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NEWS IN BRIEF

23 August

Nigerian Oil Minister Dan Etete has announced a major governmental review of the NNPC, which could involve changes at senior management level and a reduction in company divisions from eight to five.

Mitsubishi, Esso China and China National Petroleum have agreed to carry out a feasibility study on a natural gas pipeline linking Turkmenistan with China. The 8,000km gas line would be the world's longest.

24 August

Enterprise Oil finally ended its painful association with Lasmo by selling its 9.8 percent share in Lasmo on the London markets for £166.4m. The funds will be used for 'general corporate purposes'.

25 August

Aran Energy has rejected Arco's offer document, which followed its hostile £161m bid for the Irish explorer. Aran said the document contained 'no new information' and said the offer was still 'unacceptable'.

Elf Oil UK announced that its latest advertising campaign, which links forecourt petrol with the company's Fomula One success, has resulted in record sales. Figures for May and June were considerably up on last year, despite an overall decline of more than one percent in the UK market.

26 August

King Hussein of Jordan plans to stop importing oil from Iraq, according to *The Guardian*. The king has already accused Saddam Hussein of planning a second 'catastrophic' invasion of Kuwait.

28 August

Osprey, the world's first commercial wave-energy generator, sank off Caithness in northern Scotland less than a month after being launched when holes developed in its ballast tanks. Its developers, Applied Research and Technology, said they would begin building a replacement immediately.

29 August

Kleinwort Benson, Lazard Capital Markets and Merrill Lynch have been appointed joint global co-ordinators for the privatisation of Hungarian state oil and gas company, MOL.

31 August

Companies wanting licences in the UK's seventh onshore round have until 28 November to apply, according to the DTI.

Lloyd's Register has introduced a new software product certification service, designed to provide users with an assurance that a product conforms to high standards of quality, usability and integrity.

British Gas has awarded Bond Helicopters two five-year contracts worth approximately £12m. The deal covers helicopter support for the company's production facilities and drilling activities in Morecambe Bay and for its Rough and Amethyst fields in the southern sector of the UKCS.

Babcock International is to sell 75 percent of its energy division to Mitsui for £56m. The division makes boilers for power stations.

The port of Rotterdam is to carry out a study to assess the feasibility of plans to construct a 6bn cu m a year LNG carrier reception and storage facility in the Botlek region of the port. Kemira, ENECO and Fathom Fuels are behind the plans.

1 September

ENI announced the sale of 300 service stations to Kuwait Petroleum for around $500m. The two firms have also entered into a 50/50 joint venture to improve the performance of ENI's Milazzo refinery in Sicily.

Amoco's North Sea Lomond platform was shut down and 18 non-essential personnel evacuated after a minor gas leak in a wellhead valve.

GATX Terminals has opened an office in Rotterdam.

Taiwan and China's state oil companies, the CPC and CNOOC, have agreed to cooperate in research, development and technology across a broad range of oil, gas and petrochemical projects.

Shell sent warning notes out to employees instructing them not to make donations in the company name after a group of offshore workers from Brent Charlie gave money to Greenpeace.

Gas demand outside the former Soviet Union rose by nearly three percent last year, according to BP's latest *Review of World Gas*. However, a 7.6 percent decline in demand inside the FSU meant that world demand as a whole fell slightly.

2 September

British ship-repair and conversion specialist, A&P Group, has launched a new division which will specialise in refit, life extension and conversion activities in the offshore industry. A&P Offshore will be based in Tyneside and headed by managing director Steven Scott.

3 September

After over a year of deliberation, Chevron and Conoco have opted to process Britannia gas at Mobil's Sage terminal at St Fergus.

4 September

Aker Oil and Gas Technology and J Ray McDermott have formed a joint venture to market a new floating platform. The SPAR is a steel cylinder which floats vertically on the water.

Esso has slashed prices by up to 5p a litre in central Scotland and the northeast of England in an attempt to counter the threat of the hypermarkets. The cuts could be extended nationwide later in the autumn.

5 September

Arthur Andersen has valued Aran Energy's 17.5 percent stake in the Schiehallion oilfield, west of Shetlands, at just £229m – half original estimates. The news came at a crucially bad time for Aran, which is fighting off a takeover bid from Arco.

The Philippines finance ministry has recommended that state-owned Philippine National Oil Company set up a petrochemicals industry. Acting finance minister Romeo Bernado suggested the launch be funded with proceeds from last year's privatisation of refining and distribution company, Petron.

British Gas came under fresh attack when it announced an average 10 percent rise in central heating servicing prices. The new rates will affect 3m customers.

Total has pulled out from plans to build Vietnam's first oil refinery on the grounds that the proposed site at Dung Quat is too remote and lacks almost any infrastructure. Total had a 30 percent stake in the four-member consortium and was the only western company.

6 September

Oil companies will invest a massive £45bn in the North Sea over the next five years, according to Scottish Enterprise's latest oil and gas forecast.

Aberdeen University has announced the establishment of an oil and gas institute which will aim to enhance the city's position in the international offshore arena. The Institute's director, Dr George Grieg, has been seconded from BP, which has also provided initial funding of £100,000.

The Nevis field, situated in the North Sea, is to be developed 21 years after its discovery. Mobil will use state-of-the-art diverless deep water technology to bring the field onstream by October 1996.

AMEC and Agip have finally settled their long-running dispute over the £550m North Sea Tiffany platform. Agip has agreed to a final £50m payment for the work but cost overruns still mean that AMEC has made no profit on the contract.

The Colombian environment ministry has granted Ocensa a licence to build a 500,000b/d, 444-mile pipeline linking the country's Cusiana oilfield with its Caribbean coast.

7 September

South Australia has released three prospective areas for petroleum exploration in the far north of the state. The regions cover part of the Eringa Trough and Pedirka Basin.

A UK Labour government would strengthen the powers of the Oil & Gas Projects &

NEWS IN BRIEF

Supplies Office (OSO) in order to stop major North Sea contracts going abroad. Shadow energy spokesman Martin O'Neill, who made the pledge, said extra funding for OSO would also be considered.

Nigeria has signed a pact to supply Benin, Togo and Ghana with natural gas via a new $260m pipeline. Under the agreement, the line would be completed by 1998.

Interim net profits at Enterprise increased more than five-fold to £46.5m.

Canada is to reduce its 70 percent stake in Petro-Canada to just 20 percent in a sale which is expected to raise around US$1.3bn.

BP Norway manager John Hollis has urged the Norwegian government to allow foreign oil companies a greater share of the country's offshore acreage than the 25 percent stake they currently have.

Stenmar has launched Scotland's first independent ROV training course.

8 September
Conoco Norway has condition-ally agreed to pay NKr300m in compensation to Aker for cost over-runs on the Heidrun platform.

The ARCO Qatar consortium is to drill an oil appraisal well in the Gulf's North field. Gas reserves in the area far outstrip potential oil reserves, but the consortium is confident oil production will produce good returns too.

Venezuelan petrol is to increase from 8p a gallon to around 20p for premium octanes, according to President Caldera. Low grade octanes will rise by much less to avoid sharp increases in the cost of public transport.

Aran raised the stakes in its battle to fight off Arco's £161m hostile bid when it revealed for the first time that it holds reserves of 22.2m barrels in the Schiehallion field. The disclosure means the company's oil reserves are 34 percent larger than previously estimated. The firm also announced a profit increase of almost 400 percent.

9 September
Conoco shut down its Viking B North Sea installation for more than a day after a container of aviation fuel plunged overboard whilst being unloaded in bad weather. The 74 people on board were evacuated during the search but the missing container was never found.

10 September
Neste has confimed that up to 20 percent of its stock will be privatised this autumn.

A joint application for acreage in the southern part of the Barents Sea will be made in Norway's 16th oil and gas licensing round, according to Statoil's exploration vice-president Tor Fjaeran. Amoco, Elf, Norsk Hydro, Mobil and Saga will be involved in the project, alongside Statoil.

Shell's plan to dump Brent Spar at sea was a good one but it was wrong to choose such a shallow site, according to Dr Martin Angel of the Institute of Oceangraphic Sciences. He said the selected site, which was in 6,500 feet of water, should have been no less than 15,000 feet deep.

The Director General of Ofgas, Clare Spottiswoode, has accused British Gas of scaremongering over pipeline safety once competition is introduced into the domestic market.

11 September
Anderson Exploration has beaten Amoco in its bid for Home Oil, with a share exchange offer worth US$893m including assumption of Home's debt.

Schlumberger is to sponsor a new Chair of Energy Management at Aberdeen University, who will help develop management training programmes for the industry. The chair holder will work with the university's newly-established Oil and Gas Institute.

The Expro Group has relocated its Asia Pacific regional headquarters from Singapore to Perth, Western Australia. The move will both help the company increase its market share in Australia and reduce costs.

Russian oil producer, Varye-ganneftegaz, has announced major financial difficulties on a project which received a massive $170m from the World Bank. High import duties and export taxes have been blamed for the near-collapse of the project, which involves both the drilling of new wells and the repair of existing ones.

Exxon has petitioned the US District Court in Anchorage for a new trial which would reconsider the $5.3bn awarded to Alaskan fishermen and others after the *Exxon Valdez* disaster. The company claims the jury had discussed the case outside the courtroom and may even have been coerced into making the award.

12 September
Plans are afoot to link Egypt's Sumed pipeline, which runs between the Red and Mediterranean Seas, with Saudi Arabia's pipeline system. According to the Cairo newspaper, *al-Hayat*, the extension would be routed across the Strait of Tiran at the head of the Red Sea.

Amoco has opened its first Russian petrol station, in a joint venture with the Ryazan oil refinery.

Clyde Petroleum plans to spend £25m per annum on acquisitions and exploration over the next three to five years in order to lift production by five percent each year. The announcement came as the company reported strong first half net profits of £13m.

13 September
Exxon is to acquire a 50 percent stake in Oryx's Mertvyi Kultuk exploration block in Kazakhstan. The 12,200 sq km block sits to the south of the giant Tengiz field in the Caspian Sea.

Iraq has signed an agreement with Jordan to build a 140,000 b/d oil refinery at the Red Sea port of Aqaba, according to *Lloyd's List*. The pact is unlikely to put into action, however, until UN sanctions against Iraq are lifted.

13 September
UK Treasury Minister Michael Jack is to introduce legislation aimed at closing a tax loophole which allows oil companies to claim a double allowance for exploration and appraisal work.The legislation will be included in the next Finance Bill.

Ranger Oil has bid C$1.30 per share for Czar Resources in a deal worth C$89.6m.

14 September
UK motorway service compa-nies, Granada and Forte, have called upon petrol retailers to drop their prices at their sites. They claim that the gap between supermarket prices and motorway prices is as much as 10p a litre.

15 September
Lasmo's North Sea Birch oilfield came onstream two weeks ahead of schedule and at least £20m below budget.

The Single Oilworkers Federation has firmly rejected a 29.8 percent pay rise offer from Petrobras. The union is still demanding a 48 percent rise to take proper account of inflation, together with the reinstatement of 85 workers dismissed during previous strikes.

Britain and Argentina have drawn up a draft agreement governing oil exploration around the Falkland Islands which will allow Argentina to gain 'some benefit' from exploitation near the islands. A UK-Argentine Commission will oversee the oil licensing round in the less contentious areas to the south-west of the islands.

The IMO has drafted proposals for a five percent limit on sulphur emissions from ships.

18 September
Fortune Oil announced the opening of its first Chinese petrol station. Situated in the Guangdong Province, the site will be the first of a network of stations, the majority of which will be located in the Pearl River Delta.

Pakistan's Cabinet has refused to grant permission for a gas pipeline to be laid through its territorial waters. The planned pipeline would link Iran with India.

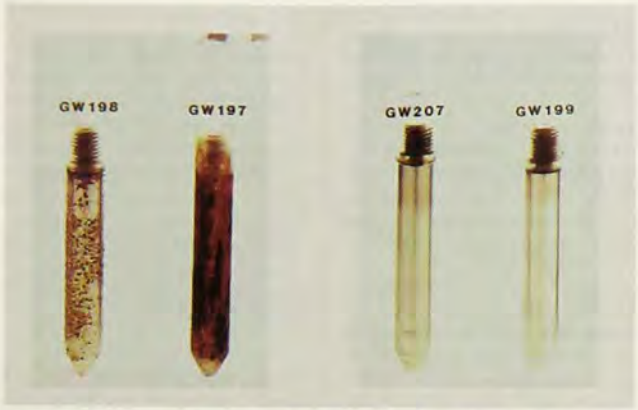
AA and RAC accuse retailers of dropping detergents

Britain's motoring organisations have accused certain petrol retailers of removing detergents from their fuel without informing their customers first.

'After the hoo-ha about detergents in late-1993, UK consumers now assume that all petrol contains additive packages,' said an RAC spokesperson. 'Yet this isn't always the case.'

The Frost Group is one of the companies at the centre of the controversy, accused of removing detergents from 182 Burmah sites taken over by the company last June. Mr Frost argues that he has never claimed to put additives into fuels sold at Save sites and that same policy now applies to those extra sites acquired under the Burmah deal.

Sainsbury's City Diesel does not contain additives either but the hypermarket claims it doesn't need them. 'This product is refined several times,' said a spokesperson. 'It is therefore cleaner than other fuels which do contain detergents.'



Shell still supports detergents, but not all in the industry agree

Gulf Oil, meanwhile, has dropped detergents from its 4 star on the grounds that cars running on this fuel are too old to reap any real benefit. 'The inevitable wear and tear on the engine,' said a spokesperson, 'has a greater effect on emissions and engine performance than any deposit build-up on valves due to a lack of additives'.

The industry has always been divided on detergents. Mobil denies industry rumours that it plans to take detergents out of its 4 star but remains sceptical about their true value. 'All our fuels are addivated because that's the fashion and that's what our customers want,' said a spokesperson. 'But if anything a bit of gunge actually helps older engines stay together.'

Yet the motoring organisations and many oil companies remain adamant that even leaded engine cars can benefit from detergents. 'The notion that all old cars are badly-maintained heaps is a misnomer,' said the RAC spokesperson. 'Some old cars are remarkably well looked after.' Texaco and Shell claim their additives not only keep engines clean but clean up dirty engines.

The motoring organisations believe the solution to the problem is to create a standard for petrol additives. 'All detergents should meet a specified and legislated minimum requirement and fuel companies should be obliged to tell customers if their petrol no longer includes them,' said the AA's Chief Engineer, Dave Lang.

The RAC would take the matter further. 'The information provided on the pumps is simply not intelligible to the average punter,' said a spokesperson. 'We believe they should be labelled so that consumers know exactly what they're buying.'

(See page 448.)

Sainsbury's to develop petrol sites away from supermarkets

Sainsbury's customers who pull up for a combined fill-up and shop could be in for a surprise in future. The hypermarket is planning to open 60 new petrol outlets, none of which will share their site with a Sainsbury's supermarket.

This radical move has been forced upon the company by a lack of space around existing supermarkets and means that some petrol stations will be up to a quarter of a mile away from any Sainsbury's store.

One-stop shopping will not be available at Sainsbury's newest sites

However, a company spokesperson stressed that none of the new sites will be the sort of 'stand-alone' petrol stations that rival supermarket Tesco is experimenting with at the moment.

'All the new sites will be run by the nearest Sainsbury's store manager and some will be so close they will actually be visible from the petrol station,' he told *Petroleum Review*.

The new sites will bring Sainsbury's total number of outlets to around 230. However, the company said it was too early to put a timescale on construction. 'We are still at the very earliest stages of planning,' said a spokesperson.

Elf would 'consider' UK sale

Elf has admitted it would 'consider very carefully' any offers for the purchase of its refining and marketing operations in Britain.

In a somewhat contradictory statement, the company repeated its commitment to finding a UK partner. However, it also acknowledged that, 'If, in the process, an interesting opportunity for the sale of our operations were to present itself, we would consider it carefully'.

The statement then went on to say, 'There is no indication of any such (sale) opportunity today and the process of exploring partnership has just begun'.

Elf issued its comments after press reports that a memorandum of sale had been sent to the banks. Elf would neither confirm nor deny this fact.

New UK register will list offshore suppliers

A new register of UK suppliers and contractors is to be launched on 2 October.

Part of the CRINE initiative, suppliers will be encouraged to provide basic information on their services and capabilities for the Offshore Supplier and Contractor Register (OSCAR). The scheme will be run by the non-profit making organisation, Quasco.

According to industry sources, there is some concern amongst suppliers over the ultimate aims of the initiative. However, Quasco has stressed that the scheme will be voluntary for now and will involve no pre-qualification criteria. It will be funded by operator subscriptions and a fee of £150 from registering companies.

'Initially, it's a registration scheme, pure and simple, set up to comply with the EU Procurement Directive,' said Quasco's Head Appraisal Engineer, David Barks. 'However, if we look at the wider picture, there is strong support for a move towards assessing performance and having performance-related feedback from oil companies.'

The CRINE sub-committee dealing with qualification management has already recommended that oil and gas companies move towards some sort of appraisal scheme for suppliers, but the idea has not as yet been given the green light by the rest of the industry.

Quasco admits that a pre-qualification database, including feedback, could be bolted onto the registration database in the future. 'If everybody gives the go-ahead,' said Mr Barks, 'it will happen next year.'

Registering with the scheme is also expected to become mandatory within a year, in order to comply with EU requirements.

The register will save time for both operators and suppliers, according to Quasco. It will advertise notices in the Official Journal of the European Union and call for competition. Interested parties will then complete a questionnaire in disc format, which is subsequently logged on to the central database.

'At present, each operator has its own individual set of questions, which prevents suppliers from drawing up a standard response,' said Mr Barks. 'This register will prevent endless duplication for the supply companies, whilst giving the operators access to a common body of information.'

Pacific energy boom will double imports

The explosive economic growth in the Asia-Pacific region is set to outstrip domestic supply to such an extent that energy imports will more than double over the next 15 years.

Up to 1,200 million tonnes of oil equivalent will be required in net energy imports by 2010 according to Wood Mackenzie – two and a half times present levels.

In a new report, the consultancy warns that energy shortages could restrain the economies of the region.

'Although we expect indigenous energy production to grow by 85 percent over the same time period,' says the report's authors, 'this will not be sufficient to meet the region's fuel needs.

'A dramatically rising oil import requirement, the search for sufficient gas supplies, the need for a major increase in electricity generating capacity and the continuing dominance of coal are all problems which the governments of the region need to address.'

ASB reprieve

The UK oil industry has won a temporary reprieve from plans to change accountancy rules for abandonment *(see September issue)*.

The Accounting Standards Board (ASB) has ruled that the current best practice guidance will stand until rulings have been made on provisioning and environmental costs.

'Lives and equipment at risk in Falklands'

Waves in the inhospitable waters around the Falkland Islands can reach heights of 60 feet Photo by G L Bound

The offshore industry faces its toughest environmental challenge yet in its search for oil around the Falklands.

'With year-round rough seas and waves higher than office blocks, lives and costly equipment will be at risk,' according to the Met. Office in London.

Conditions around the islands are worse than in the North Sea. The sea is permanently rough and 60 foot swells are not uncommon.

Personnel working offshore during the winter will not only have to contend with sea temperatures dipping below 5°C but with gale force winds. These two factors combined will create a severe wind-chill problem for workers. Rigs will also be at risk from icebergs in the Antarctic, which are capable of slipping northwards at any time.

Mr Jack Hopkins, who heads the Met's marine consultancy service, warned oil companies that accurate weather information will be vital in the Falklands.'The difference between when work is possible and "downtime" will be so marginal, companies must make the most of the weather windows that they do have.'

New report delays development of Alaskan wildlife reserve

In a move that could jeopardise the opening-up of the Arctic National Wildlife Refuge (ANWR), the US Interior Department's Fish and Wildlife Service (F&WS) has issued a report which claims that drilling poses a greater threat to Alaska's wilderness than previously realised.

This is not the first time doubts have been cast over developing the ANWR. In July, US Geological Survey research which was leaked to the press resulted in stories claiming that potential oil reserves in the 1.5 million acre coastal plain have been overstated by as much as 50 percent.

The timing of both actions has prompted the pro-development Republicans of the Alaskan congressional delegation to charge the Department of the Interior and the Clinton administration with playing politics in an effort to prevent environmentally-responsible development of their state's hydrocarbon resources.

The new report is a searing critique of a 1987 legislative environmental impact statement, which categorised the risks to the ANWR from oil and gas development as acceptable.

The F&WS report claims that the 1987 statement was 'highly compartmentalised' and 'considered impacts to species in isolation rather than as interconnected components of a complex ecosystem'. It condemns suggested methods for protecting the environment once drilling begins as 'speculative and unproven' and concludes that drilling could well threaten the 'biological richness, undisturbed vastness and fragility' of Alaska's coastal plain.

The Alaskan congressional delegation has blasted the new report. It had hoped that the relevant committees would approve measures allowing the opening up of the area to oil and gas development by the beginning of October.

After 20 years of debate and 14 hearings on the matter in the Senate alone, proponents of development on Capitol Hill are eager to get on with it. They point to the fact that the environmental effects of developing the nearby Prudhoe Bay oilfield have been fairly benign. They also argue that recent technological advances will allow development to proceed with less effect than ever before on animals and birds which live on the coastal plains.

The economic rationale favouring development is compelling. Senator Murkowski, who is leading the Alaskan congressional delegation, said that $14 billion worth of oil could well lie below the frozen coast and producing another Prudhoe Bay-sized field would generate $325 billion in net economic benefits, creating 735,000 jobs and yielding $125 billion to government coffers.

Republican congressional leaders, together with many Democrats, are still hoping for a favourable resolution in the current congressional session. They are concerned, however, that the administration may put up other obstacles to development such as designating the coastal plain a national monument.

Austrian President honours Subroto

Dr Subroto has received the Grand Cross of Merit, one of Austria's most prestigious awards.

The award, which was presented by Austrian President Dr Thomas Klestil, was in recognition of Dr Subroto's services to Austria during his six years as Secretary General of OPEC between 1988 and 1994.

French anger over latest tax increases

French motorists are bracing themselves for further price rises in petrol and diesel. From January 1996, the government will increase a consumer tax levied on petroleum products by 20 centimes/litre.

Since mid-1993, a succession of tax increases has put FFr1.10 on the price of a litre of petrol, which currently retails at FFr5.87/litre for leaded.

France has the unenviable record of having the most heavily-taxed petrol in the European Union, at 83 percent, whilst ex-refinery prices are among the lowest.

Retailing association, Syndicat National des Distributeurs de Carburants warned that 'hundreds of service stations could close as a result, with the loss of thousands of jobs'.

Oil refinery industry body, Union Francaise des Industries Petrolieres, has reiterated its stand against tax increases on auto fuels, saying 'It's the motorist who is going to pay'.

DATES FOR YOUR DIARY

THE INSTITUTE OF PETROLEUM

Exploration and Production Discussion Group
joint meeting with the Norwegian Petroleum Society

'European Gas Supply – Side Developments over the Next 10-15 Years'

Wednesday 11 October 1995,
starting at 17.00

Speaker: Andrew Wright, Management Consultant, MAI Consultants Ltd

Many factors influence the future demand for energy, but using conservative estimates it will expand considerably into the next century. It will be impossible to meet this demand from existing indigenous reserves and an analysis of new gas finding costs suggests that gas prices would have to rise significantly to encourage exploration and production companies to explore for new fields in Europe. By comparing costs with bordering countries such as Russia, Uzbekistan, Turkmenistan, Azerbaijan, North Africa, the Middle East and possible LNG projects, a pattern of likely future gas supply is proposed.

IP contact: S F Schuyleman

THE INSTITUTE OF PETROLEUM

Environment Discussion Group

'Marine Research at the Department of the Environment'

Thursday 19 October 1995,
at 17.30 (tea & biscuits will be served at 17.00)

Speaker: Mike Roberts

The DOE's marine research programme compliments and co-ordinates the larger programmes of other agencies. As such it covers a great diversity of topics. Hitherto this has been centred on the North Sea but its focus is now changing.

Dr Roberts' presentation will give an outline of the origins of the programme, its present status and its future direction. In addition it will explain its relationship to the North Sea Task Force, the 1993 Quality Status Report of the North Sea and the forthcoming assessment of the Celtic Seas.

IP contact: John Phipps

THE INSTITUTE OF PETROLEUM

EEG Discussion Group

'Development of UK Gas Markets'

Wednesday 22 November 1995,
at 17.00 for 17.30-19.00

Speaker: Richard Ward, Director of Product Development & Research, International Petroleum Exchange

IP contact: Jenny Sandrock

THE INSTITUTE OF PETROLEUM

Price Waterhouse seminars on

'Corporate Treasury Management in the Oil and Gas Industry'

POSTPONED

These seminars have been postponed until Spring 1996

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

Sparks fly at the pumps

By Susannah Cardy

The Frost Group stands accused of throwing away the rulebook with its launch of a new unleaded 4-star motor gasoline in Britain.

Mr Frost plans to introduce an additional grade to this service station

All hell has broken out on Britain's forecourts. Last month, the Frost Group introduced a new unleaded 4-star petrol. The news provoked an immediate and furious response. The Petrol Retailers Association (PRA) reported the company to trading standards officers in both Durham and Buckinghamshire. Rover took the unprecedented action of warning customers running leaded engine vehicles not to use the new fuel.

Mr James Frost, who presides over the fifth largest petrol retailing company in Britain, claims his new environmentally-friendly petrol produces the same performance characteristics as conventional leaded 4-star petrol. Rover says otherwise. According to Product Communications Director Dennis Chick, 'There is no difference between this new stuff and pure unleaded fuel'.

Deprived of lead, cars with soft valve seats experience pinking, knocking, decreasing performance and increasing emissions as the two parts of the exhaust valve begin to weld together and little chunks of metal get ripped out of the seat itself. But Mr Frost's latest product, known as Lead Replacement Gasoline (LRG), substitutes lead with an additive believed to fulfil the same lubricating functions.

Both sides claim to have carried out tests that prove they are right. 'The PRA and others have let fly without, to the best of my knowledge, carrying out any tests at all on the product,' said Mr Frost, 'whereas my supplier, OK Petroleum, had the product independently tested over a period of six months back in 1992.'

Yet Rover said it has carried out its own tests, which show that the additive simply does not work. 'It does nothing at all for valve seat recession,' said Mr Chick. 'Indeed, if a customer were to drive at high speeds in a leaded engine car with this fuel, severe valve recession could set in very quickly.' The manufacturer has warned that Maestros and Montegos produced as recently as 1992 could be at risk.

The European experience

Mr Frost argues that the fuel, purchased from VSP Marketing in Britain but originating from OK Petroleum, has been widely used in Sweden for the past five years. 'If problems were going to appear,' he told *Petroleum Review*, 'they would have done so by now'. He also points to the fact that Shell manufactures and supplies 4-star unleaded in Sweden and is currently launching a similar product onto the German market. 'How Shell then has the nerve to knock my product beats me.'

Shell (which firmly denies 'knocking the product') argue that different countries have different fuel requirements. 'We simply support each nation's motor manufacturers in what they say is right for their cars,' said a spokesperson. 'And in Britain they say 4-star unleaded is unsuitable'.

This is partly because cars with soft valve seats are more prevalent in Britain, accounting for almost 30 percent of the nation's fleet. In Sweden, the proportion drops to 15 percent, in Germany 11 percent, whilst in Austria it falls to below nine percent. An extensive motorway network means that Britain's cars are also subject to tougher driving conditions, which helps to speed up valve seat recession. Shell

also points out that many European retailers have no choice but to provide an alternative to lead: in Sweden, for example, leaded petrol has been banned since March of this year.

'The fact remains,' retorts Mr Frost, 'that around one-sixth of Swedish cars have soft valve seats and yet 4-star unleaded is deemed safe for them to use. Shell UK may claim there's no replacement for lead, but when it comes to the rest of Europe Shell appears to have a different message.'

He quotes an article which appeared in a German newsletter last August, in which Shell announced the launch of a new additive. The company claimed the product would 'replace the lubricating function of lead in valves, so drivers of cars requiring leaded fuel will be able to fill up with the new fuel and save money as well'. That 'miracle additive' turned out to be 'OK plus valve seat recession protection', a similar sounding product to Mr Frost's.

'Misleading the public'

Petrol retailers have long argued about the quality of each other's fuel but this latest dispute cuts far deeper. Whatever this new product does or doesn't do, the most serious accusation levelled against Mr Frost is that he is misleading the public.

The 4-star unleaded is already being sold at a number of outlets, via the Frost Group's retailing subsidiary, Save Service Stations. The plan is to introduce it progressively to all Save's 1,250 sites nationwide. PRA scouts recently visited six of these sites in the northeast of England to see for themselves how 4-star unleaded was being marketed. Whilst the pumps in question sported the familiar four stars, BS4040 had been cut from the labels.

'Four stars on a pump imply to the uninitiated that this is a leaded petrol, whether the leaded petrol standard has been removed or not,' said PRA Director Bruce Petter. He believes this confusion could have disastrous repercussions both for the consumer and for the rest of the industry.

'If, as Rover claims, some leaded engine cars shouldn't use this product, motorists could end up facing costly repair bills. Retailers supplied by the Frost Group could then find themselves liable,' he said.

Mr Petter also objects to the fact that this product is taxed as an unleaded petrol but sold for a 4-star price. 'To my mind, that's exploiting the government tax advantage and creating an unlevel playing-field.'

The PRA claims it is not opposed to Mr Frost's new fuel per se. What angers the association is the way in which Mr Frost has gone about things. The PRA believes he has used a loophole to introduce 4-star unleaded into Britain, rather than following correct procedures and applying for a new British Standard. 'All we ask for is clarity,' Mr Petter told *Petroleum Review*. '4-star unleaded seems to have worked in Sweden, so if this product were properly labelled and categorised, the PRA would be quite happy. Then motorists would know what they were filling up with and car manufacturers could warn their customers not to use the grade if they believed it to be unsuitable for a particular type of vehicle.'

As it is, the battlelines are firmly drawn: the PRA believes Mr Frost has thrown away the rulebook; whilst Mr Frost claims he has merely imported a product into Britain which is accepted as the legal norm in other countries. Both sides must now wait for trading standards officials to make their judgement.

THE PRA: 'Four stars on a pump imply to the uninitiated that this is a leaded petrol'

THE FROST GROUP: '4-star unleaded is accepted as the legal norm in other countries'

Shell announces low-lead petrol and low-sulphur diesel

As *Petroleum Review* went to press, Shell UK announced the launch of the first UK low-lead petrol and a low-sulphur diesel. Given the need of many older vehicles for lead lubrication to prevent valve seat recession, Shell is introducing low-lead 4-star to cater for their needs.

Mr David Pirret, General Manager, Shell UK Retail, said that the use of the new petrol would not cause any loss in engine power or fuel efficiency – the octane level has not been compromised.

Shell's new petrol meets the BS 4040 specification, having 0.07 grams per litre (g/l) of lead. This is above the 0.05 g/l, which Shell research showed to be necessary for lubrication, according to Dr Cathryn Hickey, Technical Fuels Manager, Shell UK.

Shell's diesel will have 75 percent less sulphur content than in the past, enabling it to meet the EC limit of .05 percent (by weight) which will become mandatory in a year's time.

At the pumps the new fuels will cost the same as ordinary 4-star and diesel, although they cost more to produce. Over £250 million has been invested at Stanlow and Shell Haven to be able to manufacture the new fuels. The two new fuels have been welcomed by motor manufacturers and the National Society for Clean Air.

A Shell spokesperson confirmed that his company does manufacture no-lead petrol containing additives known as valve seat recession protection(VSRP) for distribution in other countries, principally Austria and Scandinavia, where fewer cars have soft valve seats. Shell is calling for a British Standard for petrol with VSRP.

Offshore Europe '95

By Carol Reader

The four days of the Offshore Europe exhibition and conference in Aberdeen last month were universally judged to be a success – even the heavy rain which started towards the end of the week failed to dampen the enthusiasm of the exhibitors and their customers, though it certainly soaked their feet and, in some cases, their stands. Problems arose too for drivers who traditionally have to endure severe traffic jams on the routes to the exhibition centre; they now had somehow to extricate their vehicles from the wallowing mud of the car parks. Still, those who work in the North Sea are accustomed to appalling weather conditions.... On the other hand, the heavy downpours provided welcome proof that the summer drought conditions had ended.

The Institute of Petroleum launched its latest publication, 'Guideline for Routine and Non-Routine Subsea Operations from Floating Vessels' at Offshore Europe. Shown here are (L to R) K Burton (ex WS Atkins, UWG Ltd), G King (Mobil), T Hamilton (Health and Safety Executive, Offshore Safety Division), I Ward (IP Director General) and G Ferguson (BP).

Over 23,000 visitors came to the exhibition on the Bridge of Don site to view the 1,800 stands, while over 2,000 attended the conference sessions which took place simultaneously in three different halls. Organised by Spearhead Exhibitions and the Society of Petroleum Engineers, this 12th show did not attract as many visitors as some of the previous shows but plenty of business was done and exhibitors' comments mostly mentioned 'optimism' and 'confidence'.

Opening the keynote session of the conference titled 'Securing the Future', John Wils, Programme Chairman and Vice President, NW Europe Operations, BHP Petroleum, emphasised that this year would see the introduction of a greater measure of open debate to the conference sessions than in the past.

Issue of Brent Spar

This indeed proved to be the case as the continuing saga of the Brent Spar loading buoy and its disposal seemed at times to divert people's attention from other papers and was the subject of much comment both in and outside the conference hall.

Dr CE Fay, Chairman and Chief Executive, Shell UK Ltd and Offshore Europe '95 General Chairman, called his paper, A Vital Interest – the Contribution of the Offshore Oil and Gas Industry' but subsequent questioning concentrated almost entirely on the Brent Spar issue and the likely outcome.

He said that the Brent Spar debate had shown that the public needed to have a better understanding of the practices of the oil industry, its standards and values.

Of the offshore oil and gas industry, he said, 'We understand how much it contributes to society – supplying essential energy and providing huge economic benefits. We know how seriously we take our responsibilities towards the community and the environment. But perhaps we have too easily taken for granted that the public understands these things.' He added that his company had a responsibility to inform the public, 'to listen to their views and to win their trust and confidence in the way we conduct our operations.'

He went into detail of how the offshore industry had contributed to employment and to the UK economy over the last 20 years. 'It is clear that this indus-

try has provided immense benefits to this country over the past quarter of a century. At the same time we have worked constantly, and to considerable effect, to improve our safety and environmental standards.'

'The offshore oil and gas industry – in Europe and elsewhere – had always known it had a duty to deal properly with its installations when they were no longer required. International guidelines had been developed which required all structures in shallow water – three-quarters of those on the UK Continental Shelf – to be removed entirely, and several already had been.

'But for the smaller number of much bigger and heavier deep water installations case-by-case consideration of the appropriate balance between environmental, safety and economic factors has been agreed as the international standard.

'This country's process for determining the "best practicable environmental option" is a careful rational and flexible approach which considers all the environmental implications, as well as safety concerns, practical feasibility and costs.'

Concluding his speech, he stressed that the oil industry is likely to be called on to supply more oil and gas over the next half century than it has in the whole of this. 'That is some challenge, some responsibility.'

Greenpeace climbdown

One reason for the interest in Brent Spar at Aberdeen was the timely publication of a letter from Greenpeace to Shell UK, admitting that it had made a mistake relating to the oil still on board – that the quantities remaining on the installation are far less than the 5,000 tonnes Greenpeace had claimed in June.

It was generally assumed that Greenpeace had admitted its mistake because the true figures would be discovered by Det Norske Veritas, which is currently carrying out an independent survey of the contents of Brent Spar and is due to report later this month.

Dr Fay welcomed this development, saying, 'It is a step in the right direction.' He also announced that he was about to have face-to-face discussions on abandonment and Brent Spar specifically with Greenpeace UK Executive Director Lord Peter Melchett (later described as 'constructive').

The subject of Brent Spar also arose in the speech of Mr Tim Eggar, UK Minister of Industry and Energy, who stressed that a sensible, scientific debate on the subject was required.

Regarding Greenpeace's letter, he stated, 'I always said that their wild allegations were not based on fact. This proves it.' On abandonment policy, he declared, 'The government will certainly not rule out any options. Looking at proposals case by case must be the right way to proceed.'

CRINE assessment

Among the conference sessions devoted to drilling, health and safety, frontier exploration, production and well intervention, time was found in the programme to spend a whole afternoon considering CRINE or Cost Reduction Initiative in the New Era. While the second half of the afternoon looked at future developments, the first part was devoted to its deliverables or achievements to date which include:

- functional specifications
- common working practices
- reduced documentation
- cultural change
- contracts
- recommendations for a prequalification/quality management body.

Mike Curtis, Technology Director, Engineering, BP Exploration and Chairman of the CRINE Executive and Steering Committees, said that the aim now was to keep the industry going for another 25 years, to reduce costs and to keep jobs. He said, 'CRINE isn't perfect but something had to be done. Without CRINE, capital would have flowed out of the North Sea.'

Mr Curtis recognised that small- and medium-sized companies (SMEs) had criticised CRINE and were worried that they were being squeezed out. He emphasised that the CRINE Steering Committee were aware of this issue and were doing what they could to remedy the situation – discussions had already taken place with Scottish Enterprise and the Northern Offshore Federation. In addition special road shows were now spreading the CRINE message; one has already visited Teesside and others were planned for Great Yarmouth and elsewhere. Also, in recognition of the concerns of this group, three representatives of small companies had now been invited to sit on the CRINE Steering Committee.

At a later conference session, a paper specifically on whether SMEs can 'survive' CRINE decided that the answer was 'Yes' but only if they and the market adjust to the new circumstances. It pointed out that 'The oil companies, in general, by whatever means, are significantly reducing the number of contracts they have, and by corollary, the number of companies with whom they deal. They are therefore likely to be dealing directly with few, if any, SMEs....'

One possible alternative for the SMEs was to set up co-operative ventures, such as the Scottish Subsea Technology Group, which sells its members' skills to large clients. In some instances several companies join forces to offer packages of services, described as 'mini-alliances.' Another move was to set up the Scottish Oil and Gas Innovation Forum to combat the foreseen threat to technical innovation and the funding of R & D.

Summing up the debate on CRINE, Dr Fay said, 'CRINE has done a good job but it must not rest on its laurels.' Repeating the same message, Mr Wils said, 'The industry needs to look ahead to new initiatives such as the application of CRINE to decommissioning and to common solutions as to environmental compliance. It is also important that we move ahead rapidly into tackling the operating cost issues, since these costs will be soon overtaking capital expenditure.'

As he looked back at the four days of the conference sessions, Mr Wils highlighted the lively discussions which took place during the drilling open forum and capacity crowd of delegates who listened to the debate on partnering – which is here to stay. He concluded by saying, 'I hope that all of the key statements by government ministers and the conclusions reached in this conference will be communicated to the decision makers of this industry, and that this conference has served as the catalyst to securing the future.'

Does the European Commission know best?

By HJ Shields, Managing Director, Shell Italia SpA

The European Commission is setting out arguments in support of an energy policy for the countries of the European Union. However such a policy is far from commanding universal support.

To maintain adequate energy supplies at market prices to Europe, the energy industry operates against a background of limited demand growth, high social costs and rising environmental expenditure.

To secure future supplies, the prospect is for further massive investment to find and develop new and costly supplies in the upstream. In the downstream, environmental requirements, changes in demand patterns and evolution of product characteristics will all have substantial effects on the manufacture, supply and marketing of hydrocarbons.

The total estimated capital requirement in the next 10-15 years is put at between $300 billion and $400 billion for western Europe.

Addressing a conference organised by the Italian Association of Energy Economists and the International Association for Energy Economics, Howard Shields said: 'Europe will have to compete for such investments in the rapidly developing global scene with those growing economies where a worthwhile return on capital can be more easily achieved. The main feature of the investment markets is that they are becoming more competitive on a global scale. Europe's share of world trade is diminishing, and investments in other parts of the world might prove more promising.

'Companies are looking around the world for the best opportunities. The technical challenges of developing new supply projects are immense and lead times are invariably long. For instance, Troll took more than 15 years from discovery to completion.

'It seems unwise to put supply at risk by introducing legislation and policy measures, the effect of which is uncertain. To facilitate investment, EU policy should not impede normal commercial processes and should allow the market to function on strictly commercial principles. The task for government is to create and sustain economic conditions in which their industries can be efficient and internationally competitive. Shell companies do not accept that there is a conflict between short-term signals and long-term investment criteria, and regard investment in, and management of, long-term projects as a core business.'

Many in the oil and gas industry, he said, while accepting the worthiness of EU objectives, argue for a fundamentally different approach. The industry has three main concerns: creating the right investment climate, security of supply and taxation. The authors of the Green Paper (see box) seem to believe they can regulate away some perceived concerns. The industry believes this to be a misconception. History provides many examples of well-meaning intervention which has caused more problems than it has solved. Conversely, the market demonstrates a robust capacity to cope with changing situations.

The market has changed and continues to adapt rapidly, with an ever-increasing number of energy suppliers, increasing geographic diversification, new technical possibilities and an increased level of transparency.

Mr Shields asked, 'Is an energy chapter necessary in the European Treaty to respond to such changes? It is interesting to note that energy policy was left out of the Maastricht Treaty. Oil is a global commodity, and gas increasingly so, with global markets and global players. Given the import dependency of European countries, the European UnionU must be careful not to set rules which ignore the global character of either the industry or energy markets.

Security of supply

'In terms of security of supply, the Green Paper seems to be guided by a fear of dependency. The authors apparently believe that, through government

The Commission's Green Paper

According to the Commission's Green Paper, the need for an energy policy stems from a number of factors and changes in society, amongst which are:

- **the important role of energy in economic life and the well-being of citizens;**
- **changes in the geo-political environment;**
- **the establishment of the Internal Market;**
- **growing concern over carbon dioxide emissions.**

The Commission feels that an energy policy is the right instrument to respond to the above changes and has clearly identified its objectives:

- **to help improve global competitiveness;**
- **to ensure security of supply;**
- **to integrate environmental policy with a view to ensuring the highest degree of protection.**

These objectives have been spelt out in the Green Paper, which aims to provide a basis for further discussion and policy-making. The Green Paper, together with a White Paper due later this year will form the basis of the debate on whether an energy chapter should be inserted into the EU Treaty when it is discussed at the Intergovernmental Conference next year.

The Green Paper seeks to justify more intervention by the European Union in matters such as security of supply, energy balance and taxation.

No shortfall in energy

Shell scenarios assume an increase in European energy consumption of about one percent per annum over the next decade. Gas demand in the European Union could increase by 50 percent by 2005, with power generation absorbing the largest part of the increase.

Although world energy demand will increase substantially, especially outside the European Union, the world will not run out of energy and there will be enough to fuel every conceivable level of European economic development.

Recent technological and management developments have had a huge impact on reducing costs and increasing efficiencies in oil recovery. Meanwhile, proven worldwide gas reserves have been doubling every decade and will shortly overtake known oil reserves if current trends continue.

It is unlikely that huge fields will be discovered but many smaller fields will be found and existing reserves will be revised upwards. New gas supplies to Europe will come from Norway, Algeria, the CIS and the Middle East and will require major projects to exploit them.

It is likely that higher prices in the longer term will bring within reach more non-OPEC fossil fuel and will enhance economic justification for alternative energy, although probably it would be unreasonable to expect an early significant contribution from this area. Energy saving could also benefit further from technological advances.

Europe is very well placed to meet future energy demand. As far as dependency is concerned, oil is a world market and has its own mechanisms to ensure security of supply.

The European Commission seems to be more concerned at the moment about gas supply but expected growth rates in gas demand are lower than those which have been met by the gas industry over the past few decades. Europe also has about 75 percent of world gas reserves located within 5,000 kilometres of its borders.

measures, they can reduce this dependency without negative consequences and can somehow promote an "improved" fuel mix and direct energy investments into sectors they prefer, which are not necessarily economic.

'Indeed, the writers appear to advocate the use of state aid, which the European Union largely rejects. Pursuing a 'balanced fuel mix' through interventionist policies is the precursor to central planning, which has failed repeatedly across the world.

'Is dependency a real problem in the foreseeable future in a world of greatly increasing diversity of energy supply? In a world of growing global trade, no economy enjoys a situation of independence. It would be a substantial misallocation of scarce resources to take costly measures now to avoid such perceived risks.

'Mechanisms have been created to cope with temporary supply disruptions in oil and gas. In oil, the International Energy Agency (IEA) is the best cushion the European Union can expect. In gas, supply security has never been put at risk by technical or political problems. Commercially justified system redundancy and supply diversification have been made economically viable through long-term contracts. Huge mutual economic interdependencies in the gas business mitigate the political risks.

Howard Shields

'Intervention to enhance further the security of supply at European level would have its own negative economic impact and would result in higher than optimal prices for the final consumer, whether small or large. The result would be to make Europe even less competitive.'

Taxation

Pursuing the line of damage to Europe's competitive position into the area of taxation, Mr Shields' view was that the idea of using taxes to 'internalise externalities' is one of the most troublesome themes of the Commission's Green Paper. The industry, he says, is concerned about the practical difficulties of designing and implementing such taxes, and the likely negative implications for competitiveness, especially in a world where not all countries buy in to such an approach.

Mr Shields went on: 'More taxes will kill European competitiveness. Increasing fiscal pressure could create more damage than benefits and increase the imbalance that is already penalising the energy market and economies in the European Union. The Green Paper compares Europe to the United States, where energy costs are 30 percent lower, drawing the conclusion that the internal market would potentially allow huge savings in the European Union.

'The Commission "forgets", however, to comment on different levels of taxation in the United States compared with the European Union. In another example, tax revenue on oil/fuels/products

in Italy is equal to Saudi Arabia's; however, Saudi oil production, at eight million barrels a day (b/d) is almost five times Italy's consumption of 1.8 million b/d.

'The Green Paper, while acknowledging these concerns, dismisses them, stating that "the fears expressed by industry are excessive". Industries in the large energy-consuming sectors employ 3.8 million people directly but there are around twice that number of jobs at risk in the associated service industries should taxation push large energy consuming sectors out of business.

'The environmental concerns of society are real, but it is all too easy for single-issue protagonists to carry the day. This can lead to the imposition of regulations and taxes which are not always based on sound or well-understood science and which do not address the inevitable trade-offs between, for example, improving local air quality and limiting potential global climate change.

Collaboration on air quality

'Ultimately, it is society that has to pay, and it is the task of governments to see to it that money is spent effectively. An effective environmental policy should demonstrate from the start close consultation between legislators, scientists and industry. We already have a good example of how these principles work very effectively – the European Auto/Oil Initiative on Air Quality. This is a unique collaborative project involving the European oil industry, the European vehicle industry and the European Commission. It seeks to manage air quality in a rational way by identifying the most cost-effective steps towards meeting society's expectations. It recognises that no one group has all the answers and that close co-operation between all parties involved is necessary for genuine progress.

'The oil industry and the European Commission may not be on the same wavelength when it comes to energy policy, but there is evidence of tremendous potential for co-operation between them, given mutual understanding of their respective roles and aims.'

– Acknowledgement to Shell World

Award of Council for Derek Brown, Chairman, IP Petroleum Measurement Committee

IP President David Varney presented Derek Brown with an Award of Council on the occasion of the Council/staff lunch last month.

Derek Brown has been a member of the Petroleum Measurement Committee for 13 years and was elected its Chairperson in 1990. He has also been Chairperson of the Petroleum Measurement Tables Committee since it was formed in 1982 and of the Oil Loss Control Committee since its formation in 1985. In addition he was an active working member of various other IP committees in the field of petroleum measurement.

He was an employee of Esso Petroleum for over 40 years and held the position of Loss Control Manager, Esso Europe, for several years up to his retirement. He has received international recognition of his expertise in oil measurement. Since 1987 he has been Chairperson of committee ISO/TC 28/SC 3, the International Organisation for Standardisation, the major committee responsible for all ISO standards in the field of Petroleum static measurement. Derek is also Chairperson of the DTI Flow Measurement Committee and a member of its main Measurement Committee.

IP President David Varney makes the presentation to Derek Brown

Integrated gasification combined cycle in Italy

By Dr Davide Tabarelli,
Senior Researcher,
Richerche Industriali ed Energetische

There are three Integrated Gasification Combined Cycle (IGCC) projects under study in Italy, each at a different stage. All are planned to be constructed in refineries and to use heavy fuel oil as feedstock. Italy has suddenly become the cutting-edge of advanced technology in refineries as far as residue disposal is concerned. In the meantime these projects represent an attempt by the refineries to enter into the fastest growing and most profitable energy business of the future – electricity. This explains why the Italian experience is proving interesting to others.

Put simply, IGCC comprises two integrated phases: in the first heavy hydrocarbons are gasified in order to produce an easy-to-clean gas that feeds, in the second phase, combined cycle turbines producing electricity. In the last few years, IGCC has been frequently suggested as a possible solution for surplus heavy residue. The consistent investment costs and the fact that the technology, in the integration phase, is relatively new, result in a high level of risk that must be offset by the likelihood of attractive profit. In Italy this opportunity is provided by the special conditions of the electricity market resulting in the high price of the electricity produced and sold by the refineries.

What is IGCC?

The feed of an IGCC plant in refinery is heavy residue remaining from different conversion plants. In order to simplify matters, this article refers only to vistar, the residue from the visbreaker. Vistar has a high viscosity, a high sulphur content, often over 5 percent, and a high metals content. Normally the vistar is used to produce high sulphur heavy fuel oil (HSFO), blending it with distillates (heavy gasoil) in a proportion of around 70 percent of vistar and 30 percent of distillates. The disposal of vistar through gasification frees up diluents that may be used to produce gasoil.

Gasification has been used for several decades to produce synthetic gases such as hydrogen, ammonia and methanol and is based simply on the partial combustion of heavy hydrocarbons. The feedstock from the visbreaker is sent to the reactor where, under pressure, it is mixed with oxygen and steam. The hydrocarbons are partially oxidised producing a gas composed mainly of carbon monoxide (CO), hydrogen (H_2) and other unwanted pollutants such as hydrogen sulphide (H_2S) carbon dioxide (CO_2) and ash where the metals are concentrated. Being exothermic the process produces heat and steam which is sent to the second phase for the electricity production. The syngas with a temperature of 1,500° C, is cooled down in a waste heat boiler, where other steam is produced for the electricity production. Once cooled down, the syngas is washed with water in order to remove the ash and then desulphurized. At this point normally there is a plant for the production of hydrogen, one of the most valuable components in today's refineries for the production of clean products. The syngas, with a calorific value of 2,500 kcal/m^3, is then sent to the combined cycle turbines of the second phase. Thanks to the combined cycle technology and to the steam produced in the gasifier, the energy efficiency of the plant can achieve 45 percent, against 33 percent for a traditional plant.

The technology of the two phases, gasification and combined cycle, is well known; the innovation is their integration. There have been more then 250 commercial gasification applications in the last 50 years, of which around 50 were fed with hydrocarbons. However all the plants produce syngas which is mainly used in chemical plants and their capacity is well below that needed in IGCC.

At present there are only two IGCC plants – demonstration plants using coal. There is no IGCC plant fed with hydrocarbons. A further five demonstration plants, all fed with coal, are expected to come on stream shortly. Besides the Italian plants, others using heavy hydrocarbons are under construction by Shell at Pernis and by Texaco at its Kansas refinery. These are smaller than the Italian plants.

Problems

The points on which the technology risks are higher are those related to the formation and cleaning of ashes and soot. The syngas entering the combined cycle must have a low content of ashes that implies a high degree of efficiency of the cleaning in the upstream phase, but on which there is high uncertainty. Another problem is that of the metals in the soot which can be recycled, if not completely eliminated, and then create deposits inside the reactors making expensive maintenance operations necessary.

The investment cost for a plant of 500 MW like those of Saras or Isab is around $1 billion, that is $2 million/MW. This cost is roughly shared 40 percent to the gasification phase, another 40 percent to the combined cycle and the remaining 20 percent to other common facilities. This figure also includes the plants for the production of oxygen and for hydrogen extraction.

Advantages of IGCC

It is generally accepted that investment in IGCC at refineries is only worthwhile when there are particular conditions in the electricity market offering high prices for the power produced. In Italy, electricity that is surplus to a refinery's requirements is sold to ENEL, the Italian electric utility, according to the Cip 6/92 law. This administrative law considers the production of electricity from IGCC in refinery as eligible for subsidies because of its environmental benefit in disposing of vistar. In 1994 the price was fixed at 130 lire/kwh, of which 50 lire represents subsidy. This price is guaranteed in the first eight years of the investment and revised according to inflation. Also the quantities produced are supplied to ENEL according to a long-term commitment. These are the special circumstances of the Italian electricity market which encourage the use of IGCC.

The second most important point relating to IGCC is the amount of saved distillates which otherwise would have been employed in HSFO production blending them with the gasified vistar. In a IGCC of 500 MW, the gasifier is consuming around 1 million tonnes of vistar. The distillate saved in this case is around 400,000 tonnes/year.

Other advantages, which are more difficult to estimate, are related to the possibility of reaching a high level of impurity in the vistar letting the conversion plants, like the visbreaker, work at a higher level of severity. A similar problem arises for the value to be given to the hydrogen extracted from the syngas, which could vary from a few cents per cm to 20-30 cents, according to the needs of the refinery. With the increasing pressure to produce cleaner product, hydrogen is becoming an essential product in the refineries, especially in the removal of sulphur.

For a refinery selling its HSFO in a shrinking market, the need to invest in expensive conversion or desulphurisation plants becomes a necessity. The possibility of disposing of heavy residue by feeding a gasifier avoids these investments. It also avoids the need for additional investment in power generation plant. In the modern refinery electricity consumption is increasing and the need for additional capacity is quite common, as is the need to replace old capacity.

Meeting environmental standards

Of all European countries, Italy is going to suffer the most because of tighter environmental standards. This is because of the relatively high yield of HSFO in the refinery system and because Italy has decided, paradoxically, to apply stricter environmental limits than other countries. In particular, the limits set by the EEC Large Combustion Plant Directive for new large plants, have been extended to existing plants. This is the cause of the expected sharp fall in HSFO consumption that has exacerbated the problem of residue disposal in refineries. These environmental pressures facing Italian refineries explain why the production of electricity from residue gasification has been considered eligible for subsidies.

The process of privatisation under way in the electricity sector and the institutional changes expected to be introduced are likely to modify for the future the system through which IGCC in refinery is receiving subsidies. But in the meantime the new government has affirmed that for the three plants under construction for which ENEL has given authorisation the subsidy system will apply.

Three Italian plants

The Italian projects utilise the Texaco technology and all will be financed through project financing. For each project a specific company has been set up jointly owned by the refinery and by a company expert in electricity production, in order to give technological assurance to the banks.

The three plants are:

Isab, Priolo – 507 MW of capacity. Isab Energy (49 percent Mission Energy and 51 percent Isab) is the company owning the plant; Swiss Bank is the adviser for the project finance; the plant will use mainly de-asphalted oil;

Saras, Cagliari – 508 MW of capacity. Sarlux (Enron 40 percent and Saras 60 percent) will own the plant with Babcock & Brown as financial adviser; the feed will come from different streams of residue; and

Api, Falconara – 220 MW of capacity. Api Energia (50 percent ABB, Api 50 percent) is the joint venture, while Morgan Stanley is the adviser; the feed should be vistar.

IGCC proposals were also made last year for the Agip refineries at Sanazzaro and Gela but they are unlikely to be accepted because ENEL has no need of additional electricity capacity before 2002 and because the subsidised electricity prices will probably cease with the introduction of a new mechanism in the assignment of power generation capacity to the independent power producers.

The Isab, Saras and Api plants have all received authorisation from ENEL and the Italian government but still await permission to build the connections from the refineries to the ENEL grid. Construction is expected to start at the beginning of next year.

It seems therefore that the refining industry in Italy will shortly have the most advanced IGCC technology available. These new plants will permit the refineries to enter the electricity business, utilising the surplus of heavy residue. These plants are only feasible thanks to the particular conditions of the Italian electricity market and high electricity prices.

FORTHCOMING EVENTS

October

4th
London: 'Joint Conference with ETSU: Energy Efficiency in the Refining and Petrochemicals Industries – The Future'. Details: Caroline Little, The Institute of Petroleum.

6th
London: 'Marine Electric Propulsion: The Effective Solution?'
Details: Kathleen Ford, Conference Organiser, The Institute of Marine Engineers, 76 Mark Lane, London EC3R 7JN.
Tel: 0171 481 8493
Fax: 0171 488 1854

9th-10th
Kuala Lumpur: 'Production Sharing Contracts and International Petroleum Fiscal Systems'. Details: Conference Connection Administrators P/L, 151A Thomson Road, Goldhill Centre, Singapore 1130.
Tel: 65 356 0960/61
Fax: 65 356 0962

9th-11th
Florence: '11th International Conference on Pipeline Protection'. Details: BHR Group Limited, Cranfield, Bedford MK43 0AJ.
Tel: 44 0 1234 750422
Fax: 44 0 1234 750074

10th-11th
Aberdeen: 'Development and Life Extension of Commercially Marginal Reserves'.
Details: Matt Salt, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 637 4383
Fax: 0171 631 3214

12th-13th
South Wales: 'Recycling – A Law Unto Itself'.
Details: Mr J Looker, Chemical and Oil Recycling Association, 9 Parc Luned, Kinmel Bay, Rhyl, Clwyd LL18 5JG.
Tel: 01745 332427
Fax: 01745 343300

12th-13th
Edinburgh: '8th International Conference on Standard Issues and Affairs'. Details: Peter J Higham, Copson International Ltd, Refuge Assurance House, Lord Street, Liverpool L2 1TT.
Tel: 44 0 151 707 0970
Fax: 44 0 151 709 5447

12th-13th
Jakarta: 'Production Sharing Contracts and International Petroleum Fiscal Systems'. Details: Conference Connection Administrators P/L, 151A Thomson Road, Goldhill Centre, Singapore 1130.
Tel: 65 356 0960/61
Fax: 65 356 0962

15th-16th
Aberdeen: 'Learning From Real Partnering and Alliancing Agreements Offshore to Cut Costs and Maximise Efficiency'.
Details: IIR Ltd, 6th Floor, 29 Bressenden Place, London SW1E 5DR.
Tel: 0171 915 5055
Fax: 0171 915 5056

15th-17th
Washington: 'World Conference on Transportation Fuel Quality'. Details: Karin Erickson, Registration Manager, Information Resources Inc.,1925 North Lynn Street, Suite 1000, Arlington, VA 22209.
Fax: 703 525 0187

16th-17th
Hong Kong: '6th International Ship Management Conference, Facing Change: Shaping Up for the Future'.
Details: John R Woolley, Senior Conference Manager, Lloyd's of London Press, 1 Singer Street, London EC2A 4LQ.
Tel: 44 0 171 250 1500
Fax: 44 0 171 253 9907

18th
London: 'Biodegradable Petroleum Products and the Environment Conference'. Details: Caroline Little, The Institute of Petroleum.

18th-19th
Aberdeen: 'Heavy Oils – Recovery, Processing & Transportation'. Details: Owain Jenkins, International Conference Group, Suite C, Ground Floor, Long Island House, 1-4 Warple Way, London W3 0RG.
Tel: 0181 743 8787
Fax: 0181 740 1717

18th-19th
Aberdeen: 'Offshore Pipeline Design, Construction and Operation'. Details: Catharina Olsson, IIR Ltd, 29 Bressenden Place, London SW1E 5DR.
Tel: 0171 915 5055
Fax: 0171 915 5056

18th-19th
Antwerp: 'Controlling Fugitive Emissions from Valves, Pumps and Flanges'. Details: Mrs Tracey Wheeler, Conference Department, BHR Group Ltd, Cranfield, Bedford MK43 0AJ UK.
Tel: 44 0 1234 750422
Fax: 44 0 1234 750074

22nd-25th
Dallas: '70th Society of Petroleum Engineers' Annual Technical Conference and Exhibition'.
Details: Fred Herbst, SPE Public Relations Manager, P.O. Box 833836, Richardson, TX 75083-3836, USA.
Tel: 214 952 9306
Fax: 214 952 9435
Telex: 163245 SPEUT

23th-27th
Oxford: 'The Bitumen Business – Structure, Economics and Markets'.
Details: The Registrar, The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD.
Tel: 01865 250521
Fax: 01865 791474
Telex: 838950 COPLET-G

24th
Aberdeen: '4th International Conference, Water Management Offshore'.
Details: Helen Smith, IBC UK Conferences Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 453 2128
Fax: 0171 631 3214

25th
Aberdeen: '2nd Atlantic Margin Conference'.
Details: Alison Wilson, Offshore Management Centre, The Robert Gordon University, Aberdeen AB9 2PW UK.
Tel: 01224 263101
Fax: 01224 263100

25th-26th
Aberdeen: 'Centenary Conference, Showing the Way – Benchmarks in UK Environmental Technology'.
Details: CIWEM Conferences, 15 John Street, London WC1N 2EB.
Tel: 0171 831 3110
Fax: 0171 405 4967

26th-27th
London: 'Natural Gas: Trade and Investment Opportunities in Russia and the CIS'.
Details: Julia Thomas, RIIA Conference Unit, Chatham House 10 St James's Square, London SW1Y 4LE.
Tel: 0171 957 5700
Fax: 0171 957 5710

27th
Brussels: '9th International Congress: The European Lubricants Industry, its Prospects and

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its Future'. Details: Jacques Delacour, UEIL, 140 Rue La Fayette, 75010 Paris.
Tel: 33 1 46 07 79 98
Fax: 33 1 46 07 74 71

31st
London: 'Safe Competitive Logistics in a Changing World Conference'. Details: Caroline Little, The Institute of Petroleum.

November

1st-2nd
Aberdeen: 'Mature and Marginal Fields'. Details: Owain Jenkins, International Conference Group, Suite C, Ground Floor, Long Island House, 1-4 Warple Way, London W3 0RG.
Tel: 0181 743 8787
Fax: 0181 740 1717

2nd
London: 'Interfuel Competition in European and North American Natural Gas Markets'. Details: The British Institute of Energy Economics, 9 St James's Square, London SW1Y 4LE.

2nd
London: 'Occupational Hygiene Auditing Conference'. Details: Caroline Little, The Institute of Petroleum.

2nd-3rd
London: 'Regulation and The Regulators'. Details: Catherine Carpenter, Conference Manager, AIC Conferences Ltd, 2nd Floor, 100 Hatton Garden, London EC1N 8NX.
Tel: 0171 242 2324
Fax: 0171 242 2320

2nd-3rd
Oslo: 'Petroleum Tax Conference 1995'. Details: Gerd Gaeger, Norwegian Petroleum Society, P.O. Box 95, N-5049 Sandsli, Norway.
Tel: 475 99 72 35
Fax: 475 99 72 38

6th-7th
Teesside: 'Terminal Operation and Static Measurement'. Details: Mike England, Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU UK.
Tel: 44 0 1245 328 340
Fax: 44 0 1245 323429

6th-9th
Oslo: 'Preventing Mechanical Failure and Electrical Hazards'. Details: Tony Watkins, IChemE, Davis Building, 165-189 Railway Terrace, Rugby CV21 3HQ UK.
Tel: 44 0 1788 578214
Fax: 44 0 1788 560833

8th-9th
Teesside: 'Flow Metering and Meter Proving'. Details: Mike England, Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU UK.
Tel: 44 0 1245 328 340
Fax: 44 0 1245 323429

13th
London: 'The Politics of Sanctions'. Details: Julia Thomas, The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE UK.
Tel: 0171 957 5700
Fax: 0171 321 2045/ 957 5710

13th-14th
London: 'Managing Commercial and Industrial Waste'. Details: International Conference Group, Suite C, Ground Floor, Long Island House, 1-4 Warple Way, London W3 0RG.
Tel: 0181 743 8787
Fax: 0181 740 1717

14th
London: 'Iran: Partner or Pariah?'
Details: Julia Thomas, The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE UK.
Tel: 0171 957 5700
Fax: 0171 321 2045/ 957 5710

14th
London: 'Gibraltar Submarine Gas Pipeline'. Details: Helen Smith, IBC Technical Services Ltd, Gillmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 637 4383
Fax: 0171 631 3214

15th
London: 'Timewatch GCC: Economic Restructuring and Business Prospects'. Details: Julia Thomas, The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE UK.
Tel: 0171 957 5700
Fax: 0171 321 2045/ 0171 957 5710

15th-16th
London: 'Expo Software'. Details: Kate Hunnisett, Exhibition Administator, Expo Software 95, Themedia Ltd, P.O. Box 2, Chipping Norton, Oxon OX7 5QX UK.
Tel: 44 0 1608 684700/684888
Fax: 44 0 1608 684796

16th-17th
London: 'The Safe Handling of Pressure Liquefied Flammable Gases'. Details: Sarah Ashmore, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD.
Tel: 0171 637 4383
Fax: 0171 631 3214

16th-17th
London: 'South East Asia – Oil and Gas Activity'. Details: Helen Smith, The Bookings Department, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 44 0 171 453 2128
Fax: 44 0 171 631 3214
EMail: helen_smith@ibcukl on.ccmail.compuserve.com.

20th
London: 'Personal Environmental Liability'. Details: Owain Jenkins, International Conference Group, Suite C, Ground Floor, Long Island House, 1-4 Warple Way, London W3 0RG.
Tel: 0181 743 8787
Fax: 0181 740 1717

20th-21st
London: 'Advances in Solving Oilfield Scaling'. Details: Helen Smith, The Bookings Department, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 44 0 171 453 2128
Fax: 44 0 171 631 3214
EMail: helen_smith@ibcukl on.ccmail.compuserve.com.

20th-21st
London: 'Marineflex 95 on Flexible Pipes, Umbilicals and Marine Cables – Structural Mechanics and Testing'. Details: Violet Li at the Conference Secretariat, Dilke House, Malet Street, London WC2E 7JN.
Tel: 44 0 171 436 7500
Fax: 44 0 171 436 2112

21st-22nd
London: 'Integrated Environmental, Safety and Business Management'. Details: Owain Jenkins, International Conference Group, Suite C, Ground Floor, Long Island House, 1-4 Warple Way, London W3 0RG.
Tel: 0181 743 8787
Fax: 0181 740 1717

25th-28th
Saudi Arabia: 'SOPEC'95 – The Gulf's Premier Oil and Gas Exhibition'. Details: Adla Moukarzel, ITE Press Office, Byron House, 112A Shirland Road, London W9 2EQ UK.
Tel: 44 0 171 286 9720
Fax: 44 0 171 286 0177

Looking towards 4D seismic

By Dr Philip Nelson

A one-day conference held in London earlier this year was entitled '4D Seismic: Profiting from Reservoir Management'. This was probably one of the first devoted solely to 4D seismic, also known as time-lapse 3D seismic. At the end of seven papers, ranging from rock physics to Computer Aided Production, key aspects of this emerging technology had been discussed. However, delegates were left with the impression, perhaps, that the oil industry will indulge in a period of soul-searching, much as it did in the early years of 3D seismic, before 4D seismic becomes widely adopted.

The extra 'D'

Just what is the extra 'D' that gives 4D seismic its edge? It is the dimension of time, measured in months or years rather than milliseconds – the unit more commonly associated with seismology. And in those intervening months or years it is necessary to acquire new 3D surveys at the same location, with which the original, or previous survey may be compared. It can be readily appreciated that increasing the investment in seismic data to such an extent requires a high level of conviction in the minds of those running the business that the money and effort expended will pay back.

With reserves of 260 billion barrels of oil (2.9 billion of which were added in 1994), and 500 Sun computer workstations in their E&P centre in Dharhan, the main preoccupations of Saudi Aramco are, according to Richard Chimblo, Chief Geophysicist, selling oil and looking after the store.

In his paper *'Reservoir Monitoring: From Data Integration to Multi-Disciplinary Teams'*, Mr Chimblo gave the impression that Saudi Aramco is still realising the benefits of 'conventional' 3D seismic. By the year 2000, he forecast a total portfolio of 25,000 sq km 3D seismic over a productive area of some 20,000 sq km. With current production at 8 million barrels of oil per day (b/d), capacity to increase to 10 million b/d within 60 days and the continuation of 3D seismic surveying on the first-time basis implicit in his figures, it is difficult to see Saudi Aramco becoming seriously involved in 4D seismic for some time to come.

Time lapse in adoption

Ten years ago, it proved difficult enough to persuade management of the benefits of shooting a single 3D seismic survey, let alone the multiple surveys required of 4D seismic to monitor a field's production over its lifetime. The geophysics lying behind changes to the reflection sequence due to changes in a reservoir under production are well understood. They were elegantly summarised by Amos Nur, Professor of Geophysics at Stanford University, in his paper *'Rock Physics for 4D Seismology'*. In some classic cases, such reflection changes were observed long ago on 2D seismic; a good example being the gas-water contacts in the Frigg field satellites. After Frigg had been put into production, but before any production had taken place from the satellites, these water contacts were observed to be tilting towards the main field itself.

It is isolating such changes from the other differences introduced during acquisition and processing of successive 3D surveys that is proving to be one of the sticking points. In his paper *'Time Lapse 3D Seismic – Possibilities and Limitations'*, David Davies, Production Seismic Advisor with Shell UK Expro in Aberdeen, summed it up by noting, 'A base-line survey will represent state-of-the-art at the time acquired, but technical advances will continue between the base-line and subsequent re-shoots.' He went on to suggest that, 'A routine must be derived, therefore, to improve the base-line in line with re-shoots, and to 'de-resolve' the re-shoot to the base-line quality.' Both he and Ian Jack, inveterate Geophysical Advisor and R&D Project Manager with BP Exploration, confessed that many of the differences observed between new and old 3D surveys were just not fully understood.

Difference datasets

Others, notably Al Breitenbach, Conference Chairperson and CEO of Scientific Software Intercomp in Denver, were confident that difference datasets were the solution to this problem. Claiming to have used this approach successfully several years ago, he explained the simple logic behind 'difference datasets'. Production is, and thus significant changes to the reflection sequence should be, confined to reservoir levels only. Differences between one dataset and the next in those parts of the data volume not related to the extraction of hydrocarbons should therefore be entirely due to changes wrought by applying state-of-the-art geophysical technology to the new survey (the re-shoot). These would have been unavailable at the time of acquiring the original (the base-line). Once defined, these overall evolutionary differences can be eliminated from the equation, leaving only those differences attributable to hydrocarbon extraction at reservoir level. Norwegian delegates were quick to point out, however, that in some cases – notably Ekofisk – production of oil and gas can lead to significant subsidence of the overburden, with attendant disturbance of strata overlying the reservoir. In such instances, changes of the overburden reflection sequence sufficient to disturb the simplicity of the difference concept should be identified and accounted for.

Drop in seismic costs

On the cost side, Ian Jack, in his paper *'Commercial Cost and Value Positions for 4D Seismic Data and Its Operational Method'*, struck an encouraging note with a slide that showed BP's all-up marine seismic acquisition costs had fallen from a 1992 average of almost $21,000/sq km, to less than $3,500/sq km for one 1994 survey. This tended to confirm the existence of a 4–5 year 'window of opportunity' – beginning now – to establish 4D seismic as a viable field monitoring tool. During this time, seismic costs may be expected to remain low, while down-hole monitoring develops and becomes progressively more cost-effective. The low seismic survey costs currently realised with conventional towed steamers could, according to Mr Jack, be lowered further by permanently installing sea-bed geophone arrays over those fields for which a decision to conduct 4D seismic was taken at the start of the field's life. Countering an objection from the floor that sea-bed arrays were anything but cheap, the speaker pointed to the longevity of submarine telephone cables. He maintained that a permanently buried array would have paid for itself on completion of the third 3D survey in a sequence, assuming virtually no maintenance costs for appropriate equipment.

Björn Paulsson, Senior Research Geophysicist with Chevron, described the *'Development of a Downhole Hydraulic 3-Component Seismic Source for Cross-Well Seismic, Reverse VSP and Single-Well Seismic Applications.'* The result of this collaborative effort between Chevron, Amoco, Conoco and Exxon, together with the U.S. DOE, Gas Research Institute, E-Systems and Pelton, should present reservoir engineers with a means of using seismology in much higher frequency bands than can be reached with conventional surface sources and receivers. In a totally downhole context, ambient noise levels are generally much lower than in conventional surface seismic. For example, cross-well surveying from deep in one well to receivers suspended across the corresponding depth in a nearby well should yield seismic data with measurable signal content at frequencies approaching 1,000 Hz. At velocities typical for these depths, resolution can be better than 10 ft, Mr Paulsson claimed, with an inter-well range of 2,000–5,000 ft. However, the industry will have to wait with interest for the first publication of results from demonstration surveys for the [development] partners which are scheduled for next year.

Software complexity

Mr Breitenbach presented the opening keynote address on *'4D Seismic's Role in Computer Aided Production (CAP)'*. He claimed the 'CAP Era' had already arrived – which cannot be denied if CAP is accepted as no more than the sum total of all today's software packages available to the reservoir engineer. Indeed, since it is being widely discussed, 4D seismic can be said to have already taken its place in this armoury of computer aids, even though it is still evolving.

Where some took issue with Mr Breitenbach, however, was with his vision of CAP as the 'application of proven high technology by non-expert professionals on desk top computers to increase production, increase reserves and optimise economic return' – a sort of 'glass cockpit' for the reservoir engineer. In an attempt to reassure delegates that CAP would not expose a company to excessive risk, Mr Breitenbach compared it with the difference between the capability of today's 'point-and-shoot' cameras with the 'Box Brownie'. Sverre Strandenes, Manager of Geosciences at Norsk Hydro's E&P Research Centre, took issue with this, saying, 'That's OK if all you want is a picture of your uncle in the living room at Christmas.' And both he and Mr Jack went on to emphasise the dangers inherent in letting loose the non-expert with a Pandora's Box of software, the contents of which he or she does not fully understand.

This is perhaps the danger now lurking in oil company offices. Not only is there a risk that computer applications may be inappropriately applied but, even with correct application, a great deal rests on the integrity and completeness of the databases needed to execute increasingly larger and more complex tasks. There is a feeling that the creation and maintenance of these databases still receives less attention than required for trouble-free CAP (or CAEX), even when the 'non-expert professional' becomes an expert. Nonetheless, in his paper 'Seismic Monitoring – a Tool for Improved Reservoir Management', Mr Strandenes noted that, with encouragement from the Norwegian Petroleum Directorate (NPD), 'The average recovery factor from all the fields in the Norwegian Sector has increased from 34 percent to 39 percent over the last 2–3 years.' He went on to refer to the NPD's *Newsletter on Improved Oil Recovery*, in which further increases in the average recovery factor to 47 percent are forecast by means of implementing 'a broad mix of methods and processes', though seismic monitoring is not mentioned among them. He added, 'The fact that seismic monitoring is not mentioned even as a candidate for improved recovery confirms that the technology has some way to go before being generally accepted in the industry.' The bulk of North Sea oil production now comes from long-established fields that are entering their decline phase. That is one very good reason, Mr Strandenes emphasised, why new technology for improved recovery should be developed as quickly as possible.

Without doubt, the SEISMIC 95 conference made a timely contribution to this objective by focusing the industry's attention on 4D (time-lapse) seismic.

Storm warnings for tanker owners

By Peter Adam

Oil shippers are facing heavy weather in the coastal waters of the western United States and Canada. In the wake of the Oil Pollution Act (OPA) of 1990, shoreline states' (and Canadian province) politicians have started enacting new and stringent environmental laws – unprecedented in scope (at least for local governments). Such efforts, aimed at reducing the possibility of marine oil spills and the harm they cause to shore areas and coastal wildlife, are forcing tanker owners and operators to pass through previously uncharted legal realms over which both state and federal authorities, in the United States and Canada, claim jurisdiction. The storms could spread. But having battened down the hatches, the marine petroleum transport industry is preparing to sail, bow first, into oncoming waves.

In response to a statute enacted four years ago by the State of Washington governing the operation of tankers in state waters, the International Association of Independent Tanker Owners (Intertanko), filed a complaint last July in the US District Court of the Western District of Washington. Intertanko's 400 members represent 40 nations, including the United States, and control over 80 percent of the world's independently owned tanker fleet.

The organisation's civil suit – the first direct challenge to a state's right to impose strict operating requirements for oil transport in the post-*Exxon Valdez* OPA era – claims that it is unconstitutional for Washington to implement regulations applying to tanker vessel personnel, equipment and operational requirements that differ from US federal law. Intertanko took this action following an official letter from the Commandant of the US Coast Guard to the Washington State Office of Marine Safety (OMS) that was sympathetic to tanker owners' and operators' interests.

Seven defendants

Intertanko's complaint names seven defendants, including OMS administrator Barbara Herman, Washington Governor Mike Lowry and State Attorney General Christine Gregoire. The suit also names prosecutors in four Washington counties that have ports at which members' vessels regularly call; each has the authority to prosecute owners and operators of tankers if they violate the new law.

Specifically, Intertanko charges that the portion of the Revised Code of Washington that applies to State regulations governing operational, personnel, management, technological or other aspects of tanker operations in interstate and foreign commerce governed by federal law or international treaty is unconstitutional. It makes the same claim with regard to chapters of the State's Administrative Code which purport to govern operations, personnel qualifications, management techniques and practices, on-board equipment requirements and other aspects of tanker operations.

The stakes

The main purpose of the contested Washington State act is to make certain that tanker owners file an oil spill prevention plan with the state's OMS. Tankers which call at US ports are already required to file spill prevention plans with the US Coast Guard. But the state law mandating such action is detailed and comprehensive and makes supplementary requirements vis-a-vis oil spill prevention and remediation activity. The law goes far beyond mandating a response plan, covering such matters as control over tanker navigation records, comprehensive voyage planning, training programmes and orientation activity, shipboard drills, pre-employment drug and alcohol testing and reviews of personnel performance.

Thus it gives the OMS a great deal of authority.

From a purely local perspective, the stakes are fairly high. Washington State is one of the major US west coast refining centres. Washington's seven refineries produce around 600,000 barrels per day. Ports in the Puget and Victoria Island Sounds, which account for a significant portion of the state's (and British Columbia's) shoreline, are major petroleum distribution hubs.

Best achievable protection

But the problem is not local in nature and the law raises issues that are international in scope. Washington State's act undermines the way tankers are regulated and could superimpose an entire new patchworked layer of regulation on them, Intertanko claims. It opens the door for other government authorities to enact similar laws – setting the stage for fragmented and difficult-to-comply-with regulations for the tanker business.

This is evident in both the state's claim to possess the authority to regulate foreign-owned tankers closely and the criteria it has put forth for the acceptance of oil spill prevention plans.

Intertanko's suit points out that, under international law, the country of registry of a vessel is responsible for adopting and enforcing laws to protect the welfare of the crew and passengers etc. This is true wherever the ship may be. The International Convention on the Law of the Sea, to which the United States and Canada subscribe, stipulates that the nation under whose flag the vessel operates has the primary obligation of ensuring that ships respect generally accepted international anti-pollution rules and standards and that they comply with domestic laws and regulations. 'The unilateral action by authorities of the State of Washington... undermines the efforts of the federal government to secure international agreement on tanker regulation, and the bilateral treaties of free navigation, and infringes the treaty-making and foreign affairs powers of the federal government,' the complaint contends.

'Memories of the slick are likely to continue to have a decided impact on the political environment'

Generally, at least until now, the US federal government's claim to authority in such matters was uncontested. The US Coast Guard oversaw enforcement of laws and regulations consistent with international maritime practice as specified in treaties to which the United States is a party.

But now states (and territories) are claiming an enlarged authority in this sphere. It is not so much the specific requirements themselves embedded in Washington State's law that Intertanko finds troubling but it objects to the possibility that many states (and provinces) having once enlarged their authority in this sector could pass regulations that would be restrictive and non-uniform in nature.

And Washington's law has a completely different emphasis from federal law in this area. While OPA requires that tankers submit oil spill prevention plans for responding to 'the maximum extent practicable' to a worst-case discharge of oil or hazardous substances, the Washington State bases spill prevention plan acceptance on different criteria. It stipulates instead that the OMS 'shall only approve a prevention plan if it provides the best achievable protection (BAP) from damages caused by the discharge of oil into the waters of that state....' This is the BAP criteria. While federal law is worded in terms of vessels' operational practices and capability, state law emphasises protection of coastal areas from damage.

Reaction to the suit

The Coast Guard, which has jurisdiction over US coastal waters seems sympathetic to Intertanko's line of reasoning. It has warned the state that the 1990 OPA does not give Washington State the right to regulate vessel equipment, navigation and manning – matters that have historically resided within the Coast Guard's domain.

In an official letter to Washington's OMS that triggered the Intertanko suit, USCG Commandant Rear Admiral Card stated that neither the 1990 OPA (nor previously adopted laws) pre-empt the authority of any state from imposing additional liability or requirements respecting discharge of oil or any removal activities but continued to explain that the Coast Guard does not regard this as a Congressional expression altering the balance of authority between the federal and state governments. Thus, most standards that apply to vessels trading internationally or between states remain the responsibility of the federal government, areas that have traditionally resided with the Coast Guard authority and the responsibility of the Federal Government.

In response to presidential direction, Rear Admiral Card continued, the USCG is conducting a detailed review of all its existing regulations with a view to increasing consistency by aligning its regulations to the greatest degree possible with existing international standards. He urged the State of Washington to do the same.

Echoing the tone as well as the points the Commandant made in his letter, Miles Kulukunds, Intertanko Chairperson, pointed out while announcing the suit, that, 'The State of Washington, by acting unilaterally without regard to the extensive body of federal and international law governing (them) has put in jeopardy the orderly regulation of (their) operation.' Explaining that the organisation has a major stake in the development of rational and uniform regulations that promote the safety of tanker operations, he went on to say, 'We would be delighted if the State of Washington were to immediately withdraw these regulations and yield to the established federal and international regimes.'

Would that it could be so easy to resolve the matter!

Reply to Intertanko

On 19 September the State of Washington filed a reply to the Intertanko suit. While admitting that there are differences between BAP regulations and federal and international standards, the document denied Intertanko's contention that treaties and federal statutes 'evidence occupation of the field' by federal government. In other words, Washington State claims it does have the constitutional right to pass such laws and prosecute those who violate them.

It is the US federal courts, however, that, will ultimately, make that determination.

In the meantime, Intertanko's action is seen by some as a strong cautionary message to other coastal state such as California, Oregon and Alaska which are contemplating similar rules. But they, and British Columbia, are all likely to wait until they see the outcome of this case which will help to define how far states can go vis-a-vis international tanker regulation.

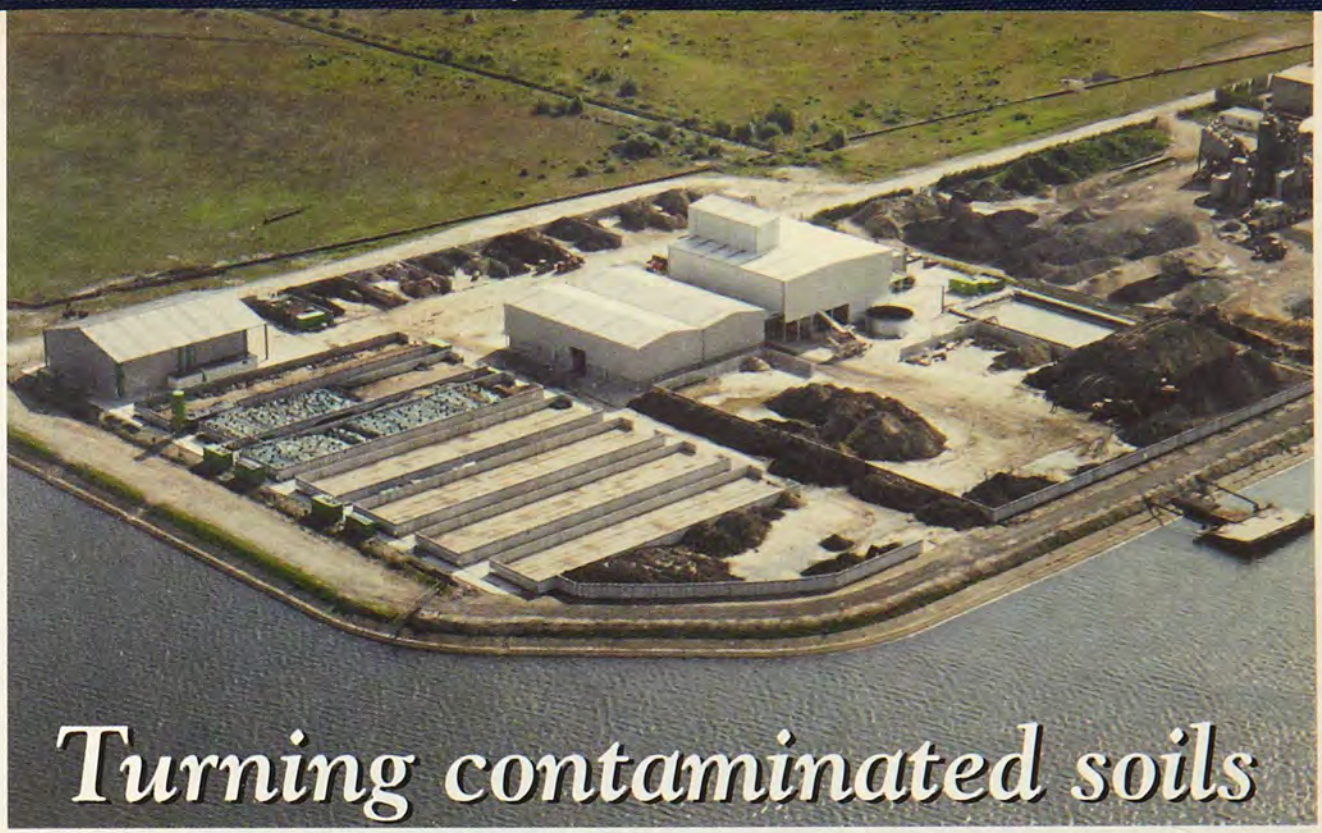
Power to the people?

This is more than an environmental matter. Though environmentalists possess powerful political influence, particularly in coastal regions, elements from their agenda dovetail with those of others and thus their influence multiplies in matters such as this. There is a general political predisposition – shared by populists of the left and conservatives of the right – to diminish the sphere of government in many areas, devolve administrative structures and decentralise power and authority generally. As a result Intertanko, as well as other organisations whose interests are global, not parochial, may have to enter legal disputes which could be numerous and protracted.

After *Valdez*

There are few, if any, traces of crude oil from the *Exxon Valdez* spill on the Alaskan shoreline; the waters of Prince William Sound are as pristine as ever and shore life goes on much as it did before the massive spill of 1989. It may be ecology as usual along the Alaskan coast but the after-effects will linger in the political realm in shoreline areas. Washington State and British Columbia have signed an agreement pledging to co-operate in establishing BAP as the criteria for accepting spill prevention plans. This is an issue that is unlikely to go away. Oil shippers are going to have to deal with it although the industry may well be able to limit, at least somewhat, the trouble and cost of doing so.

The *Valdez* incident and fears of a recurrence – overblown, according to some – acts as a powerful catalyst in prompting politicians to undertake environmental measures. Memories of the slick are likely to continue to have a decided impact on the political environment – and not only in North America.



Turning contaminated soils into clean soils

Western Europe's most advanced complex for the treatment and recycling of contaminated soils opened recently. Located at Antwerp, the plant will produce ultra-clean recycled sand.

The plant has been constructed by the Belgian group, Dredging, Environmental and Marine Engineering NV, at a cost of $16 million. Operated by a subsidiary, SOILS NV, it will process and recycle some 60,000 tonnes of contaminated soils a year by physical/chemical means, as well as treating a further 35,000 tonnes by a bioremedial system. These capacities could be doubled by working a double shift.

Luc Ponnet, Managing Director, SOILS NV, said, 'The construction of this plant is a response to new environmental legislation in many Member States of the European Union. The new regulatory regimes severely restrict and, in some cases, prohibit the dumping of contaminated soils.

'Capacity for the recycling of contaminated soils in Western Europe remains limited. There are some eight existing plants, located for the most part in the Netherlands, with a total capacity of around 2.5 million tonnes a year. However, the processes currently utilised will be stretched to meet the more onerous regulatory requirements now being introduced by EU Member States.

'The Antwerp soils recycling centre is the first of a new generation of soils recycling plants. It utilises state-of-the-art physical/chemical and bioremedial techniques for soils decontamination. It produces an end-product – clean sand – which meets higher standards than those specified in Belgian and other European regulations.'

Soils recycling centre at Antwerp

Environmental protection is an important feature of the Antwerp plant. The process facilities are totally isolated by special double membranes and other protective systems, while all the washing systems are of the closed circuit type.

Antwerp plant

The new Antwerp plant, situated on the left bank of the River Schelde, faces the Waasland Canal. Incoming soils will be delivered either by truck or by barge. After the decontamination process, the recycled sand will be suitable for construction and sea defence projects, road building, back-filling or reclamation purposes, while the slurry is dewatered to produce solid filter cakes which can be disposed of safely in landfill sites.

The company has already secured one contract for the cleaning and recycling of contaminated soils from a major petrochemicals site in Antwerp. Other customers are likely to be the oil industry, other petrochemical companies, the heavy metals sector, general industry and public authorities, and particularly owners of sites which have been contaminated following tank or pipeline leaks.

The new plant has opened at an opportune time, since a special decree from the Flemish government earlier this year imposes a much tougher regime for the handling, storage, treatment and disposal of contaminated soils. This comes into effect this month. Because of the region's high water table, the new regulations present local industry with a difficult task.

However, the owners of the new plant believe that they have the answer for treating even heavily contaminated sand and silt-based soils. In addition, they see business coming from further afield – particularly from the Netherlands, Germany and Luxembourg – regarding themselves as an international body, ready to serve the whole EU industrial community.

In the past other plants have used three processes – incineration (now largely halted on cost and environmental grounds), physical/chemical cleaning and bioremediation. However, in recent years, growing environmental awareness and stricter controls have encouraged the development of soils recycling.

One important feature of the Antwerp plant is its ability to clean smaller soil particles than the older generation of plants was able to do. The company claims that its washing facilities can produce the 'cleanest' recycled sand in the European Union.

The physical/chemical treatment technology at Antwerp represents the development of a system originated by the Dutch environmental contractor Heijmans. The processes have been designed to treat soils with the high silt content common in Flanders and in many other heavily industrialised areas of Western Europe.

Bioremediation

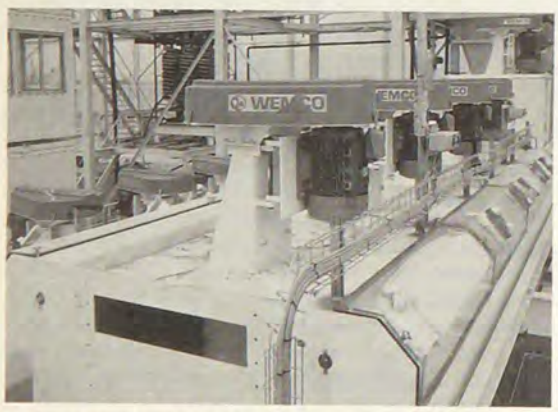
This involves the use of bacteria commonly found in soil for the degradation of organic pollutants such as petroleum products. As a natural process, it goes on slowly. In an industrial process, the process is speeded up in various ways – with the addition of oxygen, heat, moisture and nutrients. The bioremediation units are heated and injected with air; the soil is conditioned in order to optimise the level of nutrients, moisture content and texture.

These bioremediation processes are suitable for soils contaminated with hydrocarbons such as gasoline, diesel, kerosene and oil.

Physical/chemical extraction

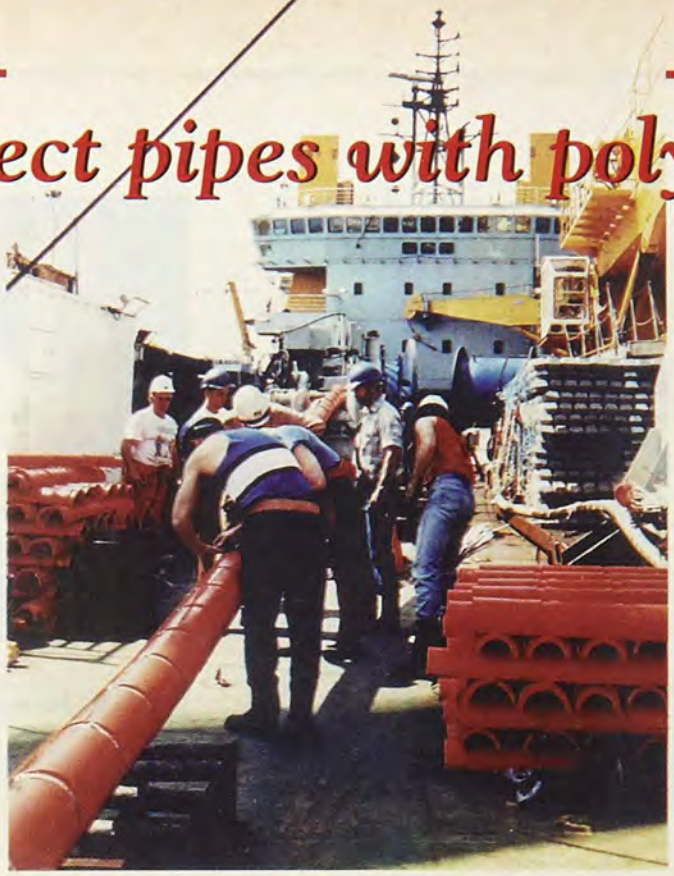
This soil cleaning technique consists of several processes. Initially, the contaminated sand goes through a separating process, with dry and wet sieves, metals and hydrocyclones. The contaminated sand is then cleaned in four different stages – spiral separation, scrubbing, flotation and countercurrent washing. The end-product is a clean sand which can be used for construction purposes.

For every 100 tonnes of contaminated soil arriving on site, 85 tonnes of recycled clean sand is produced. The volume of the contaminated slurry is reduced by dewatering to about 15 tonnes of filter cake. Cleaning standards are claimed to be high – in the case of hydrocarbons a reduction from perhaps 10,000 parts per million to 50-200 ppm.



Soil cleaning in flotation unit.

Protect pipes with polymers



As the search for oil goes ever deeper, so pipeline protectors must become more and more adaptable. Mr Des Hatfield, Sales Director at CRP Marine, argues that modern polymers are best the suited material for the job.

Exploitation of oil and gas resources in ever deeper waters means increasing dependence upon mechanical and remote seabed operation of production facilities. As a result, many different techniques of flexible and rigid pipeline configurations have been developed. These supplement the systems already established in shallow water production methods.

A common feature of both new and existing pipeline systems and associated cable and umbilical systems is that they need protection; the more demanding the surface or subsea environment, the more critical the need for that protection.

Development of sophisticated engineered polyurethane protection products has, however, kept pace with the demands for more high performance protection systems. Indeed, polyurethane and other polymers and composites offer many advantages over traditional materials, such as concrete or steel.

Inherent advantages

For a start, polyurethane can be formulated to produce a wide range of densities and compositions to offer a range of physical factors which can be specified to match the requirements of the application. These include a choice of flexibility and rigidity so that the polyurethanes can be used to absorb high impact loadings, or give high abrasion resistance, or offer a degree of support over free span areas, such as pipeline crossings.

The density can be precisely adjusted to give a ballast effect for stability or neutral or positive buoyancy for installation purposes. Polyurethanes are also highly resistant to the effects of seawater, offering long operational life even under high pressures at great depths. In addition, they are corrosion free.

High resistance to abrasion and other abuse can be imparted through the appropriate formulation. When used as a coating, polyurethane can protect GRP, steel or composite foam components.

Polyurethanes also provide insulation against temperature extremes, a factor of increasing importance as exploration into deeper waters and higher latitudes continues and the efficiency of oil flow rates becomes critical.

Polyurethane products usually have an relative density of 1.1 making them relatively light and easy to handle on board ship, for instance in pipeline laying. This is an important factor in terms of efficient operation where pipelaying vessels may be on contract at rates of several thousand pounds per day.

The pipeline, the protection and associated products can be installed in one swift operation from the vessel instead of retrofitting after the line has been deployed.

Polyurethane elastomers and syntactic polyurethanes are two product areas which have seen particular growth of late. Descriptions of recent contracts demonstrate how they can be of help in many aspects of pipeline and other offshore applications.

Pipeline protection

Conventional methods of pipeline or umbilical protection and stabilisation by such means as trenching, rock dumping and concrete mattresses can actually be the cause of impact, abrasion or erosion damage. Cover can also be incomplete, especially with concrete mattresses.

In addition, these techniques can offer no protection in mid-water, at intermediate points between water and land, whilst unsuitable seabed topography with steep slopes may also provide problems. But a polyurethane elastomer sleeve is unaffected by depth and can be used both in exposed mid-water locations and on the sea floor.

An elastomer sleeve has been used in part of the Panbi project, an Elf development in the Angolan offshore sector. The route, on which the 16 inch steel, polypropylene-wrapped pipeline was to be laid, crossed another 10 inch pipeline between two other platforms, at a depth of about 75 metres. To prevent damage to either pipeline as the new line was laid, polyurethane elastomer sleeving was attached to the 16 inch pipeline over a 50 metre length.

A different version of polyurethane sleeving has also been developed to offer rapid protection to small diameter flowlines and cables, as and when needed. This is configured as a spirally wound sleeve, which can be opened and wound manually without tools.

A pipeline protection system is easily applied on-board ship while pipeline laying.

Connector buoys

Where a flexible riser is used in a floating production system, the connector may be activated in an emergency and the riser dropped on the seabed. This can result in damage to fixed structures on the seabed or the connector can bury itself in the sea floor and become difficult to retrieve. A connector buoy supports the end of the flexible pipe allowing it to be recovered from just above the seabed mudline.

These buoys are manufactured from a syntactic foam core with a polyurethane elastomer sheath. The syntactic foam can be rapidly exposed to extreme depths without damage and the polyurethane sleeve is highly abrasion and impact-resistant, yet flexible enough not to crack during descent.

Deploying pipelines

Flotation techniques are frequently used for assisting shore approach work when deploying pipelines. By attaching buoyancy tanks to the pipeline, its weight in the sea is reduced.

However, during a subsea tow, a light, thin-walled steel tank is easily crushed by water pressure. However, when filled with low density polyurethane foam, the tank retains its buoyancy and the foam helps resist crushing of the tank wall.

Syntactic buoyancy modules help when the final positioning of the pipeline is critical. By providing positive buoyancy, they allow the pipeline to be moved into its final location with ease. The modules can then be released by diver or ROV depending on final water depth.

Flexible protection

Flexible pipelines are more and more widely used around fixed and floating production units. The inherent disadvantage of flexibility is kinking of the pipeline due to bending through too tight a radius or excessive wear and stress where the flexible pipe is connected in dynamic modes.

Polyurethane elastomer bending stiffeners and restrictors are carefully matched to the pipe diameter. Thus they allow a predetermined maximum bend radius to be reached before locking and prevent overbending, even under extreme loading.

The application of engineered polymers is providing high performance, yet cost-effective answers to a number of protection and flotation problems. The continuing developments within the polymer engineering field promise exciting answers in the expanding subsea pipeline industry.

Bending stiffeners

The safety case for quality risk assessment

By Susan Harris, Four Elements

It usually takes a major accident to force a fundamental review in an industry's safety thinking – shipping, railways and the offshore industry have all experienced this recently. The good news is that these 'paradigm shifts' can provide the foundation for a more flexible, rational and transparent approach for industry, regulatory authorities and the public alike. Increasingly, the new safety and environmental regimes rely on risk-based approaches. We see this now in the United Kingdom in railways, the offshore industry, land-use planning for major hazards, under discussion in the shipping industry, and recently introduced as a guiding principle in environmental regulatory policy-making. And most people are aware of the risk assessments that are now required for every workplace.

It is no surprise that safety and environmental risks are legitimate public concerns - the main reason why there is a stream of legislation at national, state and supranational level. And the costs to business are high if things go wrong: the HSE estimates that the total cost to British employers of work-related accidents and ill health is between £4-9 billion a year at 1990 prices. The insurance claim for *Piper Alpha* was £746 million (1988 prices).

Clearly, from the company's point of view, costs must be kept as low as possible, and the legislation complied with. In the United KIngdom these requirements are conveniently packaged together in the regulatory principle *'As Low As Reasonably Practicable'*. This implies optimising expenditure since the principle recognises a practical limit on what is justified to make small improvements in safety. In practice, for complex systems, the principle requires some quantification of risk to establish what the dominant risk contributors are and to evaluate the various options for risk reduction.

The move away from prescriptive forms of safety legislation has placed the onus on the plant operator to demonstrate that they've adequately assessed and managed the safety risks. Safety reports are now mandatory for offshore and onshore potentially hazardous developments in many countries. Even if a quantitative risk assessment is not required as part of these formal submissions, many operators of existing plant have found value in a such a systematic approach: to highlight safety-critical parts of their existing plant, to present a well-argued case to regulators, to prioritise areas for risk reduction and to decide which of several options would be the most cost-effective from the safety viewpoint.

Onshore, quality risk assessment (QRA) of major hazard plant is well established, with tools such as SAFETI (Dnvl), RISKAT (HSE), RISKPLOT (Four Elements) and SIREN (EWI) being used by industry and regulators to determine individual risk and societal risk from the range of possible plant accidents. Such tools are the workhorses of QRA. They use information from accident consequence models about the behaviour (dispersion/ignition) of the released substance, plant-specific data on the location, frequency and timing of accidental releases and combine it with information about the surrounding area - comprising meteorological data, information on topography, location and variation with time of local populations - and data on the vulnerability of humans to toxic, thermal radiation or explosion effects. Typically, results are expressed as contours of individual risk (usually annual risk of death or serious injury) around a release point or line (plant or transportation route), or plots of frequency of occurrence against accident magnitude - number killed, financial loss etc.

There are several ways in which QRA results from such programs are currently used. For example QRA studies by Four Elements using RISKPLOT have found the following applications:

- Safety reports for process or storage plant
- Determining site location
- Formal assessments needed in planning applications
- Optimising plant layouts
- Choosing the most safety-effective upgrades to existing plant
- Comparing design alternatives
- Selecting the safest transport mode and route.

The question for the petroleum industry, is what can we expect in the future?

Increasing attention to 'modification of risk.' Standard generic failure rate data used in risk assessment represent an industry-average performance. If safety audits demonstrate a better-than-average safety management system, credit can be given in the risk assessment by applying modification factors, based on the results of the audit, to the generic data.

Better interfaces. In particular, QRA software can be linked to geographical information systems (GIS) and digital maps for representations of local topography, populations and any spatially-varying parameter. Four Elements' QRA work in Hong Kong uses GIS representations interfaced with its RISKPLOT software and is currently developing such systems to assess the risk from some less conventional hazards which vary with location, such as landslides and rockfalls.

Improved hazard identification techniques. Conventionally, techniques such as HAZOP are used. Expert systems and automated hazard identification methods are being developed. Fault tree and event tree construction are moving towards methods incorporating uncertainty, using, for example, fuzzy logic (8).

More attention to the quality of QRAs: validation of models used in QRA and uncertainty analysis of the results. There is an increased awareness of the human element in performing QRAs (12).

Improved handling of environmental effects in QRA. There are at present few commercially available models which deal with the environmental effects of accidental releases. One such model is PRAIRIE, AEA Technology's model for hazardous materials releases into rivers or estuaries. There are a number of difficulties still to be resolved in environmental risk assessment: the definition of environmental damage, the valuation of environmental assets, the quantification and comparison of impacts and the modelling of complex environmental pathways. However, the requirements of the new Control of Major Accident Hazards (COMAH) Directive may prompt developments in this area.

In Europe there are recent legislative developments in which QRA, whilst not necessarily mandated, will be important, especially in those countries such as Denmark, the United Kingdom and the Netherlands, where there is a traditional presumption in favour of risk-based techniques.

Firstly there is the proposed COMAH directive, yet to be issued in its final form. This will replace the Seveso directive and its amendments. For the petroleum industry three new areas, over and above the present Seveso requirements, can be highlighted where QRA techniques can be useful. These relate particularly to the 'top tier' sites, for which a full safety report must be submitted to the authorities. Like the Seveso Directive or the UK COMAH regulations, the proposed directive does not require that the safety report include a quantitative risk assessment. The enthusiasm of the Member States' authorities for mandating QRA in the implementing regulations and guidelines will no doubt vary as at present. However, Member States are required to submit their criteria for assessing safety reports to the Commission, which has the power to establish 'harmonised criteria' for this and, indeed, for land use planning. Such criteria could, in part, be risk based, as in the United Kingdom at present.

In the case of new COMAH areas, QRA offers the following benefits:

Assessment of the risks from 'domino effects' - the risks to and from neighbouring establishments must be taken into account in the safety report. Individual establishments which do not themselves fall within the scope of the Directive (top or bottom tier) may do so as part of a qualifying group of neighbouring establishments, and as such may need to submit their own safety report.

Exclusion from the requirement to submit a full safety report. This could apply to numbers of smaller establishments on multi-establishment sites. If an operator can demonstrate that his establishment is 'in a state incapable of creating a major-accident hazard,' the safety report can be limited to documenting the prevention and management measures for residual major-accident hazards. Such a demonstration may rest solely on the low severity of a credible worst-case accident, or may need to take account of frequencies too, to show that the overall risk is low enough to meet the regulator's criteria. Clearly, a screening-level QRA would be of use here.

Environmental risk. In implementing the Seveso directive, authorities have in practice concentrated on the safety of life. The COMAH directive includes the new risk phrase 'dangerous to the environment' as a criterion in its list of qualifying substances. There are indications that damage to the environment will receive more emphasis in future. This may introduce possible risk trade-offs between measures to protect the environment on one hand and human safety on the other. An example is the increased explosion risk that may be present in vapour recovery systems. There is a need for a common set of criteria by which such benefits and detriments may be compared in risk terms. Once these are established, QRA can be used to evaluate risk reduction options using a common measure.

COMAH excludes pipelines from its scope but it is expected that the Commission will at some future date bring in regulations for control of risk from hazardous pipelines. The United Kingdom has preempted this with new regulations governing the safety of pipelines carrying hazardous substances. These are currently in draft form and apply onshore and offshore.

There is no requirement in the UK regulations for a full safety report for major hazard pipelines, but their operators must prepare a Major Accident Prevention Policy which, amongst other things, identifies the major accident hazards and their associated risks, and demonstrates that they have been controlled as far as is reasonably practicable. Risk-based arguments were used to decide which pipelines should be regarded as major hazard pipelines, with the question unresolved in the draft regulations of whether to include 'extremely flammable liquid' - including gasoline, pending further QRA studies.

The third onshore legislative development is the so-called Boreholes Directive, its onshore provisions to be implemented in the United KingdomK in the Boreholes Sites and Operations (Safety and Health) regulations, currently in draft (18). They require an occupational risk assessment of the standard type specified by the *Management of Health and Safety at Work* regulations. In addition, the 'safety and health document' must address the flammable and pressure and toxic hazards: fire, explosion, blowout, and hydrogen sulphide and other toxic gases. Again, QRA is not required. However, QRA studies have been carried out for onshore well sites where the toxic risk from sour gas to nearby populations, as well as to workers, proved to be significant, dictating the need for cost-effective risk reduction measures.

Conclusion

We can therefore conclude that QRA is a well-founded technique for safety-related decision making, with established tools available to industry and regulatory authorities. Imaginative use of QRA not only improves safety understanding, it gives operators and authorities a common and realistic ground for negotiations on regulatory compliance.

Annual Dinner 1996

The 1996 Annual Dinner will be held at Grosvenor House, Park Lane, London W1 on Wednesday 21 February at 6.45 for 7.30 pm. Dress will be dinner jacket with decorations.

1. Applications should be made by completing the form below and sending it with remittance by **Friday 20 October 1995.** (Applications received after this date will be considered separately).

2. Collective (Company) members may apply for one or more tables of *10 seats* or less than a complete table. Individual members may apply for a maximum of four tickets. *However, as demand for places usually exceeds capacity, it may not be possible to grant requests in full. It is therefore advisable not to invite guests until tickets have been allocated and this will be completed by* **3 November 1995.**

3. Allocation of tickets will depend on the degree of involvement in IP affairs.

4. Tickets will not be sold to persons or companies who are not members of The Institute of Petroleum.

5. **The price of a ticket is £115 (individual members) and £155 (non-members), plus 17.5% VAT.** It is the responsibilty of applicants to establish whether or not their guests are individual members. Collective members should note that only the company's nominated representative to the IP is entitled to the reduced individual member rate, other employees or guests must be paid for at the non-member rate, unless they are individual members in their own right.

6. Successful applicants should submit by **Friday 12 January 1996** a full list of guests (names only, not companies) including decorations. Names submitted after that time cannot be included on the Guest List.

7. Companies or individuals wishing to share tables must state this when requesting tickets, as **changes cannot be made after tickets have been allocated.**

8. **Orders for tickets cannot be accepted over the telephone. The correct remittance must accompany the application form. Tickets cannot be allocated without payment, as no invoice will be issued.**

The Institute of Petroleum
61 New Cavendish Street, London W1M 8AR
A charitable company limited by guarantee
Registered No 135273, England
For enquiries *ONLY*: 0171 467 7100

This is not a tax invoice

Application Form – IP Annual Dinner, 21 February 1996

To: Caroline Little, Conference Officer
The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK

I wish to order _____ tickets and enclose my remittance, made payable to The Institute of Petroleum.
My application is made: as an individual member*/on behalf of a collective member* (*delete as appropriate).

Individual members _____ at **£115** = £ _____

Non-members _____ at **£155** = £ _____

_____ **VAT** at 17.5% £_____ **Total** = £_____

NAME: _____ **IP MEMBERSHIP NO.**** _____

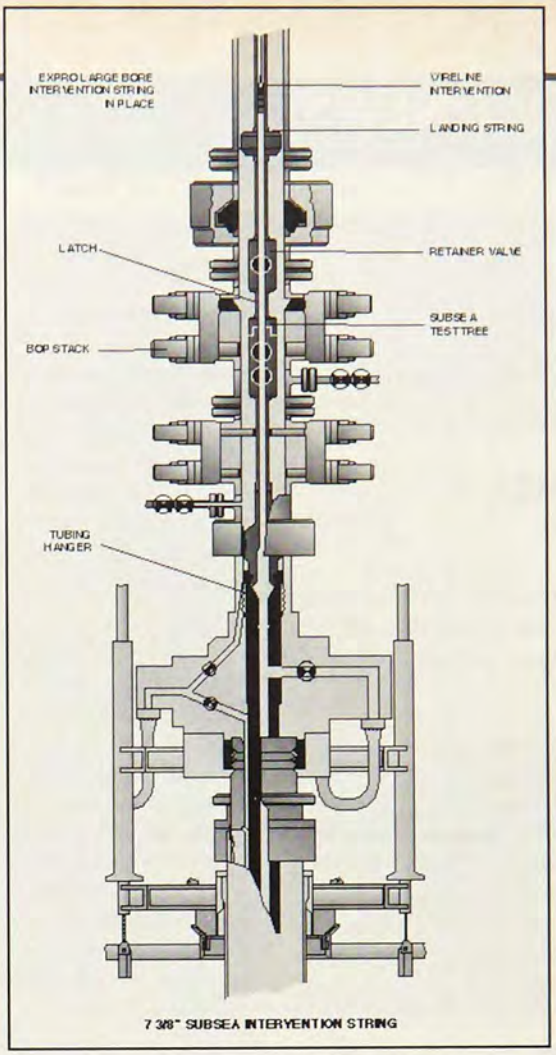
COMPANY: _____

ADDRESS: _____

_____

TEL: _____ **FAX:** _____

** please telephone Membership Department if unknown **Good, clear photocopies of this form are acceptable**



New system aids installation and maintenance of subsea wells

Recent industry developments have led Expro to offer a new large bore intervention system for the installation and maintenance of subsea wells using horizontal xmas trees.

The company has discovered that a growing number of operators are considering the application of such trees. The onset of horizontal, multi lateral drilling and completion technology has unlocked enormous potential productivity gains. When these are applied to subsea wells, large through bore completions and production trees are required. The application for horizontal subsea trees has also grown with the onset of deeper water operations, particularly in areas where artificial lift techniques such as electric submersible pumps (ESPs) are utilised and workover frequency may be increased.

A niche application for this technology was identified by Expro when applied to horizontal subsea xmas trees. By design, horizontal trees have no inline safety valves in the production bore. This area is a major concern to operators from an operations and safety standpoint. To solve this problem, the company developed a full bore safety system consisting of a suite of tools deployed within a drilling marine riser and BOP stack.

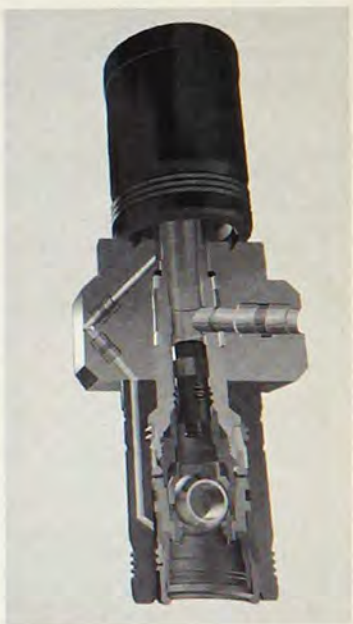
The subsea intervention string consists of a series of full bore 7 3/8 inch ID valves which are sequenced and certified to operate in conjunction with standard drilling equipment and horizontal subsea xmas trees. The equipment is fully qualified to API 14A standard and offers additional safety features to those delivered by dual bore installation systems.

The Expro 7 3/8 inch intervention string commonly consists of five basic modules:

- A tree cap lock and seal system which engages the intervention string to the internal profile of the horizontal subsea xmas tree;
- A dual ball intervention tree which is the primary safety barrier when working over;
- A latch mechanism which can be disconnected should it be necessary to retrieve the workover riser;
- A workover riser retainer valve which will retain the contents of the workover string to surface for safety and environmental protection;
- A riser lubricator valve which allows a portion of the workover riser below the rotary table to be utilised for long intervention tool strings.

The company also claims to be able to deliver a full workover solution by selecting and providing a suitable workover landing string, utilising low cost standard oil well tubulars. The entire system is rated for up to 10,000 psi operations and can be easily adapted for deep water applications.

In 1994 Expro jointly developed a full bore safety valve with the FMC Corp-oration which is placed within the upper profile of FMC's horizontal subsea xmas tree. The features of this ball insert are identical in performance to Expro's intervention tree and the two companies claim this allows operators to approach the dual barrier philosophy with more confidence than currently offered by utilising dual wireline plugs.



The full bore valve insert safety valve, developed jointly by Expro and FMC.

Expro 7 3/8 inch Subsea Intervention String.

IP INFORMATION SERVICE NEWS

E-mail: InstPet@cityscape.co.uk

You can now contact us via e-mail to request information, on-line searches, etc.

Eurolaw and DTI Briefings – ILI CD-ROM

We can now find the status of European Directives and other EC legislation and display or print the complete text. The CD-ROMs are updated every three months. For more information contact Catherine Cosgrove on 0171 467 7111

Reuters business briefing

We now have access on-line to Reuters Business Briefing. This service can find articles written in the press and leading journals dating from today's papers back through the last five years. For a fee we can search for you or you may come and use the system for yourself. For more information contact Deborah Ansell on 0171 467 7114.

Library & Information Service (LIS) Accounts

Due to demand members may now set up accounts to pay for library and information services in advance. Any item on which VAT is payable at 17.5 percent can be included, for instance, on-line searches, inter-library loans, photocopying etc. These accounts will save you time and money processing individual invoices and allow you a reduction in cost for some of the services offered. For further information and an application form please contact Catherine Cosgrove on 0171 467 7111.

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Margaret Whellams, Assistant Librarian 0171 467 7112

Online searches, information queries, statistical information –
Deborah Ansell, Information Officer 0171 467 7114;
Catherine Cosgrove, Head of Department 0171 467 7111

IP Statistical Service subscriptions – Deborah Ansell

IFEG – Catherine Cosgrove

Hours

Visitors welcome 9.30 a.m. to 5 p.m.
Telephone queries 10.00 a.m. to 5 p.m.
Monday to Friday except Bank Holidays

Esso

Since July the IP Library and Information Service has been contracted to supply much of Esso's inter-library loan, document delivery and other information needs. On receipt of a photocopy declaration form from an Esso employee in the scheme, the IP Library despatches articles the same day from stock, or arranges their prompt supply from other sources.

IP Statistical Service

The first quarterly mailing of the 1995/96 IPSTAT subscription has been mailed to all subscribers. This included a complete set of data sheets giving information on various aspects of the oil industry, and the quarterly figures showing deliveries of petroleum products into consumption in the United Kingdom. If you would like further information, please contact Deborah Ansell, Information Officer 0171 467 7114.

Library stock – or how we decide what to collect

The books and periodicals in the library come from a variety of sources. Some are kindly donated by library users and members. Various periodicals are received on an exchange basis or are sent to us free by the publishers. Everything else we have to purchase.

Since we do not have an unlimited budget and storage space is also at a premium, we have to exercise discretion in our purchasing. We scan the HMSO Daily List and BSI News for relevant items. We take note of items mentioned in the press. We pour over the catalogues produced by relevant publishers such as PennWell, SPE and API, as well as the one-off blurbs which cross our desks. We then weigh up the merits of each item and assess whether it fills a gap in the library collection,

Remember **– The library is here for the benefit of IP members and recommendations are always considered!**

Contact Margaret Whellams on 0171 467 7112

IP

THE INSTITUTE OF PETROLEUM

London Branch

'Back to Basics – Exploration: The Quest for Oil'

Tuesday 24 October 1995,
18.00 at the Institute of Petroleum,
61 New Cavendish Street,
London W1

Exploration sets the frontiers of the oil industry and is the key to maintaining future oil reserves in a world where the demand for energy continues to increase. The speaker will describe the objectives of a successful exploration company and the tools it employs to achieve those objectives. He will then go on to describe some of the current challenges and opportunities in this sector in terms of the political, technical and economic pressures it faces.

Tea and biscuits will be served at 17.00. 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

IFEG

Information for Energy Group

Visit to the Institute of Marine Engineers Marine Information Centre

Thursday 5 October 1995
at 4.00 pm

IFEG will visit the library at the Institute of Marine Engineers which can be described as a traditional library grasping new technology. Its holdings cover many aspects of the offshore industry as well as the traditional shipping areas. There will be a demonstration of the CD-ROM of Marine Technology Abstracts, new this year.

If you would like to attend please contact Catherine Cosgrove: Tel: 0171 467 7111 Fax: 0171 255 1472 E-mail: InstPet@cityscape.co.uk

IP

THE INSTITUTE OF PETROLEUM

Safe Logistics in a Changing World

31 October 1995

To be held at the Institute of Petroleum

Papers on the following subjects will be presented:

- The Drive to Improve the Cost Effectiveness of Coastal Operations
- Rail: Impact of Privatisation and Legislation, Costs, Service, Safety Pipeline Integrity Management
- Storage and Handling: The Challenges of Implementation of VOC Emissions Legislation and Cost Minimisation
- Environment – what does the future hold?
- Logistics Optimisation
- Road Transport – On-board Computers – Future Opportunities
- Contracting In – Contracting Out Road Transport: The Pros and Cons?
- Emergency Planning in the Logistics Chain

For further information, please contact Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK Telephone: 0171 467 7100 Fax: 0171 255 1472

Can Sir Ron Dearing's magic work again?

The whole of the school education sector seemed to be in ferment and constant revolution until Sir Ron Dearing's review of the National Curriculum produced a practical solution which was considered workable and acceptable by teachers, parents, educationalists and politicians. His speedy but extensive range of consultations and his willingness to listen to and reach a consensus from a wide range of views earned him much respect from all quarters.

Now the government hope that his skills can be equally effective with the next age group. He has been asked to advise on ways to strengthen, consolidate and improve the framework for 16 to 19 years old qualifications.

These currently embrace GCSE and academic 'A' levels as well as the developing General National Vocational Qualifications (GNVQs) whereas National Vocational Qualifications (NVQs) are being incorporated into modern apprenticeships.

The pathway between school and further education and the world of work is important not just for the young people themselves but the future prosperity of the country.

A major concern is the number of students who do not complete their courses. It is questioned whether the resources can be better used to enable young people to mix and match qualifications to suit their needs and abilities.

Other questions relate to whether there is scope to achieve greater coherence and breadth of study post-16 without compromising standards, whilst maintaining the vigour of 'A' levels. Should the core skills of communications, numeracy and information technology included in GNVQs be part of a programme of study for all 16-19 year olds? The lack of them seems to be a consistent criticism from employers. Perhaps the government hopes that Sir Ron Dearing's basic common sense will bring clarity to the world of education and training for 16-19 year olds. The highly specialised language, the number of bodies awarding qualifications as well as the number of qualifications and the pace of change all compound the difficulties of parents, employers and young people faced with crucially important decisions. The distinction between qualifications described as 'academic' and 'vocational' is far from clear cut. 'A' levels are available in vocational subjects such as accountancy or photography whilst business studies is available in both pathways. The distinction between GCE 'A' level and GNVQ has to do with differences in purpose, in approaches to the process of learning and in the means of assessment.

Sir Ron has now completed the consultations for the first stage of the Review and published an interim report on the outcome; the final report will be made by Easter 1996. During the next few months there will be research into the causes of wastage and non-completion. Further consultation will take place with interested organisations and more general forums held on particular issues.

It is understood that the final report will recommend further work. The Institute of Petroleum is considering organising a discussion to review the implications on the recruitment and training of young people who join the oil and gas industry.

Pedantically the review covers only England and Wales with the requirements for Northern Ireland also being considered. However, no doubt the underlying direction of the recommendations will affect the future policy for Scotland as both employers and young people are free to move around the Whitehall boundaries between the Scottish Office and the Department for Education and Employment.

Career development: who knows which way?

Is there still such a thing as a corporate career? How are careers in organisations changing and what are companies doing to help develop their people for the future?

Wendy Hirsh and Charles Jackson are authors of a new report from the independent Institute for Employment Studies which looks into the changes and challenges in corporate careers.

They have found that many large organisations believe their employees should take greater control over their careers and development, but many do not know how to because they do not know what the opportunities will be, what skills will be needed or where to go to get them.

The report recommends that organisations should decide who is responsible for career management and develop a strategy to restore the confidence of employees, to manage the changes and to achieve coherence of policies. It suggests that successful strategies evolve over time and that they require stability and continuity for proper implementation.

Information for schools

Two new colour publications are now available from the Institute of Petroleum to help school children better appreciate the activities in the oil industry.

A Young Persons Guide to Oil & Gas is a four-page leaflet which aims to trace oil and gas from formation to use by the customer. Produced in conjunction with the Northamptonshire Schools Inspection and Advisory Service it briefly describes the processes in a manner suitable for children in primary schools. It may also be used by teachers in the classroom and has been produced to meet the many requests the Institute receives from 8-11 year olds asking for more information about oil.

A new 40-page booklet *Oil, A Natural Resource* has been prepared to address the concerns of young people that our oil and gas reserves will run out soon and that oil spills at sea are polluting the oceans. Designed to be used by teachers of geography and enviromental studies, it provides them with information and case-study material at local, national and global level, as well as a range of student activities. It is suitable for 11-16 year olds, studying for GCSE and Standard Grades.

The materials have been prepared with assistance from the International Tanker Owners Pollution Federation and a geography teacher.

Following a mailing to the Heads of Geography in all UK secondary schools before the end of the summer term, over 1,500 requests have so far been received. We expect the number distributed will rise substantially during the autumn term.

Sponsorship for engineering

High-achieving A-level students who choose an engineering degree course can win £500 per year for the duration of the course. The 'Top-flight' bursary scheme launched last year is open for applications again. The £10 million scheme is funded by various government education departments and administered by The Engineering Council.

Tony Fox Memorial Scholarship winner for 1994/95, David Lackenby, is pictured receiving his award from IP Technical Director, John Hayes, in the company of Mrs Anne Fox.

Training funds for small firms

The Department for Education and Employment has launched a £5 million training initiative to help small firms. Groups of 10 or more companies are being invited to bid for awards of up to £50,000 to assist with the funding of training ideas. Two competitions will be held, one in September and one in December.

The winners of the first stage will be notified by the beginning of November 1995.

The Skills Challenge aims to improve the business performance by supporting groups of 10 or more small businesses who will work together to find new ways of training to meet their skill needs.

The awards will:-

- build small businesses' skills to keep pace with demands of their markets
- help companies to work together in groups.

Additional benefits include:-

- improved workforce skills and shared training costs
- exchanging ideas and investing best practice in training and other fields
- meeting other companies with the possibility of opening up new business opportunities.

How to take part

Everything you need to know about Skills Challenge is detailed in the prospectus, but broadly this is how the challenge will operate.

- The challenge is open to businesses with under 200 employees, and entries are particularly welcome from those with under 50.
- The training project must include 10 or more small businesses fulfilling the above criteria.
- The 10 small businesses do not have to be linked in any formal way. The reason for their coming together is simply a common need for training.
- Entry is in the form of a written 'bid' comprising the general details of the training project – not more than four A4 pages.

Further information may be obtained from a local TEC or ITO. For the petroleum industry these are PESC or OPITO.

Breakthrough techniques show benefits of NVQs

The Standing Conference on Extraction & Processing (SCEP) is the body for the oil, chemical and other processing industries responsible for developing competence standards and vocational qualifications (VQs) for engineering occupations particularly at the professional levels.

SCEP comprises company representatives from the oil and processing industries, academy and engineering institutions and its work so far has concentrated on the development of standards. It has been recognised that more attention needs to be paid to how employers and staff will use the standards. A new service that enables business teams to achieve extra ordinary improvement in results by the use of Breakthrough Management technique was used in a SCEP workshop. Vision Quest system was used to identify and understand the real requirements of employers and staff and the circumstances that influence the use of NVQs in engineering at higher levels.

Breakthrough sessions can be as small as a single meeting to design a new marketing strategy or agree principles of collaborative working with suppliers and can relate to small or large projects.

At the SCEP workshop approximately 20 people were grouped two or three per workstation interlinked by a LAN.

This electronic consolidation of a roomful of screen flip charts enabled any information gathered on any part of the network to be immediately sorted and shared with all the participants. Not only did this enable a great deal of work to be achieved in a short time but this technique inspired group members' best contributions by focusing on meeting productivity rather than procedures, on problems rather than personalities.

The brainstorming on the LAN allows everyone to talk online simultaneously – each idea entered appears on all workstations in real time, creating an exciting atmosphere of accelerated idea generation and collection. Vision Quest allows even the most reticent individual an equal voice.

It is then possible to categorise any number of alternatives and rank them. Workstation groups assign a rank to each alternative while Vision Quest computes the average rank assigned by the group as a whole and displays the results in order of group preference, at the same time showing the ranges of opinion.

The system similarly allows alternatives to be rated on a numeric scale, select alternatives, score or weight items or allocate points.

The benefits and value of occupational standards and NVQs to individuals was seen to be that they:

- allow mobility, transferability of skills and portability of skills through common universal terminology and standard qualifications
- facilitate career planning through clearer paths to qualification and professional recognition and a better understanding of people's development and training needs
- clarify the individual's role through measurable tasks and targets, can support appraisal and mentoring.

The value for companies was seen to be that they:

- improve performance (efficient working)
- ensure safe and competent working practices (effective working), reassurance of contractors and regulatory bodies
- provide a professional basis of competence through common universal terminology and industry portable standard qualifications
- help employers with human resource processes, job description, recruitment, appraisal and training through consistent assessment of competence.

Not unsurprisingly, there was some overlap between the individual and company benefits identified by the workshop.

PEOPLE

Two top executives from Ingersoll-Dresser Pump Company have been named to head pump trade associations in Europe and North America, respectively. **Mr Antonio Bonaso**, Managing Director and Chairperson of the Board of Ingersoll-Dresser Pump Company SPA, has been named President of Europump, based in Brussels. **Mr Kevin Kilbane**, President of Ingersoll-Dresser Pump Company's Engineered Business Unit, has been named President of the Hydraulic Institute, based in Parsippany, New Jersey, USA.

Mr David Woods has been appointed Project Manager of the joint Addison & Baxter Ltd and Marine Acoustics Ltd low-cost marine seismic data acquisition and onboard data processing project. He was previously with Intera, UK. **Mr Peter Hodson** also joins the project team as a senior software engineer.

BP Exploration chief geologist **Mr Richard Hubbard**, has joined Monument Oil and Gas as Head of Exploration. **Mr Andris Blankenburgs** joins from Oryx UK Energy, as Commercial Manager responsible for UK, Europe and new ventures.

***Mr John Waring* is to become the new UK Sales & Marketing Manager of Hatmann & Braun's Digital Control Systems (DCS). He will take on total responsibility for spear-heading the development of sales to the processing and energy business in the United Kingdom, as well as that of export through international engineering contractors.**

Ranger Oil (UK) Ltd (ROUK) announces the appointment of **Mr Alan Henderson** as Chair of the company. He replaces **Mr George Wood**, Chair since 1994 who is retiring. Mr Henderson joined Ranger Oil Ltd in 1990 and since 1994 has held the post of Vice-Chair of ROUK.

The C W Nofsinger Company, a division of Burns & McDonnell, announces the appointment of **Mr Richard L Cooper** to market the firm's professional engineering services to petroleum refining and chemical process industry clients.

***Dr Michael A Frend*, Technical and Business Affairs Manager for Lubricants at Shell International Petroleum Company in London, has been appointed Director General of the United Kingdom Petroleum Industry Association (UKPIA). He takes up his new post on 23 September when *Mr David Parker* retires.**

Fisher-Rosemount has appointed **Mr John Andrews** as World Wide Account Director for the ICI and Zeneca accounts. Mr Andrews has worked with Rosemount and Fisher-Rosemount organisations at Bognor Regis for the past 11 years was previously with ICI as an instrument engineer. His main responsibilties include initiating long term plans, forecasting future business needs and developing and enhancing special partnership agreements with the nominated customers.

***Mr John O'Connor*, Chief Executive Officer for BHP Petroleum has announced the appointment of *Mr Howard Paver* (above) as President and Group General Manager, BHP Petroleum, Europe, Russia, Africa and Middle East Region. He will be based in London.**

The Noble Denton Group – independent marine, engineering and meteor-ological consultants to the offshore industries – has announced several staff moves. **Mr Richard Bush** has been appointed General Manager of the Aberdeen office. He will head up a multi-disciplined team of master mariners and engineers, and will focus on the changing needs of the oil and gas industires offshore Aberdeen. **Mr Jim Tares** is to be promoted to Senior Consultant after 14 years as General Manager of the Aberdeen office. **Mr Lars Løken** has been promoted to General Manager of Noble Denton Norge A/S in Oslo where he will succeed Mr Richard Bush. He will continue to promote services such as engineering consultancy for the Heidrun and Troll Projects. **Dr Nigel Robinson** will be returning from Kuala Lumpur, where he has been working since 1993, to join the Aberdeen office.

Christos Papoutsis has been appointed EU Commissioner for Energy. Mr Papoutsis, an economist and member of the main board of PASOK (the Greek Socialist Party), has been a member of the European parliament since 1984. As the commissioner for energy, he will be responsible for the preparation of a white paper on the EU's common energy policy.

President of the Board of Trade **Ian Lang** has put **Lord Fraser** in charge of the Glasgow-based Oil and Gas Projects and Supplies Office, which seeks opportunities for UK technology in the world market. Lord Fraser will have equal rank with **Mr Tim Eggar**, the industry and energy minister, and will represent the department in the House of Lords.

Snamprogetti Ltd have appointed *Mr Richard Selwa* (above) to Manager – Aberdeen Operations. Mr Selwa will be based in Aberdeen and be responsible for promoting activities in the fields of subsea engineering, submarine pipelines, safety, environmental and reliability engineering. *Mr Richard Scholes* (below) has also been appointed to the position of Manager of the Personnel and General Services Department. He will be based in Basingstoke where he will be responsible for all matters relating to human resources, health, safety and training together with administration of the company's facilities, both in Basingstoke and Aberdeen.

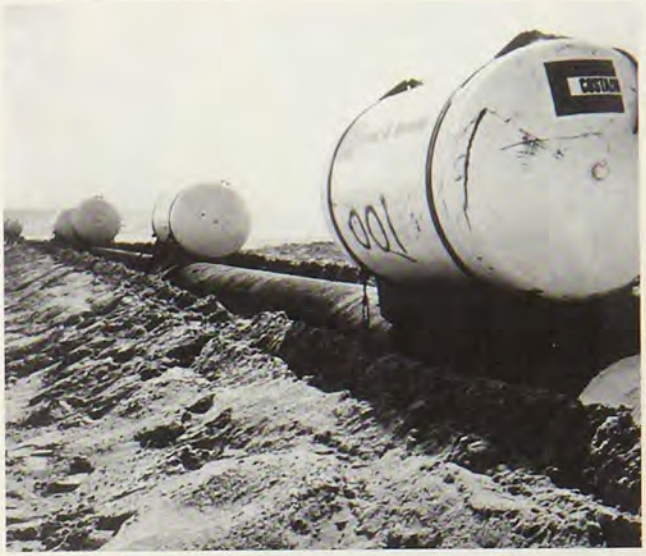
Saddling up for the seabed

CRP Marine has designed a range of polyurethane elastomer saddles for the secure attachment of equipment or structures to subsea pipelines.

The saddles are moulded with a lower profile to match the pipeline diameter and an upper profile to match the equipment being attached.

They are strapped to the pipeline using corrosion-resistant materials. This is usually carried out before the pipeline is installed, although saddles can also be retro-fitted subsea.

The polyurethane elastomer used for moulding the saddles has a slight negative buoyancy in seawater.



CRP Marine has designed a new range of pipeline saddles

Improved oil recovery

Research at the Universities of Edinburgh and Heriot-Watt, in conjunction with VIPs Ltd and Intera Ltd, has led to the development of a new computer simulation system which 'could significantly improve the recovery of oil and gas from underground reservoirs'.

The new ECL2VIS system is based on merging the capabilities of Intera's Eclipse 100 reservoir simulator with VIPS' Visage™ package for geotechnical stress analysis. The system is being validated using field data supplied by sponsoring oil companies. VIPS is responsible for overall management of the project and for the commercialisation of the new product.

The system takes into account geomechanical processes and has the potential to help solve other environmental and engineering problems related to fluid flow through reservoir rocks.

The researchers have been using experimental equipment which can stress rock samples until they crack to investigate exactly how stresses on the rocks and the chemistry of the pore waters affect the fluid flow.

Ship-shape and Bristol fashion

Inspecting for 'hot spots' at sea with a Thermovision 450

The non-contact temperature measurement technique, infrared thermography, is becoming increasingly popular amongst ships' maintenance engineers as an effective tool for monitoring the condition of on-board mechanical and electrical installations.

The technique is particularly successful at looking for connections which have become loose through vibration or for identifying joints which have been corroded.

The major advantage of the technique is that ships can be surveyed under normal operating conditions and, because thermal imaging cameras allow you to pan over large areas at a time, many installations can be inspected in one go. Any faulty connections which come into the field of view will immediately be detected as hot spots in the camera's viewfinder.

The Thermovision 450 thermal imaging system from AGEMA Infrared Systems has a temperature measurement range of -20°C to +500°C and a sensitivity of 0.1°C at 30°C. It is used in conjunction with a portable video recorder and a polaroid camera.

A video copy processor unit is used to extract thermal images from the video tape, which are then compared with photographs from the polaroid camera.

Two new optical instruments

Chelsea Instruments (CI) has added two new optical instruments to its extensive range of oceanographic instrumentation.

The first addition is the UV Aquatracka. This is a submersible fluorimeter, specifically designed to monitor the concentration of hydrocarbons and dissolved organic matter in a wide range of oceanographic applications.

It utilises a pulsed xenon light source and a miniature photo-multiplier as the detector, the output of which is read by a 20-bit ADC under the control of a microprocessor with two megabytes of RAM. The output data format is factory set as either digital RS422 or analogue voltage with logarithmic scaling. Built in test (BITE) circuitry ensures a high stability of internal calibration against both time and temperature.

CI has also launched a Mark 11 version of its transmissometer, Alphatracka. This measures light attenuation at one of four wavelengths: red, green, blue or yellow. The new version is smaller, lighter and has full ocean depth capability.

New generation pipe and joints

A new generation of polyethylene coated steel pipe and mechanical joints for the petrol station forecourt market has been launched by British Steel Tubes & Pipes and Victualic Systems.

Securipipe, British Steel's proven polyethylene coated steel pipe, can now be used with specially developed Victualic joints for underground pipework.

This combination gives the advantage of strength and speed, which comes from robust steel pipe with full corrosion protection, allied to an extremely fast installation procedure.

Fire jackets for chemical pipes

AIC Iso Fire Pro is a flexible, passive fire protection jacket system for pipe fittings.

Particularly suited to the chemical industry, it is designed to provide reliable fire protection for standard or fabricated flanges, vessels, instrumentation and other complex shapes in product, fuel and HVAC services lines.

Using a combination of proven-in-service materials, the system combines economic installation and ready access for maintenance with effective passive fire resistance. It offers up to 100 minutes protection against a jet fire (J100) and 120 minutes against hydrocarbon fire (H120).

Prefabricated from flexible, high temperature, ceramic insulation in a coated glass cloth cover, the jackets incorporate a barrier of flexible rubber-based composite which, in the event of fire, fuses into a hard protective shell.

The system has been fully tested at Warrington Fire Research Station and The British Gas Research Station in Cumbria, according to the manufacturer. Independently assessed by Lloyds Register and the DNV, the jackets are said to withstand fires of up to around 1,600°C and are deluge and abrasion-resistant.

In the event of fire, the rubber jacket transforms into a hard shell

Breathing air filling station

A self-contained system designed to supply quality breathing air for diver safety and life support requirements recently made its debut.

The Bauer Verticus V-10 Filling Station from SAS is capable of breathing air delivery rates of up to 320 litres per minute at 225 bar. The filling panel, built on the unit, has four connections for the efficient filling of breathing air bottles or storage cylinders.

The station is soundproofed and requires a floor space of only around one square metre for installation. The equipment features a four-stage high pressure compressor unit, an air processing and filtration system capable of producing breathing air to international standards, and safety controls for the monitoring of filter efficiency and compressor operation.

Operation can be manual/semi automatic or stop-start/fully automatic.

Rheometer for the drilling industry

Brookfield has launched a new rheometer to meet the demands of the oil and gas industries.

The TT-PVS is designed for measuring the viscosity of drilling and fracturing fluids under enclosed conditions.

It features co-axial cylinder geometry to provide fast, accurate measurement at high pressures and temperatures and can be easily set up to simulate in-process test conditions.

A broad viscosity range allows measurement of base gels from one cP to 500 cP and cross-linked gels between one cP and 5,000 cP. Specific performance parameters include pressures to 1,000 psi, temperature to 200°C and shear rates from 0.002 sec-1 to 6,000 sec-1.

The instrument can be rapidly set up to perform tests on multiple samples.

Measure temperature with accuracy

New from Comark is the C8650 Tempscan Precision Thermometer, which has been designed for very high accuracy, reliability and long-term stability.

The thermometer has a system accuracy of +/- 0.02°C achieved through AC bridge measurement technology. This is claimed to eliminate the drift associated with DC circuitry to provide long-term stability, avoid the need for regular re-calibration and maintain the instrument's accuracy throughout its entire measurement range.

The AC bridge technology is coupled with precision PRT (Platinum Resistance Thermometer) probes. Accuracy is increased even further as the calibration coefficients for each probe used can be entered into the instrument. This information is stored in non-volatile memory and a removable key prevents accidental tampering with programmed values.

The thermometer has two inputs and can display values from either, or the difference between them. When used with a Comark Tempscan eight or 16 channel switch box, it can monitor readings from up to 32 probes or 16 differential pairs throughout its -200°C to +800°C measurement range.

The C8650 Tempscan Precision Thermometer

Gas and fire detector for rigs and refineries

New to GMI's range of systems is the Chieftain, a four point gas and fire detection system specially designed for use in hazardous areas, such as refineries and oil rigs.

The system is housed in a fully-certified flameproof enclosure with digital display and control module visible via a square window in the enclosure.

The system is configurable for a combination of methane, hydrogen sulphide and fire. Calibration can be carried out using the external switches without opening the enclosure.

The detector is also available in its component parts for integration into another system. This flexibility is achieved by a modular construction, which has the added advantages of easy service, maintenance, calibration and repair.

The 'Chieftain' is designed for hazardous areas

Energy information repository

Information specialist Saladin has launched EnergyServer, a new type of information repository for the energy industry.

By providing a single, comprehensive store of information, the repository enables organisations to consolidate previously uncoordinated and inefficient data collection and manipulation processes.

The product collects historical and real-time data from a wide variety of information vendors and from internal sources, stores it in a central database and automatically performs the standard and sometimes complex manipulations used in energy trading and supply.

This information is then ready to be used throughout the organisation, from trading systems, spreadsheets and analytical tools to back office billing systems.

High purity pressure regulators

The HPR 1 0-10 psi range

Haskel Energy Systems of Sunderland has developed a range of eight new, high purity liquid and gas pressure regulators.

The range is designed for use in systems and processes demanding the highest standards of cleanliness in media handling for sampling, research and development, air and gas cylinder charging, and offshore and electronics component manufacture.

The regulators are available in a choice of stainless steel or brass of special high purity, machined to fine tolerance in 'clean room' environments to ensure contaminants are eliminated.

Inlet pressure capability ranges from 300 to 10,000 psi with outlet pressures of up to 6,000 psi.

Operating temperatures of between -40°C and 500°C can be accommodated within the range.

Pneumatic actuator

Parker Hannifin has launched a pneumatic rotary actuator for remote control of instrumentation ball valves, featuring a dual piston mechanism for reliability and integrity of operation.

Suitable for use with a wide range of air pressures from 20 to 120 PSIG, the actuator is available in five sizes.

The broad choice allows the actuator to accurately provide the drive force for instrumentation ball valves of up to two inches in diameter, making it suitable for a wide range of automated control applications.

CONTACTS

CRP Marine	01695 24343
Chelsea Instruments	0181 941 0044
VIPS	0181 549 3444
AGEMA Infrared Systems	01525 375660
British Steel Tubes & Pipes	01536 402121
AIC Fire Protection	01889 575700
SAS	01942 724248
Brookfield Viscometers	01279 451774
Comark	01707 331051
GMI	0141 812 3211
Saladin	01932 243233
Haskel Energy Systems	0191 549 1212
Parker Hannifin	01271 22591

INSTITUTE NEWS

NEW COLLECTIVE MEMBERS

Defence Research Agency,
Centre for Marine Technology,
DRA Haslar,
Gosport,
Hants

IP Nominated representative: Mr Bob Seymour

The Defence Research Agency (DRA) is Europe's largest defence research organisation. The Centre for Marine Technology is one of DRA's Dual Use Technology Centres with a specific mission of making the results of the UK MOD's marine-related research activities available for commercial exploitation. Specific emphasis is placed on partnerships and collaboration with the maritime, offshore and environmental industries to effect the transfer of technology.

SHL Systemhouse,
300 South Wacker Drive,
Chicago IL 60606
USA

IP Nominated representative: Ms Susan Tripp

SHL Systemhouse is an international technology-focused management consultant firm with over 5,200 staff possessing extensive experience in the energy and trading market.

OATS Ltd,
701 Delta Business Park,
Great Western Way,
Swindon,
Wilts

IP Nominated representative: Mr H Sebastian Crawshaw

OATS Limited provides specialist support for the lubricants professional worldwide. OATS Manufacturers Recommended Lubricants (MRL) service comprises recommendations based on manufacturers' requirements using OEM specifications. The MRL provides a reference tool for technical and marketing personnel in the lubricants industry and covers on and off-highway application for automotive and agricultural use.

Ernst & Young
1 Lambeth Palace Road
London
SE1 7EU

IP nominated representative: Karen Gordon

Ernst & Young provide a full range of services, integrated across disciplines and geographic boundaries, and are co-ordinated for each client by an individual service team.

Their World Energy Centres in London and Houston co-ordinate worldwide energy expertise, ensuring that they meet the changing needs of their clients. Their energy services network brings together advisers with experience in all areas of the energy industry, backed by the resources of over 64,000 people in more than 120 countries. Their commitment to the global energy industry is reflected by investment in innovative approaches to energy assurance services and by their leading methodologies for the implementation of business change, formulation of strategy, tax, asset management and outsourcing of business processes. Using extensive client relationships they are able to offer integrated solutions to energy clients. Using their understanding and knowledge of the industry they can take the wider perspective, solving immediate problems, working with clients to achieve long-term success.

NEW FELLOWS

Mr Howard W Dalton
Mr Howard Dalton is an Executive Director and member of the Board of British Gas plc. He is responsible for the CIS, Middle East and Africa Region, Exploration & Production, Pipeline Integrity International, Engineering Projects, Health, Safety & Environment. Prior to joining British Gas as Managing Director, Exploration and Production in June 1990, he held a number of senior positions with Amoco over a career spanning 30 years before retiring as President and General Manager of Amoco Egypt, based in Cairo. Born and educated in Rochester, New York, he is a graduate in Petroleum Geology from Rensselaer Polytechnic Institute, in Troy, New York.

Mr Steven M Theede
Mr Steven M Theede has been Managing Director and Chief Executive Officer of Conoco Limited since July 1994. He came to Britain in 1992, when he was appointed Managing Director - Marketing & Operations, Conoco Limited. Previously he had been President of Conoco Pipe Line Company and General Manager of Transportation Operations, Conoco, based in Houston. Mr Theede began his career with Conoco in 1974 as an engineering trainee for Conoco Pipe Line at Cheyenne, Wyoming. He served in several engineering positions before being named District Manager for Conoco Pipe Line's Pioneer District at Salt Lake City in 1979. He subsequently became Executive Assistant to Mr C S Nicandros, President of Petroleum Operations and Division Manager for Conoco's Eastern Wholesale Division.

Mr D M Faux
Mr David Faux has worked in the downstream side of the industry for 27 years in Great Britain. He started his career with Esso Petroleum in retail marketing and later worked in the same field for Shell UK. In 1974 he joined Ultramar and has held various posts in marketing and logistics. Recently he has moved from Kuwait Petroleum (GB) where he was Manager of Supply & Distribution to Kuwait Petroleum Aviation. He is an active member of the Institute – Chair of Oil Loss Committee PML6 and a member of DOC-4. He is also a member of the Chartered Institute of Marketing and the Institute of Management.

Mr John H Steele
Mr John Steele is currently Managing Director, Esso Exploration & Production UK Limited and on the board of Esso UK plc and Esso Petroleum Company Limited. He assumed this position in January 1995. Born in 1941, he received degrees at the North Carolina State University in BSc/Civil Engineering and MSc/Engineering. Mr Steele joined the Exxon Co-operation USA in 1965, holding a variety of technical and supervisory positions in Oil and Gas Production in the United States. In 1976 he was named California District Manager in Exxon USA. Mr Steele transferred to EPMI as Production Manager in 1978 and then in 1982 was appointed as Director of Esso Exploration and Production Norway. In 1985 he took up the position of Division Manager, EUSA, New Orleans. Subsequently, he became production Operations Manager and later Vice President Production, EUSA, in Houston.

Mr Robert A Solberg
Mr Robert A Solberg, Vice President of Texaco Inc. and Chair of London-based Texaco Limited, was born in Grand Forks in 1946. He graduated form the University of North Dakota in 1969 with a BSc in Civil Engineering. Mr Solberg then joined Texaco as a petroleum engineer in the Tulsa Division. He continued to hold engineering positions with increasing responsibility before being named Senior Petroleum Engineer on the Texaco USA Division Executive Staff located in Houston in 1980. The following year, Mr Solberg was appointed assistant Drilling & Production Manager in

the Houston Division, and subsequently joined the Midland Division in that capacity when the divisions were consolidated in 1984. He was appointed assistant to Management in the office of the President and Chief Executive Officer of Texaco Inc., in Harrison, New York, in 1987. He was named Division Manager in the Midland Division of Texaco USA in 1989 and was subsequently named Managing Director - Exploration & Production of Texaco Limited in 1991. Mr Solberg was elected Vice President of Texaco Inc in September 1992. At that time, he was also appointed Deputy Chair of Texaco Limited, with responsibility for all UK North Sea exploration & producing operations, and for refining, marketing and supply activities in the United Kingdom and Ireland. He was appointed to his present position in December 1994.

Mr J M Evon

Mr Evon is presently President and General Manager for BHP Petroleum responsible for Europe/Russia/Africa and Middle East Region. Educated at Pennsylvania State University he gained a BSc in Industrial Engineering (Distinction). His early work experience was gained in Technical and Development Associations with the Exxon Corperation. In 1974 he worked in Malaysia as Engineering Manager. In 1977 he took up the position as District Manager in New Orleans. In 1983 he became Vice President & Director responsible for exploration, production and natural gas for Esso Norge AS in Stavanger, Norway. He became Vice President responsible for the production department in Houston in 1988. In 1989 he was elected Chair for the Oil Spill Policy Task Group for the Exxon Company in Houston. Transferring to the Asia/Pacific, he became responsible for new ventures for BHP Petroleum. In 1991 he accepted the position of Group General Manager of BHP Petroleum, Australia. He was appointed to his present position this year.

Mr Doug Barrow

Mr Barrow trained as a deck officer. In 1975 he came ashore and accepted the position of petroleum surveyor for a short while, prior to managing a leading Arabian supplier. In 1983 he left to head the European bunker division of a Japanese trading house. After a short spell in Singapore as a bunker broker, he returned to London to manage the UK office of an Italian oil company, Maxcom, which are bunker suppliers and traders. He is a founder member of the International Bunker Industry Association where he is currently Chairperson. An active IP member, he was a speaker at the *All at Sea with Fuels and Lubes* conference held last year.

AROUND THE BRANCHES

ABERDEEN

10 October (tbc): *The Consequences of Competition on the Gas Market*
Dr Norman Ellis MD Kinetica.

14 November: *Magnus: Developing a Mature Asset*
Ian Cook, Development Team Leader, BP Exploration, Will Banks, Project Manager, Asset Engineering Alliance.

EDINBURGH & SOUTH EAST SCOTLAND

2 October: *Instrinsic Safety*
Don McIvor of MTL (Joint meeting with Institute of Management & Control).

Late October: Young Students' Visit to BP Grangemouth.

30 November: *A Layman's Guide to Vacuum Drying*
Warren Johnson, Managing Director, Hydrotesting Consultants Ltd (Joint Meeting with Pipeline Industries Guild).

ESSEX

11 October: *Applications for Nitrogen in Petroleum Storage and Distribution Industry*
Messrs Robinson, Plumb, Karim and Rawles of K Linde Gas UK Ltd.

8 November: Ladies Evening: *Garden Topics.*
Neville Fisher of Tomlins Nurseries.

HUMBER

5 October: *British Steel Challenge (The Toughest Yacht Race Ever),* Keith Mundel.

27 October: Annual Dinner/Dance, Beachcomber Club, Humberston.

23 November: *Grimsby's Information Superhighway Communications*
Steve Boon of Diamond Cable.

LONDON

24 October: Exploration.

MIDLANDS BRANCH

18 October: *Convenience Shopping and Fuel*
A presentation by Elwyn Davies of A P Blakemore & Sons (Spar) Ltd, to be held at Conoco Ltd, Conoco Centre, Gallows Hill, Warwick.

15 November: *Bioremediation Technology: Environmentally Compatible Solution for Contaminated Land, Ground Water and Industrial Effluents*
A presentation by Dr Paul Jackson of International Bioremediation Services Ltd at Houghton Vaughan plc, Legge Street, Birmingham.

NORTH EAST

17 October: *Vapour Collection and Recovery for Road Tanker Loading Terminals*
A A Sangster, Institute of Petroleum.

3 November: IP/PITANE Social and Quiz, Hallgarth Manor Hotel, Durham.

NORTHERN

17 October: *Hazardous and Controlled Waste*
Adrian Wade, Robinson Bros Disposals Ltd, Belfry Hotel, Handforth.

21 November: *Environmental Lubricants*
Dr Stephanie Harold, Lubrizol (UK) Ltd, Belfry Hotel Handforth.

24 November: Annual Dinner/Dance, Belfry Hotel, Handforth.

STANLOW

11 October: *CFC Alternatives*
Peter Clayton, ICI, KLEA at Park Royal Hotel, Stretton, Warrington.

10 November: Annual Branch Dinner/Dance, Village Hotel, Bromborough.

23 November: *Fibre Optics*
Professor G Jones of Liverpool University, Village Hotel, Bromborough.

SOUTHERN

4 November: IP Ball

SOUTH WALES

17 October: Visit to Second Severn Crossing

23 November: *Business and the Environment*
Dr Clive Morgan, Ridgeway Environmental Management, Texaco Refinery, Pembroke.

WEST OF SCOTLAND

26 October: Celebrity Lecture (by ticket), Heinz Rothermund, MD of Shell UK E&P, at Strathclyde University

YORKSHIRE

10 October: Castrol and Motor Sport

14 November: *Volvo Engines and the Future*
M T McAleary, Production Information Manager

INSTITUTE NEWS

NEW MEMBERS

Mr R H Blake, James Blake & Company, 30/32 South Fort Street, Leith, Edinburgh, EH6 5NU.
Mr M H Chu, Maritime Services (HK) Co Ltd, 21C, 88 Commercial Building, 28-34 Wing Lok Street, Central, Hong Kong.
Prince A M Esiri, 223B Ashley Gardens, Emery Hill Street, London, SW1P 1PA.
Mr M A Hill, 2 Edwinstowe Close, Weston Favell, Northampton, NN3 3NW.
Mr R C Lawrence, Davy Process Technology Ltd, 30 Eastbourne Terrace, London, W2 6LE.
Miss C H Little, Institute of Petroleum, 61 New Cavendish Street, London, W1M 8AR.
Mr M Llewelyn Jones, Gerald Eve, 7 Vere Street, London, W1M 0JB.
Mr I M Ng, Golden Faith Company Ltd, Flat 29 2/F Metro Centre II, 21 Lam Hing Street, Kowloon, Hong Kong.
Mr P J O'Keefe, Thomas R Miller & Sons (Bermuda)Ltd, International House, 26 Creechurch Lane, London, EC3A 5BA.
Mr H K Polavarapu, EPPCO., P O Box 5589 Dubai, UAE.
Miss C A Smith, 16 St James Court, Woodfield Close, Ashtead, Surrey, KT21 2RU.
Mr D Thomas, Steptech Instrument Services, Steptech House, Maxwell Road, Stevenage, Herts, SG1 2EW.
Mr D York , 18 Waltham Ave, Sinfin, Derby, DE24 9PS.

STUDENTS

Mr C Gutierrez-Dietrich, 2 Fann Street, London EC2Y 8BR.
Miss E M Lembessis, 90 Station Road, Finchley Central, London N3 2SG.

PETROLEUM REVIEW

Any readers interested in free back copies of Petroleum Review, dating from 1954 to 1967, or in a wide range of books on petrochemicals dating back to 1985 should contact Mr Richard Melville, tel: 0181 979 6615 or fax: 0181 979 9335

Summer Social Meeting Report

Members, their wives and friends had an interesting gathering at Astley Vineyards, in Worcestershire in the summer.

A pleasant evening learning about the trials and tribulations of wine growing in a northerly climate was enhanced by liberal tastings of the excellent products of this award winning vineyard. Whilst a number of the party delighted in tasting the Kerner, for many the experience of falling in love with the Madeleine Angevine made the evening more memorable.

In this part of the country, wine making was practised by the Benedictine Monks more than 600 years ago, but Astley Vineyard was only started in 1979. However it now has a high reputation for quality wines. After this year's summer we could look forward to a return visit to sample the 1995 vintage.

Amongst Midland Branch's series of technical papers held during the year, we do hold a number of social events with the next one being a night out at the Dogs in Birmingham, on 16 November. This is followed by the annual Dinner Dance, held jointly with the BLF, at Solihull on 19 January. All members and friends are more than welcome at these events.

UK Deliveries into Consumption (tonnes)

Products	*†July1994*	**July 1995*	*†Jan-July 1994*	**Jan-July 1995*	*% Change*
Naphtha/LDF	218,425	157,852	1,686,113	1,725,272	2
ATF – Kerosene	732,274	767,709	4,167,417	4,271,487	2
Petrol	1,945,753	1,808,867	13,138,210	12,470,341	-5
of which unleaded	1,125,032	1,135,291	7,426,825	7,688,471	4
of which Super unleaded	112,084	80,447	818,849	570,582	-30
Premium unleaded	1,002,948	1,054,844	6,607,976	7,117,889	8
Burning Oil	82,582	90,698	1,574,658	1,570,918	0
Derv Fuel	1,050,251	1,079,596	7,237,767	7,639,883	6
Gas/Diesel Oil	536,638	500,847	4,436,165	4,242,800	-4
Fuel Oil	599,486	584,850	5,576,074	4,827,619	-13
Lubricating Oil	66,884	75,210	464,203	523,498	13
Other Products	740,353	749,058	4,942,498	5,200,722	5
Total above	**5,972,646**	**5,814,687**	**43,223,105**	**42,472,540**	**-2**
Refinery Consumption	519,836	547,429	3,696,267	3,673,017	-1
Total all products	**6,492,482**	**6,362,116**	**46,919,372**	**46,145,557**	**-2**

*† Revised with adjustments *preliminary* ***NB:*** *The 1995 figures for lubricating oil are significantly higher than those reported in 1994. This is the result of the introduction of a new reporting format, which aims to achieve greater accuracy.*