrosion Engineer
Think Resources, Inc
Calgary, AB Yemen

Cost Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Cost Engineer
Think Resources, Inc
Multiple Locations

Cost Planning Engineer
G.A.S. Unlimited, Inc
Houston, TX

Data Management Analyst
Chevron
Houston, TX

DCT Planning & Reporting Services Manager
BP
Naperville, IL

Design Engineer
Think Resources, Inc
Austin, TX

Designer
Think Resources, Inc
Multiple Locations

Designer 5 Control Systems
G.A.S. Unlimited, Inc
Houston, TX

Designer 5 Electrical
G.A.S. Unlimited, Inc
Houston, TX

Designs Engineer
Chevron
Los Angeles, CA

Developer Support
Canadian Natural Resources Limited
Calgary, AB Canada

Development Engineer
BP
Houston, TX

Development Geologist/Geophysicist
Chevron
Multiple Locations

Development Geophysicist
Chevron
New Orleans, LA

Development Geophysicist
Chevron
Lafayette, LA

Distribution Engineer
Think Resources, Inc
Multiple Locations

Drafter
Think Resources, Inc
Alpharetta, GA

Drilling Engineer
BP
US

Drilling Engineer
Chevron
New Orleans, LA

Drilling Engineer
G.A.S. Unlimited, Inc
Houston, TX

Drilling Engineer
Think Resources, Inc
Multiple Locations

Drilling Engineer
Chevron
Anchorage, AK

Drilling Engineer
Chevron
Multiple Locations

Drilling Fluid Specialist
G.A.S. Unlimited, Inc
Houston, TX

Drilling Operations Superintendent
BP
Houston, TX

Drilling Subsea Engineer
Chevron
Houston, TX

Drilling/Production Manager
Subsurface Consultants & Associates, LLC
Houston, TX

Early Concept Development Engineer
Chevron
Houston, TX

Earth Scientist — Heavy Oil Specialist
Chevron
Bakersfield, CA

Electrical and Instrumentation Construction Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Electrical Design Engineer
G.A.S. Unlimited, Inc
Houston, TX

Electrical Design Engineer
Think Resources, Inc
Multiple Locations

Electrical Designers
G.A.S. Unlimited, Inc
Houston, TX

Electrical Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Electrical Engineer
Think Resources, Inc
Multiple Locations

Electrical Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Electrical Engineer 5 for Proposals group
G.A.S. Unlimited, Inc

Electrical Engineers
Chevron
Houston, TX

Electrical Field Engineer
Think Resources, Inc
Multiple Locations

Electrical Project Engineer 4
G.A.S. Unlimited, Inc
Houston, TX

Electrical Support/Designs Engineer*
Chevron
Richmond, CA

Electrical/Instrumentation Engineers
G.A.S. Unlimited, Inc
Houston, TX

Engineer — Maintenance
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Engineer — Rotating Equipment
Canadian Natural Resources Limited
Calgary, AB Canada

Engineer 3
G.A.S. Unlimited, Inc
Baton Rouge, LA

Engineer 4 Control Systems
G.A.S. Unlimited, Inc
Houston, TX

Engineer 5 Civil
G.A.S. Unlimited, Inc
Houston, TX

Engineer III (Manufacturing)
FMC Technologies
Houston, TX

Engineer III/V (Mechanical Project)
FMC Technologies
Houston, TX

Engineer IV (Structural)
FMC Technologies
Houston, TX

Engineer Sales
Think Resources, Inc
Harrisburg, PA

Engineer Technologist
G.A.S. Unlimited, Inc
Houston, TX

Engineer Trainee Part Time
G.A.S. Unlimited, Inc
Bryan, TX

Engineer V (Projects)
FMC Technologies
Houston, TX

Engineer V/VI HV Power Distribution
FMC Technologies
Houston, TX

Engineer V/VI Rotating Machinery/ Pumps
FMC Technologies
Houston, TX

Engineer, Rock Mechanics
Subsurface Consultants & Associates, LLC
Houston/Westlake, TX

Engineer/Completion
Subsurface Consultants & Associates, LLC
Multiple Locations

Engineer/Petroleum
Subsurface Consultants & Associates, LLC
Houston/Westlake, TX

Engineer/Reservoir
Subsurface Consultants & Associates, LLC
Houston/Gessner, TX

Engineer/Sr.
Subsurface Consultants & Associates, LLC
Houston, TX

Engineer/Sr. Staff
Subsurface Consultants & Associates, LLC
Houston, TX

Engineering Coordinator - Maintenance
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Engineering Manager
Think Resources, Inc
Multiple Locations

Engineering Tech
Subsurface Consultants & Associates, LLC
Houston/Downtown, TX

Engineering Technologist
Subsurface Consultants & Associates, LLC
The Woodlands, TX

Engineers
Subsurface Consultants & Associates, LLC
Midland, TX

Engineers/Sr. Reservoir
Subsurface Consultants & Associates, LLC
New Orleans, LA

Entry Level Mechanical or Structural Engineer
G.A.S. Unlimited, Inc
Corpus Christi, TX

Environmental Engineer
Think Resources, Inc
Multiple Locations

Environmental Engineer
Chevron; Houston, TX

Equipment Integrity/Reliability Engineer — Phase 2
Canadian Natural Resources Limited
Calgary, AB Canada

Job Listings

Equipment Performance Monitoring Engineer
BP
North Slope, AK

Expeditor
G.A.S. Unlimited, Inc
Houston, TX

Exploitation Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Exploitation Engineer, Heavy Oil
Canadian Natural Resources Limited
Calgary, AB Canada

Exploitation Engineer, Thermal
Canadian Natural Resources Limited
Calgary, AB Canada

Facilities Design Project Manager
G.A.S. Unlimited, Inc
Houston, TX

Facilities Engineer — Heavy Oil - Steam Generation Specialist
Chevron
Bakersfield, CA

Facilities Engineer
FMC Technologies
Houston, TX

Facilities Engineer — Heavy Oil - Well Gauging and Measurement Specialist
Chevron
Bakersfield, CA

Facilities Engineer: Heavy Oil Thermal Completions Spec.
Chevron
Bakersfield, CA

Facilities Engineer-Heavy Oil Steam Distribution & Metering Specialist
Chevron
Bakersfield, CA

Facilities Engineers
G.A.S. Unlimited, Inc
Houston, TX

Facilities Project Engineers
G.A.S. Unlimited, Inc
Houston, TX

Facility Engineer
G.A.S. Unlimited, Inc
Houston, TX

Facility Planner
Chevron
Richmond, CA

Facility, Automation & Electrical Engineers
Chevron
Multiple Locations

Field Operator — Bitumen Production
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Field Service Engineer
Think Resources, Inc
Multiple Locations

Field Service Technician
Think Resources, Inc
Multiple Locations

Fire Protection Engineer
G.A.S. Unlimited, Inc
Houston, TX

Floating Systems Engineer
BP
US

Flood Control Engineering Interns
G.A.S. Unlimited, Inc
Las Vegas, NV

Flood Control Project Manager
G.A.S. Unlimited, Inc
Las Vegas, NV

Flow Assurance Engineer
BP
Houston, TX

Front End Loading Subsea Engineer
BP
Houston, TX

Furnace Design Engineer
G.A.S. Unlimited, Inc
Houston, TX

Furnace Engineer
G.A.S. Unlimited, Inc
Houston, TX

Gas Distribution Engineer
Think Resources, Inc
St. Paul, MN

Gas Process Engineer / Sr. Gas Process Engineer
Chevron
Houston, TX

Geological Technician
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Geologist
Subsurface Consultants & Associates, LLC
Multiple Locations

Geologist/Sr.
Subsurface Consultants & Associates, LLC
Multiple Locations

Geoscience Data Specialist
Subsurface Consultants & Associates, LLC
Houston/Greenway, TX

Geoscience Technologist
Subsurface Consultants & Associates, LLC
The Woodlands, TX

Geotechnical Engineer
Think Resources, Inc
Austin, TX

Global Intellectual Property Rights Program Manager
Chevron
Houston, TX

GoM Appraisal and Development Geologist
BP
Houston, TX

GoM Appraisal and Development Geophysicist
BP
Houston, TX

GoM Petrophysicist
BP
Houston, TX

Heat Exchanger Specialist
Chevron
Richmond, CA

Heat Transfer Engineer
G.A.S. Unlimited, Inc
Houston, TX

HPHT Facilities Engineer
BP
Houston, TX

HSE Engineers
G.A.S. Unlimited, Inc
Houston, TX

Hull Preservation Superintendent
G.A.S. Unlimited, Inc
Houston, TX

Hurricane Project Manager — Wharf Improvements
Chevron
Pascagoula, MS

I&C Engineers
G.A.S. Unlimited, Inc
Houston, TX

I&C Project Designer
G.A.S. Unlimited, Inc
Houston, TX

Industrial Engineer
G.A.S. Unlimited, Inc
Sugar Land, TX

Inspector
BP
Multiple Locations

Inspector
Chevron
Bakersfield, CA

Installation Engineering Lead Offshore
G.A.S. Unlimited, Inc
Houston, TX

Instrument and Control Engineer
BP
Anchorage, AK

Instrument Engineer
G.A.S. Unlimited, Inc
Houston, TX

Instrument Technician
Think Resources, Inc
Multiple Locations

Instrument/Electrical Engineer
G.A.S. Unlimited, Inc
Houston, TX

Instrument/Electrical Engineers
G.A.S. Unlimited, Inc
Houston, TX

Instrumentation & Control (I&C) Engineer
Chevron
Houston, TX

Instrumentation & Electrical Engineering Specialist
BP
Houston, TX

Instrumentation and Control Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Instrumentation and Controls Engineer
G.A.S. Unlimited, Inc
Tonopah, AZ

Instrumentation Designer
Think Resources, Inc
Austin, TX

Instrumentation Engineer
G.A.S. Unlimited, Inc
New Orleans, LA

Instrumentation Engineer
Think Resources, Inc
Multiple Locations

Instrumentation Engineering Superintendent
G.A.S. Unlimited, Inc
Corpus Christi, TX

Instrumentation Technician
Think Resources, Inc
Multiple Locations

Integrity Management Engineer
BP
Multiple Locations

Jr. Electrical Engineer
G.A.S. Unlimited, Inc
Houston, TX

Jr. Flow Assurance Specialist
Chevron
Houston, TX

Junior Process Engineer
Chevron
Houston, TX

Junior to Midlevel Structural Engineers
G.A.S. Unlimited, Inc
Houston, TX

Lab Technician III
FMC Technologies
Houston, TX

Lead Blueprint Planner/Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Job Listings

Lead Contract Specialist
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Lead Control Systems Designers
G.A.S. Unlimited, Inc
Houston, TX

Lead Electrical Designers
G.A.S. Unlimited, Inc
Houston, TX

Lead Engineer
Think Resources, Inc
Harrisburg, PA Saudi Arabia

Lead Gas Processing Engineer/Gas Processing Advisor
G.A.S. Unlimited, Inc
Houston, TX

Lead Gasification Process Engineer/ Gasification Process Advisor
G.A.S. Unlimited, Inc
Houston, TX

Lead Mechanical Engineer
G.A.S. Unlimited, Inc
Pasadena, TX

Lead Oil & Gas Process Engineer/ Process Advisor
G.A.S. Unlimited, Inc
Houston, TX

Lead Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Lead Process Engineer/Process Advisor
G.A.S. Unlimited, Inc
Houston, TX

Lead Refinery Process Engineer/ Refinery Process Advisor
G.A.S. Unlimited, Inc
Houston, TX

Lead Vessel Engineer
G.A.S. Unlimited, Inc
Houston, TX

Licensing Engineer
Think Resources, Inc
Phoenix, AZ

LNG Process Engineer
Chevron
Houston, TX

Machine Shop Team Leader
FMC Technologies
Houston, TX

Maintenance Engineer
BP
Oregon, OH

Maintenance Engineer
Think Resources, Inc
Multiple Locations

Maintenance Manager
Think Resources, Inc
Multiple Locations

Maintenance Supervisor
Think Resources, Inc
Multiple Locations

Manager — Health, Safety and Loss Management
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Manager — Horizon Application
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Manager of Civil/Structural Engineering
G.A.S. Unlimited, Inc
Pasadena, TX

Manager, Production Heavy Oil North
Canadian Natural Resources Limited
Calgary, AB Canada

Manufacturing Coordinator
FMC Technologies
Houston, TX

Mapping Drafter
Think Resources, Inc
Montgomery, AL

Marine Engineers
G.A.S. Unlimited, Inc
Houston, TX

Material Handling Engineer
G.A.S. Unlimited, Inc
New Orleans, LA

Material Handling Equipment Engineers
G.A.S. Unlimited, Inc
Tampa, FL

Material Science Engineer
Think Resources, Inc
Multiple Locations

Materials & Corrosion Engineers
Chevron
Houston, TX

Materials and Contracts Representative
Canadian Natural Resources Limited
Calgary, AB Canada

Materials and Corrosion Engineer
BP
Oregon, OH

Materials and Metallurgy Engineer
BP
Houston, TX

Materials Coordinators
G.A.S. Unlimited, Inc
Houston, TX

Mechanical (Fixed Equipment) Engineer
Chevron
Houston, TX

Job Listings

Mechanical (Rotating Equipment) Engineer
Chevron
Houston, TX

Mechanical Construction Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Mechanical Engineer
Think Resources, Inc
Multiple Locations

Mechanical Engineer 3
G.A.S. Unlimited, Inc
Stoughton, MA

Mechanical Engineer 3D Modeling
G.A.S. Unlimited, Inc
Houston, TX

Mechanical Engineer 4
G.A.S. Unlimited, Inc
Charlotte, NC

Mechanical Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Mechanical Engineer Fire Heater
G.A.S. Unlimited, Inc
Pasadena, TX

Mechanical Engineer Rotating Equipment
G.A.S. Unlimited, Inc
Houston, TX

Mechanical Engineer Tanks, Piping
G.A.S. Unlimited, Inc
Houston, TX

Mechanical Engineer V Pressure Vessel
G.A.S. Unlimited, Inc
Houston/Texas City, TX

Mechanical Engineer Vessel Specialist
G.A.S. Unlimited, Inc
Houston, TX

Mechanical Engineers Package Engineers/Rotating Equipment
G.A.S. Unlimited, Inc
Houston, TX

Mechanical Engineers Pipeline
G.A.S. Unlimited, Inc
Houston, TX

Metallurgical Engineer
Think Resources, Inc
Multiple Locations

Mine Planning Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Mining Engineer
G.A.S. Unlimited, Inc
New Orleans, LA

NDE Technician
Think Resources, Inc
Tallahassee, FL

Network Engineer
Think Resources, Inc
Olympia, WA

North Slope Production Engineer
BP
North Slope, AK

Nuclear Engineer
Think Resources, Inc
Toronto, ON Canada

Offshore Operations Engineer
BP
Houma, LA

Oils Planning Engineer
Chevron
Richmond, CA

Operating Assistant
Chevron
Los Angeles, CA

Operations Drilling Engineer
BP
Anchorage, AK

Operations Manager
Think Resources, Inc
Topeka, KS

Operations Manager IPP
Chevron
Lagos, Nigeria

Panel Operators — Upgrading
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Performance Engineer
Think Resources, Inc
Austin, TX

Petroleum Engineer
BP
Anchorage, AK

Petroleum Engineer
Chevron
Multiple Locations

Petroleum Engineer
Think Resources, Inc
Austin, TX

Petrophysicist
BP
Houston, TX

Pipe Stress Engineers
G.A.S. Unlimited, Inc
Multiple Locations

Pipeline Design Engineers
G.A.S. Unlimited, Inc
Houston, TX

Pipeline Engineer
Think Resources, Inc
Multiple Locations

Pipeline Engineers
G.A.S. Unlimited, Inc
Houston, TX

Pipeline Engineers
Chevron
Houston, TX

Pipeline Field Engineer
Chevron
Anchorage, AK

Pipeline Integrity Engineer
G.A.S. Unlimited, Inc
San Antonio, TX

Pipeline Project Engineers
G.A.S. Unlimited, Inc
Houston, TX

Pipeline Project Managers
G.A.S. Unlimited, Inc
Houston, TX

Piping Designer
Think Resources, Inc
Multiple Locations

Piping Designers Autoplant
G.A.S. Unlimited, Inc
The Woodlands, TX

Piping Engineer
G.A.S. Unlimited, Inc
Houston, TX

Piping Engineer
Think Resources, Inc
Austin, TX United Kingdom

Piping Engineers Offshore
G.A.S. Unlimited, Inc
Houston, TX

Piping Materials Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Piping Materials Engineer
G.A.S. Unlimited, Inc
Houston, TX

Piping Materials Specification Engineer
G.A.S. Unlimited, Inc
Houston, TX

Piping Materials/Engineer
G.A.S. Unlimited, Inc
Houston, TX

Piping Stress Engineers
G.A.S. Unlimited, Inc
Houston, TX

Piping/Structural Designer
G.A.S. Unlimited, Inc
Houston, TX

Planner
Think Resources, Inc
Multiple Locations

Planner II (Materials)
FMC Technologies
Houston, TX

Planner Scheduler
Think Resources, Inc
Multiple Locations

Planner/Schedulers
G.A.S. Unlimited, Inc
Houston, TX

Planning Engineer
Think Resources, Inc
Multiple Locations

Plant Engineer
Think Resources, Inc
Multiple Locations

Plant Operators - Utilities & Offsites
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Plant Project Engineer
G.A.S. Unlimited, Inc
Cedar Bayou, TX

Plant Support / Designs Engineer
Chevron
Richmond, CA

Pressure Vessel Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Pressure Vessels Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Principal Gasification Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Principal Oil & Gas Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Principal Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Principal Refinery Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Process Control Engineer
Think Resources, Inc
Multiple Locations

Process Design Engineer
BP
Whiting, IN

Process Design Engineer
G.A.S. Unlimited, Inc
Houston, TX

Process Engineer
BP
Multiple Locations

Process Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Process Engineer
Chevron
Multiple Locations

Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Process Engineer
Think Resources, Inc
Multiple Locations

Process Engineer
Chevron
Bellaire, TX

Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Process Engineer Olefins/Refinery
G.A.S. Unlimited, Inc
Houston, TX

Process Engineer Requisition
G.A.S. Unlimited, Inc
Baton Rouge, LA

Process Engineer
G.A.S. Unlimited, Inc
Anchorage, AK

Process Engineer Utilities / Cogeneration Department
Canadian Natural Resources Limited
Calgary, AB Canada

Process Engineering Manager
G.A.S. Unlimited, Inc
Pasadena, TX

Process Engineers
G.A.S. Unlimited, Inc
Houston, TX

Process Engineers
Chevron
Multiple Locations

Process Lead Engineer Utilities & Offsites
Canadian Natural Resources Limited
Calgary, AB Canada

Process Systems Engineers
G.A.S. Unlimited, Inc
Houston, TX

Process Technician - Upgrading
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Procurement Manager
Think Resources, Inc
Multiple Locations

Procurement Project Manager for Catalysts
BP
Naperville, IL

Product Design Engineer
Think Resources, Inc
Sacramento, CA

Product Engineer
Think Resources, Inc
Multiple Locations

Production Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Production Engineer
Think Resources, Inc
Austin, TX

Production, Simulation and Reservoir Engineer
Chevron
Multiple Locations

Program Engineer
BP
Wisconsin, WI

Project Analyst
BP
Texas City, TX

Project Assistant/Document Control
G.A.S. Unlimited, Inc
Houston, TX

Project Control Engineer 4 (Schedule/Cost)
G.A.S. Unlimited, Inc
Housron, TX

Project Control Manager
G.A.S. Unlimited, Inc
Houston, TX

Project Control Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Project Controls Engineer
G.A.S. Unlimited, Inc
Houston, TX

Project Controls Engineer
Think Resources, Inc
Austin, TX

Project Controls Manager
G.A.S. Unlimited, Inc
Houston, TX

Project Controls Manager
G.A.S. Unlimited, Inc
Bridgeport, CT

Project Controls Specialist
Canadian Natural Resources Limited
Calgary, AB Canada

Project Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Project Drilling Eng
Chevron
Lafayette, LA

Project Drilling Engineer
Chevron
New Orleans, LA

Job Listings

Project Engineer
Chevron
Houston, TX

Project Engineer
Chevron
El Segundo, CA

Project Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Project Engineer
Think Resources, Inc
Multiple Locations

Project Engineer — Delayed Coker
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Project Engineer — Upgrading Phase II / III - Execution
Canadian Natural Resources Limited
Calgary, AB Canada

Project Engineer 4 — Mechanical
G.A.S. Unlimited, Inc
Eunice, NM

Project Engineer 5
G.A.S. Unlimited, Inc
Houston, TX

Project Engineer Gas Compression
G.A.S. Unlimited, Inc
Houston, TX

Project Engineer Instrument
G.A.S. Unlimited, Inc
Houston, TX

Project Engineer Machinery
G.A.S. Unlimited, Inc
Houston, TX

Project Engineer Manager/ Engineering Authority
BP
Carson, CA

Project Engineer
G.A.S. Unlimited, Inc
Nigeria, Africa

Project Engineer Upgrading EDS Phase II / III EDS
Canadian Natural Resources Limited
Calgary, AB Canada

Project Engineer (PE)
G.A.S. Unlimited, Inc
Houston, TX

Project Engineer/Manager
Chevron
Los Angeles, CA

Project Engineer/Manager
G.A.S. Unlimited, Inc
Bedford, TX

Project Engineer/Project Manager
G.A.S. Unlimited, Inc
Houston, TX

Project EngineerElectrical
G.A.S. Unlimited, Inc
Houston, TX

Project Engineering Manger
G.A.S. Unlimited, Inc
Houston, TX

Project Engineers
G.A.S. Unlimited, Inc
Houston, TX

Project Engineers
G.A.S. Unlimited, Inc

Project Engineers
G.A.S. Unlimited, Inc
Houston, TX

Project Engineers/Project Engineering Managers
G.A.S. Unlimited, Inc
Houston, TX

Project Leader/Engineer
G.A.S. Unlimited, Inc
Houston, TX

Project Management Process
G.A.S. Unlimited, Inc
Houston, TX

Project Manager
BP
Texas City, TX

Project Manager
G.A.S. Unlimited, Inc
Multiple Locations

Project Manager
Think Resources, Inc
Multiple Locations

Project Manager — Pascagoula Small Capital Projects
Chevron
Pascagoula, MS

Project Manager Chemical Processes
G.A.S. Unlimited, Inc
Houston, TX

Project Manager Electrical
G.A.S. Unlimited, Inc
Houston, TX

Project Manager Gas Pipeline Integrity
G.A.S. Unlimited, Inc
San Antonio, TX

Project Manager Refinery/Coker
G.A.S. Unlimited, Inc
Houston, TX

Project Manager Small Capital Projects
G.A.S. Unlimited, Inc
Houston, TX

Project Manager Sulphur Recovery
G.A.S. Unlimited, Inc
Houston, TX

Project Manager*
Chevron
Salt Lake, UT

Project Manager/Engineering Manager
G.A.S. Unlimited, Inc
Houston, TX

Project Manager-Carson Business Unit, Continuous Catalytic Reformer
BP
Carson, CA

Project Managers/Corpus Industrial Refinery
G.A.S. Unlimited, Inc
Corpus Christi, TX

Project MGR/Project Engineer/Contracts Administrator
G.A.S. Unlimited, Inc
Houston, TX

Project Single Point of Accountability (SPA)
BP
Texas City, TX

Proposal Coordinator
G.A.S. Unlimited, Inc
Houston, TX

Protection Engineer
Think Resources, Inc
Multiple Locations

QA Supervisor
Canadian Natural Resources Limited
Calgary, AB Canada

Quality Assurance Manager
Canadian Natural Resources Limited
Calgary, AB Canada

Quality Engineering Specialist
G.A.S. Unlimited, Inc
Houston, TX

Quality Engineering Specialist I & E
G.A.S. Unlimited, Inc
Houston, TX

Quality Systems Auditor
G.A.S. Unlimited, Inc
Houston, TX

R&D Engineer/Scientist — Lubrication Technology
Chevron
Richmond, CA

Record Analyst
Canadian Natural Resources Limited
Calgary, AB Canada

Refinery Process Manager
G.A.S. Unlimited, Inc
Houston, TX

Refining Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Regulatory Coordinator
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Reliability Engineer
Chevron
Kapolei, HI

Reliability Engineer
Think Resources, Inc
Multiple Locations

Reliability Engineer
Chevron
Multiple Locations

Research & Development Engineer
Chevron
Richmond, CA

Reservoir Engineer
BP
Houston, TX

Reservoir Engineer
Chevron
Bakersfield, CA

Reservoir Engineer
G.A.S. Unlimited, Inc
Houston, TX

Reservoir Engineer - Heavy Oil - Heat Management Specialist
Chevron
Bakersfield, CA

Reservoir Engineers
BP
Anchorage, AK

Reservoir Modeler
Chevron
San Ramon, CA

Reservoir Simulation Engineer
Chevron
Houston, TX

Reservoir, Production & Reservoir Simulation Engineers
Chevron
Houston, TX

Riser / Floating Systems Engineer
BP
Houston, TX

Riser Engineer
BP
Houston, TX

Risk Coordinator/Primavera Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Risk Engineer
Canadian Natural Resources Limited
Calgary, AB Canada

Rotating Equip. Engineer
G.A.S. Unlimited, Inc
Houston, TX

Rotating Equipment Engineer
G.A.S. Unlimited, Inc
Pasadena, TX

Rotating Equipment Engineer
Think Resources, Inc
Multiple Locations

Rotating Equipment Engineers
G.A.S. Unlimited, Inc
Tampa, FL

Job Listings

RWP/TRD Project Engineer
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Safety Coordinator
Chevron
San Ramon, CA

Safety Coordinator (Construction)
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Safety Engineer
Think Resources, Inc
Multiple Locations

Safety Supervisors
G.A.S. Unlimited, Inc
Houston, TX

Sales Engineer
Think Resources, Inc
Multiple Locations

SCADA Engineer
Think Resources, Inc
Multiple Locations

Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Scheduler
Think Resources, Inc
Multiple Locations

Scheduler
G.A.S. Unlimited, Inc
Houston, TX

Security Analyst
Canadian Natural Resources Limited
Calgary, AB Canada

Senior Civil/Structural Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Completions Engineer
BP
US

Senior Cost Planning Engineer
G.A.S. Unlimited, Inc

Senior Drilling Engineer
BP
US

Senior Electrical Engineer
G.A.S. Unlimited, Inc
Pasadena, TX

Senior Electrical Engineer
Think Resources, Inc
Austin, TX

Senior Electrical Engineers
G.A.S. Unlimited, Inc
Deer Park, TX

Senior Engineer (Mechanical or Chemical)/Project Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Engineer (Upstream Activities)
G.A.S. Unlimited, Inc
Houston, TX

Senior Export Systems Development Engineer
BP
Houston, TX

Senior Facilities Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Floating Systems Engineer
BP
Houston, TX

Senior Gasification Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Mechanical Engineer
Think Resources, Inc
Austin, TX

Senior Mechanical Engineer
G.A.S. Unlimited, Inc

Senior Mechanical Engineer Pipeline
G.A.S. Unlimited, Inc
Houston, TX

Senior Oil & Gas Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Pipeline Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Process Engineer
G.A.S. Unlimited, Inc
Multiple Locations

Senior Process/Project Engineer
G.A.S. Unlimited, Inc
Houston, TX

Senior Project Engineer Subsea Umbilical and Riser
G.A.S. Unlimited, Inc
Houston, TX

Senior Project Leader
BP
Naperville, IL

Senior Project Manager
G.A.S. Unlimited, Inc
Houston, TX

Senior Proposal/Project Manager
G.A.S. Unlimited, Inc
Houston, TX

Senior Safety and Health Specialist
Chevron
Louisville, KY

Job Listings

Senior Subsea Controls Technical Lead
BP
Houston, TX

Senior Subsea Development Engineer
BP
Houston, TX

Senior Subsea Engineer
BP
Houston, TX

Senior Vessel Analytical Engineer
G.A.S. Unlimited, Inc
Houston, TX

Service Manager
Think Resources, Inc
Olympia, WA

Shutdown Planner
Chevron
Richmond, CA

Site Development Engineer Utilities & Offsites/Infrastructure Department: Conventional Upgrader Proj
Canadian Natural Resources Limited
Calgary, AB Canada

Site Manager
Think Resources, Inc
Austin, TX

Specialist - Medical & Health Services
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Specialty Estimator Civil, Instrument and Electrical
G.A.S. Unlimited, Inc
Houston, TX

SQDC Coordinator
FMC Technologies
Houston, TX

Sr. Flow Assurance Specialist
Chevron
Houston, TX

Sr. Mfg Engineer
FMC Technologies
Ogden, UT

Sr. Buyer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Control Systems Engineers
G.A.S. Unlimited, Inc
Houston, TX

Sr. Cost Engineer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Electrical Engineer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Heat Transfer Engineer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Heat Transfer Engineers
G.A.S. Unlimited, Inc
Houston, TX

Sr. Process Engineer
Chevron
Richmond, CA

Sr. Process Engineer
G.A.S. Unlimited, Inc
Houston, TX

Sr. QA Engineer
G.A.S. Unlimited, Inc
Houston, TN

Sr. Qa Engineers
G.A.S. Unlimited, Inc
Houston, TX

Sr. Rotating Equiptment Engineer
G.A.S. Unlimited, Inc
Houston/Texas City, TX

Sr. Subcontract Administrators
G.A.S. Unlimited, Inc
Houston, TX

Startup Engineer
G.A.S. Unlimited, Inc
Bridgman, MI

Startup Engineer
G.A.S. Unlimited, Inc
Tonopah, AZ

Steel Detailer
Think Resources, Inc
Topeka, KS

Structural Designer
Think Resources, Inc
Multiple Locations

Structural Engineer
G.A.S. Unlimited, Inc
Houston, TX

Structural Engineer
Think Resources, Inc
Multiple Locations

Structural Engineer
G.A.S. Unlimited, Inc
Tonopah, AZ

Structural Engineer/Marine Engineer/ Naval Architect
G.A.S. Unlimited, Inc
Houston, TX

Structural Engineers
G.A.S. Unlimited, Inc
Multiple Locations

Structural Geologist
Canadian Natural Resources Limited
Calgary, AB Canada

Sub Contract Manager
G.A.S. Unlimited, Inc
Houston, TX

Subcontract Coordinator
FMC Technologies
Stephenville, TX

Subsea Controls Engineer
Chevron
Houston, TX

Subsea Controls/IWOCS Engineer
Chevron
Houston, TX

Subsea Engineer
BP
Houston, TX

Subsea Lead Engineer — Well Operations
BP
Houston, TX

Subsea Operations Engineer
Chevron
Houston, TX

Subsea Pipeline Engineer
Chevron
Houston, TX

Subsea Tree Engineer
Chevron
Houston, TX

Substation Engineer
Think Resources, Inc
Multiple Locations

Superintendent
Think Resources, Inc
Multiple Locations

Supplier Development Engineer
FMC Technologies
Houston, TX

Surveyor
Think Resources, Inc
Carson, NV

Team Lead I
FMC Technologies
Houston, TX

Tech/Engineer Reservoir
Subsurface Consultants & Associates, LLC
Houston/Galleria, TX

Technical Advisor
Think Resources, Inc
Raleigh, NC

Technical Assurance Superintendent — Marine Engineers
BP
Houston, TX

Technical Director
Think Resources, Inc
Austin, TX

Technical Writer
Canadian Natural Resources Limited
Calgary, AB Canada

Technician
Think Resources, Inc
Multiple Locations

Telecommunications Engineer
Think Resources, Inc
Nashville, TN

Transmission Designer
Think Resources, Inc
Alpharetta, GA

Transmission Engineer
Think Resources, Inc
Multiple Locations

Transmission Manager
BP
Houston, TX

Transmission Planning Engineer
Think Resources, Inc
Hartford, CT

Turbine Component Engineer
Think Resources, Inc
Harrisburg, PA

Turbine Engineer
Think Resources, Inc
Multiple Locations

Turbine Repair Design Engineer
Think Resources, Inc
Austin, TX

Upstream Project Engineers
G.A.S. Unlimited, Inc
Houston, TX

Valve Engineer/Specialist
Canadian Natural Resources Limited
Calgary, AB Canada

Vessel Engineer
G.A.S. Unlimited, Inc
Houston, TX

Vessel/Heat Transfer Equipment Engineer
G.A.S. Unlimited, Inc
Houston, TX

Vice President
Think Resources, Inc
Sacramento, CA

Water Treatment Engineer
Think Resources, Inc
Oman

Compression Engineer
Kern River Gas Transmission Company
Salt Lake City, UT

Controls Engineer
Cooper Power
Nacogdoches, TX

Development Engineer
Constellation Energy
Boston, MA

Drilling Engineer
Occidental Petroleum Corp.
CA

Entry-level Field Engineer — Wireline and Perforating Services
Halliburton
TX

Many exciting opportunities with Nexen Petroleum USA Inc!
Nexen, Inc.
Dallas, TX 75251

Natural Gas Design Engineer
R. W. Beck, Inc.
Seattle, WA 98154

O & G Production Workflow Analyst
Schlumberger
Houston, TX

Petrophysicist
Schlumberger
Multiple Locations

Piping Designers
SNC Lavalin
Calgary, Canada

Process Control Engineer
Bernard Hodes
Mont Belvieu, TX

Process Engineer
Bernard Hodes
Kenner, LA

Process Engineer
Washington Group International
Houston, TX

Sr. Completions Engineer
EOG Resources
Oklahoma City, OK

Sr. Completions Engineer
EOG Resources
Tyler, TX

Sr. Reservoir Engineer/Project Reservoir Engineer
EOG Resources
Tyler, TX

System Engineer
Great Lakes Energy
Boyne City, MI

Vessel-based Stimulation Engineer
Halliburton
Offshore - North Sea, Denmark

Architectural Designer
Think Resources, Inc
Annapolis, MD

Autocad Draftsmen
G.A.S. Unlimited, Inc
Pasadena, TX

Autocad Vessel Designers
G.A.S. Unlimited, Inc
Pasadena, TX

Autocad Vessel Drafter
G.A.S. Unlimited, Inc
Houston, TX

Bench Technician
Think Resources, Inc
Trenton, NJ

Cad Advantage Piping Designer
G.A.S. Unlimited, Inc
Humble, TX

Cad Advantage Piping Designers
G.A.S. Unlimited, Inc
Bryan, TX

CATV Technician
Think Resources, Inc
Columbus, OH

Civil Autocad Designer
G.A.S. Unlimited, Inc
Houston, TX

Civil Designer
Think Resources, Inc
Montgomery, AL

Civil Designers
G.A.S. Unlimited, Inc
Las Vegas, NV

Civil/Structural Designer
G.A.S. Unlimited, Inc
Houston, TX

Civil/Structural Designers
G.A.S. Unlimited, Inc
Pasadena, TX

Civil/Structural Designers Pipeline
G.A.S. Unlimited, Inc
Houston, TX

Control Room Technician — Bitumen Production
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Controls Systems Designers
G.A.S. Unlimited, Inc
Houston, TX

Designer 2 (Material Handling)
G.A.S. Unlimited, Inc
Centennial, CO

Designer 2
G.A.S. Unlimited, Inc
Baton Rouge, LA

Drill Site Manager
Chevron
Houston, TX

Drilling Supervisor
G.A.S. Unlimited, Inc
Houston, TX

Electrical Autocad Designer
G.A.S. Unlimited, Inc
Houston, TX

Electrical Designer
G.A.S. Unlimited, Inc
Multiple Locations

Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX

Electrical Designer Autocad
G.A.S. Unlimited, Inc
Houston, TX

Electrical Designer
G.A.S. Unlimited, Inc
Tonopah, AZ

Electrical Designers
G.A.S. Unlimited, Inc
Chicago, IL

Electrical Drafters
G.A.S. Unlimited, Inc
Houston, TX

Electrical Inspector
G.A.S. Unlimited, Inc
Opal, WY

Electrical Supervisor
Chevron
Berry, AL

Electrical/Instrumentation Designers Pipeline
G.A.S. Unlimited, Inc
Houston, TX

Electrician
Chevron
Berry, AL

Electrician
Think Resources, Inc
Multiple Locations

Electro-mechanical Technician
Think Resources, Inc
Multiple Locations

Environmental Coordinator, Decommissioning
Canadian Natural Resources Limited
Calgary, AB Canada

Environmental Technician/Technologist
Canadian Natural Resources Limited
Calgary, AB Canada

Flood Control Designers
G.A.S. Unlimited, Inc
Las Vegas, NV

I&E Designer
G.A.S. Unlimited, Inc
Houston, TX

Instrument & Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX

Instrument Inspector
G.A.S. Unlimited, Inc
Meeker, CO

Instrument/Electrical Autocad Operators
G.A.S. Unlimited, Inc
Pasadena, TX

Instrument/Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX

Instrument/Electrical PDMS Designers
G.A.S. Unlimited, Inc
Houston, TX

Instrumentation Designer INtools
G.A.S. Unlimited, Inc
Houston, TX

Instrumentation Drafter/Checker
G.A.S. Unlimited, Inc
Houston, TX

Lead Mapper
G.A.S. Unlimited, Inc
Houston, TX

Lead Piping Designer
G.A.S. Unlimited, Inc
Multiple Locations

Lead Project Controls
G.A.S. Unlimited, Inc
Houston, TX

P&ID Flowsheet Drafting
G.A.S. Unlimited, Inc
Houston, VA

PDMS Electrical Designers
G.A.S. Unlimited, Inc
Houston, TX

PDMS Piping Designers
G.A.S. Unlimited, Inc
Houston, TX

PDS Cats & Specs Administrator
G.A.S. Unlimited, Inc
Houston, TX

PDS Piping Designers
G.A.S. Unlimited, Inc
Houston, TX

Pipe Support Designers
G.A.S. Unlimited, Inc
Bothell, WA

Pipeline/Mapping Designers
G.A.S. Unlimited, Inc
Houston, TX

Piping Designer
G.A.S. Unlimited, Inc
Houston, TX

Piping Designers
G.A.S. Unlimited, Inc
Brownsville, TX

Piping Designers Flexcad
G.A.S. Unlimited, Inc
Houston, TX

Piping Designers
G.A.S. Unlimited, Inc
Corpus Christi, TX

Piping Lead Designers
G.A.S. Unlimited, Inc
Houston, TX

Piping Material Specialist
G.A.S. Unlimited, Inc
Houston, TX

Senior Field Piping Designer
G.A.S. Unlimited, Inc
El Paso, TX

Senior Instrument/Electrical Designers
G.A.S. Unlimited, Inc
Houston, TX

Senior PDS and PDMS Designers
G.A.S. Unlimited, Inc
Houston, TX

Job Listings

Sr Piping Design Supervisors
G.A.S. Unlimited, Inc
Houston, TX

Sr Piping Designers
G.A.S. Unlimited, Inc
Baytown, TX

Sr. Electrical and Instrumentation Designer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Instrument & Electrical Designer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Mechanical Designer
G.A.S. Unlimited, Inc
Houston, TX

Sr. Structural Designer
G.A.S. Unlimited, Inc
Houston, TN

Structural Designer
G.A.S. Unlimited, Inc
Houston, TX

Structural Designer Autocad
G.A.S. Unlimited, Inc
Houston, TX

Structural Designer PDMS/Offshore
G.A.S. Unlimited, Inc
Houston, TX

Structural Designer Substations
G.A.S. Unlimited, Inc
Houston, TX

Structural Designers
G.A.S. Unlimited, Inc
Houston, TX

Structural Designers
G.A.S. Unlimited, Inc
Brownsville, TX

Structural Designers/Checkers
G.A.S. Unlimited, Inc
Houston, TX

Structural Drafter
G.A.S. Unlimited, Inc
Houston, TX

Structural PDMS Designers
G.A.S. Unlimited, Inc
Houston, TX

Development Engineer
M-I LLC
Houston, TX

Engineering, Procurement and Construction Professionals
Suncor Energy
Calgary, Alberta, Canada

Reservoir Engineer
William M. Cobb & Associates, Inc.
Dallas, TX

Simulation Reservoir Engineer
William M. Cobb & Associates, Inc.
Dallas, TX

Sr. Design Engineer
Halliburton
Houston, TX

Sr. Technical Professional
Halliburton
Houston, TX

Designer 6 Civil/Structural
G.A.S. Unlimited, Inc
Houston, TX

Sr. PDS Underground Lead Piping Designer
G.A.S. Unlimited, Inc
Houston, TX

Senior Vessel Designer/checker
G.A.S. Unlimited, Inc
Houston, TX

Field Operations

Crude Tool Manager
BP
Naperville, IL

Machinist Ist Class
FMC Technologies
Houston, TX

Mechanical Integrity Consultant
G.A.S. Unlimited, Inc
Pascagoula, MS

Operations Superintendent— Primary Upgrading (H23)
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Operations Supervisor — Ore Preparation and Extraction
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Panel Operator — Ore Preparation and Extraction
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Planner/Scheduler(s)
Canadian Natural Resources Limited
Calgary, AB Canada

Shift Team Lead — Operations
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Shift Team Lead — Secondary Upgrading
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Supervisor - Mine Operations
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Electronics Technician — Wireline and Perforating Services
Halliburton
Multiple Locations

Entry Level Field Engineer — Wireline and Perforating Services
Halliburton
Multiple Locations

Entry-Level Field Engineer - Wireline and Perforating Services
Halliburton
LA

Operator Assistant - Wireline and Perforating Services
Halliburton
Multiple Locations

Pipeline / Facility Operations Manager
Chesapeake Energy
Oklahoma City, OK

Sr. Mud Engineer
Halliburton

Asset Manager — Production Engineer
Chesapeake Energy
Oklahoma City, OK

Engineering Technician
Chesapeake Energy
Oklahoma City, OK

Facilities Engineer
Chesapeake Energy
Oklahoma City, OK

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Nexen, Inc.
Dallas, TX 75251

Power Plant Technician
Wellhead
Fresno, CA 93660

Reservoir Engineers
Chesapeake Energy
Oklahoma City, OK

Sr. and Staff Drilling Engineers
Chesapeake Energy
Oklahoma City, OK

Sr. Geologists
Chesapeake Energy
Oklahoma City, OK

Charterer/Voyage Operations Manager
Chevron
Houston, TX

Electrical & Controls Technician
BP
Long Beach, CA

Electrical Technician
BP
North Slope, AK

Fleet Supervisor
BP
Chicago, IL

Land Terminal Operator Trainee
BP
Long Beach, CA

Maintenance Planner
BP
North Slope, AK

Marine Operations Superintendent
BP
Houston, TX

Operations Manager — Global Travel Services
BP
Naperville, IL

Operations Process Safety Management (PSM) Compliance Director
BP
Texas City, TX

Operations Process Safety Management (PSM) Coordinator
BP
Texas City, TX

Regulatory Fuel Issues Specialist
BP
Naperville, IL

Sr. Landman
Chesapeake Energy
Oklahoma City, OK

Supply Manager
BP
Whiting, IN

System Operator-Electronic Gas Measurement Editor
BP
Farmington, NM

Vehicle & Facilities Maintenance Manager
BP
US

Well Site Leader
BP
North Slope, AK

Well Site Leader of the Future
BP
Houston, TX

Facility Inspector
Chevron
Midland, TX

Field Evaluation
Subsurface Consultants & Associates, LLC
Houston, TX

Generator Technician
Think Resources, Inc
Annapolis, MD

Heavy Equipment Operator - Mine Operations
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Installation Superintendent Offshore
G.A.S. Unlimited, Inc
Houston, TX

International Project Manager Geotechnical Investigations
G.A.S. Unlimited, Inc
Houston, TX

Journeyman Plant Mechanic
Chevron
Mountain Pass, CA

Land Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Land Administrator, Commercial Operations
Canadian Natural Resources Limited
Calgary, AB Canada

Logistics Manager — Thailand
Chevron
Thailand

Machinist
FMC Technologies
Stephenville, TX

Machinist
Think Resources, Inc
Topeka, KS

Manager Of Inspection
G.A.S. Unlimited, Inc
Houston, TX

Mining Project Manager
G.A.S. Unlimited, Inc
New Orleans, LA

Operator
Think Resources, Inc
Multiple Locations

Plant Technician
Think Resources, Inc
Multiple Locations

Process Safety Consultants
G.A.S. Unlimited, Inc
Houston, TX

Production Supervisor
Chevron
Berry, AL

Production Tech Operator
Chevron
San Ardo, CA

Project Director Subsea Umbilical Risers and Flowlines
G.A.S. Unlimited, Inc
Houston, TX

Project Manager
Canadian Natural Resources Limited
Calgary, AB Canada

Project Managers
G.A.S. Unlimited, Inc
Houston, TX

QA/HSE Specialists
G.A.S. Unlimited, Inc
Houston, TX

Scheduler/Project Controls
G.A.S. Unlimited, Inc
Houston, TX

Seagoing Personnel
Chevron
San Ramon, CA

Service Technician
FMC Technologies
Yuma, AZ

Shift Charge Managers
Think Resources, Inc
Athens, GA

Special Projects
Chevron
Houston, TX

Supevisor - Dallas Fort Worth International Airport.
FMC Technologies
Da;;as, TX

Technical Environment Manager
Chevron
Concord, CA

Transmission Technician
Think Resources, Inc
Austin, TX

Turbine Technician
Think Resources, Inc
Springfield, IL

Utility Man (U/G) (Experienced Coal Miners)
Chevron
Berry, AL

Utility Man Trainee
Chevron
Berry, AL

Vibration Technician
G.A.S. Unlimited, Inc
Baton Rouge, LA

Welders
Think Resources, Inc
Jefferson, MO

Well File Conversion
Canadian Natural Resources Limited
Calgary, AB Canada

Wellsite Manager*
Chevron
Houston, TX

Human Resources

Advisor - Human Resources
Canadian Natural Resources Limited
Calgary, AB Canada

Organizational Development Specialist
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Administration Assistant
Canadian Natural Resources Limited
Calgary, AB Canada

Field Hiring Coordinator
TIC Holdings, Inc @ PennEnergyJOBS Career Fair
NEW ALBANY, IN

HR Assistant
Chevron
San Ramon, CA

Sr. HR Generalist and Expat Administrator
G.A.S. Unlimited, Inc
Houston, TX

HR Business Partner
Chevron
San Ramon, CA

Human Resources Busines Partner — Marketing Logistics
Chevron
San Ramon, CA

Change Management Senior Specialist
BP
Naperville, IL

Reward Consultant
BP
Houston, TX

Business Analyst — Human Resouces
Canadian Natural Resources Limited
Calgary, AB Canada

Laboratory/Research

Coke Laboratory Technician
BP
California, CA

Laboratory Services Coordinator — Contract
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Laboratory Technician - Refinery
Chevron
Richmond, CA

Mercury Porosimetry Lab Supervisor/ SCAL Coordinator
Chevron
Houston, TX

Pipeline Operator
Chevron
Big Spring, TX

Rock Physics Lab Technician
Chevron
Richmond, CA

Technology Development Manager
Chevron
Mountain Pass, CA

Wastewater/Utilities Operator
BP
North Slope, AK

Legal

Contract Administrator
Canadian Natural Resources Limited
Calgary, AB Canada

Contract Specialist
Canadian Natural Resources Limited
Calgary, AB Canada

Contract Specialist
Chevron
Houston, TX

Contracts Coordinator
Chevron
Houston, TX

Export Compliance Specialist
Chevron
Houston, TX

Group Financial Infrastructure (GFI) Testing Manager
BP
Naperville, IL

Senior Counsel
Chevron
Coral Gables, FL

Senior Pipelines Attorney
BP
Houston, TX

Senior Tax Analyst
Chevron
San Ramon, CA

Tax Analyst
Chevron
San Ramon, CA

Tax Counsel
Chevron
Concord, CA

Technical Advisor
BP
Warrenville, IL

Trading Regulation Advisor
BP
Warrenville, IL

Contract Analyst
Canadian Natural Resources Limited
Calgary, AB Canada

Miscellaneous

OEM Region Progect Manager II
Chevron
Troy, MI

Driver
Hess Corporation
Baltimore, MD

Inventory Manager
BP
Naperville, IL

Dept of Petroleum & Natural Gas Faculty Positions
West Virginia University
Morgantown, WV

Oil and Gas Equipment Dept Rental Manager
S&K Supply, Inc.
Kilgore, TX

Job Listings

PHA Facilitators Process Safety Analysts
G.A.S. Unlimited, Inc
Houston, TX

Product Delivery Truck Driver
Chevron
Roosevelt, UT

Sequence Stratigrapher
Subsurface Consultants & Associates, LLC
Houston, TX

Trainee
Chevron
San Joaquin, CA

Writer
Think Resources, Inc
Baton Rouge, LA

Sales & Marketing

Project Petrophysicist
Canadian Natural Resources Limited
Calgary, AB Canada

Trader
Think Resources, Inc
Jefferson, MO

Gas Portfolio Analyst
BP
Houston, TX

Business Development Manager
Iroquois Pipeline Operating Company
Shelton, CT 06484

Marketing Engineer
TurboCare, Inc.
Springfield, MA, CT 01022

Associate Brand Manager
BP
Wayne, NJ

Business Coordinator
BP
Warrenville, IL

Consumer Truck Brand Manager
BP
Wayne, NJ

Desktop Support Analyst Trading Services
BP
Multiple Locations

Desktop Support Trading Team Lead
BP
Warrenville, IL

Desktop Support-Team Leader
BP
Warrenville, IL

Divestment Commercial Analyst
BP
Houston, TX

Futures Executor/Trader
BP
Warrenville, IL

Heavy Equipment Technical Sales Specialist
BP
Mississippi, MS

Information Technology Professional
Chevron
San Ramon, CA

Latin American Originator
BP
Warrenville, IL

Market Analyst-Gasoline
BP
Warrenville, IL

Marketing Manager
Think Resources, Inc
Norcross, GA

Middle Office Analytics/Quantitative Advisor
BP
Warrenville, IL

North American Originator
BP
Warrenville, IL

OpenLink Endur Business Analyst
Chevron
Houston, TX

Operational Risk Manager
BP
Warrenville, IL

Project Manager Salt Lake Projects — Amine/Sulfur & Bow River Crude
Chevron
Salt Lake, UT

Quality Control Chemist
BP
Warminster, PA

Rotating Equipment Commodity Manager for North America
BP
Naperville, IL

Technology Specialist
G.A.S. Unlimited, Inc
Houston, TX

Trade Control Analyst
BP
Warrenville, IL

Trade Control Manager
BP
Warrenville, IL

Sales Manager
Think Resources, Inc
Topeka, KS

Sales Support Coordinators
Think Resources, Inc
Frankfort, KY

Oil and Gas Specialist
ATLAS Zentrum f¸r Unternehmensf¸hrung
Bern, Switzerland

Regional Utility Sales Manager
GridSense Inc

Science

Geologist, Data Management and Geological Modeling
Canadian Natural Resources Limited
Calgary, AB Canada

Mine Geologist
Canadian Natural Resources Limited
Fort Mcmurray, AB Canada

Seismic Analysis R&D Geophysicist
Chevron
San Ramon, CA

Toxicologist
Chevron
Richmond, CA

Geologist, Thermal
Canadian Natural Resources Limited
Calgary, AB Canada

Global Biofuels Analyst
Chevron
Houston, TX

Geol/Geophy Interpreters
Subsurface Consultants & Associates, LLC
Copenhagen, Denmark

Geologist/Appraisal
Subsurface Consultants & Associates, LLC
Houston, TX

Geologist/Exploration
Subsurface Consultants & Associates, LLC
Houston, TX

Geophysical Advisor/Sr.
Subsurface Consultants & Associates, LLC
Houston/Downtown, TX

Geophysical Interpreter
Subsurface Consultants & Associates, LLC
Copenhagen, Denmark

Geophysical/Sr. Consultant
Subsurface Consultants & Associates, LLC
Houston/Greenspoint, TX

Geophysicist
Subsurface Consultants & Associates, LLC
Multiple Locations

Geoscientist/Lead
Subsurface Consultants & Associates, LLC
Houston/West, TX

Geologist - Borehole
Schlumberger
Dallas, TX

Geomechanics Engineer
Schlumberger
Denver, CO

Geophysicist
Occidental Petroleum Corp.
Bakersfield, CA

Production Geologist
Occidental Petroleum Corp.
Bakersfield, CA

Principle Scientist-Physics
Halliburton
Houston, TX

Deepwater Subsalt Geoscientist
BP
Houston, TX

GoM Exploration Geologist
BP
Houston, TX

Support Engineer

Technical Applications Assistant
AIM Products, Inc.
Cranston, RI

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SPAIN SEARCHES FOR ALTERNATIVE ENERGY SOURCES

Spanish companies set the pace with new technologies in the race to find alternative solutions to the traditional practice of burning coal and fossil fuels for energy consumption in Europe

As Spain and Europe face the rising demand for energy and the high costs of fuel, plans that call for a diverse and stable supply of energy are a top priority. One such project is that of Elcogas, which is a Power Station of 335 MW based on coal gasification integration in a combined cycle plant that reduces atmospheric emissions.

Elcogas President Mr. José Damian Bogas Gálvez states "The plant has demonstrated its technical and economic viability while completing the required objectives of capacity and output using a diverse range of fuel."

Its technology has had the most favourable results for the capture of carbon dioxide and the benefits for the environment are obvious. Elcogas proposes a more than reasonable alternative to diversify risk, improve the environment and maintain profitability.

The integrated gasification combined cycle (IGCC) power plant in the Spanish city of Puertollano.

Mr. Bogas continues, "Without a doubt this technology will form a part of the energy solution "mix" of this century. Coal exists in abundance but we must make plants that respect the environment, I am convinced that an effort must be made for the diversification of supply and the consumer will choose to pay for this cleaner energy."

INTERVIEW WITH MR. CARLOS PÉREZ DE BRICIO, CHAIRMAN & CEO OF CEPSA

Q: How would you define the philosophy of CEPSA as one of the leading Spanish brands?

A: CEPSA is the oldest petroleum company in Spain and last year we were proud to celebrate our 75th anniversary. As you may know, CEPSA began in the Canary Islands because at that time there was a monopoly held by the state oil company CAMPSA in the Peninsula and Balearic Islands. But over time, with the eradication of the Spanish monopoly, CEPSA finally found itself in a market where it could expand its activities and hence, took advantage of the situation and launched a massive campaign, which included the expansion of our refining capacity. CEPSA´s refineries throughout the years have always been noted for their profitability and are equipped with petrochemicals processes in order to maximize the efficiency of each plant. What started out as a single refinery ended up being the largest private Spanish oil company. This expansion proved to be the national phenomenon that CEPSA is today. The fact that CEPSA was born in the Canaries, and had to supply a significant amount of fuel to the airlines and maritime sectors, also had a large influence on the development of its bunkering business.

Mr. Carlos Pérez de Bricio, Chairman & CEO of Cepsa

Q: CEPSA has announced an investment of more than 1 billion Euros into its refining capacity. What does such a large investment represent for the company?

A: It is an important subject for us, but it should not be overly-emphasized. Large investments have been a constant part of CEPSA's development. The fact that CEPSA has had to adapt its facilities and processes to the different requirements that European organizations have demanded from oil, energy, and petrochemical companies with regards to the environmental specifications of refined oil products has also contributed to major investments. This new investment will be allocated towards increasing the diesel production capacity of the Huelva Refinery by 2.7 million tons.

Q: Due to the liberalization of the market many Spanish energy companies have expanded their activities, what about CEPSA?

A: CEPSA, as a private company, was not a gas importer but this activity was always something we considered. Finally, five years ago, along with the Chairman of the Algerian company Sonatrach, we launched the construction of another gas pipeline and it was a project that only 10 years ago would have been unprecedented. In the Mediterranean there is only one gas pipeline feeding Spain. Therefore, building the pipeline that we were actually planning, one that would consist of about 200 km, was at that time an authentic adventure! Obviously by today's standards such an undertaking would not be considered such an "adventure", mainly due to the great depth of the gas pipeline layout on the sea bottom. The Medgaz pipeline will actually start operations in 2009 and initially will fulfil the same necessities as the existing one, but with some additional advantages: it will have direct access to Spain without passing through a third country, and it will double the quantity of gas. CEPSA will import approximately 1,600,000 cubic meters of gas through this Medgaz pipeline, which represents 5% of the entire Spanish market.

Algerian pipelines.

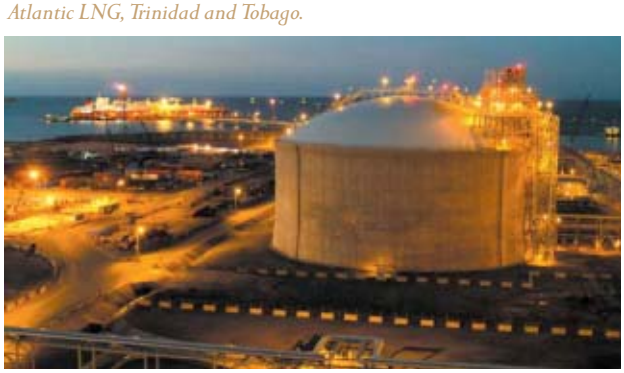
PAVING THE WAY IN LNG

Considering the significant projected increase in the world demand, Repsol YPF has identified the area of LNG as one of the pillars of the company's future growth and as new technological developments lead to continued discoveries, Repsol YPF is investing heavily in the sector in order to reap the benefits in the medium and long-term.

As a leader in the global LNG field, Repsol YPF currently has projects underway in Canada, Algeria, Peru, Mexico and the Middle East, and significant LNG-related investments in Trinidad and Tobago which are classified as being a "core business area". The stream joint venture between Repsol YPF and Gas Natural is ranked third in the global LNG trade in terms of signed LNG contracts, and the companies are leaders in the Atlantic Basin.

In addition to the above, Repsol YPF has said that it is in talks with Gazprom regarding the possibility of entering an LNG project in Russia, and is also involved in projects in Mexico.

Atlantic LNG, Trinidad and Tobago.



BUNKERING IN CEUTA

Enlargement of the Port of Ceuta.

The entire economy of Ceuta depends directly or indirectly on the Port and its activities and due to the geographical location of Ceuta, the Port continues to be the only way to reach the rest of Spain. It is also the entry and exit point for most goods and provides the foundation for most commercial activities.

Mr. José Torrado López, President of Ceuta Port Authority

The existing infrastructure is excellent for the bunkering of ships and is a proud reflection of the importance that this activity represents for the Port.

The competitive advantages that the Port of Ceuta offers, with respect to its competitors, is the quality service that can be found throughout the facility in all areas such as: infrastructure, machinery, and labour force. The Port's objective is to attract and meet the needs of the small and medium tankers that use intermediate fuels. This unique specialization in the servicing and supplying of small moored boats has no equivalent in the Straight of Gibraltar and the Port is considered to be the least congested in the Straight.

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Abstracts must have a title and list all authors. You must provide full contact information for the primary contact author (company affiliation, telephone, fax number and email address). Please designate which author will be the speaker. Presentations must be of interest and of practical value to executives, managers, engineers, and operations personnel engaged in the oil sands and heavy oil industry. Papers will be selected based on a review of abstracts by the Program Committee. Papers must not be commercial in nature.

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- Water Management
- Pipeline Development
- Refinery Expansion and Modification
- Toe-to-Heel Air Injections
- Alternate Fuels
- Innovative Technology/ Technological Challenges
- Coke Gasification
- Extraction and Upgrading
- Elements of Surface Mining
- Technological Competencies – Research and Innovation
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- Regulatory Environment
- Marketing and Transportation
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- Engineering Design
- Combined Heat and Power/ Cogeneration Technologies
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- Sizing Cogeneration Facilities
- Cogeneration vs. Stand Alone Electricity and Steam Production
- Transmissions Issues/Initiatives
- Remedial Action Scheme (RAS)
- Alberta Electricity Capacity and Market
- Mid-Columbia and California Electricity Markets
- Combustion Turbine Technologies

Information for Authors

1. Final selection of papers will be determined by the Oil Sands and Heavy Oil Technologies Conference Advisory Board. Papers will be evaluated on the basis of abstract submitted. The papers should be in English, completely original, and address issues as outlined in the conference focus areas. Papers and presentations should avoid any commercialism.

2. You are allowed 20-minutes to present a paper (presentation in English). A 10-minute discussion will follow each presentation.

3. Authors of papers selected for the Oil Sands and Heavy Oil Technologies program will be notified by the end of **February 2007**.

4. A manuscript and technical presentation will be required for each paper selected. Manuscripts shall be provided with the text on a CD-ROM or a 3-1/2" diskette in MS Word format.

5. Maximum length of paper shall be 15 typewritten pages, including references. Bibliography tables should not exceed 6 pages.

6. Full instructions on preparation of manuscripts and presentations will be sent to authors of selected papers. Complete manuscripts must be provided by **April 6, 2007**.

7. Complimentary conference registration will be provided only for authors who present a paper (One author per paper). Oil Sands and Heavy Oil Technologies Conference & Exhibition assumes no obligation for expenses incurred by authors for travel, lodging, food, or other expenses.

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2007 Abstract Submittal Form

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- ☐ Steam Injection
- ☐ Completion Technology, Strategies, and Techniques
- ☐ Modular Construction
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- ☐ Mid-Columbia and California Electricity Markets
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