

The Institute of
Petroleum



PETROLEUM REVIEW

Shipping

Richard Shepherd discusses whether the Middle East crisis will hamper the shipping market recovery

Shutdown valves

The UK government forces the issue on the installation of emergency shutdown valves in the North Sea

Syria

Rising exports of crude and products are helping the Syrian economy, according to Naji Abi-Aad

Futures

John Tomi reports on the IP Conference, 'Futures and Forward Markets Swaps and Options — Which Way Forward?'



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EDITORIAL

Editor: Carol Reader

Assistant Editor: Mark Scruton

Special Features Editor: Geoffrey Mayhew

Sub-Editor: Jane Thompson

ADVERTISING

Advertisement Director: Colin Pegley

Advertisement Manager: Jim Slater

Jackson Rudd & Associates Ltd.

Oldebourne House,

46-47 Chancery Lane,

London WC2A 1JB

Telephone: 071-405 3611/2.

Fax: 071-831 8030

RECRUITMENT ADVERTISING

Advertisement Director: Tony Miller

Account Executive: Mary Scanlan

MB Advertising

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PUBLISHERS

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THE INSTITUTE OF PETROLEUM

Director General: Ted Williams

Membership Services Director: Brian Raggett

Honorary Editor: Peter Ellis Jones

61 New Cavendish Street,

London W1M 8AR

Telephone: 071-636 1004. Telex: 264380

Fax: 071-255 1472

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Cover photo of a drilling rig operating in the Omar field, Syria (A Shell photograph).

6 December

SP Tyres have signed a deal with ELM Energy and Recycling to turn scrap tyres into electricity at a new plant planned for Wolverhampton.

The International Energy Agency announced that world oil stocks are at a ten year high. Opec oil output increased by 600,000 bpd from October levels to reach 22.9 million bpd in November and lifted world supplies, excluding the former communist bloc, to 53.8m bpd.

7 December

In an annual review of oil company drilling plans rig demand is set to grow by more than 12 percent during 1991 according to figures released by Petrodata.

Hamilton Brothers have made an oil find in its 110/13-2 well in Morecambe Bay.

Greece and the Soviet Union have agreed to build a pipeline which will supply Greece with Soviet natural gas beginning in 1993.

Chevron have decided for environmental reasons to return four exploration permits located near the Great Barrier Reef to the Australian government.

The Australian government has invited oil companies to apply for 13 offshore exploration permits for areas off the west coast.

8 December

UK oil independent Clyde Petroleum and Petrofina have agreed to swap licence interests in North Sea development prospects. Clyde is to acquire Fina's 25 percent interest in the Gryphon field block 9/18b and in exchange Fina will acquire 2.65 percent of Clyde's interest in block 16/26 containing Alba and part of Kilda, 15 percent of block 16/27b also containing part of Kilda and 5.5 percent in block 22/5b in which Maggie and Armada are located.

9 December

The United States and Japan have signed a memorandum of understanding under which Japan's Maritime Safety Agency and the US Coast Guard will exchange information on oil pollution incidents.

The Portuguese government intends to begin the process of selling off at least part of its 100 percent shareholding in the state oil concern Petroleos de Portugal SA.

The number of seabirds killed by oil spills around Britain's coastline has risen sharply for the first time since 1985 according to the Royal Society for the Protection of Birds.

11 December

A UK North Sea oil worker was killed and another injured during an accident on board a semi-submersible drilling rig.

French state owned oil company Elf Aquitaine has signed an agreement on co-operation in activities in eastern Europe with Generale des Eaux.

Iran's crude oil exports will rise 23 percent to 2.43 million bpd in the next fiscal year.

13 December

ICI was fined £1,600 for polluting the River Tees after admitting spilling up to 200 gallons of oil from its chemical complex at Billingham, Cleveland, into the river.

A group of international oil companies, led by Hadson Energy, is to embark on the Harriet Gas Gathering project in Australia following the signing of a gas sales agreement with the local electricity authority.

14 December

The UK Department of Energy is intending to put forward its case to the Treasury for increased funding for the new offshore safety division which is being set up within the Health and Safety Executive.

The UK Department of Energy has received 115 applications from 80 companies for the 12th round of offshore licensing.

15 December

Arco British Ltd, a subsidiary of Atlantic Richfield, believe that the geology under Hadrian's Wall is promising for oil and have applied to the council for permission to sink a test well.

An oil refinery in Mexico City has been ordered to reduce its output by 40 percent after it pushed the amount of sulphur dioxide in the air close to lethal doses.

Casino, the French supermarket group is selling its petrol stations for FFfr660m, to Shell and Agip, the Italian state controlled group. The deal will give Shell third place in the French petrol distribution market.

18 December

Conoco's highly prospective acreage in UK North Sea quadrant 44 has produced another discovery. The well, 44/21a-6, will also increase the company's interest in the block under a farm-in agreement with BP and Norsk Hydro.

British Gas has announced a large oil find in the Gulf of Suez — exploratory drilling produced a flow rate of 7,500 bpd.

A power station fuelled by domestic waste is planned for Birkenhead.

The EC Commission has agreed how ECU300 million of regional funding will be spent on improving the way natural gas supplies are transmitted in poorer regions of Europe.

19 December

Norway's North Sea oil output hit a new record high of 1.89 million bpd in November — buoyed by higher production from the huge Statfjord oil field and a record month from the small Gyda field.

UK independent Monument is considering bids for a 'starter pack' of British North Sea exploration and production assets.

21 December

Kelt Energy, the high geared independent oil company, is continuing talks with its bankers, owed almost \$330 million after failing to attract substantial offers for its principal assets.

Cairn Energy has completed the acquisition of a 22.2 percent stake in Compagnie Européenne des Petroles subsidiary CEP Vietnam.

Finland is likely to lift restrictions on companies importing energy after Finnish-Soviet clearing trade comes officially to an end in June 1991.

Day rates for offshore oil field supply vessels working in the Gulf of Mexico could hit \$4,000 by summer, a 30 percent increase from present levels.

French oil company Total has signed an exploration and production agreement with the Soviet Union, covering 5,000 square kilometres west of the Ural mountains near the Arctic circle.

27 December

Mr Peter Lilley, the UK trade and industry secretary, has referred Elf Aquitaine's purchase of Amoco Corporation's UK oil refining and marketing activities to the Monopolies and Mergers Commission.

Lasmo has raised a £100m loan from the European Investment Bank to help fund its continuing development plans in the North Sea.

Norwegian industrial and energy giant Norsk Hydro has announced plans to dispose of its 10.3 percent stake in Canada's Ranger Oil.

28 December

The numbers of people employed in onshore oil-related work in Scotland continue to climb and are now at their highest level since the end of 1985, before the downturn in North Sea activity triggered by a collapse in oil prices.

29 December

Oil tankers carrying dirty cargoes to the United States will pay a surcharge of 32 cents per gross ton for their first ten voyages.

2 January 1991

Nigerian National Petroleum is one of nine Nigerian state-owned enterprises to be fully commercialised this year.

3 January

The Argentine government has abandoned its central role in the oil market, allowing private producers, refineries and retailers to buy and sell oil products at market prices.

Normal production resumed on Chevron's Ninian Field following partial shutdown due to a leak of 'gaseous water' on the Central platform.

4 January

Schlumberger Ltd has acquired 51 percent of Prakla Seismos AG from the German government.

The Dutch natural gas monopoly, NV Nederlandse Gasunie, increased sales 17 percent in 1990 partly due to price increases triggered by the Gulf crisis.

Texaco's Strathspey field will be developed using a subsea system tied back to the Ninian Central platform.

South Korea has agreed to import 1 million tonnes of liquefied natural gas a year from Malaysia beginning in 1995.

Amoco (UK) Exploration have completed a £118 million safety programme on their 3 northern and southern North Sea oil and gas production platforms, plus associated pipelines.

Total-CFP has agreed to take over the LPG distribution activities of the French unit of Petrofina of Belgium for between FFfr300m and FFfr400m.

5 January

Pict Petroleum now holds a stake of 15.2 percent in Edinburgh Oil and Gas.

8 January

Elf Aquitaine's Angolan subsidiary has announced a new offshore oil discovery close to the Buffalo field.

9 January

The United Kingdom achieved an all time offshore drilling record in 1990 with 217 wells started.

10 January

Jurong shipyard, Singapore has announced a 'block booking' deal with Norway's Westfal-Larsen for its fleet of product/chemical carriers.



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Gulf oil attacked

Saudi crude production has been temporarily cut by 80,000 barrels a day (b/d) since the start of the Gulf war because of Iraqi rocket attacks on a small refinery near the Kuwaiti border.

The 30,000 b/d capacity Ras-al-Khafji refinery was the first Saudi oil installation to be hit by the Iraqis. The attack, which set fire to an oil storage tank, occurred on Thursday 17 January.

In retaliation US and Allied air attacks destroyed the artillery position responsible, but because of the threat of other Iraqi artillery units — dug in just across the Kuwaiti border — the Saudi government has temporarily closed the refinery and shut down the

nearby fields. Staff and residents of the neighbouring town have been evacuated.

Before the war the Neutral Zone Khafji complex, run by Japan's Arabian Oil Company, handled 250,000 b/d from the Khafji and Hout fields situated between Saudi Arabia and Kuwait.

Elsewhere there have been no reports of Iraqi attacks on other Saudi installations. So far, the largest ones on the east coast of the Gulf — the refineries at Ras Tanurah and Jubail, approximately 400 km south of Kuwait — have escaped any form of attack, despite the threat posed by Iraqi Scud missiles.

Meanwhile, US and Allied air forces have launched as

many as 2,000 sorties a day on Iraq and occupied Kuwait. The 71,000 b/d Daurah refinery near Baghdad was hit during a raid.

Iraq has seven other refineries. The two largest are at Baiji — a 150,000 capacity plant situated north of Baghdad near the Kirkuk oil fields and a 70,000 b/d plant in the Gulf coast town of Basra.

During the first naval operation of the war US marines from a frigate who with help from a Kuwaiti gunboat stormed oil platforms off Kuwait and captured 12 Iraqi prisoners. The Iraqis had been using the platforms to guide anti-aircraft missiles against incoming Allied air attacks on Kuwait and Iraq.

Reshuffle at Oxy

Dr Ray R Irani, chairman, president and chief executive officer of Occidental Petroleum Corporation, has announced that Occidental's Board of Directors, after an in-depth review of the company's operations, has authorised an extensive restructuring that focuses on Occidental's underlying strengths and the establishment of a more prudent debt policy.

The restructuring programme will slash long-term debt by 40 percent and will significantly improve the company's liquidity. This programme is also expected to result in an improvement in net income of \$200 million and an improvement in cash flow of \$600 million per year.

Oil prices plummet

Crude oil prices dropped significantly during the first week of the war in the Gulf because of a glut of oil on the market.

Fears that the price would soar as high as \$70 a barrel at the outbreak of war proved to be unfounded. Instead the price dropped from around \$30 to below \$20 a barrel within a week.

The rapid fall was mainly due to two factors; firstly, the apparent inability of Iraq to mount a serious threat to Saudi Arabian oilfields and refineries and secondly, the release of 70 million barrels from the US Strategic Petroleum Reserve.

The American move was part of an International Energy Agency (IEA) plan to release 2 million barrels a day from petroleum reserves in the event of war. This move was designed to calm the markets after war started.

The IEA estimates that the figure corresponds approximately to the current volume of output from the oilfields in the Saudi region closest to the war zone.

But as Saudi installations have been relatively unaffected, the US release — sold by auction and to reach the

market by 15 February — has meant the supply of oil will far outstrip demand this month as long as Iraq does not interrupt Saudi production.

Because of the glut the IEA governing board may reduce the drawdown by controlling the amount of oil entering the market. Even before the outbreak of war and the initiation of the IEA plan a spokesperson for the British Department of Energy said: 'The world oil supply will be very comfortable for many many months'.

IEA's billion barrel stockpile — the highest held in the west for nine years — is the equivalent of 96 days of total consumption by OECD nations.

Government stocks are held by eight of the 21 countries that make up the IEA, with the largest share in the United States, Japan and Germany.

War risk premiums have soared for tankers because of a number of mine warnings and fears of attack from Iraq. Premiums are changing every 24 hours. Rates have risen as high as 6 percent — depending on how far the vessel goes into the Gulf.

US drilling

According to a recent survey by Reed Tool Co of Houston, the number of active rotary rigs in the US is continuing a four year upward trend, while the number of available rigs continues to slide.

It was found that 1,677 rigs, out of 2,320 available, were working which is a utilisation rate 15 percentage points higher than last year.

US rig utilisation increased for the fourth straight year since the rate plummeted to 26 percent in 1986, when only 1,052 of 3,993 rigs were active.

UK drilling

More than 200 wells were spudded by UKCS oil companies during their 1990 exploration programmes — the area's highest-ever recorded level of offshore drilling.

According to figures from James Capel Petroleum Services, out of the 217 wells started, 174 were exploration wells, 57 percent up on 1989 and 37 percent higher than the previous record set in 1984.

However, the report showed that the remaining 43 wells spudded — all appraisal wells — were 23 percent down on the previous year.

Fina percent

Total-CFP has added 12 percent to its domestic LPG gas sales in France by taking over the LPG business of Petrofina's French subsidiary, Finagaz, in a deal worth \$59 million.

Deutsche deal

BP's German subsidiary, Deutsche BP, is to invest more than £20 million as part of a deal to supply a planned network of petrol stations in the country's five eastern states.

Together with German trading company Intrac, BP is to market refined products from the 105,000 b/d Leuna-Werke refinery near Leipzig.

Acree swap

BP and Total have agreed to swap licence interests in the Norwegian sector of the North Sea. BP will take over Total's 8.33 percent of block 1/3B close to its Ula and Gyda oilfields and 10.9 percent interest in block 15/5.

Total will take over BP's 50 percent share in blocks 29/6 and 30/4 next to the Hild field.

BP staff help rescue services

BP Oil Group Terminal Manager Steve Welsh congratulates management and staff who took part in an emergency operation to make-safe a petrol tanker damaged in a fatal accident on the M27 motorway. Although no BP vehicle was involved, the police appealed to the Hamble Terminal for assistance after one of the tanker's fuel compartments was damaged and there was a danger of product reaching the River Hamble.



Q8 expand into Hungary

Kuwait Petroleum plans to start up a chain of Q8 petrol stations in Hungary – its first major venture into Eastern Europe.

According to the exiled Kuwaiti oil minister Rashid Salem al-Ameeri, the company hopes to open 17 Q8 sites as well as upgrade one of Hungary's state-owned refineries in a proposed \$100 million deal with two domestic firms.

Products made in the refinery would be primarily intended for the Hungarian market but Mr Ameeri said the company is also looking to export.

Hungary has four refineries, one of which only produces lubricants. The other three have a combined annual throughput of between 11 to 11.5 million tonnes a year.

Amoco Suez

Amoco has announced it is producing some 9,500 barrels of oil per day from a new discovery well recently completed in the Gulf of Suez.

The GS-172-2 well was drilled from the October "J" platform, an existing platform in the North October field. During flow tests, the well produced approximately 10,370 barrels of 28° API oil per day with a wellhead pressure of 225 pounds per square inch from Asl sands of the Miocene Rudeis formation between 10,280 and 10,590 feet.

Suez find

British Gas has made an important oil discovery 6 km offshore in the Gulf of Suez. The find is regarded as the most significant in the area for nearly a decade.

The discovery was made on their first wildcat well in the North Zaaarana concession. The cumulative flow rate from five intervals between 5060–6428 feet was more than 7500 barrels of oil per day. The well flowed oil with an API gravity ranging from 18–24°. The well was drilled to a total depth of 8400 feet and has been temporarily suspended.

Brae solos

British Gas has made the first-ever new style deal with the partners of the Marathon-operated Brae field to buy more than 700 billion cubic feet of gas.

The new 15 year contract will allow the seven Brae group members to sell their share of gas individually. The first gas will be delivered in 1994.

Block bids

Confident exploration companies have responded well to the latest 12th round of offshore oil and gas licensing in the UKCS by sending in more than 110 applications for the blocks on offer.

Energy Secretary John Wakeham said: 'We received 115 applications from groups involving 80 groups.' The total does not include applications for the separate frontier round.

Combined gas

British Gas has entered into an agreement with Peterborough Power Limited to supply gas to the new combined cycle gas turbine power station at Peterborough. The supply will be 200 million therms a year for 15 years and will start to flow in 1993 when the 360 Megawatt station is commissioned.

The two major participants in Peterborough Power are Eastern Electricity plc and Hawker Siddeley Power Engineering Limited.

LASMO loans

LASMO has secured a £175 million loan from Barclays Bank to complete a field development package for their share of the North Sea Piper and Saltire fields.

The loan, to be repaid over 13 years, is in addition to £100 million borrowed from the European Investment Bank last December. Both loans are part of a five-year £650 million development programme.

Safety Oscar for Conoco



Conoco has won the 'Oscar' of the safety world – the British Safety Council's 'Sword of Honour' – for the second time.

Pictured here is Conoco's Safety and Occupational Health Manager, Mr T A Lowther (left) receiving the sword from Sir Bernard Braine MP.

War in the Gulf — the repercussions

By Dr Joseph Stanislaw, Managing Director Europe and the Middle East,
Cambridge Energy Research Associates

The outbreak of war in the Gulf on 16 January marked the end of more than five months of intense political and economic pressure by the international community to force Iraq to leave Kuwait. During that time — as the likelihood of a military confrontation became inevitable — many questions were asked about what impact such a war would have on the Middle East oil industry and the world market. Here, in this article written immediately before war broke out, Dr Stanislaw considers the major questions and uncertainties raised by the spectre of disruption to the supply of oil, following the start of hostilities.

Before going into these questions and answers it is important to note that the market is crude and product long — OPEC production is currently running at 23.5 million barrels per day (b/d). OECD crude and product inventories are about 110 million barrels above last year's levels for the same time period, a total of 96 days of forward consumption. Total inventories in the OECD come to 3.5 billion barrels, including government inventories of 1 billion barrels which could be released quickly to offset fears of a possible reduction in supplies or any real loss of supplies.

In short, the market is 'well oiled'.

Threat to Saudi oilfields

Outside Iraq and Kuwait, the oilfields most vulnerable to an Iraqi attack are three Saudi offshore fields that are within 25.50 kilometres of the Saudi/Kuwaiti border and the Saudi-operated fields in the Neutral Zone that Saudi Arabia shares with Kuwait. Slightly further south, but also vulnerable to Iraqi missiles, are several other important fields including the Berri field which is about 150–200 kilometres from the Kuwaiti border. The Neutral Zone fields currently produce 0.15–0.2 million b/d. It is estimated that production from the three offshore Saudi fields

near the border totals 1.2–1.5 million b/d. The lion's share of this amount is from the Safaniya field, the world's largest offshore oilfield. Safaniya produces a heavy, sour crude of 27° API and over 2.0 percent sulphur.

The concern to the oil market is a direct attack on these and other oil production installations. This possibility, however, is minor. The real threat is twofold:

- 1) The use of a conventional missile or one equipped with a chemical weapon launched in the direction of these installations which, even if it did not reach or hit its target, would result in panic and an immediate shutdown of all producing facilities in the area. It should be stressed here, however, that any use of chemical weapons by Iraq — even without causing casualties — would very likely result in a massive and devastating retaliation by the allied forces.
- 2) The possibility of sabotage by oil workers who are sympathetic to the Iraqi cause and who are working in those countries supporting the allied forces. Given the thousands of workers in the Middle East oil industry, it is almost impossible to completely eliminate this threat. It is probably the most dangerous with regard to interrupting oil production in any one field.

Threat to Iraqi oilfields

The threat to Iraqi oilfields is from the allied missile and bomb attacks. As with the Saudi fields, it would be very difficult to cause long-term damage, although the higher degree of accuracy of the allied missiles could result in more well heads being taken out than the Iraqis could damage in Saudi Arabia. The easiest Iraqi target would be the Rumaillah field which is just over the Iraqi/Kuwaiti border. The main producing region of Kirkuk, however, is located in northeast Iraq about 500 kilometres from the Saudi border.

Threat to Kuwaiti oilfields

The question is repeatedly raised concerning the kind of damage that could be done to the Kuwaiti fields if the Iraqis resort to a 'scorched earth' policy. An oilfield cannot be 'blown up' or destroyed with a missile or bomb. What can be done is to start a fire on the surface that is fed with the oil and gas from the field below. This is a classic well fire which people like Red Adair make a living putting out. The difference with a standard well fire and what could happen in Kuwait is in the numbers. Usually there is one fire at a time. The Iraqis could ignite many

different fires which would take a very long time to put out. It would be possible for several hundred million barrels of oil to burn in a worst case scenario. Kuwait oil reserves are estimated at about 100 billion barrels.

The loss of oil would be a minor problem compared to the ecological consequences of such a man-made disaster. The smoke from such an enormous conflagration would do considerable damage to the ecosystem of the immediate area and result in serious health repercussions in other areas.

As far as the short-term oil market is concerned, however, this scorched earth policy would have very little effect. The market is not currently relying on this oil and there is no reason in the short-term future for the continued absence of this oil from the market to have an adverse effect on price or supply.

The status of the Kuwaiti refineries is unclear. Total throughput capacity before the conflict was about 0.75 million b/d, most of it very sophisticated plant and material. Some of this has already been dismantled and shipped to Iraq. The rest could be destroyed by the Iraqis as they retreat. As with Kuwaiti and Iraqi production however, the oil market has already learned to live without these refineries and their destruction should have little short-term effect on the market.

Threat to tankers

Approximately 9.0 million b/d of oil is shipped out of the Gulf by tanker. This includes 4.3–4.5 million b/d from Saudi Arabia, 2.2 million b/d from Iran, 2.2 million b/d from the United Arab Emirates and 0.3 million b/d from Qatar. Some 3.0 million b/d of Saudi production moves by pipeline to the Red Sea port of Yanbu.

from the Iran/Iraq war. Tanker owners will probably wait to see how the situation is developing before starting to send their ships back in. There is also the possibility that Allied ships will offer to escort tankers if necessary to keep the oil flowing out of the Gulf.

Insurance companies have already increased their war insurance rates on tankers by a factor of eight since late December and are continuing to raise them. This adds a cost factor of \$0.50–1.00 per barrel on oil being shipped to the United States.

The Suez Canal

If Israel is brought into the conflict, there is a real possibility that the Suez Canal could be closed, by deliberate Egyptian government action or by sabotage. It is a narrow waterway and one sunk ship would close the canal. This would result in longer hauls with a significant increase in transit time and a sharp increase in demand for tanker tonnage due to the longer shipment times and the subsequent and immediate shortage of tanker capacity.

The IEA response

The possible loss of oil supplies in the event of hostilities has led the IEA countries to define and clarify the Coordinated Early Response Measures (CERM), that the Executive Director has the option of employing. Three OECD countries that are not IEA members — France, Finland, and Iceland — have also agreed to participate in these measures.

The IEA initiative calls for member countries to make 2.5 million b/d available to the market upon orders from the Executive Director. Of this amount, about 2.0 million b/d is to be in the form of additional oil supplies and the balance of about 0.5 million b/d is to be in the form of demand restraint. It is up to the individual countries how to bring about this restraint.

Although the details have not been revealed, it is calculated that about 1.0 million b/d of the 2.0 million b/d of additional oil is to come from the US Strategic Petroleum Reserve (SPR). As we have said previously, the United States would announce immediate release of SPR upon hostilities.

Several important points to keep in mind concerning the IEA's initiative are:

- The stockdraw and demand restraint are to be implemented so as to make the 2.5 million b/d available within 15 days of the Executive Director's decision to implement the CERM;

'The fundamental crude and product longness'

Threat to refineries

There are six major refineries in Saudi Arabia. Two of them, Ras Tanurah (0.45 million b/d) and Jubail (0.25 million b/d) are located on the Saudi Gulf coast about 400 kilometres from the Kuwaiti border. Ras Tanurah is already running at 50–60 percent capacity due to a fire in December. The risks to these refineries and to the refinery in Riyadh (0.134 million b/d), about 500 kilometres from the border and 250 kilometres inland, are the same as those described above for the Saudi oilfields — missiles and sabotage.

The other Saudi refineries are all located on the west coast at Yanbu (0.17 million b/d and 0.25 million b/d), Rabigh (0.325 million b/d), and Jeddah (0.091 million b/d). While vulnerable to sabotage, these refineries are sufficiently distant from the border to be out of range of Iraqi missiles.

The Iraqi refining industry is relatively small. There are eight refineries but four of them have throughput capacity under 8,000 b/d and one has throughput capacity of 12,000 b/d. The three larger refineries are Daurah (70,000 b/d) near Baghdad, Baiji (150,000 b/d) near Kirkuk and Basra (70,000 b/d) near the Kuwaiti border. Basra would be the easiest target for the allied forces.

The Saudi loading points of Jubail and Ras Tanurah are located about 400 kilometres from the Saudi/Kuwaiti border. The main risks to these ports are those described above concerning Saudi refineries and production.

The Iranian loading point of Kharg Island is physically the closest to the area of possible hostilities. However, it is located due east of Kuwait while the Saudi ports and oilfields are located due south. Unless Iraq wanted specifically to hit Kharg Island, which is unlikely, it would seem that the Iranian facility is out of harm's way. If hostilities last too long and Iran feels that Kharg is threatened or if tankers perceive that there is a threat, Iran might begin shuttling its oil down to Lavan Island, about 600 kilometres southeast of Kuwait. This took place during the Iran/Iraq war.

The threat to tankers in the Gulf, however, remains relatively minor. Nonetheless, tanker owners are unwilling to move their ships into the Gulf until the situation is more clear and it is evident that the waters are not mined and ships do not risk being hit by Iraqi missiles or bombs. This means that there could be some reduction in tanker activity. The discovery of a mine in Saudi waters last month increased the fear of tanker owners. However, it is not clear if this mine was recently planted or if it was left over

● The IEA governing board will meet 10 days after such a decision is taken to reassess market developments and decide whether or not to continue with the implementation of the Coordinated Early Response Measures or whether they need modification;

● These measures are not to be confused with IEA's Emergency Sharing System and do not require that member countries share the newly available oil with other member states.

● The IEA measures call for 2.0 million b/d of oil to be made available to the market but not for the distribution of this oil by any particular government body or corporation.

The SPR and the Jones Act

The SPR has been tested and the physical system works. The SPR contains about 570 million barrels of oil. The question has been raised about whether the use of the SPR in an emergency, and the release of 1.0 million b/d, would require a temporary suspension of the Jones Act which mandates that all US oil be carried in

US flagged ships. Such a reprieve might indeed be necessary but this could take as long as two weeks, at the quickest.

Role of futures markets

There has been a lot of discussion about how futures exchanges will react to an oil emergency. The New York Mercantile Exchange (NYMEX) and the International Petroleum Exchange (IPE) recently announced procedures they will implement during an emergency.

NYMEX announced a limit in price movement of \$7.50 per barrel for crude oil and of \$0.20 per gallon for products on the first two months of each contract. When this limit is reached in either of the first two contract months, there will be a one hour trading cessation in all months of the futures contract and its related option.

There will always be at least one half hour of trading following a temporary trading cessation. When trading is resumed, a second price limit of \$7.50 per barrel for crude and \$0.20 for

products above or below the limit (in the direction of the market move) in place when trading ceased will apply to all contract months.

Limits for all months will remain at \$7.50 and \$0.20 until they settle for two consecutive days less than \$3.00 (or \$0.06) above or below the previous day's settlement price.

The IPE in London has announced much less extensive measures. The IPE does not intend to introduce price limits. In the event of an exceptionally high level of activity occurring, the IPE will declare an active or fast market and certain administrative pauses will be built in much the same way the NYMEX will introduce one hour trading cessations. If an active or fast market is declared before noon, there will be a half-hour break from 13:30 to 14:00 and from 17:45 to 18:15. If the active or fast market is declared after noon, only the 17:45 to 18:15 break will be implemented.

In addition to these measures, the margins on both exchanges are at historically high levels in an effort to discourage speculation. ■

Conductivity improvers in ground fuels

Comment on Dr HL Walmsley's paper in the December issue of *Petroleum Review*.

Two developments have occurred which are relevant to current concerns about electrostatics in ground fuels in the United Kingdom.

One of these has been inclusion of a minimum conductivity requirement in Canadian diesel fuel specification CAN/CGSB 3-6 M86. Contrary to conventional wisdom, a minimum conductivity level of 25 pS/m was established; specified minimum conductivity for aviation fuels is 50 pS/m.

The level of 25 pS/m was agreed upon because of two factors: first, ground fuels are generally not loaded into tank trucks, barges, or tank cars with fine filtration just upstream of the outlet as is the practice for aviation turbine fuels. Secondly, the possibility of extremely low temperature along with commingling effects make it probable that fuel will occasionally not meet a design conductivity of 50 pS/m. Middle distillates generally show much greater proportionate loss in conductivity than aviation fuels as temperature drops.

Commingling of fuels with different additives or additive response properties will not necessarily give linear conductivity blending. Therefore if the refiner uses conductivity additives to achieve 50 pS/m at the point of fuel loading operations, accounting for distribution losses and at the lowest probable loading temperature, he is unlikely to encounter use conductivities less than 25 pS/m. Some Canadian fuels would require conductivities of 600 pS/m at 25°C to assure the fuel (or comingled product) would meet a 50 pS/m minimum at, say, -25°C following distribution.

The second development has been the issuance of ASTM D4865, Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems, which provides general information on fuel electrostatics. The guide is intended to provide sound practical advice at a user level.

While such advice is otherwise available, members sought the widest possible distribution of such information. The reasons for its development are noteworthy. A literature search by a US oil company showed that use of conductivity additives prevented elec-

trostatic ignition during handling of middle distillate fuels, even when switchloading from a previous gasoline or other flammable cargo. An attempt to impose use of these additives in ASTM ground fuel specifications was not successful because some refiners argued hazards can be avoided by prohibition of switchloading.

The other reasons for D4865 development was the observation that some small refiners were clearly not aware of potential hazards — such as in one instance where changes in loading rates and piping configuration led to five ignitions over a period of several months.

Switchloading from flammable to non-flammable ground fuels presents a small, but finite hazard, which may never rear its head at any given site — but then again, may lead to multiple incidents over a short span when unusually (and unpredictable) high electrostatic charging occurs. There is a solution, which is the routine use of conductivity additives at very low concentrations.

Dr CP Henry
Senior Research Associate
Du Pont Petroleum Laboratory



IP WEEK 1991

18-21 February
London

The Programme of Events organised by The Institute of Petroleum for IP Week 1991 is as follows:

Monday 18 February

A short afternoon Seminar, organised by the Energy Economics Group on **Financing Energy Projects**. (Contact: Susan Ashton).

As with all the discussion meetings, the audience will include people employed in many different disciplines in the oil industry, from exploration to marketing products to consumers and is open to guests as well as members of the groups.

Tuesday 19 February

A half-day morning Seminar on **Oil Price Information**. There will be presentations combined with an exhibition by suppliers of oil price information. (Contact: Jean Etherton).

An **IP Luncheon** will be held at The Inn on the Park Hotel. Speaker: HE Sheikh Ali Khalifa Al Sabah, The Minister of Finance — Kuwait. (Contact: Caroline Little).

Mr W Edward Betts from Esso Petroleum will speak to the IP's London Branch on the subject of **Alternative Transport Fuels of the Future** at 18.00 hours at the Institute. (Contact: Mary Wood).

Wednesday 20 February

The **IP Annual Dinner** will be held at Grosvenor House, London at 18.45 for 19.30. Fully booked.

Thursday 21 February

An **IP Luncheon** will be held at The Dorchester. Speaker: Mr Raymond Bloch, President, European Petroleum Industry Association. (Contact: Caroline Little).

There will be a meeting of the Exploration and Production Discussion Group at 17.30 at the IP when **Mr DC Harding OBE, Chief Executive Europe, BP Exploration**, will speak on the subject of **The North Sea—Meeting the Challenges**. (Contact: Alan Lodge).

For further information on any of the events during IP Week 1991, please contact the individuals mentioned at The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 071-636 1004. Telex: 264380. Fax: 071-255 1472.

Defeat for Iraq may slow offshore shipping market recovery

By Richard Shepherd, Managing Director, Petrodata

The American defence of the Kuwaiti and Saudi regimes against Iraq is in essence a defence of US long-term economic lifeblood: oil at a price which does not bring the US economy to its knees.

A successful defence means that Iraq's ambition to raise the price of the major asset of the Middle East by overwhelming the price doves in Kuwait and Saudi will have failed. And since offshore shipping markets are driven primarily by oil price, the potential for rapid demand growth in the 1990s will be blunted by a defeat for Iraq.

Even so, the European market for mobile rigs and the support vessels which accompany them and serve the producing fields is growing at least three times faster than other world markets and will continue to do so this year. Iraq's threat to target the North Sea with terrorist attacks is a grim recognition of the importance of the strong remaining production potential in the United Kingdom and Norway in particular as a safeguard against disruption of Middle East supplies.

Offshore shipping prospects

War in the Middle East will send oil prices well beyond the level justified by the demand-supply balance. Peace in the Middle East, with oil consuming nations firmly astride oil policy in most of the Arabian peninsula, will send prices back to their 1989-90 levels.

High oil prices will drive the whole offshore oil related shipping and mobile rig business into shortage within two years. A return to the low prices of 1986-90 will hobble growth or drive demand into decline again, if the level falls below \$15 a barrel. When the current Gulf crisis moves into historical perspective, it may be seen not simply as a righteous intervention against a local bully being unfair to his neighbour but as one of a series of symptoms of the growing tensions between the owners of the world's most sensitive resource and its largest buyer.

For shipping and marine equipment markets, the long term decline of onshore oil production in the main consuming countries spells steady growth for activity offshore. No American intervention in the Gulf would almost certainly have led to the higher oil prices which drive offshore activity. A successful western reversal of the attempt to snatch the resources of those Arab states prone to offering lower prices to the American buyer will almost certainly reduce the rate of growth in offshore shipping demand.

The coupling between oil price and offshore marine activity is direct and consistent. Oil prices drive oil company cash flow and the cashflow drives exploration and production expenditure. Exploration and field development work translates directly into mobile rig business and the support vessels which go with them.

Offshore shipping markets surged ahead after the oil price leaps of 1973/74 and 1979/80 and collapsed as prices

fell in 1986. Demand for offshore shipping worldwide has not recovered to its 1985 levels yet and neither have oil prices on an annual aggregate basis.

The gradual recovery in demand for offshore shipping began in 1988 and was consolidated in 1989 and 1990 as oil prices stabilised and showed signs of new growth. But world demand for mobile drilling rigs of all types reached 573 on aggregate in 1990 against 659 in 1984. On present growth trends it will be 1993 before the 1984 record is broken.

The European market for offshore mobile rigs and vessels has outperformed the rest of the world by a mile in the last several years. For the North Sea area as a whole, demand growth in 1990 achieved 20 percent with a further 13 percent predicted by Petrodata's annual forecast for 1991. That rise in rig activity in 1990 was almost three times the result for the world as a whole. In other words, the North Sea accelerated at four times the

pace of other world rig markets taken together. This year, the North Sea will again outrun the rest of the world, although by a smaller margin.

Supply vessel markets have followed a similar path, although the ratio of boats active to rigs working has fallen steadily since 1984.

Output trends

Without any invasion of Kuwait in August 1990, the world demand trend was likely to move gently upwards through the 1990s, driven not by crisis but by a steady shift of production capacity towards the OPEC states.

The world's two largest producers, the United States and the Soviet Union, are firmly headed towards a decline which erodes their strength. The US budget deficit would race further out of control should crude oil prices rise as OPEC took a firmer grip of supplies to the big consuming countries. Well before Iraq moved to sharpen this weapon further by grabbing Kuwait's oilfields, it was already apparent that the Arabian peninsula would develop a stranglehold on the United States in the 1990s.

That threat alone was enough to set offshore activity on the move in an effort to maintain non-OPEC production for as long as possible.

Offshore fields now provide nearly 30 percent of the world's oil production with a total volume of 16 million barrels of oil a day and the share is on an upward trend. The oil companies which produce that oil are mostly from countries outside the OPEC area, but OPEC now holds 77 percent of world oil reserves and a rising 37 percent share of the international oil market.

Non-OPEC oil supplies are likely to have reached a plateau from which down is the only future direction. The incentives to maximise exploration and production are therefore good. This suggests that expenditure and thus activity will grow as long as there are offshore reserves to be found. However, the incentive to produce will be mitigated by the economics: the balance between oil price and production cost.

The collapse in oil prices in 1986 destroyed the margins established as reasonable in the early 1980s but under threat before the fall. Thus the investment in new production collapsed as well and with it the exploration and production expansion activity. Since the pressure to produce more offshore was still present and growing, the solution lay in cutting production

costs. Exploration costs came down without new engineering solutions because day rates for rigs were forced down by market forces. Technical costs have meantime been reduced by 25-30 percent North Sea projects.

In Europe, the development of an offshore production and transportation infrastructure in the 15 years to the end of the 1980s has allowed relatively cheaper and smaller new production projects to be tied back into the well-stream processing and pipeline systems already in place and the number of new projects is accelerating again even if the capital expenditure profile may not rise as far and fast as the volume of activity.

In the United States, BP estimates that, excluding Alaska, half of the oil and gas which remains to be found is offshore, in addition to the 20 percent of known and proven reserves which are offshore. However, since 1970 the level of production from the offshore fields of the United States has trended downwards while the other major regions of

end of the month, Brent physical prices were nudging \$19 again, still significantly below the levels at the start of the year, but up more than \$3.50 from the beginning of the month. A week later the invasion of Kuwait started a speculative reaction which sent prices to \$40. As the tension ebbed in the last quarter of 1990 prices fell steadily until they reached a level just above the July 1990 price in the first week of January.

If the price had held at the post-Kuwait invasion levels for longer than a few months, equivalent in money of the day to that of the mid-1980s, then mobile rig activity would certainly have accelerated hard in most offshore theatres around the world. That in turn would lift support vessel activity above the 1990 level. In practice, during the tense months after the invasion, most oil companies stuck to rather conservative plans for expansion of their offshore activity in 1991 which had been taking shape in the budget preparations in June and July. The arrival of \$40 crude oil prices made

'Plans for UK drilling in 1991 did show an unexpectedly sharp change'

the Middle East, Latin America, Africa and Asia have all headed upwards. In the 1980s, the North Sea led the production growth followed by Asia and Africa, while a fall in the Middle East and Latin American production in the early 1980s has turned around in the last five years.

The differences in regional growth in production will be reflected in the levels of overall offshore activity, including exploration. But even though regions may offer varying levels of growth (or decline) for contractors and equipment owners, it is the aggregate trend in the world market which is likely to determine the profitability of the business.

Prospects for 1990s

At the start of 1991, excess supply of offshore marine equipment and shipping capacity still overshadows the recovery in activity and thus demand growth is the short term key. That continued growth will be a function of oil price.

The long slide in crude oil prices ended in July last year with OPEC's new target of a \$21 minimum level tied to tighter production quotas. By the

little difference to planning because few believed it was more than a spot market spike.

By itself, the temporary removal of output from two large producers, Iraq and Kuwait, does not create a supply crisis and does not justify any significant rise in oil price. It has in general been recognised that the crude oil price hike is rooted in commodity market speculation and not in underlying economic realities.

However, in the United Kingdom, historically the most sensitive and volatile barometer of offshore activity, plans for drilling in 1991 did show an unexpectedly sharp change. Shallow water drilling for gas was suddenly scheduled to turn down after eight or nine years of growth. By contrast deep water drilling for oil was headed for a 30 percent increase, far ahead of any other offshore oil province in the world.

The fact that the United Kingdom remains the safest and one of the most prospective oil targets offshore is hard to ignore when the rush to prop up reserves outside the OPEC area is more pressing than ever. Small wonder then that Iraq picks North Sea oil installations as prime terrorist targets should it have the time to mount such attacks during a war on its own doorstep.

Long-term outlook

When the dust has settled in Arabia, the long-term trends will be back in play. The short-term factors suggest continued surplus of crude oil and lower prices. But within two or three years, the loss of capacity in non-OPEC producing areas renews the upward trend in crude oil prices towards \$35-40 by the end of the decade in real terms (discounting inflation) and to \$35 or more by 1995 in current money.

That internationally traded value of crude oil will remain the primary key

activity in the 1990s and to demand for the shipping services that support them is the balance between oil price and the cost of production in the theatres which dominate the offshore business. The line drawn by the oil companies themselves between growth and recession in offshore activity lies at around \$15 a barrel for Brent crude in 1988 values. Any rise above that means growth in activity and thus in the trading earnings of offshore equipment and its resale value. Any fall below that line means a return to the loss-making scenario of 1986 to 1987.

In June 1990, the price of Brent

beyond all previous records. In fact, by spring 1990, analysts Salomon Brothers in New York had hiked their oil price scenario beyond the expectations of the previous autumn.

The 1995 target price for West Texas crude was now set at \$31.50. That would be enough to ensure rapid growth in offshore activity. Over the last 15 years the real value of crude has in fact remained remarkably flat on average, despite the peaks and troughs along the way. The pattern is that even a stable oil price with very little real growth (discounting inflation) is enough to keep offshore activity climbing at a steady upward pace.

The swing back to increased dependence on those Middle East states with the power to control the flow of crude oil to the industrialised nations, however, provides those states with the opportunity to raise the price again. It also provides the same opportunity for them to increase production and force prices lower if it suits their political strategy, individually or collectively. With more American influence in the area as a result of the Gulf crisis, the chances are that the dangerous swing in the balance of oil power will be neutralised and prices held down.

'Excess supply of offshore marine equipment and shipping capacity still overshadows the recovery in activity'

to growth in upstream oil industry activity. After the two major upward steps in 1973 and 1979/80 and the crash of 1986, the price on January 9 was barely ahead of the 1972 value in real terms (discounting inflation).

The prospects for the next 10 years are for continuing shift back to dependency on the Middle East as the primary source of supply.

Price movements

Any price rise from now onwards will not be caused by any global shortage of oil. Statoil's 1980 vision of Norwegian crude oil at \$50 a barrel (1980 money) to reflect its stature as the strategic oil reserve of the west in a world of painfully depleted finite resources was until August last year no longer a credible posture: even less so when translated to gas price.

It was always the case that any rise in price in the 1990s would be due to the very large world reserves shifting further from the major consuming countries to the Middle East and other key producing areas. Since there remains a wide gap between production cost and current price for the bulk of these reserves, there remains potential for oil prices to fall back again below the rate of inflation and in real terms to the values of 1973/4 and before.

But since offshore oil reserves are much more expensive than the largely onshore reserves of the Middle East, small falls in current money values will be enough to hit offshore activity hard.

The key to offshore oil and gas

crude hovered dangerously around the \$15 threshold. In August and September the price was easily doubled, but by early January it was back to the levels of the previous July.

In 1988 and 1989 the brakes came off oil company spending again as oil prices recovered, albeit hesitantly. As the budgets were readied for 1990, the Brent crude marker started to move significantly ahead of the balance point. The prospect of a steady \$20 or better enabled planners in the exploration and production departments to pencil in a 20 percent hike in North Sea rig activity for 1990.

From the June 1990 baseline, a steady improvement in crude prices at a 10 percent per annum rate from 1972

Rig demand

Figure 1 shows the close correlation between crude oil values and demands for mobile rigs. The relationship holds true for most areas of the world for most of the last 20 years.

Exponential growth in the price of oil has not, however, and will not always have the same effect. High prices provide oil companies with ongoing production with more cash to spend and thus tend to encourage more

'It was already apparent that the Arabian peninsula would develop a stranglehold on the United States'

onwards would put 1990 prices at just better than \$22. In practice a survey of over 200 US and international oil companies at the start of that year produced a consensus estimate of just over \$18 for 1990.

If the 10 percent per annum average progression from 1972 were to hold good over the next five years, the 1995 value would be just under \$36 dollars a barrel. That's more than enough to keep offshore markets accelerating

exploration and production expenditure. But if prices rise high enough to discourage consumption then it is clear that sales of their products will fall. This leads to over-production and falling prices as witnessed by the surge and collapse of prices in the period from 1980 to 1986.

Low prices, on the other hand, encourage consumption but discourage upstream investment in exploration and production. This in

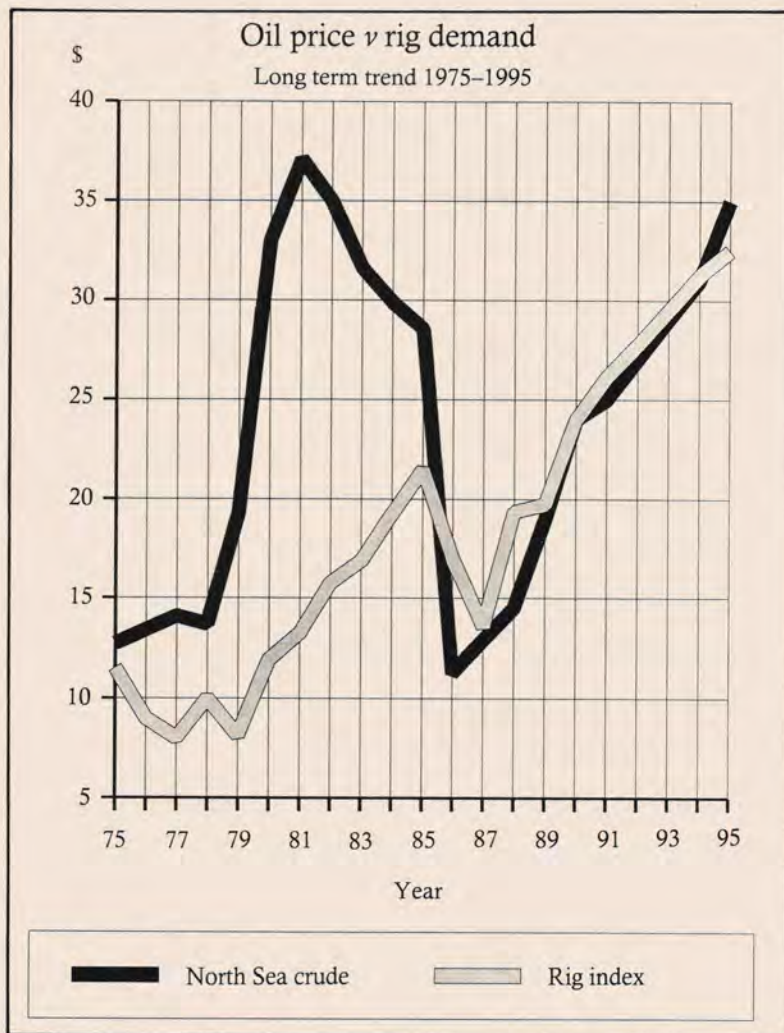


Figure 1

Source: Petrodata research

turn leads to pressures on supply and prices rise again. The cycle starts again with the balance of economic power shifting back to products and producing nations. How far and for how long they exploit that advantage is largely a matter of politics rather than economics.

The impact of crude oil price changes is not uniform. Rig activity will change direction within weeks of a significant change in oil price. In today's price climate, 'significant' means as little as \$2-3 or a change of as little as 10 percent. The weakness of the offshore service sector in recent years has meant that contracts are often short and even if they are long, they have cancellation clauses. The result is that any change in the oil companies' perception of future income from the sale of oil and gas can translate very fast into budgetary corrections.

Those changes do and will continue to vary widely from one national market to another. The United Kingdom is perhaps the most sensitive as well as one of the largest markets for mobile rigs outside the United States. UK production has been moving downhill recently, threatening the weak balance of payments and lifting the importance of new oil production from reserves which are largely offshore. The result is that by the end of last year, rig demand in the oil provinces of the UK North Sea had risen by almost 40 percent over 1989 and is set for a further 30 percent in 1991. ■



ENVIRONMENT DISCUSSION GROUP

The next meeting of the Environment Discussion Group will be held at the Institute of Petroleum on **Tuesday, 26 February 1991** starting at 5.30 pm. (Tea and biscuits will be available from 5.00 pm).

THE ROLE OF THE NATIONAL RIVERS AUTHORITY — IMPACT ON THE OIL INDUSTRY

Speaker: **Mr Peter Chave**, Water Quality Manager, NRA.

If you would like to attend this meeting please contact **Mr A E Lodge**, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: (071) 636 1004 ext 236.

The tanker market after August: a difficult autumn

In the middle of January Odd Anker Hassel talked to Petroleum Review about the effects of the Gulf crisis on world tanker markets.

He is Director of Tanker Markets and Strategies and Coordinator for Scandinavia, Cambridge Energy Research Associates. Mr Hassel has been senior economist for INTERTANKO, the International Tanker Owners Association in Oslo and was an adviser to the International Energy Agency (IEA) in Paris.

Mark Scruton: In what way has the present Gulf crisis affected the world tanker markets?

Odd Hassel: The Iraqi invasion of Kuwait on 2 August 1990 had major implications for the world and oil tanker markets. The loss of oil exports from Kuwait and Iraq, a total of about 4.0 million barrels per day and representing close to 15 percent of world seaborne oil trade, resulted in an immediate and significant decline in tanker demand.

The situation became the most severe for the larger tankers (crude, products and LPG carriers) normally trading in the Middle East. Without any immediate increase in exports from other producers to replace the lost oil from Kuwait and Iraq, this led to strong supply pressure and rate declines for larger tankers but especially for the VLCCs (Very Large Crude Carriers).

For the large product carriers, the loss of some 0.4mbd of clean product exports and some 0.2mbd of dirty product exports from Kuwait represented a significant drop in activity. As for the large product carriers, the large LPG carriers faced a difficult situation with the loss of some 0.075mbd of LPG exports from Kuwait.

Rates improved temporarily in the Caribbean and the Singapore area due to a spot shortage of vessels. The vessels in question were mainly the Aframax tankers (about 80,000dwt), the tanker size that has been largely used in the Caribbean and Far East markets. A popular size also for the North Sea and Mediterranean markets, these tankers were hit less by the overall demand decline than the larger tankers.

When Venezuela, Saudi Arabia and other oil producers increased oil exports to compensate for the shortfall, demand for tankers moved closer to, but did not reach, the demand forecast for the third quarter prior to the invasion. There was, however, some change in the size of vessels in demand. The shortfall mainly affected the VLCCs (200,000dwt and above), whereas replacement of crude exports from Venezuela required smaller tankers (eg tankers of 80,000dwt).

Increased oil exports from Venezuela and the corresponding demand for mid-size tankers has led to relatively firm markets for the 80,000dwt tankers in particular. As long as exports of oil from Kuwait and Iraq are blocked markets for the 80,000dwt tankers are expected to show relative strength. The closing of the pipeline to Ceyhan, Turkey, stopped much of the trade for the 140,000dwt tankers. Increased liftings from West Africa and the North Sea have, to some extent, replaced the loss of activity out of the eastern Mediterranean.

The market for smaller product tankers also faced a period of increased demand due to their flexibility and the increased product trading following shortfall and product imbalances.

Product tanker demand increased significantly during September and October following the severe imbalance in the product markets, with Japanese buyers being the most active. With the increased availability of refined products in the Far East, freight rates for product carriers are expected to soften, although this still leaves owners with comfortable operating profits.

Moving into the fourth quarter, with a maximum increase in exports from Saudi Arabia and others, tanker demand moved towards — or even bypassed — the outlook for the fourth quarter, as seen before the invasion. This was because some of the crude oil previously exported by Iraq through Turkey was replaced by longer-haul exports from the Gulf.

The fears of war in the Middle East led to an increased number of VLCCs fixed for mid-November with long-term storage options. Saudi Arabia and Iran apparently feared that the outbreak of hostilities might threaten the production and transportation of crude oil. Therefore, the VLCCs could function as a potential supply buffer. The increased use of tankers for storage removed some surplus transportation capacity from the market. This, together with a general demand increase in November and December, led to improvements in large tanker freight rates during November and December.

The large number of VLCCs being employed as floating oil storage created a supply buffer in case of a further escalation in the Middle East crisis. CERA estimates indicate an increase in floating storage of 60 million barrels during this period.

Currently, about 10 percent of the total VLCC-fleet is reportedly being used as floating storage. In addition to this, several fixtures reported have had up to 180 days of storage options. These vessels, now out of the Middle East, represent a potentially large addition to the volumes reported as floating storage.

Reduced availability of tonnage in the Middle East, combined with the

increased liftings, led to temporary strong upward pressure on tanker rates for the VLCCs. Since early November, rates increased more than 50 percent. A slow return of vessels to the Middle East, to a large extent linked to the extensive use of tankers as storage, kept the market firm towards mid-January. Operating results are, however, still at a relatively low level compared to pre-invasion levels, due to the higher bunker costs. Also, one trip at a relatively high rate does not significantly alter the overall depressed results for VLCC owners operating in the spot market last autumn.

were purchased at prices far above scrap level, thus reducing scrapping of old tonnage to a minimum. Secondly, orders for new tanker tonnage experienced a strong growth during 1988 and 1989. The combined effects of these developments was a growth in transportation capacity that more than outpaced the demand growth when entering 1990, even without the effects of the Iraqi invasion of Kuwait. As a result, some short-term market uncertainty had been generated during the late spring and summer of 1990, thus giving the tanker market a stronger negative psychological im-

ments. Increased uneasiness among banks indicates some forced sales during the first half of this year.

Financial factors, coupled with the increasing cost of keeping up the technical standard of older vessels, constitute a continued downward pressure on ship values. The pressure on value will be particularly strong on the large and old ships.

The short-term outlook for oil demand is weak as a result of higher oil prices, economic slowdown and the reintroduction of security of supply in government policies. The amount of oil in storage, on land and floating, adds to the downward oil price pressure that can be expected for the late spring period, unless the developments in the Gulf continue to give uncertainties about supply interference. The implications for the crude oil tanker markets during the lower spring demand period is to a certain extent linked to the use of tankers as floating storage. However, even with a continuation of the current high levels of floating oil storage, the market for large crude carriers is set to decline during the spring.

If, however, Israel is brought into the conflict, there is a real possibility that the Suez Canal could be closed. Such an event would result in longer hauls, with a significant increase in transit time and a sharp increase in tanker demand. This would generate a shortage of tanker transportation capacity that could last for some time after a re-opening of the Suez Canal.

The short-term outlook for product tankers, especially the smaller- and medium-sized tankers, is fundamentally stronger than for crude tankers.

'The VLCCs could function as a potential supply buffer'

The critical factor is the use of the floating storage, and the critical time is 15 January. The amount of oil in tankers can put significant supply pressure on the oil market, and the return of vessels can generate a similarly strong supply pressure of VLCCs in the Middle East. Combining this with a potential slowdown in the demand for oil-carrying tonnage as we move toward the end of the winter season gives an outlook for a considerably weaker market for VLCCs during the first half of this year.

What do you think has been the short-term effects of the Gulf crisis?

The most significant effect for the tanker markets of the Gulf crisis is linked to the uncertainty about future market developments combined with the sharp drop in operating results, especially for larger tankers.

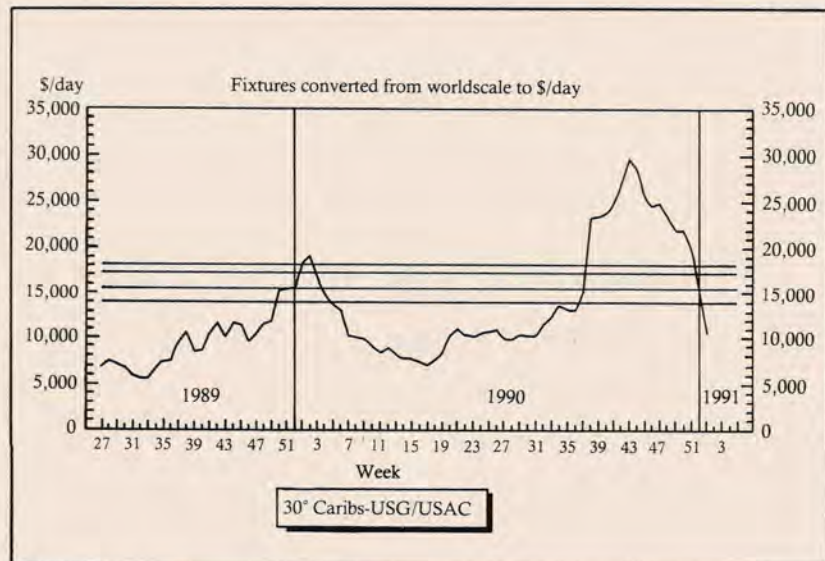
To understand the psychological impact of the Gulf crisis on the tanker markets, it is necessary to recapitulate on some of the developments in the tanker markets since mid 1980s. Following the oil price collapse of 1986 and the oil demand growth during the second half of the 1980s, a strong optimism was gradually generated within the tanker industry. This gave a strong buying interest for tankers, with secondhand values more than quadrupling for older tankers from 1986 to 1989. The optimistic outlook was supported by a gradual, but slow, improvement in average tanker freight rates combined with relatively strong demand pressure in peak winter demand periods.

The optimistic market outlook had, however, a couple of other major implications. Firstly, older vessels

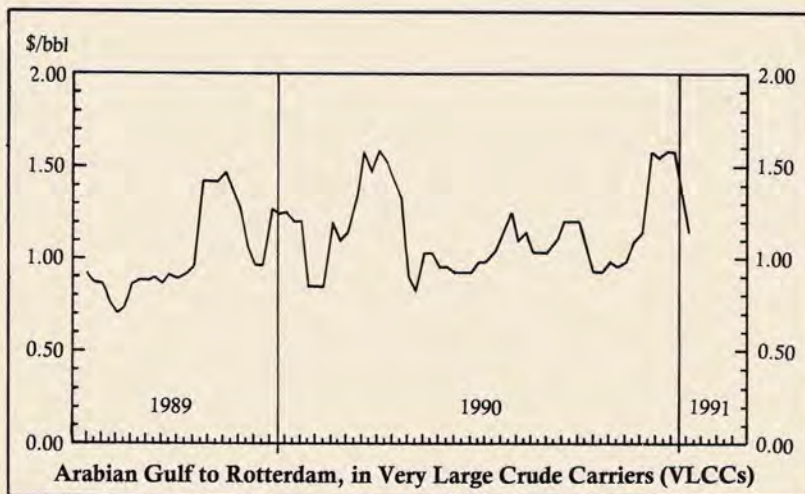
were purchased at prices far above scrap level, thus reducing scrapping of old tonnage to a minimum. Secondly, orders for new tanker tonnage experienced a strong growth during 1988 and 1989. The combined effects of these developments was a growth in transportation capacity that more than outpaced the demand growth when entering 1990, even without the effects of the Iraqi invasion of Kuwait. As a result, some short-term market uncertainty had been generated during the late spring and summer of 1990, thus giving the tanker market a stronger negative psychological im-

part of the August invasion. For the current quarter, only unusually cold weather or continued stockbuilding due to supply interruptions can counteract a demand decline and decrease in spot rates for the VLCCs. Unless some scrapping occurs, transportation capacity over the next six months will increase by some 3.5 million deadweight tons (dwt), corresponding to 500,000 barrels per day of extra Middle East crude exports.

War fears and uncertainty about future developments have left the market with few buyers for large and old tankers. High fuel costs have led to eroded operating profits — at present freight levels, operating income does not fully cover interest and instal-



Product tankers



Tanker transportation costs

As long as the Kuwaiti refineries are out of operation, the imbalances in the product markets gives generally longer hauls in smaller vessels.

What do you think will be the consequences for the tanker markets in the longer term?

There are three key issues where the Gulf crisis will cause longer-term consequences for the tanker markets.

1. Tanker demand developments

In addition to the near-term effect with lower oil demand, the uncertainties generated about the security of supply of oil from the Middle East will have longer-term implications for the tanker demand growth. A renewed focus on alternative fuels will keep oil's

share in the total energy economy lower than was expected prior to last August. At the same time, a strong interest in securing oil supply from sources outside the Middle East will tend to bring about more oil production in areas closer to consuming countries. The combined effects of these developments will tend to give slower growth in the volumes of oil transported and a more moderate increase in the average length of hauls compared with previous expectations.

2. Tanker scrapping

The reductions in tanker demand as seen for 1991, combined with uncertainty, have already led to a significant decline in secondhand tanker values. Combining this development with the

growing realisation of the cost implications of keeping older tankers in operation, coupled with the more stringent environmental legislation and sharper focus on overall tanker quality from charterers, would tend to bring second-hand values for older tankers down to scrapping levels. Limited interest in buying older tankers for trading and the banks' growing reluctance to finance such investments could result in an increasing number of tankers being scrapped. This would have a positive impact on the tanker market outlook.

3. Tanker newbuilding

The ordering of new tanker tonnage almost came to a halt following the Iraqi invasion and the market outlook, as discussed, will tend to give a very careful attitude for ordering new tonnage until any scrapping developments take place. This would not have any effects on the overall tanker supply developments during the next couple of years but would ease the previous fears of a newbuilding capacity limitation in the early 1990s.

There is, however, a very large tanker replacement requirement due to the age and technical conditions of the world tanker fleet. This could, given a slowdown in orders for new tankers in 1991, come to surface towards the mid 1990s and result in a more severe limitation on tanker newbuilding capacity. Thus, charterers looking for quality tonnage could face a situation with limited availability of acceptable oil transportation capacity. ■

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Minimising potential risk exposures in petroleum shipping operations

By M J Hind, Safety and Audit Manager, BP Shipping

The marine transportation of petroleum cargoes has always been recognised as a hazardous business, being vulnerable to the many risk exposures associated with operating in a naturally hostile environment, as well as the handling of volatile substances.

Health, safety and environmental issues constitute an integral part of the marine operations management process, with nearly every decision carrying an element of risk. Yet in spite of this inherent level of safety awareness, many of the improvements in operational standards are actually achieved reactively — as the result of some event or incident. The magnitude, nature and impact of the incident will usually determine the degree of management response action.

How often do we see quite fundamental errors in equipment design, operational procedure or personnel action (or inaction) being highlighted as the root cause of major disasters? In such cases we wonder how such elemental mistakes could ever be made! In reality, major disasters are never caused, or influenced, by one single factor; they occur when a number of seemingly insignificant errors co-incidently combine together.

Ironically, those incidents which have a major public impact are not always the most significant in terms of ineffective safety management. An example of this phenomenon is the case of the *Exxon Valdez* pollution which received wide publicity, against the earlier total loss of a similar tanker at sea, which was barely publicised by comparison, in which some 29 seafarers lost their lives and 10 times the volume of oil was lost.

Safe management

In any commercial operation, effective management is safe management. However, there is a natural conflict between good business management, which is geared to getting things done, and good safety management which, by and large, prevents things happening! Safety management primarily concerns the control of accidental loss. In a high risk business like the marine transportation of petroleum products, we have to accept that some losses will occur; our effort must therefore be directed at minimising these losses.

Traditionally, safety management effort has been applied retro-actively, where corrective measures are applied after the event. In high-risk businesses, we need to place greater emphasis on pro-active initiatives, in the same way



M J Hind

as commercial management hedges against prevailing market forces. In effect, the established Management Loop should be applied equally to health, safety and environmental (HSE) issues, as they constitute an integral part of the management process.

Pro-active loss control

Pro-active Loss Control concerns minimising the potential risk exposure and consists of four basic elements.

1. Understanding the business

A thorough working knowledge of all aspects of the business is essential in identifying the nature and magnitude of the potential risks associated with the day-to-day management decisions. An awareness of the inherent commercial pressures and the likely influences

of prevailing market forces within the industry is also advantageous if we are to anticipate possible changes in operating strategy and therefore risk exposure.

2. Evaluating the potential risk

In calculating the level of risk which the business is likely to be subjected to, we assess the severity of each potential hazard and its probability of occurrence. From such evaluation we are able to prioritise the elements of risk exposure, justify the cost of the necessary preventive measures and estimate the likely effectiveness of such controls.

In real terms, we are attempting to manage the risk.

The yardstick we use for the management of risk in the industry is known as the four 'T' method:

Terminate — Eliminate the risk. (Discontinue or modify certain aspects of the business!)

Treat — Implement protective

measures. (Minimise exposure).

Tolerate — Accept level of risk. (Minimise effect of occurrence).

Transfer — Insure against risk.

In marine circles, we generally employ a combination of all the above measures in managing the business, although the majority of effort is logically focused on the 'Treat' mode.

In extreme cases, the 'Terminate' mode is often applicable, as illustrated by the recent withdrawal of some major tanker operators from US trading because of the heavy liability clauses now being imposed by local legislation.

3. Implementing protective measures

The nature and application of the protective measures, necessary in managing the operational (and commercial) risks associated with our business, will depend on the evaluation carried out in 2 above, together with the degree

of loss control that we aim to achieve. As well as establishing an acceptable HSE performance, we are contributing to the commercial effectiveness of the business and therefore gaining a vital competitive advantage.

There are three elements of any business which need to be considered as potential sources of loss — the plant, the people and the environment (Figure 1).

In protecting the integrity and quality of the business, we must define and meet specific operational standards (some of which may be imposed upon us by statute), accepting that each element of the business constitutes both a potential cause of loss, as well as a victim of it.

In the risk 'Treatment' mode, we are dealing with the fundamental elements of the business — plant and machinery design, the required skills and training of plant operators, maintenance staff and managers, and the kind of atmosphere and working environment we want to create.

In effect, in re-assessing the 'protective' requirements of an established business, we need to go back to square one and start with a clean sheet!

Some aspects of the business require a different approach and we are forced to utilise the Tolerate mode. In such instances, we can responsibly prepare ourselves pro-actively to limit the effects of loss by establishing the necessary response procedures to deal with emergency situations.

4. Compliance auditing

Because any business activity is subject to change, and the marine industry is no exception, management must continually review its strategic objectives and adjust its priorities. Inevitably, the nature and degree of potential risk exposure will be influenced by such changes and we need to amend the operating standards and procedures accordingly.

The most effective method of achieving such pro-active re-assessment on a continual basis is through the establishment of a permanent and separate compliance auditing function. This activity has to be performed by an individual with wide knowledge and experience of the business, yet who plays no direct part in it, and is thus not subjected to the normal commercial (and political) pressures suffered by business managers.

His objectives are two-fold: firstly, to assess that the established procedures are adequate in minimising potential risk exposures and secondly, to confirm that such procedures are being strictly adhered to.

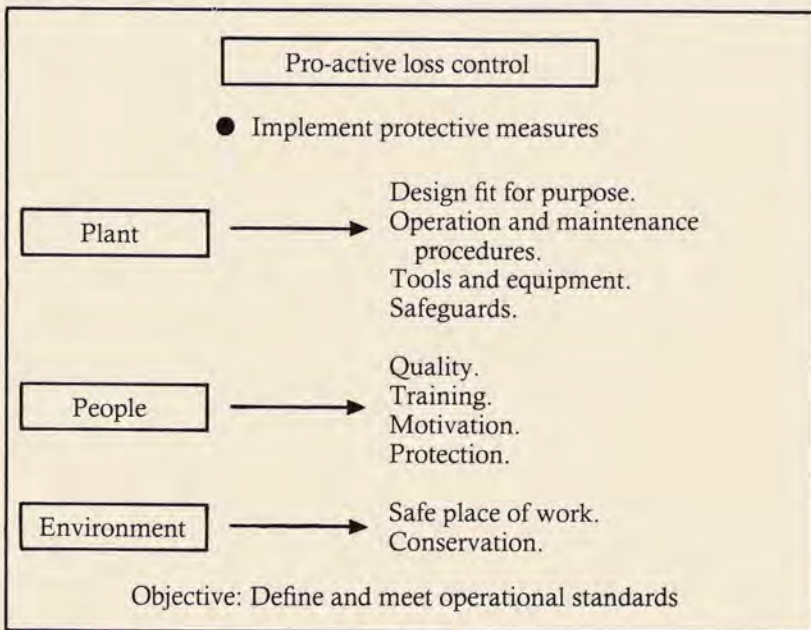


Figure 1

A compliance audit should establish that:

- Management responsibilities are clearly defined and documented.
- Statutory requirements are satisfactorily met in all respects.
- Company policy is clearly defined, understood and complied with.
- Adequate procedures exist to identify potential risk exposures.
- Operational staff are suitably qualified for task execution.
- Information management meets necessary standards.
- Lateral and vertical communication is adequate.
- An appropriate attitude to HSE related issues exists.
- Re-active measures are responsibly dealt with.
- Necessary emergency procedures are in place.

Purpose: Identify, quantify, rectify any shortcomings — pro-actively

Figure 2

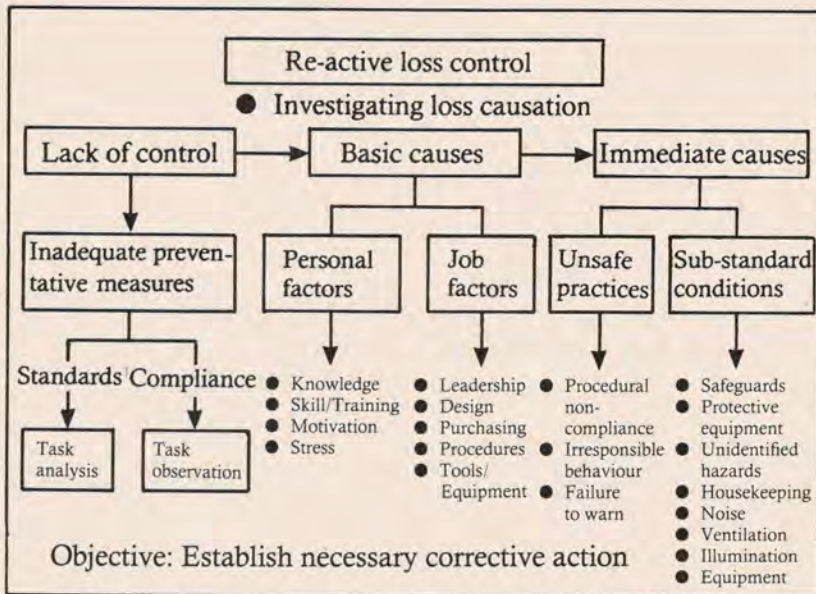


Figure 3

The scope of a compliance audit function should cover elements of the business as outlined in Figure 2 and, properly conducted, represents a powerful and effective management tool, aimed at indentifying the existence of potential risk exposures, which could subsequently lead to serious personal injury and/or substantial commercial losses.

Having said that the compliance audit function must be performed outside the financial constraints of the business, there must, of course, be a sensible balance between the likely cost of risk protection and the continued commercial viability of the business. The auditor simply provides information (furnished through an independent and external pair of eyes) upon which those responsible for commercial management may pass subjective judgement.

Practical application

As well as applying such pro-active auditing principles to its owned fleet of tankers, gas carriers and offshore shore vessels, utilising a dedicated auditor with a technical management background, BP Shipping is also charged with similar responsibility regarding other marine related Group activity.

Like most major oil companies, the majority of the BP Group's cargoes are carried in chartered tonnage, operated by 'independent' owners. This constitutes a potential risk exposure to the Group, which must be minimised by ensuring that such vessels are managed and operated to internationally accepted standards and in compliance with BP's own stringent HSE policy.

Such protection is provided by BP

Shipping's Ship Vetting Service, whose role is to ensure that every vessel chartered by the Group meets the above requirements. This is achieved through the maintenance of a comprehensive data-base, which contains a variety of information such as ship details, performance history and accident records, which is readily available in the public domain.

To augment this core information, confidential intelligence gained by the BP Group, including feedback on vessel performance from BP operated marine terminals, is added to the data-base, coupled with details of physical ship inspection reports carried out by qualified BP Shipping Inspectors.

However, the key factor in determining the overall quality and acceptability of an 'independent's' operation concerns a detailed Owner Assessment exercise, in which regular visits are made by BP Shipping representatives to the owner's office, for open examination of, and discussion with senior personnel on, the management philosophy, style and control procedures.

To illustrate the magnitude of this activity, approximately 8,800 vessel details are retained on the Vetting Data-base, about 6,300 vettings are conducted per annum, an average of 450 vessels are physically examined by BP Shipping Inspectors and up to 20 Owner Assessments are carried out every year.

In the transportation of petroleum goods, the ship/shore interface during loading and discharge operations is as important in risk exposure terms as the sea passage itself. As the BP Group operates a large number of marine terminals world-wide, regular audits of terminal procedures and operational controls are conducted under the same pro-active loss control principles.

Re-active loss control

Just as in business management, the effectiveness of our pro-active safety initiatives can be measured in actual performance. By thoroughly examining the circumstances and effects of even minor incidents, we can learn valuable lessons. Armed with this knowledge, we can amend or fine-tune the established procedures and operating standards to improve further both the HSE and commercial performance of the business.

By investigating and analysing the causes and magnitude of actual loss, we can assess what corrective action is both necessary and desirable in all three elements of the business, namely plant, people and environment (Figure 3).

In summary, effective minimisation of potential HSE risk exposures in the petroleum shipping business must primarily be achieved through pro-active effort, supported by re-active response to actual shortcomings in HSE performance. ■

This paper was first presented to the London Branch of the IP in October.



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Meeting the deadline

By Mark Scruton

North Sea oil production could be cut by a third this spring as operators who have not yet fitted their emergency shutdown valves carry out the work to meet the UK government's new deadlines. Two of the principal UKCS oil pipeline systems — accounting for around 900,000 barrels per day (b/d) — are likely to be shut down for at least two weeks, making a healthy dent in the Treasury's annual £3 billion revenue bill. Analysts County Nat West Wood Mac estimate 55 million barrels output will be lost in 1991 at a cost of about £700 million, but the Department of Energy (DEn) is determined to put 'safety first'. For some operators this is a blessing in disguise because they are taking advantage of the enforced shutdowns to carry out important maintenance and infrastructure work on their own fields.

It was because of criticism of North Sea operations in the recent Cullen report on the Piper Alpha disaster, that the Department of Energy (DEn) warned companies that safety must come ahead of production.

In summer 1989 the DEn ordered all operators to install, modify or relocate their emergency shutdown valves (ESD) — designed to halt oil and gas flow automatically in the event of a Piper-style explosion by 31 December 1990.

Although many offshore installations already had such ESD valves, the new regulations required them to be located topside as close to the water level as was reasonably practicable. The DEn estimated that of the 430 pipeline risers subject to the regulations, only 181 risers required new or relocated ESD valves.

By the December deadline set by the DEn, the oil companies had made good progress. More than three-quarters of the work — 134 valves — had been completed.

Even more would have been fitted if the programmes, particularly those of Shell, BP and Mobil, had not been affected by five 24-hour strikes by contract workers last summer, so delaying the work.

Because of delays due to the unofficial strikes and because of bad weather, some operators asked for temporary extensions to the deadline.

Colin Moynihan, Energy Minister, said: 'A number of applications for temporary exemptions have been received by my department's inspectors. In considering these applications, my inspectors have taken into account that, in all cases, emergency valves do exist but are not optimally located.'

'I have therefore decided that a

number of new compulsory measures must be implemented by operators to enhance safety until the new valves are installed, in those cases where production is permitted to continue. These include reducing the pipeline operating pressures, switching from live crude oil to dead crude oil and introducing enhanced operating procedures.'

Applications

Altogether the DEn received 53 applications for extensions to the December deadline. The DEn agreed to 25, withdrew 24 after discussions with its inspectors and refused four.

The four valves refused an exemption belonged to just two companies — three ESD valves on Texaco's Tartan field and one on Mobil's Beryl Alpha platform.

On the Beryl Alpha platform, Mobil had been required to relocate five 6-inch ESD valves. By the December deadline four had been put in position and a fifth, on subsea well 20, would have been fitted if it had not been for the unofficial strikes. As it is, following the shutdown of well 20, Beryl Alpha's average production rate of 44,000 barrels a day will only be reduced by about 10 percent until the work is carried out in the summer. At that time Mobil also plans to enhance platform safety above and beyond the DEn requirements by isolating the live crude lines away from the Beryl Alpha platform, switching them to a purpose-built, unmanned riser tower.

In Texaco's case, it was the location of the Tartan platform topsides for the risers from the Highlander and Petronella subsea fields which caused the DEn some concern. Texaco promptly carried out the required

work. The Petronella field, which produces approximately 8,000 b/d, was shut down for only a week, while Highlander, 15,000 b/d, came back on stream two weeks later. Luckily for Texaco, production from its Tartan field was not affected.

A Texaco spokesman said: 'The problem lay in the interpretation of the regulations to the particular nature of these risers, which are already fitted with subsea shutdown valves.'

Pipeline systems

Of those companies which did receive deadline extensions, Shell UK Expro, the joint venture between Shell and Esso in the North Sea, was worst hit. It was given until 31 March to reposition 14 valves on the Brent System. The system, linking 13 other fields situated off the east of Shetland, represents about a quarter of Britain's oil output.

A spokesman for Shell said it was trying to complete its £140 million ESD valve programme as quickly as is safely possible, bearing in mind the effects of the inevitable periods of bad weather during the winter.

But so far no date has been set for the shutdown — involving the whole of Shell's Brent System oil pipeline with a 1990 average throughput of 371,000 b/d — to enable the ESD valve installation to take place. Some of this work has most probably been completed. The Brent field itself produced only 22,971 b/d in December, against projected 1991 output of 275,000 b/d. A spokesman said: 'But we do accept that we will have to shut down those platforms that have not been fitted with the ESD valves by the March deadline.'

BP has even finer deadlines though fewer valves to fit. It has to position two valves, one by 20 January and the other by 26 February on its Forties field, 130 miles east of Aberdeen. This ordinarily would have just meant the shutdown of around 200,000 b/d, but BP are taking advantage of the programme to combine the work with a two week long tie-in of a new 36-inch pipeline from Forties Charlie to Cruden Bay, on the mainland of Scotland. This work, due to have started on 21 January, will also involve the shutdown of the total throughput of the pipeline from the nine fields involved in the system, amounting to 400,000 b/d.

BP also has to fit an ESD valve on its

Thistle field by 31 March but this work on its 30,000 b/d field is dependent on Shell Expro's timetable. A BP spokesman said: 'It depends what happens in the Brent oil pipeline system.'

Conoco is similarly placed, with a 31 March deadline for a valve on its Murchison field. The field's 33,500 b/d output is also part of the Brent pipeline system and work cannot start until Shell announce their programme.

Sun Oil has until 20 January to fit the seven ESD valves required by the DEN on its Balmoral field. Sun started to fit the valves on 14 January and the 32,000 b/d field is expected to be shut down for three weeks. In addition Sun Oil is also taking advantage of the shutdown to carry out maintenance

work on its nearby Glamis field which has an output of 10-11,000 b/d.

Affected output

According to County NatWest Wood-Mac, the current UK oil output is estimated at 1.75 million b/d. To date about a third, some 500,000 b/d, has been affected intermittently since the beginning of the year by shutdowns, ordered by the government or necessitated by valve installation programmes. Hopefully, by the time work begins on Shell's Brent system, with the loss of its 400,000 b/d throughput, the other fields will be back on stream. ■



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Steady growth in Syrian exploration and production

By Naji Abi-Aad

Once a net importer of crude and petroleum products, Syria became in 1989 an exporter of oil, both of its traditional Suwaidiyah heavy (24° API) crude and of a new 'Syrian Light' (37° API) blend supplied from various fields in the eastern Deir ez-Zor area.

The Syrian cash-starved government, for which increasing oil production and export has been considered as the road for economic salvation, is currently exporting some 55 percent of its produced oil, whether in the form of crude or refined products. These exports generate more than half of the country's total foreign exchange earnings and help to improve the balance of trade.

Lately, Habib Mtaniou, the Syrian Oil Minister called on international companies to participate in oil exploration activities that are under way. He added that Syria is prepared to establish 'new links of friendship' with every country that offers to cooperate in oil exploration.

There is considerable potential in the field of hydrocarbon exploration, he maintained, given that only 15 percent of Syrian territory has been explored so far and that oil and gas reserves are ample.

Oil reserves

Since January 1988, Syria's official estimate of its proven oil reserves has remained constant at 1.73 billion barrels, slightly down from 1.75 billions at the beginning of 1987. Since output averages 400,000 barrels daily, the reserve-to-production ratio is estimated at around 12 years. The bulk of these oil reserves lie in eight major fields. The biggest structure is Suwaidiyah which has over 600 million barrels of proven reserves and currently produces some 100,000 b/d of heavy (24° API) crude. It covers an

area of 72 sq km and its oil layer is some 260 metres thick. Rumailan, an extension of Suwaidiyah, has some 100 million barrels, while the smaller al-Hayane field to the north of Rumailan has recoverable reserves estimated at 30 million barrels. The Karatchok/Hamza structure contains some 150 million barrels, whereas the recoverable reserves of the recently discovered al-Thayyem field are estimated at 200 million barrels of light crude. The other light crude producing fields, Jubaisseh and Omar, have reserves of around 400 and 250 million barrels respectively.

Current exploration

Encouraged by attractive search terms and the discovery of light crude in the Shell/Pecten/Deminex 4,000 sq km acreage at Deir ez-Zor, which is proving to be highly prolific, a stream of foreign oil companies have applied for and obtained exploration licences since 1985 — and particularly since the Omar find was announced in March 1988.

In fact, apart from the activity of the Syrian Petroleum Company (SPC), 12 foreign companies and consortia had been awarded exploration licences in Syria between January 1987 and December 1990 for a total acreage of around 72,500 sq km. Today, besides the Shell, Pecten and Deminex grouping that makes up Al-Furat Petroleum Company (AFPC) and the Elf Aquitaine and SPC grouping (the Deir ez-Zor Oil Company — DZOC), exploration in Syria is being conducted

by Enron Oil and Gas, BP Development, Marathon Oil, Unocal, Agip, and consortia including Occidental/Hydroil/Wilhelmsen, Repsol/Cepsa/Petrogal, Neste Oy/Pentagon, Phoenix, Total CFP/Lasmo/Petrofina/Inpex of Japan, and Arco/Norsk Hydro. Farm-in and farm-out are regular features in the current exploration activity so groupings have a habit of changing. The foreign groups and companies are operating under Egyptian-style production-sharing agreements, in which contractors receive around 25 percent profit after cost recovery.

Apart from the fields located by Shell/Pecten/Deminex group and Marathon Oil (both converted into development/production licences), only Total CFP and Elf Aquitaine have made interesting oil or natural gas discoveries.

The government recently announced its intention to open more acreage to foreign exploration and development with the emphasis on exploiting the country's gas reserves. It pointed out that the new exploratory focus will be in the southern regions, where interest has been stirred by an oil strike across the border in Jordan.

Drilling activities

Drilling activities have been recently stepped up, reflecting an intensification of exploration operations and a decision to develop some promising fields discovered in the late 1980s (Figure 1).

The working months recorded by

	1984	1985	1986	1987	1988	1989
Seismic surveying (team/months)	32	54	43	39	60	84
Drilling rigs in use (yearly average)	23	26	20	25	31	29
Wells drilled	130	139	147	120	135	118
Footage drilled ('000 metres)	226.6	243.4	210.0	224.0	210.0	240.0

Source: OAPEC, Annual Reports

Figure 1: Exploration and development activities, 1984–1989

seismic teams jumped from 43 in 1986 to 60 in 1988 and 84 in 1989. The same upward trend was registered in footage drilled, from 210,000 in 1986 to 240,000 in 1989, and in number of wells completed, from 108 to 118 during the same period. Nevertheless, the number of rigs in operation which rose from 20 in 1986 to 31 in 1988, slightly declined to 29 in 1989.

Oil production

Until 1987 when the AFPC brought the light (38° API) low-sulphur al-Thayyem field on stream, followed by other light-crude (36°–38° API) structures found nearby, Syria had produced high-sulphur crude oil only in the 19°–25° API range, from fields operated by the SPC in the Suwaidiyah area in the northeast. The ageing of these heavy crude structures which have been in production for nearly 20 years (eg Suwaidiyah and Karatchok) has forced the authorities to resort increasingly to pumping and injection for maintaining reasonable flow rates. This has rendered extraction more difficult and costly, and heavy crude production less than expected.

In fact, the output of the heavy high-sulphur oil, which peaked in the mid 1980s at about 200,000 b/d, has since been declining to the current 150,000 b/d.

Meanwhile, the authorities have been pushing hard for light crude output to be maximised, initially to save on the cost of oil imports (mainly from Iran) to meet the required refinery product slate and latterly to increase its export revenues. As a result, oil production, averaging 194,000 b/d in 1986, has risen steadily to 232,000 b/d in 1987, 270,000 b/d in 1988 and 301,000 b/d in 1989 (Figure 2).

In October 1990, Syria's crude oil output reached 410,000 b/d, up from 370,000 b/d attained at the beginning of the year. This put the average production in 1990 above 380,000 b/d, of which around 230,000 b/d is light crude.

Oil output is scheduled to increase to some 450,000 b/d by mid-1991 and around 500,000 b/d in 1993. These objectives seem to be achievable after the installation of a water injection

system at the Omar field which has had some technical problems affecting its output rate, the linking of sections of the Iraq-Mediterranean pipeline, closed since 1982, to Syrian export networks connecting the small fields which are close together, and with the start-up of new fields being developed both by the DZOC and the AFPC.

The DZOC will bring its first field, North Attala, on stream by early 1991 with a pipeline linking the field to the AFPC export system nearby. Its discovery well, North Attala 101, yielded a cumulative flow on tests of about 8,000 b/d of light (36° API) crude. The DZOC second discovery, al-Mazraa, has also commercial light crude potential and could be brought on production as soon as the facilities being installed there are completed.

The AFPC currently develops and operates 17 fields on its two acreages, the most important of which are al-Thayyem (current output 80,000 b/d), Sijan (28,500 b/d), Omar (27,000 b/d), al-Ward (26,000 b/d), Tanak (20,000 b/d), al-Isba (16,000 b/d) and al-Thayyem East (11,000 b/d). The output of each of the others (al-Ishara, Shahel, Shdeha, Rakka, al-Ahmar, Zarit, Ash-Shola, al-Kharrata and Jido) ranges from 1,000 to 7,000 b/d.

Oil exports

Syrian crude exports have increased together with the growth in oil production, from some 70,000 b/d in 1986 to about 120,000 b/d in 1989, and around 180,000 b/d in 1990 when they consisted of some 90,000 b/d of the heavy

Suwaidiyah oil and another 90,000 b/d of new 'Syrian Light' crude.

Oil exports are expected to reach about 230,000 b/d by mid-1991 and around 310,000 b/d in 1993. This moderate rate of increase in exports compared with output is due to the 10 percent annual growth in domestic oil demand. The government hopes that the growing utilisation of natural gas in different sectors and especially for power generation will help to curb the increase in oil consumption and therefore raise the export potential.

Traditionally, the main markets for Syrian crude are Western Europe, Libya and Algeria (for blending with their light oil) and Eastern Europe. Oil exports are handled by the SPC under contracts of not more than one year, where the price of Suwaidiyah crude is based on a formula tied to its netback value, and that of 'Syrian Light' is related to the price of Libya's es-Sider crude. Recently, the SPC proposed the 1991 price for 'Syrian Light' to be set at 5 cents per barrel over spot es-Sider values, within a band of 35 cents per barrel above or below the price of dated Brent crude oil. Meanwhile, the reference API gravity for the 'Syrian Light' would be reduced to 36.5° from the current 37° API.

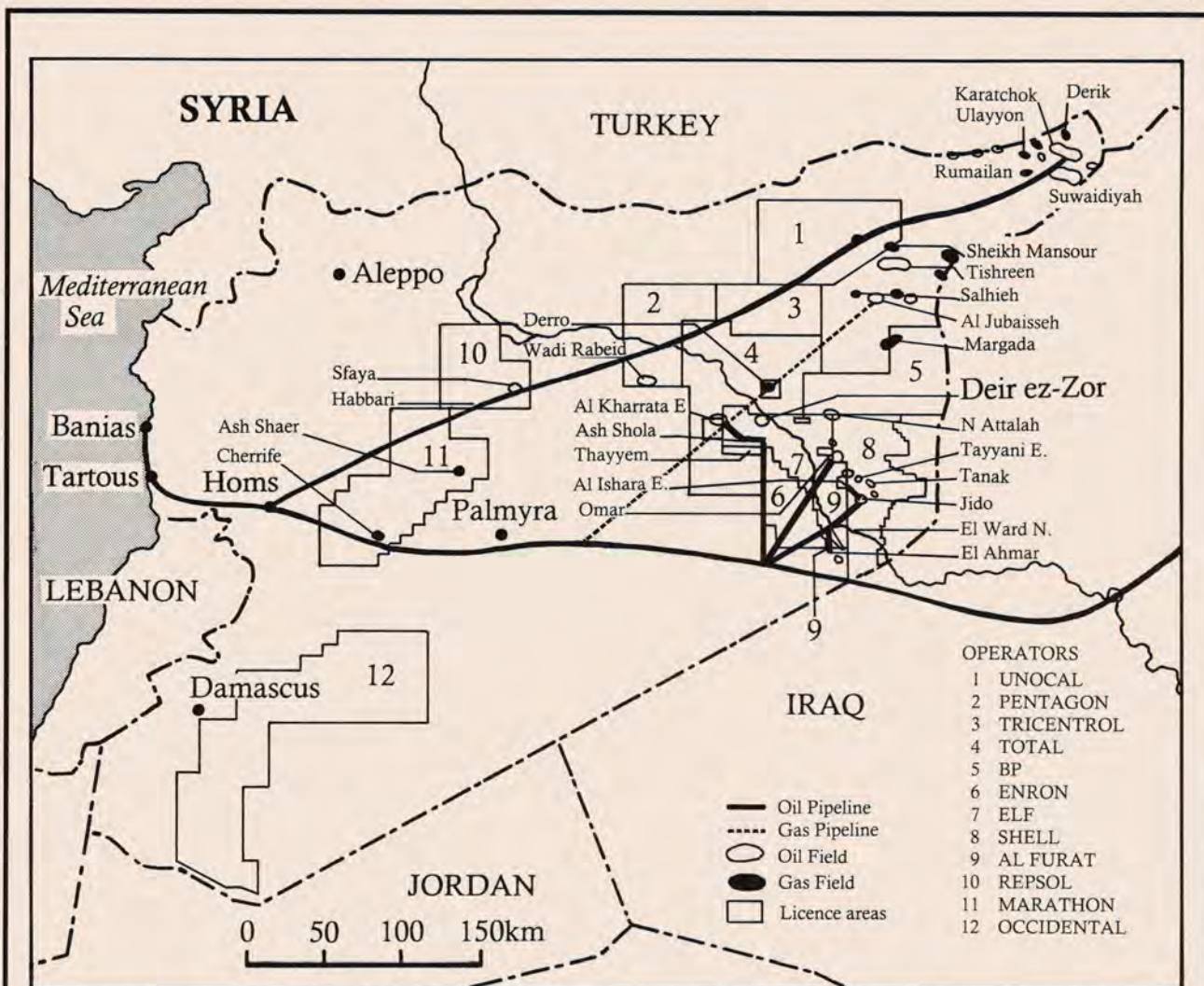
On other hand, Syria continues to annually export around 3 million tons of refined products, mostly fuel oil. Refinery modernisation and installation of upgrading capacity to process more of the SPC's heavy crude will probably result in a rise in petroleum product exports.

	Crude oil ('000 b/d)	Natural gas (million cu. m.) Gross production	Marketed rate (%)
1984	162	500	30
1985	176	520	29
1986	194	810	57
1987	232	1,210	51
1988	270	1,160	44
1989	301	1,550	65
1990*	380	2,000	n.a.

*Estimates

Source: OAPEC Annual Report 1989, Cedigaz

Figure 2: Crude and natural gas production



Syrian oil and gas network

Source: Petroleum Economist

Export outlets

The 1.4 million b/d Iraq-Mediterranean (IPC) pipeline, running from Kirkuk to the Syrian terminal of Banias, has been closed since April 1982. Nevertheless, the spur line linking the pipeline to the Lebanese refinery at Tripoli has been recently reopened carrying around 20,000 b/d of Syrian light crude, while Syria is now utilising parts of the IPC pipeline for its own internal use. Two spur lines have been connected to the T-2 pumping station of the IPC pipeline: a 92 km, 30 inch, 100,000 b/d line from al-Thayyem and other smaller neighbouring fields and a 70 km, 16 inch line from al-Ishara and al-Ward fields.

Consequently, the Banias terminal, which had been the export outlet for Iraqi crude supplied by the IPC pipeline, is currently used to load Syrian oil. The terminal consists of two berths with two 20 inch hoses each for loading crude oil, and another three berths with two 12 inch hoses each for

loading and discharging petroleum products. It can accommodate tankers of up to 210,000 dwt.

In addition, Syria has a 18/20/28 inch 250,000 b/d crude export pipeline running from the northeastern oilfields (Suwaidiyah and Karatchok) to the Mediterranean, which includes five pumping stations, a connection to the Homs refinery, and a terminal at Tartous.

The Tartous terminal can handle tankers of up to 100,000 dwt. It consists of two oil berths with two 12 inch hoses each, loading at rates of up to 4,000 and 5,000 tons per hour respectively.

Refining

The downstream end of the Syrian oil industry is run by two companies, the Homs Refinery Company and Banias Refinery Company, which can process up to 110,000 b/d and 120,000 b/d respectively of a combination of heavy and light crudes.

At the moment, the two refineries produce a surplus of fuel oil but not sufficient gas oil, gasoline and middle distillates, of which 22,000 b/d had to be imported in 1989 to meet the domestic demand.

The American UOP, under a contract with the Syrian government, is currently examining the possibility of expanding the refining sector in order to fulfil future needs by increasing the production of light products or by developing a third refinery. Indeed, the Syrian authorities are convinced that additional refining capacity of 50,000 b/d will be needed before the end of the century to cover the growth in local oil consumption. The new capacity will have to be concentrated on upgrading units.

Gas reserves

The estimates of Syria's natural gas reserves have fluctuated considerably in recent years and still vary wildly. While the Syrian Oil Minister made an

estimate of some 700 billion cu.m., in August last OAEPEC in its annual report for 1989 put the figure at 372 billion cu.m., whereas the SPC in December 1989 estimated the total gas reserves in place at 321 billion cu.m., of which 181 billions are recoverable.

According to the SPC, 95.4 billion cu.m. of Syria's recoverable gas reserves are in the non-associated form. Of that volume, 80 percent is concentrated in the Palmyra region and in the Jubaisseh fields (15.4 billion cu.m.). Gas cap reserves are estimated at 33 billion cu.m., of which 66 percent are located in the areas of Hasakah, Butma, Suwaidiyah, Audeh, Lailak and Jubaisseh. Associated gas reserves estimated at 28.6 billion cu.m., are contained in the Deir ez-Zor fields, especially Omar (16 billion cu.m.), as well as in Suwaidiyah field (5.6 billion cu.m.).

Gas development

Natural gas was not developed in Syria until the late 1980s. This was due to the old concession laws which did not cover gas finds, at least in any way that would allow the finder to recover costs.

The Syrian government recently improved the conditions for gas exploration and development and concluded an agreement with Marathon Oil to develop the latter's gas finds in the Palmyra area. At the same time, the government invited international companies to bid before June 1990 for a contract to complete the exploration of other gas structures in the Palmyra region, namely Najib, Dubaiat, Sokhne, Arak and a-Hail, to develop three of them (Dubaiat, Arak and al-Hail), and to design and build a gas transmission system for a proposed 600 MW power station at Jandar. Two of these companies, British Gas and C. Itoh, are thought to be well placed to win the contract.

Meanwhile, the Syrian authorities have been campaigning to use more gas to meet internal energy demand. Behind this drive are the need to release more oil for export, and the long-term plan to pipe gas to neighbouring countries, namely Turkey and Lebanon.

The contribution of natural gas to the energy balance of Syria has been increasing with every passing year, thanks to the expansion and diversification of its use as an energy source, as feedstock for certain industries and especially as fuel for power generation. According to the official plan, natural gas is targeted to provide 30 percent of Syria's total energy demand by the year 2000, compared with only 3.4 percent in 1988.



Seismic vehicles crossing the desert in Syria.

A Shell photograph

Natural gas could end up providing fuel for around three-quarters of all Syrian electricity generation capacity, itself set to double by the year 2000 to reach some 3,500 MW, if the still mooted oil shale-fuelled generation proves to be uneconomic.

As a result, Syria, which is currently earning some \$1.5–2 billion per year from oil exports, will get an extra boost, reckoned at about \$500–600 million annually, when the country's big thermal power stations are switched from oil to gas.

Gas production

In 1989, Syria's gross production of natural gas amounted to more than 1.5 million cu.m., which consisted mainly of associated gas (Figure 2). This is in line with the upward trend of Syrian gas output since 1985 due to the growth in oil production in general, and the rise in light crude output that has boosted the flow of associated gas. Accordingly, the gross production of natural gas reached an estimated 2 billion cu.m. in 1990, is expected to total around 2.3 billions in 1991 and some 2.7 billions in 1993.

Meanwhile, the rate of marketed gas peaked at 65 percent in 1989 from 29 percent in 1985, 57 percent in 1986 and 44 percent in 1988. It is targeted to increase through the 1990s and to reach some 90 percent by the year 2000.

Gas treatment

Natural gas has been processed in two plants, at Suwaidiyah and Jubaisseh.

A third plant is projected to be operational by the end of 1991.

Suwaidiyah processing plant has a daily capacity of 660,000 cu.m., producing 560,000 cu.m. of non-corrosive gas, 132 tons of LPG, 70 tons of condensates and 20 tons of sulphur.

The treatment plant at Jubaisseh was designed to process dry and associated gas produced at Jubaisseh field, and dry gas from the Markada, al-Hail and Ghuna fields. The plant's daily capacity is 1.7 million cu.m., producing 1.5 million cu.m. of non-corrosive gas, 70 tons of LPG, 40 tons of condensates and 50 tons of sulphur.

A project to treat the associated gas from fields in Deir ez-Zor region is expected to go on stream in the second half of this year. It aims to pool the associated gas released from the fields of Omar, North Omar, Shahel, al-Isba and Tanak via a 77 km gathering network. The plant's daily capacity will be 4.29 million cu.m., producing 4 million cu.m. of non-corrosive gas, 410 tons of LPG and 70 tons of condensates.

The treated non-corrosive gas will be transported by an 18 inch, 440 km pipeline to the Tishreen 400 MW power station near Damascus; secondary lines will supply the gas-turbine power station at al-Thayyem and the cement plant at Adra. A link will also be established between the Omar-Tishreen line and a planned line for transporting gas from Shaer and Sharifa fields in the Marathon Oil acreage to the 680 MW Baniyas and 630 MW Mahrada power stations. ■

FORTHCOMING EVENTS

February

6th

Guildford: Conference on 'Reforming Eastern European Economies'. Details: Liz Blakeway (REEE), Department of Economics, University of Surrey, Guildford, Surrey GU2 5XH. Tel: (0483) 509325. Fax: (0483) 300803.

6th-7th

London: Conference on 'Tectonics and Seismic Sequence Stratigraphy'. Details: Heidie Gould, Petroleum Group, The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 434 9944. Fax: (071) 439 8975.

7th-8th

London: Conference on 'Integrated Pollution Control'. Details: Liz Hyde, IBC Technical Services Ltd, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

11th-14th

Cranfield: Course on 'Introduction to Flow Measurement'. Details: Short Course Unit, Department of Fluid Engineering and Instrumentation, School of Mechanical Engineering, Cranfield Institute of Technology, Bedford MK43 0AL. Tel: (0234) 752766. Fax: (0234) 750728.

11th-15th

Aberdeen: Course on 'Introduction to Drilling Equipment and Practices'. Details: IBC Technical Services, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

12th

London: Lecture on 'Pipeline Engineering in an EPC Environment-Pipeline Gas Utilisation Project Stage

Call for Papers

The international conference 'Tribology 2000' will be held in Germany between 14-16 January 1992.

Papers are sought on the following subjects:

- ★ Aircraft and aerospace lubrication
- ★ Metalworking lubrication
- ★ Tribology of new materials and ceramics
- ★ Additives - types, properties, application
- ★ Base oils, mineral and synthetic fluids
- ★ Lubricant properties and their testing
- ★ Fundamentals: friction, wear, elasto-hydrodynamics
- ★ Molecular modelling/molecular dynamic simulation of lubricants

Title and abstracts should be submitted by 1 April to Technische Akademie Esslingen, PO Box 1265, In den Anlagen 5, D-7302 Ostfildern, Federal Republic of Germany. Tel: (0711) 340080. Fax: (0711) 3400843.

II - Malaysia' by L Gray, IMEG. Details: A A Reed, Secretary, The Pipeline Industries Guild, 17 Grosvenor Crescent, London SW1X 7ES. Tel: (071) 235 7938.

12th-13th

London: Seminar on 'Worldwide Engine Emission Standards and How to Meet Them'. Details: Julie Brown, Conference Department, Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. Tel: (071) 222 7899. Fax: (071) 222 4557.

13th

London: 'International Exploration Highlights'. Details: Heidie Gould, Petroleum Group, The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 434 9944. Fax: (071) 439 8975.

13th-14th

London: Conference on 'The Future of Britain's Estuaries'. Details: Ruth Day, RSA Environment Section, 8 John Adam Street, London WC2N 6EZ. Tel: (071) 930 5115.

14th-15th

Copenhagen, Denmark: Conference on 'Offshore Pipeline Technology'. Details: IBC Technical

Services, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

17th-20th

Tripoli, Libya: Mediterranean Offshore Conference. Details: C Ramsden, Jawaby Oil, 33 Cavendish Square, London W1M 9HF. Tel: (071) 499 0855. Fax: (071) 499 1771.

18th

London: Seminar on 'Financing Energy Projects'. Details: Miss Susan Ashton, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

19th

London: Seminar on 'Oil Price Information'. Details: Mrs Jean Etherton, The Institute of Petroleum.

20th

London: Seminar on 'Oil IT: Relevant Technological Changes'. Details: Libby Gallagher, SD-Scicon UK Ltd, Sanderson House, 49 Berners Street, London W1P 4AQ. Tel: (071) 580 5599. Fax: (071) 580 7716.

20th

London: Conference on

'Energy Investment: Limiting the Risk'. Details: Judith Higgins, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

21st-22nd

Edinburgh: Conference on 'Advances in Reservoir Technology'. Details: Natalie Cox, IBC Technical Services Limited, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

25th-1st March

Aberdeen: Course on 'Petroleum Exploration and Development Economics'. Details: DCA Consultants Ltd, Rosewall Cottage, Main Road, Aberuthven, Perthshire PH3 1HB. Tel: (0764) 63936.

26th

London: Conference on 'Profiting from Low-Grade Heat'. Details: Geraldine Oliver, Information Manager, The Watt Committee on Energy, Savoy Hill, London WC2R 0BU. Tel: (071) 379 6875. Fax: (071) 497 9315.

March

2nd-5th

Bahrain: '7th Middle East Oil Show and Conference'. Details: Will Martin, Middle East Oil Show, Overseas Exhibition Services Ltd, 11 Manchester Square, London W1M 5AB. Tel: (071) 486 1951. Fax: (071) 486 8773.

4th

London: Conference on 'Engineering Opportunities in the Ocean Technologies'. Details: Debby Seddon, British Committee for Engineering on Oceanic Resources, c/o SUT, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 0750. Fax: (071) 481 4001.

4th-5th

Budapest: Conference on 'Eastern and Central

FORTHCOMING EVENTS

Europe: The New Energy Picture'. Details: Brenda Hagerty, International Herald Tribune, 63 Long Acre, London WC2E 9JH. Tel: (071) 836 4802. Fax: (071) 836 0717.

4th-7th

Chislehurst: Three courses on 'Safety of Electrical Equipment in Potentially Explosive Atmospheres'. Details: Sira Communications Ltd, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

6th

London: Conference on 'Safety in Refining and Petrochemical Plant'. Details: Dr Robert Owen, Technology Forum, Stanley House, Stanley Avenue, Wembley, Middlesex HA0 4JB. Tel: (081) 900 1555. Fax: (081) 900 1134.

6th-8th

London: Course on 'Offshore Pipeline Engineering'. Details: Nadia Ellis, IBC Technical Services Limited, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

12th-14th

London: '14th National Maintenance Show'. Details: The Conference Manager, Conference Communication, Monks Hill, Tilford, Farnham, Surrey GU10 2AJ. Tel: (02518) 3111. Fax: (02518) 3143.

13th

London: Seminar on 'Use of Computers in Health and Safety'. Details: SCI Conference Secretariat, 14/15 Belgrave Square, London SW1X 8PS. Tel: (071) 235 3681. Fax: (071) 823 1698.

13th

London: Conference on 'Where are we now on Nuclear Power?'. Details:

Judith Higgins, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

18th-22nd

Zurich, Switzerland: Course on 'Multiphase Flow and Heat Transfer: Bases, Modelling and Applications in a) The Nuclear Power Industry and b) The Process Industry'. Details: Professor G. Yadigaroglu, ETH-Zentrum, CH-8092 Zurich, Switzerland. Tel: (41) 12564615.

19th-21st

Edinburgh: Conference on 'Effective Industrial Membrane Processes — Benefits and Opportunities'. Details: Conference Department, Membrane Conference, BHRA, The Fluid Engineering Centre, Cranfield, Bedford MK43 0AJ. Tel: (0234) 750422. Fax: (0234) 750074.

20th

London: Seminar on 'OIL IT: Understanding and managing your IT spend'. Details: Libby Gallagher, SD-Scicon UK Ltd, Sanderson House, 49 Berners Street, London W1P 4AQ. Tel: (071) 580 5599. Fax: (071) 580 7716.

20th-22nd

Gaithersbury, Maryland, USA: 'International Workshop on Reliability of Offshore Operations'. Details: Lori Phillips, National Institute of Standards and Technology, Building 101, Room A902, Gaithersbury, MD 20899, USA.

25th

Washington DC: Conference on 'Energy from Biomass and Wastes XV'. Details: Susan Robertson, Institute of Gas Technology, 3424 South State Street, Chicago, Illinois 60616-3896. Tel: 312 567 3881. Fax: 312 567 3857.

25th-27th

Aberdeen: Workshop on 'Risk Analysis in the Offshore Industry-After Piper Alpha'. Details: IBC Technical Services, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

April 3rd-5th

London: Conference on 'Coal in the Environment'. Details: World Coal Institute, Conference and Exhibition Secretariat, 8 Cotswold Mews, Battersea High Street, London SW11 3JE. Tel: (071) 937 4600. Fax: (071) 376 0453.

8th-12th

Leeds: Course on 'Diesel Particulates'. Details: Mrs CP Shirley, Department of Continuing Professional Education, The Adult Education Centre, Springfield Mount, Leeds LS2 9NG. Tel: (0532) 333226. Fax: (0532) 333240.

10th-12th

London: Course on 'Land Pipeline Engineering'. Details: IBC Technical Services, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

16th-17th

London: Conference on 'Developing and Financing Profitable Self-Generation Projects'. Details: IIR Limited, Industrial Conferences Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1BR.

16th-17th

London: Conference on 'Clearing the Air'. Details: Virginia Hopes, Status Meetings Ltd, Festival Hall, Petersfield, Hampshire GU31 4JW. Tel: (0730) 66544. Fax: (0730) 68865.

16th-18th

Harrogate: 'Liquidex 91'. Details: Liquidex 91, The Trinity Group, Times House, Station Approach, Ruislip, Middlesex HA4 8NB. Tel: (0895) 677677. Fax: (0895) 6767027.

17th

London: Conference on 'Information Technology for Offshore Oil and Gas Development'. Details: IBC Technical Services, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

17th-19th

London: '12th International Pump Technical Conference — Meeting the Pump Users Needs'. Details: Kay Russell, Elsevier Seminars, Mayfield House, 256 Banbury Road, Oxford OX2 7DH. Tel: (0865) 512242. Fax: (0865) 310981.

21st-23rd

Bath: Conference on 'Exploration Britain — Into the next decade'. Details: Heidie Gould, Petroleum Group, The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 287 1433. Fax: (071) 439 8975.

22nd-23rd

Bergen, Norway: Conference on 'Business Risks in the Oil Industry'. Details: The Bergen Conference on Oil and Economics, The Norwegian Petroleum Society, Ms Gerd Jaeger, (Conference Director), PO Box 95, N-5049 SANDSLI, Bergen, Norway. Tel: (475) 224885. Fax: (475) 228970.

25th

London: Conference on 'Oil Supply and Price'. Details: Caroline Little, The Institute of Petroleum.

Safer refineries—by design

By John Stephens, Handel Communications

It is hard to overstate the transformation which has taken place in refinery control rooms in recent years. The well-publicised technological changes, with the consequent freeing of previously cluttered space, allied to the application of the best contemporary design principles to the refinery business, have enabled working conditions for control room operators to be improved virtually beyond recognition.

Not all refineries have taken full advantage of the possibilities yet, but those which have are already reaping the rewards in terms of improved staff morale, higher productivity and considerably lower rates of attrition among staff.



Texaco's new control room — designed to take the strain.

According to Ron Miller, General Manager of Texaco's Pembroke refinery, the control room environment at his plant is 'so much more comfortable now than it used to be. The operators really have a pride in the workplace and are far happier with conditions than they were under the old set-up'.

Mr Miller offers a succinct summary of the changes which have taken place during the past two decades when he says, 'It's all computers now. Twenty years ago, it was all big dials on the walls. Then the next generation of instruments were a little bit smaller, but they were still on walls and the operators still had to walk up and down all the time to check them. After that, we had the TV screens and then

the computer screens with keyboards were introduced.

'Now the operator can use the screen without even needing to use the keyboard all the time — he just looks at the master screen and presses the part of the screen which he wants to be enlarged. So it's much more user friendly.'

The technology behind all these changes was largely pioneered by Honeywell, whose specially developed package for control rooms is now in use in 80 percent of the world's refineries. Honeywell account manager Chris Gumm emphasised that the impetus for change was provided by the oil industry itself.

'This has really been driven by the

industry in order to improve efficiency,' he said, 'They demand more and more technology which has put pressure on manufacturers like ourselves to meet their needs. So the evolution of the technology has largely been prompted by the industry.'

The first distributed control system was developed by us in 1975 and we have been improving it ever since. Basically, what has happened to all the information which was previously displayed on dials along the walls has been distributed to boxes which are placed around the control room and outside it.

Signals from those boxes then go to the screens and all the information needed by the operators can be dis-

played on one screen. It means that an operator can monitor what's happening throughout the refinery on one screen, instead of having to march up and down looking at a series of dials.'

Improved efficiency

Apart from the convenience and improved efficiency which results from the sophisticated new technology, there is clearly more space available in the control rooms than there was before, as operators are now confined to one desk most of the time rather than moving about. That is where the designers come in.

The redesign of the Texaco plant at Pembroke was completed by London-based international design specialists Crabtree Hall, whose other clients include Gulf and BP.

Company partner David Lett points out that the oil industry provided a particular challenge to the designers when they were first invited to become involved.

'When we saw the problems in the industry and the nature of its operation, we realised that there was much that a considered design appraisal could do to improve both company image and staff morale,' he explained. 'The refinery industry is unique in terms of the demands that are placed on its staff because of the 12-hour shift system and the fact that the operators generally are seated for long periods in front of a bank of screens outputting critical process information which requires an effective operator response.'

The design challenge was therefore to find ways of making the operators as comfortable as possible, while doing everything possible to prevent them from becoming irritated by their surroundings in order to ensure that they retained maximum concentration for as long as possible.

Those technology changes obviously meant that there was more space available to the design team, but it also presented them with the opportunity to create a whole new working environment for the operators at the nerve-centre of the refinery.

'What we are talking about really is changing the working environment from being one of a workshop — albeit a high-technology workshop — into an office environment. However, it certainly isn't an ordinary office, it's a potentially dangerous environment where operator responses are critical and safety has to be a priority,' Mr Lett explained.

'The old-style refineries had an engineering environment which didn't take ergonomics into account at all and

tended to be decorated in the one monotone colour. It wasn't a pleasant place to work. It was dominated by bulky, out-moded air-conditioning systems which were almost deafening. Finishes and fittings, whilst very functional and durable, were hardly specified for worker comfort,' he added.

Morale problems

When the designers were asked to apply their expertise to this environment, one of the first things they did was to circulate a detailed questionnaire among control room staff. This identified a clear morale problem, largely as a result of working conditions, and also unearthed complaints about eye strain because of poor lighting and numerous complaints about the sheer monotony of the working environment.

ing a clear, design objective. Our expertise within the IT sector is well-established so what we had to do was to blend that expertise with the specific needs of the petrochemical business.

'We have developed a system for the petrochemical industry, whereby fittings are built off-site which allows for speedier on-site installation and a reduction in man hours and inconvenience on site. We have incorporated slight variations of colour into the new working environment with the colours horizontally banded which is very important. It gives the eyes a horizon which is vital because if your eyes are flicking around a screen, or switching from screen to screen, then when they are raised they should be able to settle on a horizon. The eyes should not be distracted by the environment.'

So the varied and banded colours have sorted out the problem of what

'People are happier working in the new environment, morale is better, productivity is better'

Not surprisingly, there were a number of complaints about the conditions and a high level of attrition among staff — something which the industry could obviously ill afford given the high cost of training operators.

Having defined the challenge, the designers set about their task with the considerable advantage of being able to make what was virtually a fresh start. Or, as Mr Lett put it: 'Basically, we were presented with a clean sheet of paper. You still have large spaces available to you but now that technology has become screen-based, there is so much more that you can do in design terms. But at the end of the day, you must not create an aggressive environment because the bottom line is that people have to work there for long periods.'

After discussing the project with various colleagues — as well as carrying out extensive consultation with control room staff — the designers came up with the solution to the problem that had been so clearly identified.

He explained, 'Your job as a designer is to juggle all of the priorities that are put forward by the various parties working in the plant and come back with a recommendation that prioritise departmental issues whilst maintain-

ing a clear, design objective. Our expertise within the IT sector is well-established so what we had to do was to blend that expertise with the specific needs of the petrochemical business.

'We use low voltage light to colour render and soften surfaces other than general ambient lighting and all lighting is controllable by individual operators so that they can set the levels that they find most comfortable.'

Profile raiser

The next step was to sort out appropriate furnishings for the new, state-of-the-art office. Again, this involved extensive discussion with the staff who were asked their opinions on a huge number of options. 'We gave them a large range of chairs to look at before finally settling on a high-quality leather chair more usually found behind the chairman's desk. The furniture and desks are also made of high-specification materials which, apart from being aesthetically less intrusive than was the case previously, raised the profile of the operators' role within the refining process.'

The staff questionnaire also revealed a degree of dissatisfaction among the operators about the numbers of people who were moving about in the control

room and this prompted a further change. 'They said there were far too many people milling about behind them and that this was distracting so we re-routed the pedestrian traffic and introduced a series of permit counters to restrict non-essential staff,' added Mr Lett.

In addition to transforming the control room environment, the team turned their attention to other areas of the refinery, as Mr Lett explained: 'We have provided a significantly higher level of comfort in ancillary services areas, in rooms for supervisors and engineers and in the mess rooms and canteens. It is basically a completely different working world now.'

While the benefits of this transformation may not be directly calculable in money terms, the changes, although expensive, are ultimately cost-effective.

'Health and safety are obviously a priority within the industry and everything we have done has been underpinned by the necessity of improving safety. The result is a working environment which is not only more comfort-

able but is demonstrably safer. People are happier working in the new environment, morale is better, productivity is better, there are fewer health complaints and problems and the overall attrition rate is obviously much lower,' said Mr Lett.

'You cannot quantify the net bottom-line effect but there is undoubtedly a much more positive response from the people using the space. Obviously, it is at a cost and the pay-back period has yet to be quantified, but in comparison to the cost of installing the hardware at refineries, the cost of redesigning is minimal and the long-term benefits are incalculable. It's obviously important to consider the invisible return and human resources are one of the industry's most expensive assets, so it pays to look after them.'

This is certainly a view which is endorsed by Mr Miller who said: 'Some of the operators took a lot of convincing and said they were too old to learn and that they would never adapt, but in no time at all they were lapping it up. It's so much more comfortable and that's very important

when you consider that we work 12-hour shifts.'

Pride in work

He points out that the advent of screens means that the operators require more breaks and have to be more carefully managed to avoid eye-strain. 'You cannot expect anybody to sit and watch maybe eight screens plus alarm screens without a break for a long time. It needs to be carefully monitored, but luckily we got our operators involved in the design process right from the start and that makes it much more acceptable to them. They now have far more pride in their working environment.'

Mr Miller is clearly a firm believer in the benefits of using top-class designers in the refinery business but despite his faith in the new set-up, he is still left with one small problem. He explained: 'We are thinking of putting exercise bikes into the control room because the operators don't get enough exercise now that they don't have to walk up and down any more!' ■

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Obituary

Dr Armand Hammer

The Chairman and Chief Executive of Occidental Petroleum Corporation, Dr Armand Hammer — one of the industry's legendary figures — died last December after a brief illness. He was 92.

A colourful character, Dr Hammer will be chiefly remembered for two things; firstly he turned Occidental from a struggling company into the seventh largest oil company in America and secondly, he helped to thaw relationships between the Soviet Union and the United States.

A friend of royalty and heads of state — he knew Lenin while barely out of his teens — Dr Hammer was famous for his entrepreneurial expertise.

Armand Hammer was born in New York on the 21 May 1898, the son of a Jewish immigrant from Odessa. His father was a practising physician and Dr Hammer followed in his footsteps by gaining a medical degree in 1921.

But he never practised medicine. Instead Dr Hammer discovered he had a talent for business, using his entrepreneurial flair to turn unlikely businesses into robust companies.

Famine relief

Soon after graduating in 1921 he went to Russia, at a time when most capitalists shunned the new communist state. Because of aid given to famine relief, the young Dr Hammer was granted an audience with Lenin, who allowed him the right to establish a successful export-import business in the Soviet Union.

He was also awarded the first private concession from the new regime at the behest of Lenin — trading asbestos from a mine in the Ural mountains for US wheat. A second concession enabled him to start the first pencil factory in Russia.

In 1930, after nine years in the Soviet Union, he was able to return to America with a store of valuable czarist art treasures and to set up the Hammer Galleries in New York. He kept this interest in art for the rest of his life.

A string of enterprises followed requiring all his business skills, including a potato distilling business, a livestock feed firm and eventually a cattle breeding outfit.



Occidental

By 1956 Dr Hammer was living in California, preparing for retirement, when he borrowed \$50,000 — a sum matched by his third wife, Frances — to buy a struggling local oil company called Occidental as a tax loss.

The money was used to finance two 'wildcats' which both proved to be successful producers, starting yet another career for Dr Hammer.

Hammer was unable to turn all the negotiations his way, leaving him in a controversial position.

For years after the event his rivals still attacked Dr Hammer for being the man who sold out Western interests by crumbling before Colonel Gaddafi on oil supplies and prices which was seen as the cause of the end of the era of cheap oil and a watershed in the establishment of OPEC.

North Sea

However, ever quick off the mark, Occidental was able to use the profits from Libya to fund expansion elsewhere, especially in the UK North Sea. The company's Piper and Claymore developments were among the first to come on stream during the 1970s.

In the early 1980s Occidental 'struck pay dirt' again in Colombia, although selling half of its interest from the new discovery to Shell in order to reduce debt.

But Occidental came unstuck in 1988 when the Piper Alpha disaster rocked the industry. It was typical of the company chairman that when he heard of the explosion which killed 167 men he flew immediately to the scene, later personally contributing \$1 million

'One of the industry's legendary figures'

Initially he knew nothing about oil, but he had enough business acumen to hire a veteran oilman, who found some large gas reserves in California's Sacramento Valley in 1961.

Now financially secure, Dr Hammer pressed ahead with ambitious overseas expansion plans, one of which was for concessions in Libya.

It was an astute move for during 1966 and 1967 Occidental's drilling teams made large discoveries — often in areas of Libya where the majors had given up — with some wells producing as much as 72,000 barrels a day.

Unfortunately Dr Armand's luck ran out momentarily with the emergence of Libyan nationalism led by Colonel Gaddafi. Following his coup in 1969 the Libyan dictator put the squeeze on Dr Hammer by asking for increased royalties and taxes. Despite using all his considerable skills Dr

to the disaster fund.

During all this time Dr Hammer was able to keep up contact with successive Russian leaders, including Mikhail Gorbachev. Since the early 1960s he was an invaluable go-between for five Soviet General Secretaries and six US presidents.

Because of this 'special' position as a non-political statesman he was able to cut across East-West antagonism. He will be remembered for playing a major role in creating the right atmosphere for a dialogue which led to the four summit meetings between President Ronald Reagan and Mikhail Gorbachev.

Mr Gorbachev said of Dr Hammer that he was 'an old and sincere friend of the Soviet Union, who did much for Soviet-American relations and for the mutual understanding between the two nations'. ■

Futures and forward markets swaps and options — which way forward?

Last November, the Institute of Petroleum hosted this important conference which provided a timely forum to review the state of the art in the management of price risk for oil and oil products. The current volatility of trading conditions in these markets gave the conference Chairman, Walter Greaves, the opportunity to impose a critical tone to the proceedings. His opening remarks achieved the aim of generating some thoughtful and wide-ranging discussions.

There now exists a multiplicity of financial instruments to hedge risk using the forward or futures markets, or the burgeoning choice of derivatives, but to what extent is this range of services meeting the demands of the industry? What are the strengths and weaknesses of the current informal, institutional and legal arrangements, and what kinds of solutions are likely to be effective in meeting the challenges of petroleum marketing and trading in the 1990's?

The main themes that emerged were the likelihood of continuing evolution and innovation, perhaps punctuated and directed by legislative outcomes and other regulatory action. The futures exchanges called for improved consultation with other sections of the industry and the development of a more unified approach. Competitive forces continue to shape the strategies of the exchanges, which are introducing new and longer dated contracts. The connection between the financial elements of price risk management and the underlying physical factors affecting the accessibility, distribution and supply of crude and products will continue to provide the axis around which the industry will revolve.

Mr Alan Binder of Shell International Trading Company (SITCO), one of the world's largest trading operations, gave the keynote address in which he described the nature of price risk management, emphasising that the first and most important requirement is the measurement of risk, in itself a difficult task.

SITCO's risk management objectives are to co-ordinate its activities so as to minimise the cost of purchased oil. Shell and SITCO are equally regarded as profit centres and maintain an arms length commercial relationship. SITCO's main function is to buy in crude that Shell needs.

The use of paper markets add an extra dimension to trading operations. These markets allow enhanced business control, since a portfolio of positions can be expanded without adding to risk. This in turn makes SITCO an attractive trading partner, particularly to their smaller customers, some of whom lay off their risk to SITCO. Volatility in the markets will be ever present, but its nature changes through time. The markets' swing from backwardation to contango and back again in 1990 provided a pertinent reminder of how pressures in local markets can destabilise conventional wisdoms.

Mr Nigel Graham of Neste Petroleum reviewed the evolution of the forward markets since their inception in the early 1980's. Originally developed as contracts with standardised terms by oil brokers wanting to increase their turnover, the majors began to use them for hedging following the price collapse of 1986. Problems associated with these markets were, and continue to be, non-performance and demurrage. When prices are volatile, disputes increase over the terms of the contract. Late arrivals and loading discrepancies cause all the losers in the chain to clamour for the cancellation of the

contract. These problems reduced turnover, no bad thing, since the chains had grown to unwieldy dimensions, with some 130 links.

However, despite these manifest deficiencies, forward markets continue to fulfil an important function because futures markets cannot yet offer a comprehensive alternative. Refiners want a full crack spread. Thwarted by thin trading volumes in many crude and product markets, futures exchanges find it difficult to identify, design and launch appropriate contracts.

Paper contracts will therefore continue, despite the existence of futures and derivatives. Neither paper nor futures need to be used for delivery, but they can be. Traders operating in competitive markets believe strongly that the more choice of risk management devices the better, always subject to sufficient liquidity. As the oil market continues to become more sophisticated, more instruments will be invented.

Mr Daniel Carr of NYMEX announced plans for the development of a second (sour) crude contract, with a proposal for the Commodity Futures Trading Commission (CFTC) expected to be ready by March 1991. Mr Carr stressed the need for extensive consultation with industry to ensure that the end product meets with strong demand. It seems likely that the proposed contract would be basis US Gulf and providing for physical delivery. The operators of storage facilities at Houston Ship Canal, Nederland, Texas, and the Louisiana Offshore Oil Port (LOOP) have all expressed interest in the NYMEX plan.

The rationale for the contract is the absence of a big cash market dealing in the marker crude, ANS. For this reason, NYMEX is considering the delivery of a choice of crude oils, comprising ANS, WTS, and grades chosen from the Middle East, the North Sea and from South or Central America (eg Oriente). At any particular delivery it is assumed that the currently lowest value crude oil on the list would be delivered and that the trading in crude oil futures would have focused on this grade.

These are turbulent times for futures exchanges, with their detractors claiming that speculators have been dominating trading and fanning price volatility, Mr Carr was able to produce a statistical defence that the majority of business continues to be made by traders, refiners and producers.

NYMEX is seeking to protect traders by developing contingency plans to cope with the eventuality of an outbreak of war in the Gulf. If conflict were to break out on a weekend or on a settlement day, the preservation of the integrity of traders' positions renders these precautions vital to the credibility of the exchange.

Mr Peter Wildblood of the International Petroleum Exchange (IPE) characterised the roles of oil futures markets as threefold:

- i) To achieve the effective management of price risk;
- ii) To enable the process of price discovery;
- iii) Most importantly, futures trading permits the separation of pricing and supply, a feature which leads to increased trading flexibility. Traders can focus on price differentials, rather than absolute price levels.

Mr Wildblood described the market's wants and needs as follows:

- An international trading and hedging requirement
- A choice of instruments (ie flexibility)
- Price discovery
- Management of price risk
- Liquidity
- A secure trading environment
- The ability to make physical delivery

These are met by a small number of contracts, whose links with non-contract crudes and products are stable. Despite the existence of three exchanges (IPE, NYMEX, SIMEX) there remains a need for a Residual Fuel Oil contract. The IPE is hoping to introduce a naphtha contract, and to re-launch its fuel oil contract. Industry demands a wide range, both geographically and over the whole barrel. Marker grades chosen need to be acceptable in terms of quality. There is scope for the exchanges to co-operate more closely on these and other issues.

Physical delivery of futures is rare (<1% of all IPE contracts) and participants need to take account of locational problems if planning a physical deal. The management of price risk primarily requires financial, rather than delivery instruments; the volume of trade is a measure of how well a futures contract contributes to meeting risk management objectives. Hedges are rarely perfect, and the residual (basis) risk can be hedged by trading the differential. Liquidity is important in these markets to maximise flexibility for participants. Backed by a clearing system and the deposit of margins, futures trading

offers credit security, in contrast to the vulnerability to financial non-performance in the forward markets.

Mr Wildblood concluded by urging a more integrated approach to the problems that the industry faces. While there exists a reasonable spread of products, there is a requirement for a more diverse geographical spread. Exchanges want the industry's views, but industry must realise what futures can and cannot do. Companies need to be focused in their corporate objectives. The relationship between companies and the markets is exhibiting improved communication now that several contracts are well-established. But problems exist, and are being handled piecemeal. There is a need for a cogent unifying strategy, focusing on what instruments are needed. The potential benefits are great if the industry could articulate its needs.

Mr David Hammer of Phibro outlined the structure of a number of derivative instruments including swaps, floors and range forwards. He prefaced his remarks by distinguishing between three kinds of risk: 'basis risk' represents the variability of differentials; 'calendar risk' is the time-phased market outlook, which can vary between backwardation and contango; and there is the underlying 'price risk'. Mr Hammer pointed out the different price risk objectives of producers, refiners, consumers and speculators.

His detailed description of derivatives started with their definition: an over the counter principal to principal deal. Their advantage over other instruments recognises that 'as oil flows, it's priced' and derivatives enabled a hedge structure to be constructed which reflects the risk profile. Furthermore credit terms can be individually tailored.

An oil swap is the exchange of a fixed for a floating price; the maturity can be as short as three months or as long as 10 or 12 years. At maturity there is a cash settle against the average daily price over the life of the swap. The short hedger is protected against falling prices, but foregoes the benefit of a rising market. Floors and range forwards are conceptually similar, differing from swaps in accordance with the hedger's attitude to risk. A floor allows the hedger to obtain some of the benefits of rising prices by agreeing to pay a premium, calculated to take into account the time value of money as well as an estimate of the expected value of future prices, over and above the floor. As in the case of a swap, the

producer is protected from falling prices.

These kinds of risk management products are generally aimed at the short term market (up to 24 months) when producers are trying to set operating budgets and are faced with forecasting revenues predicated on the volatility of future oil prices. Longer-term deals are typically of interest to exploration and production companies who may need help in convincing their bankers of the value of proven and probable reserves. By entering into a swap which guarantees the value of future streams of production, companies exert control over one source of risk, though at the possible expense of foregone profits.

There are three ways of acquiring oil; physical acquisition, stock market purchases and position-taking in synthetic markets. Mr Hammer listed the advantages of the last of these — investors and speculators can express a direct view on oil prices; eliminate production risk; increase liquidity; escape the possible imposition of royalties; and achieve higher price security. The growing sophistication of markets and instruments means that both consumers and producers should be able to find an appropriate mechanism with which to manage price risk arising from market volatility. Indeed, 'by not protecting against price movement, one is expressing a view on the market!'

Mr Gordon Watson of Czarnikow Energy argued that oil futures markets reflect very closely the local oil markets on which they are based. His central tenet was that to use the futures market effectively, it is advisable to understand what factors are important in the underlying physical market. For example, the differential of WTI over Brent is typically positive for most of the year but in 1986 was at a discount of as much as \$2 per barrel in February and March. If the WTI market is to be used as a hedge, to protect another crude or a product it is important to estimate the influence of PADD II on the price of WTI at that time. The annual pattern versus, for example, Brent is an acceptable long term guide but in the shorter term there is a need for more local and immediate understanding.

Other important factors include the regional supply infrastructure, as well as time lags required by the wholesale sector of product markets to adjust to changes in quality differentials. Environmental restrictions can impinge on the flow of products through local distribution systems, causing sud-

den tightness in the markets served by the affected network.

The aim of a futures exchange is to design contracts which are generally accepted as reflecting the quality of the majority of the product traded in the area. For crude oil contracts, specification has simply been on the basis of a named crude. There has been less unanimity regarding trading hours. The IPE in London offers an 11-hour trading day, to facilitate an instantaneous hedge on a wide variety of trades. The NYMEX has a six-hour trading day, justified by reasoning that a comparatively short day helps to avoid periods of thin and illiquid trading conditions. Most futures contracts have a relatively short time horizon of not more than six months, but in response to competition from the rapidly growing swaps market, NYMEX is introducing hedging possibilities for up to three years ahead.

Mr David Long of OPRA presented a more technical paper, which compared the hedging efficiency of the Russian Gas Oil Forward Market and the IPE Futures contract. He also noted that the forward and futures markets still lack a complete set of instruments and that there is concentration in a few market segments, especially surrounding Brent crude.

The effectiveness of a hedge is a function of the relationship between the instrument and the underlying physical market. A short hedge is a form of price insurance, and the hedge is perfect if the futures price moves in parallel with the physical price. If the spread narrows (ie moves from backwardation towards contango) the hedge worsens; if the spread widens (ie moves from contango towards backwardation) the hedge improves. Because there are movements in the basis, hedging is not a riskless activity.

A common definition of hedge efficiency is the ratio of the variance of relative price change to the variance of the absolute price change, subtracted from 1 and expressed as a percentage. Mr Long contends that this conventional measure of hedge efficiency is defective, a fresh approach requires an understanding of the factors driving changes in these markets.

Price behaviour in the European gasoil market

1. Absolute Prices

In theory, these prices approximate to the concept of an efficient market; ie a random walk, with a quantifiable distribution of returns. In practice, however, there is evidence that there are short run dependencies

(autocorrelated short lags) arising from problems of the distribution of information. There are too many large returns (prices leap by too much) to be compatible with the Normal distribution.

2. Relative Prices

Prices belong to an integrated market ('they are dancing to the same tune'), so there is a stable long run relationship between prices. But there is evidence of short-run dependencies, and that the orientation of the market between contango and backwardation is affected by seasonal factors.

The implication of this is that prices are more closely related than appears at first sight. Simple linear regressions and other simple statistical tests fail to account for these subtleties. By measuring the efficiency of a hedge by taking into account these less obvious factors, the evidence suggests that naive hedging may indeed be effective, since this improved way of measuring hedge efficiency reveals (for the IPE gasoil contract) that the hedge performs extremely well. In addition, longer hedges (15 days) allow more variables to come into play and perform better than shorter hedges (five days). The seasonal factors for the IPE contract are stronger than for the Russian forward contract, probably because of the different delivery arrangements. Finally, there is evidence that the level of stocks is related to backwardation, which becomes steeper as stocks fall.

Mr Christophe Chassard, an independent consultant, continued the evaluation of futures contracts by arguing that they fail to provide a comprehensive method for managing price risk on two grounds:

- i) The basis risk of futures can still pose problems, particularly in volatile trading periods
- ii) The short time horizon of most futures contracts is at odds with the long term nature (5 to 10 years) of planning and investment in the oil industry.

The variability of the differential between gas/oil and jet was used to illustrate the difficulty facing airlines earlier this year, particularly during the early stages of the Gulf conflict. The basis risk exceeded the price risk in this period.

The swaps market would have provided the opportunity to make large profits, since swaps were trading in contango and gasoil on the IPE and NYMEX was in steep backwardation. Refiners could have optimised on jet

and locked in substantial profits. Refiners typically lacked the financial sophistication to take advantage of the situation.

Innovative refiners could benefit by being first into the swaps market. Long term deals such as swaps have the potential to reduce the volatility of future cash flows, and an investment project with only marginal returns could be converted to profitability as a result of the enhanced security of its revenue streams.

The oil market is evolving in ways that are similar to other markets, notably the foreign exchange markets, in which the use of futures and derivative products such as swaps has grown strongly. In oil markets, the use of futures has been weakened by the volatility of the basis risk. The ability of producers and refiners to operate in the emerging derivatives markets should be seen as a source of competitive advantage.

Ms Blanche Sas from the University of Dundee presented a detailed and provocative paper, 'Legal Aspects of Risk Management and Forward Oil Trading'.

This paper provided a comprehensive and somewhat sobering review of the legislative constraints and ambiguities connected with the use of forward oil trading and oil swaps. In the light of the disruption to the Brent forward markets that occurred in April 1990, following Judge Conner's opinion in the Transnor case, this review was timely and pertinent to all traders operating in the international forward markets.

In August 1987, Judge Conner found that the plaintiff (Transnor) had standing regarding antitrust, and similarly with respect to US commodity laws. He also analysed 15-day

Brent contracts which he found exhibited sufficient characteristics to be classified as futures contracts. In his view Brent market was part of US commerce and the contracts were futures contracts — thus the Court had subject matter jurisdiction.

In April 1990, Judge Conner reaffirmed these views. He came to the conclusion that the Brent market was 'not an exclusively foreign market and thus was a US market'. In fact he stated: 'Where the market in question has even the slightest direct ties to US commerce, that market is not an exclusively foreign market and is therefore deemed a US market.' The important point decided by Judge Conner was that Brent contracts fell within USA jurisdiction, and that the UK regulatory regime was not such that, under international law or comity, he should not assume that jurisdiction. He elsewhere stated that the Brent contract was a 'novel type of transaction, which appears to be a hybrid of a futures contract and a forward contract'. Judge Conner appeared to put heavy emphasis on the intention rather than the capability of delivery, an approach which seems to be in line with the caselaw and the UK's approach.

After the 1990 Transnor judgment the CFTC concluded that Brent contracts, as they understood them, were not futures contracts but forward contracts. This decision was made by four (out of a possible five) commissioners. The one dissenting commissioner warned that courts may decline to follow their interpretation in any future case, thus 'leaving the Brent market participants with a false sense of security'. Thus it appears that the CFTC unanimously agree with Judge Conner that the USA law, specifically the Commodity Exchange Act (CEA)

can apply to Brent contracts, despite the fact that there is light regulation in the United Kingdom. In addition, there is the continuing vulnerability to US anti-trust law which remains unaffected by the decision or the statutory interpretation. Furthermore, there are only two ways to eliminate the law created by Transnor:

- (1) The US Court for New York South District could reverse its position in a test case brought before that court or
- (2) The US Congress could change the law (ie a legislative reversal of the Transnor decision).

Finally it should be noted that the interpretation is silent as to other forward oil markets such as forward WTI, Boston heating oil, Russian gasoil, Dubai crude oil, or Littlebrook fuel oil. Because the statutory interpretation does not extend to these markets, it offers no protection against section 4(a) of the CEA.

With regard to oil swaps, the CFTC has issued a policy statement creating a non-exclusive 'safe harbour' relative to the catchment under section 4(a) of the CEA. Swaps must meet six criteria to qualify: (1) settlement in cash (2) agreements must be individually tailored, under terms that are not fully standardised (3) absence of exchange style offset (4) absence of clearing organisation or margin system (5) transaction undertaken in conjunction with the parties' line of business (6) absence of marketing to the general public. Prudent traders of swaps must therefore exercise caution that their dealings qualify for the safe harbour criteria, particularly with respect to many of the new variations of swaps that are being developed. ■

**John Tomi,
Research Manager,
Joe Roeber Associates**



ENERGY ECONOMICS GROUP

11 April 1991

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Speaker: **Mr Richard Kellaway**

Managing Director, GATX Terminals Ltd

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For further details please contact **Mrs Jane Thompson**, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004.

The problems of defining the price of the 'marker' crude oils and products

By Peter Caddy, Managing Editor, Petroleum Argus

There are two basic methods used by reporting services in establishing their price assessments. The traditional method behind price assessments uses the 'high' price and the 'low' price of deals done on any particular day for a crude or a product group.

In the days of low price volatility the difference between the two levels was expected to be small. But this methodology threw up several problems. Deals could be reported to the reporting service for off specification oil of a quality which might command a premium or a discount to more normal quality. The intention, of course, would be to shift the price in a direction favourable to the company reporting the deal.

Similarly deals could be reported of small or large size vessels or of unusual delivery dates or differing locations or credit terms. Special circumstances could also affect the price of individual deals which would not be explained to the reporting service. All these techniques could be used to influence price markers.

Eventually some form of standardisation of pricing was introduced but basic weaknesses in a 'deals done'

reporting system remained. With the increase in greater daily price volatility the difference between the high and low of deals done on any one day threatened to make any price level so wide as to be meaningless. To make a more acceptable assessment — if prices moved by a significant amount on the day — the price reporter was left with the highly subjective task of choosing whether to weight the price assessment in favour of a level at which the bulk of deals may have been done or to include deals in the assessment which were done at the extremes of the trading range.

But when prices move quickly, many trades are done at prices which the parties involved wish to keep private and confidential. Buyers are reluctant to report high priced deals either through fear of embarrassment or more often through a desire not to confirm publicly the existence of higher prices. Sellers naturally react in a similar way to price falls. Selective reporting of prices to a reporting service often with a delay of several days again left the use of a high and low methodology open to influence.

And of course there was always the possibility of downright lies being told. A deals done system relies upon the two parties to a deal telling the truth. But even the truth can be very subjective. With the increase of differential pricing and the use of exchange of futures for physicals, the price at which deals are done can become open to individual interpretation. Price reporters could be given either the absolute price or the differential at which a transaction was concluded.

Basically the primary difficulty of a high and low deals done system is the impossibility of verification which can lead to subjective reporting. This often leads to a price series not consistent with other participants' views of the

market levels. And the crucial point about price markers is that participants in the market must have confidence in them.

The buy-sell range

The alternative system to a deals done method, and the one employed at Petroleum Argus, is to use a buy-sell range methodology for a specific quality of oil, of a commonly traded volume, with specified timing, basis and location. The buy-sell range is determined by taking the highest buying and lowest selling indication in the market at a specified time, called the time stamp.

The advantage of this method is that it avoids inconsistency or distortion caused by variation in quality, size, timing and basis of reported deals. This is particularly true in separating price levels according to forward delivery period. With this approach the assessments are given greater consistency and accuracy. More importantly, it allows for verification as anyone employing the same methodology should come up with similar if not exactly the same numbers. This should also give more confidence in the price series.

Verification for a buy-sell range can be obtained from the market itself. If, for example, a seller pretends to be a buyer at a high price in order to influence the price assessments, he would soon find himself offered oil by real sellers wanting to sell above the market. This acts as a check on the credibility of market information. In other words the market itself acts as the test on reported buying and selling indications.

The potential problem with the buy sell range approach to price reporting is the question of liquidity. By closely defining the marker grade the level of trading activity used in determining

the price assessment becomes more restricted. This has led to the reproach that price assessments are now based on a smaller market and therefore are more suspect. But many crude markets are not as illiquid as they sometimes appear because of the way the market in practice establishes the price. Even if few absolute price transactions occur, a market can still be active through constant negotiation or through differential pricing.

But if a market is really illiquid, getting a buy sell range can become difficult. One way of circumventing this problem is asking the hypothetical question — at what price would you buy and/or sell the specific product or crude — and developing a market consensus from the replies. This involves talking to a wide cross-section of the market; from national producers, international majors, national oil companies, independent traders, financial trading houses to refiners and end-users. A market consensus using a buy sell range has much greater acceptability and generates more confidence than a price level apparently pulled randomly by individual deals or reliant on a visible marker such as a futures contract which is thought not to represent the supply and demand fundamentals of the market in question.

The issues of liquidity and verification present major problems for so-called real time price reporting services. These are pricing services which try and update prices on the physical or forward markets on an hourly basis. Even in very liquid physical and forward markets time has to be taken to verify, or for the market to verify, information and rumours that frenetically circulate amongst the trading community. This probably explains why Argus and Platts tend to be used most extensively in contract pricing.

Interrelationship of markers

The international oil market has become one of the most sophisticated trading structures in the world. Not everyone participates in all the mechanisms that are available but there is an interlocking relationship among all the physical markets and associated financial instruments.

Several years ago it was assumed that there would be a natural progression from physical markets through the developing forward markets into the still maturing futures markets. This led to the belief that oil was fast

becoming a commodity. But petroleum's heterogeneity has modified this evolutionary pattern.

What has happened is that all the markets, physical, forward and futures, have prospered and each one has taken on a different purpose in a cat's-cradle of relationships. Futures markets are used to hedge physical trade and other risk exposure. Forward markets are used in the same way but with the ability to hedge large volumes into the farther months and without the risk of initiating price volatility. They are also used to obtain access to physical oil in a way which is inconvenient through, or excluded from, futures contracts. In a simplified form, you could say, futures markets set general price visibility, forward markets allow fine tuning for the supply and demand situation of a specific crude or product and physical markets are the heterogeneous trades at the base of the entire trading system.

Derivative products, such as swaps and options, have now entered the matrix, tying in with futures and forward markets according to their relative ability to absorb the relevant price risk.

Differential pricing

The structure and pricing formulas in these markets throw up difficulties for reporting services. Trades in many markets are no longer being done at fixed prices. Instead trades are done at differentials to futures prices or to primary marker prices. This system of pricing is becoming more and more widespread and is accused of reducing the liquidity in marker grades and leading to circularity. But in practice this interrelationship can make price visibility more straightforward.

In differential pricing a futures contract usually provides ballpark price visibility and then a differential is negotiated against the futures contract for physical or forward trade. This can be either in an exchange of futures for physicals or simply as a price marker.

After the Iraqi invasion of Kuwait, for example, the price level of 15-day forward Brent was up to 50 cents above the level of the equivalent month on the International Petroleum Exchange's futures contract. And physical or dated Brent was up to \$2.50/bl above the level of the first month in the 15-day forward market. These differentials were in effect premiums for the possibility of physical delivery — something which was not available on the International Petroleum Exchange's Brent contract.

These differentials usually reflect the

supply and demand situation of the physical market. Most sellers and buyers of physical oil still prefer to price against physical price markers which mirror the situation in the physical market rather than on purely financial instruments such as futures. The problem for price reporting services is then how to reflect a level which is never traded on an absolute price basis.

Petroleum Argus has pioneered the concept of pricing against differentials to marker grades. The problems of using differentials to establish price markers are firstly understanding the concept; secondly, pushing aside the use of deals done to fix prices; and thirdly ensuring the assessment is logically time stamped.

The concept is not intuitive because the absolute levels derived from using differentials can be sharply at variance with the final price of other transactions occurring that day. Indeed, the price at which deals are done becomes irrelevant because it is the differential and the underlying price marker which establishes the market price. Both can be in constant fluctuation making the absolute price level of any transaction out of date as a price guide as soon as the deal has been completed. Similarly time stamping the assessment becomes essential in order to standardise the time used for the differential and the underlying price marker. Argus time stamps its dated Brent quotation at 6.30pm London time. The choice is purely arbitrary but it allows time for the reporter and the rest of the market to verify information during the day. And the 15-day market, the IPE Brent contract and the Nymex crude oil contract are all still trading allowing for an extra check on last minute information.

Such differential pricing is now used in the 15-day Brent market, on dated Brent and on just about every other spot traded crude. The key crude markers are dated Brent and 15-day Brent for the European and African region, WTI for the United States — and Dubai and Oman for the Asia area. In the Far East Indonesian crudes, which are term priced on official Indonesian crude prices, are now spot traded against a differential to the anticipated Indonesian crude price.

On petroleum products differentials against futures markets are widely used in pricing gasoline, heating oil and jet. The London IPE is used as the price marker to price physical gasoil and jet and the forward markets on Russian gasoil and French *fuel oil domestique*. Nymex gasoline and heating oil are used as the base price for US

east coast unleaded and premium gasoline (both cargoes and barges), US east coast heating oil and jet and US Gulf coast prices particularly in the Colonial pipeline.

Price assessments using a buy-sell range for the differential to a visible futures or forward price are becoming very popular and are increasingly being used in contract pricing. They are considered to reflect the physical market better than the underlying futures or forward price and can be verified by asking the market participants for their buy-sell range. This provides consistency and confidence in the price series.

Price markers are now used extensively throughout the world to establish the base price for term contracts and spot deals, to provide price histories for planning purposes and to establish tax reference prices and to provide internal transfer prices.

Saudi Arabia, for example, prices its crude oil to European destinations using dated Brent as the underlying price plus or minus a differential; Libya, Nigeria, Syria and the Yemen

use dated Brent as a price reference; spot sales using dated Brent are used by Iran and the Soviet Union. Arab Gulf crude sales to the Far East tend to use Dubai and Oman as price markers. Crude destined for the United States still has a tendency to use WTI or a price, such as Alaskan North Slope, ultimately linked to WTI.

Contract linkage on products is just as widespread as on crude. But unlike in the crude market where only a few prices provide the key for the rest, in products the heterogeneity of the market has resulted in a plethora of quotations. This has provoked a sense of exposure to the vagaries of a single-price reporting service. Many producer-exporters have now circumvented the sense of vulnerability on being dependent on a price provided by a single-price reporting service by linking to two price series. The most common are, of course, Argus and Platts, which are used in combinations by Saudi Arabia, Abu Dhabi, India, China, Japan, the Soviet Union, Algeria and by several US east coast utilities.

Need for reported prices

One question to consider is, given that price visibility is commonly associated with futures contracts, why are marker prices in the forward or physical markets preferred in term contract and spot cargo pricing?

I think this is because both buyers and sellers prefer the concept of linking their product or crude in their own highly specialised market to a price series which represents the individual and distinct supply and demand conditions peculiar to their product or crude. Price assessments based on the buy-sell range of differentials can reflect these conditions and eliminate the suspicion this very conservative industry still feels is associated with allegedly speculative devices such as the futures markets. ■

This paper was presented at the IP Conference, 'Futures and Forward Markets, Swaps and Options', held last November.



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Thomas Barrett, Managerial Adviser, European Investment Bank, Luxembourg

The Challenges Facing the Independents

Roland Shaw CBE, Chairman and Chief Executive, Premier Consolidated Oilfields plc

How Projects Actually Get Paid for

David Lindsell, Senior Technical Partner, Ernst & Young

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The Prize

By Daniel Yergin

Published by Simon & Schuster, 1991, 910pp, £20

Oil is the single most important economic commodity. Its only rival is the micro-chip. Oil has the greatest share of world trade, provides the mainstay of the world's largest companies, is the dominant force in the determination of energy prices and has now played a major part in bringing about international conflict — the First Oil War. After seven years' work, Daniel Yergin, President of Cambridge Energy Research Associates, has written its history.

The key to Yergin's history is graphically summarised by the book's title and sub-title. The growth of the oil industry has been an epic quest for the prize of wealth and power. *The Prize* is a narrative. Explanations and judgments arise naturally from the logic of events, supplemented by pithy cameos of the most important players. But *The Prize* does have grand themes — the rise of a great industry, the struggle for the control of oil, and the vital dependence of almost all aspects of society on a commodity deeply embedded in its collective psyche.

These stories are told fluently and with complete command. Complex events are unravelled with outstanding clarity and illustrated with fascinating anecdotal detail. I found particularly exciting Yergin's account of the early days, when the struggle was against nature and between the individuals who were to build the international oil companies. And I found particularly impressive his handling of the 1950s and 1960s when oil-producing countries began to wrest upstream ownership from the still-powerful international companies. The inter-

weaving of industry, national and international politics is exceptionally well done.

To my mind, the book is most illuminating when recounting the struggles for power over oil; less convincing when unearthing the vital power of oil in moulding a 'hydrocarbon society' and influencing political and military events.

The difficulties are twofold. The history is written very much from the perspective of the present and of the winners, tracing the lineages of the most powerful companies and producers of today. Power is associated with powerful people. We hear much less about the great contribution which the oil industry has made in technology and business organisation, virtually nothing of the ordinary workers in the industry. It has no real social or economic foundation. At the same time, the passages on 'The Age of Gasoline' and 'Hydrocarbon Man' are amongst the weakest in the book. They tell us the basics of the revolution in transport and its symbiotic relationship with the development of the oil industry, and of the manifold inter-connections between oil and economic progress. But they offer few new insights into social history or the changing role of oil in today's economies.

In a slightly different way, the chapters on the World Wars do not convincingly locate the role of oil in victory and defeat. These chapters contain some of the most fascinating passages of the book — such as the story of the conversion of Churchill to an oil-fired navy before World War I; and of

the possibility that if Patton had not been denied oil in 1944, World War II might have ended in that year. But it is one thing to highlight the ubiquitous role of oil, quite another to assess its true strategic importance amidst a multitude of equally urgent imperatives of strategy and logistics.

As the narrative of *The Prize* drives forward, the logic of events as the expression of power, combined with the all-pervasive roles of oil, combine to create an air of inevitability. It comes as no surprise to the reader that the invasion of Kuwait by Iraq has dramatically underlined the association of oil and power, indeed of oil and war. But the future is never inevitable. Had the book been published even six months ago, it might have ended on a rather subdued tone. Prices were weak, the industry seemed to be entering an era of much diminished significance. As Yergin himself points out, the industry has been forced to restructure, profitability is increasingly imperative.

Which will in the end dominate — the romance of the 'epic quest', which Daniel Yergin celebrates so brilliantly, or the sober imperatives of economic change? And which, in the light of recent events, should we prefer? ■

**Jeremy Turk,
Assistant Director,
Oxford Institute for Energy
Studies**

Yolla field may be next for development

By William Scholes

The Kuwait crisis has focused attention on the rich, unexploited Yolla gas field in Bass Strait, 135km north of the Tasmanian port of Burnie. Tasmania is the only Australian state without access to a supply of natural gas and its industries are particularly vulnerable to oil price fluctuations. It is a situation which could be quickly changed once a decision is made to tap the Bass Strait deposit, according to John Hayward, a commercial analyst with SAGASCO Resources. Mr Hayward said Yolla gas could fuel Tasmanian industry within five years of the project getting the green light.

The strongest impetus for development of the Yolla gas field is that Tasmania's vast system of hydro-electric schemes is drying up. The huge lakes created by the Hydro Electric Commission in Tasmania's main rain catchment areas are evaporating and the rivers that feed them are unable to replace the water taken by the heat of the sun, and programmed run-off by the commission.

A 10 year drought in the commission's terms has caused the level of the lakes to fall to only one third of their capacity. Tasmania's only back-up to its hydro electric scheme is the oil fired power station at Bell Bay in the State's north which is now in use and costing almost \$A2 million a week to run.

Exploitation of the field will depend on the Hydro Electric Commission (HEC) of Tasmania agreeing to convert its oil-fired thermal power station at Bell Bay to natural gas. Joint venturer SAGASCO has indicated that although the Yolla field could meet 50 percent of the energy needs along Tasmania's northern coast-line, its development would not be viable unless Bell Bay became a major consumer. Mr Hayward said it was estimated there was enough gas in the Yolla field to last 15-20 years. Tasmania's Resources and Energy Minister Michael Weldon said the state government was totally committed to the introduction of natural gas to Tasmania.

Shell Australia is also set to be a major new player in the race to supply natural gas to Tasmanian industry. Mr Weldon said Shell has started to look for hydrocarbons over a large area of

Bass Strait to the northeast of the island. The Shell search has coincided with moves by the state government to encourage industries in Tasmania's north to consider natural gas as a fuel option. Esso-BHP is also keen to establish a dry gas line from its headquarters in Victoria to George Town, linking Tasmania with the southeastern Australian gas grid. Mr Weldon said the availability of gas would bring an exciting new era of industrial development to Tasmania.

Discovery

In 1985, the Yolla gas and condensate field, north of Burnie, was discovered in the Bass Basin in a joint venture with SAGASCO Resources Ltd (formerly South Australian Oil & Gas Corporation), with Amoco, the Bass-Cue Group, Romney Resources and South Eastern Petroleum. The field is rich in LPG and condensate and also contains a small oil pool.

While there are many major manufacturing and mineral processing plants on the Tasmanian north coast which would benefit from a reliable natural gas pipeline supply, these industries alone provide insufficient load to make an offshore gas development economic.

The Bell Bay power station, sited in the middle of the island's north coast, is a thermal power station of 240MW capacity fired on fuel oil, and could, if converted to gas, operate to provide base-load supply and generate sufficient base gas demand to make development viable.

A gas condensate development in

Tasmania would stimulate the local economy through: direct investment in the project; aid development of processing industries on the north coast; make available cheaper electricity than from new hydroelectric and coal fired stations; contribute significantly to Tasmanian self-sufficiency in liquid fuels; and free scarce government capital for debt reduction or other uses.

Andrew M Stock, SAGASCO's Commercial Manager, told delegates at the Australian Petroleum Exploration Association (APEA) Conference in Hobart that tests on the Yolla 1 well were the first in the Bass Basin to flow hydrocarbons. These tests demonstrated that the Yolla field has excellent reservoir properties, essential for economic offshore development.

SAGASCO Resources estimates that the Yolla field contains 270 billion cubic feet of recoverable sales gas, 1.0 million tonnes of recoverable LPG, 30 million barrels of recoverable condensate and 3 million barrels of recoverable oil.

These gas and gas-liquid resource estimates could be conservative. If reservoirs adjoining the Yolla structure have trapped hydrocarbons, the structure could contain considerably greater quantities of gas and gas liquids. The magnitude of these potential reserves is impossible to estimate without further drilling.

The Yolla gas project is now at feasibility stage. Scoping engineering development and marketing studies are presently under way by the joint venturers. Discussions have been held with representatives of the development and energy planning authorities

in Tasmania. Once the results of the feasibility study are known, the joint venturers anticipate further discussions with the Tasmanian government.

At this stage there is only one well on the field and assessment of the gas resource is based on that well. Further appraisal drilling would be required on the structure to prove reserves for a gas contract. However, this work will not be undertaken until the results of the feasibility studies have been reviewed and the views of the Tasmanian government are known.

SAGASCO Resources have estimated that to develop Yolla, to pipe gas to the Tasmanian coast, to extract the condensate and LPG and to deliver natural gas to the northern Tasmanian coastline would cost about \$A500 million. The \$A500 million development would provide a boost to the ailing Tasmanian economy which has one of the highest unemployment rates in Australia.

Prospects

Today, as Mr Stock pointed out, Tasmania relies totally on imported hydrocarbon transport fuels; it has no indigenous supply source. SAGASCO Resources believes it could be economic to extract condensate and some LPG from the liquids-rich Yolla gas.

At a sales gas production rate of 17 billion cu ft per year, for example, the onshore gas separation plant could produce approximately 1 million barrels of condensate and 60,000 ton-

'The \$A 500 million development would provide a boost to the ailing Tasmanian economy'

nes per year of LPG. These represent nearly 40 percent of Tasmania's gasoline requirements and 160 percent of LPG requirements respectively.

Southern Cross Refiners is proposing to build a small refinery near Bell Bay. Condensate from Yolla could provide an ideal feedstock for such a simple refinery, providing a high gasoline-product yield.

With an excess of indigenous LPG, a programme could be initiated to convert a portion of Tasmania's vehicle fleet to LPG fuel, further reducing requirements for gasoline imports.

Mr Stock compared the penetration of LPG in the transport fuel market in Tasmania with the penetration in mainland Australian states which have indigenous state LPG supplies. Where indigenous LPG is available and logistics costs are low, LPG has achieved far greater penetration of the transport market.

'A further advantage offered by the development of Yolla based on a conversion of Bell Bay to gas is that it would allow Tasmania a breathing space in taking on additional government debt to fund new hydroelectric developments', Mr Stock said. 'Today,

Tasmania has a relatively high level of public sector debt compared with other Australian states. A considerable proportion of this derives from the capital-intensive construction programme of the Hydro Electric Commission. The development of Yolla would be funded by the private sector. This would allow Tasmania to obtain the benefits of capital investment in the economy and an increment of cost-competitive power generation without further increasing the level of government debt for essential services.'

Although any gas development, even onshore, is difficult to justify in Australia on the basis of domestic and commercial load, once the basic major trunkline infrastructure is in place to serve major users, incremental development to supply smaller users often becomes attractive.

Tasmania has the coldest climate of any of the Australian states. The development of the Yolla gas field would provide domestic and commercial energy consumers with all the benefits and comforts of natural gas for year-round climate control, cooking and water heating. ■



Information for Energy Group

OIL PRICE INFORMATION

19 February 1991 — IP Week

The following papers will be presented:

Problems of Reporting The Oil Market and Sources of Oil Price Information

Adrian Binks, Editor, Petroleum Argus

Why Gas Prices Aren't Just Oil Prices In Disguise

James Ball, Director, Gas Matters

Surviving As A UK Fuel Buyer

John Hall, Fuel Price Analyst, John Hall Associates

Exhibits will be provided by: ICIS-LOR, Saladin Computer Systems, Telerate (UK), Reuters; Platts and Petroleum Argus.

For further information and a copy of the registration form, please contact Mrs Jean Etherton, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK. Telephone: 071-636 1004. Telex: 264380.

Fax: 071-255 1472.

To insulate or not to insulate

The article 'New insulation for flanges' by RR Gould which appeared in *Petroleum Review*, August 1990 issue, although interesting, appears out of step with current thinking in the petrochemical industry. The concept of insulating valves and flanges is now being called into question.

There is no doubt that there are energy savings to be made from the application of insulation but there are several other factors to be taken into consideration, chiefly the safety hazards of insulating hot oil or gas lines. A small leak from a flange on a hot oil line could lead to the saturation of the insulation which could eventually ignite.

Similarly, a leak on a gas line could lead to a contained build-up of gases which could allow the possibility of an explosion.

If flanges are being insulated purely to protect operators from hot surfaces, (personnel protection) mesh guards, fabricated from expanded metal, offer this protection and allow a flow of air over the flange surface dissipating any gaseous build-up or oil deposit and also have the advantage of allowing earliest possible detection of such leaks as the flange remains visible.

The author is correct in stating that previous types of insulation boxes are not wholly suited for the job but fails to point out that aluminium, which was widely used in the fabrication of these boxes, is now considered a hazard in

the event of a fire because of its relatively low melting point and is generally not now specified for this use.

Because of experiences with corrosion under insulation problems, a greater amount of attention has been paid to the design of insulation boxes to ensure there is less likelihood of ingress of water. This is achieved by the use of angled tops to minimise ponding and collars at pipe run ends. As these boxes are intended to be portable, attention has to be paid to the method of sealing ends and seams. Conventional methods of sealing include mastics which are applied by hand caulking gun but this system of sealing has a major draw-back in that certain mastics degenerate under ultraviolet light and are prone to cracking. To overcome this problem, butyl rubber strip is often used. It is also important to ensure the piping insulation system is independently sealed so that it remains watertight if the box is removed for any reason or if a leak occurs.

Flexible flange covers have been used on petro-chemical complexes with varying degrees of success and although useful for awkward shaped pieces of equipment, their ability to prevent the ingress of water must be called into question.

Furthermore, it has been found in practice that after a period of time, perhaps 12-18 months, they tend to



Typical mesh guards

lose their flexibility rendering them more difficult to refit.

To conclude, the question must be asked if there is a need to insulate in the first place; if the potential hazards outweigh the energy savings and there is no operational justification for the application of insulation, it would be more advantageous not to insulate. Hot and cold flange design, with steels to suit, is well enough established to overcome the phenomenon of creep in steel. This need not be an issue in whether to insulate or not. If the case for insulating a valve or flange is overwhelming, rigid boxes can and are being designed to fit this role.

Tony Hughes
Consultant

Letter to the editor

To The Retail Petrol Business,

I was one of those unfortunates who found themselves stranded and abandoned in the West Midlands on Saturday 8 December. Along with countless others I finally ran my tank dry trying to keep warm with the engine heater. Why were no petrol stations able to supply motorists during this period? The huge power cut put all the pumps out of action — so why don't filling stations have emergency generators?

Irrespective of the amount of actual business lost, there could have been lives lost as a result of these garages inability to raise petrol from their tanks. I'm sure the relatively small unit costs would be recouped within the first couple of hours of a repeat of such conditions.

Yours faithfully,
Brian W Engel

Biofilms in metal-working cutting fluids

By Sarah Kinniment, postgraduate student at University of Wales College of Cardiff

The aim of this IP sponsored research project was to establish a stable reproducible biofilm system which could be used to test the effects of biocides and other additives on biofilm derived from metal working fluids. The project entailed as complete an investigation as possible into the structure and physiology of any biofilm generated.

The first part of the work involved isolating a group of organisms from contaminated metal working fluids. More than 70 such isolates were obtained. The majority of these were gram negative rods classified as pseudomonads or relatives of this ubiquitous group.

The constant depth film fermenter, developed in Cardiff, was used throughout the project. Here the aim was to produce full pans, 300 μm deep. The medium selected for the project was a simple mixture of triethanolamine and fatty acids, mainly oleic acid, plus minerals and vitamins (AC medium).

Emulsifiable oils and water soluble synthetic cutting fluids which contain a range of hydrocarbons and other organic molecules such as anti-corrosive agents (ie triethanolamine) and emulsifiers (ie fatty acids) are vulnerable to breakdown by microorganisms, and microbiological contamination can necessitate the early replacement of these materials (Harris, 1986).

Microorganisms in their natural habitats are generally associated with film growth and as such are often much less sensitive to antimicrobial agents than are the same microbes in dispersed suspension (Nichols, 1989). Controlling the growth of microorganisms in these biofilms is therefore one of the keys to extending the service-life of metalworking fluids.

The very complexity of biofilms, makes *in situ* studies difficult, suggesting that laboratory model systems are required if the fundamental properties of microbial film are to be understood. Several classes of model film fermenters have been described in the literature, while the area has been reviewed recently in a Dhalem conference on biofilms (Wilderer & Characklis, 1989).

In natural systems, biofilm generally accumulates to a limiting thickness, when whole sections of the biofilm detach, usually followed by recolonisation of the surface. We feel that steady-state biofilm has advantages when con-

sidering the spatial order of the biofilm, for measuring penetration or the biological effects of anti-microbial agents as a function of depth and time or for investigations using micro-electrode measurements. One way to obtain a quasi-steady state biofilm is to allow it to proliferate to a pre-set depth after which further accumulation is removed.

Constant depth biofilm fermenters were first described by Atkinson and Daoud (1970). The idea was developed by Wimpenny (1981) for a fermenter designed to investigate the growth of dental plaque organisms. The model was improved further by Peters and Wimpenny (1988). Model systems fall into two groups: those which seek to mimic a specific natural system and those more abstract in concept, which aim to model selected elements of it. The design of the Cardiff constant depth film fermenter was predicated on the need to bridge the gap between these two and to provide answers which are not easily obtainable from natural microbial film.

Methodology

Film grows on a number of pans which can be removed for examination, with each pan containing six PTFE or stainless steel plugs on which the film grows. Plugs can be accurately recessed using a template to depths up to 500 μm . The steel turn-table on which the PTFE pans are located, rotates at 1-10 rpm

beneath angled scraper bars. Pans are each drilled with a central threaded hole into which a special tool is inserted for removal and replacement. Each film pan produces six film samples, one from each plug. The fermenter is autoclavable and the design allows aseptic removal and replacement of film pans.

Temperature is controlled via a sensor, a control unit and an infra-red heating lamp. The complete assembly consists of an inoculum recirculation system, a sterile medium reservoir, peristaltic tubing pump, growback traps, the fermenter itself and waste receiver.

In the project described here the inoculum was allowed to recirculate in 500 ml of medium for 12 hours. The main batch of sterile medium was then connected to the fermenter at a flow rate of 1 ml min^{-1} . At the same time the waste outlet port is connected to a large sterile waste vessel. The fermenter was run with an air flow rate of 250 ml min^{-1} at a temperature of 30°C.

Experimental findings

Early experiments were concerned with generating a consistent biofilm; however, initial groups of isolates never produced a discrete film. Instead a structureless slime was formed. A combination of reducing medium concentration and selecting specific isolates led to good film formation. Statistical tests reveal that a satisfactorily reproducible film is generated.

Many biocides are formaldehyde derivatives and formaldehyde was used as a model biocide. Formaldehyde treated biofilm showed a concentration dependent fall both in protein concentration and viable count. Similar experiments with suspended cultures showed a dramatic difference. Formaldehyde kills 'planktonic' bacteria far more effectively that it kills bacteria in biofilms (Figure 1).

Following this part of the work, it became clear that the methods available for dispersing biofilm organisms to enable their enumeration were unsatisfactory. It was decided to optimise the procedure by investigating a range of dispersal methods including sonication, agitation with glass beads, the use of glass homogenisers etc. In the end the use of glass beads together with the dispersing agent, cirrasol (ICI Organics) and sodium pyrophosphate, was selected.

The samples of biofilm generated were investigated microscopically using transmission (TEM) or scanning (SEM) electron microscopy. Control biofilm samples show depth dependent changes in TEM sections. Near the surface organisms appear to be densely packed, entire and apparently 'healthy'. Towards the base of the film many cells appear to have lysed or to be vacuolated. SEM pictures confirm that surface cells are undamaged and densely packed. Formaldehyde alters the appearance of biofilm organisms. Surface clumping is apparent and beaded filaments are seen in SEM and TEM pictures.

A start has been made on cryostat sectioning of biofilm. This represents an exciting development since it will help to reveal something of the heterogeneity and metabolic structure of biofilm. Several different methods for cryosectioning have been developed. So far it has not been possible to prevent a large drop in cell viability in frozen sections. Further work is planned in this direction.

Future work

Future work will include further examination into the effect of formaldehyde on film viability and protein content and will be extended to the use of other biocide such as phenolics. Investigations of biocide treated and untreated film by electron microscopy will be continued. The heterogeneity of film metabolic status across the film profile will be explored further using cryosectioning viability and histochemical studies, adenylate and energy charge analysis and measure-

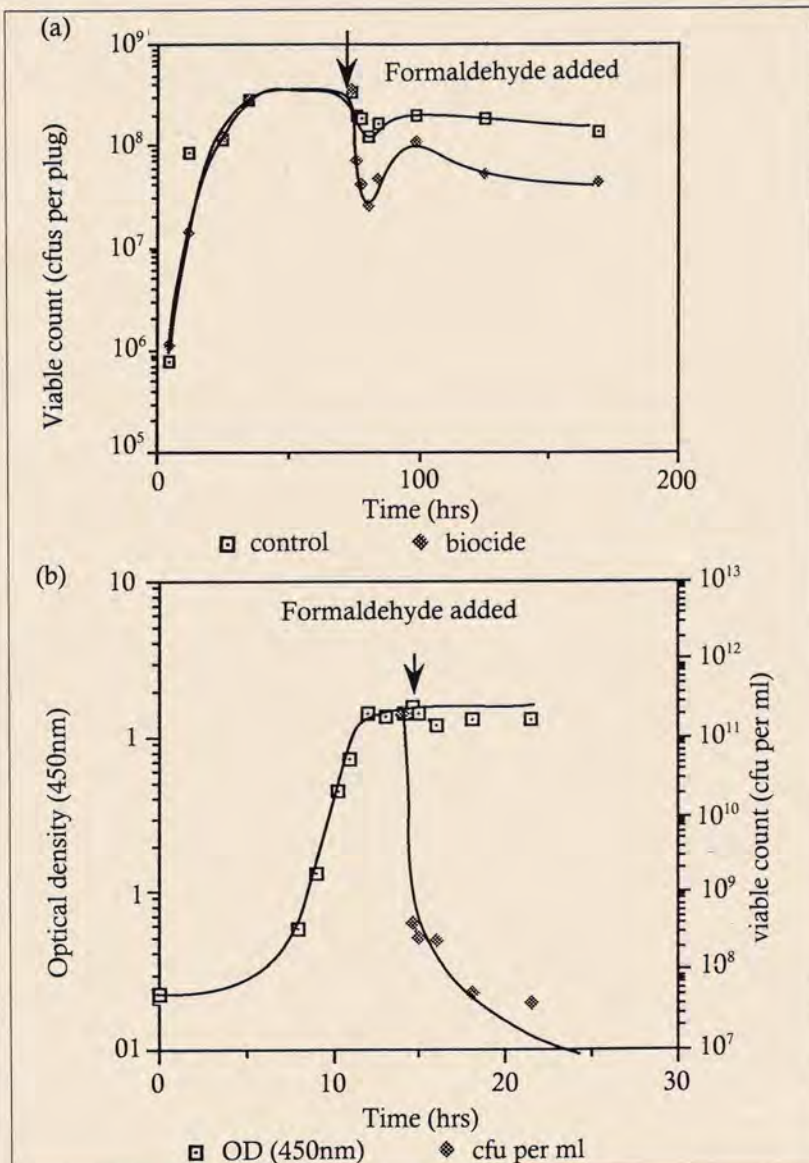


Figure 1: The effect of 400ppm formaldehyde on growth and viability of *Pseudomonas aeruginosa* (a) biofilm (b) liquid culture.

ment of oxygen and pH profiles across the film.

The initial work on the project has so far used oil free model fluids. Testing could now take place on oil containing microemulsions. Finally, if time permits, we plan to try to construct a stable consortium of typical metal-working fluid organisms which are capable of generating a dimensionally stable biofilm.

A more detailed account of this research is available in the report submitted to the Institute of Petroleum Library.

This research is supported by a contract from the Institute of Petroleum, which we gratefully acknowledge. Thanks are also due to Mr P Ruane and to Dr C Townsley of Burmah-Castrol.

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Exploration and Production

The Cullen Report on safety in UK offshore operations was published as the IP 'Drilling and Production Safety Code for Offshore Operations' was about to be printed. The recommendations of this Report impact on the Code and consequently an additional Appendix, providing information about the Report and its recommendations, has been included. The Code will now be published in the second half of February.

A third draft stage has been reached with the Code of Practice for 'Well Control during Drilling and Testing of High Pressure Wells'. The main concern has been with agreeing procedures which provide adequate protection when the equipment used for well control is rated lighter than the full bottom hole temperature and pressure.

Refining and Marketing

Following the meeting of the Conveyance Panel with HSE, a programme of tests of P/V valves taken from road tankers in service has been organised to persuade HSE that routine removal and testing of these valves during their six-year life in a vehicle is unnecessary.

The Conveyance Panel has met HSE to discuss:

- a) Immobilisation of top loaded RTW's whilst discharge hoses are connected.
- b) The safety of split delivery operations with top loaded vehicles.
- c) The area classification of the RTW cab during loading operations.
- d) Rear markings for lorries.
- e) Side guards on vehicles.

Panel C is carrying out an analysis of serious road tanker accidents and their causes. It is also establishing a means for the dissemination of information relating to the design and operation of petrol tankers.

The recently constituted Vapour Recovery Panel has started work on a Code of Practice to give advice on all aspects of vapour recovery at oil installations.

The Aviation Liaison Committee has prepared a first draft of a Code of Practice on design and construction of aircraft refuellers, at the suggestion of HSE. The Committee is also considering a proposal for major development work on maintenance techniques related to hydrant fuelling systems.

Final drafts of the two Measurement publications 'Calculation of Oil Quantities' and 'Calculation Procedures for the Static Measurement of Refrigerated Hydrocarbon Liquids' have been completed. These are being converted to ISO format and will then be balloted etc for publication in 1991.

A Workshop on the subject 'Problems Encountered During Independent Inspection of Crude and Petroleum Product Shipments' was held in December and was well attended. A summary of the proceedings will appear in *Petroleum Review*.

Good progress has been made on preparing a Fire Precautions Code. A draft of the major core areas has been produced and is being finalised before proceeding to the more peripheral sections.

Comments on the Users' Guide to Potential Safety Hazards of Hydrogen Sulphide in Heavy Fuel Oil have been received from various UKPIA and IP Committees.

The Guide will be redrafted in 1991 and reissued for comment.

A revision of the Supplement to the IP Pipeline Code has been delayed pending reappraisal of the treatment of stress factors in pipeline design.

The Bitumen Code publication has now been re-scheduled for February 1991.

Standardization

Work continues on developing and revising new test methods to bring them in line with current editorial and technical requirements. Two new full methods 'Volatility of Automotive Lubricating Oils by Thermogravimetry IP 393' and 'Air Saturated Vapour Pressure of Petroleum Products IP 394' will appear in the 1991 Test Method Book together with four new proposed methods.

A number of round-robin correlation programmes have been set up to establish the precision of various methods. Many of these incorporate laboratories from outside the UK demonstrating the present international aspect of IP test method production. However the costs of this important aspect of method development are having to be re-examined.

A Task Force has been set up for Analysis of Diesel Particulates. The aim is to produce standard test methods for submission to CEN for use throughout Europe and possibly the world. Inaugural meetings have clearly shown the keen interest of both UK and overseas companies and it is hoped to have some methods in place during 1992.

Health and Environment

A successful conference on 'Oil Mists' was held in October and reported on in the December issue of *Petroleum Review*.

A further year's work on biofilm growth has been sponsored in the industrial environment.

The first progress report of the project to investigate the Bioavailability of Carcinogens from Oil by the British Biological Research Association has been received.

The drafting of the Code of Practice for the Safe Handling of Drilling Fluids is nearing completion.

The first draft of a Code of Practice for Occupational Hygiene Audits has been produced and is undergoing further development by a working group.

An environmental project to prepare Guidelines for Site Investigations of petroleum based contaminants has been endorsed for completion in 1991.

An Environment Discussion Group has been established. The Director of Her Majesty's Inspectorate of Pollution spoke at the inaugural meeting and the Water Quality Manager of the National Rivers Authority will give a presentation at the next meeting.

General

An Institute of Petroleum list of consultancy services offered by members is being established and should be available by the end of February.

J Hayes, Technical Director

Exploration boost

The Petroleum Science and Technology Institute has placed an important oil exploration research project at the University of Aberdeen. The £900,000 Project Hedera is an initiative of Amerada Hess Limited and the Institute and will be co-sponsored by the Department of Energy. The two year project started in January.

Project Hedera plans to establish a new modular basin analysis system for oil company explorationists to carry out quantitative, three dimensional analysis of sedimentary basin development and related hydrocarbon generation, migration and entrapment. The project aims to harness the best available science in UK universities and through the development of a new basin analysis workbench, based on industry — standard hardware platforms, improve the reliability of exploration risk assessment and promote exploration success.

Project Hedera will be conducted by the Institute's project team based in the Department of Geology and Petroleum Geology, University of Aberdeen. A committee, consisting of leading academics in basin analysis together with an authority on advanced software design, will provide technical guidance. The Hedera project will be calibrated and tested using data provided by Amerada Hess.

A corporate design has been created for Hedera, the latin name for ivy, and the final software product will be marketed to oil companies operating in the North Sea and around the world. Profits will be returned to the Institute for investment in further research projects.

In addition to conducting contract research projects, such as Hedera, the Institute has responsibility for managing an extensive research programme sponsored by 37 oil companies and the Department of Energy.

Biaxial tiltmeters

A new generation of precision tiltmeters from American-based Applied Geomechanics Inc measures the deflections, deformations and stability of natural and engineered structures. Readily interfaced to standard control modules or data acquisition systems, these rugged instruments track the behaviour of critical structures, automatically detect movement, activate alarms and monitor long-term performance.

Applied Geomechanics' versatile 700-series and new ultra-high precision 500-series tiltmeters can be installed on horizontal, vertical or slanting surfaces and in shallow or deep boreholes.

Piper Bravo safety system



The Rt Hon John Wakeham, MP, Secretary of State for Energy (seated) inspecting the ICS Bailey Controls control/safety system for Piper Bravo oil rig, during his visit to the company's Telford headquarters which he officially opened recently.

With Mr Wakeham are Mike Mason, director, ICS Bailey Controls Ltd and (right) Peter Hall, Chief Executive, Industrial Control Services plc.

Tanker vents

A replacement programme for old-style vent valves on petrol tankers has been announced by the Health and Safety Executive.

All old-style valves will have to be replaced by 31 August 1992, in a programme that HSE has agreed following discussions with industry. After that date HSE inspectors will check to see that new-style valves have been fitted.

Since 1 January 1987 all new petroleum-spirit-type tankers should incorporate the new design of valve. This latest announcement extends the rule to tankers built before that date.

Rugged reels

A comprehensive selection of standard reels for a diverse range of industries is available from Amendola Engineering of Birmingham.

Manufactured in the United States by leading manufacturer Hannay Reels, they blend high tech design with quality craftsmanship. Of rugged construction, the versatile range includes reels for mounting in factories, vehicle mounting types and portable models for carrying to site.

Monitor

A new, permanently installed hazardous gas and fire monitoring system has been introduced by Kent-based Bedfont Instruments Limited. Designed for complete flexibility, the Gasmaster system can be specified with any combination of detectors for toxic or flammable gases, oxygen levels and fire. Systems with from one to four channels are available.

Quick response

Faced with an emergency subsea pipeline repair, a major UK diving contractor immediately turned to North Yorkshire-based inpipe products for assistance. The pipeline, which is in the Dutch sector of the North Sea, was damaged by a fishing trawler.

Working round the clock, inpipe products took only three days to design, manufacture and deliver the special hyperbaric pigs. To suit the internal diameter of the 10" oil pipeline, which was constructed from pipe with a non-standard internal diameter, the company had first to modify an existing tool. The hyperbaric pigs were moulded from ICI polyurethane and incorporated the company's own hyperbaric 'posiseal' inflation valve for proven diver safety.

Tough actuators



Rotork, the Bath-based manufacturer of electric valve actuators, has gone to extremes to prove the reliability of their product range. A recent Russian pipeline contract called for actuators that could withstand the rigours of a Siberian winter without reducing efficiency.

Rotork carried out 'on load' tests at ambient temperatures of 50°C without loss of performance. At the other end of the temperature scale, Rotork actuators were equally efficient.

In a recent hydrocarbon fire test, carried out at Faverdale Technology Centre witnessed by a Lloyds inspector, a standard 1600 Series Syncropak with a K-Mass moulded fireproof coating operated for 30 minutes at a temperature of 1,066°C.

Firefighter

Foam puts out ship fires safely and fast. Flexifoam, a new centralised system which can replace several systems normally in use on a ship, is now being introduced by Heien-Larssen A/S of Drammen, Norway.

For safety reasons, foam is expected to take over a major part of fire-fighting onboard ships from the other methods now in use.

The dominating extinguishing agents during several decades, halons and carbon dioxide, have serious drawbacks. Halons destroy the ozone in the upper atmosphere, while carbon dioxide is hazardous to crews because of its suffocating effect.

Foam has been in use for a long time, but recent advances in technology, equipment and system design have led to significant improvements. Lower installation and maintenance costs are added benefits.

The aim of the Flexifoam design development was that one system should be able to cover the whole ship.

From a central foamroom a foam premix is distributed to all the spaces where an extinguishing system is required. The degree of expansion needed in each different location is achieved by the choice of nozzles or generators.

The centralisation is particularly practical and cost-saving for tankers.

Cyclar

BP and UOP have announced the successful commissioning, start-up and first demonstration trials of the Cyclar process unit at BP Oil's refinery in Grangemouth. This unit is the first in the world to use the unique Cyclar process for the direct conversion of propane and butanes into high-quality aromatics and hydrogen. The products can be used for petrochemical or gasoline blending purposes.

Tanker tags

A high-tech hands-free access control system, from Cambridgeshire-based Strata Security, has been installed at Total Oil GB Ltd Langley terminal near Slough to help in the safe and correct filling of fuel tankers.

The new system uses radio frequency coded tags issued to drivers to ensure they collect the correct load from the correct bay.

Small reading heads at each loading bay identify the particular tag so that the right volume and type of fuel is dispensed by the delivery system.

New powerful skin protector



The need for powerful handcleansers that remove heavy industrial soiling without damaging the skin has been met by leading skin care specialist, Deb.

It was once common practice to add sand or sugar to soap to handcleansers in order to remove tough, ingrained dirt. To combat this malpractice, which frequently led to serious skin damage, Deb launched two heavy duty handcleansers, Tufanega and Suprega Plus.

Tufanega is a powerful cleansing gel containing micro-polymer granules, which act like minute scrubbing brushes to remove ingrained soiling.

Suprega Plus is a tough yet gentle solvent free hand cleanser, ideal for the removal of oil, grease, adhesives, most paints and general soiling because of its non abrasive polygrain action.



Lubricants specialist Millers Oils have appointed **Mr Bill Simpson**, above, as an area sales engineer. Mr Simpson, a former marine engineer, has extensive experience in the transport and engineering industries and joins Millers Oils from Fina where he spent 22 years as a lubricant sales engineer.

Osaka Gas Company Limited has announced the appointment of **Mr Shin-ichiro Ryoki** as its new President. Mr Ryoki succeeds **Mr Masafumi Ohnishi**, who is to become Chairman of the company.

Mr Terry Hazell, below, has been appointed Divisional Director and General Manager of Foster Wheeler Energy Limited's Glasgow Operations. Before his new appointment, as Manager Systems and Computer Applications and latterly as a Divisional Director, he has been responsible for the implementation of the company's investment strategy in computer design, management and information technology.



The Board of The British Petroleum Company plc intends to elect **Mr James Ross** a Managing Director of the company from April. Mr Ross will continue in his present position as Chief Executive Officer of BP America Inc but will also hold the position of Chairman. In addition he will have corporate responsibility for health, safety and the environment, and regional responsibility for the Western Hemisphere and for Africa.

The BP Board also intends to redefine **Mr Hugh Norton's** responsibilities as Managing Director. Mr Norton will be designated Managing Director with responsibilities for the Asia/Pacific and Middle East Region. He will retain his corporate responsibilities for Information Technology and Education but, since he will be resident in Singapore, he will relinquish the Chairmanship of the BP Exploration Board where he will be succeeded by **Mr David Simon**, BP's Deputy Chairman and Chief Operating Officer.



MW Kellogg Company has appointed **Mr Eric L Moorehead**, above, manager of the Kellogg Technology Development Center in Houston. His appointment strengthens Kellogg's commitment to the development and commercialisation of leading-edge technologies for the petrochemical, refining and process industries.

Stone & Webster Engineering Limited has appointed **Mr James Glass** as a Director, he was formerly Manager of Projects and Associate Director. Mr Glass has worked for Stone & Webster for 20 years on a variety of major petrochemical and electrical power projects and will continue as the company's Project Manager on the BP Chemicals HG Ethylene Project, Grangemouth.

The title of Honorary Professor has been conferred by Heriot-Watt University on **Mr Alan Wilson**, Research and Development Manager, Total Oil Marine plc, in recognition of his continuing support for research activity in the university and his contribution to teaching in areas of offshore technology and design. In Professor Wilson's career with Total, he held various technical advisory and managerial positions, working in Nigeria, Holland, Norway, France and Britain, including some 17 years' association with North Sea offshore activities, particularly the Frigg Transportation System, Ekofisk, Alwyn, Statpipe and a North Sea gas gathering proposal.

WS Atkins' new Glasgow office will be under the direction of **Mr Crawford Currie**, formerly regional manager for Harry Stanger in Scotland.



The Association of British Independent Oil Exploration Companies has appointed **Mr Roland Shaw**, above, of Premier Consolidated Oilfields as its new Chairman. Other appointments are: **Mr Malcolm Gourley**, Clyde Petroleum as Vice Chairman, **Mr Ed Harris**, Enterprise Oil as Honorary Secretary and **Mr Joe Darby**, Lasmo North Sea as Honorary Treasurer.

Arthur D Little, the international management consultancy, has appointed **Mr Michael Bennett** as a Director of its global Energy and Chemicals Practice. In this position he will advise major oil and chemical companies on the strategic issues confronting these industries, and especially on matters concerning the refining and petrochemical sectors.



Aberdeen Service Company (North Sea) Limited have appointed **Mr John Snell**, above, as Marketing Director. Mr Snell has been working in the transport and logistics field for the past 17 years, most recently specialising in the area of downstream oil supply and distribution.

The Board of Directors of Phillips Petroleum Company have elected a new outside Director — **Mr Robert Chappell, Jr.**

Mr Flemming Jacobs has been appointed Managing Director of The Maersk Company Limited in succession to **Mr Niels Iversen** who is taking up a senior position in the AP Møller Group in the Far East. Mr Jacobs has held a number of posts in the United States and Europe, and for the last five years has been Executive Vice President with operating responsibility for Maersk Line International container services.

The UK Offshore Operations Association have appointed **Mr WSH Laidlaw**, below, Managing Director of Amerada Hess, as President.



Around the Branches

Aberdeen

- 12 February: AGM at The International Drilling and Downhole Technology Centre, Offshore Technology Park, Aberdeen. Presentation by Mr David Curry, Managing Director.
- 12 March: 'An overview of the Beryl field and its extensions' by Mr Howard Paver, Technical and New Development Manager, Mobil North Sea.
- 15 March: Dinner and Dance at Dyce Skean Dhu Hotel.

Edinburgh and South East Scotland

- 27 February: 'Commissioning' by Dr G Sachs, Leeds University (Joint meeting as guests of the Institute of Chemical Engineers at Training Centre, ICI Fine Chemicals Plant, Grangemouth).
- 14 March: Spouses' evening: 'Is Malt Whisky green?' by Mr J McColl, Morrison Bowmore Distillers Ltd.

Essex

- 13 February: 'Bitumen, Ancient and Modern' by TS Hoben, Technical Manager, Shell Bitumen.
- 13 March: 'Refinery construction and maintenance' by Mr GA Walley and Mr P Tarran, Shell UK Oil.
- 15 March: Annual Dinner Dance at the 'De Havilland Suite', Airport Moat House, Southend-on-Sea, Essex.

Humber

- 7 February: AGM followed by a lecture on the proposed development of the Immingham Bulk Terminal by a speaker from Associated British Ports.
- 1 March: Annual Dinner, Beachcomber, Humberston.

London

- 19 February: 'Alternative transport fuels of the future'. Speaker to be announced.
- 13 March: 'Eastern Europe — a new market for the oil industry' by Mr D Schultz, Consultant.

Malta

- 19 April: Annual Dinner.

Midlands

- 13 February: AGM followed by a talk entitled 'A History of the British Pub' by Mr Maurice Lovett. To be held at Edgar Vaughan and Co Ltd, Birmingham.
- 13 March: 'Industrial Dermatitis' by Dr IS Foulds, The Skin Hospital, Edgbaston.

Northern

- 12 February: AGM followed by a talk by Professor Glyn Morton.
- 12 March: Joint meeting with the Stanlow Branch 'Waste Management' by Mr John Lynch, Cleanaway.

Shetland

- 19 February: AGM followed by 'Emergency . . . you've got to believe it!' George Henderson, Emergency Planning Officer.

South Wales

- 16 February: Visit to BP Wytch Farm development, Dorset.
- 21 February: AGM and 'Garden Festival Wales 1992' by Mr G Cripps, Garden Festival Wales Limited, at Stradey Park Hotel, Llanelly.
- 21 March: 'The role of the Independent in the marketing of gasoline'. Speaker to be announced, at BP Oil Llandarcy.

Stanlow

- 20 February: 'Technology of burning Orimulsions' by Mr Hancock, Power Gen.
- 12 March: 'Waste Management' by John Lynch, Cleanaway. Joint meeting with Northern Branch.

West of Scotland

- 7 March: Petroleum Dinner.

Yorkshire

- 12 February: Joint meeting with the Institute of Energy.
- 22 March: Dinner Dance.



UK Retail Marketing Survey

To be published by Petroleum
Review March 1991

The UK Retail Marketing Survey, published annually in the March issue of Petroleum Review, has established itself as a valuable source of statistics and information.

In 1991 a new format is planned. The Retail Marketing Survey, extending to 32 pages, will be separated from Petroleum Review to form a supplement. It will continue to be sent free to all members of the Institute of Petroleum and subscribers to Petroleum Review.

Additional copies (price £25) can be ordered from the Library, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004; Fax: (071) 255 1472. Copies will be despatched on 6 March.

ORDER FORM

Please send me copies of the
1991 UK Retail Marketing Survey.

I enclose my cheque for £. made
payable to the Institute of Petroleum.

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COMPANY

ADDRESS

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Institute News

Obituaries

Mr Robert Dyk, a founder member of the UK Offshore Operators' Association, died on 7 January, aged 81. Mr Dyk came to London in 1964 to take charge of Hamilton Brothers (UK) operation; he continued in this role until he retired in 1980.

In 1975 Mr Dyk was awarded an honorary CBE for his contribution to the oil industry after Hamilton's Argyll field became the first into production on the UK Continental Shelf in June 1975.

Mr Dyk had been a member of the Institute of Petroleum since 1965, serving as Honorary Secretary of the Exploration and Production Discussion Group in 1970.

Ormsby Molony, a long-serving contributor to the technical activities of the Institute of Petroleum, died at the end of December, only three months after retiring from the British Standards Institution. He was 64.

Mr Molony, the first-ever recipient of a new IP award, the 'Certificate of Appreciation' (see *Petroleum Review*, December 1990), will be especially remembered at the IP as the BSI representative on the Petroleum Measurement and Standardization Committees over many years.

Born in 1926, Mr Molony graduated from Trinity College, Dublin in 1947. The following year he attended a course in Chemical Engineering at Battersea Polytechnic, while employed as a Research Officer at Powell Duffryn's research laboratories in London.

The rest of his early career, from 1950 to 1970, was spent carrying out research for the National Benzole Company, based at Watford. By 1970 he had risen to become Deputy Chief Chemist. In the same year he left to join the BSI as a Technical Officer, eventually becoming a Senior Technical Officer in 1975.

Deaths

We report with much regret the deaths of the following members:

	Born
RB Besley, White Colne, Colchester, Essex	1912
JA Beukers, The Netherlands	1898
NB Erlam, Bideford, North Devon	1947
EW Garrod, Didcot, Oxfordshire	1928
JA Kronsten, Reading, Berkshire	1912
MH Lowson, Cranleigh, Surrey	1903
B MacKenzie, Henley on Thames, Oxfordshire	1926
JB Pratt, Doyle Hill, Guernsey	1921
JY Thirlwell, Watlington, Kent	1924
DW Whittington, Chattenden, Kent	1929
HM Wilson, Lenzie, Glasgow	1918
LHP Wood, Pontesbury, Shropshire	1927

Petroleum Review Index

The 1990 annual index to *Petroleum Review* is now available. Please apply to: Library, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004

New Fellow

Iain L Webster has been active in the petroleum inspection industry since graduating in 1978 with an honours degree in biochemistry from Manchester University. He has held various managerial positions with SGS Redwood in the Middle East before being appointed Assistant Vice-President of SGS Redwood Geneva. Mr Webster is a Member of the Royal Society of Chemistry holding the title Chartered Chemist, and is an active member of the Measurement Committee PML3 of the Institute of Petroleum.

New Members

Ahmad, I, Petroleum Research Centre, PO Box 6431, Tripoli, Libya
Amsil, PG, Hollies High Street, Buxted, East Sussex TN22 4JU
Banks, RJ, Blagden Packaging Ltd, Nash Road, Trafford Park, Manchester M17 1SX
Barnes, JS, Deep End, London Road, Southborough, Tunbridge Wells, Kent TN4 0UJ
Barr, J, 26 Barnes Avenue, Chesham, Buckinghamshire HP5 1AP
Barracough, MR, 15 Broom Park, Teddington, Middlesex TW11 9RN
Baynton, LP, 16 Bents Park Road, South Shields, Tyne and Wear NE33 2NL
Beattie, JE, 'Straw Cottage', 73 Ware Street, Bearsted, Kent ME14 4PG
Beer, MJ, Sylmar, 3 Peak Close, Armatage, Rugby, Staffordshire
Bennett, R, Sankt Annpe Gade 22, ITV, Copenhagen, Denmark DK-14-16
Best, AG, Wincanton Transport Services, Cale House, Stafford Road, Wincanton, Somerset BA9 9AD
Blakemore, KW, 7 Hoodcote Gardens, Winchmore Hill, London N21 2NG
Britton, LC, Technical Audit & Consultancy Ltd, 33 Hempstead Road, Kings Langley, Hertfordshire WD4 8BR
Bruce, C, 25 Oldfold Crescent, The Meadows, Milltimber, Aberdeen AB1 0JY
Burnside, A, 30 Gordon Place, London W8 4JE
Butterworth, KR, Allenwest Electrical Ltd, Wallacetown Division, Heathfield Road, Ayr KA8 9SR
Bye, DW, 13 Arundel Road, Benfleet, Essex SS7 4EF
Cameron, DJ, Rosemount, 7 Haddon Road, Perth PH2 7JA
Campbell, HD, 8 Sudeley Close, Malvern, Worcestershire WR14
Carlsson, Capt SE, Hus 376, S-430 84, Styrsoe, Sweden
Christenson, CO, Spektrumsgatan 11, S-421 63, Va: Frolunda, Sweden
Clendenning, IC, 19 Chauncy Gardens, Baldock, Hertfordshire SG7 6SZ
Czternastek, ZJ, Milford Associates Ltd, Oakleigh House, 6 Oldbury Chase, Willsbridge, Bristol, Avon BS15 6DV
Davis, BM, 172 Hanging Hill Lane, Hutton, Brentwood, Essex CM13 2HE
Dixon, RJ, 31 Bridgewater, Londonderry, Northern Ireland
Donnelly, J, 42 Larrickhill Walk, Portmarnock, Dublin
Dorrington, GC, 15 Alma Drive, Chelmsford, Essex CM1 1TW
Douglas, GH, 11 Robertwood Drive, Chalfont St Peter, Buckinghamshire SL9 0NH
Elmore, M, 84 Rathdown Park, Terenure, Dublin 6W, Ireland
Etman, A, 17 Sainte Genis Str, Roushdy, Alexandria, Egypt
Faber, WE, Craft Cottage, High Street, Newport, Essex CB11 3PF
Ferguson, PL, 119 Hillbury Road, Warlingham, Surrey CR3 9TG
Forsyth, W, 23 Scotts Hill Lane, Christchurch, Dorset BH23 1HF
Fraser, GM, 4 Forkedale, Barton on Humber, South Humberside DN18 5NE
Freeman, RW, 79 Moun Road, Chessington, Surrey KT9 1JH
Gelling, KP, 35 Harvey-Goodwin Avenue, Cambridge CB4 3EX
Goodwin, PA, 15 Cronarty Place, Brancunhall, East Kilbride G74 3LR
Green, AJ, 3 Magistrates Court, Church Lane, Ledbury, Herefordshire HR8 1DL
Green, MJ, 10 Highview, 49 Shepherds Hill, Highgate, London N6 5QW
Grieve, A, 35 Woodview Drive, Airdrie, Lanarkshire ML6 9HJ
Haines, J, 9 Rivermead Drive, Garstang, Lancashire PR3 1JJ
Haque, TR, 103 Hervey Close, Finchley, London N3 2HG
Harrison, CP, Shell UK Oil Ltd, Shell-Mex House (Ref UOCS), The Strand, London WC2R 0DX
Hassan, MF, Arab Petroleum Pipeline Co, 'Sumed', 431 Elguish Street, Louran, Alexandria, Egypt

Institute News

Houghton, JG, Rathnew, Co Wicklow, Ireland
 Hayes, SSgt L, HM Forces, BFHKPI, Borneo Lines, Sek Kong, BFPO4
 Head, RN, 25 Lyveden Road, London SW17 9DT
 Hendrix, RE, 1001-4 Nantucket, Houston, Texas 77057, USA
 Holloway, ML, 4 Lakeview, Canvey Island, Essex SS8 9XR
 Holmes, CH, 56 Cranmore Lane, Aldershot, Hampshire GU11 3BB
 Hudson, TG, 1 Sydney Close, Crowthorne, Berks RG11 6LQ
 James, TG, 50 Jackson's Lane, Highgate, London N6 5SX
 Jennings, K, 9 Talbot Road, Immingham, South Humberside DN40 1EU
 Johnston, JAA, 14 Braeside Crescent, Cowie, Stonehaven AB3 2RL
 Kelly, JM, 1/30 Garfield Road, Battersea, London SW11 5PN
 Lacy, MJ, 21 Rutland Crescent, Ormskirk, West Lancashire L39 1LP
 Landolt, RB, Harp House, Henwood Green Road, Kent TN2 4LN
 Leung, PH, Unit 2906, Block D, 238 King's Road, North Point, Hong Kong
 Macgregor, RJ, The Craig, Cromlet Drive, Invergordon, Ross-shire IV18 0BA
 Maimako, AZ, No 4 Anfani Street, Inukazi Gongola State, Nigeria
 Mason, NCM, 6 Fairoak Close, Kenley, Surrey CR8 5LJ
 Masson, D, 91 Raeden Crescent, Aberdeen AB2 4YL
 McDowell, C, 90 Fruitlands, Malvern Wells, Worcestershire WR1 4XB
 Millington, KS, 1 Kedleston Green, Stockport, Cheshire SK2 5DQ
 Milne, AS, 57 Strathbeg Drive, Dalgety Bay, Fife KY11 5XQ
 Milne, GR, 41 Meadow Road, Worcester WR3 7PP
 Mirzoeff, J, 9 Westmoreland Road, London SW13 9RZ
 Montgomery, DL, 1 Hamilton Terrace, London NW8 9RE
 Moore, G, Cape Cottage, 15 Beaumont Hill, Great Dunmow, Essex CM6 2AW
 Muriritirwa, W, PO Box 6348, Harare, Zimbabwe
 Nabavi, F, 20 Risley Avenue, Tottenham, London N17 7EU
 O'Mahony, J, 24 Newlyn Vale, Rochestown Road, Cork, Ireland
 Obata, H, The Sumitomo Bank Ltd, Temple Court, 11 Queen Victoria Street, London EC4N 4TA
 Outen, GP, 157 Branksome Avenue, Stanford-Le-Hope, Essex SS17 8BY
 Raggett, B, Grove House, Wilderness Road, Woodhurst Park, Oxted, Surrey RH8 9HA
 Reynolds, JM, 21 Kiln Drive, Evercreech, Somerset BA4 6AT
 Rix, JGR, Greig Middleton Ltd, 214 High Street, Guildford, Surrey GU1 3JX
 Rix, WJ, 57 Stanley Avenue, St Albans, Hertfordshire AL2 3AA
 Robinson, WD, Trinoel, 15 Kemnal Park, Haslemere, Surrey GU27 2LF
 Rowson, RS, 30 Wood Lane, Ruislip, Middlesex HA4 6EX
 Roychowdhury, AK, Flat No 2A, Minto Park Syndicate, 13 Debendralal Khan Road, Calcutta 700027, India
 Rutherford, KJ, 8 Higher Green, Ewell, Surrey KT17 3BA
 Sammut, F, Stafford House, Tas-Silg Road, Juno Heights, Marsaylokk, Malta
 Samson, R, 14 Catherine Grove, Bo'ness, Scotland EH15 9UA

Schaafsma, MG, 162 Kings Gate, Aberdeen AB2 6BP
 Scott, DR, 73B Pelham Road, Wimbledon, London SW19 1NX
 See, KS, Lot 247A, 1st Floor, Goh Mee Loke Building, Jalan Setia Raja, PO Box 1916, Miri, Sarawak, Malaysia 98008
 Setchell, DL, South Hayes, Sandy Lane Road, Cheltenham, Gloucestershire GL53 9DE
 Side, JC, 3 Dundonald Street, Edinburgh EH3 6RX
 Smith, DC, Marden, Rusper Road, Ifield, West Sussex RH11 0HS
 Snaddon, SM, 16A St Augustine's Road, Camden Town, London NW1 9RN
 Sparke, JM, 16 College Close, Dalton Piercy, Hartlepool, Cleveland TS27 3JA
 Taher, S, 16135 Aldine Westfield, Houston, Texas 77032, USA
 Tate, JD, International Paint, 27 Albert Embankment, Vauxhall, London SE1 7TJ
 Tomi, JH, 35 Chalton Street, Euston, London NW1
 Tomlinson, BH, 45 Westhurst Drive, Chislehurst, Kent BR7 6HS
 Turner, JR, 67 Harrow Road, West Bridgford, Nottinghamshire NG2 7DW
 Walker, RS, 51 Gracechurch Street, London EC3V 0BD
 Ward, PA, 8 Chantry View Road, Guildford, Surrey GU1 3XR
 Whittaker, RJ, 221 Great Gregorie, Lee Chapel South, Basildon, Essex SS16 5QU
 Whyatt, SJ, Flat 2, 26 Queens Avenue, Muswell Hill, London N10 3NR
 Wilders, BJM, 34 Fitzwilliam Road, London SW4 0DN
 Williams, T, 26 Maxwell Avenue, Mancot, Deeside, Clwyd CH5 2AT
 Wonah, P, PO Box 4, Bansara Yahe, Cross River State, Nigeria
 Woodhouse, NG, PLMS Ltd, Bergstrand House, Broadley Park Road, Roborough, Plymouth, Devonshire PL6 7EZ
 Wootton, AL, 24 Sheepcotes Lane, Southminster, Essex CM0 7AF
 Yolland, SJ, 1 Hollytree House, Bridge Road, Ebley, Stroud, Gloucestershire GL5 4TR

Student Prize Winner

Bartlett, TW, "Wynchem", Dhinnor Road, Aston Rowant, Oxford OX9 5SH

Students

Anderson, JE, Flat 7, 5 Christchurch Road, Surbiton, Surrey KT5 8JJ
 Baabood, AS, 13 Consort Lodge, Prince Albert Road, London NW8 7LX
 Basheer-Ahmed, J, 33 Royal Park Avenue, Leeds, West Yorkshire LS6 1EZ
 Ferguson, NS, Grey College, South Road, Durham DH1 3LG
 MacDonald, AJ, 3 Wellington Street, Stoke, Plymouth PL1 5RT
 Porras, E, 19 Alpha Court, Hillside Road, Whyteleafe, Surrey CR3 0BU

Deliveries into Consumption

UK deliveries into inland consumption of major petroleum products —Tonnes

Products	Nov 1989†	Nov 1990*	Jan–Nov 1989†	Jan–Nov 1990*	% change
Naphtha/LDF	375,000	269,910	3,076,950	2,789,030	-9.4
ATF—Kerosine	485,770	464,560	6,092,170	6,111,030	0.3
Motor Spirit	2,031,900	2,020,780	21,964,820	22,358,810	1.8
of which unleaded	570,840	758,120	4,082,312	7,078,660	73.4
Super unleaded	n/a	84,400	n/a	843,460	
Premium unleaded	n/a	673,720	n/a	6,235,200	
Burning Oil	214,290	183,290	1,680,720	1,793,920	6.7
Derv Fuel	929,310	936,170	9,330,260	9,842,920	5.5
Gas/Diesel Oil	764,330	733,390	7,575,310	7,343,020	-3.1
Fuel Oil	1,107,060	748,230	9,298,990	11,078,594	19.1
Lubricating Oil	76,700	63,970	817,290	770,814	-5.7
Other Products	550,110	501,900	6,055,660	5,902,662	-2.5
Total above	6,534,470	5,922,200	65,892,170	67,767,440	2.8
Refinery Consumption	503,220	482,800	5,309,140	5,310,900	0.0
Total all products	7,037,690	6,405,000	71,201,310	73,078,340	2.6

†Revised *Preliminary n/a not available

**BRITISH GAS SENIOR RESEARCH FELLOWSHIP IN SAFE PLANT DESIGN**

Applications are invited for the new British Gas/Fellowship of Engineering Senior Research Fellowship in Safe Plant Design at Loughborough University of Technology. The appointment will be for five years with the possibility of extension for a further two years.

The successful candidate will carry out independent and original research in the broad field of Safe Plant Design. It is expected that the research programme will be in areas related to British Gas operations and will provide information and guidance of national and international benefit. Some examples of possible topics are risk assessment, especially for cost-effective plant design and for demonstration of compliance with regulations; fault propagation monitoring; hazard identification techniques; fault tree synthesis; failure assessment of sequential operations; expertise in design of safe plants; safety critical process control software; process computer alarm diagnosis. However, candidates are encouraged to suggest the particular approaches they will adopt and to discuss their ideas in advance with British Gas Midlands Research Station (MRS).

Candidates should normally be under 40 years of age, and able to demonstrate proven ability in the areas of work being proposed. They may come from either an academic or industrial background. This is a senior research appointment and the salary will be commensurate with the experience and expertise required in this important area. It will not be less than £26 000 pa. There will be significant provision for research expenses.

Further Information – including the terms of the appointment, some areas of interest within the field of Safe Plant Design, general information about Loughborough University of Technology, the name of a contact at MRS and the procedure for application – are obtainable from Miss J Spring, Manager, Engineering Support, The Fellowship of Engineering, 2 Little Smith Street, London SW1P 3DL (071-222 2688) to whom applications should be sent to arrive no later than 3 April 1991.

INTERNATIONAL PETROLEUM ABSTRACTS

INCORPORATING

OFFSHORE ABSTRACTS

First Issue March 1991

Editor: Gretchen E Taylor

This new quarterly journal provides an extensive review of the onshore/offshore oil and gas industry. Literature concerning oil and gas exploration and development, petroleum refining and products, economics and offshore technology is covered. This selective compilation includes geology, geophysics, drilling, production, transport, refinery processes, analysis and testing, gas, oil and bitumen. This information is abstracted from a world-wide coverage of scientific and technical journals, conference papers, research reports, trade literature, standards and patents. The abstracts, which are indicative and partially informative, provide a comprehensive information service, which in combination with online access to the database via the Pergamon Orbit host, provides a key to all aspects of the petroleum industry.

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THE INSTITUTE OF PETROLEUM

Standard Methods for Analysis and Testing of Petroleum and Related Products 1991

Volumes 1 and 2

Standardised methods for the testing and analysis of petroleum are necessary to ensure reproducibility of results between buyers and sellers at all levels. Such methods do not stand still. As particular technical advances are made—faster, more accurate procedures present themselves and have to be assessed for their utility.

The methods for analysis and testing contained in IP Standards are reviewed constantly and a revised edition incorporating new, proposed and modified standard methods is published annually.

This edition which has been printed in A4 size contains over 250 Full and 14 Proposed Methods, for the analysis and testing of Petroleum and Related Products.

IP Standards are designated Standard or Proposed:

Standard Methods — methods that are firmly established. They will normally include precision data which have been obtained by statistical examination of inter-laboratory test results or, where this is not possible, contain a statement of reliability. These methods are still subject to revision and often form the basis of joint ASTM-IP methods and international standards. (Standard methods are reviewed every 5 years).

Proposed Methods — methods published for information and comment. They remain as proposed methods for not more than 3 years unless an extension of 3 years is approved by Standardization committee. After this they are either withdrawn or advanced to Standard.

This edition sees the revision of the majority of the methods which includes:

- The adoption of four ISO methods which replace the previous IP methods;
- Deletion of °F from all except the density methods.
- Change of dimensions and pressure into SI units.

It also contains a new appendix which gives the Density of Water based on ITS90 temperatures and a completely new Foreword which includes the New Method Format and Presentation sections.

IP Standards cover the field of petroleum and its products and are therefore an essential reference manual for chemists and engineers working in the industry and its associated fields.

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A large, stylized sign for TAMOIL. The sign is white with a blue border and features the word "TAMOIL" in bold, red, italicized capital letters. The text is centered within a blue oval shape that is split horizontally by a white line.

TAMOIL



Tamoil Italia, an integrated Italian Oil Company ranking 5th in Italy with an increasing market share, processes at its Cremona Refinery about 5 million tons per year of low sulphur crudes.

Through its network all over Italy Tamoil Italia distributes top quality gasolines, gasoil and lubes and supplies heating oil and fuel oil for Italian industries.

The company also exports gasolines and gasoil mainly to Switzerland and Austria, supplies bunker through its affiliate and trades crude and refined products all over the world.



TAMOIL ITALIA S.p.A

Milan-Rome