DECEMBER 1991

The Institute of Petroleum



PETROLEUM REVIEW

Paperless business

The impact of electronic data interchange by Dr Roger Till

Australia

Continuing expansion for Northwest Shelf gas

Colombia

Colombia aims to join the ranks of major oil producers

> World Petroleum Congress

A conference report from Buenos Aires



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Cover photo of firefighting in Kuwait. Photo courtesy of Al Awda Project.





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: . news in brief

17 October

Scottish based Highlands Fabricators has been awarded a £27m contract by Shell UK for the construction of a compression platform for the Sole Pit development in the North Sea.

18 October

OK Petroleum, the UK unit of Sweden's Svenska Petroleum, has announced plans to invest £25m in oil production in Lithuania.

Wormald has been awarded contracts totalling in excess of £1.5m for the design and manufacture of water-based fire protection equipment for the BP Bruce platform. Premier Consolidated Oilfields announced that its wholly-owned subsidiary Premier Oil Pacific has been awarded a new exploration concession offshore Cambodia.

19 October

Five people were injured when a tower containing combustible fuel at the Manguinhos oil refinery, one of the largest in Brazil, exploded and caught fire.

21 October

The oil discovery at Cusiana in Colombia, in which BP and Total each own a 40 percent stake, is almost three times as big as the country's biggest existing field. Norway's Aker group has made a significant move in the United States by purchasing a majority interest in the leading offshore yard

23 October

Gulf Marine Fabricators.

Esso Production Malaysia will invest more than M\$15bn over the next 20 years to develop gas reserves in its production sharing contract areas.

Texaco expects to resume oil production in the war-damaged neutral zone between Kuwait and Saudi Arabia in the first quarter of 1992.

BP (Switzerland) has agreed with Agip (Suisse) SA to transfer the supply of around 170 of its dealer owned retail stations in Switzerland.

24 October

Phillips Petroleum has moved into the engineering phase of development on the UK North Sea's J-block area. The plan is based on gas exports to Continental Europe via the Ekofisk complex in the Norwegian sector.

Chevron UK is preparing to spend an estimated £100m to bring its three Ninian field production platforms into line with proposed new legislation.

25 October

British Maritime Technology has joined forces with Aberdeen-based companies Stromec and Noble Engineering Services, to act as a consultant for floating production projects.

Babcock Energy has signed an agreement with Scottish Power to set up a joint company to build, own and operate Hampshire County Council's £105m energy from waste incineration plant.

Texaco has won UK government approval for the \$679m development of the Strathspey field in the North Sea.

Lasmo announced its involvement in an important find in Indonesia close to existing production facilities in the Kakap area in the Natuna Sea.

Norway's oil industry achieved record production of 2.14m barrels per day in September.

A £100,000 contract has been awarded to Scotland's Technology Training Partnership to promote energy technology and conservation in Scotland.

Hong Kong billionaire Li Ka-Shing has bought Canadian oil and gas group Husky Oil from Nova Corporation of Alberta for a total of \$325m.

29 October

Nawa Oil Company of Hungary has signed an agreement to explore for oil in Cambodia.

Eastern Electricity is to set up a gas marketing subsidiary to be known as E gas.

Conoco have suspended production indefinitely from the 20 year old Viking A complex in the Southern Gas Basin of the North Sea.

Norwegian Saga Petroleum has put forward a NKr6–8bn plan to partners for the development of two Snorre satellite fields in the Norwegian North Sea.

US oil companies Atlantic Richfield and Phillips Petroleum have announced the first oil discovery in Alaska's Cook Inlet since 1965.

31 October

Alaska environmental conservation commissioner Mr John Sandor has signed new oil spill prevention and response standards which for the first time in the United States set legally enforceable time limits for vessel operators to clean up their spills. Shell Thailand has signed a contract with Thailand to build a 145,000 barrel a day oil refinery south-east of Bangkok. British Gas has teamed up with

Agip of Italy to tender jointly for a contract to develop a giant field in Kazakhstan.

US oil company Unocal has started developing the Jakrawan natural gas field in the Gulf of Thailand, after making significant gas discoveries in five out of six wells drilled last year.

1 November

Venezuela's production of crude oil during the first half of this year averaged 2.47m barrels per day, the highest level since 1976, according to PDVSA.

6 November

The dramatic decline in Soviet oil production is set to continue with output likely to show a sharp fall of 9 percent to 9.7m barrels a day by the second quarter of next year, according to the International Energy Agency.

Norske Shell, operator of the Troll gas project in the Norwegian North Sea, is sticking with the design for its concrete platform, despite the sinking of the Sleipner gravity base structure in August. Norway's Kvaerner group is to buy a new offshore fabrication facility, and the existing Marystown shipyard in Newfoundland, in a deal worth Can\$20m.

Schemes for generating electricity from wind, sewage, landfill gas and waste, were among 122 projects approved by Professor Stephen Littlechild, Director General of UK Electricity Supply. Dive-support vessel operator Stolt-Nielsen Seaway has entered the heavy-lift market through a joint venture with a major Russian oil and gas producer - the Soviet partner, Kaliningradmorneftegaz, will provide the ship and the crew, while Seaway is to contribute the quality-assurance system and North Sea and international contracting skills.

7 November

Statoil has confirmed a significant extension of its Smørbukk field in the Haltenbanken area of the Norwegian sector of the North Sea.

8 November

The New York Mercantile Exchange has signed a contract which will create a round-theclock electronic trading system.



ENVIRONMENT DISCUSSION GROUP

The following meetings have been arranged for 1992:

Tuesday 21 January — Environmental Audits

Tuesday 24 March — Atmospheric Emissions Offshore

All these meetings will be held at the Institute of Petroleum, starting at 5.30 pm. (Tea and biscuits available from 5.00 pm.)

For further information, please contact Mr A E Lodge at the Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone 071 636 1004.



Conference preprints available

THE FOURTH OIL LOSS CONTROL CONFERENCE

REAL AND APPARENT LOSSES IN REFINING AND STORAGE

30 AND 31 OCTOBER 1991

The Institute of Petroleum will not be publishing formal Proceedings of this Conference. However, there are a number of copies of the conference preprints available which were handed out to delegates on registration as part of their registration fee.

If you wish to obtain a copy of these Preprints, please send your remittance for \pounds 75.00 (VAT zero rated) to the IP – attention Caroline Little.



The Institute of Petroleum

Last Kuwaiti fire extinguished

Thanks to intensified efforts by everyone involved, the last Kuwaiti oil well fire was capped and put out last month. This momentous event was celebrated with the ceremonial extinguishing of a token flame, a public holiday and a special gathering of distinguished guests at the Burgan oilfield. Once the celebrations are over, work continues on restoring the Emirate's oil production facilities as fast as possible.

The ruler of Kuwait, Emir Jaber Al Ahmed Al Sabah, pressed a button to symbolise the final extinction of the fire. Attending the ceremony were many foreign dignitaries as well as many of those who had taken part in the round-the-clock efforts to put out the fires, together with those who had rebuilt the infrastructure and supplied the equipment to enable the firefighters to carry out their dangerous work. The final success came suddenly and much earlier than expected, since previous forecasts had given much later dates - half the well fires had been put out by September. The achievement in extinguishing over 700 oil well fires is all the more remarkable since the first estimates by world famous firefighters from Canada and the United States when they arrived in the Gulf reckoned that the enormity of the task would mean a final completion at a date between 18 months and three years later. However, miraculously, following the most colossal exercise in logistical support from 60 companies, the task was completed in 232 days.

The most recent count of firefighting teams was 27, compared with the original four who started making contingency plans during the occupation Red Adair, Boots and Coot, Wild Well Control and Safety Boss - and arrived after the liberation by the Allies. These four companies, with extensive back-up support from many others, have been responsible for putting out most of the fires. However, over recent months extra teams came from Britain, Hungary, France, China and Iran and elsewhere to join Kuwait's own firefighters and all helped in cooperating to advance the final completion date to November - far ahead of the most optimistic expectations.

Dr Homoud Abdulla Al Rqobah, Kuwait Minister of Oil and Chairman of Kuwait Petroleum Corporation,



Emir Jaber Al Ahmed Al Sabah and Saud Al Nashmi, Chief Engineer, Kuwait Oil Co.

who addressed an International Herald Tribune conference in London last month, said that the cost had been \$1.5 billion, of which \$600 million had been spent on equipment. This total included expenditure so far on well control, repairs to refineries and gathering stations and export facilities. Enormous quantities of equipment had been brought in by sea and air, 280 kilometres of new roads and 361 water lagoons and water supply pipelines built as well as temporary accommodation for all the extra personnel, numbering over 9,000.

For the coming months the main objective is to get more oil flowing, following the resumption of exports last July. At present 470,000 barrels per day are being produced, including 140,000b/d from the former Neutral Zone. Local consumption accounts for 145,000b/d. It is hoped to increase output steadily, reaching 1 million b/d



Dr Homoud Abdulla Al Rgobah.



Crown Prince Sheikh Saad Al Abdullah Al Sabah and the Emir, (centre) and cabinet ministers.





The Emir meets representatives of the firefighting and support teams.

Sarah Akbar, centre, with rest of firefighting team of Kuwait Oil Co.

in July next year and 1.6 million b/d by end-1992. The target for the end of 1993 is 2 million b/d or even more.

Kuwait, therefore, fully intends to meet its OPEC quota of 1.5 million b/d by the end of next year — a quota agreed by the organisation in July 1990. Dr Al Rqobah stressed, 'It is our right to produce our quota'. He also intimated that Kuwait believed that it was also entitled to the quota it had not been able to fill over the last 12 months.

Since the Iraqi invasion in August last year, however, this Kuwaiti share of the OPEC cake, along with Iraq's, has been distributed among other OPEC members who will now need to accommodate Kuwaiti's speedy return to the international market. If the OPEC total is not to be exceeded, some members will be expected to make reductions to their current output levels. According to Dr Al Rqobah, the crunch will come in the second quarter of next year and become more serious in the third quarter, possibly depressing price levels. The next immediate practical problem is to clean up the 240 oil lakes, estimated to contain over 25 million barrels of contaminated crude – though estimates vary. Tenders for this work have been received and contracts will be awarded very shortly. The aim is to have the work completed by the end of next March.

The extinction of the fires is only the first stage and much work still remains to be done. While 70 of the original wells are being abandoned, the remainder require considerable attention, perhaps redrilling. Meanwhile, Santa Fe International now has several drilling rigs in Kuwait and plans to bring the number up by 10 by the end of the year.

It is also necessary to find out the extent of the reservoir damage. Kuwaiti spokesmen say that it will take some time to make these reservoir assessments. Talks are going on over the possibility of one or more foreign companies undertaking this work but nothing has so far been announced.

Work is continuing on the recon-



A special cake is cut by the Emir. Photographs courtesy of Sawt Al Kuwait.

struction of Kuwait's refineries. The plant at Mina al Ahmadi, the least damaged, is now operating at 170,000b/d, of which some is exported. Mina Abdullah is scheduled to resume operations early next year at 165,000b/d. In 12 months' time total throughput is planned to be 400,000 b/d, with further increases in subsequent months.

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Is offshore safer than onshore?

At his inaugural lecture at 1 per 10,000 men employed Heriot-Watt University Professor Julian Wolfram said 'The recent safety record of the United Kingdom offshore oil and gas industry compares favourably with industry onshore and it appears that a man may be safer offshore than when he is on land.'

Professor Wolfram is the Total Oil Marine Professor of Offshore Research and Development at Heriot-Watt. He referred to the Mortality Statistics for 1989 (England and Wales), the latest year for which they have been published by HMSO. 'These show that there were 4.6 fatalities per 10,000 men due to accidents and violence. If we look at the figure for the UK offshore sector for the same year, it was offshore.

He added that, 'looking at one year's figures for a particular industry can be misleading, as there are fluctuations from year to year. What is important, however, is the commitment to safety by the offshore industry and the widely accepted aim of reducing accident fatalities. It is worth noting that the offshore industry has spent £1 billion on safety in the last three years'.

Professor Wolfram also highlighted the need for risk assessment and safety to be taught to all undergraduate engineers as an integral part of their design education. The fact that the chemical industry leads the way in this, he believes, is a result of the goal

setting regulations which govern that industry. Similar regulations are now being introduced in the oil and gas industry.

Professor Wolfram called for better modelling of extreme events such as storm waves which would assist in the structural design of platforms. He called for a greater sharing of all such information between companies, in order to pool knowledge for the benefit of the whole industry.

He spoke of the behaviour of individuals in relation to accidents and how that can be altered by education and training. 'Considerable attention has already been devoted to the person-machine interface, but as yet very little to peoplemachine interfaces. In any

large system, such as an offshore oil and gas platform, a chemical plant or a ship, several people will be involved. There will be individual interaction between each person and the system; there will also be interaction between people prompted by the perceived behaviour of the system. In an emergency, this interaction is most important.'

Professor Wolfram praised the industry for its concern for the environment and quoted the example of environmental impact studies which are an integral part of the design and planning process. He suggested that a broader approach to safety will continue to emerge with not only the risk to human life being assessed, but also the risk to the environment.

Viking A production halted

Limited. Conoco (UK) operator of the Viking gas field in the southern North Sea, have suspended production from the Viking A complex. The decision was prompted by a combination of factors including safety considerations, the age of the Viking A facilities and current production levels.

The platforms, which lie 86 miles off the Lincolnshire coast, will continue in service as an unmanned riser installation on the Viking gas transportation pipeline.

Production from Viking will continue through the B complex and its five unmanned satellite platforms.

Suspension of production from Viking A is not irreversible at this stage and Conoco is conducting further studies to evaluate options for production of hydrocarbons remaining in the area.

Viking A dates from 1972 when engineering design and technology was less advanced than it is now. The proximity of gas production risers to the platform accommodation is considered to be unsatisfactory by today's standards. In addition, output from the Viking A area was declining as the end of its productive life approached.

'These factors, allied with the current developments taking place at Viking B, persuaded us that the safest and most efficient course was to halt production and de-man Viking A', said Mr Mike Stinson, Chairman and Managing Director of Conoco (UK) Limited.

'Viking is an excellent development which has operated satisfactorily for nearly 20 years and has served the United Kingdom and Conoco well,' he added. 'It remains a significant contributor to Britain's daily gas supply and Conoco will continue to meet its contractual commitments.'

The Viking field, situated in UK blocks 49/12, 49/16 and 49/17, was discovered in 1968 and began producing in August 1972. Conoco, as operator and BP Exploration each hold a 50 percent interest in the field.

Onshore drilling to start

Brabant Resources expects to drill two wells in southeast England this year. This follows the approval by Hampshire County Council on 7 October, of the Tonbridge-based company's application to drill an exploration well on PL088 at Lymington.

The first well will be at Hewish, on PL258 near Weymouth; Lymington-1 will follow immediately after drilling is completed later this month and will take about 30 days to drill. Brabant will operate both these wells and has a 16.67 percent interest in the licences. The target of both wells is the Sherwood Sandstone, which forms the major reservoir in the Wytch Farm oilfield, which is about 14 miles to the southwest of Lymington and 18 miles to the east of Hewish.

Brabant was awarded two new exploration licenses in the Weymouth area in the recent fourth onshore round. One lies to the west of the Hewish prospect and includes the town of Bridport, the other lies to the south of Hewish and covers Weymouth and the Isle of Portland. Brabant has an interest of 33.33 percent in these two licences, on which seismic acquisition is planned for early next year.

British Gas in Kazakhstan talks

British Gas has had talks with President Nursultan Nazarbaev of the Republic of Kazakhstan on the development of hydrocarbon reserves in the Republic.

The talks follow the signing of a co-operation agreement between British Gas and Italian oil company AGIP to jointly tender for a contract to develop the extensive Karachaganak field in north-

west Kazakhstan. The total project is valued at several billion dollars and the agreement is based on equal sharing of investment and development costs for the project.

Kazakhstan has the Soviet Union's largest hydrocarbon reserves after the Russian Republic. It currently produces around 500,000 barrels of oil a day and 6 billion cubic metres of natural gas per year.

. . . newsdesk

First gas from Tubridgi fields reaches Perth

The first gas from the remote Tubridgi natural gas fields has started to reach Perth after completion of a A\$23m development project 20km south west of Onslow.

Ian Taylor, the acting Western Australian Premier, said the gas had begun to flow down the Dampier to Perth pipeline and heralded another step in the state's expanding energy network.

The main companies behind the project — Doral Resources NL (55.60 percent) and Pan Pacific Petroleum (43 percent) — have a contract with the State Energy Commission of Western Australia to pump more than 50bn cubic feet of gas to Perth over the next 10 years.

Mr Taylor said the gas was being drawn from the first onshore field to be developed commercially in the gas and oil-rich Carnarvon Basin. In fact Tubridgi sits at the southern end of what has become known as the Petroleum Fairway — a 200km strip stretching out to sea and taking in some of the state's most important oil and gas deposits. These include Harriet, Barrow Island, South Pepper, North Herald, Saladin and Roller.

The Tubridgi development was also making use of the pipeline facilities built for the North West Shelf natural gas project. A new pipeline had been constructed from Tubridgi to link in with the main Dampier to Perth pipeline some 87km to the south east.

Mr Taylor said construction of the spur line could prove of considerable importance in helping develop other offshore fields near Tubridgi. 'The strategic position of the new spur line may enable gas to be recovered from the other fields at considerably less cost,' he said.

According to Mr Taylor, the development of Tubridgi provided Western Australia with a new link in the reliable and economic supply of natural gas to industry. 'Other developments are going to proceed and the Tubridgi facilities and the pipeline linkage seem well-positioned in relation to some of these developments,' he said.

Strathspey go-ahead

Mr Colin Moynihan, Energy Minister, has given government approval for the development of Texaco's Strathspey oilfield to proceed.

Texaco expect production to start in late 1993 from sub-sea installations connected to the nearby Chevron operated Ninian oilfield platforms. Production is estimated to climb to a rate of about 39,000 barrels a day in 1994 from up to 14 production wells.

Commenting on his decision Mr Moynihan said: 'The UK offshore supplies industry has become a world leader in the development of sub-sea technology. Employing UK expertise in sub-sea systems, tied back to existing North Sea installations can enhance the opportunities for the economic development of oil and gas reserves.'

'Texaco have already awarded contracts to Leeds based Cameron Iron Works Ltd for the well head systems, and to Aberdeen based FSSL Ltd for the sub-sea control systems.'

'New facilities to be installed on the Chevron Ninian field platforms will form a vital link in the chain and enable oil and gas to be processed before being brought ashore via the Ninian pipeline to the Sullom Voe terminal in the Shetlands and the FLAGS pipeline to St Fergus.'

LASMO bid for Ultramar

LASMO, the independent oil exploration and production company, has launched a hostile £1.15 billion break-up bid for Ultramar. The bid could create one of the world's largest exploration and production companies.

Ultramar has failed to impress the city in recent months and its shares have under-performed the oil exploration and production index by 42 percent in the last five months. With a debt to equity ratio of 87 percent, it is short of funds and there has been speculation of a bid for some time. LASMO made profits of £33.6 million in the first half of this year and is offering one of its shares for one of Ultramar's in a straight swap. The company has set its sights on a swift disposal of Ultramar's downstream assets, including refineries in Canada and California.

Ultramar's UK assets include a 21 percent share in the large Franklin field in the Central North Sea and a 30 percent interest in the Morecambe Bay sector. The company has described the bid as 'most unwelcome' and 'totally inadequate.'

Safety award for Sullom Voe

The BP-operated Sullom Voe Terminal, Shetland has won a prestigious international safety award.

The International Loss Control Institute (ILCI) carried out an audit of the terminal's safety and loss control management programme in November 1990 and assessed the site as maintaining its safety performance at the third level advanced standard.

In a letter to Sullom Voe Manager, Rod Walker, the Board Chairman of ILCI, Frank Bird said: 'It gives me great pleasure to inform you that Sullom Voe Terminal is the recipient of our very special Oil and Petro Chemical Award for 1991. The annual award is the only award we are aware of that is given for highest oil and petrochemical safety performance rating by any organisation in the United States or Canada. For that matter, in the world.

As you know, there are now thousands of organisations in North America using the International Safety Rating System (ISRS) and to have the greatest current rating in this measurement of safety excellence is certainly a most significant honour.'



Rod Walker, Manager Sullom Voe (centre left) receiving the International Safety Award from Frank Bird, Founder International Loss Control Institute (ILCI). Also in the photograph are (left) Per Olaf Brett, President ILCI and (right) Robert Arnold, Senior Vice-President, ILCI.

Petroleum Review December 1991

Doing business without paper

By Dr Roger Till, The British Petroleum Co plc

As a North Sea operator or a joint venture partner, you will appreciate the amount of time and resources taken month in, month out to handle joint interest billing statements. You are faced with two problems. One is the mound of paper involved, the other is the lack of standards in terms of what information is presented and how it is formatted. Recently business people from a number of oil companies have been meeting together and this business process has been simplified and speeded up by agreeing a standard format for the exchange of this information, and by sending the information as an electronic message. This is what 'doing business without paper' or electronic data interchange (EDI) means.

EDI is beginning to be used in both upstream (such as joint interest billing exchange) and downstream (such as product exchanges) activities. Making use of EDI is primarily a business issue because it aims to make business processes more efficient and simpler and ultimately involves the opportunity for changing the way that things are done.



Dr Roger Till.

Definition of EDI

EDI can be defined as the exchange of business information in standard formats from one company's computer to another company's computer (Figure 1). In spite of its technical name and acronym, EDI is 80 percent about doing business and only 20 percent about the technology involved to do it — indeed, implementing EDI is one of the simpler tasks for Information Technology departments.

Whereas electronic mail involves informal communication between people from their PC or workstation, EDI involves one computer application sending a formal (standard format) message to another. This exchange of messages is usually done via an electronic mailbox, provided by companies that specialise in these 'Value Added Network' (VAN) services. A VAN can be thought of as an electronic version of the Royal Mail service. In this way a business makes one connection to the electronic network and obtains access to many trading partners.

For example, in the retail industry many supermarkets use EDI to send orders electronically to their suppliers and receive invoices back in the same fashion. The barcode, that is read on items at the check-out, sends information directly to the stock control systems, triggering the ordering process. Again, the automotive industry uses EDI to obtain parts from its suppliers which are delivered direct to the manufacturing line ('just-in-time' manufacturing). Many of these EDI users are also closing the trade-cycle electronically by making payments electronically.

Advantages of EDI. The use of EDI can eliminate much of the paper mountain involved in business transactions (it is said that over 70 percent of computer output is re-keyed into another computer), can remove much of the error of data re-entry and thereby improve the quality and speed of transactions. This leads to cost savings and greater efficiency as the number of links in the supply chain is reduced. After the initial efficiency drive to use EDI, there is then a second phase when businesses can begin to look at ways of doing things differently — the move to 'just-in-time' manufacturing is just one example of this development.

EDI standard messages. To be able to exchange EDI messages, a standard format (for example for the invoice) has to be agreed. This involves business partners sitting down and discussing their joint requirements. Such EDI have standards message been developed in the United States (under their national standards - ANSI) and in the United Kingdom under Tradacoms (the retail industry in the United Kingdom was a very early user of EDI). However, about six years ago it was recognised that trading using EDI was likely to transcend national boundaries and the United Nations supported an international EDI standards initiative. The migration to these international standards is a continuing process but UN/EDIFACT (United Nations Electronic Data Interchange for Administration, Commerce and Transport) reached a watershed recently, when a large number of standard messages reached 'status 2' - full UN



Figure 1: What is EDI?

approval — in Geneva in September. These messages cover trade, customs, transport and banking and finance, meaning that the basic trading procedures can now be performed using EDI under open international standards.

Strategic alliances. One of the key long-term effects of EDI is that it makes companies, within this industry and outside it, get together to talk about how they are going to do their business with each other. This leads to simpler, better, more trusting relationships cemented by the use of open, international message standards.

EDI in the oil industry

The oil industry in the United States had about 800 people at its annual EDI conference in Anaheim at the end of September. Over 400 people attended the first EDI conference held by the Canadian Petroleum Association in Calgary in May. Over 70 people from 11 European countries attended the launch of the European Oil & Gas EDI Group in Brussels at the European Commission in June. This indicates the level of interest being shown worldwide by the industry.

EDI was first used in the oil industry in the United States, when in the late 1970s proprietary standards were developed for product exchange information being passed on the GEIS network. Use of these applications grew gradually and four years ago the American Petroleum Industry set up an EDI Task Force (initially cochaired by BP America and Exxon) to develop a wide range of applications using the national EDI message standards (ANSI X12). This group now has official status as an 'EDI Standards Committee of the American Petroleum Institute' and is known as PIDX (Petroleum Industry Data Exchange) — yet another opaque acronym!

US user groups

PIDX now has 22 user groups actively involved in developing EDI applications for the oil industry. They cover everything from upstream, exploration activities, including the exchange of geological information, well data, pipeline transactions and joint venture expenditures, to downstream, sales and marketing activities, including aviation fuel supply and invoicing, product exchange and terminal administration. Most of the initial groups were involved in joint venture activities with other oil companies but the user groups formed most recently are now also involved in inter-industry activities (cross-sectorial activities to use the TEDIS jargon) including purchasing and materials management and a joint oil industry/utilities initiative. This wide range of applications involves the implementation or modification of existing ANSI X12 messages and the development of new ones. Table 1 gives a brief description of each of these 22 user groups.

Canadian user groups

For about three years the Canadian Petroleum Association has had an EDI Standing Committee and has some nine business applications under development mostly in the upstream activities, and also involving electronic funds transfer and downstream refined product movements, again using ANSI, as listed in **Table 2**.

European user groups

National activities. About two years ago the UK oil companies formed an Oil Industry Interest Section as part of the EDI Association, which is the UK national industry-wide EDI body committed to developing standards under EDIFACT. Based on an initiative from the London Society of Chartered Accountants, which has an oil industry group, an EDI User Group was formed to begin looking at Joint Interest Billing Exchange. There is also a group, under the Norwegian Oil Industry Association working on joint interest billing. Another user group was formed to develop EDI for downstream product exchange (there has been a similar activity in Italy for some while). Both these projects have developed new messages (JIBILL and PRODEX) which are just entering the EDIFACT process. The AVNET project (a joint oil industry project with the airlines to use EDI for aviation fuel transactions) organised a European project (jointly led by British Airways and Shell). More recently the Oil Industry Interest Section has had a group looking at developing and maintaining standard codes, which will be based on the EAN (European Article Numbering) procedures. In November a new user group met at the Institute of Petroleum, akin to the Pipenet Group in the United States, to develop business use of EDI for pipeline operations associated with the transport of crude oil and oil products.

Joint Interest Billing Exchange (JIBE) Project. This is a good example of an EDI project. In upstream (eg North Sea) developments, companies work together to develop a prospect. The development is venture based, one partner acts as operator and seeks cash calls from the other partners to run the prospect. This is controlled by a Venture Agreement which provides for periodic expenditure forecasts, regular statements of expenditure and regular cash reconciliation. The issue of distributing and receiving 'Joint Interest Billings' is now being addressed using EDI. So far BP, Conoco, Chevron, Esso, Phillips Petroleum and Shell are involved in the EDI development but other companies are now being encouraged to participate -- indeed over 40 companies attended an introductory seminar last summer.

AVNET - Electronic Aviation Fuel Sales

To enable the transmission and automated processing of aviation fuel, into-plane and bulk sales related documents between trading partners.

CDEX — Check Stub Data Exchange

To provide formatted data on crude oil and gas lease check stub detail.

CODE — Crude Oil Data Exchange

To provide formatted data from run tickets, oil run statements and tank increment tables regarding crude oil purchases between producers and transporters.

COS - Crude Oil Settlements

To facilitate the exchange of crude oil settlement invoices and remittance advice between producers and purchasers.

E-Mail - Electronic Mail

To enable the petroleum companies and their trading partners to transmit unstructured business information independent of systems or networks.

GAS*FLOW - Natural Gas Accounting Information

To facilitate the transmission of natural gas pipeline document information between pipeline companies, producers and shippers.

Geological Data Exchange — American Association of Petroleum Geologists To facilitate the exchange of geological data gathered from oil and gas wells.

GRADE — Gas Revenue Accounting Data Exchange

To provide formatted data on metered volumes of gas plant lease settlement activity.

JADE — Joint Audit Data Exchange

To provide audit and accounting data for joint interest projects in a standard format.

JIBE — Joint Interest Billing Exchange

To facilitate the transmission of joint interest billing information and invoice detail between partners.

JUPUG — Joint Utility/Petroleum User Group

To define the data elements required for electronic invoicing and electronic funds transfer documents between petroleum and utility companies.

PAPS - Posted Accounting Price Standard

Enables the transmission of posted crude oil price information for accounting purposes.

PETROEX — Petroleum Product Data Exchange

To provide formatted data on refined product exchange activity between business partners (proprietary standards).

PIPENET — Pipeline Information

To facilitate the transmission of product and crude oil pipeline document information between pipeline companies, shippers and refiners.

PTAG — Petroleum Treasury Advisory Group

To define the information content and format of electronic funds transfer documents for use in the petroleum industry.

Electronic Purchasing and Materials Management

To develop petroleum industry conventions for purchase orders and invoices and to expand the number of petroleum companies and suppliers using EDI in purchase operations.

RECON — Product Exchange Reconciliation

To provide an automated matching of bills of ladings to facilitate reconciliation of exchange activity between partners.

REGS — Regulatory Data Exchange

To define data elements needed to electronically exchange reports submitted to the Department of Interior's Minerals Management Service.

Electronic Royalty Payments

To enable the direct transmission of royalty payments and remittance information from lease operators to owners.

TABS — Terminal Administration Transfer System

To provide online global credit validation prior to product lifting, to provide user with ability to control product allocation at exchange partners terminals and to provide real time access to sales and billing information.

WITS — Wellsite Information Transfer System.

To facilitate the exchange of mud logging parameter data in joint interest projects.

WODE — Well Operating Data Exchange

To facilitate the exchange of well operating data between operators, working interest owners and regulatory agencies.

Table 1: American Petroleum Institute — Petroleum Industry Data Exchange (PIDX) — User Groups

The project has two groups. The Accounting Group has developed the business aspects of JIBE, including the agreed chart of accounts and the JIBE message content and did the preliminary message design, while the Technical Group considered access methods, made recommendations about network links and looked at mapping the necessary data into an electronic format. These activities have produced a proposed EDI message, JIBILL, for UN/EDIFACT consideration and several companies, including BP and Conoco, are now ready to use EDI for this business activity.

Europewide activities. Late in June, a new pan-European EDI User Group, The European Oil & Gas EDI Group, was launched in Brussels. The TEDIS (Trade EDI Systems) programme of the Commission of the European Communities (DG XIII — Telecommunications, Information Industries and Innovation) hosted the event.

Nearly 70 oil industry staff from Belgium, Finland, France, Germany, Italy, The Netherlands, Norway, Spain, Portugal, Switzerland and the United Kingdom, representing a significant number of the major European oil and gas companies met to discuss EDI business applications and to nominate a management committee to run this new group. In line with the aims of the TEDIS programme, the group involves both EC and EFTA countries.

I accepted the nomination as Chairman of the newly formed Group; Kjell Oystein Johansen (Norsk Hydro A/S, Norway) and Thor Aarre (Mobil Services Company, The Netherlands) became Vice Chairmen.

The purpose of the group is: (1) To promote the use of EDI both within the oil industry and related industries. These EDI activities would cover all aspects of oil company business (upstream, downstream, finance etc). (2) To develop UN/EDIFACT based messages for international use. (3) To coordinate oil industry EDI activities in Europe. (4) To liaise with other groups internationally with a view to developing common standards.

This new European Oil & Gas EDI Group is the first opportunity for oil company business people from several countries to get together to implement or build truly international applications based on the UN/EDIFACT standards.

It is expected that initial user developments will focus on:

 JIBE — further development and implementation of the Joint Interest Billing project, worked on so far by the United Kingdom and Norway

- PRODEX further development and implementation of the Product Exchange project, worked on so far by the UK group and in Italy
- PIPENET a new project to develop EDI for oil and oil product pipeline operations
- GASFLOW a new project to develop EDI for gas pipeline transactions.

This is a very exciting development in the oil industry with especially strong commitment from the United Kingdom, Norway, France, The Netherlands, Spain and Italy. The Management Committee of this group first met in September in Brussels and is busy developing a two-year business plan, cementing its relationships with Europia (the European Petroleum Industry Association), the TEDIS programme and with the Western European EDIFACT board (subject to approval of its terms of reference we will be offered a seat on that standards board)

Conclusion

Though the oil industry in the United States was an early player in EDI, it has not been one of those industries like retail or automotive manufacturing where EDI needed to be implemented very early to ensure the life of the industry - indeed the last decade has had other major issues for and impacts on this industry! However, we do now see a wide-ranging international commitment to EDI - and though there are as yet no oil industry EDI groups in Australia/New Zealand or Asia, they are beginning a number of trials of EDI applications in association with their national EDI associations.

Finally it is interesting to see that the oil industry is involved in a variety of types of EDI application. Firstly, it is using EDI for exchange of information with other companies — joint venture

JIBE — Joint Interest Billing

To facilitate the transmission of joint interest billing information and invoice details between partners.

SAR - Supply Agreement Reconciliation

To facilitate the exchange and reconciliation of bill of lading information for refined product movements between partners.

PARDE — Production Accounting and Revenue Data Exchange

To facilitate the monthly exchange of production data, other volumetric data, and revenue and royalty data for crude oil, gas and all by-products between joint venture partners, owners and royalty interest holders.

COMS - Crude Oil Movement System

To improve the accuracy and time required for the exchange of data for the crude oil movements system and to reduce paper document flows.

Purchasing

To develop a base of companies interested in using EDI for purchasing and to define information requirements to transmit orders electronically.

EFT — Electronic Funds Transfer

To achieve an understanding of EDI/EFT and establish a pilot in which payments with remittance advice are sent and received using EDI.

DDEDE - Daily Drilling and Evaluation Data Exchange

To promote the timely and efficient digital exchange of daily drilling and evaluation information among well operators, partners and regulatory agencies.

JADE — Joint Venture Audit Data Exchange

To provide a standardised format for the electronic transfer of joint venture audit data.

Natural Gas

To promote standards and develop an EDI pilot for the exchange of production, nomination and allocation information to facilitate domestic and export gas transactions among producers, processors, marketers, transporters, buyers, operators and regulators.

LEARI — Lease Rental Invoices

To electronically transmit mineral lease rental invoices between trading partners.

Table 2: Canadian Petroleum Association — EDI Standing Committee — User Groups

partners (these relationships are common because the costs of discovering. developing and producing from an oilfield are very high and the risk is often shared between partners). Secondly, integrated oil companies sell products, such as lubricants, personal care products and detergents to supermarket customers (the 'hubs') who specify what style of EDI they require. Thirdly, oil companies, like many other companies, are seeking to simplify and improve relationships with their suppliers. EDI is an important part of this process. Lastly, large oil companies are also using 'internal EDI' to streamline internal transactions between their various locations

and business divisions. As in all industries the campaign for greater EDI awareness continues as a major activity for all our groups — the oneday conference we are mounting, in conjunction with the IP's Energy Economics Group, in London on 20 February next year at the Institute of Petroleum is a typical example.

The driving force for this wide range of EDI interests is to simplify and improve our business practices, to become even more cost effective and thereby to improve the quality of the service and the relationships that we can offer to our customers, suppliers, joint venture partners, shareholders and the community at large.

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Argentina — without tears

The 13th World Petroleum Congress held in Buenos Aires from 20–25 October came at a time of interesting changes in the Latin American oil scene. Since widespread nationalisation some decades ago, the industry has been in the hands of statecontrolled monopolies. Little has yet changed in Mexico and Venezuela, where memories are perhaps longest, but Brazil, Colombia, Ecuador and Peru are in the process of opening up to foreign private investment in varying degrees.

The important announcement by President Carlos Menem of Argentina at the opening ceremony meant that the host country to the 13th World Petroleum Congress has committed itself to a completely open market in oil exploration and production, after years of stagnation.

This contributed to the undoubted success of the congress, attended by nearly 3,000 participants (30 percent from Argentina) — a greater number than at the previous congress in Houston.

Another factor was the progress made in achieving an up-to-date and relevant

programme, with a larger economic content. This is no easy task, as the congresses are aimed at an international management audience, and priorities vary from country to country. This was evident in the plenary addresses from the United States and Japan, whose theme was environmental measures and their true cost, contrasted with those from Latin America and OPEC countries, who were seeking more capital and technology to develop their resources.

Stavanger, Norway, was chosen as the venue for the next congress in 1994. Dr Klaus Mai was elected President for a further three year period, and other elections included Norman White as Vice-President, and Ted Williams (ex Institute of Petroleum) for a further term on the Scientific Programme Committee.

Appearing at their last World Petroleum Congress were Derek Payne, WPC Secretary General, who retired after 20 years, and Mrs Olga Leapman, Assistant Secretary General who has been with World Petroleum Congresses for 10 years.

Conditions for growth

OPEC countries will need investment of some \$120 billion to compensate for production decline in producing oilfields, and to meet a demand for about 8–10 million barrels a day above and beyond what is already used. This is one of the basic conclusions arrived at by OPEC General Secretary Dr Subroto.

Dr Subroto announced that he would be analysing industry prospects for the 1990s from the viewpoint of the Organisation of Petroleum Exporting Countries. He pointed out that, following the 1990 Middle East crisis and the Gulf War, the era of production overcapacity seems to have come to an end, both upstream and downstream. In this context it should be noted that the 13 OPEC member countries own 84 percent of the remaining oil reserves and 68 percent of natural gas reserves. The Middle East alone has 71 percent of world oil reserves, and 49 percent of gas reserves. Despite resource availability, OPEC produces only 51 percent of all oil distributed the world over, and 18 percent of natural gas.

On the other hand, Dr Subroto underlined that production is beginning to decline in big oilfields outside OPEC, ones like Prudhoe Bay in Alaska, and Samotlor in the USSR, while according to forecasts, the North Sea will reach peak capacity before the end of the decade.

Such prospects do not necessarily mean that OPEC countries will



Dr Subroto

automatically agree to increase their production to meet foreseen oil demands. Among other things, this depends on marketing prospects for additional production, as well as consumer behaviour in the face of ecological problems arising from a growing use of fossil fuels.

Dr Subroto said that energy security is the core around which the new interdependence is centred. For consumers, security means to have oil supplies available at reasonable prices, allowing for economic growth and competitiveness. For oil producers, security means having permanent access to markets in consumer countries, maintaining oil's share in the power scheme, as well as stable, reasonable prices ensuring economic development during the useful life of hydrocarbon resources.

Dr Subroto also remarked that in many countries, 'particularly Western Europe and Japan,' oil taxes are twice the price of a barrel. In some instances, tax revenues for such countries exceed export revenues transferred to producers themselves. Oil taxes prevent consumers from enjoying any benefit emerging from crude oil price reductions.

The OPEC General Secretary pointed out that action undertaken to make oil prices stable should not be confused with setting fixed prices or manipulating market forces. Conditions should be created, he said, to minimise the prospect of future oil crises, and establish the bases for a collective, fast, effective response to help to avoid such crises.

Soviet problems and prospects

The Soviet Union will be unable to exceed its present level of 500 million yearly tons of oil output 'within the next three to four years,' said Soviet Deputy Minister for the Oil and Natural Gas Industry, Vagit Y Alekperov.

In an interview with the *Buenos Aires Herald*, Mr Alekperov said that the Soviet hydrocarbons industry will need this time to recoup its 1988 output levels. In 1988, the country exceeded the 600 million tons mark, and spilled over 100 million tons onto international markets.

Mr Alekperov gave a general review of the present situation in the Soviet Union, emphasising new rules being gradually adopted in the Soviet oil business, problems in the industry, and the outlook over the next few years.

Capital shortage

The Soviet official pointed out that 'until now, and due to our market economy, we have been unable to attract foreign capital to finance oil exploration, development, the exploitation of difficult oilfields, the construction of safety structures and offshore drilling.' These are the five upstream sectors the Soviets are keen to set in motion through the introduction of foreign capital.

In the past he conceded, 'there has been a certain arbitrariness in our relationships with the outside world,' adding that 'centralism has prevented the growth of our industry. There was an excess of investment in some regions and areas of production but huge deficits in others. We failed to take advantage of the opportunities offered by our own technological advances.'

'Regrettably, and this remains so

until today, we have yet to come to an agreement among the many Soviet republics about the overall legal framework the Union is to use in order to attract massive foreign investment into the oil and gas industries.' In his opinion, however, 'foreign companies should be granted the same rights and benefits Soviet companies have. We should apply the international rules guiding capital movements around the world to our markets.'

He further recalled that 'we have 40 mixed capital companies, grouping Soviet as well as foreign capital, which already are working in the survey of new oil wells,' and announced that about 100 similar contracts are nearing completion and signature in Moscow. Also, he said, 'a bill recognising subsoil property rights for holders of mining and/or oil rights is presently being drafted. This substantial shift in Soviet legislation is under consideration by the Soviet Supreme.'

Privatisation

Mr Alekperov further gave details about the Soviet oil industry privatisation programme. 'Initially, the state is to hand over 25 percent of oil company share stocks. Part of these shares will go directly to industry workers, while another portion will go to related companies and consortia within the oil sector.' The sale of shares to individual investors has not been provided as yet, he said, thus ruling out the possibility of the emergence of a stock market in the oil and gas sectors.

'Any contract within this risksharing programme with foreign companies,' Mr Alekperov said, 'will pay the investors the profit due to them in appropriate quantities of petroleum.'

'Argentina Plan'

President Carlos Menem launched the new 'Argentina Plan' for oil and announced a new oil law to encourage greater petroleum exploration by international and domestic companies.

He said that the state oil firm YPF will become a mixed corporation, with both private and state capital.

Inaugurating the 13th World Petroleum Congress, President Menem said the new law will allow 'unrestricted access to important areas of exploration where there is known potential' for oil.

He said the plan will replace the socalled 'Houston Plan' of ex-President Raul Alfonsin, who in 1985 offered international companies incentives to invest in petroleum exploration in Argentina, ending a government monopoly.

Dozens of private companies are exploring in Argentina under the Houston Plan.

Argentina needs advanced technology, offered by the private sector, and fewer regulations, to step up production in existing fields in the short run.

President Menem said the new petroleum law turning YPF into a mixed state-private company will be presented to Congress immediately.

He said the plan will open a total of 1,409,645 square kilometres of Argentine territory to oil exploration, with 846,256 square kilometres on the continent and the remainder off-shore.

He said the new law will permit 'free disposal' of petroleum, meaning private companies could sell oil at international prices inside or outside of Argentina.

He also said it is important to continue with the 'de-monopolisation' and deregulation of the oil industry to obtain 'more investment, more work, and greater welfare.' The Argentina Plan, announced by President Carlos Saúl Menem, opens an area of 1.4 million square kilometres of land for companies to survey for oil and gas reserves.

The survey plan introduced by the President 'opens up for oil companies, both national and international, the widest range of possibilities for developing their specific activity within a fully deregulated economy and with the aim of arriving at exploitation projects. All potential investment and company development will be covered by Law 17,319. Basically, the Argentina Plan aims at:

• increased participation by risk capital in the market;

• enabling companies to access important areas with known potential and on an unrestricted basis;

• lease out survey fields for their ensuing exploitation via concession contracts by those companies eventually finding oil in these;

• ensure the free availability of the oil and gas found and which will be liable to be marketed at international prices both domestically as well as internationally.'

The overall area open for survey works will be broken down into 846,256 sq. km in continental Argentina and 561,389 sq. km on the



President Carlos Menem

Argentine Continental Shelf for a total of 140 survey blocs. These include known sedimentary basins with vast tracts of unexplored areas in 22 of the 23 provinces.

'We feel that the Argentina Plan

will ensure unrestricted participation by the companies, without state intervention and under laws that will ensure the smooth functioning of the oil industry in a competitive and open environment.'

Closing address by Pierre Jacquard

The demand for oil will remain high in the future, both for dedicated products (mainly automotive fuels) and to a lesser degree for heating oils, LPGs and fuel oils. It's difficult to forecast, but it has been assumed that global consumption will steadily increase, reaching 4 billion tons a year, the average figure most widely quoted for 2010 or thereabouts.

Consumption on such a scale will bring reaction regarding the environment. We are all concerned by the importance attached to environmental protection; we are equally aware of how international concern has grown since the Toronto Conference in 1988 when the scientific community alerted politicians of the possible consequences of large increases in the carbon dioxide content of the atmosphere. This global aspect of our environment was aptly summed up by the president of a major petroleum group who observed that pollution knows no borders, and that environmental problems are testifying more and more to the reality of worldwide interdependence. Our industry must aim for better mastery of demand through the efficient mobilisation of existing solutions, but we must also endeavour to speed up technological progress to this end.

Among the scenarios for the stimulation of economic activity, the most likely one anticipates that the share of oil used for transport applications will continue to grow. This share already accounts for half the global demand, and for two-thirds in the most highly developed countries. The transport sector is responsible for 50 percent of the pollution caused by emissions of oxides of nitrogen, carbon and sulphur, particles and hydrocarbons. All the governments that have concluded accords with various environmental protection agencies envisage much more stringent antipollution standards, a policy which will of course affect our principal finished refinery products.

It is therefore essential that our industry broaden its knowledge so as to be able to obtain 'cleaner' products without any significant trade-off on refinery output.

To give this research every chance of success, we will have to concentrate on improving cost-effectiveness between the engine and the fuel, which will entail closer collaboration between the refining industry and automobile manufacturers.

Presently, there is no large-scale solution in sight for a replacement for the internal combustion engine. The automotive industry is making a huge effort to conform to the new regulations by designing improved systems to make engines cleaner. The main thrust of research in this field is directed at reducing pollution at source by improved combustion and by exhaustgas improvement systems. The first step is to improve the four-stroke spark-ignition engines by better combustion control through four valve technology. This approach is promising better specific consumption together with lower emissions. Similar improvements must also be made to the diesel engine.

For the longer term, several new solutions for a replacement engine are currently the subject of research:

- The development of a new twostroke engine.
- The development of new engines and vehicles which can be converted to run on compressed natural gas.
- The design of hybrid vehicles equipped with two engines: a battery-powered electric engine for urban use, and a thermal engine for intercity journeys.

Now that engine design is linked to the protection of the environment, this concern will also play a major role in the definition of future fuels and lubricants.

The elimination of lead in gasoline required by vehicles, using exhaust catalyst, will enable a significant reduction in emissions from spark-ignition engines. But robustness and efficiency of three-way catalyst are still far from optimal, especially in the event of cold starts. Again, technology must provide new answers.

According to the latest data on emission reduction, very few research programmes have so far come up with valid findings regarding optimum gasoline composition. The 'Auto/Oil' programme currently being conducted in the United States is trying to do just this and has, as a first step, tested the composition of various gasolines. The programme's ultimate aim is to purify the atmosphere of large conurbations so as to prevent the formation of smog. Initial results demonstrated the scale and complexity of the problems: it was found that the degree of influence of gasoline composition depends on whether the engine technology concerned is old or new.

The reformulation of gasolines implied by these findings will mean new specifications. These gasolines, will speed up the process of reintegrating refining in the downstream area and the establishment of petrochemical refineries.

The growing demand for middle distillates, jet fuels and, above all, diesel oil, should more than make up for the drop in domestic heating oil, witnessed in certain countries. There is much speculation about the best way of reducing particulate emissions. Initial findings have been made on the effect of the characteristics of diesel oil on emission rates but the difference observed according to the type of diesel engine used has a much more significant effect on consumption and emission than do diesel oil characteristics alone.

Confronted by stricter legislation on emissions, we must pursue our research to obtain a better understanding of the role played by the various aromatic compounds before attempting to specify optimised compositions for diesel oils.

Many challenges indeed await the refining industry, which it must be ready to tackle in order to cope with the numerous new constraints on product quality. Given the uncertainty about future specifications, flexible installations will become the rule. The problems will, however, differ widely from region to region, so each refinery will have to address them specifically. Tomorrow's refineries will become assimilated, to an ever greater degree, to a vast, integrated petrochemical complex supplying petroleum products and building-block chemicals. There is a great potential now for creating a truly integrated structure, particularly in regard to the quest for the optimum balance between refining and petrochemical production.

Many examples of how such synergy could be achieved have been put forward, involving reforming catalytic cracking, hydrocracking, and even steam-cracking units, all of which contribute toward the balance between feedstock and end products.

The fundamental change imposed by legislation is toward products richer in hydrogen and poorer in aromatic and heteroatomic compounds, with no trade-off on converter performance. How are we to obtain them? The answers can obviously only be provided by a determined new research effort in process engineering. Among the dominant themes will be the quest for new catalysts, which are generally the vital keys to technological competitiveness. They must be constantly improved to ensure higher yields in ever more severe operating conditions.

Despite the lengthy time required to implement new technologies, there do exist several essential target areas at which our mainstream R&D must nevertheless be directed.

In the realm of deep conversion there are several possible scenarios that depend on various criteria: refinery structure, the finished products market and the level of investment involved. As for automotive fuel production,



Dr Klaus Mai was re-elected President for another three years

the expected limitations on aromatics, and maybe also on olefins, should make isoparaffins and oxygenated compounds the favourites in the 'great octane race'. Transforming straightrun gasoline or gasoline cuts from conversion into isoparaffins by naphtha ring cleavage and by hydro-isomerisation of paraffins is one of the avenues to be explored with a view to replacing the catalytic reforming process.

Concerning gas oil production, there are several effective technologies available for the intensive desulphurisation and partial hydrogenation of aromatics. New, more active catalysts capable of operating at lower pressures are expected to make progress.

As hydrogen requirements increase, it will become imperative to develop new technologies and also to improve the efficiency of the partial oxidation of residues.

In the long term, energy efficiency is still the best way of limiting the increase in demand in order to preserve the environment, but for the short and medium term there exists a new application that could provide ideal opportunities for natural gas. During the last 30 years, natural gas reserves have increased sevenfold, thereby outstripping global production.

Natural gas is clean and supplies are abundant. These fundamental properties make it the number one starting material, particularly for electricity production in combined-cycle powerplants, a promising market slot in view of the reservations expressed about nuclear power as the century draws to a close. The synthesis of alternative automotive fuels represent another market niche and there are two ways for natural gas to gain a foothold here:

- The first is to direct market penetration by compressed natural gas. If this market potential is to be exploited, distribution constraints must be lifted, improvements made to auto on-board storage tanks and engines converted to run on this type of fuel.
- Secondly, natural gas will continue to make inroads onto the market in its role as an additive in the form of oxygenated compounds — i.e. ethers, derived in part of methanol — to gasolines. Further possibilities concern substitutes for middle distillates and for gasoline.
- In the longer term, direct conversion to hydrocarbons, via oxydative coupling, could prove to be a more competitive method of producing automotive fuels.

If we are to meet the growing demand for conventional oils, it goes without saying that we must have sufficient supplies. For the last five years, proven reserves have increased by more than a quarter. Never have they been so abundant and they will ensure more than 45 years of production at the current rate of consumption. The main problem, then, is not one of quantity but rather of geography, with oil reserves located far from the main end-use areas.

Two-thirds of growing reserves are concentrated in the Middle East; they are enough to ensure 100 years of production at the current rate, and it is in this part of the world that reserves have increased the most rapidly. The dominant position of the Middle East is further strengthened by the fact that the cost of extracting these reserves is extremely low — less than \$4 a barrel. But there still remain many unexplored areas with great potential, where hopes are highest for the discovery of giant oilfields.

Although unexplored onshore basins are now rare, and accessible with difficulty, the Tarim basin in China is an example of a basin with considerable potential in the Paleozoic as well as in the Mesozoic and the Tertiary.

For a long time now, little value has been placed on Precambrian sedimentary basins because the conditions are unfavourable to the preservation of accumulations in such old basins. On the Siberian platform, however, nearly 30 fields, some of them giant deposits, have been discovered. It is therefore not out of the question that similar discoveries could be made in similar basins in North America, Eastern Europe, Australia or China.

There is no doubt that vast potential resources still remain undiscovered in the Soviet Union. The Precaspian depression would appear to be a huge hydrocarbon reserve with deeply buried carbonate Paleozoic source rocks and reservoirs capped by a layer of Permian salt. The giant oilfields discovered in the 1970s have already demonstrated this potential and there are more major deposits still waiting to be discovered.

There are other examples illustrating how new reserves can show up in oil-producing countries that have already been explored to a greater or lesser degree. This was the case in Gabon with the discovery of the giant Rabi-Kounga oilfield in a Lower Cretaceous rift. This discovery is particularly instructive because it was made possible by the progress achieved in seismic surveying, combined with the sheer determination of the prospecting team. It will be recalled that in 1978, exploratory drilling missed this accumulation by a mere 150 metres or so. Another example is the giant oilfield discovered in Monagas, eastern Venezuela, which demonstrates that new reserves may be discovered in thrust belts in Venezuela and Colombia.

Deep offshore deposits along the continental margins still represent a great unexplored domain with considerable potential.

Following an exploratory phase in the 1970s, when the few wells drilled had inspired little optimism, several new factors now indicate that exploration in these areas would be well worth starting up again:

- The progress made in seismic surveying, which makes it easier to predict the location of reservoirs.
- Lower production costs.
- The significant discoveries made in the Gulf of Mexico and the Campos basin in Brazil.

The process that built up these accumulations is very likely to have taken place in other fields around Brazil and also along the West African coast. The example of the Mississippi Delta suggests that similar discoveries could be made in the Niger Delta.

The potential of already mature areas should not be forgotten either. The ultimate potential of the North Sea, the Norwegian Sea and the Barents Sea is still highly substantial from the European standpoint.

Another way we can help to increase reserves is to draw on the spinoff from R&D. The resulting technological progress (improved recovery, deep offshore operations) serves to bring down the cost of producing new oils to that of conventional oils. In the near future, the availability of more expensive resources, coupled with technological progress, will automatically lead to significant reductions in costs eventually subject to stimulation by fluctuations in the price of oils. Thanks to improved or new technologies, the distribution of the cost of reserves will have undergone considerable change by 2010: the reduction, on the global scale, in the share of reserves with low production costs will lead to the appearance of conventional oils that are more expensive to produce.

This is how the amount of accessible resources could rise to two and a half times that of current proven reserves. If we multiply the current cost of conventional oil by two, and that of new oils by a little less, the global average production cost would be down to around \$13 (at 1991 prices) per barrel in 2010.

An R&D policy, then, is the key to a consensus between all the countries involved, and thereby to international cooperation. Consumer countries will benefit because they are constantly seeking to improve their foreign trade balance and their balance of payments, and want to be sure of reliable energy supplies. As for the oil producing and exporting countries, they will also benefit from the reduction in production costs, which will stimulate the production of more expensive oil in the consumer countries, thereby guaranteeing more profitable prices for crude. So the oil producing countries will enjoy a steady income, far less subject to fluctuation than in the past, which will enable them to forge a solid basis for planning future economic development.

It is therefore imperative to continue ploughing our investment into R&D if we are to avoid future imbalances on the oil market. The lectures and debates we have taken part in have all underscored the need to overcome the remaining difficulties. Nature never goes forward in leaps and bounds; and, generally speaking, neither does research. This is a motto that has been confirmed by our five research topics.

Exploration is having more and more positive results thanks to the growing use of 3D seismic data acquisition. Seismic data processing techniques now provide much more accurate images of the subsurface, even in complex areas, making it easier to avoid major errors in wildcat positioning.

It should be noted, however, that perfect imaging is still not possible in areas with very complex tectonics,



Mr Derek Payne, Dr Klaus Mai, Mr Pierre Jacquard and Dr Norman White

where there is great lateral variation in seismic wave velocity. Possible answers to this problem lie in modelling and seismic data inversion techniques. With the help of the geologist, the geophysicist constructs models which, by successive iterations, converge on an optimal model of the geological structure.

Quantitative evaluation of the oil potential of basins has made significant progress thanks to improved methods of exploring the spacial distribution and quality of the source rock. We are now witnessing the emergence of a new generation of models which will make it possible to obtain quantitative evaluations of the volume and the composition of hydrocarbons expelled from the available source rock for migration into reservoir traps.

Optimising drilling operations by applying the closed loop philosophy — measurement/interpretation/instruction/measurement — is still possible, but is turning out to be more difficult than expected on every level. For the first level, upstream of the borehole, the problem lies with the mechanical side of the system. For the second level, downstream of the borehole, we face the difficulty of optimising borehole to meet utilisation requirements. In the future we should see two separate drilling technologies, one designed for exploration, the other for production. For wildcat drilling, R&D should be directed at reducing the cost of drilling per barrel discovered; for production, where the aim is to reduce the cost of drilling per barrel produced, it is drainage architecture we must concentrate on. In this area, we must coordinate our R&D efforts on drilling, production and reservoir management.

Horizontal drilling, which has made spectacular progress during the past four years, is yet another means of increasing reserves as it allows the extraction of hydrocarbons impossible to produce by other techniques, and this will lower production costs. The true advantages of horizontal drilling are so evident that in the future we should always ask ourselves: 'is there any reason not to drill a horizontal well?' The matter becomes even more crucial now that we know the valuable role this technology can play in implementing improved recovery methods.

Reservoir characterisation is of vital importance right from the delineation stage through to the development phase. Thanks to the concentrated efforts of geologists, geophysicists, petrophysicists and specialists in welllogging, well-testing and stochastic modelling, marked progress has already been made in this field.

Notable developments have recently been made both in 3D acquisition and processing, surface well and cross-well seismic data, geostatistical methods, detailed studies of outcrops, and sophisticated sample analysis techniques. Geologists expert in modelling reservoirs on the basis of well data are making wide use of statistical and geostatistical techniques, and further progress in these methods is expected with the introduction into these models of seismic data, and of the additional constraints imposed by the dynamics of flows measured in the well.

The selection and optimisation of deep offshore production technologies are very much dictated by the producing zones themselves. In conventional zones with small marginal fields, the upcoming technologies will be subsea production and multiphase production, once we can be assured of its reliability.

As for deep offshore operations, the problem is still one of economics. It is apparent that, for water depths of up to 1000 metres, further improvements can be made to tension-leg platforms, and at greater depths, floating and underwater systems should come into their own.

As for development of heavy and extra heavy oils and natural bitumens, there exist large established resources and recoverable reserves but their contribution to the global supply is still a modest one, standing as it does at less than 5 percent. Because the development of these new crudes would lead to increased output, there is a clear geopolitical interest at stake. More accurate cost control of familiar technologies, coupled with the development of new techniques - Orimulsion, for example - will enable R&D to play a vital role in implementing production of these crudes. Economically speaking, these products are more or less competitive with coal and heavy fuel oil.

Our industry must evolve if it is to continue to offer consumers highquality petroleum products. Such a commitment demands considerable investments, evaluated by some at \$150 billion yearly. This is the price we must pay to ensure that our activities enjoy an abiding future.

The world is undergoing a seachange, with freer access to science, and a profound shift in attitudes. We have seen, at the congress held in Argentina, that this change is a further encouragement to the transfer of know-how and technology, not only between North and South but also between East and West.

Colombia shapes up as major producer for the 1990s

By John Cranfield

With BP's Cusiana discovery estimated to hold anything up to 3 billion barrels, Colombia is just a whisker away from joining the first division of oil producers. If that position is achieved, it has been a long while coming. For exploration began in 1905, the first find was made in 1916 and production began in 1921. But, until recently, the scale was such that, although output peaked at 219,300b/d in 1970, it was rarely ahead of local demand and for much of the past 20 years the country has been a net importer.

All that is set to change. Until the early 1960s, the Middle Magdalena Basin was the only producing area, with fields small and of low energy. Then a spate of discoveries along the Ecuador border led to the point where, by the late 1970s, the Putumayo area contributed some 25 percent of overall production. A few other finds near the Venezuela border completed the picture. East of the Magdalena River, the vast Llanos Orientales (plains) had hardly been touched. But those explorers prepared to venture off the beaten track struck lucky, with an early trickle of new finds soon turning into a spate.

The spur to expanded Llanos exploration came in the early 1980s, with the discovery of Cano Limon field. When this came on stream in 1986, it made an immediate impact, overall Colombian production that year averaged 300,000b/d, against 1985's 175,000b/d. Last year, output averaged 430,000b/d, with Cano Limon chipping in 230,000b/d. But even that will pale into insignificance if Cusiana lives up to expectations. Triton, partnering BP and Total in the field, reckons potential output is 400-500,000b/d. That alone would double Colombian production. But other finds are also being made and all the signs are that 1 million b/d is not impossible. With local demand steady at around 200,000b/d, that gives a massive exportable surplus.

Investment needs

All this needs heavy investment. The legislative framework under which, when finds are declared commercial, state firm Ecopetrol can take a 50 percent stake, paying back its share of

search costs, has proved attractive. The basic rules include a 20 percent royalty and the supply of a specified proportion of output to Ecopetrol at somewhat less than market price. That covers local demand. The balance is free for export, currently to the tune of 200,000b/d. On top of that come substantial volumes of fuel oil, since 90 percent of local need is for gasoline and other middle distillates. Hydro-power covers almost all electricity demand.

While the basic rules suit the industry, the political situation rather militates against investment. The activities of the drug barons are wellknown but less so are those of the National Liberation Front, a Cubanbacked guerrilla movement, with the oil industry its main target. Pipelines are regularly blown up, with attacks on isolated drillsites also prevalent. While the industry itself is not unused to operating under less-than-ideal conditions, those providing finance are less pragmatic. Some of the smaller explorers are thus having difficulty raising cash for what are, by any standard, substantial and potentially very profitable developments.

Such problems are being solved. Action against drug-traders is having an effect, while Cuba is less and less able to support overseas terrorism. And whenever peace breaks out in Colombia, the oil industry has raised its activity level very fast indeed. Thus, the oil reserves grew from 500 million



BP's major discovery at Cusiana.

barrels in the late 1970s to around 2 billion barrels a decade later, despite a doubling of output. Now 4 billion barrels of reserves is a distinct possibility.

Moving east

Finds in the Llanos Orientales region came within months of the search started in 1979, with early discoveries including Arauca, Cano Garza, Trinidad and El Miedo. These were generally small, adding perhaps 30,000b/d to overall Colombian output. The breakthrough came early in 1983, when Occidental found Cano Limon. At that time Llanos reserves were put at 240 million barrels, with Ecopetrol estimating that total potential might be 675 million barrels. By 1986, Cano Limon alone was reckoned to hold 1.4 billion barrels and the race was on.

Cusiana is simply the biggest of recent finds. But the Llanos Basin holds a wide range of crudes, from under 14°API to 55° condensate. As a result. some large fields have not been developed, while other very small accumulations have been brought on stream within months. Reservoir permeability also varies widely. It is thus no wonder that, today, some of the earliest finds - El Miedo, for instance, now held by Bula - remain untapped. Nevertheless, the laying of a pipeline network in the centre of the basin, linked to the main export line in the Magdalena Valley, has allowed rapid development of a large number of small fields. This line, with feeders stretching through the Apiay subbasin, can now handle 107,000b/d, ample for now but far short of need should the largest finds be developed.

Cusiana-2A showed its potential this summer. Two tests in the Guadalupe formation, at 14,100– 14,600ft, produced 2,800 and 2,240b/d of 30–37° crude, plus gas at 3.3– 7.3MMcfd. The Barco formation, at 13,780–14,070ft, tested 1,640b/d of 38° crude and 11.5MMcfd gas. Further tests on these and other pays continue, with BP reckoning on a gross hydrocarbon column of fully 1,900ft.

While such a find is clearly ripe for development, others are problematical. One such is Rubiales, where reserves in place are put at 3 billion barrels. But, at 14–15° API, the crude is heavy and recovery is expected to be little better than 13 percent. Nevertheless, operator Tuskar has been pushing Ecopetrol for a declaration of commerciality. The latter has deferred a decision, pending further appraisal drilling and a lengthy flow test from



present wells. As a result, oil has been trucked from the field since mid-year, with a lengthy hiatus during the rainy season. Activity begins again in November and Tuskar hopes to see the field declared commercial within 12 months. Meantime, it has farmed out part of its interest to Dyas and is talking with others.

Pipeline expansion

Tuskar reckons that the field could produce 70,000b/d, requiring a \$150million pipeline outlet. That particular problem may be eased somewhat in the near future. Following the late-1989 completion of the 107,000-b/d pipeline from the central Llanos area to the Magdalena Valley, a consortium named Oleoducto de Colombia put forward plans for a second line, this time to move 150,000b/d, not just to the Magdalena Valley, but right through to an export terminal on the Caribbean coast at Covenas. Costing \$321 million, the line will be 51 percent owned by private-sector oil firms, with the balance being held by Ecopetrol.

Pipeline expansion is also under way into the Upper Magdalena Valley, this and the success of wildcatters in the Llanos Basin contributing to a surge in the search around the oldestablished producing areas. New finds in old areas include the Toqui-Toqui field, where American International is now drilling appraisal holes. The 70,000-b/d line into the Upper Magdalena Valley came on stream at the beginning of this year, allowing some 20 fields, mostly found by Tenneco but now held by Shell, to be brought into production.

More surprising is the way in which success has rubbed off on the Putumayo play, along the Ecuador border and totally unconnected with other search areas. Export is via the costly Trans-Andean Pipeline to the Pacific coast at Tumaco. The Garnet/Aviva group has had particular success - two of three recent finds are now being developed. Production from Linda and Toroyaco began this summer at around 3,000b/d. The Mary-1 find, which tested a combined 1,940b/d from two pays, on the pump, may follow. One problem in the immediate area is the lack of a pipeline, restricting overall output at present to the 4,500b/d that can be handled by road. Yet the export line itself has been underused for some years. So, new fields, if linked to it,

could help to lower the high export costs for the area.

Refining upgrade

NEW

The spate of recent finds has led to something of a crisis in refining. The long-established Barrancabermeja plant cannot cope with the volumes available — and the need to supply local demand. So a new plant, costing \$1 billion, was to be built in the Magdalena Valley at Puerto Trionfo. Its capacity of 75,000b/d would have largely dealt with the problem. However, that plan has now been scrapped by Ecopetrol, which is looking to a much bigger plant, located in the Casanare area near to the Cusiana field. The result, says Energy Minister Luis Fernando Vergara, would be a Colombia that was not only a crude exporter but also a net exporter of products. Start-up target for the new plant is still the mid-1990s. Meantime, Barrancabermeja will receive an investment of \$100 million for a cracker. Boosting gasoline output by 15,000b/d, this will also make it easier to handle some of the heavier crudes now being offered.

Gas too

Also aimed at freeing up further product exports are plans for a gas grid. A rudimentary network has existed for some years, feeding gas from the Guajira fields in the far north to consumers along the Caribbean coast. Now Promigas (Ecopetrol, Guajira field operator Texaco, International Finance Corp. and a number of local investors) plans to extend the system through to Bogota. This would involve 248 miles of 24-inch pipeline and 373 miles of 20-inch, turning the existing system of just 265 miles into something approaching a national grid. Last year, the European Community put up \$1 million for studies into local distribution-grid development. Agents Catalana de Gas, Gaz de France and Beicip are working up a national plan as well as a set of technical standards. Also planned is a \$1.4-billion scheme to import gas from Venezuela.

Institute of Petroleum Epidemiological Study — Distribution Centre Study: Principal Results 1951–89 Institute of Petroleum Epidemiological Study — Refinery Study: Principal Results 1951–89

These studies were first published in 1980. Mortality data were examined for workers employed for at least one year between 1950 and 1975 at eight oil refineries and approximately 750 distribution centres in the United Kingdom. The latest studies, covering the period to 1989, follow up the same workers.

Over 99 percent of the 34,569 men in the first refinery study and 23,306 men in the original distribution centre study were successfully traced to determine their vital status at the end of 1989. The mortality observed has been compared with that expected from all males in the national population.

The mortality from all causes of death in both studies is lower than that of the national population; reduced mortality is also found for many of the major nonmalignant causes of death.

Mortality from all neoplasms in both studies is lower than the national average, largely due to reduced numbers of deaths from malignant neoplasm of the lung. However, raised mortality patterns are found in the refinery study for diseases of the arteries and for deaths resulting from accidental fires and explosions.

The studies reveal some isolated and less consistent raised mortality patterns which were only found in some companies, locations and job types, and are thus more difficult to interpret. Mortality patterns are raised for malignant neoplasms of the intestine, rectum, larynx and prostate in the refinery study, and for malignant neoplasms of the larynx and prostate in the distribution centre study. Also there is a slightly raised incidence of ischaemic heart disease in one particular company in the distribution study across several job groups.

As in the original 1980 study, mortality from melanoma is raised in several job groups in the refinery study. Mortality from malignant neoplasm of the kidney is raised overall in the distribution centre study—and in drivers in particular. The mortality from this disease is highest in workers who started employment in the early 1950s.

Consistent with trends in the national population, raised mortality is found for labourers in both refineries and distribution centres, from neoplasms and malignant neoplasms of the lung, and for malignant neoplasms of the oesophagus and stomach in the refinery study.

The observed deaths from leukaemia are slightly less than expected in the refinery study and slightly more than expected in the distribution centre study. Although there is no consistent increase, some localised increase in mortality rates has been found in respect of both refineries and certain job categories within them. Mortality rate is also somewhat raised in distribution centre drivers and in particular in respect of myeloid leukaemias.

Possible lines of development of these studies include monitoring the future patterns of mortality of the study population, investigating specific issues of concern using, for example, nested case-control studies and further analyses of the data using modelling techniques.

The new update covering the period to 1989 has been undertaken by Dr Lesley Rushton of Thames Polytechnic, one of the authors of the first studies.

The two reports are now available from the IP Library, 61 New Cavendish Street, London, W1M 8AR, price £20 each.

Natural gas's alternative fuel is entering a new era

Ray Holder, Director General of the Liquefied Petroleum Gas Industry Technical Association (LPGITA) discusses in an interview with *Petroleum Review* how the cleanliness of propane and butane has been given a fillip by a growing realisation of its advantages in reducing total emissions — which, for the first time, has led to research into a dedicated LPG road vehicle engine.

Geoffrey Mayhew: The EC has proposed a special tax on fossil fuels to reduce 'greenhouse gas'. How might this affect commercial liquefied petroleum gas?

Ray Holder: One does not know how far the government will be prepared to go in relation to this and the broader environmental issues. In the past, a reduction in the use of fossil fuels has been attempted through the promotion of energy efficiency, and clearly an objective must be to reduce the level of consumption of fossil fuels by improved efficiencies and insulation.

If there was such a tax, it is not easy to speculate how it would affect the fortunes of LPG — but I will try.

I believe we are living in an era of gaseous fuels. In terms of emissions, clearly gas has much in its favour in the short to medium term if a significant reduction in CO2 and other emissions is required. An indication of this is that all the new power generating companies will be installing gas-fired combined cycle generating plant over the next five to 10 years. This will result in more efficient power generation and a reduction in emissions of other atmospheric damaging gases.

In other uses, I am sure that what holds good for natural gas must also be said to apply to the LPGs, propane and butane. LPG cannot but have a useful place in such considerations due to the fact that when it is burnt it does so cleanly, reducing the greenhouse effect. In addition it is a highly efficient fuel in use and easy to handle.

One could expect that LPG should be excluded from such a tax, or certainly favourably considered?

I believe that natural gas and LPG have a considerable contribution to make towards a cleaner environment in this era of gaseous fuels. I hope that in deciding the levels and exemptions in a tax on hydrocarbons consideration would be given to ways of encouraging people to use LPG, not the reverse.

If the use of LPG were encouraged, who would be the extra users?

The market for LPG in the United Kingdom is relatively small to all fuels but the range of its uses is large. It includes the petrochemical industry as well as holiday caravans. It is also used as a fuel for cars and other road vehicles as 'autogas'.

In the role of an auto fuel it does have particular environmental advantages which, while little known in the United Kingdom, have been put into practice elsewhere.

Let me give some examples. In Athens and Tokyo, both of which have serious air pollution problems, LPG is being used to reduce the total effect of exhaust emissions. In both cities most taxis are converted to the use of autogas, instead of petrol or diesel fuel, because it is so clean. When Athens is plagued by a smog, as it is from time to time, road vehicles not fuelled by autogas are temporarily banned.

A number of other cities are experimenting with the use of LPG for bus transport (formerly diesel fuelled) for the same reasons. Generally the conversion to LPG, autogas, is encouraged by government concessions in road or vehicle taxation.

In Holland the government does not charge excise duty on LPG as a vehicle fuel. That makes autogas especially economical to use and the LPG consumption by road vehicles in Holland has risen to the level of 17 percent of the overall consumption of automotive fuels.

How big is the automotive market in the United Kingdom?

It has become minute. In 1981 70,000 tonnes of LPG were sold to road transport vehicles. In 1990 the consumption was 2,900 tonnes.

What happened?

What affected the situation mostly was that when unleaded petrol was introduced in the mid-1980s, it was followed by a tax cut to encourage its use. This concession was not allied to autogas, which remained taxed at the rate of 50 percent of the tax on 4-star leaded petrol. At the time it was stated that it was not worthwhile to include autogas tax in the downward change because its use was so small. The industry thought that was a negative approach, and at no time has there been any encouragement in tax or otherwise for what is an even cleaner fuel, which could obviously help in the scenario for holding down emission levels.

Do potential LPG consumers have to go to the trouble of converting their vehicle engines?

They do, because so far no manufacturer has been sufficiently interested to consider a dedicated LPG engine. This includes the United States, where there is a substantial use of autogas in police cars, public road transport, cars and trucks in certain states — where there are also good servicing facilities for LPG fuelled vehicles.

Engine manufacturers have wanted a much larger demand than there is before they made an investment. So without a reasonable excise duty concession on the fuel used, the pay-back time for a conversion to LPG is often not cost effective.

However, in France a study has begun this year towards the production of a dedicated LPG engine for a road vehicle, and it is being financially supported by the French government. This is a most significant step.

It has also been reported that British Gas is engaged in research into the use of compressed natural gas as an auto fuel — an application which has already been developed strongly in Canada. This type has also been used in Australia and introduced in New Zealand.

Are you suggesting that a UK autogas market could all at once take off?

No, of course I am not. The infrastructure within the automotive market does not exist and its creation at any sort of accelerated pace would be a huge problem. But there is a case for its encouragement in cities and urban areas. Such a case has been put to the EC recently by the European LPG Association (AEGPL), which believes that in cities road transport services such as buses and delivery vehicles, which are based at a depot, should be encouraged to go over to autogas. This was a positive approach.

Does the AEGPL make special LPG studies?

It makes studies of all aspects of LPG. Sixteen countries which have an LPG industry association, such as our own in the United Kingdom, belong to it and we give it as much support as we can. In making their submission to the EC, which included a case for a diminution in excise duties for autogas, it estimated that the growth in autogas fuelled vehicles would not be more than 4 percent over five years. At the same time AEGPL stressed that it would be wrong to create an imbalance in the current arrangement for automotive fuels through, for example, a duplication in distribution tankers and fuelling facilities at service stations. They did not think that their proposal, to encourage depot based road services in cities in the use of LPG for their vehicles, would do that.

The LPGITA will watch the EC green tax proposal with great interest.

What is the size of the LPG market in the United Kingdom?

There are more than 5 million customers, mostly residential, agricultural, commercial and industrial. They use some 1.1 million tonnes of LPG a year. LPG is the result of North Sea production and onshore oil refining, and the major oil companies are also major LPG producers. In 1990 some 3.6 million tonnes of butane and propane came from the North Sea. You can see the United Kingdom produces more LPG than it consumes but there is a growing international trade and what is not sold here is sold overseas, particularly in northern Europe. It is an internationally priced product.

Naturally there is a great emphasis on safety and technology, which is the basis of our association's work. That has required high capital investment by the producers and the 50 or so independent distributors of LPG. More than £470 million has been invested by the industry in pipelines, 15 primary storage facilities, 80 bulk storage and distribution plants and over 700 road trunking and delivery vehicles. There are also many LPG rail cars.

LPG customers are people out of the range of the natural gas main, by short or long distances, and who call on us as the alternative fuel. There are many more than is realised — and probably 2.5 million more potential customers.

The heating and hot water system can be served by LPG and you can cook by it. In a lounge an LPG decorative log fire is more attractive than an electric one and easier than coal. Add to this the transportability of LPG in cylinder form and its host of uses and you can easily see what a useful fuel LPG is.

How does a customer in a rural area get LPG?

It could be a bulk customer with a storage tank with a capacity of up to 2 tonnes. As you know, propane is held in a liquid state under a pressure of 100 psi and when released it expands as a gas to approximately 250 times its volume. Should bulk not be convenient, a multi-pack installation of cylinders 47 kg in capacity is available.

The installation and maintenance of the bulk tank and the delivery and service of the cylinder is carried out by



the distributor, whose staff are required to be trained to a very high standard. Most of the oil companies and LPG distributors are members of LPGITA, which runs LPG installer training courses for both external and internal LPG installations. Engineers who pass the installation course are certificated.

LPGITA codes of practice, of which there are 27, and Health and Safety Executive regulations and guidance notes complement each other. Standards are updated and new standards established, as new equipment and techniques are developed. The members of our Technical Management Committee, and the working groups, are highly experienced technical people. Before new standards are put into effect, we gain appropriate government department agreement in addition to that of participants in industry.

The safety record is good. For example, 10,000 delivery vehicles of different types and capacities cover 100 million miles a year. There has been no incident involving catastrophic rupture of a bulk vehicle's tank. Of the few accidents reported, most have been classified as road traffic accidents, which have not included loss of product.

How does Europe stand in the world LPG market?

World supply of LPG, now about 140 million tonnes, is expected to increase marginally but steadily - perhaps by 3 to 4 percent a year - and in 1994 will still be ahead of world demand by about 10 million tonnes. In Europe as a whole, demand is above what the area produces. The volume Europe has to import in any year is impossible to predict because an unusually severe winter and a cool spring and summer can cause demand to soar. It is a good market. As the 1991 BP Review of World Gas reported, international seaborne trading rose in 1990 to just under 32 million tonnes and imports to Western Europe and Japan rose by almost 1 million tonnes each. These supplies came from the Middle and Far East.

On the other hand, a mild winter in the United States in 1990 was largely the reason why world consumption of LPG fell by 2.7 percent. Production problems can also affect supplies, although they are happily infrequent. Supply can also be affected by sudden extra demand from the petrochemical industry, whose crackers will switch from naphtha to LPG when its price is less, as is usually the case in summer. A good deal of technical change is being prepared — as in the research for an LPG dedicated road vehicle engine — and in the future a demand for LPG feedstocks for the next generation olefin plants is expected. Against that, the use of the new NGL crackers will reduce LPG demand in oil refining.

Will the advent of the Single Market help LPG in the United Kingdom?

The growth of natural gas in Europe is leading to a reduction in LPG demand but nevertheless there will be greater opportunities for this fuel — as the environmental issues are indicating. EC law on the standards for LPG appliances will be important. Almost every domestic or catering cooking appliance made for natural gas has an identical model suitable for propane. We shall continue to do all we can to ensure that EC directives are based on a full understanding of all the circumstances. We are also playing a leading part in AEGPL in Europe.

Our objective is to try to ensure that the United Kingdom is not disadvantaged through the arrival of the Single Market by unnecessary additional regulations as a result of the EC seeking harmonisation or standardisation for its own sake.

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FORTHCOMING EVENTS

December 2nd-3rd

London: Sixth Annual Energy Conference 'Energy Policy: Market-Led or Government Driven?' Details: The Conference Unit, Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE. Tel: (071) 930 2233.

3rd-4th

Harrogate: Gas '91 Exhibition and conference on 'The State of the Art and the Way Ahead'. Details: Mr Rex Cooke. The Institution of Gas Engineers, 17 Grosvenor Crescent, London SW1X 7ES. Tel: (071) 245 9811.

3rd-4th

London: Conference on 'UK and European Gas Price, Supply and Demand'. Details: Maura Fay, IBC Financial Focus Ltd, 57/61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 323 4298.

4th-5th

London: 'Subsea 91 — International Conference'. Details: Subsea 91 International Conference, Themedia Ltd, PO Box 2. Chipping Norton, Oxon OX7 5QX. Tel: (060884) 700/888. Fax: (060884) 796.

9th

London: Seminar on 'Use of Polymers in Drilling and Oilfield Fluids'. Details: Cathryn Evans, PRI, 11 Hobart Place, London SW1W 0HL. Tel: (071) 245 9555. Fax: (071) 823 1379.

11th

Chislehurst: Course on 'Flammable and Toxic Gas Detection'. Details: Sira Communications Ltd, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

11th

London: Conference on 'Russia's Oil and Gas — Present and Future'. Details Arguments and Facts International Conferences, PO Box 35, Hastings, East Sussex TN3 2UX. Tel: (0424) 444142. Fax: (0424) 717498.

11th-12th

London: Conference on 'Multiphase Operations'. Details: IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

12th-13th

London: Conference on 'A Single Market for Suppliers to the European Energy Industries'. Details: Tracy Lapard, The Ernst & Young Business Centre, Ernst & Young, Becket House, 1 Lambeth Palace Road, London SE1 7EU. Tel: (071) 931 4675. Fax: (071) 620 0940.

13th

London: Workshop on 'System Effectiveness'. Details: Ilze Lee, SD Scicon UK Ltd, Wavendon Tower, Wavendon, Milton Keynes, MK17 8BR. Tel: (0908) 585858. Fax: (0908) 281006.

January 1992 9th-10th

London: Conference on 'International Boundaries: Political, Legal and Strategic Implications'. Details: The Conference Department, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE. Tel: (071) 957 5700. Fax: (071) 957 5710.

14th-16th

Stuttgart, Germany: 'Tribology 2000'. Details: Technische Akademie Esslingen, Postfach 1265, D-7302 Ostfildern, Germany.. Tel: (0711) 3400823. Fax: (0711) 3400843.

16th

London: Lecture on 'The Zeepipe Pipeline Project'. Details: Mr A A Reed, The Pipeline Industries Guild, 17 Grosvenor Crescent, London SW1X 7ES. Tel: (071) 235 7938.

20th-21st

London: Course on 'North Sea Risk Analysis'. Details: DCA Consultants Ltd, Rosewall Cottage, Main Road, Aberuthven, Perthshire PH3 1HB. Tel: (0764) 63936.

26th-30th

Houston, USA: Conference on 'Engineering for Sustained Environment'. Details: Frank Demarest, ASME, 1950 Stemmons Freeway \$5037C, Dallas, Texas, USA Tel: 214 756 4901. Fax: 214 746 4902.

27th-29th

New Delhi, India: International Seminar on 'Emerging Trends in Offshore Technology and Safety'. Details: Dr S L Agarwal, Engineers India Limited, 11th Floor (Certification Division), 1 Bhikaiji Cama Place, New Delhi - 110 066, India. Tel: 6070279. Fax: 6872693.

28th-31st

Malta: 'The First Mediterranean Oil & Gas Exhibition and Conference' co-sponsored by the IP. Details: Spearhead Exhibitions Ltd, Rowe House, 55–59 Fife Road, Kingston upon Thames, Surrey KT1 1TA. Tel: (081) 549 5831. Fax: (081) 541 5657.

February 11th-12th

Houston, USA: Conference on 'Energy Strategies — The Quest for Markets'. Details: Cambridge Energy Research Associates, Charles Square, 20 University Road, Cambridge MA 02138, USA. Tel: (617) 497 6446. Fax: (617) 497 0423.

17th-18th

Singapore: Conference on 'Pacific Petroleum and Energy Finance and Investment Exchange'. Details: Global Pacific Enterprizes Pty Ltd, 25 Kevin Avenue, Avalon, Sydney 2107, NSW, Australia. Tel: (612) 973 1912. Fax: (612) 973 1925.

17th-21st

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

18th

London: Lecture on 'Gas Pipelines BS8010 and Risk Assessment — A Case Study'. Details: Mr A A Reed, The Pipeline Industries Guild, 17 Grosvenor Crescent, London SW1X 7ES. Tel: (071) 235 7938.

18th

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

18th-19th

Nuremburg, Germany: 'Hydrogen Energy

Technology III'. Details: VDI-Gesellschaft Energietechnik, Postfach 10 11 39, W-4000 Dusseldorf 1, Germany. Tel: 49 211 6214.

20th

London: Conference on 'Doing Business Without Paper — the impact of EDI (electronic data interchange) on the upstream and downstream oil industry'. Details: Susan Ashton, The Institute of Petroleum.

FORTHCOMING EVENTS

25th-27th

London: Course on 'Introduction to Petroleum Exploration for Non-Geologists'. Details: The Administrative Secretary, JAPEC, c/o The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 439 4944. Fax: (071) 439 8975.

26th-28th

Santiago, Spain: Conference on 'Deepwater and Marginal Oilfield Development'. Details: Offshore Conference Services, 34–36 Apsley End Road, Shillington, Hitchin, Herts SG5 3LX. Tel: (0462) 712049. Fax: (0462) 711889.

March 2nd-6th

Orlando, USA: Conference on 'Energy from Biomass and Wastes'. Details: Susan Robertson, IGT, 3424 South State Street, Chicago, IL 60616. Tel: 312 567 3881. Fax: 312 567 3857.

4th-6th

Amsterdam, The Netherlands: 'First International Conference on Carbon Dioxide Removal'. Details: ICCDR c/o KIVI, PO Box 30424, 2500 GK, The Hague, The Netherlands.

8th-12th

Divonne les Bains, France: '8th Advanced International Petroleum Executive Seminar'. Details: Dr Bob Gale, Seminar Manager, Petroleum Economics Limited, Piercy House, 7 Copthall Avenue, London EC2R 7BU. Tel: (071) 638 3758. Fax: (071) 638 3708.

9th-13th

Edinburgh: Course on 'Production Logging'. Details: Tom Inglis, Centre for Continuing Education, Heriot-Watt University, Riccarton, Edinburgh EH14 4AS. Tel: (031) 451 3014. Fax: (031) 451 3005.

10th

London: Conference on 'What's New in Lube Oils'. Details: Miss Caroline Little, The Institute of Petroleum.

17th-19th

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



Coventry: Conference cosponsored by the IP on 'Pipeline Systems'. Details: Mr David Crow, BHR Group Limited, Cranfield, Bedford. Tel: (0234) 750422. Fax: (0234) 750074.

29th-1st April

London: '4th Conference on Petroleum Geology of NW Europe'. Details: Conference Associates and Services Ltd, Congress House, 55 New Cavendish Street, London W1M 7RE. Tel: (071) 486 0531. Fax: (071) 935 7559.

April

7th-12th

Lagos, Nigeria: First international oil, gas and petroleum exhibition — 'The World of Oil in Nigeria'. Details: Glahe International Group Ltd, Woodcroft, Bures Hamlet, Suffolk CO8 5DU. Tel: (0787) 228164.

13th-17th

Edinburgh: Course on 'Reservoir Modelling'. Details: Tom Inglis, Centre for Continuing Education, Heriot-Watt University, Riccarton, Edinburgh EH14 4AS. Tel: (031) 451 3014. Fax: (031) 451 3005.

28th

Dubai: 'Britain in the Gulf 92'. Details: International Conferences and Exhibitions Ltd, 51–53 High Street, Kings Langley, Herts WD4 9HU. Tel: (0923) 261988. Fax: (0923) 261669.

28th-29th

Milan, Italy: 'The Third European and Middle Eastern Pipeline Rehabilitation Seminar'. Details: Susan Carradice, Pipeline Integrity Management, The Pipeline Centre, Farrington Road, Rossendale Road Industrial Estate, Burnley, Lancashire BB11 5SW. Tel: (0282) 415323. Fax: (0282) 415326.

28th-30th

Birmingham: 'Control and Instrumentation 92'. Details: MGB Exhibitions Ltd. Marlowe House, 109 Station Road, Sidcup, Kent DA15 7ET. Tel: (081) 302 8585. Fax: (081) 302 7205.

28th-30th

London: Course on 'Drilling Technology Overview'. Details: The Administrative Secretary, JAPEC, c/o The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 434 9944. Fax: (071) 439 8975.

Tuesday 18 February

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IP WEEK 1992

Special luncheon — Mr Kenneth T Derr, Chairman and Chief Executive Officer, Chevron Corporation will be the guest of honour and speaker on the topic 'Letter from America'. Mr NJ Tilling, Paramins Group, Exxon Chemicals will talk to the IP's London Branch on the subject of 'Trends in Automotive Fuels and Lubricants'.

Wednesday 19 February

The IP Annual Dinner.

Seminar on 'Oil Price Information'

Thursday 20 February

Conference on 'Doing Business Without Paper — the impact of EDI on the upstream and downstream oil industry'.

For further details please contact Miss Caroline Little at the Institute of Petroleum on (071) 636 1004.

Oil market trends in Germany and Eastern Europe

By Dr Jochen H Mohnfeld

Oil Industry Division, Federal Economics Ministry, Bonn

The East German oil market has entered a phase of rapid growth, with an increase in demand of 70–100 percent in the next 10 years likely. Similar energy structures as in East Germany exist in the former COMECON countries Hungary, Czechoslovakia, Poland and, to a lesser extent, Bulgaria and Romania.

This paper analyses the current situation and the future outlook for oil markets in Eastern Germany and in other Central and Eastern European countries. The first part of the analysis describes the patterns of energy use in Eastern Germany and gives a brief outlook for oil markets, based on the assumed convergence of the Western and Eastern German economies. In the second part, the similarities and dissimilarities between Eastern Germany and other Central and Eastern European energy markets are examined.

Eastern German oil market

Eastern Germany was until 1990 part of COMECON. Its economy, therefore, was very closely interwoven with those of the other Central and Eastern European countries, with the Soviet Union in both a pivotal and dominant role. This pattern of economic interdependence underlies much of today's energy situation and will continue to affect future progress.

In terms of gross national product (GNP), the gap between Eastern and Western Germany was larger than often thought. In 1990, total GNP in the former (East) German Democratic Republic, expressed in purchasing power parities, is estimated to have been only about one tenth of that in Western Germany. Moreover, per capita GNP in Eastern Germany was only 39 percent of that in Western Germany - below the levels in Greece and Portugal. This low starting level implies dynamic growth prospects for the future, now that the chains of the centrally planned economy have been broken.

Eastern Germany's energy economy was physically almost entirely separated from Western Germany and not economically integrated with the world market. For oil and gas, Eastern Germany was — like other Eastern European states — almost totally dependent on the Soviet Union.

The Eastern German energy supply was predominantly based on a single domestic source - lignite, a fuel with a very low calorific value. (One ton of lignite has a heat content of only 0.2 tons of oil equivalent (toe)). Table 1 presents data on primary energy consumption by major fuels in Eastern and Western Germany and in key Central and Eastern European states. Coal (mainly lignite) in Eastern Germany accounted for 73 percent of total primary energy requirements, while oil accounted for only 14 percent. In contrast, oil's share in Western Germany and in other Western European states stands at around 40 percent. Moreover, oil consumption per capita in Western Germany was 2.6 times higher than in Eastern Germany (Figure 1). This relative under-utilisation of oil.

brought about by administrative intervention, was also the case in other Eastern European nations.

On the other hand, energy efficiency in Eastern Germany was less than one half that in West Germany (Figure 2). This low efficiency also characterises other Central and Eastern European economies.

Oil consumption pattern

Starting from widely divergent consumption levels and background conditions, oil markets in Eastern and Western Germany are likely to take quite different paths of development in the future. This section presents an outlook for oil consumption to the year 2000.

Total inland consumption of oil in West Germany stood at 99 million tons in 1989, while in East Germany it was only 16 million tons (Figure 3). Pre-unification data are used to highlight the contrast. For Eastern Germany this figure includes refinery use, bunkers and military use, while these items are excluded for Western Germany. In the Western part of



Figure 1: Per capita oil consumption

Germany, oil consumption will continue to shrink, as it has done since 1979, but probably at a slower pace than previously expected. The main reason for this slowdown is that economic growth will probably be somewhat higher, at around 3 percent per annum, due to the long-term stimulation of unification and the creation of a single European market.

In contrast, oil consumption in Eastern Germany could increase from 16 million tons to 27 million tons by the year 2000, or by 70 percent (Figure 3). The underlying determinants of these divergent trends are different for each of the major petroleum products. Gasoline: In Western Germany 26 million tons of gasoline were consumed in 1989. Gasoline consumption in Eastern Germany at that time was only 3 million tons. If Eastern Germany attains the same levels of vehicle ownership and usage as the rest of the country, gasoline consumption there could increase to 6.3 million tons by 2000, or by 110 percent (Figure 4). Pushing the growth in fuel use, the number of passenger cars in Eastern Germany could more than double, from 3.9 million in 1989 to 8.8 million by 2000. Gasoline consumption will rise slightly less than proportionately with the number of cars, as the vehicle consumption per kilometre will gradually decrease.

The assumption of an equal level of motorisation in Eastern and Western Germany is reasonable. Car ownership per 1,000 inhabitants stood at only 235 in Eastern Germany in 1989, compared with 480 in Western Germany. By 2000, the densities in both areas of the country are assumed to achieve the same level, at around 530 cars. During the last 18 months, a rapid increase has already been evident. A car is the first major consumer durable that households want to purchase. For Eastern Germany, a car has become a symbol of personal freedom.

Diesel fuel: In Western Germany, the historical trend of dieselisation for passenger cars will probably continue. There will also be a strong increase in diesel used for commercial transport. As a result, diesel consumption in that region is forecast to increase from 17.1 million tons in 1989 to 19.3 million tons by 2000, or by 13 percent (**Figure 4**).

In Eastern Germany 3.4 million tons of diesel were consumed in 1989, with about one-third each in agriculture, commercial transport and public transport. This pattern of diesel consumption in Eastern Germany is quite different from that in Western Germany because private diesel cars were non-existent, while in West Germany they account for 13 percent of the passenger car fleet. Since the future economic structures are going to become similar, it is estimated that by 2000 the share of diesel cars in the passenger car fleet will be in the range of 15 to 18 percent in both parts of Germany. The outlook for continued dieselisation is based on the better fuel efficiency of diesel motors which is about 20 percent greater than for gasoline.

The share of commercial freight trucked on roads in Eastern Germany will rapidly increase. In the past, commercial freight was moved mainly by rail. It is expected that much of this business will now shift to highway transport. Thus, commercial transport diesel use will also expand rapidly in

		Germany			Czecho-	Soviet	
	EC	West	East	Poland	slovakia	Hungary	Union
Coal	21	27	73	78	60	28	21
Lignite	(3)	(8)	(69)	(12)	(40)	(17)	(3)
Oil	45	40	14	14	20	29	31
Gas	18	17	9	7	11	29	40
Nuclear	13	13	4	-	7	10	4
Other	3	3	-	1	2	4	4
in mtoe ³	1,116	268	89	122	76	30	1,401
					Source:	IEA Statis	tics; estimates
Base yea	r: 1989						and a second
² Total pri ³ Million t	mary ener onnes of o	rgy requi	uirement valent	tS			

Table 1: Primary Energy Consumption Structure¹ (percent)



Eastern Germany. In contrast, diesel demand in agriculture will shrink. As a result diesel consumption in Eastern Germany is forecast to rise from 3.4 million tons to 5.4 million tons by 2000.

Home heating: Energy use in Eastern Germany's residential sector reflects very clearly the philosophy and deficiencies of central planning in socialist countries. A very dramatic change is now expected. The existing structure of home heating in Eastern Germany is totally different from that in Western Germany (Figure 5). Light heating oil was almost non-existent as an energy source for home heating (Figure 6). Its use was not permitted. Lignite was by far the dominant heating fuel: 64 percent of homes were heated directly, another 25 percent relied on district heating, of which about 60 percent was based on lignite. In total, about 80 percent of home heating was lignite-based. This fuel was forced onto the residential sector by the central plan, which required maximum import substitution - regardless of its economic and environmental consequences.

Most observers assume that light heating oil will soon capture an important role in the Eastern German home heating market by replacing lignite; it will also be used in commerce and industry. This will result in an increase from almost nil in 1989 to about 4 million tons in 1995 and 6 million tons by 2000 (Figure 6).

In summary, oil consumption will grow rapidly in all sectors in Eastern Germany, with a total increase of 70 percent by 2000. In contrast, over the same period in West Germany, a gradual shrinkage of about 2 percent in total is foreseen. The following factors underlie these divergent trends:

- Rapid growth of the Eastern German economy is expected after the adjustment crisis levels off — in about one to three years time.
- Fast growth of personal disposable income in Eastern Germany will lead to a more than doubling of motorisation and to a switching in home heating from coal to more convenient and less polluting fuels like oil and gas.
- A certain moderate increase in oil consumption in Eastern German industry and commerce will result from this economic growth but oil use there will ultimately depend on its competitive relationship with other fuels.
- For heavy fuel oil, no massive increase in Eastern German consumption is foreseen, since new power stations will probably be

based predominantly on imported coal since import restrictions are not applicable to Eastern Germany as opposed to Western Germany.

The background and ultimate outlook for energy use in other Central and Eastern European economies might be similar to those for Eastern Germany but the pace of development will certainly be slower. The reason is that Eastern Germany has, in one single step, changed to a market economy. Although Eastern Germany is suffering at present from this drastic change, the adjustment crisis will pass relatively fast, as the resources of the Western German economy and appropriate new policies are employed to bolster the recovery.

Central and Eastern Europe

The political map of Europe in terms of trading blocs and the state of economic development has undergone tremendous changes during the last few years. As a result the future is more uncertain than ever before.

- Eastern Germany has become part of the European Community (EC). It has totally abandoned the state planning system. Though there are problems of transition, they appear small and of a manageable dimension in relation to the task in other Central and Eastern European countries.
- Three of the six former Central and Eastern European COMECON countries have taken irreversible steps towards democracy and free markets (Hungary, Poland and



Figure 4: Motor fuel consumption in Germany

Czechoslovakia). But the transition of these economies appears to be more difficult and time-consuming than expected. They are undergoing a restructuring crisis, which, in some cases, will worsen further before it improves.

- In Bulgaria and Romania, the future course of economic development is less clear. In Romania, a neo-socialist regime has won the parliamentary majority. In Bulgaria there is a socialist majority in parliament but a president pressing for economic reforms. For both countries it remains open whether moves toward more market-oriented systems will be taken.
- The biggest unknown in any calculations about the fate of Eastern Europe has become the disintegration of the Soviet Union. The old

order is rapidly falling apart after the coup against Mr Gorbachev failed in August. A new order - a new Union treaty, independence for a number of former Union republics, new trading links — is not yet emerging. Mr Gorbachev, in his function as President and leader of the Soviet Union, did not develop a real economic reform concept. Instead Mr Yeltzin, the President of the Russian Republic, has since the failed coup become the motor of economic reforms. Nevertheless, there is so far little visible progress in the transformation process. The situation is exacerbated by the fact that some regions and even whole republics refuse to exchange goods and services and are reverting to a barter type of economy. The grow-



ing crisis of the former Soviet economy is nowhere seen more clearly than in the energy sector.

This crisis in the Soviet Union is transferred to its former Central and Eastern European COMECON partners because of their extraordinarily high trade interdependence. In the former (East) German Democratic Republic, for example, almost 80 percent of its exports were directed toward COMECON members, with the Soviet Union alone accounting for 60 percent of the COMECON trade. In the case of Czechoslovakia, the dependence reached almost 90 percent. Hungary has lessened its interdependence with the Soviet Union and other Central European states in the last few years but to do so, it had to incur a large foreign debt.

The Soviet Union was the dominant supplier to the other energy COMECON countries, mainly of oil and gas. The complementary nature of energy relations between the Soviet Union and the rest of COMECON is evident from Table 2. Around 90 percent of the energy imported into these countries came from the Soviet Union. Other intra-bloc trade and imports from the rest of the world were minimal. All these trade links are now in disarray. At the end of 1990, the soft rouble pricing was terminated and converted to hard currencies. It has been estimated by the OECD that this

	Share of imports in total primary energy consumption percent	USSR	Import shares Other COMECON states percent	Others
Poland	3	93	1	6
Czechoslovakia	31	88	4	8
Hungary	45	89	9	2
Former GDR	26	90	3	7
			Source: IEA Sta	itistics (1988)

Table 2: Share of energy imports in Central European countries

the UN sanctions. In addition, all Central European states, including the former German Democratic Republic, are seeking to establish new pipeline connections, giving themselves greater supply flexibility. Import facilities for sources other than the Soviet Union had been rather limited. Despite this thrust to diversify import sources, a crucial role for the (former) Soviet Union in Central and Eastern European energy markets will remain for the next few years.

Future trends

There are three basic characteristics of the energy sector in Central and Eastern Europe today that will condition the prospects for future oil market

'The Soviet Union is the world record holder for energy inefficiency'

change to market prices for oil will cost the Central European states in 1991 about \$8 billion more for the same quantity of oil as in 1990.

Because of this one-sided reliance on Soviet oil, the Central European states ran into supply difficulties in the autumn and winter of 1990–91, when the Soviets slashed oil exports by 20 to 30 percent. For 1991, in the new oil trade agreements between the Soviet Union and individual Central European states, the contract volumes are down to just 50 percent of those in 1990.

Alternative sources of supply have become necessary. Iran, for instance, has emerged as a new and important supplier of incremental crude to Central Europe, partly under barter arrangements, now that Iraq (the former main source) has been eliminated by developments. **Table 1** shows that four of the six Central and Eastern European states are heavily coal based. Coal accounts for 60 to 70 percent of their total energy supplies.

Secondly, they use very little oil in relation to total energy needs - between 14 percent (Poland, East Germany until 1990) and 20 percent (Czechoslovakia, Romania). This is half the ratio in Western Germany and Western Europe. Corresponding to this low share is the low per capita oil use (Figure 1). Per capita Western European countries used two to two and a half times more oil than a typical Central European country. This gives considerable scope for an increase in oil consumption, once the economic adjustment process is over and standards of living improve. This is, of course, not the case for the Soviet Union, where high per capita oil use reflects high inefficiency and waste in space heating, industry and power generation.

And thirdly, energy is used very inefficiently in Central and Eastern Europe and in the Soviet Union. Figure 2 shows updated energy efficiency ratios. In Central Europe energy use per unit of output was on average more than twice as high as in Western Europe. The Soviet Union is the world record holder for energy inefficiency.

High inefficiencies today, however, imply a high potential for improvements in the future. The current efficiency malaise is due mainly to the pricing system, which does not, as a rule, reflect scarcity, economic rent, or consumer preferences. Energy in general, and oil in particular, has been underpriced in all the Central and Eastern European states and the Soviet Union. It is estimated that the real transfer prices for crude oil between the Soviet Union and its former COMECON trading partners were equivalent to only about \$7 per barrel before the intra-COMECON rouble price formula was terminated at the end of 1990.

The real remedy to this tremendous energy waste is price reform. It will be difficult to achieve this within a short period for social reasons, since rising energy prices will mean lower personal income and a lower standard of living. Nevertheless, until economic reforms get underway, even additional investment and foreign aid are unlikely to remedy the basic problems of the energy sector. Precisely for this reason the recent World Bank loans to Poland are tied to the condition of price reforms and the reduction of that country's public deficit. The establishment of the new European Bank for Reconstruction and Development in London was also intended to aid the Central and Eastern European countries in

creating market economies — 60 percent of the projects financed must be channelled to the private sector.

Conclusions

- The main uncertainties for the entire Central and Eastern European area arise from the political instability in the disintegrating Soviet Union because of its dominant role as the supplier of oil and gas to the former COMECON countries.
- Despite these external uncertainties, the transition from planned to market economies is well underway in Poland, Hungary and Czechoslovakia but remains uncertain in Romania and Bulgaria.
- None of these countries has, however, as favourable a starting position as Eastern Germany, so the transformation process will take longer. Eastern Germany, meanwhile, is integrating into the West German market economy at a rapid pace.
- The relative low income per capita in Central and Eastern Europe at present should rise if economic reforms get underway. Rising standards of living will cause an increased level of oil use. Until now, oil use in these countries was artificially suppressed because of the policy of import substitution. This led to high economic and environmental costs from excessive coal (and in particular lignite) use.
- Provided the economic reforms are successful, the main conditions for rising oil use in the entire Central and Eastern European area will be: increased commercial road transport and increased private motorisation as a result of rising standards of living and free consumer choice; also, switching from coal to more convenient sources of home heating, like oil and gas and switching from coal (lignite) in industry and power generation to less polluting fuels in order to reduce environ-

mental pollution.

- In the (former) Soviet Union, however, where oil use per capita is almost as high as in West Germany, its use is not bound to rise. Rather it will fall if price reforms increase the incentives to use energy economically and/or the new independent republics have to find new sources of supply on the world market.
- High inefficiences and waste in the entire energy sector of Central and Eastern Europe present a problem not only in economic terms but also in terms of excessive environmental pollution. Both problems can be addressed properly only through economic reforms. The potential for savings and improvements of efficiency under market conditions are tremendous.

This article represents the author's own views.



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The US natural gas market: a depressed scene

By Judith Gurney

Following several years of a weak market, spot prices for natural gas in the United States fell dramatically at the beginning of 1991. In May, prices had plunged to a five-year low and by the end of July, the Louisiana Gulf Coast onshore spot price for natural gas, a standard reference price, was \$1.18 per million BTUs, the lowest in 10 years. Natural gas producers, both major oil companies and small independents, drastically reduced their spending on drilling, cancelled the development of new gas projects and, in some cases, shut down wells. It has been estimated that one-third of all gas wells were closed down from time to time during the summer.

One reason for these very low prices was the unusually warm and short winter. There were more fundamental causes, however, for the drop in prices from 1984 to 1991 shown in **Figure 1.** One reason was long-term overproduction and excess supply which forced many producers to accept whatever price was required to move their gas. Although companies which produced oil as well as natural gas could afford to shut down their gas wells rather than sell at low prices, many small gas companies could not do this, and they sometimes had to sell their product below replacement cost. Another cause cited for the current low prices is the presence of independent companies positioned in the natural gas market between the end-users and the wellhead, which control a sequence of transactions that conceal finding and production costs and make it difficult to match supply and demand.

Market structure

The configuration of the natural gas market in the United States differs from



Source: National Energy Information Center, Energy Information Administration, US Department of Energy.

that in Europe. Whereas there are relatively few large European producers of natural gas, working a relatively few large fields, American natural gas production involves producers and fields of vastly different sizes. Some 30 companies, including several major oil companies, account for one half of US natural gas production, while close to 5,000 small, independent companies account for the other half. The transport of natural gas, on the other hand, is controlled by comparatively few companies. Some 30 pipeline companies handle 90 percent of interstate gas transport, and 15 deal solely in intrastate transport. These 45 independent pipeline companies connect some 1,500 local gas distribution companies through a complex, 2-million mile pipeline network covering about two-thirds of the country. Many areas in the northeast, northwest and southeast, however, still lack pipeline hookups. Table 1 shows the total amount of natural gas delivered by local distribution companies to end-users, including residential, commercial, industrial and electric utility customers, over the past decade.

Up until the early 1980s, virtually all gas sold across state lines was purchased at the wellhead by interstate pipeline companies, which added cost of service and regulated profit margins before delivery to local gas distribution companies, which then sold to end users. By 1991, the picture had changed and the majority of gas sales were spot transactions. The prevalence of spot market sales, however, presented a problem for the many small

producers that have difficulty assuring the long-term supplies and prices which end users require before committing themselves to projects that use natural gas. Electric utilities need longterm supply contracts with known prices and volumes to satisfy the financing requirements of financial investors. In this case, as in others, a potential new market for natural gas has not materialised due to uncertainty regarding long-term supply and cost. Many industrial customers do not want to invest in tanks for storing natural gas, nor to be dependent on a fuel which has had supply shortages in the past. notably during the bad winter of 1974-75 and in 1977, when businesses and schools in 22 states closed for lack of gas heat during a record cold spell. This negative perception regarding natural gas supply is not limited to the industrial market but affects the residential market as well.

Year	Billion cubic feet
1980	18,216
1981	17,834
1982	16,295
1983	15,367
1984	16,345
1985	15,811
1986	14,814
1987	15,542
1988	16,320
1989	17,099
1000*	17 037

Table 1: Natural gas delivered to end-users

Source: Natural Gas Supply Association

Deregulation

In the hope of improving the functioning of the natural gas market, the federal government is in the process of trying to free the gas industry from a regulatory structure that began when the industry was in its infancy in the late 1930s and evolved, in an evermore complex pattern, over the next four to five decades. The legally complicated procedure to get rid of overregulation and consequent market distortion began with the Natural Gas Policy Act of 1978.

Prior to the passage of this deregulation legislation, the federal government regulated prices at the wellhead for natural gas committed to interstate pipelines. The fact that it set relatively low prices from 1954 onwards discouraged oil and gas producers from exploring for natural gas, and reserves appeared to be rapidly depleting. Producers were reluctant to commit themselves to long-term contracts at low prices with interstate pipelines, and preferred to sell their gas intrastate, if possible, as prices for intrastate gas were unregulated and generally higher.

By the mid-1970s, federal wellhead price controls had led to chronic natural gas supply shortages in the interstate market. These were so serious that some states issued moratoriums on new residential and commercial uses of natural gas, and the federal government banned the use of natural gas in most new electricitygeneration and industrial applications. Natural gas consumption fell by approximately 10 percent from 1974 to 1979.

The 1978 legislation initiated a process of phased decontrol of wellhead gas prices and awarded tax incentives for finding gas. The government pegged the partially decontrolled wellhead prices to a fixed projection of rising oil prices and natural gas producers responded with record drilling levels in 1980 and 1981, encouraged by the higher wellhead prices which they could now get for their product. Many federal regulations discouraging consumption still remained in effect, however, and the rise in natural gas prices in the early 1980s prompted many businesses and electric utilities to use more coal or oil. Residential customers also favoured the use of electricity and sales of gas ranges, for instance, dropped sharply, while sales of electric ranges soared. The loss of customers at a time when new gas supplies were coming on stream soon created a gas surplus. By 1984, prices were falling steadily. Drilling levels plummeted. Membership in the Independent Petroleum Association of America, the trade group of independent oil and gas drillers, declined from 10,103 in the peak year of 1981, to 5,333 at the end of 1990.

Companies suffer

The decrease in gas prices during 1991 has seriously affected many in the industry, particularly pipeline companies which still had so-called 'take-or-pay' long-term contracts for the purchase of gas at set prices. These long-term contracts became a serious liability after 1985, when the federal government began the unravelling of the existing gas transport system by allowing local gas distribution companies to buy directly from producers at the wellhead and to transport their purchases through the pipeline system. Columbia Gas System, Inc. of Wilmington, Delaware, one of the largest US gas transmission and distribution companies, experienced such severe financial difficulties because of its takeor-pay contracts that it declared bankruptcy in July. Columbia, with more than 18,000 miles of pipelines supplying 15 East Coast and Midwest States. had some 4,100 take-or-pay contracts, requiring it to take 'excessive' quantities of gas at prices in some cases more than five times the current spot market price.

Although other pipeline companies also have troublesome take-or-pay contracts, none seems to be in as much difficulty as Columbia. Most paid suppliers in the late 1980s had to restructure their long-term contracts to be more sensitive to market prices. Producers, both large and small, also have suffered financially from the current situation. In recent quarterly earnings reports, Mobil, Atlantic Richfield, Chevron, Texaco and Phillips Petroleum, for instance, attributed reduced profits to the low prices they were getting for their natural gas output. Drilling companies, too, have been hurt. Halliburton Company, a Dallas-based drilling and well-service firm, for instance, laid off 1,200 workers during the summer.

	1990 Trillion o	1988	
Field gas resources	I fullon cubic feet		
Probable, current fields	190.1*	173.2	
Possible, new fields	267.8	267.1	
Speculative, frontier	262.9	265.2	
Subtotal	720.8	705.5	
Coalbed methane	145.1	90.1	
Proved reserves	167.1**	187.2	
Total	1,033.0	982.8	

*Includes 24.6 tcf previously carried as proved reserves in Alaska. **Department of Energy estimate; reflects removal of 24.6 tcf of Alaskan gas previously carried as proved reserves.

Table 2: US gas resources and reserves

Source: Colorado School of Mines, Potential Gas Committee

Reserves and imports

As Table 2 shows, US natural gas resources and reserves in 1990, including proved reserves, have been estimated as 1,033 trillion cubic feet (tcf). Over 80 percent of the field reserves represent non-associated gas either in structures producing only gas or in condensate reservoirs which also produce natural gas liquids. The 5 percent increase in reserves in 1990 compared with 1988 has been attributed to advances in technology in natural gas exploration and production techniques. The principal gas exploration areas in the lower 48 states include the Gulf of Mexico, the Rocky Mountains, the Midcontinent and the San Juan basin.

Despite current oversupply of natural gas within the United States, for logistic, and sometimes price, reasons, the nation imports about 8 percent of its natural gas consumption, mostly by pipeline from Canada. Imports have doubled over the past four years and are expected to increase. The United States exports a small quantity of natural gas, mostly Alaskan LNG to Japan, and there are plans to increase exports by pipeline to Mexico.

Imports of Canadian natural gas accounted for 7.7 percent of the US gas market in 1990. Some 40 percent of these were consumed in the Midwest, 37 percent in California, 13 percent in the Pacific Northwest, 8 percent in the Northeast, and 2 percent in the Rocky Mountains. Despite the depressed US gas market, which forced Canadian producers to accept a 15 percent reduction in price when renewing their contract with California customers in August, Canada hopes to increase it's gas exports. Its pipeline companies are planning to expand their systems, primarily to New England and California. Trans-Canada Pipeline Ltd, based in Calgary, has a large pipeline expansion project currently under construction, designed to transport 832 million cubic feet daily from Western Canada to Iroquois, Ontario. On the US side of the border, a consortium of 13 partners led by Trans-Canada is constructing a 370-mile line to deliver gas throughout New York state, including Long Island, as well as to New Jersey, Connecticut, and other parts of New England.

A second major pipeline project underway involving Canadian gas is an 844-mile expansion of Pacific Gas Transmission's system. This will hook up and extend the existing 911-mile network feeding natural gas from a group of 190 producers in Alberta, Canada, to local distributors in California as well as to distributors in Washington, Oregon, and Idaho. Projects have also been proposed to deliver more Canadian gas to the Midwest through pipeline extensions to the lines now feeding several import stations in that region. US gas producers, arguing that the difference in rate structures for pipelines gives a price advantage to Canadian gas, are trying to convince government regulatory authorities to make changes which will deny Canadian gas an advantage over domestic gas.

Liquified natural gas

Although current LNG imports are only 1.7 million tons/year, this figure is expected to increase over time. Panhandle Eastern Corporation of Houston, Texas, which began importing Algerian LNG in 1982 and ceased doing so a year later, resumed importing in December 1989. The current contract with Algeria calls for Panhandle to import 3.3 tcf over 20 years to its regasification terminal at Lake Charles, Louisiana. In 1990, this facility received 12 shipments of LNG; in 1991, it expects to receive 15.

In addition, Distrigas of Massachusetts Corporation, which first started importing Algerian LNG in 1971 and stopped in 1985, resumed importations in 1988. It hopes to expand its regasification plant at Everett, Massachusetts, and is negotiating a contract with Nigeria, which plans to start exporting LNG by 1995 or 1996. Shell and Columbia Gas plan to reopen the Cove Point, Maryland, LNG terminal, which has been closed since 1980, to handle imports of both Algerian and Nigerian LNG in 1993.

What the future holds

The 1990s were supposed to be a golden age for the US gas industry. Repeated threats of oil shortages and decreasing oil reserves, stricter pollution laws and federal tax credits for exploration costs seemed to guarantee a promising future for natural gas in the United States. So far, this has not happened.

Analysts disagree on what the future will bring. Some predict that gas surpluses will continue and hold prices down for the next several years, thus dampening enthusiasm for exploration and driving more producers into serious financial trouble. Others are more optimistic and see a gradual recovery as a result of long-term demand growth, annual reserve replacements significantly below production and reduced operating costs due to technological advances. Still others see the industry recovering as a result of the ongoing attempts by regulators to unbundle pipeline services, such as transportation, balancing, marketing, gas purchasing and storage, so that customers can choose and pay for only those services they desire, as well as to simplify the regulatory approval system for new pipeline construction. One thing is sure: there is no consensus at this time about the future of the gas industry in the United States for the coming decade.



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New chapter opens on Northwest Shelf

By William A Scholes

Woodside Petroleum Limited, operator of the \$A13 million offshore gas project off the northwest coast of Western Australia, is about to open a new chapter in the history of the Australian petroleum industry.

While the largest project now under way, the \$A1.8 billion Goodwyn offshore gas platform and the \$A1 million third liquefied natural gas train are on target for commissioning in mid-1993, the project will be overtaken by a much smaller but probably even more important development — the Cossack field which was only committed for development in April, but is scheduled to produce oil before the Goodwyn gas platform comes on stream.

For many years analysts and geologists maintained that the Northwest Shelf region was a gas province. Only a few politicians, including the late Rex Connor, Minerals and Energy Minister in the Whitlam government in 1972, held different views.

Mr Connor, whose idea of a national pipeline grid to distribute the Northwest Shelf gas across the continent to southern and eastern Australia was pooh-poohed by Conservative politicians as a 'socialist dream' in the 1970s, always maintained that there were enormous oil deposits along the Northwest Shelf. While this 'socialist dream' is now accepted as a national necessity in Australia, and will become a reality later this decade, so will his forecast of oil strikes off Western Australia.

First oil

Initial production from Cossack is expected to be in the order of 80,000 barrels per day, starting early in 1993. This represents Woodside's first true oil production in its 27 year history.

The much larger Wanaea prospect, discovered in 1989, has been officially declared to contain some 150 million barrels of oil. In its latest annual report, Woodside states that the probable oil reserves are 148.4 million barrels, associated with 0.16 trillion cubic feet of gas.

Woodside Development General Manager Don Henery has said that Wanaea should now be progressing to the definition phase, with first oil targeted for 1995. At this stage, a concrete structure is still a possibility, he said, adding that the Wanaea logistics are not dramatically different from Goodwyn's, where a lot of money had to be spent on the foundations.

In the past year, Woodside carried out a \$A65 million rock dumping operation on the North Rankin A platform pipeline and is now gearing up for development of the Cossack and Wanaea oilfields.

Woodside has started a huge seismic programme so most of 1991–92 will be given over to 3-D seismic, on WA-28P and WA-1P, which will lead to subsequent drilling for more oil. The search for oil has been redoubled since the discovery of the Wanaea field in April 1989 and is being undertaken by a new company, Woodside Petroleum WA Oil Pty Ltd. Based in Perth the new company is running exploration and the development of the Wanaea and Cossack fields, using the group companies such as Mermaid Sound Port and Marine Services.

The Cossack project will use floating production and offshore loading techniques such as those developed by BHP Petroleum on the Jabiru, Challis and Skua fields in the Timor Sea.

Wanaea is also likely to be developed in this fashion.



LNG expansion

By the time these two projects are on stream, the Northwest Shelf project will be producing seven million tonnes a year of LNG. At the time of writing, negotiations are taking place between the NW Shelf project and Japanese utilities for a 20 percent increase in their LNG contracts. This will necessitate planning for the fourth process train which Woodside Managing Director Charles Allen has predicted will be needed before the end of this decade. If we get to four trains, then we will need to have more than one extra platform, he said.

Japanese demand

At a recent conference in Darwin, Hiroshi Kamoi, General Manager, Planning and Development, Sumitomo Corporation, predicted that Japanese imports of LNG would nearly double by the end of the decade.



Massive structure of LNG train 3 which is currently under construction. Further expansion is also being considered by the project partners.

Photo courtesy Woodside Offshore Petroleum.

Proved/Probable Hydrocarbons as at 31/12/1990							
The Aller of the	Probable						
Areas/Fields	Dry Gas (TCF)	Condensate (MMBBL)	Oil (MMBBL)	Dry Gas (TCF)	Condensate (MMBBL)	Oil (MMBBL)	
(1) Project		The second second		Real Providence	A MAN STATE	The many	
Licence Areas	100	102.0	A CARDON AND	(00	1245		
North Rankin	6.14	103.2	- 20	0.98	124.5	63	
Goodwyn	3.78	228.9	3.8	4.27	200.7	0.5	
Angel	1.09	50.9	and the second second	1.75	05.0	210020	
Other Fields including		and the second second	M. W.F.	1 mars		Mr. Sugar	
North Rankin West,	0.40	18.9	3.8	0.76	25.8	8.8	
Goodwyn South,				11 1 1 1 1 1 1		States and	
Tidepole and Dockrell J	A Carton Contraction	a she and	have the second	le il and	a server have a	and the second	
Total	11.41	401.9	7.6	13.76	500.0	15.1	
(2) Permit Areas	a Part of				A Standard	1.10	
WA_28-P Venture		1.2.2			1		
Cossack	All and a second	1.52	51.6	19 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		88.1	
Wanaea	0.12	1 1 2 2 2 1 2 1	106.3	0.16		148.4	
Fcho/Yodel	0.20	18.2	-	0.34	37.1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Wilcox	0.25	15.1	1. 1920- 11	0.34	21.4		
Lambert		1	1.9		-	5.7	
Egret			0.6			5.7	
Total	0.57	33.3	160.4	0.84	58.5	247.9	
(3) WA-33-P/EP-36		And And And		1			
Venture Seaft Deef	6.11	70 3	11 0 to	13 31	158 5	P. S	
Scott Keel	2.25	327		5.40	54 1	1 - 1 - E - C - C	
Breckhock	5.25	32.1	La	5.40	54.1	and the second second	
Total	9.36	112.0	-	18.71	212.6	-	
Grand Total	21.34	547.2	168.0	33.31	771.1	263	

Imports in 1990 reached 34 million tonnes, and will reach at least 54 million tonnes, and possibly 60 million tonnes by the year 2000.

Supply sources are limited and output from major existing sources of LNG in Indonesia, Malaysia, Brunei and Western Australia and a new large-scale plant in Qatar will not be sufficient to meet demand.

Mr Kamoi said that unless mediumscale projects with an output of 1.5–2.5 million tonnes a year are launched by the year 2000, demand for gas in Japan, Korea and Taiwan would not be met. He added that even if projects were tailored to meet demand in the year 2000, they would fall short in the period 2000–05.

Even if large projects in Alaska, Natuna, and Yakutsk, expected to be launched by Japan after the turn of the century, proceeded smoothly, there would still be a need for medium-sized projects as a buffer to adjust the balance between a gradual increase in demand and discontinuous increase in supply from gigantic projects.

Sumitomo itself wants to establish a \$A2 billion LNG plant near Darwin based on the Tern and Petrel gasfields in the Bonaparte Gulf area. Mr Kamoi said that the Darwin project could be on stream in 1998, producing two million tonnes a year of LNG.

The other LNG project being mooted is the Gorgon gasfield off Western Australia now under study by the WAPET consortium to come on stream at the end of the decade.

The LNG buyers are eight Japanese electricity and gas utility companies with service areas embracing 90 million people. They are: The Tokyo Electric Power Co Inc, Chubu Electric Power Co Inc, The Kansai Electric Power Co Inc, The Chugoku Electric Power Co Inc, Kyushu Electric Power Co Inc, Tokyo Gas Co Ltd, Osaka Gas Co Ltd, Toho Gas Co Ltd.

The six equal participants in the LNG phase of the Northwest Shelf Project are:

Woodside Petroleum Ltd (Operator), BHP Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Ltd, Chevron Asiatic Ltd, Japan Australia LNG (MIMI) Pty Ltd, a company jointly owned by Mitsubishi Corporation and Mitsui & Co Ltd, Shell Development (Australia) Proprietary Limited.



LNG tanker Northwest Sanderling takes on cargo at Dampier, Western Australia.

Photo courtesy Woodside Offshore Petroleum.

The 100th cargo of LNG was delivered to Japan in July. The honour of carrying the milestone cargo went to the newest of the four LNG ships the *Northwest Snipe*.

The *Snipe* arrived at the Burrup Peninsula plantsite on 26 June; loaded its cargo of 125,000 cubic metres of LNG and left the next day. While it was in port, a commemorative plaque was presented to the ship's master, Captain Jim Attrill.

With four ships constantly plying the route to Japan, deliveries were running at a rate of six cargoes a month, and LNG production on the Burrup Peninsula was averaging more than 10,000 tonnes a day throughout this year.

The LNG carriers have reliably delivered LNG cargoes to each of the eight Japanese electricity and gas utilities. By mid-year these sales had brought export revenue of over \$A1 billion to Australia, since exports started in July 1989.

Production and delivery rates were increased further from October when the fifth vessel in the LNG shipping fleet, the *Northwest Shearwater*, collected its first LNG cargo.

With five ships available to service the Northwest Shelf LNG joint venture, the two existing LNG trains at Karratha are producing above their design capacity at more than four million tonnes a year. Meanwhile, construction of the seventh vessel, the *Northwest Seaeagle*, has been fasttracked to enable delivery to be brought forward from 1993 to the end of November next year. The *Seaeagle* is being built by Mitsubishi Heavy Industries, with fabrication and erection of both its hull and aluminium cargo tanks well underway.

Early delivery of the *Seaeagle* and the advancement of LNG Train 3 completion will enable each LNG seller to increase deliveries into the Japanese market.

The Northwest Sandpiper, being constructed by Mitsui Engineering & Shipbuilding, remains on schedule for delivery in February 1993. The addition of an eighth tanker will be necessary when additional trains are commissioned.

Untapped reserves

However, the Northwest Shelf partners still have enormous untapped gas reserves. Scott Reef, further north in the Browse Basin, would have to fit into these long-term plans, as the field's probable gas reserves are as big as North Rankin's and Goodwyn's combined — apart from 158.5 million barrels of condensate.

A project which might see the light of day in this century is Echo/Yodel, in the same WA-28-P permit as Cossack and Wanaea, but no planning activity is expected for several years. The field holds 37.1 million barrels of condensate and 0.34 trillion cubic feet of gas, probable, and could possibly employ a floating production facility.

An appraisal well drilled on the Angel field and additional 3-D seismic have recently increased its proven gas reserves significantly. The probable reserves now stand at 1.75 trillion cubic feet of gas and 83 million barrels of condensate. A further appraisal programme is targeted for 2000/2001 and might result in a manned or unmanned platform, a spider or subsea development.

Oil development in Oman

By Naji Abi-Aad, Energy Consultant

Although Oman was not isolated from events at the north of the Gulf, the impact of the conflict over Kuwait has been felt less keenly than in other Gulf Cooperation Council states. Meanwhile, the Sultanate's increase in oil production, and the rise in world oil prices has undoubtedly helped its economic prospects in the short term by boosting the value of oil exports. The government's financial performance has improved accordingly, with the projected budget deficit turned into a surplus.

Indeed, after producing an average of 650,000 barrels per day (b/d) in the first half of 1990, Oman responded to concern about world oil supplies caused by the embargo of Iraq by pressing ahead with plans to raise crude production to around 700,000 b/d in September and 770,000 b/d in November and December last year. This rate of production is considered the maximum output capacity, which had been previously frozen in support of OPEC's price-raising measures. The sultanate's average oil production in 1990 amounted to around 675,000 b/d, compared with about 620,000 b/d in 1989.

Petroleum Development Oman (PDO) is responsible for virtually the whole of the sultanate's oil production. Its output amounted to some 650,000 b/d in 1990, representing more than 96 percent of the total. In only three of the eight concessions outside the PDO area, namely Elf Aquitaine's Butabul permit, Occidental's Sunainah acreage and Japex Wadi Aswad licence, is oil currently being produced on a commercial basis.

The main oilfields in production are Yibal (which yielded 149,100 b/d in 1989), Fahud (56,000 b/d), Rima (65,000 b/d), Nimr (36,000 b/d), Marmul (34,100 b/d), Lekhwair (26,000 b/d), Sayyala (22,700 b/d) and Occidental Safah (22,300 b/d).

By retaining the best endowed regions for itself, PDO controls the bulk of Oman's oil reserves and production. While exploration activity remains intense in the country, PDO is responsible for almost all drilling operations at the moment, while other companies have maintained less buoyant levels of exploration activity. Consequently, their efforts to find oil in commercial quantities have been poorly rewarded.

Reserves

Exploration work carried out by PDO in 1989–90 led to several hydrocarbon discoveries. As a result, Oman's proven crude oil reserves officially increased from 4.33 billion barrels at the beginning of 1990 to 4.8 billion barrels on 1 January 1991. At a rate of output of 700,000 b/d, that gives Oman a reserve to production ratio of 20 years. The proven reserve figures do not include 60 billion barrels of heavy oil which Oman hopes to add to the general reserves as soon as production costs are reduced to economically viable rates.

Over half of Oman's oil reserves are concentrated in the north, where six fields — Yibal, Natih, Fahud, al-Huwaisah, Lekhwair and Shibkah form a single geological structure containing recoverable reserves of some 1.8 billion barrels. There is also a large oil-bearing structure in the south, centred around eight main producing fields.

Proven natural gas reserves were also revised upwards at the beginning of 1991 and put at 10.25 trillion cubic feet of which 2.75 trillion is associated gas and 7.5 trillion is dry gas, compared with a total proven reserve of 9.84 trillion cubic feet at the beginning of January 1990.

According to PDO Managing Director Henk Merle, the company will continue in an aggressive way to replenish its reserves base and ensure that new reserves exceed what it plans to produce each year. This will involve exploring for new reserves and increasing recoverable reserves in existing fields by enhanced recovery methods.

Oilfield development

To achieve this objective and maintain



Work has started on the Lekhwair field to exploit additional reserves. A Shell photograph



An oil rig in the Omani desert.

the 700,000 b/d production capacity throughout the 1990s, PDO has allocated a total capital expenditure budget of \$3.38 billion for the five years from 1990 to 1994. Of that total, \$922.8 million is allocated to exploration, \$1,145 million to drilling and production and \$1,317.3 million to equipment. The company is planning to more than triple the number of producing wells (1,240 wells in 1989) in the next 10 years, even with the presently planned plateau production, whereas the number of connected fields will rise from the current 61 to over 100.

To tackle the increase in development drilling over the next few years, PDO raised the number of its drilling rigs to a record high of 16 with the delivery towards the beginning of 1990 of four additional rigs.

Currently, many fields are being further developed, the most important of which are Yibal, Lekhwair, Birba, Safah and Daleel. At the Yibal field, it is planned to drill some 75 additional wells in the four years 1991-94 and to construct new production and water injection facilities. Yibal's output had already been stepped up from 120,000 b/d to over 150,000 b/d by the end of 1986 through the use of water flooding to increase recovery. That drilling programme, coupled with the continuous stimulation of older producing wells, is expected to maintain output at about 150,000 b/d for some years to come.

Development work involving Brown and Root and the local National Drilling Services Co was launched in late 1990 at Lekhwair field. It provides for the drilling of 126 new production wells and the installation of facilities for water injection (including 47 wells) and high-pressure gas injection. The total cost of the project, which is designed to boost the field's production from 24,000 b/d to 110,000 b/d in 1992 and 200,000 b/d by the year 2000, is estimated at over \$500 million.

At the Birba field, in the south, PDO has embarked on a gas injection project in order to raise production from 8,500 b/d to 20,000 b/d in 1992. A turnkey contract worth \$31 million was awarded in November last year for the construction of the necessary facilities to a consortium composed of the Dutch company Comprimo and the Lebanese concern Consolidated Contractors Co.

Occidental is currently expanding the production capacity of its Safah field through the drilling of additional exploration and development wells



The Institute of Petroleum

and the expansion of gas reinjection facilities. A total of 30 development wells were drilled in 1990 compared to 28 wells completed in 1989. The field's output, which averaged 25,000 b/d in October 1990, is expected to reach 28,000 b/d in 1992.

Japex Oman which brought its Daleel oilfield into production in July 1990 at an initial rate of 8,500 b/d, postponed plans to step up the field's output to 10,000 b/d, deciding to maintain production at 8,500 b/d for the time being.

The development programme drawn up by Japex provided for 20 wells to be drilled in Phase I, completed in mid-1990, and for a further 54 wells to be drilled between 1993 and 1995, which will raise the field's capacity to 25,000 b/d.

Gas development

The Ministry of Petroleum and Mineral Resources is going full steam ahead with plans to replace the local consumption of petroleum products by natural gas use. Officials are currently putting the final touches on a new fiveyear plan for the exploitation and utilisation of natural gas which is expected to come into effect this year.

The department of gas affairs in the Ministry of Petroleum or an independent agency will be in charge of implementing the plan. The department already has responsibility for all of Oman's gas reserves, since foreign companies with concessions in the sultanate only have rights to oil.

The department operates the Natih/ Yibal gas field and the gas treatment plant there, the capacity of which is currently being expanded from 300 million to 583 million cubic feet/day. The \$74-million expansion contract was awarded in October 1990 to Comprimo and Japan's Nygata.

The extra capacity at Natih/Yibal is needed to satisfy additional demand. Domestic consumption, which has grown dramatically over the past decade, is now increasing at a steady 7 percent annually. New industrial plans and growing use of gas-fired power generation units will surely lead to further increased demand.

The government is looking to reduce its dependency on the Natih/Yibal gas field. The fields have not yet reached their maximum output and are expected to continue production well into the next century. However, the authorities are keen to develop new gas sources including Bukha and Henjam (West Bukha) fields.

Buhka field's reserves are estimated at about 40 million barrels of condensates and its ultimate production potential at 60,000 b/d of condensates and 300–400 million cubic feet/day of gas.

The field's original development

programme, drawn up early in 1988, provided for the gas to be carried from an offshore platform to the separation facilities of the neighbouring Saleh field in Ras al-Khaimah. Indeed, since most of Oman's gas demand is on the coast of the Gulf of Oman, it is not feasible to pipe Bukha gas to domestic customers.

Nevertheless, a radical shift in the development plans appeared at the beginning of 1989 when the sultanate agreed to provide natural gas from the field as feedstock for a floating methanol plant planned to be built off the coast.

The plant schemes were abandoned in July 1990, however, because of doubts about the long-term future of methanol prices. Instead, projects have again been considered to pipe the gas to Ras al-Khaimah, where it would enter the Dubai and northern Emirates grid and could be sold to Dubai's Jebel Ali industrial zone.

Meanwhile, in June 1990, Oman and Iran signed an agreement providing for the creation of a joint ministerial committee to study the possibility of jointly developing the Henjam field (known also as West Bukha) which straddles the territorial waters of the two countries in the Strait of Hormuz. In fact, the fate of the field, which could have a capacity of some 100 million cubic feet/day of gas, will remain closely linked to the relations between the two countries.

Exploration and Production Discussion Group

The following meetings have been arranged for 1992:

Thursday 16 January

Aims, objectives and activities of the Petroleum Science and Technology Institute

Thursday 20 February

Future new developments and techniques for offshore activities

All these meetings will be held at the Institute of Petroleum, starting at 5.30 pm. (Tea and biscuits available from 5.00 pm.)

For further information, please contact Mr A E Lodge at the Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone 071 636 1004.

. . publications

General

A Place in the Sun — Shetland and Oil, Jonathan Wills (Mainstream Publishing Company, 1991), ISBN 1-85158-401-3, pp 176, £11.99.

Author-journalist Jonathan Wills chronicles the development of the Sullom Voe terminal and its impact on Shetland culture, economy and environment, both during its construction and afterwards.

From Fisher to the Falklands, Vice Admiral Sir Louis Le Bailly (Marine Management (Holdings) Ltd for The Institute of Marine Engineers, 1991), ISBN 0-907206-40-9, pp 227, £17.50.

In the early part of this century, Admiral Lord Fisher of Kilverstone sought to rouse the Royal Navy by harnessing new technology to warship design and operation. The author was a contemporary of some of the most brilliant engineering revolutionaries of the century, who strove to continue with Fisher's reforms. The near failure of the fleet to keep the country from starvation in two world wars led to drastic reorganisation in the 1950s and 1960s to produce the technologically advanced navy of today. The steps along the way, from Fisher to success in the Falklands, are described.

Tankers

Tanker Spills — Prevention by Design, National Research Council (National Academy Press, Washington, 1991). ISBN 0-309-04377-8, pp 350, \$34.95.

This book evaluates a wide variety of ways to improve tank vessel resistance to penetration during an accident and assesses alternatives for reducing outflow if the ship's hull is breached. In addition to evaluating design options, the book recommends ways to make a tanker more 'crash-worthy' and to allow the crew to respond more effectively in an accident. It deals directly with concerns about the stability of damaged tankers, fire and explosions, salvageability and cost implications of alternative tanker designs.

Petrochemicals

Handbook of Petrochemicals and Processes, G Margaret Wells (Gower Publishing Company, 1991), ISBN 0-566-02775-5, pp 400, £72.

The handbook provides comprehensive, up-to-date information on 76 petrochemicals and their processes, giving details of the chemical reactions involved in transforming raw materials, such as olefins and aromatics, into chemicals, plastics and synthetic fibres. The competing processes for each product including the latest technical developments are described, with their feedstock requirements, catalysts and conversion rates compared.

Taxation

UK Oil Taxation, David Bland (Longman Law, Tax and Finance, 3rd ed. 1991), ISBN 085121-7842, pp 275, £80. Substantially updated and revised, the book provides expert guidance on the many and often complex tax provisions. It

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comprehensively discusses all the latest changes and developments in the taxation of oil and gas production in the United Kingdom. It gives the latest assessment of UK oil legislation and expert guidance on how to keep tax payments to a minimum, benefit from reliefs and capitalise on exemptions.

Offshore

The International Law Relating to Offshore Installations and Artificial Islands, Salah E Honein (Lloyds of London Press, 1991), ISBN 1-85044-416-1, pp 111, £75.

This new industry report is a thorough discussion of the complex legal problems which face those involved in the construction and operation of offshore installations. The examination has been restricted to international law and includes the provisions of the 1982 Convention on the Law of the Sea and the 1958 Geneva Conventions on the Law of the Sea. The report provides practical answers to legal questions concerning the competence of states to exercise their authority on offshore matters, and the legal responsibilities of those who operate offshore.

Planning

Least Cost Planning: Should Utilities Invest in Energy Efficiency Rather than in New Supplies? Ann Davison (Oxford Institute for Energy Studies, 1991), ISBN 0-948061-57-x, pp 34, £14.

The essence of least cost planning is that in some circumstances it is more profitable for a utility to encourage its customers to use less electric power/water/gas than it is for the utility to sell a larger quantity of its product. The paper discusses the experience of least cost planning, policy debates arising from it and how applicable least cost planning is, outside of the United States.

Biotechnology

Biotechnology — The Science and the Business, V Moses and RE Cape, Editors (Harwood Academic Publishers, 1991), ISBN 3-7186-5111-4, pp 596.

Biotechnology is the application of science to business, the bridge between biology and commerce. For the first time, this book treats the science and the business as one integrated subject. It explores those aspects of business management, economics and law that are most relevant to the subject, in the context of the scientific advances underlying biotechnological development.

Microbiology

Microbial Enhancement of Oil Recovery — Recent Advances, EC Donaldson, Editor (Elsevier Science Publishers BV, 1991), ISBN 0-444-88633-8, pp 530.

Proceedings of the 1990 international conference on microbial enhancement of oil recovery. Today's oil production technology leaves one-third to one-half of the original oil in place in the reservoir at abandonment of secondary recovery. This leaves a very large target for microbial enhanced oil recovery which was shown by the research at this conference to be capable of producing up to 50 percent of the residual oil and to show trends which are encouraging enough to stimulate more small field trials.

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CATS — Credit accumulation and transfer schemes — a growing opportunity

... education and training

A national system of credit accumulation and transfer has been introduced by The Council for National Academic Awards (CNAA) which is already supported by over 30 polytechnics and colleges.

Why did CATS originate?

The prime reason for the development of CATS was the recognition that more students needed to be recruited to higher education from nontraditional backgrounds, such as those with vocational qualification or work experience. By providing credits for their previous learning and enabling them to accumulate further credits on a flexible basis, it was considered, quite rightly, that they would be attracted to higher education. Providing additional flexibility through the facility for the negotiation of individuallydesigned programmes, has further added to the attraction of the CATS option.

The first CATS project and the tariff system

The first pilot CATS scheme was launched by CNAA in 1986. It is now a national system, with an agreed tariff to exchange points.

There are three levels of award at the first degree or

The CATS tariff

Points at unde (cumulative) 1 Certificate 2 Diploma 3 Bachelors Degree	rgraduate level 	Points at ma. (cumulative) M-Diploma M-Degree	sters level
Total	-360 points	Total	—120 points

undergraduate level (1, 2 and 3), based on the standard of the Honours degree, beyond this there are awards at M level, as shown in the **table**.

Taking the masters degree for 120 points, it is likely that the course would break down into 90 points for the taught part of the programme and 30 points for the project or thesis, although splits of 70/50 have been approved.

CATS in practice

The procedure for implementing CATS varies between institutions. However in general a CNAA application, giving a complete history of the applicant's previous qualifications and experience, is considered by CNAA officers and advice given, as to how to proceed.

The outcome is usually referral to an institution offering an appropriate course, or alternatively the applicant can register directly with CATS and negotiate a 'learning contract' comprising credit for previous study and a programme of learning, towards a CNAA award.

Who supports CATS?

Most polytechnics and colleges, and well over half the universities, are practically committed to CATS. There is also strong support from amongst government, employers and professional bodies.

The influential Management Charter Initiative (MCI) has placed CATS towards the centre of its agenda for the reform of management education gualifications.

The assessment of prior experiential learning (APEL)

This assessment process is a means of quantifying the learning which an individual has derived from life experience. It has already established a strong foothold in vocational awards kitemarked by NCVQ. In higher education many academic institutions are making progress with APEL and it is becoming for increasingly possible individuals to have their prior experiential learning assessed. Under CNAA, students are undergoing APEL through the development of portfolios and assessments. 'challenge' Several management applicants have recently achieved CNAA awards through this process.

Summary

CATS should be seen as a further development in the many changes now taking place in UK education and training systems, in particular the introduction of both flexibility and easier access, to both diploma and degree courses.

As such CATS may prove to be useful for employers as well as staff, in that studies may take place flexibly over a longer time-frame, without the necessity to take leave for the 12 months usually required to complete a masters degree.

Further information on CATS and ECCTIS database of 'CATS' courses

CNAA — CATS Scheme, 344/ 354 Gray's Inn Road, London WC1X 8BP. Tel: 071 278 4411. Educational Counselling and Credit Transfer Information Service, ECCTIS 2000 Ltd, Fulton House, Jessop Avenue, Cheltenham, Glos GL50 3SH. Tel: 0242 518724.

Certification practices in the European Community

The Treaty of Rome includes as one of the four freedoms sought by the single market the free movement of workers across member state boundaries. This requires mutual recognition of individual competencies and, of course, the qualifications that are entailed. John Barnes, in his book

'Certification Practices in the European Community,' published by City & Guilds writes there are, as yet, no European qualifications as such, only those of individual member states. The largest awarding body in the United Kingdom is City & Guilds, whose qualifications are at least as European as any other. Indeed they already figure largely in the official journal of the European Communities. Two European Community initiatives in this area are worth noting:

i) European Directive No 48 (1989) provides for a general system for the recognition of higher education diplomas. Implemented early this year it includes for example chartered engineers, and sub-charter qualifications. Further consultations are current about other qualifications in regulated occupational areas.

ii) The European Council Decision No 368 (1986) established a mechanism for comparing qualifications earned by vocational training. The European Centre for Vocational Training has published comparisons of

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.. education and training

120 occupational activities across 12 member states, comparisons in which the City & Guilds qualifications feature largely.

What qualifications are being considered?

- Certification of achievement in education or training eg GCSE, degrees, NVQ.
- Registration by professional or industrial bodies eg CEng, SRN.
- Licences to practise eg HGV licences.

In most member states (UK, Republic of Ireland and Portugal excluded) some form of registration or licence to practise is required where a worker offers some form of service to a client. This is the craft sector eg opticians, hairdressers, mechanics, travel agents and the European Council is currently trying to get member states to dismantle bureaucratic restrictions in this sector which inhibit the movement of qualified personnel within the Community.

There is no intention to introduce such restrictions in the United Kingdom, but it would be wise to get UK qualifications recognised by those member states holding such restrictions. By the same token, for UK employers and educational/training institutions to accept people from other member states on the basis of their own national qualifications, it will be necessary to know what those qualifications mean. Are they educational certificates, certificates of registration, licences to practise? Are they based on proven competencies, passing tests or attending courses? Do they correspond to any UK certificates?

Comparable developments are taking place in the UK offshore oil industry. Training standards laid down by the Offshore Petroleum Industry Training Organisation (OPITO) for emergency and survival training courses have to be followed by training establishments providing such courses. The training certificates subsequently awarded are basic qualifications for offshore employment. These are already qualifications attracting interest among training establishments in other member states anxious to produce skilled personnel qualified for jobs in the UK offshore oil industry. So the OPITO is being invited to inspect EC training establishments with a view to awarding them 'approved status.' whereby they can offer acceptable 'cross boundary' qualifications in offshore safety and survival skills acceptable to the United Kingdom.

Publications

Higher Education Developments - The Skills Link. Provides a summary of current and recently completed development projects which have received support from the Department of Employment through the Higher Education Branch of TEED (its Training, Enterprise and Education Directorate which was formerly the Training Agency). Available from TEED. Department of Employment, Moorfoot, Sheffield S1 4PO. The

The NVQ Framework. National Vocational Qualifications (NVQs) are qualifications about work which fit into a NVQ Framework. The National Database gives full details of the NVQ Framework. Because NVQs are

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about achievement, individuals working towards NVQs can get a National Record. Available from National Council for Vocational Qualifications, 222 Euston Road, London NW1 2BZ.

Management Development Publications Catalogue. April 1991. Available from Management Development Publications, Freepost, Nottingham.

Diary Date

The Business of Training in 1992. Human Resource Development Week Wembley Exhibition and Conference Centre. 31st March to 2nd April 1992.

Employee development and assistance programme

From time to time it is interesting for oil industry personnel to hear about initiatives which have been found to be successful in other industries. Consequently the Institute's Personnel, Education and Training Discussion Group recently arranged for Ken Mortimer, Education and Training Manager, Ford Motor Company Ltd., to give a presentation on 'The Ford Motor Company Employee Development and Assistance Programme (EDAP) — A Personal Training Contract Concept expressed in Cash Terms'.

Mr Mortimer said that EDAP offers employees a wide range of personal and career development education and training activities, and makes available a variety of employee assistance services to encourage healthier lifestyles.

EDAP is available to all Ford employees, with participation on a voluntary basis, in the employee's own time. The Company funds the programme at the rate of £50 per employee, creating a fund of £2.1m annually. EDAP makes available up to £200 per employee, subject to the approval of local committees consisting of management, staff and hourly unions.

The programme complements Ford's job related training and health programmes and in the two years of its operation it has become a huge success. Over 50 percent of company employees are taking advantage of language or degree courses, are developing skills, or are becoming generally healthier.

The programme is a model for adult education developments and a significant initiative in improving industrial relations in the Ford Motor Company.

Neighbourhood engineers sign up the 1,000th school

The 1,000th secondary school recently signed up to join The Engineering Council's Neighbourhood Engineers scheme, which links professional engineers and technicians with schools.

The scheme not only helps schools and young people by assisting teachers to deliver the national curriculum, but it also develops a wider awareness of the important part that engineering and technology play in daily life.

There are now 4,000 Neighbourhood Engineers helping in secondary schools across the

United Kingdom. The scheme links three or four professional engineers and technicians with their local secondary schools to work in teams with teachers.

The Department of Trade and Industry has granted The Engineering Council pumppriming funds of up to £612,000 over a three year period to expand the Neighbourhood Engineers scheme nationwide. An ultimate target has been set to have 24,000 Neighbourhood Engineers associated with the country's 6,000 secondary schools.



Simon Small (centre) was recently awarded an Institute of Petroleum Student Prize for outstanding performance on the MSc cause in Petroleum Geology at the Royal School of Mines, Imperial College in the 1990/91 academic year. Also present (from the left) were Paul Jennings and Julian Beer, BP Exploration Operating Company Ltd (speakers at the meeting), Ian Ward, IP Director General, and Bob Stoneley, Professor of Petroleum Geology at Imperial College.

... technology news

Breakthrough for sea survival equipment

A dramatic advance in survival equipment to save lives at sea has been achieved through a research programme carried out on behalf of Shell and Esso. The six-year £800,000 programme was conducted by a wide range of medical and academic specialists of the Robens Institute of Industrial Health and Safety, and with assistance from the Royal Navy. A key role has been played by a small specialist firm, Shark Sports Limited, of North Broomhill, Northumberland.

Currently there is a range of survival suits and life jackets in use in the North Sea. There is no universally accepted specification for them.

The new equipment has the approval of

the Civil Aviation Authority (CAA) and the Department of Transport. A close interest has been taken in the programme by the Health and Safety Executive.

The new system consists of two principal elements. Each is interlinked, but is capable of independent use to suit a variety of purposes. Shell has taken out patent applications on the manufacturing techniques for all parts of the system.

The survival suit can be used either in the sea or worn to assist escape from offshore platforms. It has a three layer construction, and carbon dioxide gas is released between the layers to provide insulation. Leakage of water into currently-used uninsulated suits can diminish their potential effectiveness in protecting against hypothermia. The gas insulation gives considerably increased survival times.

The novel design of the life jacket ensures that its wearer will be turned face up and held out of the sea, even if unconscious. The CAA has approved two models for aircrew use. There is a separate marine version, which has been approved by the Department of Transport.

A further possible element in the system is still under study. Known as Air Pocket, it is a simple bag and breathing tube. It would enable a submerged survivor in an upturned helicopter, in any position under water, to extend his breath-hold time by re-breathing his own exhaled breath.

Flowline protection

New subsea products for marginal fields

Four subsea products for use in remotely controlled underwater offshore production were displayed in detail for the first time at Subtech 91, Aberdeen, Scotland in November.

The four are the work of Alpha Thames, specialists in subsea engineering, and were developed over the past two years. One of the products, an innovative method of automatically connecting pipelines on the seabed, has secured EC funding of £245,000. Another product, an all-electric actuator for subsea valves, is financially assisted by the Offshore Supplies Office. They have been designed to be sold individually or in combination for the development of marginal offshore fields in the 1990s.

Each will also become components in PRIME, a seabed hydrocarbon production and processing system project which has been launched by Alpha Thames, to halve the capital costs of marginal field development.

They are: a high voltage/power underwater connector; a remote electric actuator; a module pipework isolation connector; and connection of underwater systems and pipe/flowlines.



Poole based boatbuilder RTK Marine has just built one of its Sea Trucks to be used for diving operations in Angola. The Series 408, eight metre workboat was ordered as a result of new regulations recently introduced to make diving operations safer. It was an obvious choice because of its low operating cost and ease of maintenance, unsinkability and its excellent stability.

A single-coat Hyperlast polyurethane protection and insulation coating for subsea flowlines used in the oil industry has been launched by Macpherson Polymers. The new method, developed over four years by Macpherson Polymers, applies polyurethane directly to a fusion bonded

polyurethane directly to a fusion bonded epoxy corrosion protection coat. It is simpler, faster and less expensive than alternative methods.

Breathing apparatus

A new self-contained breathing apparatus set for use in fire and rescue, marine, industrial and petrochemical applications that complies with and exceeds the latest European standard, EN137, has been unveiled by Racal Health and Safety.

The Racal 3000 CEN set uses the most advanced materials currently available to give maximum comfort, confidence and safety.

For the first time, EN137 has stipulated a weight limit of 18 kilograms for breathing apparatus sets. The new set can accommodate the latest lightweight, hybrid compressed air cylinders.

The set's demand valve exceeds the requirements of EN137 and incorporates true bypass and automatic first breath positive mechanisms. The quick fit demand valve connects directly onto the facemask using a convenient 90° rotation and click action. The EPDM mask has two exhale valves to reduce exhalation resistance and a high performance speech diaphragm is provided.

. . . technology news

Award for hydrocyclone technology

Conoco Specialty Products Limited and the University of Southampton have received the 1991 Hydro Award for outstanding achievement in the field of water quality improvement in the United Kingdom in recent years.

The Hydro Award, introduced in December 1990 by Norsk Hydro (UK) Limited recognises the development of Vortoil hydrocyclone technology by Conoco and the University of Southampton.

Vortoil technology was originally developed by Professor Martin Thew, Dr Ian Smyth and Dr Derek Colman (now of BP Research) as a research programme at Southampton. Its principal use is in the offshore oil industry where water produced from the reservoir must be cleaned up before being returned to the sea.

The system proved so effective that it is now manufactured and marketed worldwide by MML Vortoil Limited, an affiliate of Conoco Specialty Products Inc, based in Gloucester

Vortoil hydrocyclone Each day. systems are used to treat more than 6.2 million barrels of produced water in virtually every significant offshore oil region of the world including the North Sea, the Gulf of Mexico and the Arabian Gulf.

Recent Vortoil design improvements permit any separation capacity to be met. More than 99 percent of residual oil can be recovered from produced water, reducing contamination so that all regulations governing the quality of discharged water are met or improved upon.

New road tanker introduced

P&O Distribution has completed trials on a new dual-purpose vehicle, designed specifically for the parallel distribution of packaged and bulk products for Kuwait Petroleum Lubricants of Leeds, West Yorkshire.

The prototype is now in regular service and a second vehicle, built to the same specification, commenced operations in September.

Originally, the fleet included rigid road tankers, 17-tonne curtainsiders and 28tonne articulated vehicles. Tankers were used to deliver bulk product, while curtainsiders carried packaged items only. But when customers ordered mixed loads, this meant that two vehicles were required to complete the delivery.

Modifications carried out by P&O Distribution have resulted in a 17-tonne curtainsider vehicle which can carry up to

eight 1000-litre intermediate bulk containers, plus packaged product. The mix can be adapted to suit individual delivery schedules so that customers receive complete orders from one vehicle, and substantial savings can be made on vehicle running costs.

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Although flowbins are used by other operators for the bulk delivery of lubricants, P&O Distribution believe that the system developed by them in conjunction with Kuwait Petroleum Lubricants leads the field in terms of cleanliness, safety and customer service.

Each container is dedicated to a single product, and the lubricant is measured by meter at the loading point. Samples are then taken from each container as a further quality control check and the containers are weighed before being loaded onto the delivery vehicle.

New interlocking panel system

Textron Specialty Materials have introduced the CHARCAST[™] Interlocking Panel System. The panel system, designed for fireproofing maintenance and upgrades on offshore production rigs and on-shore refineries, provides a reliable solution for those areas where blasting is not permitted and/or surface preparation (a requirement for sprayed fireproofing) is not possible.

The CHARCAST system is comprised of interlocking fireproofing panels attached to a galvanised steel substructure which is mounted to the area being fireproofed. This substructure helps to speed up the installation process, provides an isolation system for external fasteners and reinforces the panels, thereby improving their impact and explosion resistance.

CHARCAST is, by all definitions, a fireproofing system,' said International Business Manager John Dunk. 'The interlocking panels, combined with the steel substructure, result in a system that offers greater structural integrity and reliability than any other product of its kind.

By eliminating butt joints in the panels, CHARCAST's unique interlocking design provides an effective barrier to moisture and a joint which does not open in the event of fire. The interlocking joints have internal fastener platens which produce tight, strong, weatherproof joints.

Hot showers

Recent orders received by IMI Rycroft Ltd, Bradford, West Yorkshire, to supply hot water calorifiers for the accommodation units on a number of new offshore platforms, will ensure that workers will enjoy the comfort of hot showers when finishing their shifts, even during the height of mid-winter, when outside temperatures often fall well below zero.

Currently under construction, the platforms include Piper Bravo, and other platforms for the BP Bruce, Agip Tiffany and Marathon East Brae oilfields

The order for the Marathon platform is particularly significant in that the two 10,000 litre capacity electric calorifiers are to be made from 20 mm thick copper plate - IMI Rycroft is probably the only UK company able to undertake work using this gauge of material.

... technology news

Petroleum vapour recovery

British specialist pump manufacturers, Charles S Madan & Co Ltd of Altrincham, have launched an innovative vacuum vapour pump with special technology which permits both flow and pump rotation in either direction.

Intended for the European petroleum distribution market, the Madan vapour pump has specific application for Stage II vapour recovery.

It is designed to be easy to install and will provide petrol pump manufacturers with a compact and versatile vapour pump product for retrofit and original equipment purposes.

Corrosion resistant and Physikalisch-Technische Bundesanstalt approved, the vapour pump has ribbon type flame arresters fitted to inlet and outlet ports, a cross port relief valve and non-return valve fitted to the outlet.

It operates on the rotary sliding vane principle and is constructed using SG iron, brass and steel. The pump is shock proof and suitable for internal zone zero hazardous areas for conveying petroleum vapours.

Designed to be highly flexible for retrofitting into confined spaces, the pump is pulley driven and can be rotated in either direction. The inlet and outlet can be on either side of the pump, independent of the rotation.





Quadrex Scientific has introduced the TITRA-LUBE TBN field test kit which is designed to quantify base additives in diesel engine lubrication oil. The kit is quick, accurate, inexpensive and requires no special training to carry out the test on site.

The TITRA-LUBE TBN field kit has been extensively tested by several major oil companies, large-engine manufacturers, and the U.S. Navy, where results have shown the kit to be as accurate as existing laboratory methods. The kit is based upon the ASTM D664(4) method.

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Seafloor in 3-D

The world's first real-time shipboard 3-D display of integrated side scan sonar, bathymetric and sub-bottom profile data has been introduced by Addison & Baxter Ltd.

Triton Technology's Bathimagery technique uses high-speed computers and visualisation software so that the operator can 'fly' across a section of ocean floor, generating animation sequences and making interactive interpretations of geological and other features in 3-D and stereo 3-D. It has wide uses in offshore oil and nearshore site investigations, in surveillance and it improves the efficiency of ROV operations.

New PARAMINS branding

PARAMINS, a division of Exxon Chemical Company, has established a new system for applying brand names to its products around the world.

'The new system is far more user friendly than the one it replaces,' said David C Corson, Vice President, Marketing for PARAMINS. 'The new product brand names are easier to remember. They often reflect the product's function. With the new system, a customer will be able to distinguish between products that are commercially available and those still under development.'

The changeover will be gradual, taking about 12 months to complete. To ease the transition, PARAMINS has prepared a brochure, available from sales representatives worldwide, detailing how PARAMINS products will be branded under the new system, and why.

'The new system reflects our interest in service by making it easier for customers to identify precisely the PARAMINS product that meets each specific need. It also emphasises the superior quality of products we deem worthy of carrying a PARAMINS brand. In the long run, the new branding system will make doing business easier for all of us,' Mr Corson said.



A scene from the latest health and safety initiative at BP Chemicals, Baglan Bay — a series of broadcast quality video magazines produced by Harrogate-based Training Video Associates. The three-times-a-year programme is entitled Lifeline and was devised in partnership between BP and TVA. BP's first consideration was to publicise occupational health and safety issues in an interesting way. The resulting series is intended as a trigger for discussion, rather than straightforward instruction.

. . . people



Mr David Kem, above, has been appointed Conoco's Vice President, refining and marketing Europe, based in London. Mr Kem will have responsibility for Conoco's refining, marketing and distribution activities throughout Europe. He has also been appointed Chairman of Conoco Limited - Conoco's refining, marketing and distribution company in the United Kingdom. He succeeds Mr Gary Edwards who has transferred to Conoco's Houston office and been appointed Executive Vice President, refining, marketing, supply and transportation.

Mr Jon Campbell-Harris has been appointed Sales and Marketing Director of the May Holdings Group. He will be responsible for the marketing of the products of Valetmatic Limited, Jetwash Limited and Brushwash Limited.

Phillips Petroleum Company have announced a number of senior appointments. Mr Bill Thompson has been elected Vice Chairman; he has been a senior executive since 1986, when he was elected Senior Vice President, planning and technology in 1986. Mr Wayne Allen has been elected President and Chief Operating Officer; he will succeed Mr Glenn Cox, current President and Chief Operating Officer, who retires at the end of this month. Mr Charlie Bowerman has been appointed Executive Vice President, planning and technology, and Mr Dave Tippeconnic will become Executive Vice President, downstream operations.

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Elf UK has announced the appointment of **Mr Jöel Bouchard** as Managing Director of Elf UK Plc and Elf Aquitaine UK (Holdings) Plc. Mr Bouchard was formerly Managing Director of Elf Petroland in Holland. He will be responsible for Elf UK's oil and gas exploration and production facilities in the United Kingdom, replacing **Mr Pierre Moussel**. He has also been appointed Director of Elf Enterprise Petroleum Limited.

Mr Larry T Nierth Jr has been appointed Director and Vice President of Texaco Denmark Inc. Mr Nierth joined Texaco after graduating from the University of Texas. After a number of managerial positions, he was named Manager, Negotiations and Contracts, for Texaco's international exploration function in 1982, and has held the same position in the company's Middle East/Far East Division since 1985.

Mr Jan Muelder, who is currently Director and Vice President of Texaco Denmark Inc, is retiring from Texaco after 40 years service. Mr Muelder joined Caltex Pacific Indonesia in 1951 as a tax attorney and held managerial positions with increasing responsibility both in that country and in New York. He was appointed Managing Director of Texaco Malta Inc in 1974 and became Director and Vice President of Texaco Denmark Inc in 1977.



Textron Specialty Materials have appointed **Mr Michael Ogles**, **above**, as European Offshore Sales Manager. He is responsible for overseeing all offshore marketing and sales activities for the company's fire protection systems in Europe.

At the 13th World Petroleum Congress the following senior appointments were made for the next three-year Congress period: **Dr KL Mai** was re-elected President and Chairman of the Executive Board, **Mr Pierre Jacquard** was elected Senior Vice President and (ex officio) Deputy Chairman of the Executive Board.

Mr Adrian Young has been appointed a Director of Caspen Oil plc following the acquisition by Caspen of the Manchesterbased machine tool companies owned by Mr Young. He will be responsible for developing a new engineering division for Caspen.

Helle Engineering Limited, the Aberdeen based subsea electronics and diver communication manufacturer has appointed **Mr Brian Gribble** as its Managing Director.

Mr Jose Meruelo has been appointed Senior Project Engineer with Bandera Engineering Inc. He has 25 year's experience in facility design, pipeline design, welding inspection, quality control, supervision of fabrication and installation of oil and gas production facilities both off- and onshore. After one year as President-Elect Mr Roger Abel has been appointed President of the Society of Petroleum Engineers. Mr Abel is Vice President and General Manager, Exploration and Production, USSR of Conoco Inc. Also appointed are the new President-Elect Mr Jacques Bosio of Elf Aquitaine and six new Directors — Mr Robert Chase, Mr Michael Cotton, Mr Richard Sandtveit, Mr Peter Gaffney and Ms Eve Sprunt.

Century Oils Group Managing Director Mr Adrian Parsons has announced a new organisational structure for Century's UK operation. Coupled with the departure of six directors and senior officers. about 100 people will be leaving as a result of the restructure. From within the former management two new directors have been appointed: Mr Frank Thornhill, formerly Chief Chemist and Strategic Business Manager, becomes Director of Development and Manufacturing. Mrs Janice Bordill, formerly Human Resource Manager becomes Director of Personnel. Two Century previous Directors Mr Andy Hayman remain becomes Director of Customer Service, and Mr Alan Greenhalgh becomes Director of Finance and Administration.



The Offshore Contractors Council (OCC) is to relocate its secretariat function from London to Aberdeen. At the same time the OCC have appointed **Mr Iain Bell**, **above**, as Secretary. Mr Bell has been directly associated with the onshore and offshore engineering construction industry in the United Kingdom and overseas for over 30 years. The OCC represents 50 of the United Kingdom's leading offshore engineering, maintenance and construction contractors.



pointed **Dr Michael Smith**, **above**, previously a non-executive Director of Globe, as Chairman and Chief Executive, to succeed **Mr Michael Plant** who, as planned, has stepped down from the Chairmanship to become a nonexecutive Director.

The Institute of Petroleum

Institute News

Musical evening

Fina is generously sponsoring a concert at The Institute of Petroleum on the evening of 10 December. In the first half, Louise Hopkins (cellist) will perform; and in the second half, Jozik Koc (baritone), accompanied by Rebecca Holt, will sing songs from some musicals.

A **limited** number of tickets are available free to members on application to Mrs Mary Wood. There will be wine at 6.00 pm., music at 7.00 and a buffet supper at 8.15.

Around the Branches

Aberdeen

10 December: 'The Work of the Oil Spill Response Service Centre', David Salt, Oil Spill Service Centre, Southampton.

Edinburgh and South East Scotland

12 December: 'Environmental Audit — The plain facts!', Dr P Upton, Manager, Dames and Moore UK (joint meeting with the Pipeline Industries Guild).

Midlands

6 December: Greek Night Out.

North East

12 December: 'Quality Assurance in TQM', Mr SRR Kirk, ICI Ltd.

Southern

13 December: Visit to the Ordnance Survey.

Yorkshire

10 December: 'A visit to Ackrill Newspapers — aspects of producing the Harrogate Advertiser'.

New Collective Members

Roland Berger & Partner, 33 Davies Street, London, W1Y 1FN. Tel: 071 491 9592. IP Nominated Representative: Mr David Sharman, Manager.

The company is a subsidiary of Roland Berger & Partner GmbH of Munich, a management strategy consultancy operating worldwide to the 'majors' and national oil companies, primarily downstream.

Union Bank of Switzerland, Box No 428, 122 Leadenhall Street, London, EC3V 4QL. Tel: 071 901 6111. IP Nominated Representative: Mr C Waltenspuel, Assistant Vice-President.

The Union Bank of Switzerland is involved in all aspects of international banking, specialising in particular on financing of natural resource projects; lending to oil majors, contractors, suppliers and joint venture projects.

King-Wilkinson Ltd, Endeavour House, Cleveland Centre, Middlesbrough, Cleveland TS1 2PQ. Tel: 0642 210301. IP Nominated Representative: Mr LB Bailey, Business Development Manager.

King-Wilkinson Ltd is a subsidiary of Babcock International Group plc, specialising in conceptual design, engineering, procurement, construction, supervision and management, commissioning and maintenance for the oil and gas production, treatment and distribution, refining and petrochemicals industries. Marubeni International Petroleum Co (UK) Limited, 120 Moorgate, London EC2M 6SS. Tel: 071 826 8668. IP Nominated Representative: Mr K Hishinuma, Managing Director.

A subsidiary of Marubeni Corporation, Japan, the company, known as MIPCO UK, trades (physically and handling) in crude oil, oil products and oil futures. MIPCO co-ordinates Marubeni's oil trading activities throughout Europe and the Middle East.

McGraw-Hill, 13 rue du 4 Septembre, 75002 Paris, France. Tel: 33-1 42 60 37 00. IP Nominated Representative: Dr Silvia Pariente-David, Research Director.

McGraw-Hill is a multimedia publishing and information services company. Platt's provides subscribers with a complete coverage of the petroleum market 24 hours a day, distributing information by newsletter, fax, telex, electronic network and satellite, through Platt's Global Alert. DRI/McGraw Hill provides information, analyses, forecasts and advisory services to planners, marketers and policy makers in the energy sector worldwide.

New Members

Mr RW Adair, 33 Darnley Drive, Kilmarnock, Ayrshire KA1 4UF

- Mr DD Afropong, 20 Mawdley House, Webber Row, London SE1 8XQ Mr Y Agyemang-Duah, Ghana National Petroleum Corp, Private Mailbag, Tema, Ghana
- Mr MM Arbab, Universal Network Corp Ltd, Merlin House, 122–126 Kilburn High Road, London NW6 4HY
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- Mr SA Ashaolu, Marketing Manager, Nigerian National Petroleum Corp, PMB 12701, Lagos, Nigeria
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Captain CJ Casson, 5 Ord Bn, BFPO 16, Germany

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- Mr MH Withers, Marketing Director, Selantic Industrier, 6740 Selje, Norway
- Mr DP Wood, Dowell Schlumberger, Marble Arch House, 66 Seymour Street, London W1H 5AF

Student Prize Winners

Mr LWF Butler, Hillhead Farm, Forres, Moray, IV36 0QT Mr SM Small, 29 Trafalgar Avenue, London SE15 6NP

Students

- Mr AJ Bailey, Imperial College of Science & Tech, Dept of Mineral Resources Eng (MSc), RSM Prince Consort Road, London SW7 2BP
- Miss CJ Glover, RGIT Survival Centre Ltd, 338 King Street, Aberdeen AB2 3BJ
- Mr DP Gwynne, Strathisla, 11 Baillieswells Road, Bieldside, Aberdeen AB1 9BB
- Mr A Joobeen, 64 Clarendon Court, Sidmouth Road, London NW2 5HD
- Mr DW Rodman, 2FR, 37 Market Street, Aberdeen AB1 2PY

Deliveries into Consumption

UK deliveries into inland consumption of major petroleum products - Tonnes - September 1991

Products	Sep 1990†	Sep 1991*	Jan-Sep 1990†	Jan-Sep 1991*	% change
Naphtha/LDF	279,330	221,270	2,329,550	2,462,940	5.7
ATF-Kerosine	588,520	613,770	5.083.610	4.652.900	-8.5
Motor Spirit	1,920,500	1,955,160	18,297,240	17,940,490	-1.9
of which unleaded	700,240	827,090	6,002,310	7,246,500	20.7
Super unleaded	76,750	100,130	674.860	854,530	26.6
Premium unleaded	623,490	726,960	5.327.450	6.391.970	20.0
Burning Oil	131,140	160,130	1,492,700	1.661.490	11.3
Derv Fuel	850,110	896,720	8.000.480	7,943,240	-0.7
Gas/Diesel Oil	590,560	564,760	5,983,960	5,961,470	-0.4
Fuel Oil	691,240	889.370	9.961.257	9.303.740	-6.6
Lubricating Oil	74,550	64,920	625,200	571.740	-8.6
Other Products	444,690	567,420	4.629.513	4.879.260	5.4
Total above	5.570.640	5,933,520	56,180,150	55.377.270	-1.4
Refinery Consumption	438,740	497.890	4.407.610	4.525.510	2.7
Total all products	6,009,380	6,431,410	60,587,760	59,902,780	-1.1
†Revised *Preliminary					

... branch spotlight

London Branch

The first 'branches' were student sections and the London Section was inaugurated in 1923. Previously, on 16 May 1923, a meeting of the student members of the Institution was held in London to discuss the formation of student branches. It was resolved that:

A branch of the Institution of Petroleum Technologists be formed in London for the students of the Institution and that this branch should co-operate with any other branches that may be formed.

Following the meeting, an organisation committee agreed that the Student Section should be divided into two branches known respectively as the London and Birmingham Branches.

At the inaugural meeting on 23 October in the Institution's offices, FRS Hewson presented a paper entitled, 'The Use of the Hand Auger in Geological Mapping.'

HR Austin became the first chairman. Even in the 1920s difficulties were experienced in obtaining reasonable attendances — on one occasion in 1929 only two students turned up to discuss a paper on 'Pinking.'

In 1933 Council decided to allow 'Branch Members', as distinct from Individual Members, and in 1935 nine associated students were recorded in the Annual Report of the London Branch. In the following year, a meeting was held with the students of other engineering institutions to arrange a joint programme of lectures and to facilitate the attendance of students at the meetings of other organisations.

During World War II, the activities of the Student Section lapsed and it was not until 1946 that an attempt was made to revive it. Initial moves were unsuccessful as, under the Institution rules, only a small number were eligible for membership. Eventually, the sphere of interest was broadened and this became the basis of the London Branch which was inaugurated in 1948. A little later a Student Section was reborn. The branch has continued in this form to the present day, although the Student Section ceased to exist many years ago.

As with most other branches, the main activity of the London Branch is its programme of lectures which are held monthly from September to May. The subjects of the papers relate to every aspect of petroleum ranging from technical topics such as 'Petroleum Engineering' to 'Helicopter Operations.' Attendances vary and, ignoring a small number of 'old faithfuls', each paper tends to attract a different audience. This is not surprising,



A London Branch Committee of the 1950s: From left to right: Bill Davies (Petrofina), Jim Clark (Mobil), Ron Leach (Hon Sec, Shell), Wilfred Davies (Chairman, Esso), Stan Price (Monsanto), Steve Kiernan, John Jewell (Castrol) and Bob Walters (Carless).

in view of the large membership in the Home Counties. Three years ago the average attendance was 58 per meeting and in the current session numbers have ranged from 30 to 60. We have yet to attract an audience of two (although this seems to be tempting providence).

The annual lecture at Imperial College has attracted a great deal of interest from students and this year's paper by IP President Mr Basil Butler 'Never A Dull Moment — 36 Years in Petroleum Engineering' was an outstanding success.

In the past, the AGM has been combined with a Ladies' Evening and papers on subjects such as 'Silverware', 'Roses' and 'Antiques' were presented. On one occasion a fashion show was organised. At the present time, in order to encourage members to stay after each lecture, wine and cheese are provided.

Socially, the branch has held annual luncheons and dinner/dances over a period of years. At the luncheons addresses have been given by many prominent people among whom Lord Robens, Mr Enoch Powell, Sir John Hill and Sir John Greenborough will be particularly remembered. The dinner/dances at the Spanish Rooms, Barrington House have become well-known for their 'party atmosphere'. Each summer a visit is arranged and interesting outings to refineries, research centres, the Humbly Grove oil field and the Thames barrage have ended the session's activities.

From the results of the Institute's Mem-

The Institute of Petroleum

bership Database Study, there appear to be around 2,700 members in the London/ Home Counties area, all of whom are circulated with information about meetings. This study showed that the most frequently selected areas of interest are:

- Engineering/project management/design and construction.
- Refining and manufacturing.
- Transport/pipelines and supply.
- Marketing/sales/distribution.
- Environment.

A London Branch study, however, conducted at the end of 1990, highlighted the following main areas of interest:

- Marketing.
- Environmental protection.
- Offshore (general).
- Exploration and production.
- Trading/finance/tax.

Refining and manufacturing were well down the scale. Although marketing and the environment figure high in both studies, the differences reflect the differences in the personnel employed in the Home Counties, compared with the Institute's total membership.

Looking to the future, the London Branch intends to strengthen its ties with student bodies, particularly Imperial College, by holding additional meetings at the college. In view of the recent Mori Report, it also plans to co-operate with the Education and Training Committee in activities associated with schools.



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The Institute of Petroleum

DOING BUSINESS WITHOUT PAPER

The Impact of EDI (electronic data interchange) on the upstream and downstream oil industry

THURSDAY 20 FEBRUARY 1992

To be held at

The Cavendish Conference Centre, London

As a North Sea operator or a joint venture partner, you will appreciate the amount of time and resources taken month in, month out to handle joint interest billing statements. You are faced with two problems. One is the mound of paper involved, the other is the lack of standards in terms of what information is presented and how it is formatted. Recently business people from a number of oil companies have been meeting together and this business process has been simplified and speeded up by agreeing a standard format for the exchange of this information, and by sending the information as an electronic message that is what 'doing business without paper' or EDI (electronic data interchange) means.

This conference will set the scene by introducing EDI, showing its importance in many industries (your weekly shop at the supermarket depends on EDI for ordering the goods you buy), its impact in Europe (efficient trading in an integrated Europe, both east and west will demand EDI) and hearing the views of an oil industry director. The afternoon is devoted to reports of the current EDI activities in the oil industry in the United Kingdom, both upstream and downstream. Associated with the conference there will be an exhibition from EDI service providers (those companies that provide the 'electronic Royal Mail' services by which the EDI messages are transmitted).

For further information and a copy of the registration form, please contact **Susan Ashton**, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK. Telephone: 071 636 1004. Telex: 264380. Fax: 071 255 1472.