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Finance How the European Investment Bank finances energy developments

THE INSTITUTE OF PETROLEUN

Profitability through Innovation -The European Petroleum Industry's Response to a **Regulated Retail** Market

4-5 June

To be held at the NEC, Birmingham

The IP European Retailing Conference will take place alongside the '96 Forecourt Show, organised by Blenheim Exhibitions. It will be a two-day event, taking advantage of the international nature of the show. focusing on retailing in the wider European context, comparing and contrasting experiences in the United Kingdom and Continental Europe and the new developing markets to the east. It will cover both the rapid commercial developments and the important scientific, engineering and environmental issues associated with gasoline retailing and thus will appeal not only to retail marketers, but also to planners and technical specialists.

For further information, please contact: Lisa Tompkins, Blenheim Exhibitions and Conferences Ltd. Tel: 0181 742 2828 Fax: 0181 747 3856 BLENHEIM





'Hydrogen - The Refinery Green Light'

Thursday 25 April

To be held at the Cavendish **Conference Centre, London**

The importance of hydrogen as a refining medium has been growing dramatically in recent years. The technology now helps the refiner to meet the whiter demand barrel, with products which conform to the ever more stringent specifications imposed by environmental regulations.

This conference explores the possibilities and the achievements of hydrogen processing over the whole range of products. First, an overview paper that critically compares the 'hydrogen-in' with the 'carbon-out' processes, largely from an economic outlook. Then two papers on alternative production methods for hydrogen - one leading to the 'make or buy' option as a means of assuring a hydrogen supply and one illustrating the depth of experience and great diversity of feedstocks possible by the gasification process. A paper on hydrogen management discusses how by-product hydrogen from cat reforming can be increased and purified to improve its effectiveness in hydroprocessing plants.

The fifth paper discusses an active major refinery revamp in Holland which includes hydrocracking, with residue gasification to produce the necessary hydrogen, and the rationale leading to these process selections. The final paper deals with hydrocracking for base lube oil production and the revolutionary Isodewaxing process now in commercial operation.

Chairman - David Waterfield Process Technology Manager, Cat Reforming and Hydroprocessing, BP

Overview - the advantages of hydrogen over other forms of processing Dr G D Tobin, Foster Wheeler Energy Ltd

Hydrogen from steam reforming - The Supply Options Mr A Regent, Air Products plc

Hydrogen production using the Texaco Hydrogen **Generation Process Technology** Mr J Gardner, Texaco Ltd

Hydrogen management - production from cat reforming and use in distillate processing Messrs G L Gray, J McVay, J L Navarre, M Whysall, UOP Ltd

Hydrogen in residue processing - the Shell Pernis project Mr HMB Bijwaard, SIPM Pernis, Netherlands

Hydrogen in lube oil processing - update on Isodewaxing Mr S Nutting, Chevron International

For a copy of the registration form, please contact Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK Telephone: 0171 467 7100 Fax: 0171 255 1472

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Those readers wishing to attend future events advertised are advised to check with the contacts in the organisation listed, closer to the date, in case of late changes or cancellations.

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COVER PHOTO Fish thriving near rigs. Photo by Dave Stanley, Louisiana State University.

News in Brief

26 February

Pogo Producing Company and its partners report that the Pakakrong 1 exploration well on block B8/32 in the Gulf of Thailand has produced gas at a rate of 25.5 mncuft/d and oil and condensate at 738 b/d.

27 February

Caltex Pacific Indonesia has found oil at two sites on the island of Sumatra.

Betz Ltd has secured a £3m

sole supply agreement for the provision of on-site speciality chemicals with the Shell (UK) Stanlow manufacturing complex. The company will also proplex the company will also programmes for power generation, cooling water, effluent treatment and crude oil processing.

28 February

Elf Exploration UK has awarded the front-end engineering and design contract for the Elgin and Franklin development project to Kværner H&G Offshore. The development includes a production, utilities and accommodation platform located on the Elgin field with wellhead platforms for the Elgin and Franklin production wells iniked to the central platform.

Agip and Croatian state energy company INA Industrija Nafte have signed a \$320m deal to jointly develop four gas fields in the northern Adriatic Sea.

The French government is

to sell 9.5 million of its shares in Total. The shares represent 4 percent of the company's capital. The government will retain a 1 percent interest in Total after the sale.

Enterprise Oil reports that well 53/5b-5, 6 km south east of the Davy field, has flowed at a stabilised rate of 12.6 mncuft/d.

29 February

Lasmo reports that it returned to the black last year with a profit of £34m after tax, compared with a £3m loss in 1994. Sulzer (UK) Pumps has secured a £2.6m contract from Brown and Root to supply 15 pumps for a floating production, storage and offloading vessel destined for the Schiehallion field to the west of the Shetland Isles.

Pak-Arab Refinery has placed a contract with Babcock King-Wilkinson for the provision of project management services on its new oil refinery project at Mahmood Kot, 65 km from Multan in Pakistan. The refinery will process 100,000 b/d, maximising middle distillate production to provide much needed fuel oil for power plants in the vicinity.

The UK government has

outlawed fishing in 300 square miles of coastal waters around Milford Haven following the Sea Empress grounding and subsequent oil spill (see Petroleum Review, March 1996).

Phibro Energy USA has been awarded the first US Department of Energy sales contract for crude oil from the Strategic Petroleum Reserve Weeks Island site in Louisina, reports *Lloyd's List*.

Agip, chevron and Texaco have embarked on an 18month geophysical survey agreement with China National Offshore Oil Corporation to conduct seismic surveys on a 625 km² offshore tract in the Pearl River Mouth Basin of the South China Sea.

1 March

Interconnector UK has received planning permission from the North Norfolk District Council to build a gas compression station within the existing Bacton terminal. Original plans to locate the station on an adjacent green field site were refused following local opposition.

Associated British Ports has commissioned a new pipeline and bunker fuel facility at the port of Lowestoft. The new pipeline will allow vessels to load bunkers from an outer harbour facility. A Texaco and Tenneco Energy joint venture has secured a licence from the Polish government to explore for natural gas on five contiguous blocks in central Poland southwest of Warsaw

2 March

Statoil's Yme oilfield, the smallest to be developed on the Norwegian continental shelf to date, has gone into production.

5 March

Kvaerner has made a £904m agreed takeover bid for Trafalgar House. It is thought that Trafalgar's Cunard shipping line may be sold off as part of the deal.

Total and its partners Unocal, PTTEP and Moge have discovered natural gas during initial drilling on the M5 and M6 blocks of the Moattama permit located 10 km from the Yadana field in Indonesia. The well produced gas at a rate of 26 mncutt/d.

British Gas Exploration and

Production has awarded a five-year contract to Seaforth Maritime for the provision of logistics operations services in support of three Armada gas condensate fields. It includes the provision of dedicated and shared supply vessels, computerised logistics control system, procurement, cargo handling and storage services.

Halla Engineering and Heavy

Industries has agreed with Sofregaz to join together to build LNG storage, carriers and terminals in South Korea, reports *Lloyd's List*.

6 March

Phillips Petroleum has been given the go-ahead by the UK Department of Trade and Industry for an \$82m gas reinjection plant for the Judy/Joanne project. Phillips and its co-venturers plan to begin liquids production in April 1997 at initial rates of 30,000-40,000 b/d. Gas will be reinjected for later delivery.

Lasmo has agreed commercial

terms for the processing of gas from Wintershall UK's Windermere field on its Markham facilities. Production is scheduled to begin during the first quarter of 1997. Once processed, gas will be exported to the Den Helder terminal in the Netherlands through the K13 Extension and WGT pipelines.

7 March

The pilot and captain of the Sea Empress had not agreed a plan of approach into the port of Milford Haven according to an interim report from the UK government's Marine Accident Investigation Branch. The vessel was also reported to have had no mechanical deficiencies at the time the pilot boarded the vessel. The full investigation into the incident is expected to take some months.

8 March

Amoco Sharjah Oil Company reports that it achieved record production levels last year with rates averaging over 700 mncuft/d. The company forecasts peak production volumes of 900 mncuft/d this year.

UK Environment Minister Sir Paul Beresford has laid before Parliament new gas safety regulations which include measures aimed at further reducing the incidence of carbon monoxide poisoning resulting from the use of dangerous gas appliances in rented accommodation.

9 March

The Norwegian Ministry of Industry and Energy has put forward a proposal reducing the amount of gas contributed from the Statoil/Saga Aasgard field to meet continental Europe sales contracts in the year 2000 from the 10.8 bncum/vr of gas. originally proposed by Norway's Gas Supply Committee, to 8.9 bncum/yr. It is suggested that the 2 bncum/yr of gas required to make up Norway's total sales commitment will come from Norsk Hydro's Oseberg field.

News in Brief

The state-owned Tuxpan power station on Mexico's Gulf coast is reported by Mexican environmentalists to have spilled several million litres of fuel oil into waters off the state of Veracruz, according to *Lloyd's List*.

11 March

Talks between the United Nations and Iraq on the possibility of limited Iraqi oil sales have resumed in New York.

AMEC Process and Energy

Limited has secured the contract for a 700 tonne gas injection module for Phillips Petroleum's Judy platform (see 6 March).

Texaco has awarded a £12m, three-year contract to Kvaerner Oil & Gas Services for

the provision of offshore construction services in support of the oil company's offshore facilities. In the spirit of CRINE, profitability will be incentivebased on performance against project estimates.

UK Minister for Energy and Industry Tim Eggar has opened Bond Helicopters' new £750,000 heliport at Liverpool Airport. According to Bond the new base, together with its facilities at Blackpool Airport, will allow the company to support all future exploration, appraisal and development activities in the Liverpool Bay area.

12 March

Amerada Hess and Premier

Oil have been granted UK Department of Trade and Industry approval for the development of the Fergus field. The field, to be developed as a subsea tie-back to Fife, is scheduled to come onstream later this year. Total recoverable oil reserves are estimated at 6 mn barrels.

The UK Health & Safety Executive says that the latest figures on accidents and injuries offshore show a 'clear reduction' in 1993-94 and 1994-95. Conoco Pakistan Exploration & Production, Albion International Resources, Jupiter Exploration, Pan Energy Pakistan and Petra Pakistan are soon to begin oil and gas exploration in the Duki block in Central Pakistan.

13 March

Woodside Petroleum, on behalf of partners BHP Petroleum, BP Development Australia, Chevron Asiatic, Shell Development and Japan Australia LNG, has said that preliminary interpretations of the logs of the North West Shelf Lambert-2 appraisal well indicate a gross gas column of 126 metres.—

British Petroleum has announced that it is aiming to increase company income by \$1.5 bn to approximately \$4.5 bn/yr by the turn of the century. The company also plans to increase capital spending over the same period from \$5 bn to \$6 bn/yr, keeping net debt to between \$7 bn and \$8 bn without assuming any significant change in external factors such as oil prices or product and chemicals margins for the industry as a whole

The 2,500 tonne, single piece jacket for Texaco's Erskine field has left Lewis Offshore's Stornaway construction yard and is scheduled for installation by the Saipem S7000 heavy lift vessel sometime late next week.

OMV has announced that it

will be increasing its supplies of natural gas by 500 mn m³ per year following the signing of an agreement with Russian natural gas producer Gazprom. OMV will now import about 5.5 bn m³/yr of natural gas from Russia and up to 1.5 bn m³/yr from Norway. This, together with the 900 mn m³ domestic production of OMV, will secure Austrian gas requirements into the next millennium.

14 March

Thailand is offering over 100 new onshore and offshore blocks in its 15th international licensing round. Most of the blocks are in the Gulf of Thailand.

Amerada Hess has awarded

an EPIC contract to the Kvaerner Stolt Alliance for the design, supply and installation of the flowlines and manifold systems for the Durward and Dauntless field development project in the UK sector of the North Sea. The fields are being developed together by means of a common FPSO and associated shuttle tanker offloading product.

Phillips Petroleum Company

and Anadarko Petroleum Corporation have made their third discovery in the Gulf of Mexico's subsalt play. The Agate #1 well on Ship Shoal block 361 tested at a combined flow rate of 4,126 b/d of oil and 24 mncuft/d of gas.

15 March

Saudi Arabian Oll Co has entered the European downstream sector through a new partnership with Greece's leading oil and shipping family, reports *Lloyd's List*. The Saudi oil producer has paid \$379m for a 50 percent stake in the Vardinoyannis family's Motor Oll Group which includes the Avin petroleum distribution network and Greece's largest private oil refinery.

Nedlloyd of the Netherlands

has sold its Neddrill division to Noble Denton Corporation for \$300m in cash and 5 million of the US company's shares. Noble Denton will now be one of the largest drilling contractors and integrated oilfield service providers in the world.

Total is to acquire the Ugandan government's 50 percent interest in Total Uganda as part of the government's policy of liberalisation of the domestic economy.



France: J. Manguet, +33 4901/016 - Ber

Newsdesk

Germany targets marine diesel engine emissions About 98 percent of ships and Technol- up (cause)

About 98 percent of ships worldwide use diesel engines as their primary source of propulsion power. German-designed and manufactured units represent 47 percent by number and 52 percent by rated output of all diesel engines at sea today.

In a bid to retain market share and meet future stringent environmental controls, Germany launched a three-year, industry-wide research programme last November aimed at significantly reducing harmful emissions from marine diesel engines.

A total of 12 German marine diesel engine manufacturers, shipbuilding industry subcontractors. universities and research institutes are involved in the **CLEAN** (Clean and Low Soot Engine with Advanced Techniques for NO Reduction) project. Managed by Germanischer Lloyd, the project has the support of the Federal Ministry for Education, Science, Research ogy which is providing funding of DM13 million, Total costs are expected to reach over DM30 million. An 'Air Pollution Annex to the International Maritime Organisation's (IMO) Marpol convention is currently being compiled that will regulate emission lev-

els of NO_x and SO₂. A 30 percent reduction in NO_x emissions over 1992 levels is expected to be one of the initial targets (see graph).

The CLEAN project aims to reduce markedly visible soot and particulate emissions from diesel engines under all operating conditions. Furthermore, it plans to go



Rated engine speed [1/min]

beyond the new requirements of IMO - the goal is a 50 percent reduction in NO_x emissions from large diesel engine design and a 95 percent reduction through the use of selective catalytic reactors (see graph).

The reductions are to be achieved without increasing fuel consumption – an ambitious goal given the difficulties of attaining high efficiency and cleaner exhaust emissions at the same time.

Hamburg-based shipping company TT-Line has made its new Nils Dacke ferry available for sea trials of the new technologies adopted under the CLEAN project.

Egypt opens first public natural gas service station

The Natural Gas Vehicles Company (NGVC) opened Egypt's first public compressed natural gas (CNG) service station on 27 February. The opening ceremony was performed by Petroleum Minister Dr Hamdy El Banbi.

Located in Almaza, Cairo, the new service station is the first in a series of CNG fuelling facilities which NGVC plans to construct in the greater Cairo area for public use. The company also plans to build and operate centres that will convert vehicles to CNG.

According to NGVC Chairman and Managing Director Yehia El Ridi, the growing use of Egypts own supplies of natural gas as a transportation fuel was a logical extension of the efficiency and environmental benefit which natural gas can provide. Egypt already uses natural gas for 80 percent of its thermal electricity production.

'Natural gas emits 85 percent less pollutants that gasoline and has no lead content,' said Frank Chapel, Engineering/Technical General Manager and Managing Director of NGVC. 'It is the cleanest burning fossil fuel available and can make a major contribution to the reduction of urban pollution.'

The Egyptian government has priced CNG at approximately half the cost of gasoline to encourage uptake of the 'cleaner' fuel. Basic vehicle conversions are expected to cost in the region of \$1,000. Once converted, vehicles will be able to run on either CNG or gasoline.

ČNG delivers the same fuel performance as gasoline but burns more cleanly and will start and drive well under all temperature conditions, states Amoco, which has a 40 percent interest in NGVC. Egypt Gas and Enppl (Engineering for the Petroleum and Process Industries) hold the remaining 40 percent and 20 percent respectively.



Tesco fuels petrol pump price war

Tesco has promised to make its petrol the cheapest within three miles of any of its 254 service station forecourts in the United Kingdom. Furthermore, the company states that its petrol will be cheaper than that of competitor supermartest within a five-mile radius.

The supermarket has also increased pressure on its rivals by extending its Clubcard loyalty scheme to petrol. Motorists can now redeem supermarket goods against vouchers collected for petrol purchases at Tesco service stations. They will receive one point for every £5 spent on petrol, after a minimum spend of £10, and for every 25 points will receive a voucher worth £1.25.

This latest petrol price pledge is seen as another threat to the thousands of small independent retailers in the United Kingdom which are struggling to remain competitive in the current petrol pump price war (Petroleum Review, February 1996).

Newsdesk

Conoco prepares to remove redundant Viking A platform

Conoco plans to undertake its first North Sea decommissioning project later this year – the removal of its redundant Viking A platforms.

Four of the field's five steel platforms comprising Viking A are to be removed, while the fifth, Viking AR, will be left to continue as a riser platform for Viking B gas production, as it has done since Viking A ceased production in 1991.

Removal, once approved by the UK Department of Trade and Industry, will involve the heavy lift vessel *Stanislav Yudin*. More than 99 percent of the steel and other material from the platforms, which weigh some 8,600 tonnes, will be recycled.

According Project to Manager Ray Daniels, the removal process will 'virtually be the reverse of installation'. The bridge linking the FD platform to the rest of the Viking complex will be removed first, followed by the FD platform which will be lifted off in sections. The remaining linked platforms will be removed in a similar manner. In total, 22 major lifts (over 50 tonnes each) and 24 minor ones will take place

The platforms are to be taken to the Swan Hunter yard on



Viking A platforms

Tyneside for dismantling into their component parts, including steel, copper wire and aluminium. Less than one percent of the dismantled materials is destined for a licensed landfill site. This includes five tonnes of asbestos used for insulation and fire protection that cannot be recycled.

Conoco reports that surveys have shown that there is no naturally occurring radioactive scale brought up from the gas reservoir, nor is there a significant amount of drill cuttings on the seabed. 'Because this is a gas platform, there has been no heavy crude on it,' says Mr Daniels. 'The only fluids left are traces of chemicals and light oils used by the process plant.' These will be removed before dismantling begins.

The company intends to consult widely with fishing and fish production interests and environmental bodies such as English Nature. 'We understand the interest and sensitivities that surround such activities,' says Mr Daniels, 'and we will be leaving a clean seabed when we finish operations.' He concludes, ' We are proud of our environmental and safety record and intend that this project will add to our reputation in this area.

Onshore licenses

Onshore oil and gas exploration in the United Kingdom is set to significantly increase following the award of 22 licences for 74 blocks under the 7th UK onshore licensing round.

The majority of awards were in the East Midlands and Lincolhshire basin in which a number of oil and gas discoveries have already been made. Other awards were for less wellestablished areas such as South Wales, Yorkshire and Humberside, Hampshire, Oxfordshire and Wiltshire.

Some of the awards were for blocks straddling land and sea boundaries. UK Junior Energy Minister Richard Page has applied 'strict conditions' to these cases so as to exclude any oil and gas activity below the low water mark. Activities above this mark require planning permission which will take account of any environmental impact.

This is the first onshore UK licensing round in which companies have been able to apply for the new unified Petroleum Exploration and Development Licence that covers the full life-cycle of any hydrocarbon discovery.

More oil in Papua New Guinea

Oil Search Ltd reports that its latest wildcat on the Paua discovery in Papua New Guinea could be brought into production in 12 months' time if two more wells on the structure prove successful.

According to Managing Director Peter Botten, the development might coincide with the commissioning of the nearby Gobe field which has proven and probable reserves of 95 million barrels. The field is expected to cost 33-400 million to develop.

One of the advantages of the Paua and nearby Moran structures is their proximity to the processing facilities at Agogo on the Kutubu oilfield. Partners in the Kutubu fields estimate that development costs of Moran and Paua will be low, with a 17 kilometre dual gas/oil pipeline to the existing Agogo facilities, says Mr Botten.

Chevron, the Kutubu operator, has estimated Paua to have a reserve potential of 135 million barrels of oil, equivalent to half of the reserves of the Kutubu fields.

Oil Search is to participate in 12 wells in the Papua New Guinea Highlands over the next 18 months at a cost of \$25 million per year. Among those wells is Makas-2X, estimated to have recoverable reserves of 150 million barrels, Sarat-2X with potential reserves of 350 million barrels and Wasima and Nomad-1X, each with a reserve potential of 100 million barrels.

Aboriginal boundary dispute delays pipeline construction

Work on Tenneco Energy Australia Corporation's A5215 million gas pipeline linking eastern markets with the southwest Queensland gas fields has been brought to a standstill by a dispute between Gungari tribe members and the Goolburri Aboriginal Corp Land Council over traditional land ownership boundaries.

Tenneco says that is has no dispute with either of the parties arguing over traditional links with the land to be traversed by the Balera to Walumbila gas line but states that the matter has caused a 'rescheduling' of construction operations.

The 750 km pipeline is designed to carry up to 110

petajoules of gas from next, year to supplement supplies to coastal Queensland markets from the state capital, Brisbane, north to the port of Gladstone. It will allow gas from the Cooper and Eromanga basin regions, which currently supply South Australia and New South Wales, to reach this market for the first time.

The new pipeline is the second major Queensland project to be delayed by aboriginal issues. CRA Ltd recently failed to settle a land dispute with local tribes affected by the proposed AS1 billion Century zinc mine in the north of the state. Mine construction could be delayed by up to six months.

Newsdesk

New gas pipeline for Danish North Sea under consideration

Dansk Olie og Naturgas (DONG) and Amerada Hess are studying the possibility of building a new natural gas transport system in the Danish sector of the North Sea in order to service Denmark's rising demand for natural gas.

DONG owns the existing pipeline system transporting gas from the Central Graben fields in the southwest Danish North Sea to the west coast of Jutland. The system has an annual capacity of some 7.5 billion cubic metres of gas, a figure corresponding to the total amount of gas which the Dansk Untergrunds Consortium will deliver to DONG from 1997 when the pipeline system nears full capacity.

From the turn of the century DONG expects to sell an additional 2 hncum/ry of gas. New gas supplies will have to be secured to meet this need - which the existing pipeline will be unable to handle.

A new gas transport system would be able to handle not only the new supplies but also gas from South Arne and other smaller fields that would not be economically viable if they had to bear the costs of a transport infrastructure on their own. Amerada Hess and DONG would, in appropriate circumstances, seek co-operation with other field owners. The pipeline could also be linked to the Norwegian system.

It may be possible to transport gas to Denmark from the UK, German and Norwegian sectors via the new pipeline.

Depending on which technical solution proves most attractive, the new gas transport system is expected to cost some Kr1.5-2.5 bn.

Espinosa, at a special ceremony at Harwich International station in Essex on 5 February.

The naming was in recognition of the renewing of a 10year contract between Mainline and Carless to transport gas condensate from the condensate plant at North Walsham in Norfolk to Carless' refinery at Parkeston Quay, Hanwich. Up to 12 trains per week run between the two locations. This is the equivalent of 30,000 lorry movements each year on East Anglia's roads.

Mainline Freight, Carless and Railtrack also worked together with the Department of Transport to secure a £2.9 million grant from the UK government for the renewal of eight miles of railway line from North Walsham which will allow its continued use by the condensate trains.

Storage tank fire study

Fires on large floating roof storage tanks such as those used at refineries and terminals are rare. However, when a fire does happen it is often difficult to extinguish and the potential environmental and economic impact can be severe.

Recognising the seriousness of such fires, Agip Petroli, BP Oil, Beta Refineries, Conoco, Elf, Hungarian Oil and Gas Corporation, Mobil Oil, OMV, Petrofina, Repsol, Shell International, Total and Veba have joined forces to launch an initiative to develop guidance on the most appropriate fire hazard management practice for large storage tanks.

The joint industry project will review tank design, construction, inspection, operation and maintenance as well as incident detection equipment, fire protection systems, fire consequence prediction and fire fighting practices.

Work on the LASTFIRE (Large Atmospheric Storage Tank Fire Integrated Risk Management Study) initiative is to be carried out by independent oil industry fire hazard management consultancy, Resource Protection International, in conjunction with fire hazard experts from BP Research and Engineering and Shell Research.

Record-breaking deep water contract for Stolt

Stolt Comex Seaway has been awarded a S6 million plus contract by Shell Offshore Inc for the installation of well control/chemical injection umbilicals on the Mensa field development in the Gulf of Mexico.

The contract will set two new records for the offshore industry, according to Stolt. Not only are the umbilicals to be installed at a record depth of 1,625 metres, measuring 100 km between the subsea manifold and the host platform they will also be the longest subsea control lines in the world.

Asia energy study

Asia's energy consumption is projected to increase by an average 35 percent per annum to the year 2015 compared with 2.2 percent per annum on average for the world, according to the DRI/McGraw-Hill Global Energy Group's most recent forecast entitled 'Asia Pacific Outlook'.

Indeed, the region is expected to outpace North America, today's largest energy consumer, by the year 2000 and its energy consumption is forecast to be 50 percent higher than North America by 2015.

The report also states that Asia will account for half of the increase in global energy consumption between 1995 and 2015, its share in the world energy market place rising from its current 27 percent to 35 percent in the same period

China is expected to account for 27 percent of the overall increase in energy demand in Asia and, by 2010, it will consume more energy than the whole of Western Europe. Meanwhile, India's energy consumption is forecast to increase by 18 percent. Together, China and India will account for almost one-third of the world's increase in energy consumption.

The report also predicts continued growth in demand for oil in Asia, with an increased gap between regional production and consumption. Despite the openration companies, such as the Tarim Basin in China, DRI expects oil imports to double by 2015.

New name for freight locomotive

A Mainline Freight class 58 locomotive was named Petrolea by the Chairman of Carless, Jacobo Hernandez



Kim Jordan, Managing Director, Mainline Freight (left) and Jacobo Hernandez Espinosa, Chairman, Carless Refining & Marketing (right) with the newly named 'Petrolea' locomotive

New electric power plant for Argentina

Amoco Power Resources Corp and Camuzzi Argentina have joined forces to build and operate a power generating plant in southern Argentina. Amoco owns a 40 percent interest in the new company Energia del Sur, while Camuzzi, the largest private gas distribution company in Argentina, holds the remaining 60 percent share.

The Central Termica Patagonia plant, located in Comodoro Rivadavia some 1,000 miles south of Buenos Aires, will consist of two General Electric Frame-6 gas turbines with a combined capacity of 77 megawatts of electricity.

The fast-track construction project is scheduled for completion in nine months and the first turbine will to go on line by the end of September. Local gas supplies fuelling the power plant will be supplemented by additional gas supplies from the nearby Cerro Dragon field.

This project will add a reliable, cost-effective electricity source to the region and will provide additional jobs during the construction phase,' said Alejandro Nanissevich, Camuzzi's Managing Director.

Diary Dates



Joint meeting: Exploration & Production Discussion Group and Energy Economics Group

Upstream Oil & Gas -UK Fiscal Policy

Keynote Meeting Wednesday 17 April, starting at 17.00

By Mr J L Stretch, Deputy Managing Director, Agip UK Ltd

The tax changes of March 1993 exempting future developments from Petroleum Revenue Tax have led the UK fiscal regime to be described as 'favourable'. Mr Stretch will review the UKCS fiscal policy, its past evolution, the effects on the industry and will give some pointers for the future.

IP contact: Jenny Sandrock



Joint meeting: Exploration & Production Discussion Group and Information for Energy Group

Performance Contracting: Beyond Alliancing –

The upstream service industry in the next millennium

Thursday 9 May, tea at 17.00 for 17.30 until 19.00

By Mr Robin Pinchbeck, Managing Director, Atlantic Power & Gas Energy Economics Group

Energy and the Media – A Personal Perspective

Tuesday 30 April, tea at 17.00 for 17.30 until 19.00

By Mr Jeremy Cresswell, Aberdeen Press & Journal, Energy Journalist of the Year

IP contact: Jenny Sandrock



Energy Economics Group

Recent Developments in US Energy Policy

Wednesday 15 May, tea at 17.00 for 17.30 until 19.00

By Mr Bruce Rogers, Commercial Attaché, US Embassy, London

IP contact: Jenny Sandrock

IP contact: Jenny Sandrock

All meetings are held at the Institute of Petroleum Please tell the IP contact if you plan to attend any of these free meetings Tel: 0171 467 7100 Fax: 0171 255 1472

Newsdesk.

UK trade mission to South America

UK Trade Minister Lord Fraser led a UK trade mission to Venezuela and Colombia last month, as part of the DTI's 'Link into Latin America' campaign.

The trade mission set out to develop the commercial opportunities offered by the rapid growth being planned in both countries. In Venezuela the oil industry is being opened up to international companies for the first time in 20 years and expansion plans require S58 billion of investment over the next six years.

In Colombia there are numerous opportunities for trade, particularly in the oil sector as the Cusiana and other fields are brought on stream. The members of the trade mission also planned to visit Cusiana.

Lord Fraser also launched a series of seminars in Caracas and Maracaibo to share experience and expertise gained in the North Sea. In particular, the seminar speakers intended to spread the CRINE message, concentrating on measures to reduce costs in oil and gas production which have produced savings of 30 percent in capital and operating costs.

Lord Fraser said, 'The DTI's series of seminars will highlight the UK's considerable expertise in cost effective oil production, based on the challenges of the North Sea.' He added that the North Sea could provide 'valuable and transferable techniques'.

New exploration company formed

Energy Africa has been created from the upstream interests of Engen Ltd and floated on the Johannesburg stock exchange. This leaves Engen to concentrate on the downstream sector in South Africa.

The split was necessary in order that international capital could be obtained for the acquisition of assets outside South Africa. The Treasury at present restricts the use of South African funds to exploration activities.

The new company already has production through its percent share in the Alba field in the North Sea, a 10 percent share in the Bukha gas condensate field offshore Oman, as well as interests in the Nkossa and E-BT ollfields offshore Congo and South Africa which are currently being developed (see Petroleum Review, February 1996).

Energy Africa also has interests in other oil, gas condensate and gas discoveries offshore the UKCS, Oman,

Correction: Please note that the three terminals mentioned *Petroleum Review's* March 1996 article on the Sea Empress incident should have read Texaco, Gulf and Elf. Congo, South Africa and Namibia. For instance, it has a 25 percent share in the Shelloperated Kudu gas discovery offshore Namibia which is currently being appraised and is confidently expected to have considerable potential. In the absence of any sizeable local market, this gas might be piped to Saldanha in South Africa for electricity generation and/or the local steel industry.

According to John Bentley, Managing Director, Energy Africa, the company's production is planned to double to 14,000 barrels a day by 1998 – without new discoveries. Proven and probable reserves of oil and condensate are estimated at 35 million barrels.

Exploration efforts will in future be concentrated on West and Southern Africa (especially Angola, Congo, Gabon and Namibia) in joint ventures with leading international oil and gas companies operators. An 'aggressive' dilling programme is planned.

The Herbrandston jetty, formerly owned by Esso, is now leased to the Milford Haven Conservancy Board. We apologise for any confusion caused by this error.

BP and Mobil combine downstream

Last month BP and Mobil announced an unexpected merger of their refining, marketing and lubricants business in Europe, representing a desperate move to cut costs and restore margins to something like previous levels.

The assets to be pooled total around \$5 billion, with \$3.4 billion from BP and \$1.6 billion from Mobil. The pan-European net annual sales of over \$20 billion. If approved by the European Commission and others, the combined operation would have 12 percent of the fuels market in 43 countries and become the largest supplier of lubricants, with 18 percent of the market.

Under the terms of the agreement the two former competitors will create a joint venture with operating partnerships for fuels and for lubricants in every country where they already do business or might start one. BP, with a 70 percent share, will operate the fuels partnerships, including refining and manufacturing and their commercial and retail networks (some 5.600 BP and 3.300 Mobil service stations). BP's distinctive green colouring will be adopted by the Mobil sites, while a new joint loop has yet to be decided.

For its part Mobil, with a 51 percent share, will operate the lubricants partnerships, running the blending plants and selling the lubricants and special products of both companies.

These combined operations will obviously bring job losses, currently forecast at 2,000-3,000 from non-service station staff.

Optimism for UK offshore sector

A new report, *Towards* 2020, gives optimistic predictions for the UK offshore sector for the next 25 years. Based on a detailed survey of its 34 member companies, the UK Offshore Operators Association (UKOOA) has published figures predicting that self-sufficiency in oil is guaranteed for the immediate future. Production will continue to exceed domestic demand for the next 10 The joint venture will not cover all downstream operations of the two companies. It is proposed to exclude global activities such as international trading, aviation, marine, shipping and gas marketing.

BP Chief Executive John Browne believes that the BP-Mobil merger will 'not just achieve costs savings – it will also provide a tremendous platform for growth.'

Because of the continuing surplus refining capacity and poor margins, BP had already announced elements of rationalisation in Europe, with the proposed sale of its Lavera refinery in France, the closure of the Pernis section of the Nerefco refinery in Rotterdam and the upgrading of its Europoort site. Mobil had taken similar decisions – last year it closed its Woerth refinery in Germany.

The refining problems have been compounded by declining margins on gasoline and other products at the pumps. These have occurred at the same time that competition has hotted up, particularly in the United Kingdom, where Esso recently extended its Pricewatch campaign from Scotland to the whole country, dropping its pump prices to among the lowest available in the vicinity. Meanwhile the supermarkets are fighting to keep the market share that they have already won. In this suicidal scenario, companies which can find ways to save \$500 million annually in operating costs, as BP and Mobil forecast, are obviously in a better position to survive and see off some of the competition.

years and sufficient technically recoverable reserves exist to justify 'significant' levels of production for a further 20 years.

Production is forecast to peak at 3 million barrels per day around the year 2000.

The survey also found that gas output could double its 1990 rate, reaching 10,000 million cubic feet a day by the year 2000, if there were the corresponding demand.

The impact of legislation on decommissioning: recent international policy developments

By Peter Holt, Head of the Offshore Decommissioning Unit, Oil & Gas Office, Department of Trade and Industry

The last year has been an interesting one for those of us concerned with the decommissioning of offshore installations. This morning I will reflect on policy developments over the past year and give you my own view of what lies ahead.

Brent Spar

It was at this conference 12 months ago that the Minister for Industry and Energy Tim Eggar announced that he had approved Shell's plans for the decommissioning of the Brent Spar. Of course that decision was not taken lightly. Shell decided that deep-sea disposal of this loading buoy was the best practicable option after 30 studies undertaken over a period of four years.

I have no wish to linger unnecessarily over the details of the events of last year which provided me with one of the most intensively busy periods of my career. But it is probably worth reminding ourselves that the government's action in approv-

ing the decommissioning of the Spar was fully consistent with UK obligations under international law, and particularly with the OSPAR Convention. That convention was signed as recently as 1992. It contains specific reference to regulation on a caseby-case basis. The day after Mr Eggar made his announcement, the government informed the other contracting parties to the OSPAR Convention that the Brent Spar was to be disposed of in over 2,000 metres of water. Those governments made no adverse comment on that notification until after Greenpeace boarded the installation. I believe that to be significant.

As you all know, Shell eventually decided not to dispose of the Spar in the deep waters of the Atlantic. The Spar is now anchored in Erfjord near Stavanger in Norway. DNV published a study in October last year which confirmed that Shell's estimate of the contents of the Spar was substantially accurate. Claims by Greenpeace about the nature of the contents of the Spar were shown to be extremely exaggerated.

Shell are currently evaluating ideas which have been submitted to them. They will draw up a long list of proposals for which contractors will be invited to submit proposals. That long list will in due course be reduced to a short list which will receive more detailed evaluation. Any new proposal for the disposal of the Brent Spar will need to be considered by the government. It is clear that any such proposal will need to satisfy us in respect of those factors which previously led us to believe that deepsea disposal was the best practicable environmental option.

International policy developments

Where are we now on the international front? How did we get there, and where are we heading?

The Fourth North Sea Conference The North Sea Conference of Environmental Ministers meets every four years to consider environmental protection of the North Sea. The fourth North Sea Conference met at Esbierg in Denmark in May. That meeting took the view that, in furthering a precautionary approach, decommissioned installations should either be re-used or disposed of on land. Because the North Sea conference as a body has no executive powers, it invited the OSPAR Commission to implement that agreement. The North Sea Conference ministers also agreed to take concerted action within the London Convention to require disposal on land of decommissioned installations.

The United Kingdom and Norway both entered reservations to that part of the Ministerial Declaration. The Norwegian reservation says that Norway was unable to accept this provision on the grounds that disposal on land is not necessarily the best solution from the environmental point of view for all installations. The UK reservation says that the United Kingdom does not accept this proposal since the environment will be better protected by the adoption in each case of the best practicable environmental option identified by a thorough case-by-case examination, as provided for in Annex III of the **OSPAR** Convention 1992

France entered a footnote to that part of the declaration registering its understanding to be that the statement applies only to metallic structures, and the removal of such structures has to take full account of the IMO resolution A.672 (16) of 16 October 1989 and other relevant IMO guidelines.

So there we were on 9 June 1995 in a position where the North Sea environmental ministers (minus those from Norway, United Kingdom and, to some extent, France) established a policy that decommissioned installations should either be re-used or disposed of on land. The only North Sea states apart from Norway and the United Kingdom which have offshore installations on their continental shelves are Denmark. Germany and the Netherlands. All the installations on the continental shelves of those three countries are light and in shallow water. They are of a class which are required to be entirely removed under the IMO guidelines and standards. The United Kingdom also possesses light installations in shallow water which are required to be entirely removed. They will be entirely removed, and it is likely that they will be returned to land. I will refer to this again later.

Norway and the United Kingdom are the two states which have large concrete installations and large steel installations both in deep water. Neither of those two states has subscribed to that part of the ministerial declaration.

OSPAR

The next development was the meeting of the Oslo and Paris Commissions in Brussels 26-30 June 1995. At that meeting the Commissions agreed a four-part decision:

- A moratorium on the disposal at sea of decommissioned offshore installations until the Commission has adopted a decision on the disposal of offshore installations with a view to banning the disposal of such installations at sea;
- To ask the OSPAR working group on sea-based activities (SEBA) to prepare a draft Decision to be presented at the next OSPAR meeting with a view to its implementation in 1997;
- To ask SEBA to prepare an inventory of all installations in the Convention area.
- To take concerted action within the London Convention with the aim that the revised convention would require the disposal on land of decommissioned offshore installations.

As recently as September 1992, the OSPAR countries agreed that they would require best available techniques and best environmental practice. They agreed that no disused offshore installation should be disposed of at sea without a permit issued by the competent authority of the relevant contracting party on an individual basis. That is exactly what the United Kingdom did in approving Shell's plans for the Brent Spar. But there we were just less than three years later – at the end of June 1995 – with the same countries seeking a ban on sea-disposal. You might find that perplexing.

The OSPAR convention is the regional convention covering the north-east Atlantic concerned with the protection of the marine environment. The London Convention is the worldwide convention concerned with the protection of the marine environment.

London Convention

The next step in our story is the London Convention meeting last December last year.

At that meeting there was a call from some of the northern European OSPAR contracting parties - notably Denmark and the Netherlands - for a ban on seadisposal. The London Convention is constituted very differently from OSPAR. It represents a much wider spectrum of opinion which considers these matters from a different perspective. The countries of Latin America and North America, as well as Russia, China, Japan and Australia joined the United Kingdom and Norway in speaking against the proposal for a ban which was defeated. The Scientific Group of the London Convention will consider at its next meeting whether there are any scientific grounds for change. They have considered this question on several previous occasions. I would be surprised if they changed their previous view which was that no further action was necessary within the Convention.

SEBA 1996, Aberdeen

The most recent step in this convoluted story took place in Aberdeen in February when the OSPAR SEBA meeting discussed offshore decommissioning.

Although a couple of contracting companies at that meeting were keen to move to talk about banning sea disposal now, the general view was that shared by Norway and the United Kingdom that to do so would be precipitate. Let me tell you why.

Studies presently pending

There are many studies presently underway. The House of Lords Science and Technology sub-committee III has been conducting an inquiry into decommissioning for some months. This is an eminent committee which has taken evidence from a wide body of interests: from government, the oil companies, contractors, scientists, and environmental groups. They were to have reported towards the end of February. I now understand that they are likely to publish their report some time in March (see page 163).

The end of March is the time when we will be receiving the report of the independent and international group of scientists chaired by Professor John Shepherd of the Southampton Oceanographic Centre. That group is undertaking an authoritative independent review of scientific and engineering evidence in relation to the environmental impacts of deep-sea disposal of decommissioned installations. This will act as a benchmark against which other options can be assessed.

We are conscious that the existence of large drill cuttings piles around the base of some platforms has implications for decommissioning options. We have commissioned a study which will examine environmental effects, whether any action should be taken to remove the piles, and if so how. We expect that study to be completed in about three months.

I referred earlier to that class of installations which is required to be entirely removed under the provisions of the IMO guidelines and standards. These are light installations in shallow water such as are found in the southern basin of the North Sea. In terms of numbers, these installations represent about 75 percent of the total of all installations on the UK Continental Shelf. I believe it may be possible to undertake a generic study which considers all those factors which will be included in a best practicable environmental option study - these are such things as technical feasibility, risk, environmental factors, consideration for other uses of the sea, and cost. The likely outcome of such a study is that if they are being removed then the BPEO will be that they should be returned to the shore. We will be commissioning such a study soon.

The European Commission has been considering a study of its own for some time. Terms of reference have been discussed with both the international oil companies and the environmental groups. If that study is to be both valuable and respectable it must consider sea-based disposal options as well as those on land. We have made that view known to the Commission. I understand the latest position to be that the European Commission will soon go out to tender through the medium of the Official Journal. The results of the study are expected to be available by September 1996.

The outcome of SEBA 1996

Following discussion at the SEBA meeting in February, it was agreed that notwithstanding the Decision taken last June that SEBA should prepare a draft Decision on the disposal of offshore installations, the preparation of such a draft Decision which would command the unanimous support of contracting parties was not possible at the meeting. Further careful consideration of this matter - with Norway as the lead country - was required, particularly to take into account the forthcoming EC study. A SEBA ad hoc Working Group on the Disposal of Offshore Installations will be convened in the latter part of this year to prepare for further discussion at SEBA 1997. The lead country should prepare a draft Decision on the Disposal of Offshore Installations for examination by SEBA 1997 and subsequent presentation to the Ministerial Meeting of the Commissions in June 1997. This matter will be discussed at another intermediate level before it goes to the Commission in June. However I do not foresee any major change of direction to what was agreed in Aberdeen.

A tentative categorisation of offshore installations was prepared in Aberdeen in February and SEBA has agreed that this categorisation could form the basis for further work to assess appropriate disposal options for the categories identified.

Those tentative categories include:

- 1. Floating installations
- 2. Subsea completion facilities

 Steel installations standing in less than 75 metres of water and weighing less than 4,000 tonnes in air, excluding the deck and superstructure (after 1 January 1998 a 100 metre depth criterion will apply)

4. Other steel installations – topsides and substructure

5. Concrete installations – topsides and substructure.

The way forward

As you are aware, the UK government, and the Department of Trade and Industry in particular, has committed considerable time and energy to the decommissioning process in the past 10 years or so. We believe that we are well placed to make a major contribution, together with our Norwegian colleagues, to the work which lies ahead in the Scientific Group of the London Convention and in OSPAR.

We remain convinced that the way forward must lie in a continuation of the scientific process through which we arrive at the best practicable environmental option. Reason must prevail over emotion.

It is likely that the BPEO for at least 75 percent of installations on the UKCS will be disposal on land. Land disposal will not necessarily be the best option in all cases. What we are interested in, as I believe I said here last year, is reaching sensible conclusions based on a consideration of all the facts. We are interested in protecting the marine environment. We are interested in protecting the environment on land too. There can be no compromise on that.

We will be very interested to read the conclusions of the House of Lords Science and Technology Committee.

Our own draft Guidelines on Decommissioning were issued as a consultation document last May. The consultation period ended in August and I would like to thank those organisations which made a contribution to our thinking. We have not yet issued the Guidelines as a final document because we want to take account of the outcome of the House of Lords inquiry. After the House of Lords inquiry report is published, our first priority will be to consider what they have to say and to prepare for ministers draft observations on the report. I believe we have 60 days to do that. The final version of the Guidelines will be published some time after that. The Guidelines will refer to some amended form of consultation with interested parties including the scientific community. I am not yet able to say what form that will take.

Conclusion

I am very much aware that one of the worst things for any industry is uncertainty. It is perfectly reasonable for you to want to know where you stand so that you can make reasonable planning assumptions. We had believed that the conclusion of the OSPAR Convention provided certainty. We were wrong. The present discussions which I have described will not be concluded until the OSPAR ministerial meeting in June 1997.

Meanwhile, some things are clear. I believe we know what the answers are in respect of the lighter platforms in shallower waters. Like Leman BK which Mr Eggar announced recently, they will be entirely removed and brought to shore. I believe that a generic BPEO study will support that view.

Floaters are easy. They will float off either to be used again on another field or to be scrapped in the usual way on shore.

We all know that large concrete installations are a problem. The Ekofisk concrete tank is particularly difficult. Many people are coming to realise that leaving such structures in place may be the only solution.

The main contentious area will be the large steel jackets. It is the objective of the United Kingdom to ensure so far as is possible that options which may be beneficial to the environment are not closed off. I know that my Norwegian colleagues hold a similar view. We will continue to ensure that all the arguments are made in the right quarters.

This and the following two papers were given at an IP conference on decommissioning held during IP Week in February.

Decommissioning around the world

By W S Griffin, Phillips Petroleum Co Director of Special Projects

Addressing the IP decommissioning conference, Bill Griffin aimed to give a global perspective to the subject of decommissioning. While it proved somewhat difficult to include every country that has offshore production, he gave a comprehensive guide to the worldwide decommissioning experience, regulations and plans.

He said in part:

The sun never sets on the offshore oil and gas industry.' Why? Because it is global. How often do those of us in the business ever think about which countries in the world have offshore production and what is the status of decommissioning in various countries? I want to give details of what is going on where. Since last summer and the Brent Spar, people around the world are more attentive to decommissioning.

Asia

China: There are 30-plus fixed structures but China will not face decommissioning before the year 2005. However, the initial offshore industry was begun with converted jack-up rigs and several of these have been decommissioned, all of which were taken onshore. They are a signatory to the United Nations Convention on the Law of the Sea

(UNCLOS) and the London Convention. They are in the process of developing regulations for decommissioning and modifying existing environmental laws to cover platforms. There is legislation in place that would allow for sea disposal of platforms. They do not plan to change the legislation but they do indicate that current thinking is to require onshore disposal. China operates with Production Sharing Contracts (PSC) as most countries in Asia do and the older PSC will require clarification to cover decommissioning. Recent PSCs talk about decommissioning but there are different opinions as to what is meant.

India: India has ratified UNCLOS and the Ministry of Petroleum and Natural Gas has recently established a Working Group to develop offshore legislation that would include decommissioning. They are not signatories to the London Convention. All 156 of their platforms are operating and redundant structures are not expected for several years. Sea disposal is a viable option.

Recent PSCs have a special provision for abandonment costs. The provision states that the contractor shall notify the government when it determines that the estimated remaining recoverable reserves of any field, net of operating costs, equals two and a half times the estimated abandonment cost. The government has the opportunity, within 60 days, to take control of the field and the abandonment obligation. If the government chooses not to take control, the contractor may then proceed to recover the abandonment cost from the remaining production and do the actual abandonment.

Philippines: There are six fixed structures in the Philippines. As in China, early offshore development was made through the use of converted jack-up rigs. One jack-up has been removed to date. Existing legislation provides only general guidelines on decommissioning of offshore structures. The Department of Energy has received a report from a consultant that presented proposed guidelines that recommend sea disposal but no action has been taken. The whole issue is currently under review by the government which does not expect redundant structures before the 21st century.

Thailand: There are 82 platforms in Thailand: The first decommissioning is not expected for at least five years. Provisions are contained in the Ministerial Regulation No 12 for site restoration when production ceases but they are very general guidelines and will require darification before they can be applied.

Indonesia: There are 414 platforms in Indonesia. None has been decommissioned to date but several are near term. Draft regulations have been prepared that require the removal of redundant platforms but there are no current plans to finalise the regulations.

PSCs signed prior to 1994 do not have provisions specifically addressing decommissioning. Since the assets are owned by the state, it appears that the government has full financial liability. For contracts signed after 1994 the contractor is liable for decommissioning but can recover the cost.

Malaysia: There are 209 structures in Malaysia. The issue is imminent but there is no national legislation and the PSCs are very unclear as to who has the liability.

ESCAP

The Economic and Social Commission for Asia and the Pacific (ESCAP) sponsored a seminar on The Removal and Disposal of Obsolete Offshore Installations and Structures in the Exclusive Economic Zone and on the Continental Shelf last September – the third in a series of such seminars. The focus was to help to develop an effective regime for decommissioning in the Asia Pacific region.

At the conclusion of the seminar, several recommendations were developed but one in particular expressed the consensus of those present towards total removal and the possible loss of the option of sea disposal of platforms.

'Based on the deliberations of this seminar, it is recommended that the London Convention be informed of the concerns that the participants of the workshop have with regard to total removal and a ban on disposal at sea of platforms. The possible requirements for total removal or ban on disposal would impose harmful consequences on the oil and gas industry in the ESCAP region.'

United States: The United States has been removing platforms for many years. The first documented removal was in 1973 but earlier removals have been noted. Minerals Management Service (MMS) guidelines are in place and used.

The US Gulf of Mexico contains over 4,000 structures. It is estimated it would cost \$4.5 - 5.0 billion to remove all of the structures currently in the Gulf of Mexico. The cost averages a little over \$1 million per platform. Over 90 percent of the Gulf platforms are within 100 miles of shore and in relatively shallow water. It is the small ones that account for the vast majority of the approximately 1,000 that have been removed to date. Most of these jackets weigh from a few tons up to 2,000 tons. There have been a few in the 3,500 ton range removed. There are almost 200 large structures in the Gulf of Mexico but they will not be decommissioned for many years. The official US position advocates total removal but authorities from the Reagan administration through to the current Clinton administration privately concede that as the larger structures become redundant special concessions will probably be necessary

In the United States Title 43 of the Interior Department's regulations concerning public lands addresses the removal of property upon termination of an oil and gas lease and is controlled by the Interior Department of the United States, both offshore and onshore.

Title 43 states: 'Upon the expiration of any lease, or the earlier termination thereof as provided in the regulations in this part, the lessee shall within a period of one year thereafter remove from the premises all structures, machinery, equipment, tools and materials other than improvements needed for producing wells or for drilling or producing other leases, and other property permitted by the lessor to be maintained.'

Previous mention has been made of Offshore Continental Shelf (IQCS) order No.3 which tells to what extent removal is to be made. There are MMS regulations which describe the process. Of the approximately 1,000 that have been removed, all but one have been recycled either into scrap metal, artificial reefs or reused at another location.

Scrap metal

Over 90 percent have gone into the scrap metal market. These are very small structures which can be hung from a small salvage yard crane and cut into pieces. The cutting is a very labour intensive process. The scrap steel must be cut into 1.5 metres x 2.0 metres to meet salvage requirements. In the 1980s there was an international flow of scrap but that is not true today. At least not from the United States.

Artificial reefs

There have been approximately 90 jackets converted to reefs. There are cases where the structural steel of the deck and topsides have been used but 1 am not aware of any instances where process equipment has been used. Most 'rigs' recycled into reefs contain only jackets.

The artificial reef programme began in 1984 with the passing by Congress of the National Fishing Enhancement Act. In this national legislation, the US Federal Government granted to the coastal states the right to manage the reef programme off their coast. It is very important to note that the oil industry did not initiate this programme. The fishery people came to the industry.

There are over 350 managed reefs in the Gulf of Mexico. Only 50 have 'rigs' or platform parts. To summarise – less than 10 percent of the platforms removed contribute to less than 15 percent of the managed reefs.

The use of redundant platforms in artificial reefs is one viable means of recycling but by no means is it the solution. The 'Rigs to Reef' programme is strictly managed – it is a very rigorous process to get approval to put a platform into the programme. (see page 168).

Reuse

The use of refurbished platforms in the Gulf of Mexico is not as popular today as it was in the late 1980s. The main reason is because more attention is now being given to structural integrity criteria. The structures being removed were mostly installed in the 1950s and 1960s and since that time design criteria has become much more complex and demanding.

In the late 1980s one contractor refurbished and reinstalled more than 50 structures in one year in the Gulf of Mexico. He is not doing that today.

Reuse gives quick turnarounds. Platforms can be on-line 50-75 percent faster through reuse of rebuilt facilities rather than a new build. One operator refurbished and reinstalled a jacket in 68 days versus a new build of 180 days.

Cost is another benefit which shows a 30-50 percent reduction in jackets and 15-20 percent with topside equipment. During the late 1980s contractors were quoting up to 50 percent in total savings. The only first-hand experience I can quote was a fast turn around but the cost was greater to refurbish the jacket than a new build.

Dump

The one structure not recycled was dumped in deep water in the Gulf of Mexico. I have not been able to get actual documentation but the office which does keep such documentation remembers this happening before 1973 when records were first kept on removals. Several others have verified the incident.

Europe

So much has already been said that the following discussion is very brief. About 25 percent of the platforms are large structures.

United Kingdom: Currently there are approximately 218 structures in the UK sector of the North Sea. Some 170 of these will be entirely removed but 50 others are very large and discretion needs to be used in the decision process. A case-by-case approach will allow the best solution to be selected

The Petroleum Act of 1987 and the Food and Environment Protection Act of 1985 are the key legislation on platform decommissioning in the United Kingdom.

In May last year the DTI's abandonment unit in Aberdeen issued a Document on Guidance Notes for Industry, with the stated aim of considering how compliance with DTI regulations could be made as flexible and speedy as possible. Comments were requested by last August on the document in order to determine if changes should be made to the abandonment programme. The industry is awaiting the final regulations.

In October last year, the Industry and Energy Minister formed an expert study panel headed by the Natural Environment Research Council to examine engineering aspects and the environmental impact of deep sea disposal. The panel is composed of scientists from several countries other than the United Kingdom. A report on the panel findings is due shortly

Further, the select Scientific and Technical Issues Committee of the House of Lords held hearings on platform decommissioning in October and December last year. It is rumoured that this report will recommend that the DTI should consult with more NGOs in reaching a decision on decommissioning.

Norway: There are about 70 structures on the Norwegian Shelf and 50-plus of them must be considered large. Like the United Kingdom, Norway needs a case-by-case evaluation available to them for these big structures.

The basic requirements for decommissioning are contained in the Petroleum Act and the Safety Regulation Act of 1985. The operator must submit a Cessation Plan to the Ministry of Industry and Energy for approval. The final approval of the Cessation Plan must be given by parliament.

A White Paper was produced by the government in 1995 which endorsed the case-by-case approach. It is expected that parliament will approve the White Paper shortly.

Denmark: There are 30 structures on the Danish Shelf and national legislation requires total removal to shore.

Netherlands: There are a few more than 100 structures in the Netherlands sector. These are small structures that will all be totally removed to shore.

Germany: There are two small structures in Germany which will be taken ashore.

Ireland: There are two structures in Ireland. The Irish parliament is currently processing a law requiring all structures to be brought onshore.

OSPAR

The Working Group on Sea-based Activities (SEBA) met recently in Aberdeen. The E & P Forum has NGO observer status with SEBA. The forum submitted several papers – one of which was on decommissioning. Also, two offshore tours were organised for the delegates. Nine SEBA delegates went to the BP-operated Miller platform in the UK sector and 15 delegates went to the Phillips-operated Ekofisk complex in the Norway sector.

South America

Brazil: Brazil has deep water developments and is considered an industry leader in deep water technology. Most of their developments are with floaters, TLPs and seabed completions. There are six fixed structures in water depths of up to 300 metres. Brazil was very vocal at the recent London Convention and wanted no part of a moratorium on sea disposal.

Venezuela: All their current structures are in Lake Maracaibo which is considered inland water. Venezuela was present at the London Convention (not a member) and spoke against the moratorium.

Peru: There are 20 or more large structures on a very narrow Continental Shelf. Peru was at the London Convention (not a member) but did not speak. It is assumed they were there to protect their interest in wanting sea disposal available.

North and West Africa

The offshore industry in West Africa is located in Nigeria with about 175 structures, Angola with about 70, and Cameroon, the Congo and Gabon with about 50 each. The structures are of the Gulf of Mexico variety. The Congo has about 35 large structures and was present at the London Convention (not a member). They did not speak. Angola also has some 15 large structures. West Africa is one area where knowledge about decommissioning is very limited. The IMO Guidelines, UNCLOS and the London Convention would be applicable.

The platforms in North Africa are almost exclusively offshore Egypt (about 100 structures) and a few in Tunisia and Libya.

The regional Barcelona Convention protects the Mediterranean Sea against pollution resulting from the exploration and exploitation of the continental shelf and the seabed and its subsoil. The convention says in article 20 'The operator shall be required by the competent state to remove any installation which is abandoned or disused in order to ensure safety of navigation, taking into account the guidelines and standards adopted by the competent international organisation. Such removal shall also have due regard to other legitimate uses of the sea in particular fishing, the protection of the marine environment and the rights and duties of the other states."

Middle East

The structures in this part of the world are in the Persian Gulf. Abu Dhabi has more than 350 structures. Iran has about 150, Dubai about 75, Saudi Arabia about 100 and the rest are in Kuwait, the Neutral Zone and Qatar. Most of the structures are small and in shallow water. This area is cov-

ered by the Regional Kuwait Convention which in article XIII clearly states that 'Platforms and other seabed apparatus and structures are to be removed in whole or in part to ensure the safety of navigation and in the interests of fishing.' It further says that redundant equipment cannot be deposited on the seabed of the continental shelf when it is no longer needed.

Conclusion

The issue of decommissioning offshore facilities is global. Over 53 countries or more than 25 percent of the sovereign states recognised by the United Nations are faced with the issue. There are very strict international rules in place and, as discussed, most countries are currently in the process of refining their regulations.

There is no doubt that the decommissioning of the very large structures will cause public concern. The world will be watching. The industry must be transparent and communicate, communicate and communicate with all interested parties. There is no way that decommissioning of these very large structures can be done without dialogue. The industry is committed to:

- Supporting regulatory decisions that are based on sound science
- Using these principles in all areas of the business
- Each facility is different
- Engage in dialogue with all parties.

It is inherently wrong to throw anything into the sea but it is also inherently wrong to damage the environment onshore, or expose workers and society to danger. Sometimes a lesser wrong has to be selected to produce the overall best solution when all factors are fully considered. The industry has never proposed anything other than total removal for 90-95 percent of the structure.

Lords still ready to consider disposal at sea

A House of Lords Committee, having studied in considerable depth the decommissioning of oil and gas installations in the United Kingdom, last month published a report which makes various recommendations on the options available.

One recommendation from the House of Lords Select Committee on Science and Technology states that sea disposal should remain an option for structures that have been thoroughly cleaned. In the committee's view, there are already large amounts of metals in the sea from both natural and manmade sources and the traces of hazardous materials that might finish up in the sea as a result of the disposal at sea of oil and gas installations would be small by comparison. At the same time the committee believed that the alternative option of disposal on land could have a serious environmental impact.

These findings are at variance with public opinion expressed most forcibly last summer when Greenpeace led a public campaign objecting to the disposal of the Shell/Esso Brent Spar storage and loading buoy in the deep waters of the Atlantic, causing an international outcry which culminated in Shell withdrawing its plans and reconsidering its options – a lengthy process which is still continuing. Shell frequently describes Brent Spar as 'unique' (see page 164). Undoubtedly its design, purpose and history were unique but the influence and repercussions of the Brent Spar saga are all-pervasive.

Acknowledging public concern over possible pollution of the marine environment, the committee recommended that the government should consider the use of an independent body to carry out all prescribed monitoring of installations disposed of at sea.

To reduce the cost of identifying and monitoring possible deep sea disposal sites, the committee proposed that a single ecologically acceptable site in UK waters should be identified by the government. In this 'graveyard', the government would allow the disposal of installations. It was even suggested to the committee that the Brent Spar site in the Atlantic should be the appointed 'graveyard' – because work had already been done on it.

Other recommendations included:

- The DTI should continue to be the lead department on decommissioning
- That each decommissioning proposal should be considered on a case-by-case basis to find the 'best

practicable environmental option' (BPEO), as proposed in the International Maritime Organisation Guidelines and the government's own Draft Guidelines

- The government should ensure that environmental, fisheries and navigational concerns as well as health and safety risks are not only fully considered but seen to be so
- That every best effort should be made to reuse or recycle structures
- That all decommissioning proposals should be freely available for public inspection
- That pipelines and drill cuttings piles should be covered by the same rules
- That the government should seek to restore international agreement on decommissioning.

However, the committee stressed that only a minority of installations in the North Sea (the larger structures) would be considered for disposal at sea. Under domestic and international regulations everything in the Southern North Sea, for instance, would have to be removed entirely and most would be brought ashore.

Why is Brent Spar unique?

By Graham Dunlop, Senior Project Engineer,

Brent Spar Decommissioning Project, Shell UK Exploration and Production

There is much that is unique to Brent Spar – most notably its structural features – but the consequences of its unprecedented position in the world's spotlight last summer have also posed some unique challenges for Shell, for the oil and gas industry, and indeed for society more generally.

I will try to encapsulate here the many elements that have made the Brent Spar exceptional. We will look at its unique structure and the specific engineering challenges, touching briefly on the original deepwater disposal plan and the exceptional events of last summer. I will then try to give a flavour of some of the exciting initiatives that are helping us to forge ahead to find an acceptable solution for the Spar, which include a new contracting process and plans for consultation which I believe could prove unprecedented in the oil and gas industry. Finally, I would like to suggest some of the issues which the Brent Spar affair has raised not just for Shell, but for society as a whole.

Structure of the installation

The technical features of the Brent Spar, a decommissioned oil storage buoy, are now well known and there is a growing appreciation of its unique nature. However I am not convinced that there is a real understanding of the full extent of the Spar's dimensions and what these mean as regards moving it around. People have become familiar with the sight of its topsides large enough in themselves - showing above the water. But the Spar is like an iceberg. Most of its bulk, mainly the six huge storage tanks, is beneath the water's surface. At 14,500 tonnes, the Spar weighs about the same as 2,000 double-decker buses, it is longer than a football field floating on its end, and its huge tanks displace 66,500 tonnes of water. Apart from the waters to the north of Orkney, most of the North Sea is too shallow to accommodate it.

The Spar is clearly different from any other installation in our waters and to that extent has never represented a precedent for the disposal of other structures, the large majority of which will be brought ashore and dismantled. Indeed our original thoughts were to return the Spar to shore for disposal but the more we studied how this might be achieved, the more difficulties we uncovered. The challenge was never primarily one of dealing with waste or the actual process of scrapping, both of which would have been manageable once the Spar reached the shore. Herein lay - and lies - the fundamental issue. Removing the Spar from the water or even just raising it higher, without posing undue risk to people or the environment, requires an exceptional feat of civil engineering.

Disposal risks

While the Spar is robust and fit for the purpose for which it was designed, the most up-to-date calculations of its structural strength under various stresses have shown that the original installation process cannot readily be reversed. Raising it up out of the water in its vertical floating position, or attempting to rotate it to the horizontal, both pose a significant risk to its structural integrity. This is mainly due to its intrinsic design and to the need to maintain, during movements of this kind, the balance of internal and external pressures which stop the tanks walls from buckling and imploding. This challenge is further complicated by the fact that two of the Spar's its storage tanks were damaged during operation. Any future solution will have to balance benefits carefully with these risks.

With these constraints in view, detailed studies two to five years ago by various independent and expert companies established deepwater disposal as the Best Practicable Environmental Option (BPEO) - an exceptional solution as only a few other UK installations would potentially be candidates for this kind of disposal. As shown by the detailed inventory also carried out, the Spar is not by any means the 'toxic time bomb' alleged. Its deepwater disposal would have had negligible impact on the marine environment. This was confirmed by independent scientists and oceanographers, and supported in consultations with environmentalists, conservationists and fishermen. The integrity and professionalism of the original inventory was later endorsed by Det Norske Veritas, which carried out a further independent audit of the Spar's contents for Shell at the safe anchorage in Norway. In comparison with deepwater disposal, the safety risks in terms of fatalities during onshore disposal would have been six times greater.

Alternative option sought

However, these scientific and risk evaluations were largely swept aside in the exceptional events of last summer, when outrage against deepwater disposal of the Spar arose in many people from a deeply rooted belief in the principle of 'clean seas'. The rest is history. Shell abandoned the deepwater disposal plan and has now begun an open, wide-ranging initiative to find a solution to match or better deepwater disposal – an initiative which will have consultation, dialogue and high-profile public examination as central features.

The challenges of finding a disposal solution for this unique installation remain. But we are committed, with the help of others, to meeting them.

Indeed in recent months we have received some 400 letters proposing many imaginative solutions for the Spar. They have ranged from removing the topsides to shore for use as a training facility to creating a fish-ranch with the submerged tanks, or in some way using its unique dimensions to harness wave power and generate lectricity. In many cases these ideas have come unsolicited from individual members of the public and have proved truly stimulating and encouraging as we set out on the new way forward.

Search process

Practically underpinning our search for a solution is a unique contracting process put in place by Shell last October. Typically, a company invites contractors to bid for a specified solution but in the case of Brent Spar, Shell does not know what the final disposal option will be. So the process consequently requires contractors to compete to find and develop the best solutions. We will then award the implementation contract to whoever has developed the BPEO. This process will harness not only the expertise of the major contractors with all their different resources but also the ingenuity of the many entrepreneurs who have already contacted Shell.

We are currently at the stage of finalising the long-list of some 20 or so contractors from those who responded to our public PIN notice in the Official Journal of the European Communities in October and who would be capable of undertaking the work. The next step will be to ask the long-list of contractors to outline their preferred disposal options and compete to get on to the shortlist of some six or so finalists. A database of all the imaginative ideas that we have already received for the Spar's disposal will be made available to the contractors to help them in this process, along with more recent studies into the Spar's structure that are due to be completed soon. The short-listed contractors will then be required to work up their proposed solutions in detail for Shell's final BPEO assessment.

The challenge to the contractors is to help us find an alternative BPEO for the Spar's disposal. The UK government has made it clear that the BPEO remains deepwater disposal until demon-

strated otherwise. The two main dismantling alternatives for the Spar would involve either raising it gradually up out of the water in its vertical floating position, so that cross-sections can be cut off and removed to a barge for scrapping onshore, or rotating the Spar on to its side so that it can be lifted horizontally on to a barge for removal to shore. Both options would need to address the unique challenges of sustaining the structural integrity of the installation. The safety implications of the time and labour intensity of such operations will be a vital consideration in the BPEO assessment. Alternatively, some sort of re-use option is attractive. In Norway, for example, decommissioning proposals for other installations have found considerable support for re-using parts of them as harbour facilities or in fish farm developments.

Shell has stated its commitment to wider consultation this time around, which we envisage being carried out in



tandem with our practical search for a solution. Our aim is that our final proposal to the UK government will be informed by the views of many other interested and representative parties. While consultation is of course not unique in itself, it is something that I imagine has been rarely undertaken by a commercial enterprise on the wide-ranging and international basis that we would like to see in place. Its implementation poses many challenges not least who are "the public" we are seeking to involve? There is also the guestion of involving Europeans in consultation on an issue which is legally the preserve of the UK government. The organisation of such a consultation is complex but we are currently working on plans which we hope will advance over the next few months.

In the end, however, it is Shell alone which will have to complete the BPEO analysis to arrive at a balanced solution to recommend to the government for

Brent Spar is currently moored in Erfjord, Norway Shell 'Way Forward' process to identify BPEO



approval. We hope to arrive at this solution towards the end of the year.

New modus operandi

In many ways the events surrounding Brent Spar are illustrative of a new climate in which business must operate and of a new way of doing business. Within Shell UK, we have accepted that technocratic compliance with rational, sciencebased regulation is not, in itself, enough. We are committed to engaging in a wider political and public domain where the trust, confidence and 'licence to operate' from the public at large have to be won. The measures that we are undertaking to achieve this in our search for a solution for Spar will, I believe, become increasingly characteristic of the way business is done in today's society. In the future, I believe that Brent Spar will be seen as a forerunner of many things quite beyond what it already represents in the context of decommissioning offshore installations.

Lessons for society

Brent Spar has posed unprecedented challenges for Shell but also an opportu-

nity to learn and change. But let me finally step back from these for a brief mention of some of the issues which Brent Spar has raised for society as a whole. In the same way that Shell has recognised the need to consult more widely and absorb not only rational arguments but also deep-seated emotions and beliefs, so we in the industry must also work harder at encouraging people to think about the trade-offs between the benefits industry brings and its ultimate costs – both economic and environmental.

Selecting the best environmental course at any point in time will never be simple - nature is wonderfully diverse and scientific views are constantly developing and rarely unanimous. However, decisions on cost are similarly difficult and the notion that they can be ignored is unsustainable. Society faces many problems and resources spent disproportionately on one make it harder to tackle others. In a modern democracy, the whole of society has a role to play in balancing these issues. The need for wider consultation is clear but any debate must include rational consideration of the facts. Single issue campaigners can play a valuable role in arguing for a particular point of view but the value of this is debased if it is clouded by alarmism and exaggeration. They also have a responsibility for enabling the best practicable solutions to be chosen.

If the unique sequence of events surrounding Brent Spar has achieved a good outcome, it has surely been to place such difficult environmental choices, and the contribution science can make to finding solutions, at the forefront of many more minds. We will continue to defend the balanced approach to environmental decisions, in the belief that abandoning it would be disastrous for our economies, our societies and for the environment. But we will also pay much more attention to listening to and consulting people about the many issues involved and to gaining their confidence and trust.

The Brent Spar is no longer just a North Sea installation but a unique and defining event. The challenge now is to ensure that it defines a new stage in the regulation of business activity which enjoys the popular support of hearts as well as minds. Certainly, Shell is striving for this goal.



Measurement Manual Part X Section 6

Code of Practice for the Calibration of Retail Metering Pumps/Dispensers

This section of the Manual, published in January, is the first of two documents prepared specifically to give guidance on measurement for retail service station operation.

Until now, no codes of practice have existed to provide such guidance for service station owners, oil company retail engineers and those engaged in the testing and calibration of the equipment.

Trading Standards Officers who test and stamp retail dispensers as being fit for trade in accordance with the Weights and Measures Act 1985 have guidance notes for implementation of the Regulations but these do not constitute nationally established and agreed procedures.

This Code was prepared in response to needs expressed by industry for guidance on recommended calibration procedures and equipment tolerances applicable to measuring equipment for dispensing motor spirit and diesel fuels. It is not intended to supplant regulatory requirements, nor to override Conditions of Licence, or any other requirements established by Trading Standard Officers or Petroleum Officers for particular retail service stations.

For the above reasons, the development and drafting of the Code involved ongoing detailed discussion and reviews with the regulatory authorities NWML, LACOTS and ITSA plus PPMA and other organisations. This close co-operation has been of great benefit in producing a universally accepted Code of Practice, enabling a review of existing procedures and interpretation of the Regulations, plus the introduction of a new design of certified volumetric measure with automatic temperature compensation.

The Code describes procedures for the checking and calibration of metering pumps/dispensers using certified and traceable calibration standards for volume and temperature. Adherence to these procedures will ensure that the measuring equipment performs well within the statutory accuracy requirements and to the more stringent accuracy and repeatability limits commonly required by industry and recommended by the Institute.

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are designed to identify any measuring devices for motor spirit or diesel fuel which are delivering outside legal measurement tolerances and also those in excess of industry tolerances but still within legal requirements. Observance of the specific procedures and recommendations of this Code will result in a uniform approach towards calibration by all parties involved, whether calibrators, authorities or site licensees and will greatly improve the control and performance of dispensers.

Furthermore, in the present climate of deregulation, deprescription and self-verification, this Code could form an important cornerstone for future retail operations.

Members of the Working Group who produced this document were drawn from the Commercial Measurement Committee PM-D-4 and the Service Station Marketing Committee DOC-4A.

The second specific retail document, due for publication shortly, is Code of Practice for the Calibration of Underground, Horizontal Cylindrical Tanks at Service Stations.

J D Snook, Chairman PM-D-4 This publication is available from The Library, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Price: £28 (25 percent discount for IP members).

Rigs-to-reefs — not the ultimate solution

Rigs-to-reefs' – the redundant offshore structures as artificial reefs – is being championed as one of the few constructive solutions in the current debate on North Sea decommissioning. Depending on the interest group questioned, however, the response to this proposed approach ranges from unqualified enthusiasm to dogged opposition.

By Lucia Susani, Principal Environmental Engineer, Snamprogetti Ltd

Encouragement to marine life

The ability and propensity of marine life to colonise underwater structures has long been recognised. Any hard substrate of large surface area left on the seabed has the potential for becoming an artificial reef. Varying with water depth, light penetration and bottom currents, sunken structures will foster the establishment of algal and invertebrate communities, which in turn can act as habitat and food sources attracting fish life.

This process already occurs in North

Sea waters and platforms are known to be effective in enhancing local fish populations. A 1979 study of fish catches in the Ekofisk field in the Norwegian North Sea showed the density of certain species to be up to 10 times greater close to platforms than in areas more than 500 metres away. More recently, a UKOOA-sponsored review of videotapes of underwater platform surveys reported fish to be present at 67 percent of the platforms reviewed in the southern, central and northern North Sea.

Inactive as well as working structures attract fish. In 1987 the University of Aberdeen assessed fish life around the wreck of the semi-submersible *Transocean 3*, sunk to 110 metres of water in the northern North Sea. Despite the lack of light or other stimuli from the structure, the seabed in the area adjacent to the wreck and the water column up to 15 metres

Photos: Marine Life at Rigs-to-reefs site in the Gulf of Mexico by Dave Stanley, Louisiana State University



above it were found to contain more fish than open areas one or more kilometres away.

These accumulated findings are offered as evidence by proponents of a rigs-to-reefs' programme for the North Sea. Such a decommissioning alternative would avoid the high costs and technical difficulties of onshore jacket disposal, or the controversy linked to the deep sea alternative. It would provide financial savings to the offshore operators, offer potential benefits to the fisheries industry and provide a sanctuary for overfished stocks in North Sea waters.

Proposed for North Sea

Dr Gordon Picken, Manager of AURIS Environmental at the University of Aberdeen, has been studying offshore reefs for over 10 years. He believes that scope exists for the development of reef areas in the North Sea. In his view, the latticed, open-cage structure of the steel platform jacket is ideal for artificial reefs. There is potential here for one industry to donate very valuable material to another,' he comments.

In a North Sea 'rigs-to-reefs' scenario, decommissioned steel jackets from the smaller gas platforms could be removed, cleared of any toxic or polluting materials and deposited at selected inshore locations. Here, they could act as angling attractions and potential fixed-gear commercial fishing areas. Alternatively, closely grouped larger structures in deeper offshore waters - within a given field, say - could be toppled where they stand to form a reef area, which would act as a sanctuary. 'It would offer a contribution to helping fish populations to thrive in an environment where they are under extreme fishing pressure,' says Dr Picken.

Gulf pioneers

The inspiration for redeploying disused rig structures as artificial reefs in the North Sea stems from pioneering activities in the Gulf of Mexico, where the 'rigs-to-reefs' programme has proved extremely successful. Dr Chuck Wilson, of the Department of Oceanography at Louisiana State University, was instrumental in launching and structuring the programme. 'Fishermen had known for a long time that fishing was good around platforms. I put together a committee of interested parties to see how this could be exploited,' he said.

'Rigs-to-reefs' was enshrined in US legislation in 1984 as the National Fishing Enhancement Act. It is administered by the state governments of Texas, Louisiana and Alabama, all of which have dedicated reef sites in the Gulf of Mexico. On decommissioning structures, operators may dispose of the



jacket at a designated site, after stripping all pollutants and hydrocarbons from the steel frame. A fee is paid to the relevant state government, representing half of the savings made by the operators through not having to dispose of the platforms on land. In exchange, the state absolves the operator of any future liabilities related to the structure. The funds are used for long-term monitoring and research on the reef areas.

Twenty to thirty times more fish are found at the artificial reef areas in the Gulf than in nearby open waters and as many as 75 percent of Louisiana sport fishing trips now head to the sites, which have become a clear economic boost to the recreational industry. Advantages of the programme to offshore oil and gas operators are largely economical, based on the amount saved by avoiding onshore disposal. 'Donation' of the structure to create a reef is also viewed as a positive public relations move.

The significance of the programme as a solution to platform decommissioning is admittedly limited. Over the past 10 years, around 100 redundant jackets have been donated to the development of reefs. This represent less than 10 percent of the total removed from the Gulf of Mexico to date. The rest (over 1,100) have been taken onshore for complete dismantling. However, Dr Wilson predicts that 'By the time all of the Gulf platforms are removed, 25-30 percent will have been used as reefs.' This is a substantial contribution to decommissioning.

Contrast with North Sea

Climactic and commercial differences with the Gulf of Mexico offer the main obstacles to the transfer of a successful 'rigs-to-reefs' programme to

the North Sea. In the Gulf, the greatest benefits derived from the reefs have been to the sports fishing industry. Conversely, UK fishing organisations are openly opposed to offshore reefs. Commercial fishermen fear that the presence of the structures will inevitably hinder their activities, curtailing trawling areas, hence reducing fishing grounds. The cold and hostile North Sea waters are also not popular for sport fishing. 'We firmly believe that artificial reef structures in deep water areas are not feasible,' says Mike Sutherland, Offshore Liaison Officer, Scottish Fishermen's Federation. He sees 'rigs-toreefs' as an 'easy way out' to resolve the operators' disposal problems. This viewpoint is shared by environmental

groups. According to Simon Reddy of Greenpeace, 'A rigs-to-reefs programme involving toppling *in situ* is completely unacceptable. The idea is a cover-up by the oil industry to justify dumping.'

Fears also exist that long-term degradation of underwater structures will result in debris breaking off and drifting uncharted across the sea bottom – a significant safety issue for fishermen. These things bring more threats than benefits,' comments Mr Mike Sutherland.

However, the argument is refuted by evidence at the Gulf of Mexico reef sites, where no significant deterioration has been observed over the past 10 years. Dr Wilson comments, 'The structures have an anticipated lifetime of 300 years before degradation.' based on the average corrosion rate of steel in seawater. The presence of anodes on the jackets, and their colonisation by biofouling algae and other organisms, help to slow down the degradation process. Moreover, 'The structure is not going to break up into bits ... There will be a gradual sloughing off of iron on the surface,' says Dr Wilson.

Potential pollution

Another concern of 'rigs-to-reefs' is associated with the potential pollution linked to the structures and to the cuttings piles on which they may be located. The majority of steel jackets however consist of clean, inert material. Stripping of any pollutants would in any case need to be performed prior to disposal at a reef site. The quality and stability of any underlying cuttings pile would need to be assessed for jackets toppled in situ – transport away from the production site would resolve this issue.

Pilot study proposed

To ascertain the viability of artificial reefs in the North Sea, Dr Picken has proposed a pilot study, involving the placing of a 20 metre x 20 metre x 50 metre latticed steel cage, closely resembling a jacket segment, at 40 metre depth at a selected inshore site. The identified location is approximately 9 km offshore of Brora, East Sutherland, in the Moray Firth. It was agreed in collaboration with local fishing groups and nature conservation bodies, ensuring avoidance of conflicts of interest, especially with regards to trawling activities. The proposal is currently under review at the Scottish Office.

The principal goal of the proposed pilot reef, says Dr Picken, is 'to research and understand how a high profile steel reef works in the North Sea.' The structure is also expected to create a site for sports angling, thus bringing economic to the local area. advantages Commercial fishing would be discouraged in order to prevent over exploitation. Monitoring of the structure would be undertaken over a five-year period, to determine the colonisation and transformation of its habitat. Interviews with local anglers and fishing organisations, and management of fishing activities, would determine the effectiveness of the reef in stimulating fishing activities and the related economy.

The concept of such an inshore reef has received better acceptance from both environmental and fisheries organisations. Mr Reddy admits, 'If pilot studies show the inshore reef option to be a good idea, Greenpeace would back it in principle,' whilst Mr Mike Sutherland remarks, 'We are a bit more open minded, although sceptical, about artificial reefs in inshore areas - there may be opportunities.' He adds, however, 'We view the scope for sports fishing as very minimal. There is no sports fishing going on now in the proposed inshore reef area and we do not believe you would ever see it generating into anything significant."

The Whitefish Producers Association in Scotland has collaborated with Dr Picken in the selection of an inshore site for the proposed pilot structure. We are happy to go along with the pilot study in the Moray Firth,' remarks its representative George Sutherland, 'But we expect the structure to benefit sea angling rather than commercial fishing. It will be a location for anglers to visit.'

The scope for enlarging the pilot study into a full-fledged reef programme has not been significantly



elaborated at this time. Dr Picken explains, 'If the pilot reef study is successful, it will hopefully foster the use of the structures, both inshore and offshore.' However, he emphasises, 'I don't want to see uncontrolled disposal of structures at sea, calling them an artificial reef system. It would have to be a relatively small number of carefully selected locations.'

Mr George Sutherland is not optimistic. He says, 'If one reef site proved to be quite successful, I could never see it expanding to more than two or three structures,' largely because of the limited scope for sports and inshore fishing in the Moray Firth. He adds, 'We are encouraging the reef but we have no hopes of its being a saviour of the fishing industry.'

Not the ultimate solution

No-one expects the programme to offer the ultimate solution to the decommissioning quandary currently confronting the oil companies. There may be at the most the potential for three or four controlled, managed inshore reef sites for the smaller North Sea platforms,' says Mr Reddy. 'Rigs to reefs is not the solution for 400 platforms. Many of the structures are so big that they would stick out of the shallow inshore waters.' They would also not be appropriate for the decommissioning of concrete platform bases. 'These are closed structures, with no interesting open spaces for fish to swim in and out of,' comments Dr Picken. Similarly, installations such as the Brent Spar oil buoy, which might contain contaminants, would also not be appropriate as reef components.

For the high-quality, clean-steel structures comprising the majority of platform bases, 'rigs-to-reefs' presents a constructive decommissioning alternative. As Dr Picken reflects, 'Let's not miss an opportunity for re-using this resource just because we don't understand it well enough'.

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Watt Committee on Energy, Burlington House, Piccadilly, London W1V 0LQ. Tel: 0171 434 3988 Fax: 0171 434 3989

15th-16th

Norway: 'Pricing Access in Oil & Gas Transportation, Storage & Processing'. Details: SMi Ltd, 1 New Concordia Wharf, Mill Street, London SE1 28B. Tel: 0171 252 2222 Fax: 0171 252 2222

15th-16th

Manchester: 'Static Measurement of Bulk Liquids'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 SWU. Tel: 01245 328340 Fax: 01245 323429

15th-17th

Bahrain: 'GEO '96 Conference', Details: Arabian Exhibtion Management WLL, PO Box 20200, Manama, Bahrain. Tel: 973 550033 Fax: 973 553288

15th-17th

London: 'Gasfield Production Forecasting'. Details: BHR Group, Cranfield, Bedford. Tel: 01234 750422 Fax: 01234 750074

15th-17th

New Orleans: 'Offshore Lease Abandonment and Platform Disposal'. Details: Louisiana State University Conference Services, 177 Pleasant Hall, Baton Rouge, LA 70803 USA. Tel: 1 504 388 6264 Fax: 1 504 388 4541

15th-18th

Warwick: 'Applied Geoscience Conference'. Details: The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: 0171 439 8975

16th

Aberdeen: '5th Annual OIM Conference – Maximising Performance'. Details: Offshore Management Centre, The Robert Gordon University, Viewfield Road, Aberdeen, AB9 2PW. Tel: 01224 263101 Fax: 01224 263100

16th-17th

Marrakesh: '5th Annual Mediterranean Gas Markets Conference'. Details: Overview Conferences, 82 Rivington Street, London EC2A 3AY. Tel: 0171 613 0087 Fax: 0171 613 0094

16th-18th

Birmingham: 'Process Separation '96'. Details: Exhibition Marketing Manager, Oriel House, 26 The Quadrant, Richmond, Surrey TW9 1DL. Tel: 0181 910 7840 Fax: 0181 910 7989

16th-18th

Birmingham: 'Environmental Technology (ET 96)' Details: IBC UK Conferences Ltd. Tel: 0171 637 4383.

17th-18th

Manchester: 'Flow Metering and Meter Proving'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU. Tel: 01245 328340 Fax: 01245 323429

22nd

London: '1996 Marine Surveying Forum'. Details: International Business Communications Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N BJX. Tel: 0171 637 4383 Fax: 0171 631 3214

22nd-24th

Hertfordshire: '8th European Gas Contracts Negotiating Workshop'. Details: Langham Oil Conferences Ltd, 37 Main Street, Queniborough, Leicester LE7 3DB. Tel: 01509 881022 Fax: 01509 881576

23rd

London: 'Colloquium: Energy and Transport'. Details: The Watt Committee on Energy, Burlington House, Piccadilly, London W1V 0LQ. Tel: 0171 434 3988 Fax: 0171 434 3989

23rd-24th

Edinburgh: 'The EUREKA Brokerage Event: Oil and Gas Technologies'. Details: The Petroleum Science and Technology Institute, Offshore Technology Park, Exploration Drive, Aberdeen AB23 8GX. Tel: 01224 706600 Fax: 01224 706601

23rd-24th

Cambridge: 'Environmental, Health, and Safety Auditing Skills and Techniques'. Details: Arthur D Little Ltd, Science Park, Milton Road, Cambridge CB4 4DW. Tel: 01223 420024 Fax: 01223 420021

23rd-25th

Fort William: 'An Introduction to Offshore Operations'. Details: SUT, Innovation Centre, Exploration Drive, Offshore Technology Park, Bridge of Don, Aberdeen, AB23 8GX. Tel: 01224 823637 Fax: 01224 820236

24th

London: 'Restructuring the Electricity & Gas Markets: The New Scene' Details: Louise Collins, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: 0171 580 04008 Fax: 0171 580 4420

24th-25th

Aberdeen: 'OILMEX '96'. Details: Management Events Ltd, PO Box 351, Hook, Hants RG27 9YY. Tel: 01256 762460 Fax: 01256 761224

25th

London: 'Hydrogen – The Refinery Green Light'. Details: Caroline Little, The Institute of Petroleum

25th-26th

Moscow: 'Distribution of Oil and Gas in the Former Soviet Union'. Details: Business Seminars International Ltd, Sussex House, High Street, Battle, East Sussex, TN33 OAL. Tel: 0171 490 3774 Fax: 01424 773334

26th

London: 'GPA European Chapter Keynote Speech and Luncheon' Details: PO Box 90, Wilton Centre, Middlesborough TS90 8JE. Tel: 01642 437359 Fax: 01642 437374

28th-30th

Rome: '8th ELGI AGM and Grease Training Course'. Details: ELGI, Hemonylaan 26, 1074 BJ Amsterdam, The Netherlands. Tel: 31 20 671 5162 Fax: 31 20 673 2760

29th-30th

Aberdeen: 'AIM '96: Asset Integrity Management'. Details: Debbie Graham, IIR Ltd, 6th Floor, 29 Bressenden Place, London SW1E 5DR. Tel: 0171 915 5055 Fax: 0171 915 5056

Forthcoming Events

29th-30th

Aberdeen: 'Products Tanker Conference'. Details: The Conference Division, LLP Ltd, 1 Singer Street, London EC2A 4LQ. Tel: 0171 250 1500 Fax: 0171 253 9907

29th-30th

London: 'Optimum Offshore Safety'. Details: EuroForum, 45 Beech Street, London EC2Y 8AD. Tel: 0171 878 6888 Fax: 0171 878 6999

29th-3rd

London: 'Economics and Operations of Bunkering and Marine Lubrication'. Details: The IMarE Conferences Department, The Institute of Marine Engineers, 76 Mark Lane, London EC3R 7JN. Tel: 0171 481 8493 Fax: 0171 488 1854

30th

London: 'Wet H₂S Attack on Steels'. Details: Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ Tel: 0171 973 1312 Fax: 0171 222 9881

May

6th-9th

Houston: '1996 Offshore Technology Conference'. Details: OTC, PO Box 838668, Richardson, Texas 75083-3868 USA. Tel: 1 214 952 9494 Fax: 1 214 952 9495

8th

London: 'New pipeline regulations: the future of pipeline safety'. Details: Pipeline Industries Guild, 14/15 Belgrave Square, London, SW1X 8PS. Tel: 0171 235 7938 Fax: 0171 235 0074

9th-10th

London: 'The North Sea Annual Conference'. Details: The Conference Division, LLP Ltd, 1 Singer Street, London, EC2A 4LQ. Tel: 0171 250 1500 Fax: 0171 253 9907

13th-14th

London: 'Israel: From Siege Economy to Economic Powerhouse'. Details: The Conference Unit, The Royal Institute Unit, The Royal Institute Unit, The Royal Institute Institute Institute Institute James's Square, London SW1Y 4LE. Tel: 0171 927 5700 Fax: 0171 321 2045

13th-15th

London: 'International Oil Technology Forum'. Details: International Quality & Productivity Centre Ltd, 3rd Floor, 38-84 George Street, Richmond, Surrey TW9 1HE. Tel: 0500 &21057 0181 332 1112 Fax: 0181 332 1191

14th-15th

Istanbul: 'Oil and Gas Pipelines in the Central Asian Republics'. Details: Business Seminars International Ltd, Sussex House, High Street, Battle, East Sussex TN33 OAL. Tel: 0171 490 3774 Fax: 01424 773334

15th-16th

France: 'The European Gas Grid Systems'. Details: IBC Technical Services, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 637 4383 Fax: 0171 631 3214

15th-16th

London: 'Basic Oil and Gas Accounting'. Details: IBC UK Conferences Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 453 2708 Fax: 0171 631 3214

17th

London: 'United States Oil and Gas Accounting Standards' Details: IBC UK Conferences Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 453 2708 Fax: 0171 631 3214

21st

Aberdeen: 'New pipeline regulations: the future of pipeline safety'. Details: Pipeline Industries Guild, 14/15 Belgrave Square, London, SW1X BPS. Tel: 0171 235 7938 Fax: 0171 235 0074

21st-22nd

Russia: 'Legal and Tax Regimes for Oil & Gas Projects in Russia'. Details: Euroforum, 45 Beech Street, London EC2Y 8AD. Tel: 0171 878 6888 Fax: 0171 878 6999

22nd

London: 'Aerospace technology transfer: Past track record and current potential'. Details: Conference Dept., Royal Aeronautical Society. 4 Hamilton Place, London W1. Tel: 0171 499 3515 Fax: 0171 493 1438

22nd-23rd

London: 'Production Sharing Contracts'. Details: IBC UK Conferences Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 453 2708 Fax: 0171 631 3214

23rd-24th

London: 'Capacity & Margins in European Oil Refining'. Details: SMi Ltd, 1 New Concordia Wharf, Mill Street, London SE1 2BB. Tel: 0171 252 2222 Fax: 0171 252 2272

29th-30th

Poland: '1996 Central/ East European Gas Conference'. Details: EconoMatters Ltd, 82 Rivington Street, London EC2A 3AY. Tel: 0171 613 0087 Fax: 0171 613 0094



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Publications

Motor Gasoline

Editors: E L Marshall and K Owen (The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 4WF) 282 pages. ISBN 0 85404 409 4. Price: £99,50.

In recent years there have been dramatic changes in the public perception of gasoline, mainly as a result of concern about the environment, that have necessitated changes in the composition of the fuel itself and led to the development of reducedemission fuels. This book provides the latest information on the legislation and technology involved for oil companies producing motor fuels and looks at the implications for the industry and the benefits for the environment, It also assesses the possible alternatives to fuels for spark ignition engines, the importance of which will grow as environmental pressure increases and oil reserves are exhausted.

Thermal Methods in Petroleum Analysis

Heinz Kopsch (VCH, Pappelallee 3, D-69469 Weinheim, Germany) 515 pages. ISBN 3 527 28740 X. Price: £110.

Summarising the results of 12 years of thermoanalytical investigations into petroleum and its products, this publication is of interest to those involved in research, product characterisation, process development or quality control in the oil recovery, oil refining, petrochemical, lubricant and asphalt industries. The book not only presents the various methods and underpinning theory employed in obtaining thermoanalytic data but also explains how such data from multicomponent hydrocarbon systems can be characterised by comparison with data obtained from model substances, ie, pure hydrocarbons. The reactions central to various refinery processes, tertiary oil recovery, lubricant stability testing and oil shale retorting are investigated as are relevant pyrolysis and oxidation reactions. The book also brings readers up to date with recent developments in instrumentation and provides a list of suppliers of recommended hardware and software.

The Complete Guide to Oil & Gas Derivatives

Petroleum Intelligence Weekly and Price Waterhouse (PIW Publications, 575 Broadway, 4th Floor, New York, NY 10012, USA or Price Waterhouse, World Petroleum Industry Group, 1201 Louisiana, Suite 2900, Houston, TX 77002, USA) 81 pages. Price: \$535 (paperback); \$425 for PIW subscribers and Price Waterhouse clients.

This publication aims to help companies to develop risk management programmes by outlining the multiple ways in which financial derivatives are revolutionising all aspects of the energy sector, including financing and risk management, and providing an overview of the risks and pitfalls involved with various oil and gas derivatives strategies.

Gas and Oil in Northeast Asia -Policies, Projects and Prospects

Keun-Wook Paik (The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE) 274 pages. ISBN 0 905031 94 6. Price: £14.95 (paperback).

Northeast Asia is an area in which energy developments are of supreme importance. The region's rapid economic growth is leading to ever increasing energy demands, but at present energy supply depends very heavily upon imports. This study explores the region's energy situation and resources, and examines the political, economic and industrial issues that underpin any effort to develop the major oil and gas reserves. It focuses upon frontier projects in the Russian Far East and China, and assesses future possibilities for multilateral energy relations.

Fluid Catalytic Cracking Handbook

Reza Sadeghbeigi (Gulf Publishing Company, European Marketing Office, Trottenstrasse 20, CH-8037 Zurich, Switzerland) 322 pages. ISBN 0 88415 290 1. Price: £72.

This manual provides practical information covering all the key areas of fluid catalytic cracking (FCC) and is of use to process engineers responsible for troubleshooting FCC units, refinery management responsible for training of operating and technical personnel, corporate economic planners and companies servicing FCC facilities. Focusing on the fundamental topics affecting FCC operations today, the publication includes coverage of FCC process technology, FCC feedstock properties, selection of the proper FCC catalyst and the chemistry of cat cracking reactions. Other chapters discuss the monitoring and evaluation of FCC unit performance, factors affecting yields and qualities of FCC products, how to maximise profit margin and enhance unit reliability and design parameters for modifying existing unit equipment as well as techniques for effective troubleshooting. Looking to the future, the handbook also examines the role FCC will play in reformulated fuels and the processing of poor quality feedstocks.

Oil in the New World Order

Editors: Kate Gillespie and Clement M Henry (University Press of Florida, 15 NW 15th Street, Gainesville, FL 32611-2079, USA) 339 pages. ISBN 0 8130 1367 4. Price: £45.

This publication not only looks at the development of the international oil industry and oil markets in the post-Gulf War and post-Cold War era but also addresses a number of subjects of current interest in the political economy of petroleum markets in the Middle and Far East and Former Soviet Union.

Oil Company Profits 1996

Gilbert Jenkins (Sunningdale Publications, 1 Hamilton Drive, Sunningdale, Berkshire SL5 9PP) 56 pages. ISBN 1 872546 75 7. Price: £42.

This publication presents key statistics for 200 UK oil companies grouped according to activities such exploration and production, refining, storage and transportation. For certain companies, these statistics cover up to 10 years of operations. Based on bulk market prices for crude oil and refined oil products, estimates are made of the profitability of UK oil companies' activities by sector in 1995 with forecasts for 1996. Turnover, profits and numbers employed are provided for most companies, with other entries including detailed statistics for distribution costs, salaries and exports. An analysis of British Petroleum's UK operations on a quarterly basis from 1983 is also included. Average prices and margins for sales of motor gasoline, gas oil and residual fuel oil are listed quarterly from 1993.

International Offshore Engineering

Editors: F L L Carneiro, A J Ferrante, R C Batista and N F F Ebecken (John Wiley & Sons Limited, Baffins Lane, Chichester, West Sussex PO19 1UD) 617 pages. ISBN 0 471 96193 0. Price: £95.

Offshore oil production activities in deep water scenarios are the source of new challenging problems and the catalyst for new and creative solutions. This volume brings together a number of papers illustrating recent advances in such offshore and ocean engineering problems, encompassing theoretical, computational, experimental and practical points of view, which were presented at the Ninth International Symposium on Offshore Engineering held at COPPE, Federal University of Rio de Janeiro in Brazil in September 1995. Topics covered include hydrodynamic analysis, floating structures, reliability analysis and damaged structures, fatigue analysis, risers and pipelines, real time process operations, underwater robotics, and reservoir simulation and stability around deepwater wells.

EPEFE and the European Auto-Oil Programme

By Francis H Palmer, Technical Director, CEC

The European Union (EU) Auto-Oil Programme is a joint activity between the EU Commission, the European oil industry (EUROPIA) and the European motor industry (ACEA) that was established in the wake of rising public concerns about motor vehicle exhaust emissions and their effects on health and air quality. Since 1970, when the first exhaust emission legislation for motor vehicles emerged, progressively more severe legislation has been introduced, culminating with legislation in 1996 that will make emission limits more severe than many US regulations that will be in force at the time. Further directives on emissions - aimed at the year 2000 and beyond - are likely to emerge from the EU Commission Directorates later in 1996. Auto/Oil is designed to provide European legislators with a rational scientific basis for the setting of future European vehicle exhaust emission limits for road transport on a cost-effective basis, linked to air quality needs. taking into account motor technology and fuels, as well as other non-technical measures such as inspection and maintenance, and traffic management systems

Guidelines and principles for this unique approach to cost-effectiveness measures were agreed by the European Parliament and Council as laid down in Article 4 of Directive 94/1211EC. Although this Directive applies to the emissions of light duty vehicles for 1996/97, guidelines were included for the construction of future legislation that would apply in the year 2000 and beyond.

Auto/Oil is an extremely large undertaking, bringing together the Commission and the automobile and oil industries for the first time at a European level in a co-operative programme. The EPEFE Research Programme into the inter-industry relationships between vehicle and fuel technologies and their impact on exhaust emissions, which is just one part of the Auto/Oil process, has cost more than \$11 million, not including the cost of developing prototype technology and advanced fuels. (More detailed information may be obtained from the ACEA and EUROPIA Secretariats in Brussels). A draft report was formally released last July at a meeting organised by the Commission



Figure 1

to brief Member States on the status of the Auto-Oil Programme. The EPEFE Programme was designed to enhance data already available within Europe and from the United States where relevant - to help establish the relationships between fuel composition and vehicle technology and to identify and quantify what reductions in road traffic emissions could be achieved by combining advanced fuels with advanced vehicle/engine technologies under development for the year 2000. Results from the EPEFE Programme were embodied into tables and used to quantify complex equations that were associated with fuels and vehicle/engine technologies for inclusion into the Commission's Air Quality Modelling studies. This process facilitated the search for the optimum combination of measures to achieve the European Union's Air Quality objectives. (Figure 1).

Impact of already agreed measures

The mandatory use of catalytic converters from the beginning of 1993 and other agreed measures that have been or will be implemented in the near future, such as the introduction of a 0.05 % m/m sulfur in diesel fuel and the halving of exhaust emission limits this year, will have a profound effect in reducing road transport derived air pollution in the coming years despite the expected growth in road traffc.

Figure 2 shows the expected change in the passenger car fleet whilst Figure 3 show the influence on emissions with time. The effect on such emissions as NOx, CO and HC shows a significant downward trend despite vehicle population growth, but the impact of the already agreed and existing measures vary from country to country depending upon existing vehicle population and consumer buying habits. A slow turnover of purchasing new technology in the market-place in some countries will delay the beneficial impact of the already agreed and





existing measures. Even on an average European basis, the passenger car life span is around 10-15 years and for commercial vehicles, the life span is somewhat longer.

In addition, more recent Commission ozone results has shown that existing and already agreed measures will result in a 20-30 percent reduction in ground ozone by the year 2010. What is more, even with a total ban on city traffic, ground ozone will only be reduced by a further 10 percent. One of the main conclusions from this outcome was that it is important to tackle stationary sources. A flow chart identifying the already agreed measure is outlined in Figure 4.

Air quality needs and results

Urban air quality will improve significantly as a consequence of the already



Figure 3: Estimated reductions in emissions

Figure 4

agreed measures indicated (Figure 4). Even so, the Commission still has a mandate. from the FU Directive 94/12/EC. to establish compliance of reactive and non-reactive pollutants in the urban environment. The question of

whether 'summer smog' was responsible for respiratory and other health-related problems as a result of traffic pollution causing too high ozone levels needed to be addressed.

Air quality target bands were identified, based largely on the World Health Organisation (WHO) guidelines, with upper and lower (tighter) target bands. A seven city air quality study was undertaken to assess current and future air problems associated with reactive and non-reactive pollutants. These seven cities - London, The Hague, Cologne, Lyon, Milan, Madrid and Athens - were chosen to be representative across urban Europe. (Figure 5)

The main conclusions from the emissions/air quality modelling studies confirms that urban air quality in all seven cities:



- Improves significantly as 1.3 consequence of already agreed measures
- CO and benzene meet the lower criteria by the year 2000 / 2005
- NO₂ lower criteria band determines that further emission reduction measures are needed
- Severe NO_x emission reductions are required to achieve NO2 targets in almost all of the seven representative cities

The outcome shows clearly that NO_x is the real problem for 100 percent compliance with the lower air quality band. As an example, NO_x reductions for the year 2010 are:

55 percent for Athens 40 percent for London.

Urban Air Quality Modelling - Summary of the **Required Emission Reductions 2005**

CITY	2005								
	NO _x CO				benzene				
		emission reduction %			emission reduction %			emission reduction %	
	conc µg/m³	upper 186 µg/m ³	lower 66 µg/m³	conc µg/m³	upper 3000 µg/m ³	lower 1500 µg/m³	conc µg/m³	upper 16 µg/m ³	lower 10 µg/m³
Athens	147	0	55	992	0	0	7.0	0	0
Cologne	103	0	35	454	0	0	3.0	0	0
Den Haag	69	0	5	361	0	0	2.0	0	0
London	111	0	40	589	0	0	2.7	0	0
Lyon	115	0	45	653	0	0	4.6	0	0
Madrid	147	0	55	0	0	0	5.6	0	0
Milan	152	0	55	0	0	0	5.2	0	0

Figure 5

However, CO and benzene were not found to be a problem after the year 2000/05 because of the benefits of the existing and agreed measures.

A full list of the required reductions for each pollutant and each of the seven cities, for the years 2005 and 2010, is shown in Figure 5. The Commission recognises that reductions in NO, brings other benefits. For example, every 10 percent reduction in NO, would generate reductions of:

- 12-15 percent in CO
- 9-13 percent in HC
- 12-15 percent in Benzene
- 10 -11 percent in PM.

While the existing and agreed measures, together with those measures required to meet the NOx air quality targets will significantly reduce ozone episodes, they will still not be sufficient to meet the ozone air quality target. Even the extreme measures directed at traffic will have limited effect. This clearly demonstrates that a totally integrated approach aimed at reducing emissions from all sources, including those from stationary sources, is required.

Cost effectiveness

Fuel parameter ranges studied are given in Figure 6, whilst the vehicle/ engine technology assessed is shown in Figure 7.

Preliminary results recently released indicate that about 90 percent of European cities can meet the NO_v targets with a set of non-extreme measures. The remaining 10 percent of European cities, which generally lie in southern Europe, cannot meet the

Figure 6: Fuel parameter ranges

Fuel/Parameter	Study Range		
Gasoline			
Lead	0.013-0.005 g/l		
Oxygenates	0-2.7% O2		
Aromatics	50-20%		
Benzene	3-0.7%		
Olefins	15-5%		
Sulfur	500-30 ppm		
RVP	80-60 kpa		
E 100	35-65%		
E 150	85-90%		
Diesel	The letter arrest light by		
Sulfur	500-50 ppm		
Density	820-855 kg/m ³		
Poly Aromatics	8-1%		
Cetane No	50-58		
T95	370-330 °C		

 NO_{χ} targets even with a much more severe set of measures. Only the use of local, non-technical measures such as fleet replacement, traffic management, enhanced public transport and better vehicle maintenance, offers any hope of attaining the NO_{χ} emission reduction targets in these cities.

City diesel, once postulated as a possible solution, is not considered cost-effective, although it is recog-

	GASOLINE		DIESEL
1	Improved electronic engine control	1	Very high pressure injection
2	Exhaust gas recirculation (EGR)	2	Increased cylinder pressure
3	Improved & low 'light off' washcoats	3	Improved clearance volumes
4	Greater catalyst loading	4	Multi valve engines
5	Dual oxygen sensors	5	Exhaust gas recirculation
6	Sequential fuel injection	6	Controlled intercooling
7	Reduced engine clearance volumes	7	Variable pressure turbo
8	Leak free exhausts	8	Electronic unit injectors
9	Cylinder disablement	9	Particulate traps
10	Electrically heated catalysts	10	De-NO _x catalysts
11	Low temp stable lambda sensors	11	Manufacturer other
12	Auxiliary air injection		
13	Air assisted injectors	1	
14	Double wall exhaust pipes	1	
15	Close coupled & Under body Cats		
16	Carbon canisters - Improved charcoal	1	
17	Low loss systems/minimum joints		
18	Manufacturer other	1	

Figure 7: Vehicle/engine technology assessed

nised that there may be scope for urban buses, municipal trucks and taxi fleets using CNG or LPG as a dedicated fuel.

Non-technical measures are also to be included in the analysis, as are inspection and maintenance programmes, including on-board diagnostics and remote emission detection, However, non-technical measures do not affect emission levels directly but rather indirectly through changing driver/vehicle owner behaviour via economic instruments.

A full set of the cost-effectiveness results, including the contribution from non-technical and inspection and maintenance measures, should be available by the end of October.

Perhaps an easy way to explain the European Air Quality objectives and their relationships with cost-effectiveness is shown in Figure 8.

Conclusion

In summary, the EU Auto-Oil Process can be considered as a five-step process. As this process approaches its final' stages and having identified urban NO_X is a key driver, additional steps are now being considered which include the particulate mass and ozone precursors (VOCs and total NO_X), in addition to urban NO_X. Whilst the inclusion of these will increase the emission reduction severity, they will also increase the costs of the severity of the cost effective measures.

The ultimate aim is to produce cost effective options after considering all possible packages, both technical and non-technical. With most of the practical studies having been completed or very nearly completed, in line with a sound scientific rational approach, Europe stands at a cross-road, with the political debate just starting.

As particulates (PM) remain the big unknown in terms of their derivation, size, life span and their impact on air quality and health, and in terms of their contribution to air pollution, (there are currently no

Figure 8

WHO standards), debates and studies on this topic will grow concomitant with the growing interest in using gaseous fuels, with potentially very low particulates, to replace the use of diesel in dedicated buses, trucks and taxis.

A draft directive is expected to emerge from the Commission soon for consideration by the EU member states and ultimately the European Parliament. Whilst politics are inevitable in legislation and law making, it is comforting to know that one of the bases on

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which future European legislation will be made with respect to air quality improvement has itself been based on a unique rational scientific approach



of which Europe can be justly proud. This paper is based on a talk given by Mr Palmer at a joint meeting of London Branch and Environment Discussion Group held during IP week. The EPEFE Report is now available and can be obtained from the ACEA and EUROPIA Secretariats.

The UK and Continental Gas Industries -Converging or Diverging Models?

Friday 24 May

To be held at the Cavendish Conference Centre, London

This conference will investigate, not the state of the gas industry next year or the year after, but where it will be 10 years from now. While taking account of the immediate changes, the introduction of competition, the significance of the Interconnector and the break-up of British Gas, it will look at alternative paradigms for the future.

- Developments in the United Kingdom are surely not a model for Europe?
- Will Britain adopt some French or German elements?
- Who, apart from the power generators and petrochemical companies, will be the big buyers and distributors?
- Where will domestic consumers buy their gas? From their local 'utility' company or the local supermarket?

This is an essential event for people with a long-term interest in the industry, general management, strategists, consultants and opinion leaders.

A copy of the programme and registration form will be available shortly from Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK. Telephone: 0171 467 7100 Fax: 0171 255 1472

Financing the future in a world competing for limited funds

The European Investment Bank (EIB) has a dual (indeed on occasions even a split!) personality - it is a bank operating on sound and prudent banking principles, and simultaneously a European Union institution. This gives us a different perspective from the commercial banking world, though we share this feature with the other multilateral financial institutions. I believe, however, that we are complementary to the rest of the finance sector and can bring specific advantages to the table. particularly through our exceptionally wide sphere of operations and knowledge of the sectors in which we operate. During this talk I hope to share with you some of our views about necessarily uncertain future trends in the energy sector. and about the place of the EIB and similar public financing institutions. I will be talking about the energy sector as a whole, and not just the oil and gas industry.

By Sir Brian Unwin KCB, President and Chairman of the Board, European Investment Bank

The role and activity of the EIB

Established in 1958 under the Treaty of Rome, the EIB is the legally autonomous, financial non-profit maximising institution of the European Union, based in Luxembourg and owned by the member states. Its main statutory task is to contribute to the balanced, steady and integrated development of the EU which it fulfils by making long-term loans for capital investment projects that help promote EU policy.

As the 'house bank' of the Community, the scope of the banks' business has considerably expanded in line with the policy decisions of successive European Councils. This applies both within the Union - in favour of improved communications, to protect the environment, to strengthen the competitiveness of European industry and to enhance energy security - and outside it in over 120 countries around the world, notably in the neighbouring regions of Central and Eastern Europe and the Mediterranean Basin. This nonmember country lending is in support of the European Union's external co-operation policies. Of most significance within the Union, the bank has in recent years assumed an important role in the construction of the Single Market with, among other things, the Trans-European Networks (TENs) initiative. Several of the priority TENs projects, selected by the December 1994 Essen European Council, are for energy transmission.

To fulfil its main mandates the bank, with its triple-A rating, borrows large volumes of long-term funds on the capital markets which it onlends, at a fine margin, and in a wide range of currencies, for project investments. The selffinancing character of the bank sets it apart from the other main policy instruments of the Community.

The bank carries out a full economic, technical and financial appraisal of its projects, and a financial appraisal of its borrowers. This appraisal in itself can add value to the projects which the bank finances. We offer funds subject to adequate security, which could flow from a government (sovereign guarantee), public authority, commercial banks, corporate sponsor's guarantee or the proport itself (limited recourse finance).

The bank does not just finance large projects – small-scale investment in industry and infrastructure can also benefit from EIB finance through our so-called 'global loans' (in effect, lines of credit to banks and other financial institutions which they pass on, in agreement with us, in smaller loan packages). However, the majority of EIB resources are devoted to infrastructure lending, including communication and energy networks (the links and nodes of networks, such as power stations and transmission lines; oil developments, pipelines and refineries).

For the power sector, examples of such bank financing offered in the recent past include diesel generation in Mali, a number of the gas-fired power stations in the United Kingdom and gas-fired combined heat and power plants in Denmark and Germany, transmission and distribution reinforcement in Greece, the Skagerak power cable between Denmark and Norway, and the Baltic cable between Sweden and Germany, as well as an electricity interconnector between Spain and Portugal. For the hydrocarbons industry, investments include the development of the Ping Hu oil and gas field in China, the Captain oil and gas field in the North Sea, and oil and gas fields in Liverpool Bay, as well as extension of a major gas line in Thailand, and the construction of gas pipelines bringing Algerian supplies through Morocco across the Strait of

Gibraltar into Spain and from Tunisia under the Mediterranean to Italy.

European energy policy

In the field of energy policy, as a European institution, we seek to respond to the priorities set us by our shareholders - the member states. The most recent exposition of this is a White Paper released late last year by the Commission, which builds in turn on the 'Delors' White Paper of December 1994 on jobs and competitiveness. So far as energy is concerned, the objectives are overall competitiveness, security of supply and environmental protection. It is difficult to think of energy measures which do not have some effect on at least two and guite often all three of these objectives. Taking the objectives in turn:

Overall competitiveness The intention is that energy should be available in such a way that it contributes to wider economic policy, such as increase in prosperity and job creation. The route to this is through the integration of the European energy market – the Single Market – and liberalisation of that market. This will create a level playing-field and a favourable climate for investment.

Security of energy supplies This is in the sense of managing external dependency, a key aspect in view of the significance of energy imports in supply to the European Union. It can be targeted by measures for securing supply during oil crises, consistent with member countries' obligations agreed through the International Energy Agency (IEA). Among other things, this requires diversification of energy supplies and closer co-operation with associated countries of the European Union, including aspirant member countries.

Environmental protection It is important that development should be sustainable. Member governments should therefore internalise the external costs and benefits of economic activity – and hence the impact on the environment. This is related to economic policy actions such as CO₂ taxes, promotion of energy efficiency and fostering of renewable energy.

These are newly stated policy objectives at EU level. The bank has for a number of years been following lending guidelines which are consistent with them, and this will continue. Projects will be 'eligible' for our funding if they are consistent with these developing energy policy objectives, though this gives us a broad area in which to play.

World energy background – demand

The policy of the bank, or any similar financing institution, must be set in the context of the likely need for fuels. Projections of demand are unfortunately always wrong – but this at least gives me a certain liberty. Forecasting in this area is a bit like trying to paint the wings of an aircraft in flight – I may cover enough of the job but the result is likely to be rather messy.

One of the best forecast sources is the IEA, so I will use this for illustrative purposes. The IEA puts forward a central proposition that satisfying the world's growing energy demand will become increasingly problematic, unless there are either higher energy prices or higher energy savings than historical consumer behaviour would suggest.

This potential unsustainability is not because of a constrained geological resource base. Global resources of fossil fuels are not a limiting factor to supply for the foreseeable future. Moreover, costs of production of all fossil fuels are now, and will remain, below the current level of crude oil prices in energy equivalent terms.

The precise numbers in the IEA scenarios for the period to 2010 are not critical for my purpose. What is important are three common features. Firstly, there will be some growth in electricity, oil and gas demand in all regions. Secondly, there will be a continuing reduction in the relative share of oil, particularly in favour of gas. Thirdly, there will be a dramatic shift in the centre of gravity of world consumption of energy towards the developing countries and especially those around the Pacific rim.

World energy background prices

These IEA results derive from a scenario exercise – they are not forecasts, but rather internally consistent alternative world views. One of the scenarios suggests prices will rise, the other not.

It is, however, useful to try to say something a little more specific about prices. The disconnection between the costs of production of some energy sources and the price of delivery to consumers makes this an area fraught with uncertainty. The consensus forecast today is that the price of oil at least will be broadly flat over a reasonable horizon.

There are three critical elements – demand, supply and OPEC behaviour. I shall not try to discuss these in detail. Suffice to say that the assumption of flat oil prices – held for example by the World Bank and many oil companies – is not generally the result of a sophisticated balance of these various elements. It is more a reflection of the persistent incorrectness of earlier forecasts which invariably showed rising oil prices.

Gas prices are regional phenomena and are if anything more difficult to project. The considerable increase in gas use taking place in many developed regions, and certainly in the developing world, does not mean that demand is running ahead of supply. Indeed, the fuel is only now assuming a place in the world energy economy consistent with its supply potential. This consideration suggests that gas prices may be steadily uncoupled from oil, and grosso modo will decline, at least outside the United States with its already-deregulated industry.

Power prices are entirely a regional phenomenon. At the risk of heroic simplification, it would be possible to argue that power prices are usually too low in developing countries. The utilities there are often instruments of economic and social development policy. Equally, prices can be too high in the developed world, where the costs of inefficient monopolies are passed through to the consumer.

What conclusions do I draw from this discursion through energy futures? Firstly, demand for fuels will not fall anywhere, and indeed there will be strong growth in the developing countries as a group. Secondly, it is a better assumption that oil prices will remain flat than that they will rise. Thirdly, gas prices are more likely to fall than rise. Finally, electricity prices will have to rise in developing countries but perhaps fall in the West.

One implication of these relatively

low price trends is that the energy industries will not necessarily be able to generate adequate capital internally.

Energy capital requirements

This leads me on to the key issue of the amount of capital required to develop and supply world energy. It is extremely difficult to assess – and estimates tend to reach telephone-number proportions.

Something useful can, however, be said. For the oil and gas industry, a recent estimate suggests that there could be a substantial range in demand for capital during the period 1996-2005. At the lower end, the requirement could be \$800 billion (in an environment of flat demand and oil price weakness). At the top end, the financing need could be \$1,365 billion (rising demand and oil prices). This is therefore, in round figures, \$100 billion a year.

These capital flows will be required for:

- Replacing hydrocarbon reserves;
- Downstream regulatory costs associated with environmental issues;
- Developing grassroots refining capacity in Asia-Pacific and Latin America;
- Reconstruction and development of infrastructure in the Former Soviet Union;
- Development of major gas and power projects, including liquefied natural gas;
- New pipelines and replacing the global stock of obsolescent tankers;
- Privatisation of state-owned energy assets;
- Augmenting depressed industry cash flow.

For the power sector, the World Bank estimated in 1990 that the financing needs of the developing countries during the 1990s will be of the order of 560-100 billion annually. In the LDCs, demand for power is undoubtedly rising fast. In addition, the nature of the product is changing: electricity must now meet higher standards in terms of quality (needed for computing and appliances) and reduced environmental impact in genreation. On the other hand, there is a large potential in many developing countries for improving the efficiency of power generation and use. This is particularly true if state power companies raise their prices to repair their finances. We do not have comparable estimates for the power sector financing requirement in the developed world. However, it is not implausible to suggest that in total the financing need for the power sector worldwide will be of the same order of magnitude as for oil and gas.

In summary, uncertainty rules as ever, but the gross estimate of a capital requirement of about \$200 billion per annum worldwide for the commercial energy industries is a useful broad starting point. It will be in fact an underestimate, by excluding a considerable range of individually small investments, for example in energy saving.

Energy capital availability

Will the capital be available to finance such a requirement? It seems to me that this question should be taken in two parts: does the world generate adequate capital resources for its investment needs across all economic activity, and will enough of this flow to the energy industries?

Not being a professional economist, I do not want to tread too deeply into macroeconomics. However, a basic Keynesian identity suggests that as long as the world continues to save, it will have resources to invest. In recent years, savings ratios in the West have been slowly reducing and might carry on doing so as the population ages. However, there is no indication that saving will reduce in the developing world. Indeed, many developing countries demonstrate prodigious propensities to save.

As far as the ability of the energy sector to attract its share of the savings pool is concerned, I should like to suggest that capital will flow to energy industries, but only on condition that there is:

- Firstly, structural reform of national economies (primarily but not solely an issue for developing countries); and
- Secondly, sectoral reform for the power and, to an extent, oil and gas sectors (something for developed and developing countries alike).
 Structural reform concerns a series of

much-discussed initiatives, on which I need not dwell. These include liberalisation of markets and prices, saving to be carried out by the household sector of the economy rather than by government and development of domestic capital markets. Such markets would be able to trade debt and equity, which would encourage creation of long-term investment securities capable of attracting, for example, pension and insurance funds and directing them to productive capital creation.

Sectoral reform of power and gas industries has to involve clear, predictable and independent regulation. Additionally, services will need to be 'unbundled' to reduce political intervention, non-commercial behaviour and inside-tracking by government enterprises.

Why are these structural and sectoral reforms needed? Why can we not go on as we have done before? In principle, there are five sources of capital for industrial activity. First, from governments. Second, retained enterprise earnings. Third, new equity investment, Fourth, project (limited recourse debt) finance. Finally, corporate debt finance. However, it is commonplace that governments worldwide are finding it increasingly difficult to support economic activities from fiscal resources. This is evident in the European Union as governments strive to reduce budget deficits and public debt both for sound macroeconomic reasons and in order to meet the Maastricht convergence criteria.

Retained earnings are a huge source of investment capital – perhaps 60 percent or so of European capital formation. However, in the Third World and in the energy sector, many enterprises have been decapitalised. If anything, the balance sheets of such corporations need to be repaired rather than acting as a source of funds. Further, as mentioned above, in a low energy price future, internal funds generation will be constrained.

Raising new equity can be difficult, given the undeveloped nature of capital markets in the LDCs and the weakness of corporate balance sheets.

Project finance, for reasons which I will put forward briefly later, is a restricted adjunct to the main sources of capital. It has of course conventionally been more important to the oil and gas industries than to the power sector. Finally, corporate finance is the 'mature' source of capital investment – but enterprises accessing it must be financially sound and usually with a track record.

It is clear, therefore, that several of the sources of funding are subject to constraints - indeed are failing to sustain the industries they serve. This is the core of the need for structural and sectoral reform. These problems are perhaps worse in the developing countries than the West - but it is relevant that the predominant need to invest in energy will occur in the developing world. Note also in passing that the bulk of the financing required for large industries cannot in the long term be imported. Domestic sources must prevail, though this is not to deny a significant quantity and quality (demonstration) role for foreign capital.

At this point, I should like to state again that capital will flow to where it is needed but only on condition that structural and sectoral reforms take place. The trend is that capital, particularly from governments or from retained earnings, cannot be forced into activities. There is a chance that important energy industries – power, gas and refining in developing countries particularly – will be short of capital, at least in the sense of having to pay too much for it.

These ideas of the need for reform could, of course, be further elaborated. Capital will flow when providers of it can gain a reasonable return, critically supported by:

- Security and predictability perhaps characterised as the ease of entry of investment to a sector; and
- Liquidity essentially the ease of exit from the investment. commitment

What I am saying here is that investors will fund an investment if they can predict the return with reasonable certainty (and that the return will not be expropriated). Additionally, investors must have the potential to liquidate their investment. This is a potential which, once available, they will in all likelihood not need to exercise.

Managing the transition

Developing the argument further, we can thus assume that there will be no

shortage of energy projects over the coming years (because of the growing underlying demand for energy); and that there is in totality plenty of capital looking for a home in projects assuming the economic environment is acceptable to investors. The problem is how to bring the two together.

If projects and gross investment capital are in principle not constrained, one limited resource undoubtedly is the political will to carry out the reform programmes - the structural and sectoral changes to which I have already referred. A second limitation may be just as binding – the skilled personnel to arrange the financings, exemplified by the trends in infrastructure funding towards limited recourse or project financing.

Project financing has some dear advantages. For developing countries, it provides urgent foreign capital. It keeps the lights on, and the project will – assuming it is profitable – generate a quick boost to national income. Additionally, it has a demonstration effect for efficiency and starts to open up hitherto protected sectors to competitive forces.

However, there are also disadvantages. The overt and covert costs of project finance structures, including but not limited to the guarantees, are always considerable. Perhaps as important, they constitute a major use of human capital in developing one-of-akind, purpose-built vehicles.

Project financing is usually spoken of in the same breath as deregulation, as though the two are symbiotic in perpetuity. But it is not well appreciated that project finance cannot (and perhaps more important, should not) in the long term bear the full weight of capital provision to liberalised energy industries. Project financing rather plays its biggest role as a transition to fully mature corporate finance structures. With the latter, recourse is in part or mainly to the balance sheet of stable and self-supporting enterprises.

My colleagues in the project finance industry should not worry about this conclusion. Deregulation and privatisation are like a Mexican wave, which will sweep on round the stadium, opening up as it does so new opportunities for innovative financing. It can even make several trips round the stadium! After that, it is up to corporate loan financing to carry the bulk of the burden of financing the energy industries.

The role of the IFIs

Let me now return to the role of the European Investment Bank and other Multilateral Financing Institutions (MFIs). In a sense, the multilateral financing institutions are indifferent to the funding environment in which they have to operate. We can provide finance to public sector enterprises. IFIs tend to be less averse to sovereign risk than commercial funding, and indeed some even have an appetite for it. We can, and often do, also provide corporate finance to a project, which in the case of the EIB would usually be supplemented by a corporate or commercial bank guarantee. Finally, we can participate in limited recourse financing, where partial or full release of completion guarantees is an element of the arrangement.

A number of benefits can stem from this. In the case of the EIB, we have an unparalleled range of experience in the energy industries both in the European Union and outside. This is a resource on which co-financiers, and indeed on occasion even promoters, can draw. We are agents for structural change in the industries where we intervene. We carry out detailed techno-economic appraisals, which can give all parties to the venture confidence in proceeding. These appraisals are the basis for our track record and allow us to become magnets for private capital. As part of the structure, we can also help to mitigate project, safety and environmental risk - to which we are particularly sensitive especially over the long term. And we are a catalyst, to give leadership to the commercial banks.

In summary, I believe the essential point is that the EIB and other IFIs have an important role to play in the transition to a more stable financing structure for the energy industries worldwide. It is in this spirit that I should like to conclude, recommending that the energy and financing industries continue to work closely with us to ensure the availability of energy for a growing world.

'Environmental Guidelines for Petroleum Distribution Installations'

he oil industry has been concerned for many years to protect the environment and to work with legislators to help frame appropriate legislation. However, there have not been, up to now, any generally agreed industry guidelines promoting good environmental practices at distribution installations. The last few years has seen a considerable amount of consolidation in this area with more and more companies setting up exchange and throughput arrangements. Inevitably this has highlighted differing views about environmental practices. This situation, plus increased awareness that an industry approach was needed with legislators, has led the Institute to develop specific environmental guidelines.

Environmental Guidelines for Petroleum Distribution Installations has been written specifically to help the oil industry and its customers to understand the environmental issues involved in the operations, to provide an agreed industry viewpoint, to set out the current best and most cost effective practices to reduce environmental impact and meet legislative requirements, and finally to try and provide an indication of future trends.

Each section of the guidelines has a one page summary and in many areas the current UK/EC legislative back-ground is explained.

Philosophy and management commitment

The basic philosophy followed throughout is very simple – 'prevention is better than cure.' The industry should not rely on high tech ' end-of-pipe' solutions to clean up any effluents from distribution operations. If the pollution is not generated in the first place, it does not need to be cleaned up.

To make this philosophy work it is necessary to ensure all employees understand what is involved and what they must and must not do. One of the first sections of the guidelines deals with setting up a management system to set standards, review current practices, make plans for improvement, carry out training and monitor progress. If company management is not committed to environmental improvement, it will not happen.

Risk assessment is also discussed. Once the problems and goals are understood, it is possible to review each operation at a site to assess the risk it poses to the environment. This gives a way of setting priorities and allocating resources.

Operational considerations

The main part of the guidelines is devoted to various operational considerations set out under headings which reflect key activities that must be carried out in order to protect the environment. All the key activities are consistent with the 'prevention is better than cure' philosophy.

Containment This section covers the requirements of primary containment (tanks, pipelines etc which actually hold the product) and secondary containment (facilities to catch and hold up any product which escapes from the primary containment).

Control The principle here is to collect any product or contaminated water that is produced and channel it to suitable treatment facilities. Two concepts that are introduced are release minimisation (equipment designed to reduce the generation of waste product and water) and segregation (uncontaminated water run-off is segregated from potentially contaminated water).

Treatment of aqueous effluent The various types of separator are discussed along with their likely performance limitations and some design considerations.

Sampling and testing It is important to know if treatment equipment is working correctly. The need for properly trained personnel and the use of accredited testing laboratories is covered together with quality assurance and quality control recommendations.

Waste, oily waste and sludges This covers the need for a waste management programme, the requirement to minimise waste production, the use of licensed waste disposers and the documentation and records required.

Contaminated sites

This section offers a structured approach to dealing with the identification, investigation, evaluation and remediation of potentially contaminated sites, which may be operational now or have been operational in the past.

Development and consultation

The guidelines have been developed by environmental specialists from the IP member companies with consultation and input from regulatory authorities. It is hoped will provide a framework for cooperation between companies and for discussion with legislators. J R Morgan

Environmental Guidelines for Petroleum Distribution Installations is available from:

The Library, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Price £44.00 (25 percent discount for IP members).

IP Library and Information Service News____

WWW Page for the Institute of Petroleum

URL:http//www.cityscape.co.uk/users/eg61/

Access us on the Internet to find out about forthcoming events, library services, new publications, membership etc. months. Let us know if you find the pages useful (or not), and their ease of use. Suggestions for improvements and extra features would be welcome. Contact Catherine Cosgrove.

We will be adding to the pages over the coming

Some recent additions to the Library

The effects of vertical integration on oil company performance. Oxford Institute for Energy Studies. By: Barrera-Rey, F. 1st edition 1995.

Middle East oil and gas. 1st edition OECD/IEA. 1995. (Reference only)

Health and safety in the UK oil and gas industry: The legislation, the organisation and the sources of information. Study for BA(Hons) Librarianship and Information studies 1994. By: Mackie E A. Robert Gordon University. 1994. Section 2 Contingency planning. International Maritime Organisation, 3rd edition. IMO. 1995.

Reformulated gasoline: Lessons from America. Oxford Institute of Energy Studies OIES. By: Seymour A. 1st edition. OIES papers on energy and the environment EV 1995.

Texte 17/94 – Modifying European gasoline composition to meet enhanced environmental standards – and its impact on EU refineries. UMWELTBUNDESAMT UBA, Arthur D Little. 1st edition. UBA-FB 94-028. UBA 1994.

Manual on oil pollution -

THE INSTITUTE

Conference Proceedings

- Minimising the Impact of Decommissioning
- Oil & Gas in the Global Economy: The Outlook to the Millennium

The above conferences were held during IP Week 1996. Bound proceedings from both these conferences, including papers from speakers in industry and government, are now available for sale at a cost of £48.00 each. (25% discount to IP members).

Contact The Library, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK. Tel: 0171 467 7100. Fax: 0171 255 1472. E-mail: InstPet@cityscape.co.uk

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CD-ROMs

During April we will be trialling four CD-ROMs in the Library:

• DOE Energy Science & Technology – 'a vast multidisciplinary database referencing the international research literature that is relevant to energy'.

 Petroleum Abstracts – 'produced by the University of Tulsa it is the complete research tool for petroleum exploration, production and development'.

 Ei Energy & Environment – 'a specialist energy/environment engineering subset of Ei COM-PENDEX*PLUS giving worldwide coverage of energy/environment engineering journals and significant published proceedings of engineering and technical conferences'.

 Derwent Petroleum Power Engineering (DPPE) – 'the pre-eminent CD-ROM database for patent monitoring in the petroleum and power engineering-related industries'.

You are welcome to come and try them out for yourself and give us your opinion as to their usefulness (for the trial period prints will be charged at 50p each for members and £1 each for non-members, but actual use of the CD-ROM will be free.)

Telephone Margaret Whellams on 0171 467 7112 to book an appointment (or just turn up but be prepared to queue!)

Education and Training

IP meeting with science teachers

The Institute exhibited for the first time at the annual meeting of the Association for Science Education (ASE), visited by over 5,000 science teachers and advisers. This vear's three-day meeting held at Reading was University during the New Year holiday. Its seminars, displays, visits, workshops and lectures enable science teachers to learn more about their profession and improve their teaching skills.

The IP display included a range of information and education resources produced by the Institute and some oil companies, together with a video. Our recent leaflet A Young Person's Guide to Oil and Gas was eagerly collected by teachers of children of all ages and Oil, A Naturai Resource, a booklet of case studies and information, originally prepared for geography teachers, was examined and then requested by teachers for students of business and environmental studies as well as science.

Because oil is a study topic in the National Curriculum for Science as well as the syllabi of several examining bodies, there were many requests from teachers for information on the oil industry. Interest in oil is also keen because of the introduction of many new GNVQ courses and the requirement for teachers to demonstrate the relevance of their teaching matter to the world of industry and commerce.

Events such as the ASE meeting are an ideal opportunity for the Institute to meet teachers and help to give them a better understanding of the industry. At the same time we can find out their needs and requirements. We plan to attend other similar gatherings, as well as careers events for young people.



Beaumont NVQ/SVQ review

The independent, year-long review of top NVQs/SVQs, led by former industrialist and businessman Gordon Beaumont, was completed at the end of last year and presented to the Department for Education 8 Employment. The National Council for Vocational Qualifications and the Scottish Vocational Education Council have jointly reported on the Beaumont findings and the Department plans to announce an action plan shortly.

Their report submitted that, where NVQs/SVQs are working well, there is enthusiasm for the product and its underlying principles. However, it is evident that there is much room for improvement in the system.

There are clearly improvements that need to be made to the language used, the procedures in recording assessment and the credibility of assessment. There is substantial support for the concept of competence and its use as the basis of NVQs/SVQs, supported by 82 percent of those responding to the question in the consultation. However, only 56 percent believed that the notion of competence was accurately reflected in the way most current standards were expressed.

One outcome of the consultation was a definition of competence:

The ability to apply knowledge, understanding and skills in performing to the standards required in employment, including solving problems and meeting changing demands.'

NVQs/SVQs are generally thought to be successfully delivering competence. Of the employers responding to the questionnaire, 85 percent expressed confidence that individuals with an NVQ/SVQ are truly occupationally competent.

There was a concern from employers that NVQs/SVQs may not reflect achievement of competence where assessment is primarily conducted outside the workplace. However, there was criticism that the employers' views were based on an unsatisfactorily small number of samples.

The conclusions of the Beaumont report include recognition that there is widespread support for the NVO/SVO concept. Some 80 percent of respondents to the consultation do so, while 85 percent of employers responding to questionthat naires confirm NVOs/SVOs outweigh the costs. They list many benefits: improved performance and motivation; increased flexibility and preparedness for future work demands; improved quality of goods and services; and more costeffective training. Despite this, there are widespread criticisms of implementation.

Whilst two-thirds of the employers say that VQs have increased workforce flexibility, there is a tension between the needs for the present job and wider needs.

There is a problem, however, in the way the standards of competence are written, and the language and format being difficult for all users, and it is recommended that plainer English be used in all documents.

The 'bureaucracy' was also widely criticised, with awarding bodies being perceived as not being customer-focused.

There has been a view in the past that knowledge and understanding was not important in VQs. This is not the intention, and nearly all employers recognise this; however, there was concern that their specification is not sufficiently clear or detailed.

It was found that the quality of assessment needs to be improved and costs reduced. This will partly be achieved by re-formed standards, such as the use of plain English and clearer guidance on assessment and the use of simulation, which should also streamline procedures and paperwork.

It was recommended that fresh guidance and best practice should be issued on assessment, the use of portfolios and simulation.

The review also found that the way funding was applied caused much concern and that good information is scarce. Marketing activities had so far been targeted on raising awareness, whereas now it needed to concentrate on understanding and implementation.

Lastly, although there is a willingness to change, it was recommended that no further structural or process changes should be made until the end of the year 2000.

Education and Training The changing role of the trainer

Towards the end of last year the Fenman training organisation held a series of training forum events to examine trends in the field of training and development and to identify the major changes in the role of the professional trainer.

It was concluded that the role of the trainer in the United Kingdom is changing significantly. With many organisations adopting a self-managed approach to learning, this means that the trainer's role is increasingly becoming one of co-ordination and advice. Individuals are being encouraged to take greater responsibility for their own development. while the role of managers as coaches and personal development advisers is becoming more significant.

Trainers are increasingly seeing themselves as 'internal consultants' to their organisations. Whether they are regarded as such depends very much on the culture of their organisation!

The way it was

During the 1980s training departments advertised menus of courses which were fairly predictable and constant. Individuals were sent on a course and the trainer's job was to stand up in front of a group of people and 'teach'. This was the time of 'chalk and talk' training.

What is happening now?

The days of menu-driven courses seem to be numbered, as more and more organisations take a strategic view. There is a shift away from the obligatory set of courses and a move towards more innovative approaches, resulting in a new mix of learning methods.

Many organisations now have personal development planning programmes in place which are geared towards improving performance at both the personal and organisational level.

More people are recognising that, to remain employable, they must develop themselves. The responsibility for personal development therefore is shifting from organisation to individual.

This has resulted in the arrival of 'Continuous Professional Development' and career planning, where the trainer's role is to provide support and guidance to individuals working towards N/SVQs and other nationally recognised standards.

The move away from heavy dependence on courses towards a mix of other learning methods is generating interest and experiments in mentoring. Mentoring is becoming more widely used as an individually focused development technique and in some cases is being offered to help with career planning and to review progress made with personal development plans.

Line managers, too, are being encour-

aged to develop their role as coach and personal development adviser.

The strategic role of training

In their desire to be more competitive, organisations are now the seeing strategic value of training. They are building training - or, rather, learning into their plans as a means for achieving their business objectives.

The methods

used have to withstand careful evaluation and scrutiny. The learning has to be seen to be not only relevant but costeffective. Organisations want to be able to evaluate the results and they want to have a clear goal in mind before embarking on it.

However, the difficulty of evaluating learning is still a perennial problem, and is one of the key issues facing trainers to-day.

Increased use of selfstudy materials

Organisations are developing more self-study programmes to reach a much larger and more varied group of learners than when trainer-led courses were the main delivery method.

The flexibility offered by self-study is attractive to both trainers and learners, and is ideally suited for integration with other learning methods. Some organisations offer workshops and sandwiched courses between self-study sessions, thus allowing learners to prepare in advance for their course and then

follow up the session with private self-study combined with highly 'targeted' practice.

The trainer as an internal consultant

The role of the trainer has changed from 'trainer' to 'consultant', 'facilitator', or 'friend'. More and more of their work is based on a oneto-one approach.

Since internal trainers are doing less 'training' and more advising and co-ordinating, they are having to become increasingly flexible and innovative in their annroaches

It is impossible for trainers to work one-to-one with every individual and consequently the manager's role as coach is the focus of much attention. The trainer's role is becoming one of support for the coaching manager.

The modern trainer is thus a champion of 'learning how to learn', focused on identifying appropriate learning methods which are suited both to the needs and preferences of the individual and contribute to organisational goals.



Oliver Whitfield was awarded the IP Student Prize for the best assessed course work on the Petroleum Geoscience MSc course at Imperial College last year. He was also awarded the Geology Prize.

Here he is seen at the presentation with IP Fellow Dr Douglas Hobson (right), who introduced the postgraduate reservoir engineering course at the Royal School of Mines when he was on the academic staff 40 years ago.

Technology News_

High speed UV images aid engine design

Detailed investigation of spark ignition allows combustion engine manufacturers to design engines that provide not only greater fuel efficiency but also cleaner, more environmentally friendly levels of exhaust emissions.

Inco Electro-Optics' new 'UV Ultranac' ultra high speed digital imaging system, which is sensitive to the ultraviolet light spectrum, enables analysis of the events at the very earliest stages of spark ignition.

and delates. (Block

The computer controlled, fully programmable camera is capable of taking up to 20



UV Ultranac camera

million frames per second and provides sensitivity to beyond 200 nanometres. Its image tube has a sapphire UV-transparent window and special photocathode which is highly sensitive to the UV spectrum.

Mapping lightning risk

Oil refineries and petrochemical complexes are vulnerable to thunderstorms and lightning strikes which can cause havoc and cost millions of pounds.

In order to help assess the risks on a county-by-county-by-county-by-county-by-county-by-countybasis, the Meteorological Office has developed an online PC computerised system that provides a colour graphical display of forecast lightning risk as well as actual lightning strikes.

The MIST software can be loaded onto any modern PC and is designed for the operational nerve centres and control rooms of major organisations, including oil refineries and petrochemical companies which need this vital information in order to plan when best to carry out high explosion risk activities.

Lightning risk forecasts, based on a large number of atmospheric variables, are produced at the Manchester Weather Centre and sent direct to the Met Office Telecommunications Centre at Bracknell via modem links.

The result is a map of the British Isles with counties colour coded by risk of lightning. These forecasts are for up to nine hours ahead, are updated every six hours and are available 24 hours a day.

Gas detection unit keeps tabs on workers with new remote FM alarm system

The PM200 personal gas monitor range featuring a Transmitter Activated Base Station (TABS) designed by Protector Technologies' Sabre Gas Detection recently won first prize in the Environmental Control and Monitoring Category of the 1996 Safety & Health at Work Exhibition Product innovation awards.

The battery operated TABS monitors FM radio transmissions from a PM200 personal gas monitor worn by workers operating in a potentially hazardous gaseous environment. The system is capable of monitoring the status of up to seven users or groups of users, who can be outside the direct line of sight at distances of 50 to 250 metres.

In the event that a specified danger gas level is exceeded, the system alerts both the operator and safety staff located some distance away. Safety staff are also alerted if a worker hits the panic button on their personal gas monitor. TABS will also warn if the monitor goes out of range and will reconfirm once the unit is back in range.

The system is fully programmable and can be set to specific requirements.

The TABS units can be interlinked in areas of poor radio reception. Alternatively, a remote radio antenna can be linked to the main TABS unit to extend the range covered. TABS can also activate remote alarms if required. According to the manufacturer, all its PM 200 units can be upgraded to include radio transmission to TABS units as and when required.



TABS will alert workers and safety cover personnel when specified danger levels are reached.

Spreading the word on elastomer seal technology

Elastomer seals are widely used in the petroleum industry. In a bid to reduce the risk of seal failure, expensive in both financial and environmental terms, the British Hydromechanics Research (BHR) Group and MERL have developed a range of life prediction, finite element software and standard material test procedures for elastomer seals used in the oil and gas industry.

A new 'Seal Life Users Group' (SLUG) has been formed to encourage wider application of the new software by operators, contractors and equipment manufacturers within this industry sector.

Subscribers to SLUG will receive a copy of the software and a data manual compiled over seven years of material testing, together with on-line consultancy, training in the use of the software tools, trouble shooting and design application help on site.

The new software model can analyse a combination of factors including seal shape and size; initial squeeze and deformed seal shape under pressure; dimensional changes due to swell and temperature changes; time-dependent fluid diffusion in/out; timedependent material property changes as a result of elastomer/fluid interaction and time-dependent sealing-contact stress.

Account can also be taken of compression set in calculating the final sealing contact stress, say BHR.

Safe steel grinding

A recent gas-explosion study by Christian Michelsen Research at Bergen has shown that Clean'n Strip grinding discs developed by 3M do not create sparks when grinding steel – an important safety factor in the oil/gas industry.

The discs consist of a sintered material of polyamide, a binder and grains of silicon carbide which act as the abrasive. The disc is self-regenerating with new grains coming to the surface as the disc is worn down. This results in a uniform finish until the disc is worn out.

Technology News

New concept targets deepwaters of the Gulf of Mexico

British-Borneo Petroleum Inc and Atlantia Corporation have signed an agreement formalising the basis of further development work on the 'SeaStar', a low-cost production concept for the deep waters of the Gulf of Mexico.

The SeaStar Production System is a single column tension leg platform (TLP) designed for producing offshore oil and gas fields of up to 50,000 barrels of oil per day in water depths ranging from 200 to 2,000 metres. Intended for use on deepwater fields with recoverable reserves of up to 100 million barrels of oil, the SeaStar family includes over 40 proprietary hull shapes, any of which can be constructed and installed in under two years, states Atlantia.

'Traditional TLP designs are characterised by multiple large diameter columns (usually four) that pierce the water surface and support a large drilling and production deck, with space on the deck for 10 to 40 wellheads,' says Atlantia's Pat Blandford. 'The SeaStar is characterised by a single large diameter column that supports a smaller deck which can accommodate enough equipment to process oil and gas from up to 10 wells. While SeaStar's wells are often completed subsea, its configurations will allow wells to be completed at the surface.'

The lower production rates of the previously marrates of the previously mareconomic fields for which SeaStar has been developed, the design's smaller deck and single column have allowed the system to be smaller than traditional TLP designs. As a result, SeaStar's installed cost is in the range of \$25-75 million, depending on use, compared with \$200-500 million for larger traditional designs.

Ms Blandford emphasises that SeaStar is not meant to supplant the traditional platform designs used in the development and production of the larger deepwater fields, such as the recently identified Mars and Auger fields in the Gulf of Mexico but rather is intended to fill a niche to produce the smaller reservoirs heretofore considered by industry to be non-commercial using traditional designs.'

Development engineering of the SeaStar concept began in 1991 under a threeyear grant to Atlantia from the US Department of Energy. The successful conclusion of the study and Atlantia's ongoing relationship with British-Borneo led to an agreement to market the system. The two companies have completed the first site-specific design, final model testing of which was carried out at the Offshore Technology Research Centre in Texas.

The first SeaStar platform is designed to produce up to 35,000 barrels of oil per day and to inject water into the reservoir. In order to accommodate the equipment to process this amount of oil, the original configuration (shown below) has been modified by increasing the centre column's diameter and removing the external cylindrical tanks. The external buoyant tanks have been retained in the design.



Artist's impression of SeaStar

The power of sound

The Expro Group has developed a new ultrasonic processor that minimises the amount of oil content on cuttings from drilling operations, thereby simplifying disposal operations.

The processor emits intense ultrasonic waves which, when travelling through liquids, generate small cavities that enlarge and implode to create tremendous heat.

This implosion can result in localised temperature hospost' of up to 5,000'C while the surrounding temperature remains close to ambient. When used with specific chemicals, the implosions caused by the ultrasonic processor reduce the size of oil-based mud cuttings to below 60 microns and clean the cuttings to less than 0-25 percent residual oil.

According to the manufacturer, the system is highly efficient and does not require extra personnel to operate, is environmentally friendly with low power requirements and low levels of noise emission, is virtually maintenance-free and can be retrofitted to existing pipework.

Capable of coping with a wide range of particle types and sizes, the ultrasonic processor uses just 2kW of power to process 1 ton of cuttings per hour and is said to be 95 to 98 percent efficient.

New low-tech bioremediation process for petroleum-contaminated soils

Seymour Johnson Air Force Base near Goldsboro in North Carolina is testing an innovative, low-tech bioremediation technique to clean up petroleum-contaminated soils. SCAT-manufactured 'turner' units are playing a vital role in the project, says Malvan Group Limited, the UK distributor of SCAT systems.

Soil at the base is heavily contaminated with petroleum from a variety of sources such as underground storage tank excavation projects, spills from jet engine fuelling operations and the rare plane crash. In the past, this contaminated soil has been removed and disposed of by incineration at a brickyard. Not only did this cost between \$50 to \$100 per ton, the soil had to be replaced at an additional cost.

The base is now trialling a new bioremediation process for cleaning the soil developed by Patterson Exploration Services. A 50 x 200 feet treatment area on an abandoned taxiway was endosed by concrete curbs to prevent runoff and the area coated with an impermeable sealer to prevent any leaching into the soil. A layer of compost from the base's on-site composting programme, to prevent acidental damage to the sealant, was then covered by a layer of contaminated soil. This, in turn, was covered by another layer of compost and topped off with a layer of turkey manure.

SCAT compost turners, also used in the base's composting programme, made two passes to mix everything evenly and to incorporate oxygen into the mixture, an ingredient necessary for the microbes in the aerobic bioremediation process to act, and the area was covered by a vinyl tarpaulin tied to eyelets in the concrete curbing. The turners are also used to reintroduce oxygen into the system in the event that the treatment area becomes unaerobic.

The base expects to save \$200,000 in the first year of using this bioremediation process. Not only does the process eliminate transport and incineration costs, it creates no additional pollution hazards or incinerationassociated air emissions. No additional capital is required as the process uses existing equipment. Furthermore, once a stockpile of clean soil is available, the base can backfill the remediation site at no extra cost.

Some 200,000 tons of contaminated soil have been cleaned by this process to date.

Technology News

Three-in-one tanker safety system

A floating oil storage and offloading tanker moored off the West African coast has been fitted with an innovative safety system developed by Crowcon Detection Instruments.

It is the first time that Crowcon fire detection, gas detection and emergency shut-down facilities have been embi-

been combined in a single unit, states the manufacturer.

The system was built on behalf of Monaco-based oil storage company B E Storage. The supertanker, which has a dead weight of 273,000 tonnes, is moored to an oil rig off the Congolese coast.

The system comprises 158 Ditech modular control cards housed in a 2.2 metre high cabinet (see photo). While the majority of the Ditech cards receive signals from remote sensors, the system also includes cards to



operate alarms or extinguishers, to shut down the oil pumps in an emergency, and to control functions such as fault detection and manual override.

Over 200 remote sensors are connected to the system. Of these, 74 detect flammable gas. Fire sensors operate in 92 zones, many of which contain more than one sensor. There are also 35 miscellaneous sensors monitoring variables such as oil pressure, oil temperature and pump activity.

Brass fuel shut-off valve for added safety

A new fuel shut-off valve for diesel engines operating in potentially explosive atmospheres has been developed by Amot Controls. The 'Model 8065' valve is of all brass construction, instead of the more commonly used anodised aluminium, in order to eliminate the possibility of soarking.

The valve is of a simple, rugged design, uses minimum working parts and has a tamper-proof, nonadjustable trip setting of 2.2 bar. It has three connections, fuel in and out, plus a pilot connection to the lube oil circuit. Lube oil pressure holds the valve open. In the event of a loss in oil pressure, the valve closes and stops the fuel supply to the engine. The unit can be mounted on the fuel injector pump to give fast response, or in line. Additional safety sensors, including temperature, pressure, flow and level instruments, when used with the shut-off valve can create a custom hydraulic engine shutdown system, states the manufacturer.



Model 8065 fuel shut-off valve

Safe density measurement and logging

The new 'DMA 3000' dip-in portable density meter launched by Paar Scientific uses a remote density probe dropped into the liquid or slurry to be measured in order to avoid the dangers associated with drawing samples out of a tank.

Connected to a hand-held evaluation unit by up to 20 metres of cable, the probe can also identify any layering in the liquid by giving a continuous reading. Up to 200 readings can be stored for further analysis.

The probe employs two vibrating columns containing the liquid and density is calculated by measuring the change in frequency compared with pure water. The unit can also calculate specific gravity and density at reference temperature and concentration. The measuring range is 0 to 2g/cm¹ at temperatures of up to 40°C. A built-in temperature sensor allows for compensation of temperature on the density, eliminating the need for a thermostat.

All wetted parts of the probe are manufactured from stainless steel or Hastelloy to provide resistance to nearly all corrosive fluids.

legislation management software E O Associates' new 'Euro ing manual handling, dis-

Window on UK health and safety

Six-Pack for Windows', together with its 'COSHH Organiser for Windows', offers a flexible and integrated modular system heat minimises the time needed to manage data relating to UK health and safety legislation.

Information stored in the integrated data management system can be easily accessed and analysed, according to the manufacturer.

The software produces user-friendly reports on health and safety legislation including that covering manual handling, display screen equipment, personal protective equipment and works equipment and the workplace.

On-line help is available for those users not familiar with the regulations. For example, the COSHH module auides the user stepby-step through all aspects the Control of of Substances Hazardous to Health Regulations 1994, allowing a full routine assessment to be completed. Pre-loaded examples of substance and assessment data provide further help to the user.

Contacts

Imco Electro-Optics	01268 540166
The Meteorological Office	01344 856655
Protector Technologies	01252 342352
BHR Group	01234 750422
3M	00 47 63 84 73 25
British Borneo	00 1 713 650 8292
Atlantia Corporation	00 1 713 850 8885
Malvan Group	01734 816588
The Expro Group	01224 723601
Crowcon	01235 553057
Amot Controls	01284 762222
Paar Scientific	0181 540 8553
E O Associates	01908 510034

People

Ranger Oil (UK) Ltd (ROUK) has announced the appointment of Mr Malcolm Pattinson as Director, Exploration. Mr Pattinson has replaced Mr Stan Cockett who has become General Manager of Ranger Oil Angola Ltd.

Mr Peter Nicholls has been appointed Executive Chairman of TOTAL Gas Marketing Ltd. Mr Nicholls was formerly Director of Industrial Marketing at TOTAL Oil Great Britain Ltd and is now responsible for downstream gas activities in the United Kingdom. The new Director of Industrial Marketing is Mr David Bleasdale who returned to TOTAL Oil Great Britain after five years with TOTAL Petroleum Services, the oilbroking arm of the TOTAL Group.

Ms Jeanne Golay has been appointed as director of a new licensing directorate by Ofgas. The directorate has been created to deal with licensing aspects of the developing competitive market in gas supply.



Hardy Oil & Gas plc has announced the appointment of Ms Anne Marie **Cannon** as Development Director. Reporting to the Chief Executive, Ms Cannon will be involved in investor relations, acquisitions and disposals and commercial aspects of operated activities. Ms Cannon has eight years industry experience with Shell Expro and Thomson North Sea and five years corporate finance experience with Schroders.

Mr Michael Whelan has resigned as Chairman and Managing Director of Aran Energy plc following its acquisition by Statoil (UK) Ltd Mr Finn Kulås, Managing Director of Statoil (UK) Ltd has been appointed Chairman of the Board of Aran Energy plc. Mr Jacob Sannes, General Manager of Statoil (UK) Ltd E & P will take the position of Managing Director of Aran Energy plc.



Inspectorate plc has appointed *Mr Neil Hopkins* as Director Oil and Petroleum and also American Regional Director. Mr Hopkins will have full profit responsibility for all of the Inspectorate's business in North and South America as well as the oil and petroleum function arcross the world. He will report directly to the Chief Executive, Jeff Luesley.

Mr David Raeside has been promoted to the position of Commercial Director at ASCo. Based in Aberdeen, Mr Raeside previously held the position of Commercial Manager and now will be responsible for all of the company's marketing, sales and contracting activities. ASCo. has also announced the appointments of Mr Vic Baxter as Management Systems Adviser and former Christian Salvesen Business Development Manager Mr Frank McManus as Transport Manager.



Mr Steve Marsh has been appointed as new General Manager of Serto UK following the death of former General Manager, Mr Peter Cox in July last year. Mr Marsh has experience of the petrochemical and nuclear industries as well as expertise in the managing of turnkey construction and engineering projects.

Brindex has announced the appointment of Mr Alan Gaynor as Chairman of the Association. Mr Gaynor has been Chief Executive of British-Borneo Petroleum Syndicate plc since 1989. The list for other officers is: Vice Chairman, Mr Russell Harvey, Managing Director, LASMO North Sea plc; Mr Mark Hope, UK Manager, General Enterprise Oil plc and Honorary Treasurer, Mr Charles Jamieson, Chief Executive, Premier Oil plc.

Dr Peter Kassler has been appointed non-executive director of Clyde Petroleum plc. Dr Kassler has recently retired from Shell International Petroleum Co where he was Group Planning Co-ordinator. His appointment at Clyde Petroleum commenced on 1 March this year.

Former Hardy Oil & Gas finance director **Mr Tony Whyatt** has been appointed to the same position at JKX Oil & Gas. Mr Whyatt also spent 17 years with occidental Petroleum. He replaces **Mr Stephen Cutler** who has resigned to pursue other interests.

Mr J H Choufoer and Mr J D Hooglandt will relinquish their positions as members of the Supervisory Board of the Royal Dutch Petroleum Company on 30 June this year. Mr Choufoer, who has been associated with the Royal Dutch/Shell Group of companies for more than 45 years, has been on the supervisory Board since July 1987. Mr Hooglandt has been on the Board since July 1988. Mr J D Timmer has been proposed to take over.

Mr Patrick Kilgarriff has been appointed as a Director and Senior Consultant at Offshore Technology Management. Mr Kilgarriff has extensive experience in many areas of offshore and marine technology and has also worked in offshore technology in the Former Soviet Union.

Scott Pickford have announced the appointment of **Mr Kevin Condron** to the position of Technical Marketing Geoscientist, Data Management Division, based at the Aberdeen Balgownie office.



Mr Jean Paul Amiard has been promoted to Vice-President, Europe/Africa of Western Atlas Logging Services. Mr Amiard joined Western Atlas in 1969 and has worked in various locations in Europe, Africa and the Middle East. He will continue to be based in London.

Institute News

NEW MEMBERS

Mr G S Armstrong, Bathgate Mr A P Augarde, Powell Duffryn Terminals Limited Dr M Bayliss, Bridgnorth Mr R E E Baxter, Industrial & Marine Eng Services Mr G Bellamy, Birkenhead Mr J R F Bennett, Aberdeen Mr M R Benton, Kleinwort Benson Limited Mr C E Brackley, Haddenham Mr A R Bradley, GAB Robins New Zealand Limited Mr N W Bromell, Abbots Langley Mr J Buchan, Ocean Group plo Mr S Buckingham, Rex Procter & Partners Mr N A Buckingham, Wildwood Mr A K-L Chan, Hong Kong Mr C K Chew, St Albans Mr J Dar, Glasgow Mr I Dixon, Hampton Ms F Dizadji, Roberts & Company Mr C Eastman, Ditchling Mr R L Ebert, Texaco Limited Mr R A Ezard, Bayliss Design Dr A Fenech, Malta Dr P L Frank, Painswick Mr F R Frimpong-Manso, Ghana Capt P B Giles, Vine Gordon & Company Limited Mr M Goldsobel, Pi-Gliloth Pet Terminals & Pipelines Mr B D Goodyear, Input Output Sensor Mr J J Gowen, Water Weights Limited Mr M Green, Esso Petroleum Co Limited Mr J Hartley, EIS Energy Information Services Limited Mr C R Hawker, Rainham Mr A Henri-Michel, Cote D'Ivoire. Mr P F Jordan, Wargrave Mr E D Kasunga, Zambia Mr Y Katsuo, Idemitsu Petroleum Norge a.s. Mr R J Lefevre, Willenhall Mr P R Littley, Stoke-on-Trent Mr P Luyts, Belgium Mr R M MacDonald, Fleet Mr C Maggiori, Cruden Bay Mr J J Marshall, Input Output Sensor Dr A P Matharu, Chevron (UK) Limited Mr M Nohmi, Mitsubishi Oil (UK) plc Mr P Osephius, Gants Hill Mr C M Panes, Cunningham Int (Thailand) Limited Miss J Rees, London Mr M F Ring, Gulf Oil (GB) Limited Ms J K Roberts, Middle East Consultants Mr D Robertson, Angus Mr R H Seymour, Newport Pagnell Mr M J Silvia, Unocal Corporation Mr P Q Smith, Advanced Products Limited Mr O Traore, Burkina Faso Ms P D Watkins, London Ms J L Williams, O I L Limited

STUDENTS

Mr T Zaugg, Petro-Canada Lubricants

Ms A K Amundsen, London Mr F Donagher, Sheffield Mr M S M Milad, Reading Mr E Mineman, London Mr K O Osundairo, Dundee Miss O Popoola, Dundee Miss O Popoola, Dundee Mr O J Wright, London Mr O J Wright, London

New Members

It has come to our notice that the names and addresses of new members have been used by third parties for their own purposes. Regretfully, we have therefore decided that in future only names, together with company names, towns or countries will be published.

NEW FELLOWS

Mr R W Hooks

Mr Hooks is currently an Analytical Manager with Shell Research. He has been a member of a number of IP committees and at present he chairs both the Volatility Panel and the Analytical Sub-Committees. He also represents Shell on the main Test Method Standardization Committee, a position he has held since 1985. He is internationally recognised as an expert in the field of petroleum testing. He is convenor of a number of ISO and CEN working groups and is a regular member of the UK delegation to both European and International Petroleum Committee meetings. He is also involved in the working of ASTM, sitting on a number of committees and chairing one of the analytical working groups. Mr Hooks is the current Chairman of the IP Stanlow Branch and a member of the IP Couroll.

Mr R E Lawrence

Mr Lawrence graduated in 1958 from Trinity College, Cambridge. As a consultant with Scottish Enterprise, his current responsibility is in the field of economic development projects in the oil and gas exploration sector.

Mr E N Longworth

As Executive Director and Managing Director of James R Knowles overseas subsidiary, his current responsibility is within the development and management of an international consultancy group specialising in technical, contractual and legal advice in the engineering and construction industry including oil and gas sector clients.

NEW COLLECTIVES

Synergix Limited, Synergix House, 3 Oaklands Park, Wokingham RG11 2FD

Nominated Representative: Mr Barry Lawrence

Synergix UK Limited is involved in the design and implementation of computer based fuel management systems for airport operations, including modules covering despatch, inventory control, accounting and data transmission.

Spectra-Tek UK Limited, Swinton Grange, Malton, North Yorkshire YO17 00R

Nominated Representative: Mr Steve Coulson

Spectra-Tek's system solutions enhance the accuracy, integrity and security of petroleum and gas measurement, while reducing the total cost of ownership. The company operates internationally in the fields of custody transfer and allocation measurement, loading of road, rail and marine tankers and the control and automation of multi-product pipelines.

Institute News

Montrose Fire & Emergency Training Centre, Forties Road, Montrose, Angus, Scotland DD10 9ET

Nominated Representative: Mr Jim Boner

MFETC provides fire-fighting/safety and emergency management training. This includes management of client training programmes, emergency management and fire-fighting training for personnel at all levels in the petrochemical, manufacturing, processing industries and commerce. The centre is approved by OPITO and the Department of Transport. All instructors are qualified to Scotvec Skills Assessor Levels D32 & D33. Consultancy services include the provision of safety officers on a contract basis, organisation of emergency response evaluation exercises, safety audits, development of company-specific emergency procedures and training programmes, development of competencies, assessment of competence and overseas training.

Masons, 30 Aylesbury Street, London EC1R 0ER

THE INSTITUTI

Nominated Representative: Mr Neil H Bogle

Solicitors with particular expertise in upstream oil and gas and field-related agreements, onshore and offshore process engineering matters, environmental and planning issues, health and safety, project finance and structured finance, information technology, EU advice relating to the above, all forms of engineering, technical and IT litigation, arbitration, expert determination and alternative dispute resolution.

London Branch

Back to Basics – Marketing/Retailing

Wednesday 24 April, at 18.00

By Mr J Milne, General Sales Manager, Repsol Petroleum Ltd

James Milne's presentation will demonstrate the basics of market strategy in the retail petrol and domestic heating oil markets in the United Kingdom. The discussion will feature the evolution of these markets and their future development. Emphasis will be placed on customer requirements, which are seen as a key factor in successful marketing. He will then consider the consequences of fundamental structural change that the system is currently undergoing and the impact of environmental issues on the business.

Note: The meeting will be preceded at 17.30 by the AGM of the London Branch. Tea and biscuits will be served at 17.15. Light refreshments will be available afterwards. Enquiries: Mrs E Walker, Hon Secretary, London Branch. Tel: 01926 404768 or Mr J M Wood at the Institute. Tel: 0171 467 7128 Cardcast Limited, Card Court, Chertsey Road, Byfleet, Surrey KT14 7AE

Nominated Representative: Mr Poulton

Cardcast provides plastic card fraud prevention services. The company maintains the only comprehensive national file of lost and stolen cards and distributes this information to Cardcast controllers at points of sale around the country by means of data broadcast. Cardcast is used by all major international oil companies active in the United Kingdom.

AROUND THE BRANCHES

ABERDEEN 9th April: Current oil exploration & development in Azerbaijan Speaker: Eddie Whitehead BP 14th May: 1995 Technology Award Winner (tbc) Speaker: K Fearnley, Expro, North Sea HUMBER 9th May: Advances in Medical Techniques LONDON 24th April: Marketing/Retailing Speaker: James Milne, General Sales Manager, Repsol Petroleum 21st-22nd May: Special Products (tbc) MIDLANDS 17th April: Heavy fuel oil: an essential element of the industrial fuels portfolio Speaker: Mike Drew, Gulf Oil (GB) Ltd NETHERI ANDS 25 April: TQM Applied to the Oil Industry Contact Branch Secretary for more information 23rd May: Loss control: the future of the inspection companies NORTH FAST 17th April: Vapour conservation for oil terminals Speakers: T Williamson and I Morrow, Whessoe Varec Ltd NORTHERN 22nd April: Hot Pot Supper, followed by Sportsman's Evening, 7 for 7.30 pm at Belfry Hotel, Handforth SOUTH WALES 30th Anril: Value Engineering Speaker: Kimberley Dere-Edwards of BP Chemicals 22nd-23rd May: Weekend visit to Telford





Financial Risk Management in the Oil and Gas Industry

An important series of seminars for treasury specialists or anyone with profit responsibility in the petroleum industry.

29 April: Management information systems in the treasury environment 3 June: Trading and misuse of derivatives

Speakers will be experts from within the industry and Price Waterhouse's specialist groups.

All seminars 17.00-19.00

Details from Jenny Sandrock at the IP. Tel: 0171 467 7104 (direct line) Fax: 0171 255 1472 or from Jain Fidler at Price Waterhouse Tel: 0171 939 3000 Fax: 0171 378 0647

PETROLEUM REVIEW INDEX 1995

Free copies of the 1995 Index for Petroleum Review are now available on request from:

The Library, The Institute of Petroleum 61 New Cavendish Street London W1M 8AR Tel: 0171 467 7100

UK Deliveries into Consumption (tonnes)

Products	†Jan 1995	*Jan 1996	tJan-Dec1994	*Jan-Dec1995	% Change
Naphtha/LDF ATF - Kerosene Petrol of which unleaded of which Super unleaded Premium unleaded Burning Oil Der Fuel Gas/Diesel Oil Fuel Oil Lubricating Oil	275,779 527,547 1,628,103 994,326 921,265 311,709 956,710 692,696 797,113 68,079	266,993 591,403 1,674,661 1,099,979 61,850 1,038,129 374,753 1,105,791 733,836 598,933 71,404	2,866,165 7,284,373 22,837,969 13,161,770 1,349,112 11,812,658 2,654,698 12,914,260 7,489,236 9,275,387 794,542	2,884,587 7,660,114 21,861,536 13,833,611 942,504 12,891,107 2,763,194 13,428,178 7,214,861 7,975,904 894,114	-3 12 3 11 -15 13 20 16 6 -25 5
Other Products	684,930	672,157	8,744,107	8,895,257	-2
Total above	5,942,666	6,089,931	74,860,737	73,577,745	2
Refinery Consumption	571,643	575,691	6,256,348	6,482,335	1
Total all products	6,514,309	6,665,622	81,117,085	80,060,080	2
t Revised with adjustments *preliminary					



The European Auto-Oil Conference: the

interrelationship between fuel standards, engine design and air quality

Friday 12 July

To be held at the Cavendish Conference Centre, London

Following the completion of the European Programme on Emissions, Fuels and Engine Technologies (EPEFE) and the expected publication of the Draft Directives on Fuels and Vehicle Emissions by the Commission of the European Union, a period of hectic consultation and lively debate begins with this conference.

Representatives of the oil and motor industries, together with environmentalists, will respond to proposals from the Commission about the objectives and content of the Directives and the process for implementation before their execution through EU institutions, national governments and the European Parliament.

Despite two postponements of this event, following delays in finalising the legislation, it still provides a timely opportunity to hear the arguments and enter into the dialogue and will be crucial for general management, strategists and planners, as well as those charged with technical implementation of the forthcoming regulations.

A copy of the programme and registration form will be available shortly from Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M BAR UK, Telephone: 0171 467 7100 Fax: 0171 255 1472



Energy issues in Central Europe:

refining, marketing and distribution

Wednesday 3 July

To be held at the Institute of Petroleum

The first of two IP conferences in association with the Department of Trade and Industry on the new developing energy markets of Central Europe, focusing especially on the 'new economic tigers', the Czech Republic, Slovakia, Poland and Hungary.

This event will concentrate on the opening of new investment and development opportunities in refining, marketing, transport and distribution, including analysis of environmental and financing considerations.

This is an important event for people and companies seeking to understand these new markets, especially contractors, equipment suppliers, consultants and service companies for which openings may arise as existing facilities are upgraded by indigenous organisations or with the involvement of major international investors.

A copy of the programme and registration form will be available shortly from Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK. Telephone: 0171 467 7100 Fax: 0171 255 1472



Introduction to Oil Industry Operations

Wednesday 19 June – Friday 21 June

This course is designed as a general introduction to the whole range of oil industry operations from the search for oil and gas to the delivery of products to the customer. It will include an appreciation of the principal functions of the different parts of the petroleum industry and the inter-relationship between them. It is likely to be appropriate for:

- Participants from within the oil companies whose experience is limited to one function of the industry and who require a broader perspective of the industry's activities.
- Participants from financial and commercial institutions, other energy industries, analysts, suppliers, service companies and contractors; and government organisations who need an informed 'birds eye view' of the oil industry.

Topics to be covered during three days will include:

hanging Perspectives in the International	Exploration for Oil and Gas			
Dil Industry	Petroleum Production			
latural Gas	Introduction to Marketing/Distribution/Retail			
asic Concepts of Drilling	Markets			
low Technology Serves the Business	Supply			
Marine Transportation	Refining			

This is a self-contained course but is followed by:

Introduction to Petroleum Economics

Monday 24 June – Wednesday 26 June

This course is designed as a general introduction to the economics of the oil industry and may be particularly valuable to companies who do not hold their own in-house induction courses covering this subject. It is likely to be appropriate for:

- Participants from within the oil industry whose experience is limited to one function of the industry and who require a broader perspective of the economic factors affecting the industry.
- Participants from financial institutions, government, other energy industries and the supply and service industries which want to obtain an informed and concise introduction to the economic and commercial background to the industry.

the Oil of Major Oil Oil Companies

Topics to be covered during the three days will include:

Geopolitics of Oil The Oil Markets		Structure of	
OPEC/Middle East	Crude Oil Markets	Industry	
Asia and Pacific Region	Product Markets	Development Companies	
Eastern Europe and the	Oil Price Reporting	The National	
Former Soviet Union	Oil Futures Market		
North America	Oil Supply and Price – the		
North Sea Basin	Outlook		

For copies of the registration forms for both courses (to be available in April) please contact The Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London WIM BAR. Tel: 0171 467 7100 Fax: 0171 255 1472