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The Institute acquired its crest, designed by the College of Heralds, in 1949. Its motto, 'Conjunctione Potiores' (strength through unity), supports a shield portraying the Archaeopteryx, an avian fossil which was found in Jurassic strata similar in age to important oil-bearing formations in the North Sea.

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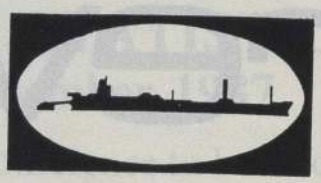
MARGINAL & DEEPWATER OILFIELD DEVELOPMENT

An International Conference
organised by
The Institute of Petroleum
in conjunction with
Lorne & MacLean Marine

13th and 14th OCTOBER 1987
to be held at the Institute of Petroleum



The Institute of Petroleum

Lorne & MacLean Marine

Oil market events during 1986 have depressed the economics of offshore field development worldwide. Lower oil prices have pushed many previously *marginal fields* below the commercial threshold, whilst fields once considered strong candidates for development must now be classed as *'marginal'*.

Are the oil companies prepared to commit themselves in the use of new untried technology, or will field developments in the short term use existing familiar technology?

This Fourth International Conference looks at improvements in platform concepts, as well as innovative floating production and subsea completion solutions, together with other factors including taxes, financing and development alternatives which may offset lower oil prices.

Papers being presented during the two days will include:

What Makes a Field 'Marginal'?	Barclays Bank plc, UK (Corporate Division, Engineering Dept.) Tom S Radford — Snr Petroleum Engineer
Floating Production Platforms in combination with Fixed Lightweight Wellhead Structures	Aker Engineering A/S, Norway Olav Andenæs
Submarine Pipelines Installation Techniques for Deepwater and Marginal Field Development	Brown & Root/Vickers Ltd., UK Dr T Sriskandarajah, C Selvapatt, D Sakaria
'Seatower' — a recent Development in Steel Gravity, self-elevating Production and Drilling Platforms with application for Low Cost Marginal Field Developments	Bethlehem Steel/Worley Santa Fé Ltd. RL Smith, Bethlehem Steel, Texas, USA RE Scales, RE Smith, Worley Santa Fé Ltd.
Concrete Platforms for Marginal Oilfields	Norwegian Contractors, Norway Dag N Jenssen, Engineering Projects Manager
Philosophies and Concepts for Cost Effective Shallow Water Developments	JP Kenny & Partners Ltd., UK S Duckworth, Chief Engineer
Marginal Fields — The Analyst's Viewpoint	Smith Rea Energy Associates Ltd., UK George H Robinson and Brendan Shevlin
The First Operational Single Point Turret Mooring System — installed at the 'Nilde' Field	IMODCO AMCA International, USA James Kentosh, Senior Project Engineer
The Contractor's Role in Development and Operation of Floating Production Concepts for Marginal Fields and early Production	Smedvig IPR A/S, Norway Øistein Nyberg, Managing Director
LMEF and IPEF — Design and Fabrication Concepts Impact on Platform Design, Cost and Time	Haugesund Mekaniske Verksted A/S, Norway T Eeg Olsen, Business Development Manager
'PLTB 1000' — a Tension Leg Platform for Deep Water	Institut Français du Petrole/Alsthom (ABC)/ Bouygues Offshore/C.F.E.M./CG DORIS C Sparks, JP Manesse, R Jardinier, Ch. Perol, J Martin
The Reality of High Pressure Swivels for Gas Reinjection	Single Buoy Moorings Inc W Franken and B d'Hautefeuille
Advanced Oilfield Development	Rauma Repola Oy Vesa Vuorenpaa

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A View

The *Institute of Petroleum* exists to promote a balanced objective view of problems or developments in its sphere, based on the available evidence.

The environmental field, in this *European Year of the Environment*, is particularly prone to emotional pleading for or against change, be it on behalf of industries, neighbourhoods or even countries. Enlightened legislators recognise that one man's livelihood is another man's perceived environmental threat and try to preserve a sense of proportion.

Thus any rational debate about the need for and extent of possible legislation to reduce hydrocarbon emissions into the atmosphere, for economic as well as environmental reasons, should primarily be concerned with controlling solvents and vehicle exhaust/evaporative losses. These together constitute about 80% of total hydrocarbon vapour release, according to recent EEC and CONCAWE studies, while on the other hand refuelling of vehicles accounts for less than 2%.

This fact has not, however, prevented the introduction of the so-called *Stage II* at service stations by certain US state legislatures and it is also under active consideration in Germany and Scandinavia.

Stage II is a vehicle refuelling vapour recovery system of double or coaxial filler hoses with special nozzles at the petrol pump, while return vapour is manifolded back to the service station tankage and eventually to a refrigerated or other type of recovery unit back at the depot. This would entail appreciable cost and upheaval for both motorist and retailer for little benefit except perhaps in a public relations sense. Similarly, proposals to reduce gasoline volatility to an extent that would have any significant effect in minimising vapour losses, would be expensive and could cause problems for the motorist.

If, however, there is still concern about the need for something to be seen to be done at the point of contact with the general public, a much more efficient solution is to hand at a fraction of the overall cost. Evaporative losses from the car fuel feed system can be caught by an onboard absorbent carbon canister. These are now inexpensive standard fixtures in new US and Japanese cars and in cars made in Europe for export to these markets.

A simple breather tube adaptation is all that is needed for a larger canister to absorb also the vapour released during refuelling and this is now proposed by the Environmental Protection Agency in the United States. The vapour held on the carbon is desorbed from it during normal running by the engine air intake and so ends up as useful fuel. Of course, new cars fitted with electronic feed mixture control for use with lean burn engines or three-way exhaust catalyst would be best able to take full advantage of this latter point.

Tests on vehicles fitted in this way are in hand in the UK and in Germany. Meanwhile, the Institute's Marketing Group is starting work on a code of practice for reducing hydrocarbon vapour losses in distribution between depot and filling station delivery (so-called *Stage I*) to achieve a measure of uniformity in design and practice as these are progressively installed over the next few years, again largely for economic reasons.●

AEH Williams

Headlines

14 August

Enterprise Oil announces it is beginning offshore exploration programme over 20,000Km area off the Seychelles

Soviet Geology Ministry says USSR conducted three experimental underground nuclear explosions this year to extract oil from deep layer of rock in Siberia

EEC publishes document detailing proposals for harmonisation of excise duty on oil and oil products

17 August

A/S Norske Shell says its two partners in Draugen Field approved declaration of commerciality and field will come on stream in 1992 pending Norwegian govt approval of plan by year end

Explosion rips through Arabian American Oil Co LPG plant in Saudi Arabia, loading of LPG cargoes is likely to be severely disrupted as a result

Elf Aquitaine signs technical co-operation accord with Petroleos de Venezuela with emphasis on refining and gas treatment

18 August

New and large gas field stretching across several North Sea blocks is emerging as test drilling proceeds

Occidental Petroleum says it has upgraded by more than 60% the estimated reserves of its Scapa field in the North Sea

BP pioneers escape gangway to rescue entire crew of oil platform in 20 mins for use in Forties field

Oil prices fall sharply despite tension in Gulf, it's attributed to mounting concern about oil overproduction by OPEC

19 August

China National Offshore Oil Corp and BP Developments sign wildcat well contract for drilling in Pearl River estuary off South China Sea

Nicaraguan govt says it doesn't have the oil it needs for rest of year and called on 'countries who are friends and supporters' to help resolve critical situation

Engineers on Ekofisk oil field complete last phase of massive operation to raise sinking platform decks

20 August

Kerr McGee announces possibly the largest find in North Sea for a decade, field could contain 350m barrels of oil and significant quantities of gas

Petrobras confirms a possible 3.5 bn barrels oil reserve on deep water south of the Campos Basin offshore Brazil

Oil prices continue steady fall after API issued figures showing significant increase in stocks of crude and products

21 August

UK govt to embark on large-scale marketing campaign to attract private UK investor to £7.5 bn BP share issue

NYMEX says it will study possibility of evening trading hours and will implement $750,000 trading incentive programme for heating oil and propane futures

Venezuela reduces recent premium placed on crude oil in effort to maintain sales into US

24 August

UK southern gas basin is increasingly centre of interest in North Sea with some prospects poised for development following recent drilling successes

Japan reports that the Chubo Electric Power Co and Pertamina are scheduled on 28 August to sign contract for Japan to buy 2.12m tons of Indonesian LNG over next three years

Optimistic Norwegian govt assessments of drilling in Norwegian waters have been confirmed by Central Bureau Statistics which expects 35 wells to be spudded this year

Venezuela and Mexico head list of oil exporting countries that might have been chosen by USDA to participate grain-for-oil barter programme

26 August

Vega oil field offshore Sicily goes into production pumping 10,000 b/d of crude oil, it has a capacity of 3.3m tons annually

USSR denies it's cutting back oil deliveries to Nicaragua and says it is willing to negotiate an increase in supplies

Norway could drop its 7.5% production cutback in support of OPEC if oil prices stay below $18 a barrel and the group doesn't discipline production

27 August

The IRA threatens to attack tanker drivers and executives of oil and petrol companies supplying the Northern Ireland security forces

Petrolio Brasileiro says Brazil's domestic oil production fell 2.2% to an average of 585,000 b/d during the first seven months of 1987

Peru prepares to import crude oil for first time since 1978 to cover shortfall in refinery runs following fall in production over last six months

28 August

Western oil analysts say they're sceptical about size of recent onshore oil discovery in North China

Zairean subsidiary of Petrofina is seeking oil and drilling rights over 8,200 sq km of land in Zaire and plans to sink four or five exploration wells

1 September

India to finalise oil exploration contracts with foreign companies in some of 27 offshore blocks on offer in September

Mobil Producing Nigeria recently discovered a new oil field in southern Nigeria

Norsk Hydro sells its 30% stake in Mongstad refinery for NKr 600m to Statoil

2 September

Plans to develop North Sea Emerald field will use innovative financing methods and up-front oil sales agreements

Reappraisal of known reserves in China's Daqing oil field show it holds about 11.2bn barrels more than estimated and is a big boost to the country's oil industry

US plan to barter surplus farm commodities for oil may be unworkable as oil exporting countries may want to sell oil for hard cash not as trade for grain say analysts

3 September

Energy Dept's Advanced Energy Statistics show oil output from British sector of North Sea fell by 4.7% in first seven months of 1987

Venezuela revises its 1987 oil income projections upwards to $9.451 bn, $180m more than originally estimated

4 September

Mobil announces it's made its second significant Southern Basin gas discovery in three months from a block south of the Leman gas field

Iran succeeds in shuttling oil out of Gulf despite Iraqi jet strikes

Chairman of First International Capital Corp. called for a world flag to speed harmonisation of standards for safety and pollution control

7 September

Britoil reviews plans for test drilling in central Manchester after analysing seismic data collected last year

Total Oil Marine has been given go-ahead for £170m extension to St Fergus gas terminal at Peterhead

Production on the Ekofisk platforms has been resumed following the completion of the jacking up operation Phillips announce

8 September

Feasibility study confirms development of Challis oil discovery in Timor Sea economically viable

Nicaraguan President says USSR agreed to ship another 100,000 tons of crude oil to country but Nicaragua will still be short of oil this year

Latest IEA data shows crude oil production by OPEC nations increased from 18.3m b/d in July to 19.7m b/d in August

9 September

First of 10 development projects in North Sea which UK govt plans to approve by year-end is announced by Secretary of State for Energy

Latest exploration results show natural gas reserves in Indonesia's Natuna field at 60–70 trillion cubic feet

10 September

UK govt announces approval for development of Kittiwake North Sea oilfield at cost of £350m

Oil and gas will shortly begin to flow from world's deepest producing well offshore Brazil say Petrobras

Chinese news agency says oil field with estimated reserves of 700m barrels discovered off southern China

11 September

International Finance Corp says it will provide $20m loan for development of Khalda fields in Western Desert of Egypt

Maltese Industry Secretary says Libya to provide Malta with cut price oil until year-end

Pemex director says Mexico planning five year $15bn oil exploration programme that could raise Mexico's proven reserves by 4bn barrels

14 September

ARCO's President says oil exploration and drilling in Alaskan National Wildlife Refuge was necessary to prevent greater US dependence on imported oil

US State Dept rescinds objections to US oil companies doing business in Syria

15 September

US and Canadian gas industries urge their govts to reach gas trade treaty to ensure development of gas in Canada and market in US

17 September

Corpoven says it is operating a well producing 7,300b/d of heavy oil from Orinoco heavy duty belt in east Venezuela

World crude stocks so high that even if OPEC cuts output to 16.6mb/d ceiling oil prices unlikely to hold at $18 a barrel says US oil expert

Consultants Gaffney Cline say comparative stability in world oil market has encouraged exploration in waters around UK and Northern Europe

18 September

Chevron Corp says it will sell 10% of its stake of Angolan partnership with Sanangol to AGIP SpA

Johnson Matthey is to set up a new plant in Brussels to make 4.5m catalysts pa for vehicles running on lead free petrol

'An industry that is looking to the future'

The Hon Peter Morrison, MP, Minister of State for Energy, in a recent interview with *Petroleum Review* stated he was:

- seriously impressed with the incredible advances in technology made by the oil industry

and he confirmed

- that the next UKCS offshore round would provide further opportunities for the industry to test new exploration ideas

The Hon Peter Morrison, MP, Minister of State for Energy, who has special responsibilities for oil and gas.

Geoffrey Mayhew: Given the uncertainties that overhang the international oil industry constantly, do you believe the UK oil industry has a big future?

Peter Morrison: You preface your question by saying 'given the uncertainties'. There is nothing more certain than the fact that there are uncertainties, which I have learnt in the course of my time in the Department.

Therefore, one cannot make any great prediction as to what the prices of oil will be. Subject to a certain stability in oil prices, I think that the potential for the UK oil industry is set fair.

If you had asked me that question 10 years ago, given many of the discoveries which have taken place in the last 10 years, I certainly could not have predicted today's situation.

Mostly I think this has come about because of the development of new technology. What might once have been perceived as a non-starter is now perceived, through new technology, as a starter, both in terms of the geological play and the potential of getting oil out of fields, which might not have been a commercial possibility before.

Do you see the 1986 oil price collapse and the current uncertainties as having an adverse effect on the oil industry's long-term future?

I go back to the point which I made: the most important thing so far as the oil industry is concerned is to have a period of stability in terms of price. With stability comes the ability to have long-term planning. I think a price which fluctuates from, let us say, 30 down to 10 dollars, is not necessarily helpful to the industry as a whole. Stability is very important.

Has the United Kingdom Government's policy in, for example, not limiting North Sea production, been a contributory factor in the relative steadiness of the price for much of this year?

To claim to be able to answer that question with any sort of certainty would be foolhardy. There are so many different factors which affect the price of oil and the position of the United Kingdom and the policy which it pursues is but one.

The Government has been quite firm right throughout in not limiting production.

I agree with you but if you look at it the other way round when the big drop in the price of oil came about, Norway did limit the amount of surplus. Has their production development changed in any different way to our own as a result? The answer is no. So the policy which the Government has pursued would appear to me to be the most sensible. In any event UK production represents less than five per cent of the world total so that UK policy will have had minimal effect on world prices.

Do you expect the technical abilities of the UK oil industry to be put to the test in another offshore licensing round?

Yes, I do. As a newcomer I am seriously impressed, especially now that I have more of the facts and figures at my fingertips, by the incredible advances in technology which have been made.

As a pure aside, I am concerned that what the oil industry has achieved in the North Sea is not properly understood. I will do what I can to make sure that these achievements are more widely understood.

What has also impressed me in terms of conversations I have had with companies is the amount of resources which they are putting into further research and development. That, of course, will be reflected in the next round, whenever that may be.

In the last round, the tenth, the companies awarded licences were complimented for seeking out new and less obvious locations for possible resources. Will that be one of the factors in the next round, when it comes?

Yes, it will be one of many factors. Obviously, we wish to see as sensible development of the UKCS in terms of the marketplace as we can. If because of new technologies there are areas which hitherto have not been perceived as starters, but now are, it is sensible to look at them.

Would there be more exploration to the west of the Shetlands, for example, the frontiers?

I cannot predict at this stage what the likely shape of the next round will be. It is too early. In Mastermind language the answer to that question is 'pass'.

Are we likely to see a third onshore round in the lifetime of the Government?

I cannot anticipate a third, having just announced a second, the closing date being 28 October. If I can explain, however, one of the reasons for holding the second round was because of the high-level of interest. I would hope that this interest will bear fruit in the number of applications we receive.

Would you outline the Government's overall energy policy in relation to exploration?

Yes, it is based principally on the market place. We wish to encourage the max-

'I have a warm feeling about the future'

imum worthwhile exploration activity and to see development of the oil and gas reserves that are (or have been) discovered. Complementary to that we wish to see the tax rate by the Chancellor maximised whilst still enabling the oil industry to flourish. This is a judgmental point in terms of the fiscal regime in place at any one time.

It is a balance. It is also (and this comes back to the great imponderable) what the price of oil will be at any given moment.

The Chancellor has to make a judgement because, as I say, he wishes to see further development which is not over-enhanced nor, indeed, incumbered by his taxation policy.

Where do you think the balance lies at the present time, Mr Morrison?

I can only go by the conversations which I have had with companies. Fair-do's, they may be saying 'Well, we will leave him be for a bit, we will not bash him around the ears' but if they are not saying that there appears to be no great push, zeal, ardour, conviction, etc for any great changes at this stage. That is the message I have received.

Of course, we would all like to pay less tax, but having got over that prejudice of desire to have less taxation and then looking at it as a commercial operation, I do not get the impression that there is any great desire on behalf of companies to see great changes, but I am always ready to listen.

Do you find confidence in the future among oil companies?

I think that at about the time I arrived – maybe a little before – there was a growing feeling (and I do not want to over-estimate it) that the future held opportunities and possibilities. Whereas, if you had been talking to me nine months ago I think there was a general feeling of gloom and doom.

I think that companies are beginning to take down files which have been sitting gathering dust and saying 'Well, perhaps this is worth looking at now.'

You are very pleased to have arrived at an interesting moment?

Well, of course. From my point of view it is obviously much more attractive to deal with an industry which is looking to the future rather than the past. I have a warm feeling about the future.

You are in the process of meeting all sides of the industry?

Very much so. I am the sort of fellow who likes to meet the people who are in the front line. So I have set sail on quite a big programme of getting to know the industry. There are two aspects to this; one is that of sitting round a table in the Department and the other is being out there seeing things at first hand. I like to see what's happening on the ground. So I have made a number of visits and plan more especially to the supply industry.

They have been very hard-hit.

They have been hard-hit. I do not want to under-estimate it; from a business which was running at just over £3 billion in 1985 to a business which was running at just over £2 billion in 1986. Nevertheless, £2 billion is a very substantial figure and UK industry won 82 per cent of it. I do not wish in any way to take away from the fact that they have had pain, anguish and more besides, but still there is a significant domestic base, and one of the things which I want to do is see how I can help them expand into export markets.

Do the universities who, with training establishments, have developed quite important courses for various categories of students interested in taking up careers in oil, fall within your orbit?

I go back to the point which we were discussing a moment ago, namely, the further development of 'oil related' technology. That does not happen in a vacuum, it happens through industry and academia coming together. As I would anticipate further strides (and strides is quite a big word as opposed to steps) will be made in developing that technology. The backing of the universities is to be commended.

The oil refining industry is passing through an intensive phase in restructuring and must be one you are following with keen interest?

Not least because Stanlow is on the edge of my constituency. Before I became Minister of State for Energy that was, as a local Member of Parliament, already of interest to me. You can look at it both ways: you can look at the straight distillation and then you can look at the cracking capacity. The figures for Europe as a whole, in terms of average cracking capacity expressed as a percentage of crude oil distillation capacity is 13 per cent and for the UK it is 20 per cent. That, as far as the United Kingdom is concerned, is to our advantage, because it means we have the ability to be much more flexible than the rest of Europe.

Your predecessor was kind enough to attend the symposium of the Institute of Petroleum earlier this year. He advocated the Institute become more involved in the offshore codes of practice.

I have the highest regard for my predecessor. He was a great expert. As a result of his action the Institute has met with me and my officials to discuss their involvement in the creation of codes of practice for offshore operations. I am hopeful that they will be able to play a consultative role.●

The Hon. Peter Morrison, Conservative Member of Parliament for the City of Chester, was appointed Minister of Energy following the June 1987 General Election. He has special responsibilities for oil and gas.

Educated at Eton and Keble College Oxford, he followed his father (now Baron Margadale) and his elder brother (now MP for Devizes) in to the House at his first attempt in February 1974, when he was 29. Prior to this he had worked as a personal assistant to the Rt Hon Peter Walker, MP, the present Welsh Secretary, and then as an investment manager for his firm Slater Walker Securities. He was also a partner in a Scottish farming enterprise, and fund-raiser for a mentally handicapped charity.

Within two years of election in 1974 he had joined the Government as a whip, first in opposition and then as Lord Commissioner of the Treasury between 1979 and 1981.

He became an Under Secretary at Employment in 1981, being promoted to Minister of State in 1983, where he oversaw the expansion of the Manpower Services Commission.

After serving for a year as Minister of State for Industry, he resigned in 1986 to take on the unpaid post of deputy chairman of the Conservative Party in charge of recruitment and fund-raising. He continued to hold this post when reappointed to the Government in June.

Phase 3 for the North Sea: the gas and condensate fields of the central sector

Shortly after the Rt Hon Cecil Parkinson, MP, Secretary of State for Energy, had declared that the UK offshore oil industry was poised for recovery, Mr Bob Reid, Chairman and Chief Executive Shell UK Limited, gave a masterly review of the lessons of the 1986 oil price collapse, clearly saw the emergence of a new UK industry based on more offshore gas and stated that cost, not time, was now the key factor in North Sea oil development.

They were addressing the *Offshore Europe 87* conference in Aberdeen, with representatives from 60 countries.

● Mr Parkinson, who opened the conference and exhibition, sponsored by the Society of Petroleum Engineers and a rival to that at Houston, Texas praised the oil industry's confidence and determination to survive after the price collapse

● He said the UK government, which had acknowledged the need to adjust the fiscale regime from time to time, would continue to create an atmosphere helpful to the expected resurgence and renewal over the next two years of the North Sea oil industry

● One of Mr Reid's major points was: 'To maintain any momentum in the development of diversified economies OPEC needs a price in excess of $20. Whether the disasters of early 1986 will bring a new discipline to the cartel and allow them to achieve a continuing balance of supply at this level is still the major question. Whether the investors in non OPEC oil believe that OPEC has the answer and whether they can invest further at this sort of price level is their risk and the challenge to their technology'

Three other keynote speakers discussed the question of beyond survival.

● Mr Edward Blair, Vice President, Engineering Operations, Hamilton Bros Oil & Gas, believed innovation, a systematic approach to risk analysis, teamwork and an overdue standard UK offshore unitisation agreement would help independent operators to survive.

● Mr Jim Wood, President and Chief Operating Officer, Baker Hughes Incorporated, said: 'We believe Brent oil will be priced at up to $23 between now and 1990. OPEC needs incremental demand. Even without OPEC accord the market will self correct in three years.'

● Mr David Morrison, Director, Research, Wood Mackenzie and Company Ltd, said: 'Confidence is beginning to re-emerge. The future is as exciting as we thought when the first generation fields were discovered 14 years ago.'

Mr George C Band, Director General, UK Offshore Operators Association Ltd, said the major challenge was to extend the oil production plateau and stave off further decline as long as possible.

Oil industry leaders are keen

The Rt Hon Cecil Parkinson stressed that *Offshore Europe* was one of the truly great events of a very important industry which had made a vital contribution. His support for it, and that of the Hon Peter Morrison, Minister of State for Energy, who has special responsibilities for oil, was evidence of their confidence in the oil industry.

More and more people were recognising the world wide application of the technologies developed by the oil industry for the North Sea.

It was an understatement that life in the oil industry had not been easy in the last year, due to the price collapse.

'But the offshore has never looked for an easy life,' he said 'You are proud of your ability to face up to the challenges. You are poised to take advantage of the opportunities of recovery. I do not believe the spirit here today is one of depression. It is again optimistic.

'There is every reason to believe the worst is over. We can look forward to better times.'

Oil industry leaders had told him of their confidence and their plans. Many wanted to talk to him about the prospects of the 11th exploration round.

'Our in-trays are full,' he commented.

Ten offshore oil and gas projects, including new oil fields, would get the green light before the end of the year. *Three were announced the following day.*

Mr Bob Reid, Chairman and Chief Executive of Shell UK Ltd, said: I shall concentrate on the lessons of the price collapse of 1986 and the implications which the events of the last year have for the future of the North Sea oil industry.

continued overleaf

Lyn Arscott, on the left, 1988 President of the Society of Petroleum Engineers, the Lord Provost of Aberdeen, Henry Roe, George Band, Director General of UKOOA; Cllr Geoffrey Hadley, Convenor Grampian Regional Council, David Stott, Chairman, Spearhead Exhibitions, and the Rt Hon Cecil Parkinson, MP, Secretary of State for Energy at the opening of *Offshore Europe 87*.

There is an old Arab proverb which says 'He who foretells the future lies even if he tells the truth.' The events of 1986 bear testimony to the wisdom of this proverb. No soothsayer could have foreseen the cataclysmic happenings of the year.

Balance disturbed

As 1985 drew to a close, some form of price collapse seemed inevitable but its extent was not foreseen. The stability of 1985 had been created by the willingness of a major oil producer to swing down and provide the all-important balance of supply and demand. This balance was disturbed in 1986 in an attempt to share the burden more broadly across the cartel. The initial results of this move were disastrous and the price fell from $28 to below $10. An analysis of this dramatic turn of events suggests certain important conclusions.

Firstly, it proved that the market has no magic floor — the floor will only emerge when the buyer sees the purchase as a good buy. This can be because he is short of material and has to buy, or because he believes if he doesn't buy today it will be more expensive to buy tomorrow — and this can simply be the result of general market tightness or as security against a supply emergency.

At the beginning of 1986 no refiner was short of oil. The market perceived no tightness nor did it see any security risk. Buyers believed they could buy cheaper tomorrow and so held off and the price fell and fell and fell. It was only when tightness was perceived and buyers saw opportunities to pick up bargains disappearing that the market recovered.

Secondly, it proved that the market mechanism in the UK could continue to operate in the most adverse circumstances and that the Brent market was resilient enough to handle a disastrous fall without a major default. This is indeed an important reassurance for a relatively young market and a credit to the market makers.

Thirdly, the price collapse confirmed that the premium for security of supply had disappeared. The market believed, and believes today, that the actions of the many Governments involved to maintain supply and hold substantial security stocks will underpin an even and ready supply of oil.

My definition of Governments is a non-exclusive one — the security stocks in the United States are as important as the pipelines to the Red Sea and the shuttles through the Gulf. In essence the market perceives that disruptions, if they occur, will be temporary and their effect on price equally so. The fundamental force on price therefore will be the balance of supply and demand.

Whether this will have been a wise position for the buyers to have taken, only time will tell.

The fourth factor to emerge in the developments of 1986 is the most compelling factor on the supply side of the equation — the economics of the cartel. In 1973 OPEC's revenues from oil totalled $23 billion. By 1980, after the second oil crisis, they reached a peak of $275 billion. By 1985 with the forces of substitution, conservation and recession at work on the demand side of the equation, and non OPEC production eating into OPEC's market share on the other side, OPEC revenues had fallen to $134 billion. With the collapse in 1986 their revenues had fallen to $75 billion.

In summary, since the second oil crisis, when OPEC produced almost half of the world's oil production their share has fallen to little more than 30 per cent and their oil revenues have been slashed by almost 75 per cent. The seriousness of their predicament has been accentuated by the fact that oil represents 90 per cent of their income.

Economic logic

The origins of the price recovery in the latter part of 1986 and 1987 must lie in the economic logic of these numbers. To maintain any momentum in the development of diversified economies OPEC needs a price in excess of $20. Whether the disasters of early 1986 will bring a new discipline to the cartel and allow them to achieve a continuing balance of supply at this level is still the major question. Whether the investors in non OPEC oil believe that OPEC has the answer and whether they can invest further at this sort of price level is their risk and the challenge to their technology.

These are the basic questions facing the North Sea investor. The dimension of his decision-making is no longer time — how quickly can he get his oil to market — it is cost. How cheaply can he produce his oil? It is here that technological innovation plays its part. But before I come to that, let me examine briefly what damage the events of 1986 have wreaked on the offshore industry.

The damage

In 1986 198 holes were drilled in the North Sea compared with 290 in 1985 but the 1986 level was the same as 1983. Rig utilisation, which had been relatively steady at around 90 per cent for five years, plunged to 40 per cent early in 1987 recovering to around 55 per cent by mid year. In comparison, the Gulf of Mexico plunged to 25 per cent and was still below 40 per cent at mid year. Aberdeen may have been a bad place to be in the last year but if it is any consolation there were worse, particularly as production activity continued unaffected by the crisis.

Risk and uncertainty has always been the habitat of the oil industry. The United States has faced problems of over-capacity many times in this century. Rigs have stood idle before and fortunes have been lost. Political developments have continued to plague the industry and today is no exception.

Momentum vital

In 1986 what we, with out partners Esso, saw as vitally important for the North Sea and for Britain was to maintain momentum. For this reason we proceeded with Tern and Eider and put work into the yards and we kept Kittiwake on the drawing board until we achieved the economies needed to secure the project's

Mr Cecil Parkinson toured the exhibition and met Mr L Pearson, General Manager McDermott, Scotland, centre and Mr B Sewell, Business Development, McDermott, Scotland. Mr George Band, UKOOA, is on the left.

viability. This development now goes ahead.

The natural reaction is that this is all very well for Shell and Esso, they are big enough to take the rough with the smooth. But let me contest this a little — the risks are the same for everyone — I have spent the first part of my address delineating them. But these risks are balanced to a certain extent by working in a stable political environment with a history which is favourable to the oil industry — governments which are receptive and a fiscal regime which, while never ideal, at least is sympathetic, and reflects a willingness to help the investor.

A new industry offshore

As a large producer, therefore, on balance we saw the maintenance of momentum as the key objective and we are not sorry that we did. What we said, however, in those dark days of 1986 is as relevant today as it was then.

British Gas has played a major part since the second oil crisis in the maintenance of momentum and it is crucial that it should continue to exercise this role. The import of Frigg gas in the seventies created a major hiatus for the industry and whether it was right or wrong is irrelevant, there is no need for it to happen again.

There is adequate gas within British waters to meet the demand this century, and this means work for the yards, for the steel industry and for the host of specialist contractors many of whom are British companies, who service our industry.

This is the basis of a new and very important industry for the UK and it is vitally important that its momentum is maintained. I believe that we are on course and one could say that we are entering phase three of North Sea development. The first phase was the exploitation of the Southern gas basin, phase 2 was the bringing on stream of the northern oil fields while phase 3 will be the development of the mainly gas and condensate fields in the Central North Sea — just as exciting a prospect as phases 1 and 2.

Gas pipelines

There are several major projects in the offing and current interest centres very much on how their gas may best be brought ashore. A number of ideas have been put forward for pipelines and several companies are bidding for their own particular scheme. In particular, competing proposals have been reported for BP and Marathon. This, of course, is very understandable. Collecting revenues from other companies is infinitely preferable to paying them for carrying your gas, while owning a pipeline is of considerable strategic value in determining future developments.

The Department of Energy is involved in the pipeline decision and sensibly supports a policy of non-proliferation of pipelines. As the 'owner' of an existing pipeline and onshore processing facilities I would like to add my four penn'orth to the debate. It is clear that additional pipelines and processing facilities will be needed. It would seem to me to be logical and cost-effective for one pipeline to be built to bring the sour gas ashore from the Northern-most fields like Brae and Miller. As far as the southern part of the region is concerned, our own existing Fulmar gas pipeline could well provide the backbone of a gas gathering system.

It was built to accommodate the maximum output of Fulmar, which will begin to decline in the early 1990s. We realised at the outset that the line would then provide a capability to bring ashore gas from other fields and we built in a number of junctions to enable them to be tied in without affecting existing production.

The line is well positioned and has the capacity to accommodate foreseeable gas developments in the Southern part of the Cental North Sea. It has the added advantage that sour and sweet gas would be kept separate and so gas processing costs would be minimised.

As for the processing gas, we have applied for planning permission to expand our facilities at St Fergus. This project, if it is allowed to proceed, would provide the facilities to sweeten any sour gas as well as further conditioning modules to supplement our existing gas treatment plant.

It would provide enough capacity to process all the gas available from the discoveries already made in this important sector of the North Sea and would also offer the fullest integration with the existing infrastructure for gas and NGL processing at St Fergus and Mossmorran.

The lessons — and the future

I have spent time on the lessons the price collapse has taught us — the resilience of the Brent market — the vindication of Adam Smith's forces of supply and demand — the market's clear perception that concern for security of supply is not capable of exercising a sustained influence on the market price and the belief rightly or wrongly in Government's omnipotence to maintain this situation — the hard reality of economic logic and its impact on the cartel's discipline — and finally the continuing attraction of the North Sea, its favourable political and fiscal environment whch underwrites the strong arguments for maintaining momentum.

The events of 1986 have proven the resilience of North Sea investment but more importantly they have defined the path for the future. Cost not time is the key factor. A continuous re-examination of costs will be a feature of the future. More imaginative ways of doing things which are technologically innovative and cost effective will be the order of the day. Those companies who have invested in research and development will see the benefits.

The way forward is one which will see a continuing partnership with Government to find the right fascal formula to attract investment and encourage new development. It is also one in which the growing services industry will build their international business to broaden their base and reduce their vulnerability to the vagaries of a single market.

Aberdeen has been a good home for the industry. It has allowed a sensible integration without overpowering its own identity. Aberdeen is Aberdeen. It is a city which understands the sea and all its dangers and uncertainty. Above all it is a city which understands prudence and it is that quality above all which assures survival. 'Aberdeen Beyond 2000' is a new local initiative which is very much in keeping with the spirit of the city. One which Shell has been very happy to join.

The oil driven boom here of the past twenty years has helped to cushion the local economy against the decline in more traditional industries. The temporary hiccup in that boom draws attention to the dangers of too great a dependence on one product — not that Aberdeen has ever been a one product economy, nor must it be allowed to continue to depend too heavily on oil. The project aims to help develop and maintain a broader base and is moving into gear. It has rightly received encouraging support but could always use more. I commend it to you and wish your conference every success. ●

Much more work for rigs

Jim Woods, President and Chief Operating Officer, Baker Hughes Incorporated, speaking of the service and supply industry, saw

To be held at the Institute of Petroleum

'Will UKCS Gas Condensate Reserves be Developed?'

17th November 1987

A one-day Conference being organised by the IP Exploration and Production Group

The first gas condensate reservoir on the United Kingdom Continental Shelf (UKCS) was discovered in 1967. By the end of February 1987 over 30 significant offshore gas condensate discoveries had been made in the UK Sector of the North Sea, although many of these still require further appraisal.

The Conference will examine the number and nature of these discoveries, the need for heavier jackets to carry the greater weight of the large topside facilities compared to conventional oilfields, the merits of exploiting gas condensate fields by gas recycling or blowdown pressure depletion techniques and the economic framework for developing a gas condensate reservoir.

Attention will be given to supply and demand considerations in the light of the contribution that gas condensate fields might make to the future UK gas supply, about which there is considerable speculation.

A Discussion Panel at the end of the conference will provide an opportunity for questions to be put to a group of individuals with specialist knowledge of gas condensate matters.

PROGRAMME

9.30 **Opening of the Conference** GH Chipperfield, Deputy Secretary, Department of Energy

9.35 **Introduction by the Conference Chairman** RTL Mowll, Chairman IP E&P Discussion Group and Development Director (Dorset), BP Petroleum Development Ltd.

9.45 **National Considerations** KRJ Trott and DW Mann, Department of Energy

11.00 **The Resource Base** PJ Hill, BP Petroleum Development Ltd (NW Europe)

11.45 **Facilities** R Drabble and KH Skerrow, Total Oil Marine plc

12.30 **Lunch**

14.00 **The Economic Framework** MB Mick, Marathon Oil UK Ltd

14.45 **Past Experience and a View of the Future** EA Blair, Hamilton Brothers Oil and Gas Ltd

15.30 **Discussion Panel** To comprise the Conference Chairman, all speakers and CDC Willy, UK Offshore Operators Association

For a copy of the registration form, please contact **Caroline Little**, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 01-636 1004. Telex: 264380. Fax: 01-255 1472.

OIL SUPPLY AND PRICE

10th November 1987

A One-Day Conference
to be held at
The Cavendish Conference Centre
London

PROGRAMME

Chairman: Mr Tom S Radford, Chairman IP Energy Economics Group, and Senior Petroleum Engineer, Group Energy Department, Barclays Bank plc

'Keynote Address'
Dr Fadhil J Al-Chalabi, Deputy Secretary General, Acting for the Secretary General, OPEC
It is very important to note that Dr Al-Chalabi's presentation will be 'off the record'.

An Energy Analyst's View of Middle East Suppliers in the Short Term
Mr Mehdi Varzi, Director, Kleinwort Grieveson Securities Ltd.

Discussion

World-wide Oil Reserves
Mr David Jenkins, General Manager, BP Exploration Ltd.

IEA Assessment of Short Term Prospects
Mr Quincy Lumsden, Director of the Office of Oil Markets Development, International Energy Agency

The Impact of European Energy Demand on the World Oil Supply and Price Equation
Mr Robert de Bauw, Director of Oil and Natural Gas, Commission of the European Communities

Discussion

Lunch

Chairman: Mr Robert Belgrave, CBE
Chairman, Joint Energy Programme, Royal Institute of International Affairs

A Major's view of the World Oil Markets post 1986
Mr Ken Shovlar, Manager of Industry and Group Analysis, Shell International Petroleum Co Ltd

The US Oil Market: Price Leader or Paper Tiger?
Mr Chuck E Bishop, Manager Economics, Marathon Oil Co, Finlay, Ohio

Oil and Global Macroeconomics: Relation between the Short and Long Term
Mr Peter Oppenheimer, Fellow, Christchurch College, Oxford

Discussion

For a copy of the registration form, please contact **Caroline Little**, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 01-636 1004. Telex: 264380. Fax: 01-255 1472.

increased oil demand, many more rigs at work than now and higher oil prices by 1990.

The figure for international working rigs in 1990 he estimated at 3,000 internationally, about half the number of 1981. North Sea production, however, could be less at that time.

Baker Hughes believed OPEC would achieve internal agreement on production quotas.

Unit agreements now more necessary

Edward Blair, Vice President Engineering and Operations, Hamilton Brothers Oil and Gas, concentrated on risk and efficiency as factors vital in a North Sea independent's survival.

Risks could not be avoided, but an independent would be better to operate on conventional than frontier areas, and look for technology that had been thoroughly researched—citing a heavy lift innovation offshore that had saved £30 million.

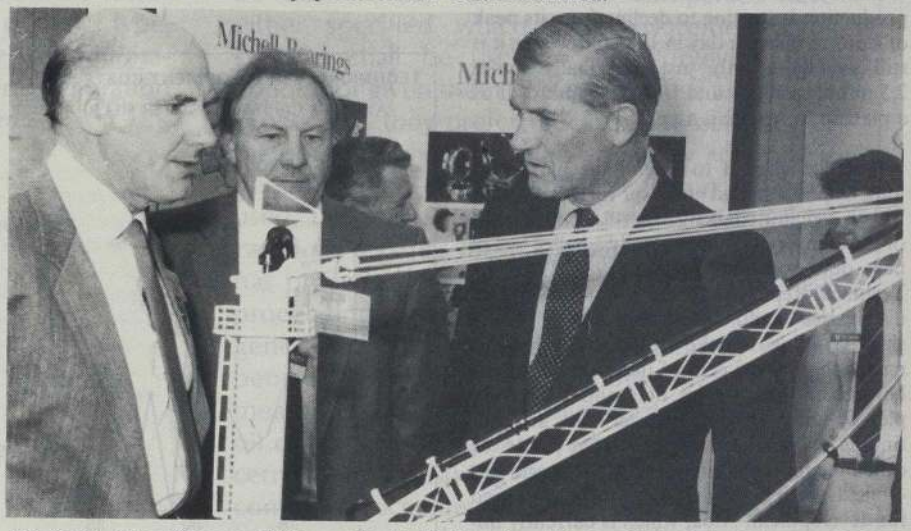
Following the 1986 price collapse Hamilton, already streamlined, had reduced overheads by 25%, field operating costs by 40% and increased the economic life of three interlinked oil fields by two years.

Elsewhere, in oil and gas operations, there had been standard unitisation agreements in operations for many years. It was now more necessary for the North Sea and was a task that engineers and lawyers could surely effect.

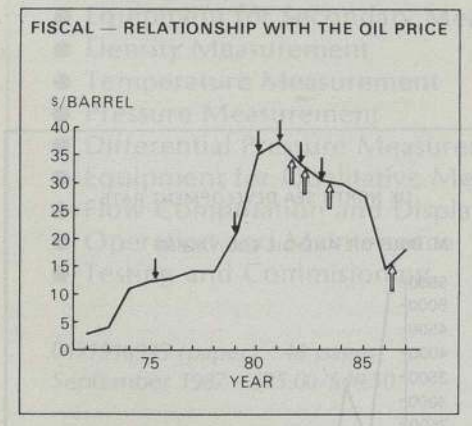
Government more responsive

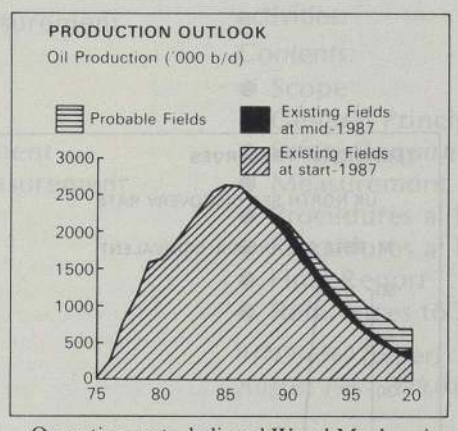
Mr David Morrison, Director, Research, Wood Mackenzie & Company Ltd, in providing an economic view on the theme of 'beyond survival' produced charts, some of which are reproduced in adjoining columns, and overleaf.

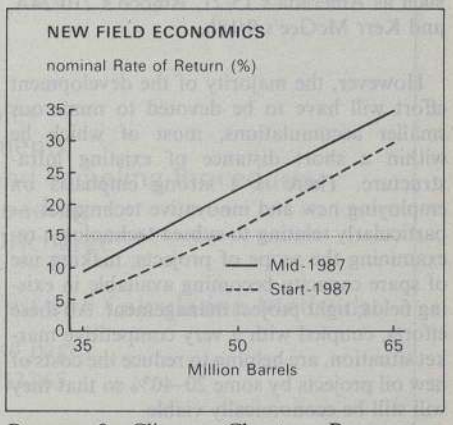
Richard Biggs, Senior Engineer (CCDS) EEV, left, and Ken West, Marketing Manager (Gas Sensors) EEV, demonstrate equipment for Mr Cecil Parkinson.



Pat Kelly, Sales Manager Offshore, Hastie Engineering, left, Ian Gibb, Sales Manager Offshore, Brown Bros, and Jim McNeill, Sales Director, Vickers Safec Ltd, discuss with Mr Cecil Parkinson.







One of the key factors in OPEC's philosophy was their need for a higher market share. They were prepared to use price to achieve it.

North Sea development therefore had to be very good to fly. In the long term, the price would rise, and the North Sea had better prospects than elsewhere.

British Gas and the oil companies were playing poker over prices.

Operative costs, believed Wood Mackenzie, would be contained at 1984/5 levels. Pipelines would have to be the way forward for small fields.

The government was more responsive in fiscal attitudes than five years ago.

An important point was that a number of North Sea fields were about to become commercial, and Mr Morrison gave a list of the fields Wood Mackenzie expected to start in the next two years: Arbroath, Amethyst, Bruce, Barque & Clipper, Chanter, Ravenspurn North, Don, Welland, Emerald, Ettrick, Glamis, Kittiwake, Miller, Osprey, and T-block.

His conclusions were that industry confidence was re-emerging, finances were improving, new projects were coming forward and opportunities for the innovative existed.

Mr George C Band, Director-General UK Offshore Operators Association Ltd, said, in

part: UKOOA is delighted to continue as Patron of Offshore Europe in 1987 and to welcome you all to the opening of its biennial exhibition, particularly now that it has a permanent home in this magnificent Conference Centre opened two years ago by the Prime Minister. It is the eighth in the series, which commenced in 1973 and we like to think it now rivals its counterpart in the new world, the Offshore Technology Conference in Houston.

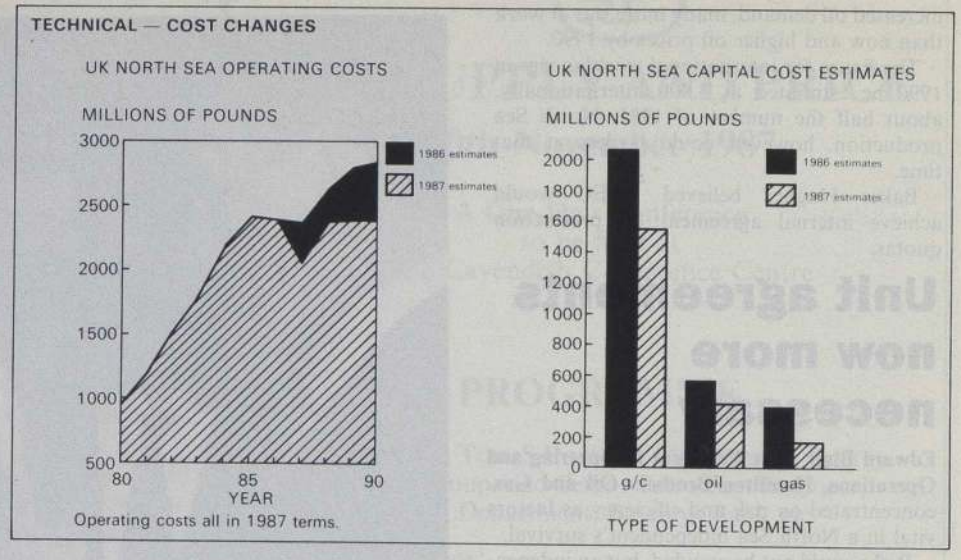
Two years ago, Brent blend crude oil was selling at around $30 per bbl. Since then we have had the oil price crash to under $10 per bbl last summer and the reactions within OPEC which have led to a modest recovery around $18 per bbl. In response to submissions from the industry, we were also grateful for a little help from the Chancellor in the last Budget.

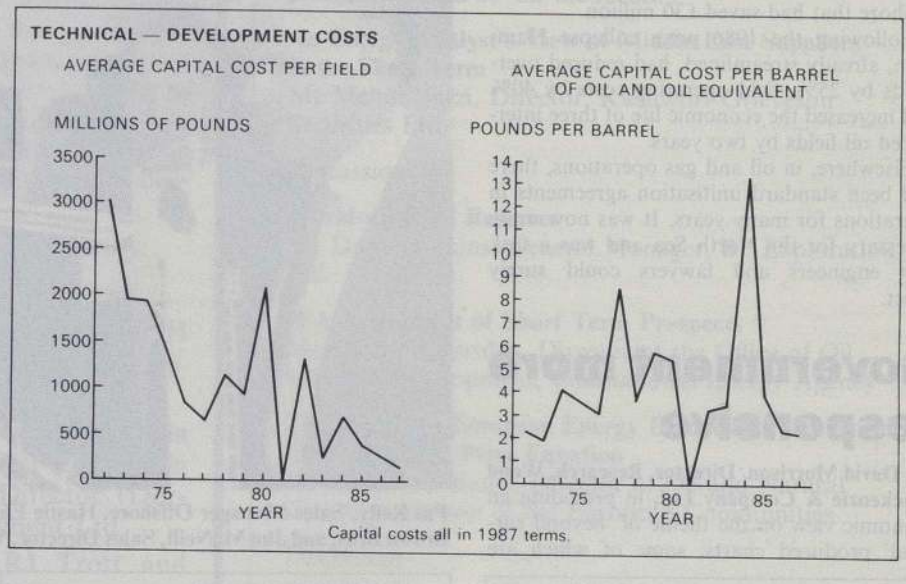
We are now all faced by a major challenge to adapt to the new situation. The press tends to make much of the fact that UK offshore oil production is starting to decline from its peak of 2.567 m bbls per day in 1985. However, it is still averaging only just marginally under 2.5 m bbls per day and I like to think of it as a plateau rather than a peak.

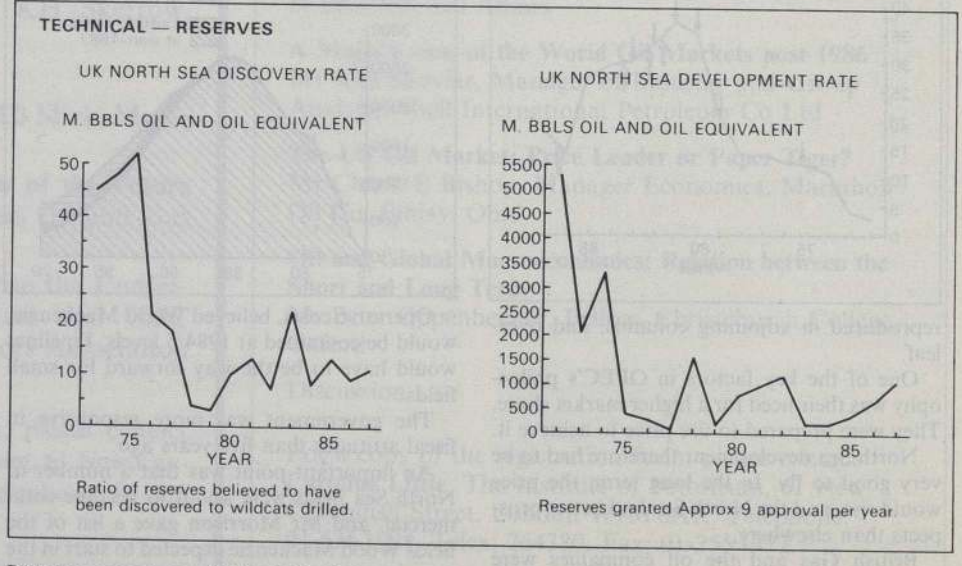
Our challenge is to extend the plateau as long as possible and stave off further decline. This is a major challenge for all of us because of the complexity and generally smaller size of new developments. In our 1984 UKOOA Technical Report we forecast that 90% of new discoveries would be less than 100 m bbls in size. Looking on the optimistic side, this means that 10 per cent of them would indeed be greater than 100 m bbls and I am very pleased to say that these larger fields are continuing to be discovered in what could be called the more mature areas of the North Sea — fields such as Miller, soon to be proposed for development, Alba, which is currently under appraisal, and exciting discoveries of recent months as yet unappraised and unnamed such as Amerada's 15/21, Amoco's 210/24A, and Kerr McGee's 9/18b.

However, the majority of the development effort will have to be devoted to numerous smaller accumulations, most of which lie within a short distance of existing infrastructure. There is a strong emphasis on employing new and innovative techniques — particularly relating to subsea technology; re-examining the scope of projects; making use of spare capacity becoming available in exising fields; tight project management. All these efforts, coupled with a very competitive market situation, are helping to reduce the costs of new oil projects by some 20–40% so that they will still be economically viable.

Offshore gas also represents a further abundant energy resource for Britain; newly discovered trends in the Carboniferous of the Southern Gas Basin and up to 15 tcf of gas condensate accumulations in the Central North Sea. Several of our members are locked in price negotiations with newly privatised British Gas to determine whether these finds can be developed profitably in the next decade in preference to imported supplies. ●







Diagrams courtesy of Wood Mackenzie & Company

Ensuring the tiger's teeth do not hurt

By Dr Jan WH Geerlings

Dr Jan WH Geerlings, Deputy Director General of Energy, The Netherlands, discussed the economic reasons behind Dutch energy policy when he addressed the DRI European Energy Outlook Conference in Amsterdam recently. He asked:

Why does the Government feel called upon to pursue an energy policy? Wouldn't it be better to leave the energy markets to free market forces? In principle the answer is 'Yes'.

- If markets are functioning properly, the price mechanism will ensure the correct decisions and the best possible results will occur.
- Sufficiently transparent markets and the price mechanism ensure that the right signals are given to the economic subjects.
- Nevertheless, there are considerations that make government action necessary. The price signals do not always reflect all the positive and negative effects of products. Environmental effects can be mentioned as an example of external effects.

Another reason for government influence is that the transparency of the market or clarity on prices as signals for energy investments are not always perfect everywhere. The government, through information, advice and demonstration of new techniques, can increase market clarity.

A third consideration for government intervention lies hidden in the imperfect operation of the principle of full competition.

In the energy field technical or natural monopolies often occur because gas and electricity must be transported through fixed transmission lines and pipelines. Government policy is aimed at directing the distribution and production of energy into the right courses.

In The Netherlands we are currently involved in an extensive restructuring process in both the electricity production sector and the energy distribution sector. This process is aimed at incorporating competitive stimuli and at making efficient operations possible.

An imperfection

Another form of market imperfection lies hidden in the long-term character of energy supplies. In future the market mechanism may again be obstructed by oligopolistic or monopolistic elements on the oil market. Rising demand for oil will reactivate the power of OPEC or the Gulf states. For, a higher demand for oil will place OPEC as a whole in a position in which it could reach its own maximum production capacity or stay below that level and thus push prices up.

If OPEC were to be placed in a position to drive oil prices up sharply again — in the driver's seat if you like — this situation would be undesirable for most of the net oil-importing countries, developed and developing countries alike. Switching to other types of fuel, efficiency improvements and investments in indigenous production of fossil fuels usually take years. They take lots of money and in many cases considerable losses in capital are incurred.

We know from experience that because of this, the economic shock and the consequent recession resulting from an oil crisis are considerable. We must therefore take such a possibility into consideration. A policy can then be formulated to ensure that energy supplies do not present an obstacle to our economic development. In energy terms: security of supplies must be guaranteed.

Security

Of course there are other ways of looking at energy policy, but here I have chosen security.

In what way can the government give direction to guaranteeing security of supply? We must make a distinction between preventing sharp price and supply fluctuations and its consequences on the one hand and controlling sharp price and supply fluctuations on the other, or if you like: managing their consequences.

In *preventing* disruptions with regard to prices and supplies, two aspects can be considered.

Firstly, one can consider reducing the vulnerability of the economic system. Exploration and production of indigenous energy resources can contribute here. In principle, bringing down demand for energy resources with a high supply and price risk will similarly reduce the vulnerability of the economy.

Secondly, prevention of supply and price disruption is aimed at minimising the overall chance of disruptions in energy supplies. The emphasis here lies on preventing a distortion in the global oil balance. Moreover, with all sources of energy, deliveries should be spread over several foreign suppliers.

Policy relating to the prevention of supply and price risks and their consequences is developed in three ways.

These are energy saving, diversification and exploration/exploitation of domestic energy resources. The policy mix will be composed of these three policy options, depending on the specific situation in which the country finds itself. Energy saving policy, supported by high energy prices, has been reasonably successful in The Netherlands since 1973.

Between 1973 and 1983, 21% was saved overall. The government is assuming that until the year 2000, a further potential efficiency improvement of about another 20% exists. In the IEA region energy efficiency improved by 19% between 1973 and 1985.

Fuel mix

Diversification policy in general is aimed at spreading the risks related to the supply of energy sources. However, a justified fuel mix differs from each country. After all, the optimal pattern is related to the specific circumstances of a country. The IEA countries have formulated a common line of action in the field of diversification. Given the expected situation on the world energy markets, these countries try to realise an optimal fuel mix in which oil consumption is in principle brought down to a minimum. Naturally, the alternatives for oil must be economically viable.

In the Dutch situation oil consumption has largely been reduced to applications where no alternatives, or only expensive ones, are available, such as the transport sector and non-energy uses in industry. Of total oil consumption 73% takes place in these sectors. For comparison I give you the figures of the entire IEA region and for the US: 63% and 75% respectively.

However, the share of gas in The Netherlands is still high. In 1985 the gas share amounted to 53% of all primary energy consumption. This high share is closely related to the extensive gas infrastructure in The Netherlands.

In the electricity sector too, the share of gas remains considerable, although it is in this sector that diversification is most advanced. From 1988 onwards, 40% of capacity in the Dutch electricity sector will be coal-fired. Since 1982 the government has initiated research and development programmes with the aim of offering the coal option more opportunities in The Netherlands.

An important aspect here was the fact that coal can indeed be employed in an environmentally sound manner. Environmentally acceptable options form an important part of a new multi-annual programme for coal research, which the Minister of Economic Affairs has sent to Parliament recently.

Nuclear power plants now play a limited role in Dutch electricity generation. The government decisions to enable an expansion of the number of nuclear power plants were suspended after the accident at Chernobyl. The possibility and desirability of nuclear power in The Netherlands are at present undergoing a thorough analysis.

Indigenous production

The third instrument, exploration and production, should take place profitably. Ensuring supplies by means of indigenous production which can only be achieved through direct or indirect subsidisation gets us nowhere. Exploration and production policy in The Netherlands is aimed at optimising the conditions in which oil and gas exploration and production take place. The stability of our financial and legal system forms the most important part of the policy. Since 1973, it has proved to be reasonably successful. Apart from production of the immense Groningen gas field, gas production rose in The Netherlands between 1973 and 1985 from virtually zero to 25.5 billion m^3 per year. Crude oil production rose in the same period from 1.5 million tonnes to 4.5 million tonnes per year.

Crisis management

So far I have discussed policy aimed at preventing market disruption or, if you like, energy crises.

I now come to the control or management of crises.

If, despite all the precautions of the IEA countries, a supply and price disruption nevertheless occurs, the thing to do is to restrict the detrimental consequences to a minimum. The provision we have made for this and the international agreements that have been reached can be divided into **three subjects**: emergency stocks, demand restraint measures and distribution schemes.

The importance of crisis-control instruments has meanwhile again been underlined at the IEA energy ministerial meeting in May of this year. There the ministers again pointed out the importance of both stocks and demand restraint measures. The ministers also indicated the need for international cooperation in the implementation of crisis control measures.

In The Netherlands, an *Oil Stockpiling Act* has recently been passed by Parliament. This Act, now being in force, means that we shall be in an even better position to meet our international obligations in the field of emergency stocks. This is not to say that today or yesterday we did not meet our obligations.

At present the total stocks in The Netherlands are far above the IEA requirements that 90 days of a country's net imports must be reserved. These large stocks naturally cannot be seen in isolation from the Dutch position on the international oil markets.

Coordination

If a country pursues an energy policy on its own it can only limit the size of the consequences of a supply or price disruption. That country can go so far as to become self-sufficient in energy at all costs and will thus no longer be vulnerable. That is: a supply or price disruption will then have no direct effect on energy supplies in that country. Needless to say that severe indirect effects by means of an economic depression in the other energy-importing countries will take place.

Many countries, however, do not have sufficient indigenous energy resources that can be produced in an economically viable way. On the basis of effectivity and cost considerations, therefore, an internationally interlinked distribution of energy production and consumption is to be preferred.

The risk of a supply or price disruption can only be reduced by controlling the cause of a disruption, unless this disruption is exogenous, such as one caused by oligopolistic conduct.

One must therefore ensure that the overall call on such an oligopoly is as limited as possible. In preventing this sort of disruption, the harmonisation of energy saving, diversification and production policies of the different energy consuming countries represents in our view an effective long-term policy. If we can not prevent the tiger from biting we should at least prepare ourselves so that its teeth do not hurt. If a supply disruption, regardless of its origin, occurs despite all precautionary measures there are crisis control mechanisms at place in an IEA context. These mechanisms have their supplement in the European common market.

The basic principle of such mechanisms is to move to the use of emergency stocks and announce demand-restraint measures. Also the IEA has the opportunity to move to the redistribution of oil.

What is the added value of international coordination of crisis control measures?

If a single country moves to the use of stocks and/or to the introduction of demand-restraint measures, this will have little effect on the consequences of a crisis.

Internationally coordinated action will, however, have an effect because of their combined power.

The use of distribution schemes ensures that the economic setback is shared among the different countries and thus minimised.

International coordination of crisis control measures therefore has a clear added value.

Apart from that, the existence of stocks, demand-restraint measures and oil distribution schemes also has an effect on the prevention of a crisis. After all, to the oligopolists the existence of these instruments represents an extra barrier to the use of oil as a political weapon.

International coordination in the field of energy stretches further than the harmonisation of the policy instruments mentioned.

International coordination in the field of research and development is clearly of great importance. The exchange of information on experiences with various policy options in the different countries also contributes towards an improvement of the national policy mix.

The Dutch government strongly endorses a consequent and consistent energy policy with a view to long-term developments. I make a plea for an internationally coordinated energy policy. Not only in the interest of a healthy economic development in the industrialised nations, but also in the interests of the developing nations. Their bill will not be smaller than ours but they will have much more difficulty in picking it up. ●

The largest service station in Europe, the BP South Mimms, on the M25, has multi product dispensers.

Multi hose pumps seen as essential for a changing range of forecourt fuels

Peter Noble reports

A new breed of fuel dispenser is making an increasing impact on Britain's forecourts — as John Blake, Director of Sales for Gilbarco, the UK's leading service station equipment and systems manufacturer, explains:

● 'Multi Product Dispensers, or MPDs, are a major and timely development for the oil industry, promising enhanced forecourt flexibility and capacity at a time when the fuel mix pattern is changing fundamentally as a result of the arrival of unleaded petrol.'

The movement into MPDs is being led by Shell and BP, but it is widely expected that others will follow as the emergence of unleaded signals an end to the era of the blender, the dispenser that has dominated UK forecourts for the past two decades or so.

Shell claims it was first to introduce a multi product unit into the UK market, when it opened the first of its innovative Travellers Check outlets.

Melville Tuck, the company's Chief Engineer, explains the thinking behind

The Shell Travellers' Check site at Woodbridge Hill, Guildford has MPDs.

the move. 'For many years, the typical forecourt configuration was blenders with a mono diesel pump. Diesel was separated and differentiated because of the risk of misfuelling, but the motorist knew he could go to any blender and get 2, 3 and 4 Star petrol. With unleaded appearing on the horizon, however, we had to change our thinking. We could have gone for mono and duo pumps with segregated pumps and lines, but that would have meant directing motorists to specific pumps, a move that could have led to confusion. In our view, the best route to take was the MPD.'

For Shell, the main attraction of the MPD was that it allowed all grades to be made available at all refuelling points, a principle considered fundamental by the company. Today, Shell has upwards of 60 Travellers Check sites in operation and is planning many more, all equipped with multi-product pumps.

The new-style dispensers are designed to form an integral part of the forecourt construction, and have three hoses each side of the island dispensing 2 and 4 Star and diesel.

Another influencing factor for Shell was the likely growth of unleaded sales and the flexibility MPDs provided. The feeling in the industry is that as unleaded grows, so 2 star will decline, until it is phased out entirely. Opinions are divided, however, on the time scale for that development.

'We are not convinced that we should get rid of 2 star and replace it with unleaded throughout the country,' says Melville Tuck, 'But maybe in two years time unleaded will have risen that could be a possibility. After all, 2 star is just 10% of throughput, so unleaded does not really have a lot of ground to make up. At several sites in Ipswich, we have taken out 2 star and installed unleaded. The result, interestingly, is that while we have not unexpectedly lost overall volume, the availability of the new fuel has led to a steady increase in its sales.'

Different approach

BP, similarly, sees 2 star declining as unleaded marches towards market dominance, and it is also enthusiastic about MPDs, although it has adopted a different approach to Shell.

'We see multi hose products as being an essential part of the forecourt,' says Mike Lugg, Engineering Manager, Retail Division, BP, 'but we do not believe that having three grades at each refuelling position is realistic. There is simply too much pump redundancy in that configuration. It is a nice idea, a marketing man's dream, to have every product at every point, but it is not on. It would be complicated and expensive and would exacerbate the problem of misfuelling.'

The latter point is particularly significant, since any change in fuel mix patterns is usually accompanied by motorist confusion and increasing misfuelling. The rationale seems sound: if you put three grades alongside each other, there is likely to be more misfuelling than if those grades were separated. But that has not been borne out by Shell's experience.

'Since installing MPDs,' says Melville Tuck, 'we have had FEWER misfuelling problems. The reason why, I think, is that with three hoses just six inches apart, the motorist has got to consciously make a decision. Of course, we have made that decision as easy as possible through signalisation. The 2 star hose is yellow, the 4 star is red, with black for diesel and green for unleaded, when it is offered. We also clearly indicate the fuel on the pump nozzle and nozzle boot.'

BP, however, seems adamant that dispensing three products or more at one point is NOT the way ahead. Its established forecourt configuration is one diesel pump, and one unleaded, with the remainder being Gilbarco Quadro units, which dispense two products at the same point (4 star and 2 star). It is a pattern tailored to current demand, which breaks down into 85 per cent 4 star, 10 per cent 2 star, 5 per cent diesel and a very small amount of unleaded. But that demand mix is changing.

'Within the five to seven year lifespan of pumps, there will be a number of important fuel changes,' says Mike Lugg. 'Diesel, for example, will increase, but not by an amount that will justify more than one or possibly two hoses. It will remain a specialist product for some years, and will continue to present a potential problem of misfuelling. For that reason we will not offer it from multihose dispensers, but will keep it separate, with its own livery and, in our case, with an audible warning.'

He adds: 'Like diesel, unleaded is currently a specialist fuel. It needs to be separate and given clear signalisation because of the problem of misfuelling. For now a single stand alone pump is adequate for demand, but in the longer term it will become the dominant fuel and the leaded grades will drop away. Certainly, within the lifespan of current equipment, I expect to see the arrival of equality between leaded and unleaded.'

Of course, predicting the growth of unleaded sales is complex, largely because it is a matter of price and Government fiscal policy. Sales could leap if the Government were to give motorists a price incentive to buy the fuel.

When unleaded captures around 15/20 per cent of the market, BP plans to switch its Quadros to selling 4 star and unleaded. By that time, it estimates that the two products will be able to live side by side and that motorists will be sufficiently familiar with the new fuel to prevent the occurrence of confusion and misfuelling. The company does not expect to see a significant demand for 2 star at that time.

Unknown factors

That is the scenario most likely to emerge, but it could be altered by the influence of several, as yet, unknown factors. There could, for example, be a second grade of unleaded petrol introduced. Such a development is currently being hotly debated in the industry, and if one of the oil companies could produce a higher octane unleaded fuel economically, there is no doubt it would be popular with the vehicle manufacturers.

Another option is an unleaded fuel with an octane rating lower than the standard Eurograde of 95 at the pump. Again if it could be produced economically enough to give a worthwhile forecourt price advantage, it would be in demand. A third option could be an unleaded fuel with special additives.

Each of these options would have considerable complications for service stations. 'The dispenser is the easy part of it,' says Mike Lugg, 'but underground tankage and plumbing, that is where the difficulty lies.'

Pump policy

While Shell and BP have clearly defined pump strategies, Esso is still hammering out its plans. 'We are currently formulating a pump policy for the future that will relate to the changing product mix,' explains Colin Leather, Technical Development Engineer, Esso. 'But next year you will see how we are relating our policy to the growth of unleaded.'

For now, Esso's network of company-owned sites relies on an army of blenders and mono pumps, although it does have one Gilbarco Quadro for evaluation. Dealer sites are, of course, free to apply their own policies and many have installed MPDs.

'We are carefully and continually looking at what is happening in the market place,' says Colin. 'We see unleaded replacing 2 star in the medium term future, but we do not see a need to have three hoses at its point; that gives too much capacity redundancy.'

For the minor oil companies, the move to invest in MPDs has a relatively low priority. 'We are not using them and do not need them,' says John Dunk, Chief Engineer, Equipment, Total, expressing a view that sums up their general app-

roach. 'But the market is always changing and with the increase in unleaded we may have to revise our thinking.'

For now, Total is satisfied with its electronic twin dispensers which are supplied by Ferranti and Gilbarco.

Big range

MPDs have been in use in the USA since the late 1960s, so the technology is not new, but the new breed of products being marketed by the UK's pump suppliers is unquestionably state-of-the-art.

Each of the major pump makers offers a range of multihose units. Basildon-based Gilbarco led the market with its four-hose Quadro and has just received full Weights and Measures approval for its new six-hose pump, the Highline 2 Multiline. John Blake says the newcomer represents a major advance in petrol retailing efficiency and capacity. Both the Quadro and the Multiline are compact machines, not much bigger than standard blenders, but they boast a wide range of features, including a separate meter and mechanical totaliser for each grade, and a Ferranti-Packard display that will not fade in sunlight like LED and Liquid Crystal systems.

But perhaps the most important consideration for customers contemplating investment is that both units utilise well-proven electronic and hydraulic components.

Avery Hardoll has its Multipoint range of 2, 4, 6 and 8 hose pumps, and National Sales Manager, John Campbell-Harris, says that the 4 hose unit is proving the most popular. He adds: 'The top end of the market — the oil companies, some of the independents and large dealer groups — is moving towards MPDs, but that is not to say that there is not a vast market for singles and twins.'

Significantly, in a recent development, Avery's parent group, General Electric Company, acquired Gilbarco Inc. of America. The UK Gilbarco operation was obviously included in the deal and gives GEC a powerful forecourt triumvirate that includes Gilbarco, Avery and PM Services, the nationwide pump installation and maintenance organisation.

For Gilbarco, the acquisition has brought substantial financial and technical resources that will further strengthen the company. GEC has already stated firmly that Gilbarco's corporate indentity will be maintained and that no changes in management, policies, practices or programmes are anticipated, leaving the Basildon concern free to pursue the strategies that have made it number one in the UK by a wide margin.

Tokheim claim to have installed more multi hose pumps in the UK than anyone else, and have the distinction of supplying one of the very first sites to open in this country, namely the Shell Travellers Check site at Hitchin.

Ken Linton, Tokheim Sales Director, says: 'Tokheim have enormous experience of this type of equipment all over the world and this experience has taught us that there are certain design criteria which are essential for good performance, reliability and serviceability. One is the use of three phase continuous duty electric motors. Where one motor and pumping unit are used to supply two meters the robustness of three phase motors gives considerable advantages over the more conventional single phase unit.'

He notes there is also considerable interest in the UK in the use of submersible pumping units, a system very popular in the US. Not only can more consistent flow rates be achieved but considerable savings can be made on underground pipe work, he points out. Tokheim dispensers can be supplied either in suction or submersible form.

'The future for the petrol forecourt we believe will be mainly in the quad and twin market with the owned and operated sites of only possibly three oil companies using Multi Product Dispensers,' said Mr RE Higgs, Sales Manager of the Fuel Dispensing Group, on behalf of Ferranti Industrial Electronics Division.

'The main changes we feel will be in the kiosk operation which will use back office micros where a number of sites could be grouped back to an area office which in turn would have direct computer links with the terminal and 'C' store suppliers. Some sites in the future will be 'Gas Bars' only. these will be satellites of a main station, unmanned and open 24 hours a day.'

Formed in 1983, Dunclare has a recently-introduced series of 2, 4, 6, and 8 hose pumps. These, it says, complement its established Highway/Prestige range of mono, twin and blender pumps.

'The MPD benefits principally the high volume site,' says Dunclare MD, Bill Peet, 'because the motorist can drive to any of the multi-pump units and find the grade of fuel he requires. That, obviously, speeds the traffic flow across the forecourt.'

But on smaller sites he sees no requirement for MPDs. 'The sale of 2 star and diesel is probably no more than 15 per cent of sales, with the remainder being 4 star. At a cost of say £8,500 for a six-hose MPD, the small dealer is paying a high price to obtain, in the main, two hoses for his 4 star.'

He adds that the small/medium retailer would be better advised to invest in either Quadro or Duo pumps.

MPDs do have many advantages for both the retailer and the consumer, but, as Bill Peet indicates, the predictable snag is that they are more expensive than blenders. A six-hose MPD, for example, will cost upwards of £7,500, while a blender runs out at about £4,300. One answer to overcoming that increased cost may lie in another product that is widely used in the USA — the Submerged Turbine Pump. With an STP system, the forecourt dispensers do not suck product from the underground tanks but are instead force-fed by the STP located in the tank.

John Blake believes that such systems are particularly economical if a site has three or more dispensers offering the same grade of fuel, since each dispenser does not have to house its own pump.

With an STP system, however, because the fuel has to be supplied to the dispenser through pressurised pipework, it is necessary for sites to take precautions against the possibility of leaks by installing detectors. Additionally, the fuel lines should also have impact check valves to stop the product flow in the event of a problem at the dispenser. STPs are, clearly, a product about which more will be heard in the future. They are another weapon in the industry's armoury, which together with MPDs, will enable the oil companies to meet the challenge of offering the best possible service levels to Britain's motorists on a changing range of fuels.●

The search for profit in a USSR refinery leads to a product switch and less cost

Dr DC Wilson considers that the Gorbachev efficiency improving revolution should have a profound influence on the USSR refining sector and he describes improvements which are now taking place

Soviet oil production has been growing slowly in recent years, from 603mt in 1980 to 615m in 1986 and is likely to reach 618m this year. The 1990 target is 635mt. Exports have risen from 159mt of crude and products in 1980 to 185m in 1986 after dropping temporarily in 1985, and the Russians expect them to remain at over 180mt/yr well into the 1990's. Domestic consumption has declined slightly since 1980 from 459m tons to 445m in 1986, although it can be expected to rise by under 1% a year in the future.

Overall industrial production growth rates, averaging 3.9% a year since 1980, have been sustained by extremely rapid growth in the production of gas and nuclear power, together with a gas-for-oil conversion programme which has cut the consumption of fuel oil by general-purpose power stations from 150mt in 1980 to 126m in 1986 and a likely 120m in 1987. Gas is also forcing out fuel oil in other sectors, particularly those operating large industrial boilers and combined heat-and-power plants, and there is also a programme to extend the use of CNG by the transport sector.

The current five year plan, 1986–1990, expects that refinery throughput will rise from 500m tons in 1986 to 525m in 1990, with capacity usage growing from 86% to 88.5%. The number of operational refineries should rise by one to 47 with the commissioning of the much delayed Chardzhou plant in Central Asia. It is planned that the depth of refining (ie, the output of light and middle products as a share of throughput), should rise from 60% in 1985 to 65% in 1990 and 77% in 2000. The Minister of Oil Refining and Petrochemicals believes that the growth in output of light and middle products from 300m tons in 1985 to 341m in 1990 'will satisfy the economy's consumption of automotive fuel' which is planned to rise by 12% during the period, while that of liquid petrochemical feedstocks rises by over 20%. Meanwhile, the output of fuel oil and bitumen is expected to drop from 200m tons in 1985 to 184m in 1990.

Quality

The improvement in the product slate is being achieved in three ways. Firstly, there has been a discernable improvement in the quality of Soviet oil with the growth in output from Siberian fields yielding light crudes. Soviet planners expected to squeeze 6.6% more gasoline and 1% more diesel from a ton of crude during primary refining in 1985 compared with the typical ton of 1975 (see *Soviet Energy to 2000, David Wilson, Economist Intelligence Unit, 1986 p.143*) and probably did so.

Secondly, aging and obsolete primary plant is being replaced by a standard unit known as a LK-6 with a capacity of 6mt/yr. This unit is able to perform five processes — desalting, atmospheric and vacuum distillation, visbreaking and catcracking, although the catcracker is rather primitive by Western standards. The restructuring and modernisation of the two refineries at Baku during 1976–1982 raised the share of light and middle products obtained during primary refining from 36.5% to 42.6%.

Thirdly, the Soviets have been extending and upgrading their secondary refining sector. From 16.4% in 1965, its capacity as a proportion of primary capacity has risen to 33.1% in 1980 before stabilising at this level until 1985. The movement is now upwards again, although an important shift in emphasis is taking place. Until recently, the USSR has concentrated on building catformers and hydrofiners to improve product quality. Total hydrofiner capacity has risen from 18mt/yr in 1970 to 112m in 1986. Since 1985, a new 2mt/yr plant has come on-line at Lisichansk in the Ukraine, where all diesel is now hydrofined compared with 88% for the USSR as a whole. It is unlikely that many more plants will be built as the sulphur content of crude has been dropping markedly with 56% of crude now having less than 1% sulphur.

From 17.5mt/yr in 1970, catformer capacity has grown to 48mt/yr at present. Since 1985, Czech-made plants of 0.9mt/yr each have been built at Lisichansk and Moscow, and several more are to be built before 1990. With the production of benzene and xylene reaching a plateau for the time being, the new plants are intended to upgrade gasoline rather than assist in the manufacture of aromatics. During the 1990's, there should be a substantial increase in the number of new catformers as the Soviets strive to improve gasoline quality. The share of gasoline with 76 octane and above is planned to rise from 64% in 1980 to 96% in 1990 in order to meet the requirements of more efficient auto engines.

Cat crackers

Although the Russians have been operating catalytic crackers since 1950, no more than 50 have so far been installed with an aggregate capacity of 25mt/yr. The two most recent plants are combined visbreakers and catcrackers of capacity 1.5mt/yr each at Moscow and Pavlodar, and 8 more are under construction or planned according to a long-term programme. These include plants now being installed at the Novo-Baku Lenin refinery, where a growing demand for auto products must be met from a stable supply of Caspian crude, and at Mazheikiai in Lithuania. The equipment is domestically produced by the Khimmash plant of Dzerzhinsk with each device costing £43m. The construction of another catcracker has just started at the Novo-Groznyi 'Anisimov' refinery and similar facilities are to be installed at Mozyr and Novopolotsk in Belorussia before 1990. The Lithuanian and Belorussian refineries are charged primarily with refining products for export as part of a long-term Soviet aim to maximise foreign trade revenue by exporting products rather than crude.

Catcrackers are also integral features of new 6mt/yr primary processing units such as the AWT-6 supplied by Chemieanlagen Grimma of Leipzig. In the last few years, these plants have been installed at 12 Soviet refineries.

The USSR has two hydrocrackers at Angarsk and Ufa, and a third should have been installed during the second quarter of this year at Omsk. Another under construction at Yaroslavl should start up before 1990.

Coke

The huge non-ferrous metal industry in the USSR has created a large demand for high-grade petroleum coke. Cokers with a aggregate capacity of 9.3mt/yr are now operational, with the latest starting up at Pavlodar last January. Another 0.4mt/yr plant should have come onstream at Krasnovodsk before the end of this year, and others are under construction at Omsk, Perm and Novo-Kuibyshev. Krasnovodsk has four cokers because the high vanadium content of the local Turkmen crude is transferred via the coke to the non-ferrous metals during smelting.

Coking and visbreaking, being modern variants of the obsolete thermal cracking process, also yield appreciable volumes of light and middle products for comparatively little cost. So long as the demand for automotive fuel grows at the current 2.3% a year, and the quality of crude continues to rise, then the USSR can meet its short-range targets for light products from technologically simple and inexpensive thermal crackers and a limited number of expensive catalytic and hydro crackers.

Automotive product

One of the more interesting features of the 1986–1990 plan is the low growth rate for automotive fuel production. With more commercial vehicles and over one million new cars appearing on Soviet roads each year, a growth of 12% over five years looks on the low side. However, a number of important changes are taking place in the transport sector. The rail network is still expanding, and planners are

striving to move freight by rail rather than road wherever possible. It is planned that rail freight turnover should increase by 26% during 1986–1990 while road transport grows by much less; it actually declined during 1982–85. Yet, diesel consumption by the railways is falling as the rail electrification programme accelerates on the basis of cheap nuclear and hydro power.

The road transport fleet is being converted from gasoline to diesel and the share of diesel powered lorries is due to rise from 28% in 1985 to 54% in 1990. Moreover, it is planned to raise the number of LNG and CNG-powered vehicles from 120,000 in 1985 to one million in 1990 when it is hoped that 1,000 gas filling stations will be operational compared with 153 at present. The gasoline thus saved will be made available to the USSR's 15 million private motorists who currently get a raw deal with fuel rationed by unavailability in many areas. So, by the sort of adept control of demand for automotive fuel which could not be accomplished in free-market economies, the Soviets are expecting to match the consumption and production of gasoline and diesel without an unduly rapid restructuring of the refining sector.

Gorbachev reform

The Gorbachev revolution, with its aim of improving efficiency by devolving decision-making from central ministries to associations (ie, combines of enterprises), should have a profound influence on the refining sector. The Ministry of Oil Refining and Petrochemicals was one of the first to implement the new policies with the Soyuznefteorgsintez organisation (which administers all Soviet refineries), giving plant managers increased powers while insisting that they operate on a self-financing basis.

In an over-simplified nutshell, this means that the managers can sign contracts with other enterprises and organisations without seeking the Ministry's approval, and that loss-making plants will no longer be subsidised from the centre.

Last summer, the Bashkirneftekhimzavod Association, which runs four refineries in the Bashkir republic, was set the task of raising the share of light and middle products from 60% in 1985 to 75% in 1990, with the management given complete freedom to achieve this in whatever way they thought fit.

There were some immediate improvements: the purchase of a new reactor and fuel-feed system for the catcracker and the rejigging of the thermal cracker at the Ufa 22nd Congress refinery increased the output of auto fuel at little extra cost.

But more substantial changes were being held up by the sloth and incompetence of the local design institutes which prepared projects that were obsolete or too expensive. For projects that were accepted, the blueprints were provided only after long delays.

Taking advantage of the new policy to encourage competition, the director of the Ufa refinery made a grand tour of the nation. He visited a Moscow research institute which was finding it difficult to get its inventions tested and contracted to test them if the institute would design the plants he needed.

At the Moscow refinery, he saw a system which automates refinery processes and acquired from its director the blueprints and the addresses of the manufacturers.

The director of the Novo-Ufa refinery signed a contract to acquire the means to process sour gudrons into sulphur and bitumen. All these contracts would have needed referral to, and approval from, the Ministry under the old system, and could have taken years to complete.

Last October, Deputy Minister V Popov applauded the Ufa initiatives and, recognising that incentives must be provided to encourage their emulation, announced that the depth of refining would join processed throughput as a principal plan target, the fulfillment of which would lead to bonuses for the workers.

Subsidy gone

The Gorbachev reform is not painless, however, and VA Tarkhov, director of the association which administers the three refineries of Kuibyshev region, says that 're-orientation from the old system was not simple. The inertia of traditional thinking was fully reflected in the association's results of 1986, 'when a profit of only £30m against a planned £96m was achieved.' This was partly due to sloppy management, with £16m paid out in fines for the under-supply of products and late payment of bills.

But the main problem was that the loss-making and aging Kuibyshev refinery was no longer subsidised. This meant that the potential profit was cut by a third and that the cash available for investment was slashed from £54 to £26m. This was not enough for the planned investment programme and another £20m had to be found quickly from within the refineries.

Although this was not fully accomplished, the search for additional sources of profit brought substantial savings through improvements in productivity, simple organisational measures such as the despatch of surplus fuel oil from Novo-Kuibysnev to the Kuibyshev Refinery's catcracker and changes in policy such as the decision to stop production of lighting kerosene in favour of more valuable diesel. All these developments have occurred thanks to the greater freedom of action accorded to refinery management by the Gorbachev Reform.

Dramatic future?

Although there is little likelihood of a radical change in the structure of Soviet oil refining during the rest of this decade, things will move dramatically after 1990. If the Long Term Energy Plan to increase secondary refining capacity four-fold during 1980–2000 (ie, to 700mt/yr) is to be fulfilled, then growth rates of over 10%/yr during 1990–2000 must be achieved. Given the difficult and costly task of installing the highly complex equipment envisaged, it is unlikely that this target will be reached. Nevertheless, there should be large contracts in the offing for Western equipment suppliers able to provide the Russians with the plant they need at competitive prices. ●

Creating jobs outside the oil industry

by Harry Hossent

Come out of the Royal Festival Hall any evening and, if you fancy a drink and some food, it is possible you will wend your way to *The Archduke*. In doing so you will be patronising a wine bar which, indirectly, was started in business by the oil industry.

The Archduke came into being through the good offices of an organisation called the London Enterprise Agency, specifically formed to help new commercial ideas take root and flourish. Behind LENTA, along with some dozen other companies, are Shell and BP.

Helping young businesses is but one part of the corporate image of industry today. Large organisations like to be concerned about many aspects of present-day living — clearing an overgrown stretch of land, caring for the aged, buying a painting for the nation, supporting the theatre, backing a marathon, endowing a hospital bed.

Shell, BP and Esso willingly set aside part of their annual expenditure to the development of new young businesses, and have been doing so since the 1970s. Long before Richard Branson and UK 2000 began improving the environment in the hope of creating 5,000 new jobs and a better Britain, these three oil companies were flexing some practical muscle.

The seeds of oil industry concern in this direction seem to have been planted in 1977. In that year Michael Pocock, then chairman of The Shell Transport and Trading Company Limited, delivered the Ashridge Lecture, for which he took as his subject *More jobs — a small cure for a big problem*. The lecture acknowledged the pressing need in the UK to create new jobs, explored the different sectors from which these might come, and identified small and new firms as an area of key potential, yet proportionately in decline.

It also reviewed a number of ways in which support for the small firms sector could be developed, particularly by big business.

'What made everyone sit up at the time was the notion that industry rather than the Government should be doing something about it,' recalled Henry Durowse, manager of Shell's Enterprise and Education Service.

Shell decided that some private sector initiative should be shown. This led to the formation of what is now the London Enterprises Agency in the City's Snow Hill. In those early days the first working party basically just offered advice and assistance. By 1980, however, the scheme was under way and running. Its first client was a Ms Elizabeth Phillips now owner of *The Archduke*.

'She was conscious that when you come out of the National Theatre on the South Bank or the Royal Festival Hall, there was nowhere to go for a meal, a chat or a drink,' said Robin Heal, head of Community Projects at BP International, by then allied in LENTA with Henry Durowse.

'She wanted to set up a wine bar in one of the arches underneath Waterloo Station.'

Easier said than done at first. Negotiations with the GLC had fallen down because the arch was claimed to be industrial space and the rent was beyond Ms Phillips' means. Cutting out bureaucratic red tape, LENTA spoke to some senior people at the GLC.

At the same time the agency was allocated a Shell secondee who was a property specialist who redesigned the wine bar idea to produce a cheaper building reconstruction. A complete new deal was negotiated. Today *The Archduke* has doubled in size, while Ms Phillips has added to it with a new restaurant in Smith Square.

Using its strength

LENTA is but one example of the oil industry using its strength in a practical way to help new businesses. And it is a fact that the failure rate of small businesses whose proprietors have not been helped by an enterprise agency is around three out of five, against one in twelve for those who have taken the good advice.

When BP closed its refinery on the Isle of Grain four years ago, with 10 other companies it formed the Medway Enterprise Agency, aiming to provide advice and a wide range of services to the population of the Medway towns. Here the Project Manager is Keith Perks, seconded from BP Oil to tackle the job of creating young businesses in the area; so far, 3,139 clients have received counselling, 653 businesses have been started, and MEA has helped to create 3,433 jobs.

One such effort was created by 11 toolmakers whom Keith Perks helped to pool their redundancy payments in order to finance a toolmaking business. Employing in numbers only one third of the former workforce, they now have a turnover equalling that of the company which made them redundant in the first place.

Keith Perks is one of 34 people from BP working full time on a whole range of similar activities throughout the UK. In Hampshire a planning executive from BP Oil, as Client Services Manager for the Hampshire Development Corporation, endeavours to stimulate employment in the county by showing what Hampshire can offer.

About 300 enterprise agencies now exist in various parts of the country, and more are being formed. Both BP and Shell have seconded full-time managers to many of them to provide advice and help where local initiative has identified a need.

Shell has in fact provided pump-priming funds and capital equipment support to two small industries groups operating at very local level, which have been initiated by successful local businessmen wanting to offer their knowledge and experience to new and less well-established operators. The Esso attitude towards job creation is slightly different.

John Gooderham, the Contributions Manager, said: 'Part of all our community relations activities is Esso's response to the problem of unemployment. In this particular field we've felt that job creation is a somewhat difficult expression to grab hold of.

'In fact, we're not entirely sure you can consider creating jobs as an integral part of your business activity. Whereas if we set up in a new service station or undertake a major new investment, there are jobs created in the area and, of course, these are real jobs.

Esso gives practical support to organisations such as Project Fullemploy, the Prince's Business Trust, Instant Muscle and others, along with a commitment to the country's enterprise agencies.

Over a three year period, Esso will have provided £60,000 for the Wandsworth Youth Enterprise Centre in South London; while this follows the broad format of a youth enterprise centre, it is unique because it is a partnership initiative between the public sector, industry and several well-known youth enterprise development charities.

Providing practical help such as training, business advice or start up bursaries for the young unemployed in the nation's cities is a sphere in which Esso is currently playing an expanding role. Last year the decision was taken to give a significant increase to Esso involvement in schemes that would help generate employment opportunities, with particular emphasis on young people, and £500,000 was made available over three years. This year the company's budgeted contributions to organisations working with inner city problems tops £250,000.

Project North East, also supported by Esso, has as its major objective schemes to help unemployed young people between 18 and 25. Already it has set up a successful Newcastle Young Enterprise Centre. Esso is funding Project North East's BISON — Business Information System on Line — the first database business guidance scheme of its kind in the UK. Project Fullemploy is deeply concerned with training young unemployed in several inner cities throughout the country; a year ago Esso (along with Kelloggs) handed over a sponsorship cheque, part of a three-year joint commitment of £85,000 for their Manchester project.

Redundant premises

Both Shell and BP have made use of redundant premises and land to help with job creation schemes. BP, for example, recently set up a million-pound enterprise company at Neath, South Wales, to acquire and redevelop surplus land and buildings at its Llandarcy Refinery, now being reduced in size to produce only special products like lubricating oils, bitumen, some kerosine, waxes and extracts.

To be called D'Arcy Development Limited, after William Knox D'Arcy, who gave his name to the refinery when it was built in 1921, the company will also seek further grants and loans from public and private sources to provide an estimated total budget of £4 million over a period of three to four years. D'Arcy Development will aim to be strictly commercial, but all profits will be ploughed back to generate more jobs and nothing will accrue to BP.

One major tract of land which will be available for immediate development is a 20-acre site near Llandarcy village; by the middle of this year, the refinery's information centre and part of its head office, covering about three acres, will be ready for development as office accommodation, leisure activities, a training centre or even a manufacturing base. The bath-house, medical centre and LPG bottling plant will also be available from the end of 1987.

Business initiatives

Since that original Ashridge lecture in 1977, Shell has been involved in numerous business initiatives. One of the first was the development of an enterprise unit in a converted grain warehouse at Spitalfields. LENTA Properties did Spitalfields and the partners are Shell, BP, Barclays Bank and Midland Bank. This was followed by the Broad Oak Enterprise Village, unique in that it is wholly managed and funded by Shell UK Ltd with cooperation and advice from local councils and enterprise bodies.

Broad Oak is sited on land next to Shell's research centre at Sittingbourne, Kent. Work on site began in May 1985 and by November a total of 14 offices and 11 workshops were fully booked. Among small businesses taking advantage of Broad Oak's facilities are various craft companies, light engineering firms, a secretarial agency, a furniture manufacturer and a business consultant.

Near Manchester, Carrington Business Park is another business initiative on the part of Shell UK Ltd, its objective to provide a range of premises in a planned commercial environment specifically to help new and expanding firms to become established. Costing some £1.3 million and spreading over 17 acres, Carrington Business Park is on land formerly used by Shell Chemicals UK. Office space starts with merely the hiring of a desk and telephone and climbs up to full suites, while centralised facilities include a reception area, a business bureau offering full secretarial services, a conference room, exhibition areas, telecommunications and catering. While the majors look towards the broader picture, all three are still concerned with individuals.

'As far as my department is concerned, there has been a large number of initiatives aimed at young people — getting them to value their own skills,' said Henry Durowse of Shell.

One such idea has been Livewire, which aims to encourage 16 to 25-year-olds to create their own work by providing voluntary advisers for every youngster entering the scheme. So far about 5,000 young people have been helped to develop their own ideas and to create lasting jobs. The scheme is a partnership between the private sector, public sector, local government, voluntary agencies and individuals; Shell UK provides the overall finance and direction, and the latest move is to find more volunteers to offer what Bob Reid, chairman of Shell UK, has called 'their skills, experience and plain commonsense in helping youngsters develop their business ideas.'

'Our target is 500 volunteers' said Bob Reid. 'The volunteers who staff the national Livewire network form the backbone of the whole scheme — without them there would simply be no Livewire. So it's vital that as many people as possible contribute what they can to the scheme.'

This year two Birmingham men, both aged 26, were presented with a £1,000 cheque to set up their own draughtproofing business — given as part of Esso's commitment to the Neighbourhood Energy Action Scheme.

NEA, funded by the Government and sponsored by Esso, provides draughtproofing and insulation for the homes of disadvantaged people, in doing so it also trains, and pays, youngsters who would otherwise be unemployed. Its aim is to train young unemployed with a view to setting up their own businesses. Government assistance stops, however, when trainees reach the age of 26.

At this point in the Birmingham example, Esso stepped in with its own special contribution to the two young men who had become over age during their training.

Shell also helped in preparing an NEA manager's handbook entitled *Getting Organised.*

BP has a scheme called the Small Business Loan Fund, and recently it helped former staff from Llandarcy Refinery to form a metal fabrication and welding company with the help of a £10,000 low interest loan. Another two former refinery employees who bought a butcher's shop with their redundancy money expect to add a mobile butcher's business to it this autumn, again with help from the Fund.

Undeniably charitable

Whether these ingenious and undeniably charitable methods of helping new businesses will, in the long run, improve the quality of independence and lead to profitable enterprises being solidly established is something only time will tell. A survey recently produced by the Small Business Research Trust, based on information gathered from the 1980 General Household Survey, seems to refute many of the notions generally held about the lifestyle of the small businessman.

Thus, of 31,000 people in 12,000 households, 610 were self-employed and 289 were small business owners with up to 24 employees. Data from the 1980 survey suggests that the former outnumber the latter by as much as over two to one.

Yet, at the moment, support from many Government-aided organisations tends to go to businesses employing more than one person. In addition, small business policies introduced since 1979 have been aimed at manufacturing and have discriminated against service businesses, though less than one in five small businesses is concerned with manufacture.

In the working population, too, the GHS survey indicates that black people are slightly less represented in the small business sector then they are in the working population as a whole.

On the other hand, small business owners are twice as likely to have been born overseas than the employed population as a whole.

Demographic patterns

John Gooderham of Esso put a finger on one aspect of help for young industry. 'Part of our reason for concentrating on the training aspect is that we feel that demographic patterns are beginning to alter,' he said.

'Pretty soon there aren't going to be nearly as many young people coming out of schools. The major problem will be a lack of young people with the right skills and perhaps the right attitudes, so training and education are going to become even more important. Without that, it may well be that the young people will not have the right skills and training to fill jobs sensibly for companies such as ours.'

Robin Heal added to the message. 'This isn't just about creating jobs,' he said. 'The Llandarcy exercise is a good illustration of this — we're not just talking about employment but about community benefit.

'What we're saying at Llandarcy is that job creation is important, but we also want to look at the total site and find out how we can get that back into use by the community.'

Equally, Henry Durowse echoed these sentiments. 'What has grown out of LENTA, for instance, is that thousands of small businesses have been set up and attitudes have changed — people have realised that it's just as desirable to be in a small firm as a large one.

'We have generated schemes for getting graduates into small firms with a great deal of success and we're currently looking at other organisations which stimulate young people to value their ability to do things — our educational system tends not to do this. They concentrate very much on academic skills, which is obviously essential, but there needs to be a redressing of the balance.' ●

Old aircraft, fine museums and a little help from the oil business

A Conoco tanker refuels a Second World War B-17 Flying Fortress at Duxford Airfield prior to the old bomber's nostalgic flight to a museum in Texas

When it comes to nostalgia, old aeroplanes take a lot of beating. When the Lone Star Flight Museum in Houston, Texas acquired a B-17 Flying Fortress, the enthusiasm must have been palpable. The problem was that the huge four-engine World War Two bomber was at Duxford Airfield in Cambridgeshire, scene of the late Group Captain Sir Douglas Bader's finest hour.

Enter Conoco, a relative newcomer to the field of aviation fuelling in the UK and not a company to go in for lavish sponsorship as a general policy. But, prompted by the parent company, which has its corporate headquarters in Houston, Conoco Limited provided all the fuel and lubricants and other assistance to route the B-17 successfully to its new home via Prestwick, Iceland, Greenland and various North American stopovers.

By the first of next month Conoco will have invested a further £5 million in its aviation business in the UK, bringing total investment to £7 million in the two years since its entry into the market.

'First of all, we had to prove ourselves a competent and efficient supplier with a provincial airport network,' Iain Campbell, Manager — Aviation Fuels, told *Petroleum Review*. Conoco will open new facilities at Edinburgh, Glasgow and Newcastle to go with existing ones at Leeds/Bradford, Blackpool and Coventry. Another four major supply points are scheduled to be added by 1990.

Fastest growing

Mr Campbell pointed out that aviation fuelling 'is the fastest growing sector in the oil industry, with an annual growth rate of around six percent.' Conoco already supplies Ministry of Defence contracts and the United States Air Force as part of its share of a total UK market in the region of five million tonnes.

According to Iain Campbell, Conoco 'can project a totally independent alternative' which is very attractive to airlines.

'To maintain product integrity,' Mr Campbell said, 'we badge our tankers Aerofuel and use them exclusively to transport from base terminal to airport terminal. This ensures no contamination and outweighs the disadvantage that the vehicles cannot be used elsewhere.'

Contracts have already been negotiated with British Airways, Dan Air, Britannia Airways and Air UK, plus several foreign carriers. Others are in the pipeline.

Conoco use an intermediary, Ogden Allied, to handle the flight refuelling side of its business, although all of it is carried out under Conoco's name and in Aerofuel livery, under Conoco's direct control.

'The rationale behind this,' explains Iain Campbell, 'was that it enabled us to bring detailed expertise to bear very quickly. Ogden Allied have a

great deal of experience in North America and Canada in inter-planing to wingtip.'

Conoco appears to have its finger on the pulse of aviation fuelling, although there is a long way to go before it can challenge the giants of the business. In terms of publicity, the Flying Fortress episode was never intended to be grandiose; it did, however, cast momentary limelight on historic aircraft, a part of the past which is probably of interest to a great many people within the petroleum industry.

Like all but one of the Shuttleworth Collection aircraft this Gloster Gladiator is still reliably airworthy

Fighter station

Duxford is part of the Imperial War Museum. Its objective is to preserve all the principal features of a Battle of Britain fighter station. When the IWM first began to use the site in 1971 it had been virtually unused since the RAF moved out. Duxford was used as a main location in the film *The Battle of Britain*, after which the three surviving hangars became listed buildings.

A great deal of hard work, much of it on a voluntary basis, has brought in some wonderful exhibits and restored them and the airfield itself into a permanent memorial to the courage of the men and women who fought and won and lived and died during the aerial conflict.

Commercialism has crept in inevitably, for it is the only way to make such museums pay their way. Better by far than a perpetual dogfight with creditors. Frequent air displays, pleasure flights, restaurant and shop facilities help to keep the cash registers ringing and continue the investment in a finer museum. There are now nearly 100 aircraft on display at Duxford, where the next big project is the complete restoration of the original officers' mess. Duxford invites sponsorship proposals for this thriving public attraction and is open to all suggestions.

The Shuttleworth Collection at Old Warden aerodrome near Biggleswade, Bedfordshire is a somewhat different kettle of airplanes to Duxford. First of all, it incorporates many civilian flying machines as well as military, including a reconstruction of a similar machine to the one in which Louis Bleriot first crossed the Channel.

But the most surprising thing about the exhibits in the Shuttleworth Collection is that all but one of them fly, or are capable of doing so. Founded by Richard Ormonde Shuttleworth in 1908, the collection also includes veteran motor vehicles, another of Richard's overriding passions. Killed in a flying accident in 1940, while serving with the RAF, the collection and the adjacent agricultural college were given a new lease of life by a trust set up by Richard's mother.

'We're open all year, except for a week at Christmas,' Bob Elliot, the collection's librarian informed *Petroleum Review*. 'Mind you, with no heating in the hangars it gets pretty cold in January. You feel like going out and shaking each visitor's hand at that time of year. But people still come, from all over the world. The air displays attract thousands.'

Mr Elliott, who has been connected with the collection in varying capacities for many years, wistfully recalled the history of the exhibits as he gave a guided tour. The collection owes much to LA Jackson, who came to Old Warden from Brooklands to become first engineer. He carried on at the collection, apart from serving as a Squadron Leader in the Engineering Branch of the RAF during the last war, until retiring as manager in 1966.

Self-supporting

The collection is self-supporting through gate receipts and souvenir shop sales and is run by a small kernel of permanent staff.

One of the major attractions in the Shuttleworth hangars is the Mark Vc Spitfire, the only Spitfire still flying which has clipped wings and an original three-blade propeller. It was used in the film, *The Battle of Britain*, and the collection also has a reproduction Boxkite previously used in another film, *Those Magnificent Men in their Flying Machines*.

Spitfires are again one of the main draws at the RAF Museum in Hendon, North London. This houses more than 60 aircraft, split into three distinct units: the Royal Air Force Museum itself, Battle of Britain Museum and Bomber Command Museum.

Like the others aforementioned, Hendon offers a complete day out with exhibitions of old uniforms, flying gear, airfighting tactical displays, even a reconstruction of Sir Barnes Wallis's office with pictures and models of his famous designs, like the dambusters' bouncing bomb.

The American contribution to the Bomber Command Museum is represented, in part, by a B-17 Flying Fortress; one that will be staying on the eastern side of the Atlantic.

These museums and others like them form a lasting tribute to the heroic achievement of men who took to the skies, be it to fight elements or enemy or to battle the inner demon in each of them which made them have to fly.

Jim Berry

Royal Air Force Museum Hendon, London NW9 5LL; telephone: 01-205-2266. The Shuttleworth Collection, Old Warden Aerodrome, Near Biggleswade, Bedfordshire SG18 9ER; telephone: 076-727-288. Imperial War Museum, Duxford, Cambridgeshire CB2 4QR; telephone: 0223-833963. ●

Environmental protection management in offshore oil and gas fields

by Dr PK Probert, BP Group Environmental Services, BP International Limited

The response of industry to environmental obligations and responsibilities has been an area of heightened debate in recent months stimulated particularly by the European Year of the Environment, publication of the final report of the World Commission on Environment and Development, and the forthcoming Second International Conference on the Protection of the North Sea. These initiatives help to highlight the principle that industry should continue to strive for a preventative approach to the environmental consequences of its activities.

Effective environmental protection depends on foresight. Prior identification of potential environmental problems and constraints provides a flexibility and scope for avoiding costly delays in developments that is generally lacking if the environmental issues are only addressed retrospectively. This principle is now well understood in the petroleum industry.

Disregard for environmental aspects of development may result in heavy financial commitments. Also, if environmental studies can be seen to be based on sound science and undertaken objectively, then misplaced public concern can be allayed. An increase in public confidence will in turn expedite the progress of subsequent developments.

Environmental protection management (EPM) is an active practice and one that is continually evolving. It can, however, be seen as comprising three main components: impact assessment, monitoring and review. Briefly, impact assessment is a critical examination of all relevant environmental effects that would result from a project; monitoring provides an essential feedback of information on the effectiveness and adequacy of environmental protection measures; whilst the review, or audit, is carried out periodically to assess the overall environmental situation at operating sites and to identify current and potential environmental problems and how these might be remedied.

Support at all levels

Linked to these components is research, which provides support at all levels of the process and a means of improving its sensitivity and predictive capability. Also important are contingency planning and training, as well as a broad programme of environmental education within oil companies as a whole. Although divisible into broad areas, environmental protection management is very much an integrated procedure. This paper will address in particular the impact assessment and monitoring aspects of the process, as applied to offshore oil and gas fields.

The term environmental impact assessment (EIA) gained currency relatively recently, with the development of a more rigorous approach to such appraisal. Inherent in the modern concept of EIA is an objective and comprehensive assessment – including an analysis of the effects of alternative approaches to development and operation – and incorporating where possible a quantitative evaluation of effects.

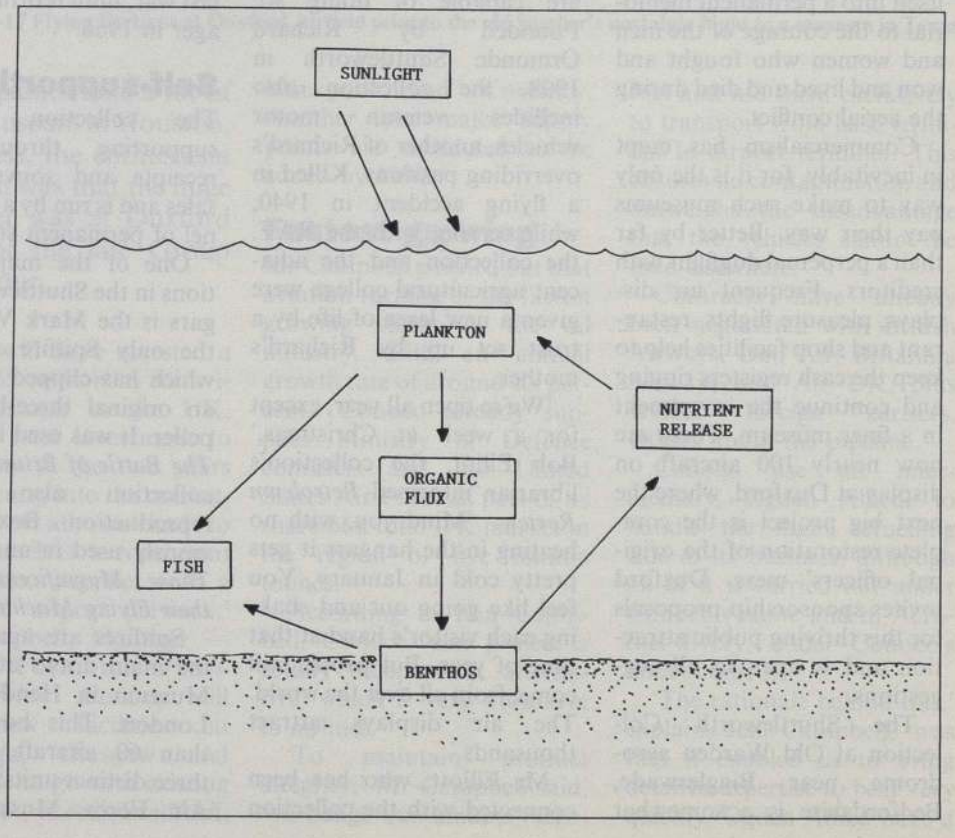
The scope of an EIA may vary considerably, especially since the word 'environment' encompasses a range of meanings, from a definition covering only the natural environment (air, water, soils, geology, biota) to one including a gamut of socio-economic factors. Although socio-economic aspects are not considered here, they may often have important secondary effects on the natural environment.

The word 'impact' also has a variety of meanings, but in particular it has strong connotations of collision and implications of damage or injury sustained. It is perhaps unfortunate that a more neutral word is not used (eg influence), since in many instances there may be no discernible adverse effects, and influences may sometimes be deemed beneficial or, at least, benign.

EIAs are undertaken for a number of reasons. There are regulatory requirements to meet which will vary from country to country. There are also individual company policies, industry guidelines and codes of practice, such as those from the IP, which may exceed those laid down as statutory requirements. From a project development point of view an important aspect of EIA is the identification of potential constraints that may arise for environmental reasons, and clearly this needs to be done as early as possible so as to avert costly delays. Related to this, the EIA may provide an input to design specification and operational procedures to keep harmful environmental effects to a minimum. The EIA also serves to define the monitoring programme, which provides a check on the efficacy of the environmental protection measures. The public at large tends to be unaware of the often

Figure 2

SIMPLIFIED SCHEMATIC RELATIONSHIP OF MAJOR COMPONENTS IN A MARINE ECOSYSTEM



This article was developed from a presentation given by Dr PK Probert at an Institute of Petroleum Exploration and Production Discussion Group meeting which took place earlier this year.

ECOLOGICAL IMPACTS OF THE OIL INDUSTRY

4th and 5th November 1987 to be held at The Institute of Petroleum

A symposium sponsored by

The Institute of Petroleum
The Oil Pollution Research Unit of the Field Studies Council

OPRU is a small group of about twenty scientists with particular expertise in marine and coastal ecology, chemistry and sedimentology. The findings of OPRU's research into the impacts of discharges to the marine and coastal environment will be presented. The main focus is on experimental work and field surveys within the oil port of Milford Haven, developing to research in other parts of the world.

Early studies concentrated on experimental applications of oil and dispersant in the field and the recording of impacts on species and communities. As experience and understanding of effects developed, the expertise was applied to providing specialist advice during spills and to increasing numbers of monitoring and impact studies associated with refinery discharges, coastal terminals and offshore oilfields, both in temperate areas and the tropics.

Presentations have been selected from the last ten years of research. Subject matter includes survey and monitoring techniques and approaches, impacts on intertidal and subtidal rock and sediment communities, and the fate of oil in sedimentary systems. These main themes are illustrated with case studies. The emphasis throughout is on the application of research findings to forward planning, environmental management and protection.

The concepts and data put forward are relevant to a wide audience, especially oil companies and government authorities, as well as scientists working and training in this and related disciplines.

4th November

The Origins and Growth of the Oil Pollution Research Unit
Authors: J. M. Baker and B. Dicks

Rocky Shore Monitoring
Authors: K. Hiscock and A. E. Little

Oil in Wetlands
Authors: J. M. Baker, J. A. Bayley, J. Oldham and M. Wilson

The Effects of Oil and Dispersants on Seagrass
Authors: S. Howard, J. Baker and K. Hiscock

Sediment Macrobenthic Communities — from Oil Ports to Offshore Oilfields
Authors: D. Levell, D. Rostron and I. M. T. Dixon

Determination of Hydrocarbons in Environmental Samples: Sampling and Analytical Variability
Authors: S. E. Howells, N. M. Dodd and C. Turner

5th November

The Role of Dispersants in the Persistence and Fate of Oil in Sediments
Authors: D. I. Little and J. M. Baker

Sediment Contaminant Transport in Milford Haven
Authors: D. I. Little and P. McLaren

Refinery Effluent Discharges into Milford Haven and Southampton Water
Authors: B. Dicks and D. Levell

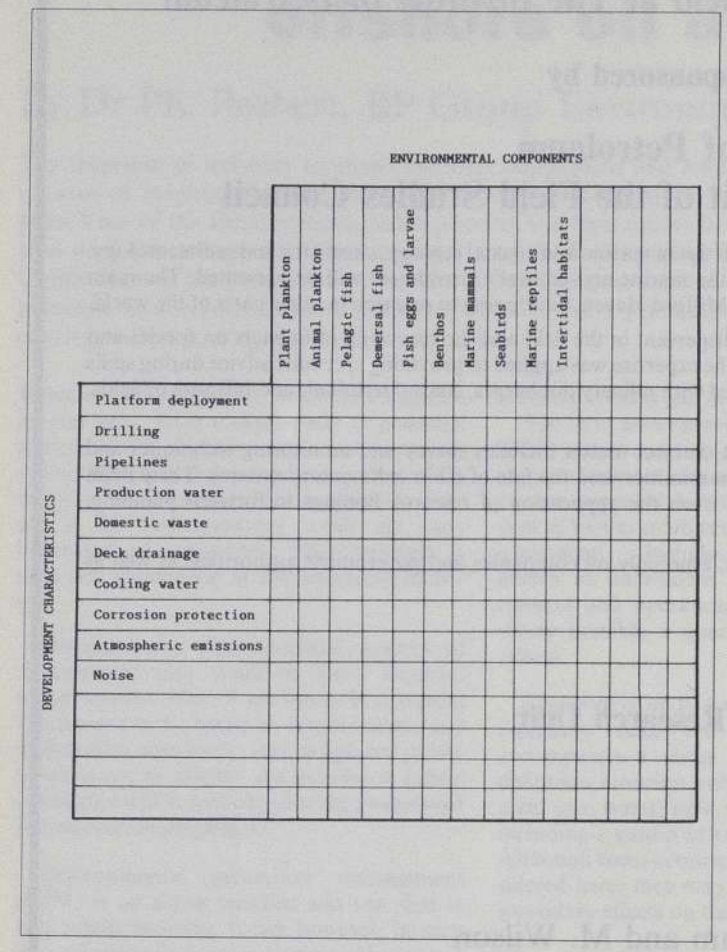
Monitoring the Sullom Voe Terminal
Authors: S. S. C. Westwood, G. Dunnet and K. Hiscock

Environmental Sensitivity Mapping and Oil Spill Response
Authors: B. Dicks, R. Wright and S. Howard

For a copy of the registration form, please contact **Caroline Little,** The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 01-636 1004. Telex: 264380. Fax: 01-255 1472.

Figure 1

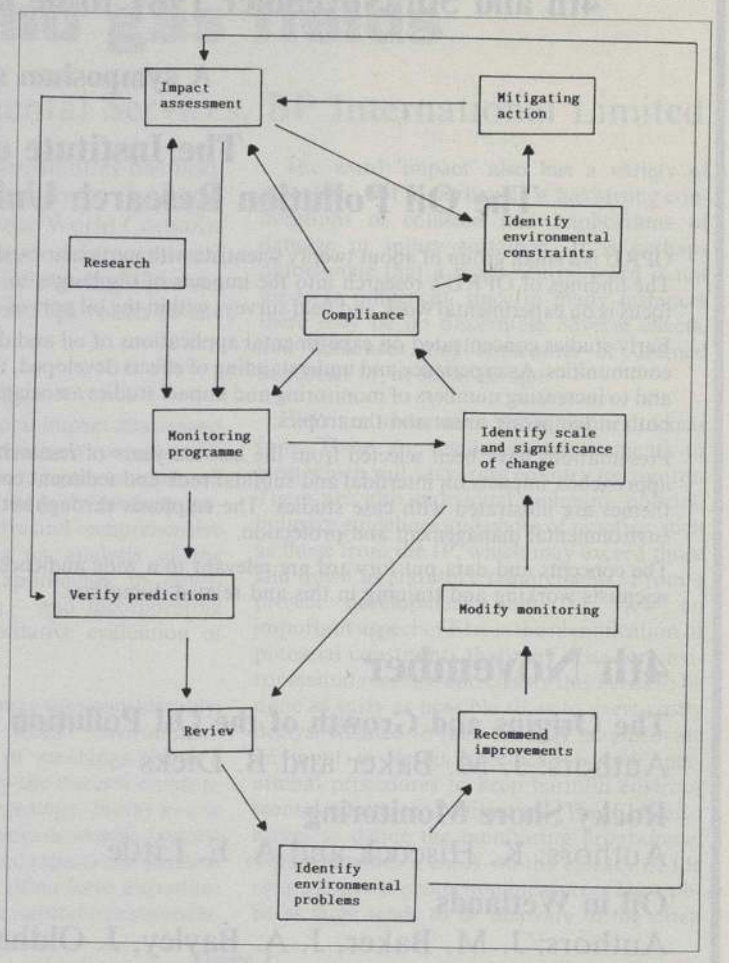
GENERALISED IMPACT MATRIX



Example of part of generalised impact matrix

Figure 3

ENVIRONMENTAL PROTECTION MANAGEMENT



Principal elements in environmental protection management procedure

major environmental studies that are mounted in relation to offshore petroleum activities, and the potential public relations aspect of an EIA may need to be considered too.

In order to carry out an EIA, the principal requirements are a detailed specification of the project during its development, operational phases and decommissioning – and here continuing consultation with the project engineers is vital – and information on the different components of the environment, in this case especially ocean climate and water quality data, information on the seabed sediment types and on adjacent coastal morphology, and on the different types of biological habitats and their resident plants and animals.

Once information relating to a proposal, the site and its environs has been obtained, it is possible to start to identify potential impacts and their respective significance. One of the simplest ways of achieving this is by using an impact matrix, in which the characteristics of a development proposal are tabulated on one axis and site characteristics on the other[1] **(Figure 1)**. When the interaction of components on the two axes is likely to result in an impact, the intersection is marked. Various systems are in use for scoring impacts and thus enabling an assessment of their relative importance.

Depending on the proposal to be appraised and the level of detail required, expanded matrices dealing with specific impacts may be constructed. It is important to bear in mind that the impacts of the construction and operational phases of a development may differ appreciably as, for example, in the discharge of drilling wastes and produced water. In assessing potential interactions, various points need to be considered, in particular whether the environmental effects are detrimental or beneficial, short-lived or long-lived, temporary or permanent. Moreover, because of the interrelatedness of biological systems, impacts may have a number of indirect effects.

Biological information

There is clearly a need for basic biological information in carrying out an impact assessment, not just on the species present, but also on their life history patterns, their migratory behaviour and respective susceptibilities to stress and disturbance. Many species may be at a site only at certain times of the year, and larval and juvenile stages of marine species are commonly more sensitive to contaminants than are the adults.[2]

Ideally, if data permit, consideration should be given to the function of organisms, their role in the cycling of energy through the ecosystem, and their relative importance in the food web. However, in many parts of the world, only limited biological studies have been carried out, and the local flora and fauna are poorly known and incompletely described. It may be difficult to undertake a detailed EIA in such areas and preliminary wide-ranging biological surveys may be indicated. An essential aspect of determining the state of knowledge is consultation with the expertise available (eg government and university departments, nature conservation bodies – both statutory and non-statutory – and fishery organisations).

In addition to assessing the environmental effect of a development during normal planned construction and operation, it is essential to take account of environmental implications that would arise in emergencies, and to have contingency plans that include environmental considerations. In particular, with oil spill contingency plans, information is needed on the occurrence of vulnerable species and habitats as this may have an important bearing on the best options for responding to a spill.

Organisms most at risk are those likely to come into contact with a contaminated sea surface, such as sea birds, marine mammals, intertidal plants and animals, and organisms in aquaculture facilities and storage pens in tidal areas.[3] For example, vulnerable species of birds are those that congregate in the open sea in large numbers, such as auks, ducks, cormorants and gannets. From a major study

of the seabird populations in the North Sea it is possible to identify areas that would be especially sensitive to oil pollution at particular times of the year on account of important concentrations of seabirds.[4]

Shores most susceptible to oil spill damage are the very sheltered ones where oil may persist and become incorporated in sediments. Particularly vulnerable are those sheltered habitats in which plants themselves determine the structure of the habitat, such as saltmarshes[5] and their tropical equivalent, mangroves.[6] In these systems, both of which are highly productive, the diversity of associated plants and animals is dependent on the continued presence of the primary vegetation. There are important economic considerations too where fishing and shellfishing operations are carried out in tidal areas, or where there are important industrial or amenity elements.

Emergency situations

Difficult decisions inevitably arise during emergency situations as there may well be conflicts of interest. However, much can be done at the contingency planning stage to identify sensitive areas and to determine priorities for protection. A useful starting point is mapping the relative sensitivity of areas. Relative sensitivities of marine habitats and resources to oil in the North Sea have, for instance, recently been summarised.[7]

Another powerful tool in oil spill contingency planning is computer modelling to forecast oil spill behaviour, and a number of such models have been devised.[8] Combined with information on the sensitive environmental components, oil slick modelling can provide a valuable input to the EIA for accidental scenarios.

The second main element in environmental protection management is monitoring. The word 'monitor' comes from the Latin meaning to warn, and the aim of monitoring is to give notice of changes caused by the development. Monitoring offshore installations is of two main kinds. Discharge monitoring is concerned with the monitoring of discharges to ensure the attainment of performance standards. This is commonly carried out by means of physical or chemical analyses of effluents, but may also involve testing their toxicity to various organisms. A wide variety of chemicals are used offshore, the largest use being associated with drilling fluids, which have been the subject of extensive toxicity testing.[9,10]

The other main type is the monitoring of the receiving environment, particularly the biological effects. This can be divided into three broad categories corresponding to different levels of biological organisation. At the community level one is looking at possible impacts on the whole assemblage of species in a habitat. Alternatively, or in addition, one may choose to focus on particular species that have been selected as sensitive indicators of environmental disturbance. At a cellular level there is the possibility of examining specific biochemical processes and how these respond to sources of stress in the environment.

In environmental studies associated with offshore oil and gas fields, a major emphasis has been on monitoring, at the community level, of the seabed organisms, the benthos. Many benthic species are sedentary or of limited mobility and thus tend to be the organisms most affected by such activities. The benthos also tends to be more suitable for monitoring than the organisms inhabiting the overlying water, which inhabit a three-dimensional and more variable environment, and in many respects the status of the benthos represents an integrated picture of processes occurring in the overlying water.

Functionally, the benthos occupies a central role in the cycling of organic materials in the sea **(Figure 2)**. The food chain is fuelled by the initial production of plant plankton in the surface sunlit layers. The flux of organic material from the plant and animal plankton to the sea floor provides food for the benthic organisms. In turn these support the bottom-feeding fish, including many commercially important species, such as haddock, cod, plaice and sole. Decomposition of organic materials in sediments is chiefly carried out by bacteria, and by this process essential nutrients are released back into the overlying water where they can be re-used by the plant plankton.

Although benthic organisms range in size from microbial organisms to fish, the emphasis in benthic monitoring studies has been on the invertebrates that burrow into the seabed sediments. Principal among these are many types of worms related to the familiar ragworms and lugworms, the bivalve molluscs (various clam-like species), and small crustaceans related to the sandhoppers common on sandy beaches.

In typical studies of the sediment and benthos in the vicinity of offshore installations, samples are taken along transects from the position of the installation and extending to beyond the likely influence of the field under normal operating conditions.[11,12,13] The outermost stations thus serve as reference sites. The major transect is usually sited parallel to the direction of the prevailing current, and sampling positions are sited at increasing distances from the installation (usually up to five to 10 kms). At each station, replicate quantitative samples are taken from the seabed using a grab. Subsamples of sediment are analysed for sedimentary properties and determination of, for instance, hydrocarbon and metal content. Each sample taken for benthos is sieved to separate the contained animals from the sediment, and the animals retained on the sieve are preserved for subsequent sorting and identification in the laboratory.

Natural variability

A problem central to all monitoring is the usually large natural variability of animal and plant populations. At least at shelf depths, populations of benthic organisms are typically patchily distributed and exhibit marked seasonal and longer term fluctuations of abundance. Ideally, monitoring needs to be a repeated process to enable one to distinguish between this background noise and any signal due to a disturbance to the system.

Even a limited environmental study can generate a large data set, with information on species' distribution and abundance, and the associated environmental measurements (eg bathymetry, water quality and sediment type, hydrocarbon and metal content of the sediment). Various computer-based techniques have been developed to enable more stringent analyses to be performed and to facilitate greater objectivity in assessing the degree of disturbance to benthic community structure. A commonly used technique compares the stations (and species) on the basis of their degree of similarity and sorts them into groups which can then be examined in relation to environmental and pollution gradients. For instance, how does the pattern of station groups correspond with that of natural variables, and are there communities that depart from this pattern because of pollution?

Processing of benthic samples is particularly time consuming and accounts for a large proportion of the cost of such studies. A balance therefore has to be struck between the comprehensiveness of the study (and its eventual predictive capability), and the available funding. Partly for this reason there has been interest in monitoring one or a few species that appear to be sensitive indicators of environmental disturbance. A species that has been used in this respect is the common mussel, *Mytilus edulis*, which has the advantage of being a common, widely distributed species that has been intensively researched. Mussels feed by filtering off minute organic particles suspended in the surrounding water. Large volumes of water thus pass through the body, the hydrocarbons from suspended particles and those dissolved in seawater accumulate in the mussel's tissues. Since they are important fouling organisms, mussels growing on platforms have been used to follow possible contamination.

Assessing concentration

Many monitoring techniques have been concerned with assessing the concentration at which pollutants cause mortality. However, many substances may impair the ability of an organism to function normally at concentrations far below those that cause death. These sub-lethal effects may involve, for instance, feeding, growth or reproduction and, over a long period of time, may directly or indirectly contribute to premature death.

Mussels have also been used for the measurement of these sub-lethal biological effects and interest has focused on the so-called scope-for-growth index. This is an integrated measurement of the animal's condition taking into account consumption of food and its fate in the overall energy balance of the individual.[14] Nevertheless, although many aspects of mussel biology are now well known, much work remains to be done to elucidate the response of mussels and other organisms to stress in the environment. Also at the population level, the proportion of oil-degrading bacteria in sediments has been used as a monitoring tool at offshore fields.[15]

Most approaches to monitoring, however, give no indication of the causes of perceived effects. That a community or species is being subjected to stress may be indicated by monitoring, but often there may be little evidence of the cause of that stress. Symptoms of stress are often similar when the disturbance is a natural event or when caused by a man-induced change. In order to overcome this

problem, recent research has been directed at an examination of specific responses at the biochemical level, for example using the mixed function oxidase (MFO) enzymes which take part in detoxification processes, and which have been identified in many species. Parts of the MFO system are enzymes specifically induced by hydrocarbons, and induction of MFO activity has been used in monitoring programmes. General parameters that have been investigated as biochemical indices of stress are the taurine:glycine ratio and the adenylate energy charge as an expression of the energy status of an organism.[16]

To complete the overall environmental protection management procedure, results from monitoring and EIA provide an input to the environmental review or audit.[17] These are carried out periodically to assess the whole EPM programme and whether or not it is operating satisfactorily. Of particular importance here is the performance in the light of current and anticipated legislation. This necessitates a rigorous examination of management systems, plant operations, monitoring practices and data.

Another important aim of the review process is to verify the predictions in an environmental impact assessment, where applicable. During the EIA process a variety of forecasts will have been made on how the development and operation of an offshore installation is likely to affect the environment. From monitoring studies that have been carried out it is important to establish the validity of these forecasts and whether or not changes in operational procedures are indicated as a result of impacts that were not foreseen. This aspect also provides an important feedback to the EIA process and thereby the opportunity to improve the accuracy and predictive capability of this phase.

As a result of carrying out a review, various changes are likely to be recommended to improve environmental performance where appropriate.

Clearly a number of factors need to be considered here, including compliance with regulatory consents, implications for operating procedures, and cost. The implementation of recommendations may require changes to the monitoring programmes.

Continuing research

A fourth aspect of EPM which provides support to the various activities described above is a continuing research programme. Much research has been funded especially by oil companies, organisations such as the IP, government departments and research laboratories. This is a very wide ranging field and among the general areas currently being investigated, are the fate and effects of petroleum hydrocarbons in the marine environment, the toxicity of hydrocarbons, drilling muds and dispersants, dispersion models, survey and monitoring methodology, indices of disturbance, taxonomic studies, and development of computer software for the analysis of ecological monitoring data.

To reiterate **(Figure 3)**, the initial impact assessment serves to identify environmental constraints, and mitigating action can be recommended which is then fed back into the EIA. The EIA also serves to define the monitoring needs, and again this may in part be determined by regulatory requirements. The results of the monitoring programme provide a check on the scale and significance of changes. This information and EIA predictions are reviewed periodically. If environmental problems are identified, improvements are recommended and monitoring programmes, procedures, management and design may need to be modified. The identification of environmental problems can also provide a valuable input to the initial impact assessment. Providing an input at all levels should be a programme of education aimed at training personnel in the principles of EPM and their implementation, and the maintenance of an environmental awareness.

Preventative approach

It should be evident that EPM recognises the importance of a preventative rather than a reactive approach to environmental issues as the preferred starting point, and that this principle is adopted at all the main levels of procedure. The importance of a preventative philosophy is a key message of the European Year of the Environment which was launched by the European Commission in March. EYE will also serve to publicise the Commission's proposals for the Fourth Environmental Action Programme for 1987–92, in which the prevention of pollution will be primary focus.

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The Institute of Petroleum publishes a series of booklets giving background information and a series of oil data sheets giving succinct facts and figures on different aspects of the oil industry. These are:

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3. A Glossary of Selected Terms Used in the Oil Industry
4. Main Oil Products and their Principal Uses
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7/8. North Sea Oil & Gas: Information Sources

9. UK Offshore Fields in Production and Under Development
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15. World Refining Capacity
16. North Sea Crude Prices
17. Opec Crude Prices
18. Representative Retail Prices for Motor Spirit
19. The World's Top Ten

A set of these costs £3.00 (p & p inclusive).

Members who would like copies are asked to apply to the Information Department, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, enclosing the cost.

Young minds tackle an old oil problem

Report by Diana Bearblock of CWA Consultants, London

'At present, crude oil samples are collected using a bottle fitted with a special cork; the bottle is lowered to different depths — three in all — opened from the surface and pulled up when it is full.'

Sounds like child's play, but this is the method used to sample and quantify thousands of barrels of crude oil, and upon which commercial decisions and deals are made involving millions of dollars.

In an industry which has pushed forward the frontiers of technology to extract oil from the bed of the North Sea, brought oil out of the frozen wastes of Alaska and built pipelines across continents, oil traders are painfully aware of the problems caused by primitive and inaccurate methods of measurement.

This problem was put to pupils of Sevenoaks School Creative Technology Centre by Dr Ivan Vince of CWA Consultants, to see if young innovative minds could devise a simple, accurate sampling device to solve the oil industry's problem.

The aim of the centre is to provide school children with the incentives and facilities to develop their creative and innovative talents in the fields of science and technology.

CWA discussed various projects with Patrick Rolleston, the school's director. The oil sampling device generated interest amongst the pupils and a 'brainstorming' session was held. This was attended by three CWA staff (including a seasoned marine surveyor and an experienced petroleum chemist), Mr Rolleston and two pupils from Sevenoaks school.

It was decided that the sampling device should meet the following criteria:

- It should be capable of being lowered through an inspection hole in the top of a 25 metres deep tank and take a continuous sample of the contents from top to bottom
- It should be easily carried by one person
- It should be safe, ie no electrical components outside British Safety Standards
- The device should be simple to operate and sampling should take no more than a few minutes.
- The sample should not have a volume greater than two litres
- The prototype should be developed using readily available, low budget materials

From that point on, the project was in the hands of Sevenoaks pupils Sarah Rolleston and Gabrielle Provan. CWA paid visits to the school to see how ideas and prototype models for the sampling device were progressing and arranged for Sarah and Gabrielle to visit a tank farm on the Thames Estuary so that they could see the scale of operations and test their equipment.

Novel ideas explored in the development of this project included a 'zipped' flexible tube. The unzipped tube would be lowered into the tank and closed when the end reached the bottom. However, since it was realised that it would be impossible to operate a 25 metres long zip from the surface and 'since zips tend to fall apart', this idea was shelved.

A second idea was to use a rigid tube with a cord through the centre attached to a bung in the bottom. The tube would be open while it was lowered into the tank and then sealed by pulling the cord when it reached the bottom. This idea was abandoned since a 25 metre rigid tube is not easy to carry around.

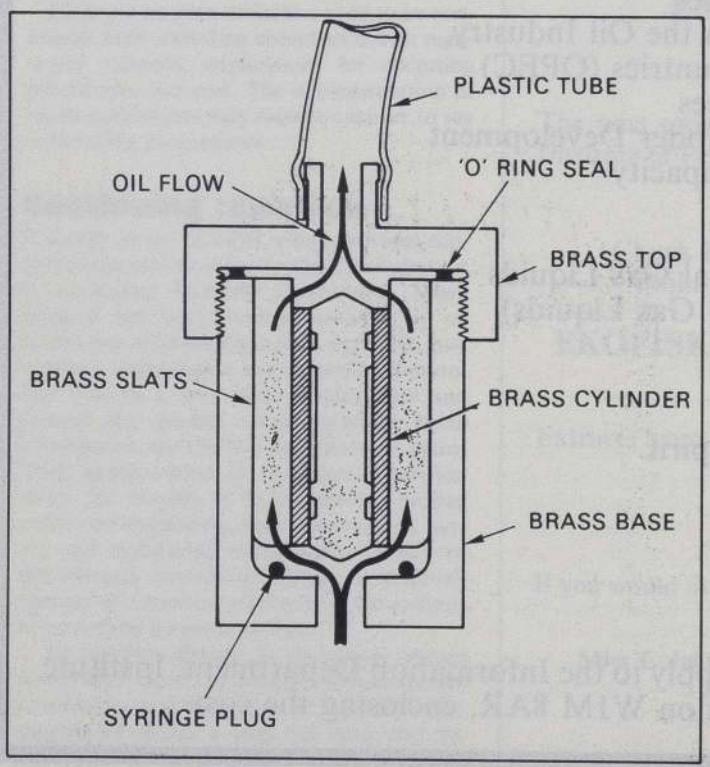
The idea eventually taken to a full scale model, developed and built entirely by Sevenoaks School consisted of a 25 metres flexible tube, with a brass syringe valve at the bottom, housed in a cleverly designed plywood drum and carried like a rucksack. The plywood housing also had sufficient space for storing collecting bottles and spare syringe valves.

The sampling device is unwound from its housing and lowered into the tank with the valve in the open position so that a continuous 'core' sample of the tank contents flows into the tube as it is being lowered. Once the valve reaches the bottom of the tank, both ends of the tube are sealed and the device is withdrawn. The valve is then carefully removed from the base of the tubing, a syringe plug is inserted in the base of the tube, a bicycle pump attached and the oil 'pigged' through the tube into the sampling bottle.

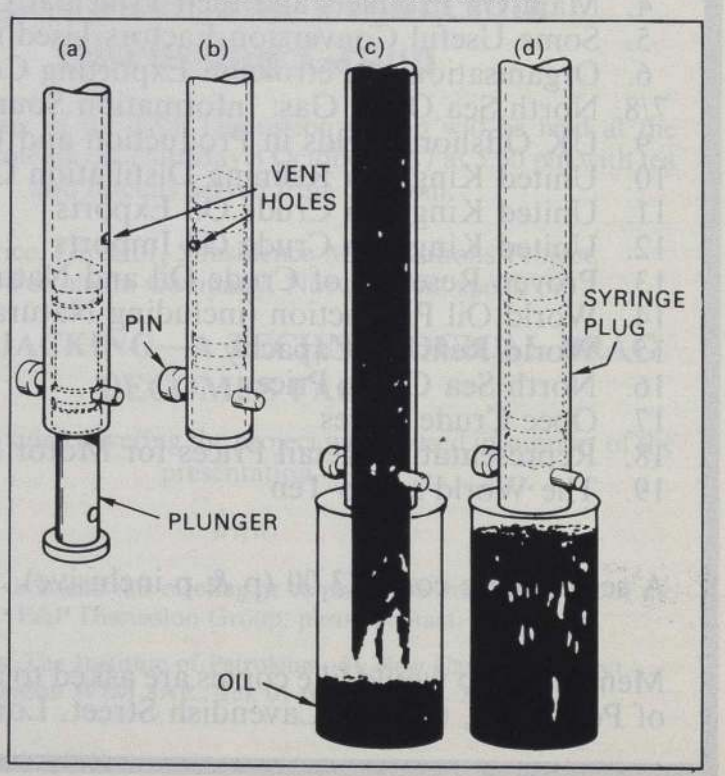
The result is a REPRESENTATIVE, two litre sample of oil drawn as a 'core' from all depths of the tank which can be analysed for density and used in quantity (and quality) determinations. An additional benefit of the 'core' sample is that it can be 'dissected' at intervals to determine the degree of tank stratification and contents mixing.

Sarah and Gabrielle were among the youngest finalists of the Joint British Association and Philips Contest for Young Scientists and Inventors held in March this year. Their entry has been chosen for the finals of the Young Engineers for Britain competition which is organised by the Engineering Council. The invention has been patented and CWA believe there are strong incentives for making the device a commercial reality.●

VALVE MECHANISM



TOP END MECHANISM



The expanding role of a UK association

RA Custis, describes the work of the Energy Industries Council, of which he is the Director General

A recent day at the Energy Industries Council involved putting the final touches to organising an oil and gas seminar in Brazil, advising members of the effects for them of the new Consumer Protection Act and helping an individual enquirer track down manufacturers of a specific item of equipment. For interest, the Brazilian seminar involved over 40 papers and was the largest single-industry event of its kind under the auspices of the British Overseas Trade Boards.

The Energy Industries Council is the major trade association of UK based companies involved in providing equipment and services to the energy industries. Members include engineering contractors, fabricators, manufacturers of equipment and components, service companies and a bank or two — 200 companies in all.

Our name may imply that oil and utility companies are amongst our members. This is not so, although the Council enjoys a very close relationship with them.

Origins

In 1943, when most people's minds were on other things, a handful of company executives met under the auspices of the then Federation of British Industries and formed the Council of British Manufacturers of Petroleum Equipment. They were basically concerned with the expected post-war need to refurbish and expand refining capacity and petrochemical plant and to improve town gas production facilities.

The organisation grew through the 1950s and 1960s, when the industry tended to be more localised, with many small companies participating.

By 1971 the industry had changed. The North Sea was developing, first the gas fields in the Southern basin and then gradually the oil fields further north. Memberships expanded to embrace contractor and service companies. The long original title was no longer appropriate and so the initials CBMPE were adopted as the legal name. Many older members of the industry still refer to us by these initials.

Ten years later, recognising the changing nature and emphasis of members' activities, the current title of Energy Industries Council was adopted.

Throughout its existence the Council has been concerned only with the production, conversion, generation and distribution of energy. Historically it has tended to concentrate on oil, gas and petrochemicals, but nuclear business is now forming an increasingly important part.

Combined heat and power is a growing interest and no doubt we shall embrace the more exotic renewable sources when they become economically viable.

The Council's governing body, the Executive Committee, comprises three officers — the chairman, his immediate predecessor or elected successor and the treasurer — plus sixteen members elected from among the nominated representatives of member companies, the chairmen of the five regional committees and a number of co-optees, usually the chairmen of the more important operational committees.

It is independent and receives no financial support from the government, except that which is available through all recognised trade associations for export promotion. It relies on member companies' annual subscriptions and its earnings from various activities.

Nominated company representatives — usually directors and senior executives — form the main line of communication for the Council. A three-weekly News Bulletin informs members of activities and marketing news. A popular feature within the bulletin is 'News from Members' which enables everyone to be kept informed on product developments and contracts that have been won.

The three main functions of the Council are in providing a forum for its members; representing their views to users, governments and other authorities and in providing facilities to assist them in their marketing activities. The objective of all activities is to help members market their goods and services. Everything we do, in one way or another, is aimed towards that goal.

Forum

The Council operates mainly through Advisory Committees made up of members' representatives. The committees are designed less as a decision making body — for they cannot be binding to members — but more to give the opportunity of exchanging views on matters of mutual interest in the marketplace and to hear presentations from user industries, governments or other official bodies, on current developments, in addition to helping formulate representations on behalf of the Council.

Some committees are functional, eg Offshore, Overseas, Commercial and Technical Steering. Others are sectorial, such as Oil and Petrochemical Contractors, Pipework and Fabrication, Nuclear and Radioactive whilst many are technical, on a wide range of subjects including standards, quality assurance and safety engineering.

Representation

The Energy Industries Council is an accredited trade association, recognised by the appropriate government bodies as representing the interests of the industry. Because of this, it plays an important role in putting the views of its membership to the various statutory and regulating bodies as well as to the government direct. Close relationships are maintained at official and ministerial level with government departments, principally with our 'sponsor' departments — Trade and Industry and Energy. On occasion we also work alongside the Foreign and Commonwealth Office, the Treasury and the Export Credits Guarantee Department. Naturally, with the importance of offshore oil and gas, both nationally and internationally, our liaison with the Offshore Supplies Office is particularly close and detailed.

On the other side of the coin, we co-operate on a continuing basis with user organisations such as the UK Offshore Operators Association (UKOOA) and the Engineering Equipment and Material Users Association (EEMUA) and with the individual oil companies and utilities. Apart from the obvious direct benefits, it enables us to present a concerted policy to statutory and regulatory bodies such as the Health and Safety Executive and the British Standards Institution.

It has already been said that marketing is the essence of the Council's work. Direct services include the organisation of exhibitions and seminars at home and overseas — user companies often forming part of the list of exhibitors. Selling missions are made to specific overseas markets.

The publication of the Energy Industries Council catalogue and buyers' guide is circulated to designers, specifiers and buyers throughout the world. Specifications, data sheets and codes of practice for a wide variety of equipment and operations are also prepared and published.

A Members' Capability Register records in detail the equipment and services offered by companies and it is now recognised as a prime reference point for overseas energy operators.

Perhaps even more important than the direct services offered are the many indirect means by which the Council can assist marketing. Much of our committee work is devoted to seeking ways of simplifying the market by unravelling the knots and taking out the thorns. Common forms of contract, clear specifications, simplification of pre-qualification and bid procedures are examples in one direction. Dissemination of fuller information about projects and contracts, or means of financing and the availability of aid are other instances.

Simply giving the opportunity of purchaser and seller, contractor and supplier, user and manufacturer, to meet informally on neutral ground and discuss matters of common interest is a valuable service intended for the good of the entire industry.

The Council itself exists for the good of the industry it serves and not for the benefit of a few entrepreneurs. It is non-profit making so its strength and prosperity is a direct reflection of the strength and prosperity of its industry.

Over the past few years of volatile and uncertain energy markets have not been the easiest in our history. But we believe that a strong association is essential to the health of the industry and we are determined to aim towards the whole industry being better placed to face future challenges as patterns of energy use adjust to the needs of the twenty-first century. ●

Crude oil tank bottom failure

Description of failure

A floating roof storage tank for crude oil failed very rapidly. The tank measured 43·9 m in diameter and 16·45 m in height. It was full to a depth of approximately 10 m immediately prior to failure and disgorged in less than 5 minutes.

The tank had been filled over a period of several months with a mixture of crude oil, slop oil from another refinery shutdown tankage, fuel oil tank bottoms from a storage installation, recovered crude oil from crude tank drainings, sludge recovered from the refinery sludge pit, recovered slop oil from the refinery sewer system, and slops from ships ballast.

This mixture was being prepared for processing using a procedure of heating tank and water draining.

Instructions were issued to heat the tank to 60°C and water drain on a daily basis. The mixer was left *off* as it had always been normal practice at this refinery to heat slop oil tanks, without circulation, to encourage water/sludge separation.

The tank was heated from 33·5°C to 46·8°C (11 days later) and from tank dips, a total of ca 300 tonnes of water was drained off.

Although the tank level indication showed temperature to be only 46·8°C, temperature recording was on average of 10 points (or less if some bulbs had failed and been shorted out) throughout the tank. This included the vapour space. It is known that temperature stratification can occur when dealing with mixtures of this nature. Therefore the temperature in the bottom of the tank could have been well above that recorded on the tank level indicator. This was supported by verbal comment from operators who drained the tank and reported the drainings to be very hot — about 80°C. There was no separate temperature indication at the base of the tank.

Failure investigation

Initial inspection of the damage to the tank revealed that the floor plates had failed both at welds and across the sketch plates. Damage appeared to consist of a hole, about 20 ft by 10 ft on the floor of the tank, and excavation of the tank pad about 6 ft deep and 20 ft square. The force of the wall of oil emitting from the tank severely bent steam and sludge lines external from the tank. Steam coils and plating from the fracture were distorted and torn badly. The tank roof had a buckle crease where legs fell into the hole created. The extensive buckling and bending of the plates suggested that a large cavity must have existed beneath the plates prior to collapse. The plates that failed were adjacent to the tank water drain and sump. All failure surfaces (that could be seen) were ductile/sheer indicative of a sudden catastrophic failure. There was no evidence of corrosion of the floor plates and the paint coating was still intact. Some plates further towards the centre of the tank had failed at welds.

The subsequent metallurgical and geotechnical investigation concluded that the initial failure was due to undersized fillet welds being overstressed due to greater than normal tank heating conditions. The very rapid nature of the failure was the result of the initial leak, at the failed weld, into cohesionless sand which was readily eroded and rapidly led to loss of support beneath the floor plates.

The tank had suffered an earlier failure in 1976 when it dumped 12 000 tonnes of heavy crude into the bund. When the floor was sandblasted, wastage to full penetration was found in three locations, with less severe wastage in several areas of the floor. The failure was less catastrophic than the 1986 failure with the majority of the tank contents spilled into the surrounding bund within 19 hours of initial leak detection. The 1976 failure was concluded to be due to 'washout'. This mechanism of failure is not uncommon, particularly where small leaks have occurred in tanks founded on sandy soils. These soils are susceptible to instability when excessive liquid pressure occurs in the pores, and particularly so when hydrodynamic forces are caused by percolation of the liquid through the soil towards the outside of the foundation.

The rate of acceleration of instability of the foundation depends to a large extent on the viscosity of the oil. In the 1976 failure it was fortunate that the oil was a high pour crude. Had it been a light product, the washout would have been much more rapid, due to faster penetration through the soil.

Recommendations

To guard against the possibility of future failures the following recommendations were made following the more recent incident:

1 A detailed analysis of the effects of tank heating on the structural integrity of storage tank floors to be carried out to determine maximum allowable operating temperatures. Local temperature indicators to be installed adjacent to the tank floor plates to measure and control the temperatures.

2 More stringent examination of the floor plate fillet welds to be performed. Attention to be given not only to the sealing quality but also to their adequate size.

3 In order to attempt to control the rapidity of possible future failures it would be necessary to undertake precautionary measures such as chemical grouting or other works beneath tanks which are in a similar condition.

It should be noted that the undersized fillet weld which failed or initiated the collapse had been the same size since the tank was commissioned and only failed under extreme tank heating conditions.

Fuel oil tank explosion

A fixed roof 2,500m^3 fuel oil tank was struck by lightning during a thunderstorm and the roof and horizontal access way to an adjacent tank were blown off and landed in the bunded area. The tank level at the time was 11.2m out of a working maximum level of 12.2m.

The fire was detected quickly and tackled by the refinery fire service with foam and totally extinguished in 10 minutes. The absence of the roof assisted the attack.

In checking an adjacent tank on the same duty after the incident, flammable concentrations of about 90% of the Lower Flammable Limit (LFL) were detected.

The presence of volatile hydrocarbons was traced back to the rundown of propane precipitated asphalt from the Propane Deasphalting Unit of the lubricating oil treatment stream without adequate steam stripping to remove propane.

Kerosine tank failure at service station

A spillage of kerosine occurred at a service station when an above ground tank seam split during a delivery, allowing 1350 litres to escape.

The tank was a standard $\frac{1}{4}$" thick mild steel rectangular tank of nominal 2,700 litres capacity, with dimensions of 6'–0" × 4'–0" × 4'–0" deep, fitted with a 3" fillpipe and a 3" vent pipe.

It sat on four steel legs, and was located close to the service station wall. There was no bund wall. The tank was finished in a black bituminous paint, which was apparently in good condition. The tank bottom was however quite rusty.

Opinions differ on when the tank was last used, varying from three to 10 years. The service station was re-entering the kerosine market after a number of years out of it. A sudden cold spell made the re-use of the tank urgent. It was inspected by an engineer of the oil company, and by the pipework contractor and appeared to be in good order.

The initial delivery was made, and when 1350 litres had been pumped in, the delivery driver noticed kerosine leaking from underneath the tank. The bottom seam adjacent to the wall then failed completely and the whole contents of the tank poured out onto the forecourt.

The fire brigade was immediately called, and on arrival flushed the product into the forecourt drainage. Drain gulleys and drainage interceptor were pumped out the following day.

Similar tank failures have occurred during deliveries on two previous occasions. In all cases tank venting capacity was not thought to be a contributory factor.

Following an earlier and similar tank failure, the oil company elected to construct bund walls around all future above ground tanks of this type.

The oil company is now considering further measures to avoid similar failures in the future. These include:

a) periodic detailed examination of small above ground tanks of this type, with particular reference to bottom plate and seam condition.

b) automatic replacement of tanks of this type when they reach a certain 'service age', or where they have remained empty for lengthy periods.

Road tank regulations

Further certificates of exemption under the Dangerous Substances (Conveyance by Road in Road Tankers and Tank Containers) Regulations 1981 have been issued by the Executive. It is believed these two have particular relevance.

No. 6 of 1986

During 1985 consultation took place with interested associations regarding the possible revision of Schedule 4 to allow driver-controlled deliveries at petrol filling stations ie deliveries during hours when the filling station is closed and only the tanker driver is present. Subsequently, HSE decided to allow trials to take place at a limited number of filling stations throughout Great Britain in order to gain experience of this type of operation before taking a final decision on revising Schedule 4. The first site in South Shields is now operational under the terms of Certificate of Exemption No 6 of 1986 and further sites are being considered.

A Code of Practice for Driver Controlled Deliveries to Premises Licensed for the Storage of Petroleum Spirit has been published by the Institute of Petroleum on behalf of UKPIA. It is available only from the Institute.

No. 1 of 1987

The regulations do not cater in all respects for the circumstances where a road tanker or vehicle carrying a tank container may have crashed and is being towed or otherwise moved by a recovery vehicle. The tank may be punctured and so not comply with Regulation 6 (construction of vehicles and tank containers).

In addition, the driver of the recovery vehicle may not have received instruction in line with the requirements of Regulation 21 (instruction and training for drivers).

The new certificate, therefore, exempts the operator of a road tanker or tank container from the requirements of Regulations 6(1)(b) and c(i) in circumstances where the tanker or tank container is damaged and is being moved to the nearest safe place for repair or for cleaning or purging, provided that steps have been taken to make it as secure from leak as is reasonable in the circumstances and the vehicle is escorted by a police or fire brigade vehicle.

In addition, the certificate exempts the operator from Regulation 21 in like circumstances if the driver of the recovery vehicle is accompanied by a person who has received training in accordance with Regulation 21 or if the recovery vehicle is escorted by a police or fire brigade vehicle.

Copies of both certificates of exemption can be obtained from:

Health and Safety Executive
HSD-A3
Room 417
1 Chepstow Place
London W2 4TF
Tel: 01-229 3456 Ext 6207

Safety publications

Management guidelines on safety at multi-contractor sites

CONIAC Guidance Note: Managing health & safety in construction: Principles and application to main contractor/sub contractor projects. HM Stationery Office £3.50 net
ISBN 0 11 88 39187.

'None of us should accept the inevitability of the poor accident record in the construction industry,' said Dr John Cullen, chairman of the Health and Safety Commission when he launched the new CONIAC Guidance Note 'Managing Health and Safety in Construction.'

'Because of the complexity of site operations, and the involvement of many different contractors working together, the proper management of site work is as crucial to health and safety as it is to the final product,' he continued. 'Attention to the guidance will help contractors, large and small, to understand their responsibilities and help to reduce the toll of accidents.'

The guidance note spells out in detail the roles of all the parties involved, from the client to the smallest sub-contractor. It points out the essential considerations for health and safety at all stages from the initial design to the actual construction process. The essential steps to be taken by each party to the project are clearly set out. They are as applicable to small sites as to large and complicated ones. Whenever the health and safety of those on site depends on the cooperation of one contractor with another the guidance will be invaluable. Many of the major firms already use similar systems.

Guidance on LPG storage at fixed installations

HSE Guidance booklet HS (G) 34; Storage of LPG at fixed installations, HM Stationery Office or booksellers, price £6.00
ISBN 0 11 883908 X.

The Health and Safety Executive has published guidance on the safe storage of LPG at fixed installations in its guidance booklet HS (G) 34. This document updates HSE Guidance Note GS5 and Safety Series booklet HS (G) 15.

It also completes the revision of HSE guidance on the storage of LPG. Last years revised guidance on the storage and use of LPG in cylinders was published as Guidance Note CS4 — 'The keeping of LPG in cylinders and similar containers'. In 1985 Guidance was issued on the small scale storage and display of LPG at retail premises — Guidance Note CS8. Earlier this year a further guidance note, CS11 — 'The storage of LPG at metred estates' was published.

HS (G) 34 gives guidance where LPG is stored under pressure at ambient temperature in fixed vessels larger than 150 litres capacity (50 Kg).

It is said to be applicable to all installations of this type eg at major petrochemical sites, industrial and commercial premises, hospitals etc, as well as to the loading and off-loading of road and rail tankers.

However, with regard to major sites, the recently published IP LPG code — 'Liquified Petroleum Gas Model Code of Safe Practice Part 9 Volume 1 Large Bulk Pressure Storage and Refrigerated LPG' — provides added guidance on the criteria for establishing safe locations for plant and equipment, based on consequences analysis related to likely incident scenarios. (See September 1987 issue *Petroleum Review*).

The location and spacing of LPG storage and other equipment with respect to boundaries and other critical areas within the plant are dependent on radiation flux levels being kept below recommended maxima. Suitable calculations methods are set out in the code to determine heat flux from pool fires and flares.

Dangerous substances in harbour areas

Approved Code of Practice: Dangerous substances in harbour areas, HM Stationery Office or booksellers price £4.00
ISBN 0 11 883857 1.

The Dangerous Substances in Harbour Areas Regulations 1987 (DSHA) came into force on 1 June 1987.

The regulations, drawn up by the Health and Safety Commission (HSC), replace a complex system of local by-laws with a uniform and comprehensive framework of controls over the carriage, loading, unloading and storage of dangerous substances in British ports.

The HSE will be producing a separate guide to the DSHA Regulations later in the year. This will provide general interpretative advice for those who have to comply with the regulations, and should be read in conjunction with them.

Fall from top of road tanker

A truck operator fell from the top of his vehicle while loading and suffered a compound fracture of his left leg.

It is still not certain what happened as there were no witnesses and the driver has no clear recollection of events but it seems that having positioned his vehicle under the loading bay and lowered the drop platform, which extends the full length of the bay but not of the vehicle, he was manoeuvring a loading arm into the front compartment of the truck when he stepped or possibly slipped backwards and slid down the near side of the tank between it and the loading stand stairs. He landed heavily on his left leg which fractured.

As a result of this incident measures have been taken to reinforce a loading procedure which requires an operator, when loading, to work always from a position on the top of the vehicle where he maintains the loading arm between his body and any void however small at the front or rear of the vehicle.

The rise and rise of the petrol pump

by Fred Wilson, Consultant to the Pump Manufacturers Association

There are few aspects of modern life that are not in some way based on the oil industry—in particular transportation. The modern petrol pump, designed to deliver precise quantities of liquid energy into the fuel tanks of motor vehicles, can relate its progress to that of the car industry. This article highlights some of the evolutionary factors that have affected the design of the petrol pump.

When the pioneers began drilling for oil and refining the product, they had a distribution problem. At the time, the answer was the barrel, which is still used by the industry.

The steel barrel with a crude pump inserted to draw out the petrol was used to fill the vehicle in the early days of the motor car.

Subsequently the two gallon can provided a complementary and more flexible source of supply to the motorist. Both forms of container are still in use.

In the more developed countries where the pressures of bulk supply and the need for increased safety in handling the product became paramount, sophisticated twin glass container devices and hand operated pumps came into use.

In the 1920s the oil companies,

The Barrel; 40 US gallons.

together with a few far seeing manufacturers, set in train research schemes designed to increase the speed and accuracy of product flow to their customers, and, in terms of the petrol pump continuous flow positive displacement meters were devised.

These meters, still the heart of the modern petrol pump, are in truth highly refined and accurately produced hydraulic motors where the stroke of the pistons is converted into a rotary motion to drive indicators of one form or another to indicate the quantity of liquid passing through the device.

The advent of the meter and therefore the possibility of creating power operated metering systems that could draw, accurately measure, and deliver petrol from underground tanks of around 5000 gallons capacity represented a change in design not only for petrol handling equipment but also for filling stations (specialised sites now made sense) and for the distribution system as a whole.

Filling stations as such allowed oil companies/site owners to think more in terms of marketing than before, and as the car population grew it became apparent that the petrol pump had to integrate into the whole as a significant part of marketing policy.

As always setting down the parameters for a design remained difficult, account needing to be take of the interaction of many important factors, such as oil company marketing philosophies and needs, competition, performance requirements, spares factors, regulatory constraints, materials characteristics and supply, production techniques and costings, and environmental effects (world wide conditions). All these influences and more added up to factors which affect the evolution of successful petrol pump designs. Truly successful pump manufacturers are the ones who manage to get their compromises right on these factors.

In the 1930s the mechanical computer was developed. At last it was possible to fill-up without needing a university degree to work out the price to pay, eg $10\frac{3}{4}$ gallons × 1s-$4\frac{1}{2}$d per gallon. One could also now buy by price alone.

However, the rigidity of mechanical devices such as the computer in adapting to ever increasing marketing pressures for self-service control, and the provision of management data became readily apparent. It was providential that co-incident with the problem of rigidity holding up development, came the advent of higher technologies such as electronics.

The application of electronic technology to petrol pump computer and control systems amounts to a second step change in the evolution of the petrol metering pump. A parallel to this effect is in the realm of cash register design. The mechanical cash register although a wonder of ingenuity had reached the practical limit of its development until electronic technology was applied.

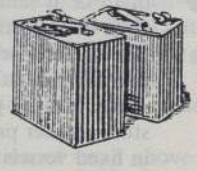
So profound is the effect of the application of electronics technology to petrol pumps that it may almost be said that a customer at the pump these days is, to all intents and purposes, in direct communication with his bank account.

All through the history of the evolution of petrol metering pumps marketing pressures on the Filling Station have been an important factor. In the early 1930s and up to the early 1950s petrol pumps were built tall, approximately 6′ 6″ to the top of the housing upon which was then mounted an oil company globe. Such pumps were often installed eight or more to an island from which would be sold petrol from more than one oil company.

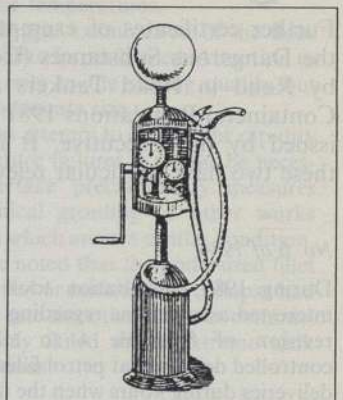
A disadvantage of this wall of pumps, even if only four were on an island, was that it obscured the shop which in emerging marketing terms was unacceptable. In stages manufacturers reduced the height of these pumps to around 4′ 6″ but in doing so the advantage of the hose drape from a six foot height was lost and hose handling became a problem even when efficient re-coiling devices were used.

One of the many virtues of the modern high hose pump is that the hose drape from a height of around seven feet has given good hose handling characteristics. Another advantage of the modern pump is the "see through" design achieved by building low profile hydraulics with plenty of space between the top of the hydraulic housing and the computer/indicator housing, made possible by the advent of electronics technology and the flexibility in design that it allows.

Swing arms, radial arms, wet hose and dry hose systems, twin pumps, blend pumps, advances in materials technology etc, are influences which have an historical bearing on the evolution of the petrol metering pump as it is seen today.



The 2 gallon can.



A hand pump.

However the most significant influences were power operated metering systems, computers, electronics technology, and self-service marketing philosophies.

The advent of self-service attended or unattended may be said to be the third step in the evolutionary progress of pump design leading to the introduction of multi product dispensers (MPDs).

MPDs are the end result of marketing philosophies which reach out to create high throughput self-service filling stations having a ground area sufficient to provide at least four through to sixteen filling positions at any one time. (There are constraints upon how many actual filling operations may take place simultaneously). Such filling stations may also provide space for shops selling a wide range of goods.

Most of the data generated by the sales made on the forecourt are channelled electronicaly to a console operator and other point of sale process equipment.

However, it is the configuration of the pumps at the filling position which is of prime importance to the motorists, and the latest developments usually allow motorists the choice of two grades of fuel and both sides of an MPD can be used simultaneously. There are several variants of the MPD development all designed to make maximum use of forecourt space.

Where will the future lead? Probe and drogue sealed fills or sealed fills by other means? Head up displays? Area price posting? Satellite un-attended filling stations?

Whatever may happen the pump industry will as always respond to satisfy a realistic market requirement. ●

Invention of infra-red gas detector is a major advance in field

An invention by Shell scientists which detects the presence of flammable gases, is to be manufactured and marketed by a British firm. The detector uses a beam of infra-red light to detect any gas which crosses its path, and will be at its most useful when applied on North Sea platforms and in oil refineries.

Shell describe it as a dramatic advance in safety systems for a wide range of industries.

Sieger Limited, a leading UK manufacturer of gas detection equipment, has been licensed by Shell to manufacture and market the system, world-wide.

The detector was developed by Shell Research Limited at its Thornton Research Centre by a team from its Operations Equipment and Measurement Division led by Dr John Cole and Dr Stephen Skippon. The detector makes use of modern infra-red and solid-state electronics technology to provide a sensor which is inexpensive, reliable and capable of giving considerably greater protection than conventional catalytic devices.

Instead of measuring the gas concentration at a point, the new instrument projects an infra-red beam through the area where gas escapes may occur. Gas will be detected if it enters the beam anywhere along its path. The result is that the chance of detecting a release of gas at an early stage is far greater than it could be with a point detector.

Inherent simplicity

The advantage of the open path instrument does not imply high cost. The inherent simplicity of the new system, which has no moving parts, makes it very competitive with existing sensors.

Previous attempts to make a beam detector have used gas-lasers, which are expensive and need high-voltage power supplies. High voltages are extremely undesirable in detection equipment, since it must not itself be capable of igniting the escaping gas. The Thornton detector operates at voltage and power levels which are sufficiently low to ensure that this is the case.

The instrument consists of a transmitter and a receiver. These may be either separate or fitted together in one unit and used in conjunction with a special reflector. The transmitter section contains the infra-red source and optics to collect the radiation and project it outwards as a collimated beam.

The receiver section monitors the intensity of the beam at two wavelengths. Hydrocarbon gases such as methane or propane absorb radiation at one of these wavelengths, but not at the other, so the ratio of the two signals can be used to detect the presence of these gases.

The signal processing is carried out by a microprocessor incorporated into the receiver unit. Sophisticated software has been developed at Thornton which enables the microprocessor to perform the ratio calculation and determine whether gas is present, as well as to carry out various self-checks.

The use of this ratio method provides a complete solution to two potential difficulties. The windows of any optical or infra-red instrument used in an industrial environment soon become dirty, leading to a reduced signal. A similar problem might occur if the instrument is located in the open air, because in bad weather the transmission of the path may be reduced.

However, neither of these two situations causes the Thornton detector to malfunction, because in either case the signals from both of the wavelengths which the receiver detects are attenuated equally, so their ratio remains constant. The microprocessor can also distinguish between the presence of gas and a solid object obstructing the beam.

If the beam is obstructed for a short time, for instance, by someone walking through it, then the microprocessor ignores the interruption and resumes normal operation once the obstruction is removed. On the other hand, if the obstruction lasts for a significant length of time, the microprocessor will signal that a fault condition has occurred.

The new instrument has nearly the same sensitivity to explosive mixtures of all hydrocarbon gases and vapours. It can be used both in the natural gas, coal mining and water industries, where the main hazard is methane, and in petrochemical plants where heavier hydrocarbons may pose a threat.

'Fail-safe'

A major advantage of the new instrument is that it is 'fail-safe'. It will not give a misleading zero reading if dangerous levels of gas are present. The catalytic type of detector may not detect gas at all if the catalyst has been badly poisoned.

Two versions of the detector have been developed and tested at Thornton. In one, the transmitter and receiver sections are mounted together in the same housing and used in conjunction with a special reflector panel. This version is designed for use on offshore platforms and in other places where a relatively short path-up to about 30 metres (100 feet) is required.

A special feature is the design of the reflector panel, which is made up of an array of corner cube retroreflectors, similar to 'cat's eyes' on roads. This design ensures that the beam is always returned exactly to the receiver, even if flexing of the platform or vibration causes the reflector to move slightly. One of these detectors is to be installed for trials on a platform in Shell and Esso's Brent field, in the northern North Sea.

In the second version, the transmitter is separate from the receiver. Several receivers can be used in conjunction with each transmitter, to keep installation costs low. This version is designed for use in petrochemical plants, where longer path lengths are necessary. Each receiver may be up to 200 metres (656 feet) from the transmitter.

Second version

This second version has been extensively tested at Thornton and at Shell UK. Exploration and Production's natural gas liquids processing plant at Mossmorran, Fife. The Mossmorran field trial provided the answer to a crucial question.

It was necessary to establish how the detector would cope with rain, fog and snow when used outdoors. The trial began in November, 1986 and lasted for six months. The infra-red beams spanned a complete process module, a distance of 92 metres (302 feet). The trial was an outstanding success, with not one break in operation throughout a typical mixture of Scottish winter weather.

The international oil industry will be an important market for the invention. But the biggest opportunity will come from a wide spread of other industries.

An early customer will be Shell UK Exploration and Production, the operator for the joint venture between Shell and Esso in the North Sea, which produces about a third of the country's gas. It has worked closely with the Thornton team on the development of the detector.

'The work of our team has led to the most significant advance in the field of flammable gas detection for many years,' said Dr Donald Paul, head of the Operations Equipment and Measurement Division of Thornton Research Centre. 'Our invention has none of the drawbacks of conventional detectors and it is reliable, inexpensive and offers some unique advantages.' •

Swedish test of Gold's gas theory inconclusive

Drillers on one of Europe's most speculative wildcats are packing up to go home. The money's run out. And that's a pity since the hole, just north of Lake Siljan in central Sweden, was drilled to test the controversial Gold theory of gas formation.

Professor Thomas Gold, of Cornell University, US, postulates an abiogenic origin for much of the world's gas, but had never previously managed to persuade anyone with the right sort of cash to put it to the test.

Now, as the crew from Ratliff Drilling Co head back to the US, the backers are setting their computers to work to see if it was all worthwhile.

Although conventional thinking wrote off the Siljan wildcat even before it spudded, one thing is certain: gas was found. Trouble is, it cost $21 million and the volume — still officially undisclosed — was small. Now, says Ingvar Wivstad, chairman of Dala Djupgas AB, the consortium formed to drill the hole, spending stops 'unless results of the studies of the test drilling reveal something extraordinary.'

If results suggest that further drilling could be worthwhile, the partners will seek more funds. Currently the chances of that must be 50:50. For, against the disappointment at Siljan must be set the fact that, 800 miles north and still on the Fenno-scandian Shield, Soviet drillers have found hydrocarbons in similar rocks. The difference is that the Soviets drilled to over 12,500 m. Siljan drilling is being halted at 6,300 m.

Gold's theory suggests that hydrogen has existed in vast amounts since the solar system was formed. Any carbon present would combine with it to form hydrocarbons, incorporated in the forming Earth as solids. When compressed and heated these would give off their lighter components, mostly methane. He backs this theory up with the suggestion that there is today far more carbon around than could ever have been formed from fossils alone. Methane produced from the primordial carbon postulated by Gold would naturally seep up through the rocks, some being oxidised to carbonates, some being trapped in sedimentary rocks. Methane is found elsewhere in the solar system, says Gold, in places where life — as we know it — does not exist.

Siljan was chosen for trial drilling because the area was impacted in the distant past by a meteorite. This fractured the granite to provide a suitable reservoir. And since the area is totally granitic, any gas found could not possibly have come from an organic source. The Soviets have applied the same theory further north, the only difference between Siljan and the Kola area of Russia being the lack of fractured granite at Kola to act as a reservoir.

Gold published his theory in 1979. In 1982, the Swedish state power company Vattenfall took up the idea. Widespread geological surveys confirmed that the Siljan Ring — named from the ring-like impression left by the meteor's impact — would fulfil all the conditions needed to prove the theory. Seismic showed potential reservoir conditions, carbonates were found in trial drilling, while petroleum seeps — known since Viking times — were tested all around the ring. And the water in lakes within the ring was found to contain up to 2,000 ppm methane, contrasting strongly with the 1–3 ppm found outside the area.

Of the $21 million raised to test Gold's theory, Vattenfall put up a third. A group of scientific bodies, led by Chicago-based Gas Research Institute, put up the rest. A drilling rig was bought and the well was spudded in July last year. The initial target was TD of 5,000 m by early 1987. A quarter of that was drilled within a month, work slowing after the initial spurt so that extensive coring and testing could take place. In October 1986 non-commercial gas showed and the sponsors agreed to move TD to 7,500 m.

Now the cash has run out with a somewhat inconclusive hole — gas found but not in the volumes that would prove the theory beyond doubt.

It takes maybe 10 dry holes to pinpoint gas on a good conventional play, So, as far as Siljan is concerned, the message must remain the same as before: watch this space.

Queen inaugurates new field

Her Majesty the Queen recently inaugurated Britoil's Clyde oil field from the company's headquarters in Glasgow. The ceremony linked the Glasgow offices with the Clyde platform (above) by means of a live two way TV and audio satellite link so Her Majesty could unveil plaques at both locations.

The Clyde field was discovered in June 1978 by the first well drilled on block 30/17b which had been awarded under the fifth round of licensing in late 1977. In 1982 a development plan submitted by Britoil was approved by the Government and the orders for the jacket and modules followed.

In July 1985, the jacket was floated out and installed followed by the float out and installation of the topsides 11 months later. The field produced its first oil in March of this year, and is now nearing peak levels of production — about 50,000 barrels of oil per day.

Winfrith launch

The Rt Hon Cecil Parkinson, MP, Secretary of State for Energy, recently inaugurated the Winfrith Petroleum Technology Business Centre, which belongs to the United Kingdom Atomic Energy Authority. The centre's objective is to sell the UK oil industry petroleum engineering expertise worldwide.

Dragonfly saves sea plough

Dragonfly, a sophisticated deepwater remote operated vehicle system recently recovered an ECA sea plough which had been lost in 170 metres of water, some 150 kilometres offshore west coast of France.The sea plough, weighing more than 17 tonnes, standing three metres high and measuring more than 10 metres in length, was located by the Dragonfly in less than 20 minutes of the first dive, using its forward looking sonar.

In total, seven dives were made, more than 46 hours in the water, the result of which was the plough being successfully recovered.

Dragonfly was developed in East Anglia jointly by the OSEL Group and the Offshore Projects Group of GEC Avionics. Its unique modular design and powerful onboard computer system makes it possible to reconfigure the system for operation in a variety of modes by simply adding work packages and reprogramming the system to suit. The theory has been borne out by practice: Dragonfly's four most recent projects have been deepwater rig support, salvage, pipeline inspection and shallow water platform maintenance.

The picture shows The Prime Minister, The Rt Hon Margaret Thatcher, FRS, MP, being greeted at Murphy Eastern's (MURCO) Winston House head office in North Finchley, London, by Gerald McAully, MURCO president, left, and colleagues Jim Stebbings and Marie Bloom. The company is an important member of the community in her constituency, and Mrs Thatcher had expressed a desire to visit MURCO Petroleum, a supporter of national and local charities for many years. In 1987 it chose to raise money for the National Society for the Prevention of Cruelty to Children. Mrs Thatcher had at one time been a branch secretary of the NSPCC, so her visit presented an appropriate occasion for her to present MURCO's cheque for £5,000 to Mrs Ross-Collins of the Barent and District branch. Mrs Thatcher also addressed the MURCO management and staff.

UK drilling activity picks-up

Gaffney Cline & Associates, the UK-based advisers on international energy affairs, report that figures recently released for the second quarter of 1987 show oil price stability during the first half of the year has begun to encourage increased drilling activity in UK and offshore Continental Europe waters. In the UK, exploration drilling has increased, while total drilling activity (including appraisal and development wells), has recovered strongly. This reflects an encouraging build-up in activity by the industry as it puts the events of 1986 behind it, they say. In Europe, overall drilling activity has improved slightly while exploration continues to decline.

GCA's senior partner, Peter Gaffney, said 'Our indices suggest the industry is beginning to focus on a more stable future now that attempts to maintain oil prices seem to be reasonably successful. The recent UK 10th Round Licence Awards should continue to be a positive influence later this year and early next year. Release of acreage in other European offshore areas is also expected to encourage exploration.'

Boom in oil and gas IT

Expenditure on information technology is becoming particularly significant in the oil industry despite the uncertainties about price. Scicon estimate this to be some one per cent of turnover, and growing at the rate of 15–20 per cent a year. That brings the current total for the international industry to about £10 bn a year of which one third is spent by oil industry companies on IT external services of the type provided by Scicon.

They find a much greater involvement by top management in IT budgets. The distributions of IT expenditure is also shifting from management to engineering and major projects. The cake is now: corporate 21, exploration and production 22, refining, marketing and distribution 44, and other 13.

The fall in prices in 1986 did not affect IT development as managements worldwide turned to this science for cost effectiveness.

Scicon means to strengthen its position as a leading IT company and will concentrate more on energy, this being primarily oil and gas. For example, more than half its income is from major one-off IT projects for particular clients, which they manage. Not all companies want to be in the IT business themselves, and those which have a large staff involvement need outside assistance.

The variation in IT work in the oil industry is also developing strongly. Scicon devised the sophisticated computer system for the telescopic offshore escape gangway on BP's emergency support vessel, Iolair, for the Forties field. They have recently launched an IBM based modelling system, Miriam, for engineers to use in plant reliability trials. It helps to identify potential problems due to the inherent unreliability of equipment and to define where there is a need for duplication. It was developed from a system they devised for Statoil.

They recognised that IT in refining marketing and distribution will grow rapidly and that companies are not yet taking full advantage of the management systems which are available.

Management priorities are seen as profit margins and differences in customer services, the IT priorities being retailing systems, customer service systems, transportation systems, standardisation and multi-nationality, for example, retail IT services being pan-European, without boundaries.

A gas era

The probability that the UK sector of the North Sea has reserves of gas as interesting in size as the first oil discoveries 14 years ago was naturally a background topic of great interest at the recent Offshore Europe Conference and Exhibition in Aberdeen.

The day before the conference, Kerr-McGee (UK) and its partners announced they had completed testing well 9/18b-7 which discovered oil and gas on block 9/18b. As they reported earlier, the well flowed 22 degree API gravity oil at a rate of 6,844 barrels per day on a $1\frac{1}{4}$ inch choke from Eocene sand. A second test, from a higher perforated interval, flowed at a rate of 8.7 million cubic feet of gas per day on a $\frac{3}{8}$ inch choke also from the Eocene sand.

Appraisal drilling will be conducted to determine field size and to establish commercial potential, but it has already been described as the biggest North Sea find for a decade. It lies 200 miles north east of Aberdeen.

Partners in the block are Kerr-McGee Oil (UK) 25%; Fina Petroleum Development, 25%; Santa Fe Minerals (UK) 25%; Aran Energy Exploration Limited 15%; and Clyde Petroleum (Netherlands) 10%.

These reports have followed the expectation that another large gas find has been made about 100 miles east of the Humber. Conoco announced a significant discovery of gas in block 44/22 and observers have suggested it is possible this is part of a huge field spreading through a number of adjoining blocks. Many other companies are involved in these.

It is not surprising that in the same breath, experts are discussing the pros and cons of pipelines as well as what might be the gas volumes, where they are situated and the timetable for their use.

Shell used the Aberdeen Conference to offer their existing Shell/Esso Fulmar pipeline as a means for collecting gas from new areas. Mr Bob Reid, as reported on page 7, sees gas and gas condensate being Phase 3 of the North Sea's development and, at the same time, the basis of a large new UK industry.

The government's view on North Sea gas transportation has yet to be given. A proposal in the past to establish a joint industry gas gathering pipeline system for the North Sea did not attract. What appears certain, however, is that the UK sector's gas reserves are adequate for a long time.

Producers and distributors

ICC Financial Survey of Oil and Petroleum Producers and Distributors, published by the Financial Surveys Division of the ICC Information Group Ltd. £145.

An annual publication aimed at providing financial and market profiles on both quoted and unquoted companies within the industry. Individual entries include financial data covering a three-year period, information on company location, details of trade and key personnel together with details of parent companies. The Financial Survey is intended as a day-to-day reference guide aimed at executives and researchers.

Fluid machinery for the oil, petrochemical and related industries

Published by Mechanical Engineering Publications, PO Box 24, Northgate Avenue, Bury St Edmunds, Suffolk IP32 6BW. 236pp. £31.

The published results from the Third European Congress, held in The Hague in May this year, considers advances made in design philosophy, installation and testing methods and the practical application of new improved rotating machinery. The papers in this volume encompass many different aspects discussed at the meeting, including centrifugal compressors, dry gas seals, improved rotor stability and pumping machinery. It also covers the injection of various substances to improve recovery of oil reservoir dregs. Illustrated with photographs and line drawings.

New edition of Register

The Register of Ships, 1987–88, published by Lloyd's Register of Shipping, 71 Fenchurch Street, London EC3M 4BS. Price £250; UK forwarding charge £25 + VAT; European £42. Three volumes.

This updated annual publication gives details of more than 77,000 merchant vessels. Over 50,000 amendments and alterations are processed annually and published in cumulative supplements which are forwarded to subscribers at no extra charge.

Shell sponsored report

Environmental and Planning Regulatory Background to Onshore Exploration and Production, produced by the University of Aberdeen's Centre for Environmental Management and Planning, University of Aberdeen, Old Aberdeen AB9 2UF. 104 pages. Available free of charge from: UKPA/412, Shell UK Exploration and Production, Shell-Mex House, Strand, London WC2R 0DX.

Commissioned by the Environmental Affairs Department of Shell UK Exploration and Production, this is a comprehensive report which summarises the environmental and planning regulations governing onshore oil and gas exploration and production in Britain.

Approved Training Establishments

The Offshore Petroleum Industry Training Board recently published a six-page booklet as their first issue of Approved Training Establishments. It is available, free of charge, from the OPITB, Forties Road, Montrose, Angus, Scotland DD10 9ET.

This booklet details the UK training establishments which have been granted OPITB approval following a series of comprehensive inspections of offshore basic sea survival and firefighting courses being offered to the offshore oil industry.

Guidelines to enhance safety of loading and unloading Bulk Liquified Gases

Two documents have been recently published by the Society of International Gas Tanker and Terminal Operators Ltd: Recommendations and guidelines for linked ship/shore emergency shut-down of liquified gas cargo transfer; Guidelines for the alleviation of excessive surge pressures on ESD. Copies are available from Witherby & Co Ltd, Book Department, 32–36 Aylesbury Street, LONDON EC1R 0ET priced at £7.50 for the ship/shore ESD link system recommendations and £10.00 for the surge alleviation guidelines, both prices include sea mail charges.

Ship/shore link system; recommendations are given for a standardised link to connect ship and terminal ESD systems to communicate and initiate emergency shut-down (ESD) of cargo transfer safely and as quickly as reasonably practical. Criteria for an intrinsically safe electrical link system are described in an appendix which have received approval in principle from a number of certification and regulatory authorities worldwide. Surge pressure alleviation guidelines; the aim of the document is to assist persons unfamiliar with this phenomenon of surge pressures and to give practical guidance to the operators and designers of both liquefied gas ship and terminal loading and unloading systems to enable them to recognise the potential hazards of surge pressure and understand the factors affecting it.

Sullom Voe and the environment

Environmental Monitoring at the Sullom Voe Development in Scotland, prepared by the Shetland Oil Terminal Environmental Advisory Group (SOTEAG), 16-page booklet. 50 pence. SOTEAG, University of Aberdeen, Tillydrone Ave., Aberdeen AB9 2TN.

A recently launched progress report to mark 10 years of environmental monitoring at Sullom Voe. A decade of work, which will continue, generally concludes that there has been no significant or unacceptable changes in the environment at Sullom Voe.

Understanding the futures market

Trading Energy Futures, A Manual for Energy Industry Professionals, Stewart L Brown and Steven Errera published by Quorum Books. Available from Quorum Books, A Division of Greenwood Press Inc, 88 Post Road West, Box 5007, Westport CT 06881 USA priced at $7.95 each.

The book is designed to help those who are new to energy futures trading, as well as experienced traders wishing to upgrade their knowledge. It offers an opportunity to develop a solid understanding of how energy futures markets work and how futures contracts may be used to maximise profits in the energy business.

Oil Cargo Measurements

IP Petroleum Measurement Manual Part XVI Procedures for Oil Cargo Measurements by Cargo Surveyors; Section 1 — Crude Oil. Copies available from John Wiley & Sons Ltd, Distribution Centre, Shripney Road, Bognor Regis, West Sussex PO22 9SA priced at £19.00 with a 25% discount for IP members.

It is now generally recognised that the oil industry would benefit from the use of commonly accepted measurement and accounting procedures when oil cargoes are being surveyed. Part XVI Section 1 of the IP Petroleum Measurement Manual deals with crude oil cargoes and a later section will cover petroleum products. It is intended that these should assist those engaged in the many activities relating to the survey of oil cargoes.

People

Tricentrol plc recently appointed two new directors to its Board, **Paul Smith** (above) and **George Miller** (below). Mr Smith has been appointed executive director and Mr Miller a non executive director. The company also announced that **William Gassick**, a director since 1983 is leaving following his appointment as chairman of Pict Petroleum.

Dr George G Fenton has been named chief executive officer of Bridge Oil (USA) Inc. Following Dr Fenton's departure from Australia, **Andrew A Young** was appointed production manager for Bridge Oil in Sydney.

The Board of Directors for Esso UK plc has announced the appointment of **Morris Foster** as manager, Production, Esso Exploration and Production Ltd.

Rudi Meyenburg recently joined John Brown Engineers and Constructors as chief facilities engineer. **Dr Ray Williams** has also recently joined the company as supervising pipeline engineer with responsibility for the Mechanical Designs Section of the Pipeline Systems Department.

Richard M Bateman has joined Welex, a division of the Halliburton Company as its Houston Reservoir Description Department chief petrophysicist.

Pierre Moussel has been appointed managing director of Elf Aquitaine UK (Holdings) Limited and Elf UK plc. He has also been named chairman of the group's distribution subsidiary, Elf Petroleum (GB) Ltd.

Hydrainer Pumps Ltd has announced **Graham Purl** (above) as area manager of its Sheffield depot.

Richard Barry, formerly a director of LASMO Engineering and Operations, took up his new position as president and general manager of Hubday Oil (Malacca Strait) Ltd in Indonesia recently. Hubday Oil is a joint LASMO/BP venture.

Dean F Porter has been named district manager, North Sea Sun Oil Company, Aberdeen District.

Ray Holder, former head of BP Oil's Gas Branch has been appointed the first director general of the Liquefied Petroleum Gas Industry Technical Association. He will head a small, full-time executive team whose brief will be to create greater public awareness of the use and versatility of LP gas and, at the same time, allay concern over the safe handling of the product.

British Gas chief executive, **Robert Evans**, has been elected President of the Energy Industries Club for 1987/88. He will begin his term in office at the AGM in October, succeeding Sir Archie Lamb.

Weatherford International recently appointed **EG Parks** (above) as vice president, chief financial officer and treasurer.

British Petroleum recently announced it has appointed seven executives from its US company BP America Inc to the boards of the international businesses responsibile for the group's worldwide operations. **Charles H Bowman**, president of Old Ben Coal, joins the board of BP Coal. **E John P Browne**, executive vice president of BP America and **William J Johnson**, president of the Standard Oil Production Company, join the board of BP Exploration. **J Douglas Campbell**, president of the Standard Oil Chemical Company, joins the board of BP Chemical International. **Frank E Mosier**, president of BP America and **John G McDonald**, president of Sohio Oil, join the board of BP International. **J. Colin E Webster**, executive vice-president of BP America joins the board of BP Minerals International. **W M Jones**, president of Purina Mills is already a member of the board of BP Nutrition.

United Transport International announced the appointment of **John Osbourne** (above) as Group communications executive recently.

London & Scottish Marine Oil (LASMO) PLC announced **Tom King's** appointment as general manager, Engineering and Operations recently. The appointment is effective from 21 September.

Robert E Henderson has been appointed president and chief executive of Trafalgar House Oil and Gas Inc, effective 4 September.

Hyrolec Technical Services Ltd have appointed **Phillip Armstrong** as a specialist consultant/technical sales engineer.

Chris Moor has been appointed recruitment manager of Metal and Pipeline Endurance Limited (MAPEL).

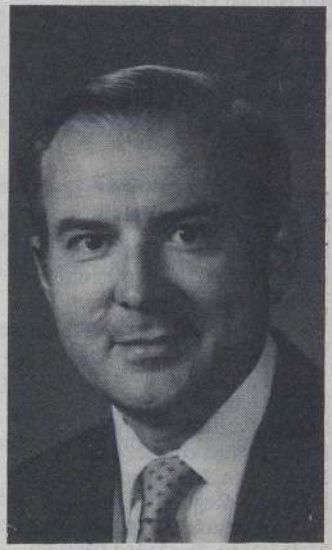
Girdlestone Pumps has appointed **AG Salisbury** to its board of directors.

Dr Peter Nowottny has been appointed general manager of Scicon Limited's Energy Department. He has been with Scicon for nine years.

Bob Craven-Jones (above) has been appointed as a director of Burmah-Castrol UK's Petroleum Fuels Division.

Brian Jones has been appointed area sales manager, Scotland for Girdlestone Pumps, to be based in Glasgow.

Former market support manager for BP Detergents, **Wallace Cowan**, has recently been appointed UK sales manager of the company.



CBI Industries Inc has announced that **George L Schueppert** (above) has joined the company as executive vice president, Finance and will serve as CBIs chief financial officer.

Roger Bowles has joined International Petroleum Engineering Consultants Ltd as manager, Consulting Services. He will be responsible for coordinating efforts of IPECs team of engineers and geologists in the conduct of client studies.

Events

5–6 October Virginia
Marine Structural Reliability Symposium. *Details:* AJ Attermeyer, Registration Chairman, Ship Structural Reliability Symposium, Military Sealift Command, Washington Navy Yard, Bldg. 210, Room 123, Washington DC 20398 USA.

6 October Norway
Symposium on Subsea Separation and Transport. *Details:* Ketill Borge-Ask, The Norwegian Society of Chartered Engineers, Ingeniorenes Hus, Kronprinses Gate 17, Oslo 2, Norway. Tel: 02 41 87 35.

6–7 October London
International Offshore Safety Conference. *Details:* IBC Technical Services Ltd, IBC House, Canada Road, Canada Road Industrial Estate, Byfleet, Surrey KT14 7JL. Tel: 01 236 4080. Tx: 888870.

14–16 October Edinburgh
International Conference on Offshore Separation Processes. *Details:* Conference Dept, BHRA, The Fluid Engineering Centre, Cranfield, Bedford MK43 0AJ. Tel: (0234) 750422. Tx: 825059 BHRAG.

22–23 October London
8th Annual Oil and Money Conference. *Details:* Susan Lubomirski, Conference Director, International Herald Tribune, 63 Long Acre, London WC2E 9JH. Tel: 01 836 4802. Tx: 262009.

25–30 October Moreton-in-Marsh
Handling Emergencies in the Oil Industry. *Details:* Petroleum Training Federation, Room 326, 162–168 Regent Street, London W1R 5TB. Tel: 01 439 2632.

26–30 October Aberdeen
Subsea Production Systems, a five day short course. Details: Lisa Cohen, Manager, IHDRC European Region, 15 Welbeck Street, London W1M 7PF. Tel: 01 487 2550. Tx: 24360 ERC G.

27–30 October Venice
International Conference on Pollution of the Marine Environment. *Details:* Janet Clover, Conference Associates ACOPS, 27A Medway Street, London SW1P 2BD. Tel: 01 222 9493. Tx: 934346 CONFAS G.

27–29 October Hamburg
Fourth European Symposium on Enhanced Oil Recovery. *Details:* Dr Manfred Albertsen, c/o DGMK, Steinstrasse 7, D-2000 Hamburg 1. Tel: 040 32 64 79. Tx: 211 446 dgmk d.

27–30 October Edinburgh
Institution of Electronic and Radio Engineers to hold a conference on Offshore Search and Rescue Communications and Marine Safety. *Details:* The Conference Secretariat, Institution of Electronic and Radio Engineers, 99 Gower Street, London WC1E 6AZ. Tel: 01 388 3071.

10–12 November Aberdeen
Subtech '87 — a conference on sub sea technology. *Details:* Bob Munton, Spearhead Group, Rowe House, 55/59 Fife Road, Kingston upon Thames, Surrey KT1 1TA. Tel: 01 549 5831. Tx: 928042 SPEARS G.

15–20 November Moreton-in-Marsh
Planning for Emergencies. *Details:* Petroleum Training Federation, Room 326, 162-168 Regent Street, London W1R 5TB. Tel: 01 439 2632.

17–19 November London
Second international Conference on Developments in Automated and Robotic Welding. *Details:* The Welding Institute, Abington Hall, Abington, Cambridge CB1 6AL. Tel: 0223 891162. Tx: 81183.

25–26 November Rotterdam
First Rotterdam Oil Symposium. *Details:* Conference Office, Nederlandse Vereniging van ondernemingen in de Energie branche (NVE), PO Box 29822, 2502 The Hague, The Netherlands. Tel: (0)70 546811. Tx: 31440 vng nl.

7–8 December London
The second BIEE/IAEE/RIIA Energy Conference – Energy 1987: The new market equilibrium? *Details:* Patricia Louison, Conference Secretary, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE. Tel: 01 930 2233.

7–10 December India
Construction Management Seminar. *Details:* Marpri Business and Consulting Services Ltd, Regional Office, PO Box 3524, Abu Dhabi UAE. Tx: 23360 HACCO EM.

8–11 December Birmingham
Autotech '87 — automotive exhibition and congress. *Details:* Richard Bull, Press Officer. Tel: 021 780 4171, ext 710.

10 December London
4th Annual Symposium on Microprocessor-Based Protection Systems. *Details:* Rosamund da Gama, Manager Conference Division, The Institute of Measurement and Control, 87 Gower Street, London WC1E 6AA. Tel: 01 387 4949.

7–9 January 1988 India
Operations Planning Seminar. *Details:* Marpri Business and Consulting Services Ltd, Regional Office, PO Box 3524, Abu Dhabi UAE. Tx: 23360 HACCO EM.

27–28 January 1988 Norway
1988 Offshore Oil and Gas Pipeline Technology Seminar. *Details:* Mallory Barker, IBC Technical Services Ltd., Bath House, 3rd Floor, 56 Holborn Viaduct, London EC1A 2EX. Tel: 01 236 4080. Tx: 88870.

3 February 1988 New York
NYMEX dinner 1988. *Details:* New York Mercantile Exchange, Four World Trade Center, New York, NY 10048. Attn: Diana Femia. Tel: 212/938–2216.

10–11 February 1988 London
Conference on Offshore Engineering — Cost Reduction. *Details:* Conference Office, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA. Tel: 01 222 7722.

8–10 March 1988 Amsterdam
Petrotech '88, international trade fair and conference for the oil and gas industry. *Details:* International Exhibition and Congress Centre, Europlein, 1078 GZ Amsterdam. Tel: 020 5411 411. Tx: 10613.

20–24 March 1988 Dubai
The 3rd Arabgas and oil technology exhibition. *Details:* John Fletcher, International Conferences and Exhibitions Ltd, 29 Dering Street, London W1R 9AA. Tel: 01-499 7774. Tx: 21591 CONFEX G.

13–14 April 1988 London
Offshore Update '88 – A new concept for a changing market. *Details:* City Exhibitions & City Conferences Ltd, 8 Dukes Close, Alton, Hampshire GU34 1PH. Tel: 0420 87303.

5–9 June 1988 Amsterdam
33rd ASME International Gas Turbine and Aeroengine Congress and Exposition. *Details:* The American Society of Mechanical Engineers, 4250 Perimeter Park South, 108, Atlanta, Georgia 30341 USA. Tel: (404) 451 1905. Tx: 707340 KTC ATL.

7–9 June 1988 Venezuela
Latin American Petroleum Show. *Details:* Spearhead Exhibitions Ltd, Rowe House, 55/59 Fife Road, Kingston upon Thames, Surrey KT1 1TA. Tel: 01 549 5831. Tx: 928042 SPEARS G.

9–17 June 1988 Leningrad
MORTECHPROM – Marine Technology '88. *Details:* NOWEA International GmbH, PO Box 320203, 4000 Düsseldorf 30, Germany.

3–5 October 1988 Norway
International Geology Conference – Correlation in hydrocarbon exploration. *Details:* Norwegian Petroleum Society (NPF), PO Box 1897–Vika, 0124 Oslo 1, Norway. Tx: 77 322 nopet n.

18–21 October 1988 Kuala Lumpur
Gastech '88, the 13th International LNG/LPG Conference and Exhibition. *Details:* Gastech Ltd., 2 Station Road, Rickmansworth, Herts WD3 1QP. Tel: 0923 776363. Tx: 924312 Gastec.

8–10 November 1988 Aberdeen
IRM/ROV – Aberdeen '88. *Details:* Offshore Conferences and Exhibitions Ltd, Rowe House, 55/59 Fife Road, Kingston-upon-Thames, Surrey KT1 1TA. Tel: 01-549 5831. Tx: 928042 SPEARS G.

Advanced maintenance on ships

Douglas Robinson, General Manager, Marine Management Centre Ltd and Mike Hind, Manager, Pinnacle Services, BP Shipping Ltd

Synopsis

This paper describes the development of a maintenance management system using condition and performance monitoring as the main influence in determining when maintenance should be done. A summary of fifteen years operating experience of this system is given.

The authors indicate that the system has proved effective and has shown benefits in reduced maintenance manhours and spare gear usage. They go on to identify the parallels which exist in terms of process plant applications. They conclude by indicating how computer technology is now being used within the system.

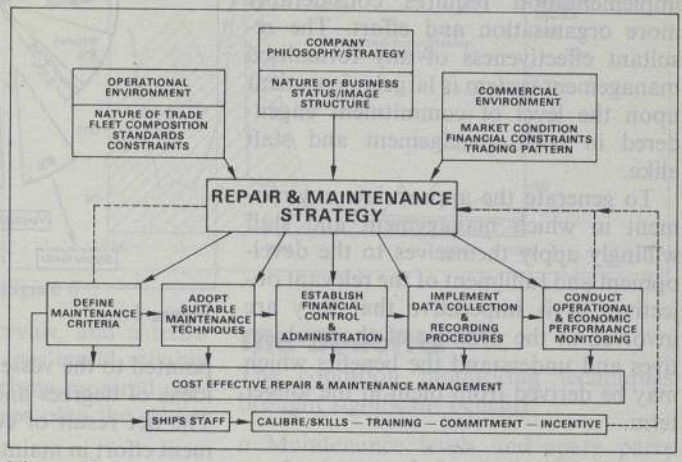


Figure 2

Introduction

The severe recession in the Shipping Industry has forced shipowners and shipmanagers to achieve greater operational efficiency to sustain commercial effectiveness. In his efforts to remain competitive, the shipowner has had to adopt a variety of cost-cutting measures, not least in the area of maintenance.

In reviewing their operational procedures, to reduce expenditure and achieve maximum efficiency, BP Shipping have evolved their Maintenance Management System which has involved a great deal of work in:

- Methods of monitoring and control of the condition of fuel combustion in internal combustion engines in order to improve combustion efficiency.
- Maximising steam plant efficiency through the correlation of actual plant condition at any power and range of ambient condition with the design parameters — thereby enabling very fine tuning of plant operation and clear assessment of plant operating condition.
- Methods of assessing the condition of rotating machinery through vibration and shock pulse analysis.
- Development of energy conservation and fuel management techniques.

Typical Maintenance costs

The expenditure on repairs and maintenance in relation to any industrial sectors total operating costs are dependent upon a number of factors, most of which are influenced by the overall Company Policy and the maintenance philosophy employed.

In many sectors of industry, maintenance is still viewed with little priority and as a result, little or no management effort is applied. Expenditure on maintenance can constitute a significant proportion of operating costs and should therefore be treated as part of the overall management task.

This point is emphasised in **Figure 1**. A typical breakdown of operating costs for a product tanker whose owner employs modern ship management techniques and properly trained, professional operating staff is shown.

The costs for a similar vessel, operated on more conventional management lines would be proportioned differently. Whilst seagoing personnel and administration costs would constitute much smaller percentages, repair costs could be as high as 50 per cent.

Of prime importance, however, is the magnitude of the bottom line, or the overall size of the pie diagram, and thus the degree of potential profitability to their owner. The skill lies in striking a balance between the cost of the administration of a maintenance management system and the benefits accrued through the resultant reduced maintenance costs. What cannot be so easily quantified is the level of operational enhancement which can be achieved through improved vessel efficiency and availability, which, in turn, creates greater potential profitability.

The Maintenance Strategy

The first step in establishing any formalised maintenance policy, from which the strategy is derived, is to consider the many factors which can influence the maintenance requirements, (shown in **Figure 2**), such as:

a **Company–Philosophy/Strategy**

The objectives and results achieved by the maintenance management system must be compatible and enhance the Company's corporate philosophy and strategy.

b **The Operational Environment**

The operating environment will have considerable influence on the requirements and design of the maintenance system.

c **The Commercial Environment**

As will be shown later in the paper, the commercial conditions under which the business is conducted will have a great influence on maintenance policy and strategy.

Having identified the operational parameters, management is able to establish a suitable maintenance strategy which determines:

What maintenance is required
How it is carried out
When it is carried out
Who carries it out and the level of training required
How it is administered and controlled
How performance and cost effectiveness is measured.

The Paper by Mr D Robinson and Mr M Hind was first presented at a meeting of the London Branch of The Institute of Petroleum this year.

The Management Objectives

The formulation of an appropriate maintenance strategy is a fairly straightforward and logical process. Its implementation requires considerably more organisation and effort. The resultant effectiveness of any formalised management system is largely dependent upon the level of commitment engendered in both management and staff alike.

To generate the appropriate environment in which management and staff willingly apply themselves to the development and fulfilment of the relevant objectives, it is imperative that they are involved in the defining of those objectives and understand the benefits which may be derived from them in the longer term.

The Integrated Approach

From both operational and commercial viewpoints, it is important that maintenance is fully integrated with all other aspects of production, plant and operational management. Operationally, if the maintenance function is to be effective, factors such as safety, staff skills and levels, statutory requirements, spare gear stock levels, data acquisition and analysis and communication need to be considered. Commercially, budgeting and cost control methods, accountancy procedures and financial performance analysis requirements are also relevant.

Whilst all the elements of the management function are designed to perform specific tasks on a stand alone basis each must be complementary to the others and integrated in building block fashion to provide a solid foundation on which to sustain a successful business operation, through sound techno-economic decision making processes.

Figure 3 illustrates the principle on which an integrated maintenance management system is established.

The Development of a Marine Maintenance Management System

In examining the potential benefits to be derived from an integrated management approach to maintenance, it would be useful to briefly summarise the historical developments in maintenance techniques within the BP Shipping fleet.

Prior to the mid 1960's, the Company operated a fleet of some 100 vessels of varying sizes and ages. No formal planned maintenance existed other than that initiated by the Chief Engineer ap-

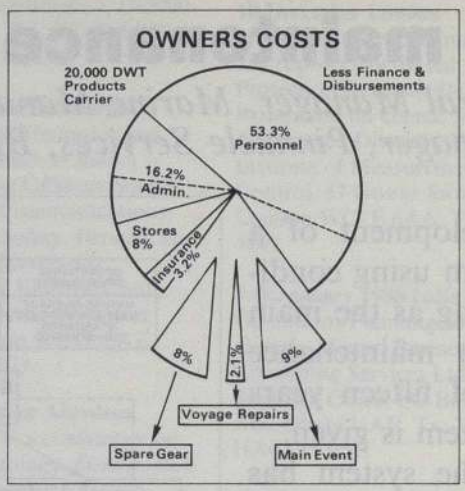


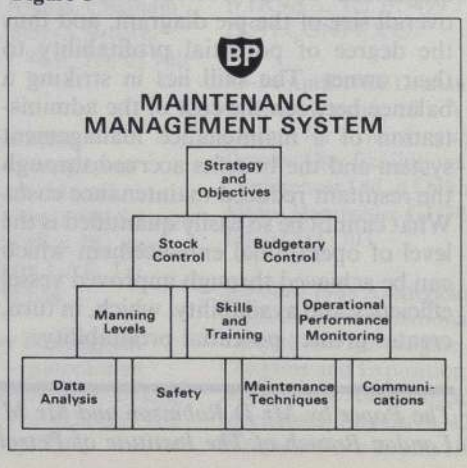
Figure 1

pointed to the vessel. This led to varying ideas of degrees and maintenance done. The net result of co-ordinated management effort in maintenance activity led to frequent delays and breakdowns. Changing market conditions demanded greater reliability and availability. The need for a formalised maintenance system was realised.

It was also recognised that a comparatively small number of the total maintainable items were responsible for the majority of both expenditure and/or maintenance hours. This follows the well known "Pareto Analysis" principle. A calender based maintenance schedule was formulated for each class of vessel covering the high cost, high maintenance load machinery and additionally, those items of equipment considered critical to sustain the vessel's operation in all aspects.

The maintenance programme was geared to correspond to the Classification Society's continuous survey of machinery five year cycle (CSM), with interim service levels arranged at intervals and at levels recommended by the equipment manufacturer and based on operational experience. The system, of necessity, had to be rigid in its initial application, due mainly to the lack of any

Figure 3



real historic information and to ensure that the common theme was established through the fleet.

The practical operation of the system was carefully monitored during the first twelve months of its existence and a number of problems were subsequently highlighted:

a Some operating staff were slow to accept the benefits of the system and there was evidence that the management objectives had not been adequately portrayed.

b The manhour effort required to fulfil the maintenance and clerical reporting requirements of the system tended to overload the ships staff, who had an operational role to fulfil in addition.

c No allowance had been made in the calendar based system for machinery which was operated intermittently such as cargo system equipment, emergency diesel generators etc. Therefore, unnecessary maintenance effort was being applied to equipment — ie machinery was being over-maintained.

d Some seagoing staff felt that the technical decision making processes had been transferred to Head Office due to the rigidity of the system.

e Equipment spare gear usage increased due to the rigid application of the maintenance routines laid down.

However, the main objective was achieved in that maintenance was now applied on a whole ship basis throughout the fleet, unscheduled maintenance declined and breakdowns became less frequent. An upward trend in vessel effectiveness and availability resulted.

Expansion of Improved Management Techniques

A formalised Shipboard Management System was established in the early 1970's, in which the senior officers were encouraged to take up more direct responsibility for the management aspects of the vessel. Thus, the degree of decision making onboard increased to levels more comensurate with the training and ability of the officers employed.

Feedback data amassed through the maintenance and stock control systems was collated on a main-frame computer within Head Office. Analytical procedures were established to facilitate the identification of high cost areas, excessive maintenance effort, heavy spare gear usage and so on. Comparisons were drawn between ships of a class, between different classes and between similar equipment of different manufacture.

This information was used to good

BP GROUP

BP EXPERIENCE

MAINTENANCE MANHOURS REDUCTION
—USING CONDITION BASED SYSTEM
COMPARED TO CALENDAR SYSTEM

Examples:-

	Calendar System Hours	Condition System Hours	% Reduction
INERT GAS FAN	568	256	55
CARGO PUMPS	541	424	21
FEED WATER PUMPS	569	423	26
ALTERNATORS	186	69	63
TOTALS	1864	1172	37

Figure 5

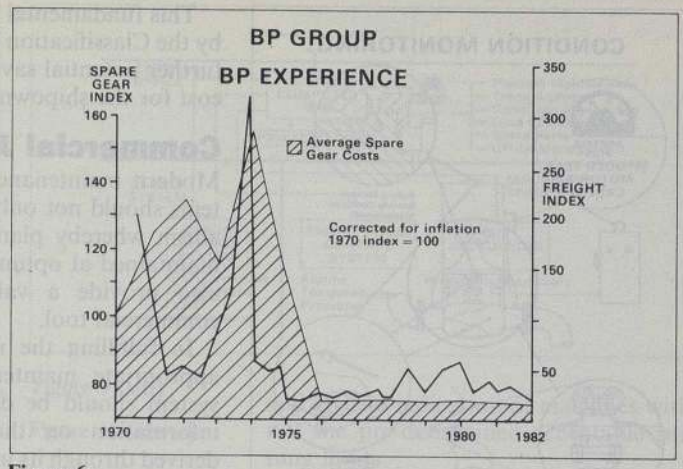


Figure 6

effect in subsequent new building programmes by ensuring that, where possible, the most cost effective machinery types were selected in terms of both reliability and maintenance requirements. It also highlighted troublesome machinery which could then be modified or, where justified, replaced.

Further Developments

By 1972, the formalised maintenance programme was firmly established throughout the fleet. Many lessons had been learnt. More importantly, attitudes towards maintenance had changed. It now constituted an integral part of the ship management function. The information generated from the system also provided a useful and highly effective management tool.

As a further step in reducing maintenance cost and improving efficiency, Predictive Maintenance through Condition Monitoring was introduced into the BP Shipping Fleet in 1973.

The application of this philosophy enabled Engineers to conduct maintenance only when it was necessary, ie when the condition of the machine deteriorated to a level where its performance dropped off or it became unreliable in operation. If the level of deterioration could be monitored at regular intervals, and a trend established, the Engineer could reliably predict when the machine required corrective maintenance and plan the schedule in advance.

Condition Monitoring, as in **Figure 4**, was by no means new to operational engineers. Traditionally, the human senses had been usefully employed for generations — sight, hearing, smell and touch — in determining that a machine's condition was satisfactory or otherwise in the broadest sense. Latterly, instruments and tools had been devised to supplement the natural attributes of the Engineer — pressure gauges, thermometers, ammeters and flowmeters — and enhance his ability to establish that a machine was operating satisfactorily.

Whilst such instruments largely fulfilled a performance monitoring role rather than *condition*, if a machine appeared to be performing correctly within its design parameters, it was reasonable to assume that its condition was acceptable.

Condition based maintenance was fully integrated into the existing calendar planned maintenance system. As the techniques became firmly established and operational experience was gained, the application was expanded to cover approximately 50 per cent of the scheduled maintenance function.

The Benefits

The condition monitoring techniques brought significant benefits:

a Maintenance levels and spare parts costs reduced significantly. (**Figures 5, 6 and 7**).

b The incidence of breakdowns was further reduced.

c The Engineer's professional status was enhanced through the increased technical decision making processes re-established at shipboard level.

d An improved forward planning capability for maintenance was achieved, resulting in better utilisation of plant and manpower.

e Further improvement of ship operational efficiency and availability resulted. (**Figure 8**).

Performance Monitoring

Corrective maintenance was introduced based on Performance Monitoring principles in relation to fuel economy, ie boilers, economisers, heat exchangers, turbines and main & auxiliary diesel engines.

To meet the new criteria, the maintenance management system was expanded

Figure 8

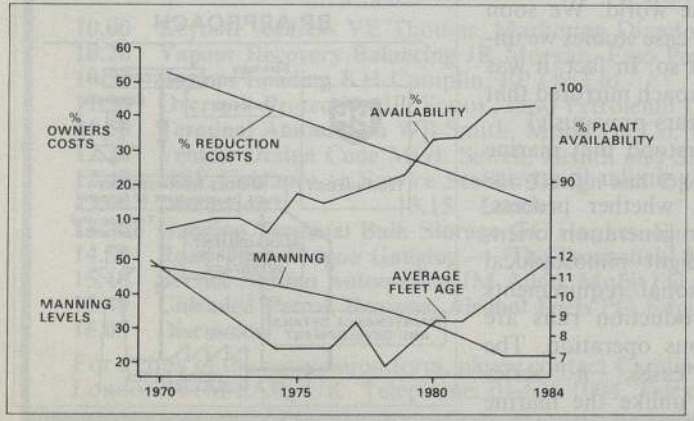
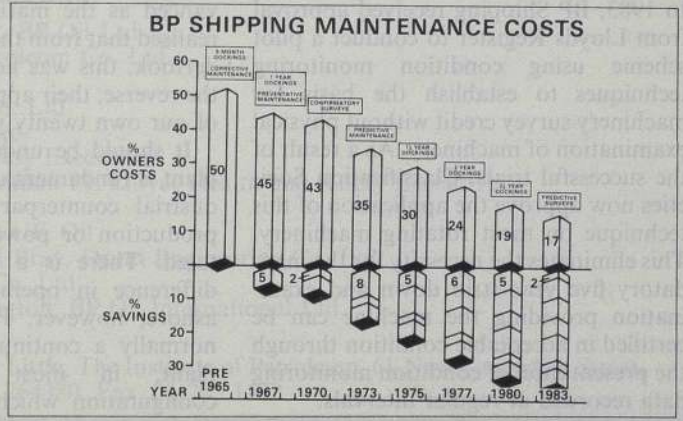


Figure 7



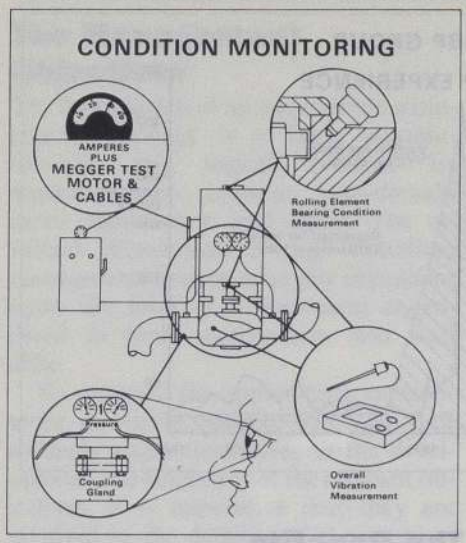


Figure 4

to cover performance monitoring techniques, which integrated fully with the existing elements. More sophisticated measuring instruments were installed to improve the performance measuring capability, expenditure being fully justified in the potential fuel savings.

One area identified as being of significance was that concerning main diesel engines, all of which were of the large bore, slow speed type. Practical trials were conducted using electronic MIP calculators which accurately measure combustion conditions within the cylinders.

Whilst the results of the trials proved that the engines were operating satisfactorily as far as overall power output was concerned, it was found that minor adjustments to fuel pump and injection timing could achieve significant reductions in fuel consumption in terms of cost.

An associated data recording and analysis procedure was developed to enable operating staff to accurately assess the instrument output and convert the information into a corrective maintenance requirement.

Approval of Condition Monitoring Techniques

In 1983, BP Shipping received approval from Lloyds Register to conduct a pilot scheme using condition monitoring techniques to establish the basis for machinery survey credit without physical examination of machinery. As a result of the successful trials. Classification Societies now approve the application of this technique on most rotating machinery. This eliminates the necessity for the mandatory five year strip down and examination providing the machine can be certified in acceptable condition through the presentation of condition monitoring data recorded at regular intervals.

This fundamental change of approach by the Classification Societies constitutes further potential savings in maintenance cost for the shipowner.

Commercial Justification

Modern maintenance management systems should not only provide the mechanism whereby plant and machinery is maintained at optimum levels. It should also provide a valuable management commercial tool.

In fulfilling the requirements of the appropriate maintenance strategy, the system should be designed to generate information on the financial benefits derived through its implementation, both directly and indirectly. The reductions in maintenance costs, as well as the commercial effects of improved plant availability and better utilisation of manpower and materials, must be offset against the capital costs of meeting the strategic objectives, to establish that the measures have proved cost effective overall.

Direct maintenance costs are not difficult to quantify and resultant benefits are easily identified. However, the cost of administration and training must also be considered, ie the indirect element. As the operational and commercial constraints change, the counteractive alteration in strategy must be adequately monitored and, if necessary, modified to ensure that cost effectiveness is sustained. Such measures require dedicated effort and commitment by Management and staff alike.

Industrial Parallels

Having implemented the Maintenance Management System throughout the BP Shipping Fleet, we were commissioned by other shipowners, world-wide, to establish the system and, more importantly, its conceptual ideas into their organisations. It was, however, with some trepidation that we sailed further into shore based industrial organisations. Our preconceived expectations of industry were that the management and maintenance philosophy would be as advanced as the marine world. We soon realised that from the case studies we undertook, this was not so. In fact, it was the reverse; their approach mirrored that of our own twenty years previously!

It should be understood that marine plant is fundamentally similar to any industrial counterpart, whether process, production or power generation orientated. There is a slight philosophical difference in operational requirements ashore, however. Production runs are normally a continuous operation. The plant, in most cases, a series configuration which unlike the marine plant has little or no redundancy in equipment. In our view, such operations were ideally suited for some form of condition monitoring. More importantly, the results of these techniques should integrate into a management system which would give the correct information and thereby allow the decision making process for ultimate selection of the priority machinery requiring maintenance during the forthcoming short shutdown period.

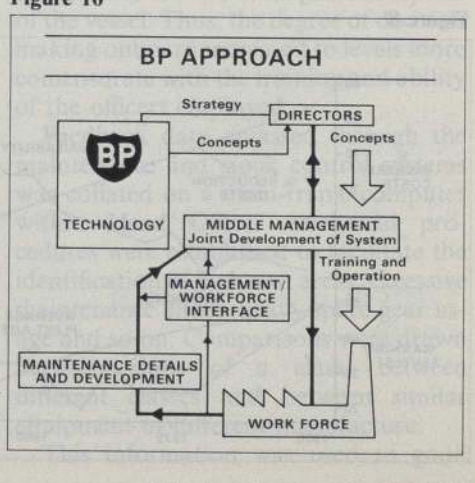
What is apparent in most cases is that maintenance is viewed as a "necessary evil". Although the production and maintenance departments work well together, they have little in-depth understanding of each others' requirements or problems. Furthermore, any overall company strategies, objectives or commercial requirements are inadequate. In the main, most companies are production orientated, which leads to a situation whereby the production objectives of maximum output and plant availability at all times dictate the maintenance objectives. These, therefore, are linked to immediate failure rectification. In other words, the maintenance departments are "fighting fires", frustrated by the awareness that future failures existed but because of production priority, they can do little about them. This point is illustrated in **Figure 9**. What must be clear is that our main task, after defining the commercial justification, is to begin the psychological transition and implement a totally integrated approach to maintenance.

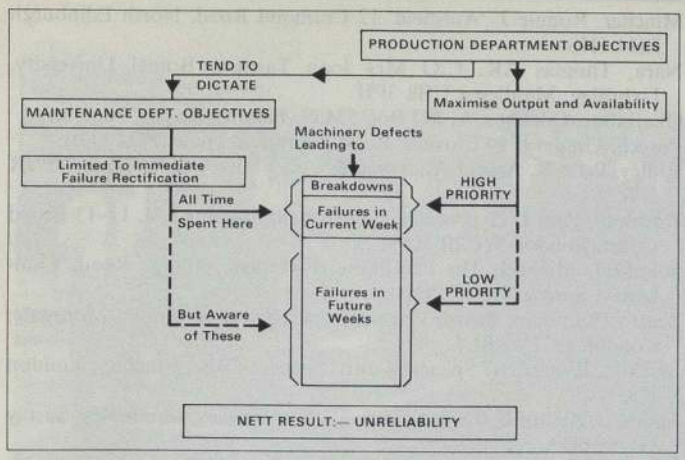
Implementation Strategy

In an environment such as described in the previous paragraph, and where the traditional barriers between production and maintenance staff exist, the implementation of modern maintenance techniques could be difficult.

Because the potential value of such techniques, in economic terms, can only be realised through a total commitment by staff, through a clear understanding of the philosophy behind its implementation, it is vital that an integrated

Figure 10





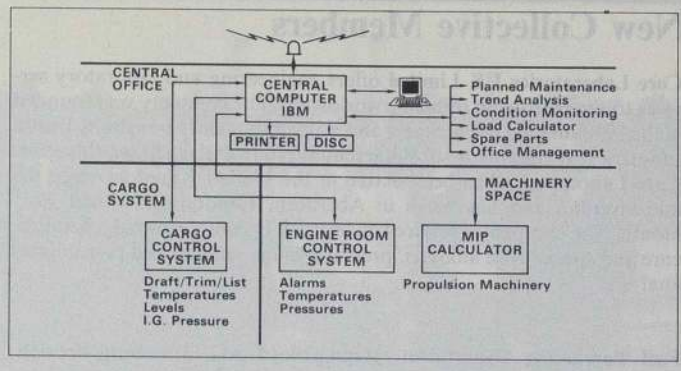


Figure 9 (left)

Figure 11 (above)

approach is established at an early stage. (**Figure 10** illustrates graphically these concepts). Staff must be properly trained in the use of such management tools' and be made aware of the importance of the high organisational content inherent in them. Condition Monitoring systems can provide the Plant Engineer and Manager with important information about the reliability of the plant, but the technology must be properly applied and administered.

Management

Earlier was described the development of our manual system. Today, we and our clients successfully use micro-computer technology to assist in the management and data interrogation of the maintenance system. As a logical evolution, the computer is used to define the when, the where and the how of the maintenance task. More importantly, however, they give quick analysis of equipment history and spare gear holding to allow areas of high maintenance effort and its resultant expenditure to be identified. Clearly an asset to management who can then use the information in the making of their strategic plans for investment in new plant, or even to the disposal of plant.

Advances made by the manufacturers of condition monitoring equipment now allow the use of computers. The computer is used to programme a data collector which will tell the operator which machine to monitor and where to take the readings. The collector is then downloaded onto the computer, which will store the information, trend it, analyse it and give an indication of machines without the pre-determined acceptable running limits.

The designers of new ships now give much consideration to the operational and administrative control systems. Within the next few years, hard-wired computer network management of operations, planned maintenance, condition and performance monitoring and spare gear will be the norm. (**See Figure 11**). By using satellite communication, or other transfer modems, management will quickly assess the operational performance efficiency and effectiveness of their vessels. The commercial implications of this for management planning and control are immense. Commercial management of shipping in the near future will keep their competitive advantage by utilising the technology described above. We would consider that their industrial counterparts would too!●

New Collective Members

Core Laboratories UK Limited offers engineering and laboratory services to the petroleum industry worldwide. The company was founded in the 1930s in the United States and was subsequently bought by Litton Industries. It became a subsidiary of Western Atlas earlier this year. Core Laboratories has been active in the United Kingdom since the mid-seventies and has bases in Aberdeen, London and Great Yarmouth. The company's services include PVT, compositional, chemical, core and special core analysis, pressure-gauge services and petrological analysis.

Fuel Purchasing Department, Hapag-Lloyd AG, Hamburg/Bremen, West Germany, purchases refined petroleum products for internal use by Hapag-Lloyd in its operations which include a fleet of container vessels, a passenger liner, aeroplanes and roadside haulage; harbour and ocean-going tug and towage; cargo storage and container-loading and discharging facilities.

New members elected by Council

Brown, Martyn D, Press Offshore, Howdon Yard, Willington Quay, Wallsend, Tyne & Wear NE28 6UL.
Burns, Alan J, 17 Kenwood Ct., Elmwood Cres., London NW9 9AB.
Coster, David S, PO Box 10330, Madinat Al Jubail, Al Sinaiyah 31961, Kingdom of Saudi Arabia.
Darby, Seamus, Burmah-Castrol (Ire) Ltd, PO Box 15, Tivoli, Cork, Ireland.
Davey, Jane J, Enterprise Oil Plc, 5 Strand, London WC2N 5HU.
Elnady, Nabil, Nadico Port Said Marine Works, PO Box 1050, Port Said, Egypt.
Ferguson, Craig M, James Howden & Co Ltd, 195 Scotland Street, Glasgow G5 8PJ.
Ferris, Kenneth M, Lindsey Oil Refinery, Killingholme, Grimsby, South Humberside DN40 3LW.
Fleck, Alastair R, 34 Rue Jacques Ourtaz, 11000 Carcassonne, France.
Furness, Richard A, Centre for Flow Measurement, Cranfield Institute of Technology, Cranfields, Bedford MK43 0AL.
Garrett, John RB, Sedgwick Offshore Resources Ltd, Sedgwick Hse., The Sedgwick Centre, London E1 8DX.
Hamp, Roland, Brock's Ghyll, Best Beech Hill, Wadhurst, East Sussex.
Ingham, John S, Whinney Murray & Co., PO Box 213, Dhahran Airport, Saudi Arabia 31932.
Irvine, Richard H, Birkenhead & Associates Ltd, Halton House, 20/23 Holborn, London EC1 2NH.
Jeffries, Denis J, 34 Water Lane, Totton, Southampton SO4 3DN.
Keiller, Michael I, 14A Northfield Court, Badgemore Lane, Henley-On-Thames, Oxon R69 2JH.
Lam, Wilson, 73 Maidstone Rd, 3/F Tokwawan, Kowloon, Hong Kong.
Martiniussen, Anton H, 55 Cumberland Ave., Willow Park, Worplesdon, Guildford, Surrey GU2 6RQ.
Maxwell, Robert DR, Azzawiya Oil Refining Co. Inc., (Marine Division) PO Box 6451, Tripoli, Socialist Peoples Libyan Arab Jemaheriya.
Mincher, Ronnie J, 'Auisfield' 12 Cramond Road, North Edinburgh EH4 6HS.
Nara, Thomas AK, C/O Mrs Joan Tarrant, Brunel University, Uxbridge, Middlesex UB8 3PH.
Okaisabor, Odekhoa A, PO Box 53439, Falomo, Lagos, Nigeria.
Purcell, Gregory, 14 Clovelly Road, Southsea, Hants PO4 8DL.
Ridley, Peter R, Arthur Anderson & Co., 1 Surrey St, London WC2R 2PS.
Rothwell, Paul J, Hydrocarbon Treatment Systems Ltd, 11–13 Broad Court, London WC2B 5ON.
Schofield, Michael, The Penthouse, Fiveways, Grange Road, Camberley, Surrey, GU15 2DH.
Scotton, Graham, British Petroleum plc, Britannic House, Moorgate, London EC2Y 9BU.
Shichijo, Ryosho, 97 Spencer Court, Spencer Close, Finchley, London N3 3TZ.
Smithers, Arthur B, 6 Springcross Avenue, Hawley, Camberley, Surrey GU17 9DA.
Sweatman, Graham RP, 'Gralyn', Westfield Road, Goxhill, Nr Barrow-on-Humber, South Humberside DN19 7JA.
Terry, Philip A, 191 Hillside Terrace #31, Nederland, Texas 77627, USA.
Tosanwumi, Theophilus B, N.N.P.C. Petrochemicals, Carbon Black Plant, PO Box 207, Effurun, Bendel State, Nigeria.
Trousdale, Richard M, 19 Montpelier Rise, Wembley, Middlesex HA9 8RG.
Wood, Derek C, 15 Fairfields Road, Biddulph Moor, Stoke-on-Trent, Staffordshire ST8 7PE.

Around the Branches

West of Scotland Branch Session 1987-88

1987

12 November: EB Norwood, Manager of Engineering Odeco (UK) Inc., 'Offshore Mobile Drilling Ops'.

10 December: Lord Boardman, Chairman of NatWest, 'A Year for Recovery'. Joint Meeting with Glasgow Chamber of Commerce – TBA.

1988

21 January, evening: Ian Lithgow, Consultant, Interface Ltd, 'Recovery at Ecofisk'.

18 February, evening: JS Carlton, Senior Surveyor, Lloyds Register of Shipping, 'Advanced Engineering Research Programme'. Annual General Meeting.

1 March: Professor Ian Fells, University of Newcastle Upon Tyne, 'Alternative Energy'. Joint Meeting with Wind Energy Association.

17 March, evening: Petroleum Dinner, Hospitality Inn, Glasgow.

The theme for the year is: A Year for Recovery

All meetings are in the Western Club, (221 2016), 32 Royal Exchange Square, Glasgow G1 unless stated otherwise.

Application for Institute Fellowship

Members of the Institute of Petroleum are reminded that they are eligible for the grade of Fellow after they have been a Member of the Institute for 5 years and can meet the required criteria.

Their application will be judged on a number of factors, among which are qualifications, time spent in the industry, level of responsibility reached and contribution to the work of the Institute.

Applications should be made through the Membership Secretary at the Institute.

The above photograph shows the members of the London Branch and their guests during a visit to the Humbly Grove Field. Among those shown are: seated first right, TH Farmer, chairman; seated third right, Edith Walker, branch secretary; second row, centre, NE Walters, past chairman and membership secretary. Also in the picture are: GF Dunn, T Yamauchi, E Marshall, TR Miller, GH Robinson, M Loveday, B Stocker JM Jenkins, JR Ashford, M Moseling, CF Britton, G Richardson, PA Christoporou, JR Sayers, MA Cox, JUP James, M Cullingham, H Cowan, JC Jewell, P Newman, P Hendricks, MJ Laws, R Drabble, NJ Hooper, HC Stinton, TR Lloyd, RJ Wells, JA Endacot, LB Christodoulides, A Davies.

Aberdeen

13 Oct: 'Security of Britain's Offshore Oil and Gas Installations', by Prof Paul Wilkinson, Dept of International Relations, University of Aberdeen.
3 Nov: 'Automative Offshore Weather Forecasting', by David Horton, Managing Director, The Meteorological Office.
12 Nov: Annual Dinner.

Edinburgh and South-east Scotland

15 Oct: 'Measurement, Sampling and Allocation Methods in Shared Pipelines', by TJ Hollett of BP Petroleum Development (joint meeting with the Institute of Measurement and Control.)
5 Nov: 'The Effects of Oily Discharges on the Firth of Forth', by TM Leatherland, Forth River Purification Board.
24 Nov: IP/Britoil Student Lecture — 'Deep Sea Structures', by S Clinton, Head of Central Engineering for Britoil plc.

Essex

14 Oct: 'Future Training Needs for the Oil Industry', by a PTF speaker.
11 Nov: Ladies Evening: Cheesemaking and International Cheeseboard — at 1730 hours, followed by buffet supper.

Humber

30 Oct: Annual Dinner Dance.
26 Nov: 'Economics of Refining', by JC Brice, MD, KBC Process Technology Ltd.

Irish

27 Oct: Paper by Irish National Petroleum Corporation.
12 Nov: One-day seminar on 'Hydrocarbons and the Environment'.
19 Nov: Annual Dinner.

London

21 Oct: 'Driver Controlled Deliveries at Retail Sites', by B Joslyn, Contents Measuring Systems Ltd.
19 Nov: 'Ekofisk Field — Past, Present and Future Challenges', by R Wiborg, Engineering Manager, Phillips.
23 Nov: Annual Luncheon. 'The UK North Sea — a Summer's Day', by Charles Smith, Managing Director, Chevron Petroleum UK Ltd.

Midlands

14 Oct: 'Electricity Generation by Wind-power', by a speaker to be announced.
11 Nov: 'Unusual Characteristics of Multigrade Motor Oils', by Dr Ralph Oliver, University of Birmingham.

Northern

3 Sep: Golf Day at Dunham Forest, Altrincham.
13 Oct: 'Diesel Engines', by J Stephenson, Cummins Engines.
17 Nov: 'Application of Naphthenic Base Oils', by SG Jonas, Nynas.
27 Nov: Annual Dinner Dance.

Shetland

10 Nov: A speaker from Sovereign Oil.
8 Dec: 'The Mechanism of Boiling', by Dr Richard Pike, BPPD.

Southern

13 Oct: 'Environment Year', by Dave Dando, Esso Petroleum.
17 Nov: Address to the Southern Branch, by Dr PH Jungels, President of the IP.

South Wales

15 Oct: 'Stress at Work', by Steve Bradley, Head of Dept of Behavioural Sciences, University College Swansea.
19 Nov: 'The Development of the Modern Airship', by JAI Reid, Chief Engineer, Airship Industries.

Stanlow

14 Oct: 'Cavern Storage', by G Turnbull.
18 Nov: 'The Shell Enterprise Unit', by J Keane.

Yorkshire

13 Oct: 'The Lubrication of Textile Fibres', by G Readman, Director and Technical Manager, Benjn. R Vickers & Sons Ltd.
10 Nov: Speaker: P Smith, Business Planning Manager, Commercial Division, Shell UK Oil Ltd.

Obituary

It is with profound regret that we report the death of **Crichton Wilkinson,** a founder-member of the Institute of Petroleum West of Scotland Branch, in which he played a very active part. He served the branch with distinction, as Vice-Chairman and then Chairman. He represented the branches of the Institute on the IP Council from 1982 to 1985.

Professionally, he was with Foster Wheeler, where he worked wholeheartedly on the promotion of the company's activities in Glasgow and Scotland over the past 15 years.

His family was very important to him and he is survived by his wife, Christine, his two daughters and a son.

Deliveries into Consumption

UK deliveries into inland consumption of major petroleum products Tonnes

Products	*May 1986*	*May 1987*	*Jan–May 1986†*	*Jan–May 1987**	*% change*
Naphtha/LDF	277,510	151,490	1,621,280	1,363,030	−15.9
ATF—Kerosine	511,600	531,870	2,027,080	2,119,940	+ 4.6
Motor Spirit	1,894,600	1,839,050	8,580,630	8,779,100	+ 2.3
Burning Oil	108,420	110,230	981,020	954,440	− 2.7
Derv Fuel	638,980	693,160	3,178,980	3,388,160	+ 6.6
Gas/Diesel Oil	659,380	585,290	4,577,770	3,996,650	−12.7
Fuel Oil	1,025,050	593,340	5,405,430	3,934,690	−27.2
Lubricating Oil	66,160	68,720	332,320	338,760	+ 1.9
Other Products	468,120	532,660	2,241,360	2,554,810	+14.0
Total above	5,649,820	5,105,810	28,945,870	27,429,580	− 5.2
Refinery Consumption	468,490	438,430	2,231,560	2,155,600	− 3.4
Total all products	6,118,310	5,544,240	31,177,430	29,585,180	− 5.1

†Revised *Preliminary

A Selection of Additions to the IP Library

ASSOCIATION FOR PETROLEUM AND EXPLOSIVES ADMINISTRATION. Model construction requirement for petroleum spirit can and drum stores including electrical requirements and hazard zones. APEA, July 1986. # 935.3

EUROPA PUBLICATIONS. International Who's Who 1987–1988. 51st Edition. London, Europa Publications, 1987. # 081 Ref

GAS PROCESSORS SUPPLIERS ASSOCIATION. Engineering Data Book. 10th Edition. Tulsa, Gas Processors Suppliers Association, 1987. # 520

HOUSE OF COMMONS: ENERGY COMMITTEE. The effect of oil and gas prices on activity in the North Sea: Third report from the Energy Committee together with Minutes of Proceedings relating to the Report, Minutes of Evidence and Memoranda of Evidence. London, HMSO, 1987. # 138

INSTITUT FRANCAIS DU PETROLE. What can we expect from research and innovation to reduce oil costs in exploration and production?: IFP policy in this field. By: Favre J. Rueil-Malmaison, IFP, Feb 1987. # 387

INSTITUTE OF PETROLEUM. Model Code of Safe Practice 9: Vol 1. Liquefied Petroleum Gas. Vol 1: large bulk pressure storage and refrigerated LPG. Chichester, John Wiley, 1987. # 935.1

INSTITUTE OF PETROLEUM. Petroleum retailing: Europe and the UK Papers presented at an Energy Economics Group Conference, held at London, 20–21 May 1987. Radford TS. Editor. London, IP, July 1987. # 900

INSTITUTE OF PETROLEUM. Specifications and qualification procedures — aviation fuel filter monitors with absorbent type elements. London, IP, June 1987. # 935.1

INSTITUTION OF GAS ENGINEERS. The Australian gas industry. By: Smith NA. Institution of Gas Engineers Communication 1331. London, IGE, May 1987. # 161

INSTITUTION OF GAS ENGINEERS. Coal hydrogenation. By: Borrill PA. Institution of Gas Engineers Communication 1310. London, IGE, Nov 1986. # 850

INSTITUTION OF GAS ENGINEERS. Deregulation of the gas industry in Canada. By: Walker RD. Institution of Gas Engineers Communication 1329. London, IGE, May 1987. # 113

INSTITUTION OF GAS ENGINEERS. Development of the Morecambe Bay gas field. By: Brown HC. Institution of Gas Engineers Communication 1325. London, IGE, May 1987. # 137.1

INSTITUTION OF GAS ENGINEERS. The development of gas condensate fields on the United Kingdom Continental Shelf (UKCS). By: Beaumont DN. Institution of Gas Engineers Communication 1307. London, IGE, Nov 1986. # 137

INSTITUTION OF GAS ENGINEERS. Offshore structural steels — a decade of progress. By: Kirkwood PR. Institution of Gas Engineers Communication 1334. London, IGE, May 1987. # 539

INSTITUTION OF GAS ENGINEERS. Morecambe — discovery and development Hughes HWD. Institution of Gas Engineers Communication 1328. London, IGE, May 1987. # 137.1

INSTITUTION OF GAS ENGINEERS. Towards a trenchless pipelaying policy. By: Wilson FD. Institution of Gas Engineers Communication 1311. London, IGE, Nov 1986. # 615.1

OFFSHORE TECHNOLOGY CONFERENCE. Nineteenth Annual Offshore Technology Conference, 1987 Proceedings. Held at Houston, 27–30 April 1987. # 357

OIL POLLUTION RESEARCH UNIT. The fate of untreated and dispersant treated oils as a function of sedimentology of intertidal areas under a range of energy conditions. Pembroke, OPRU, 1986. # 769.2

PETROLEOS DE VENEZUELA. The journey from Petrolia: Petroleos de Venezuela, tenth anniversary. Martinez AR. Caracas, Petroleos de Venezuela, 1986. # 122

SOCIETY OF PETROLEUM ENGINEERS. New methods for controlled injection of steam into multiple sands. By: Hong KC. SPE 15472. Richardson, SPE, 1986. # 537

US DEPARTMENT OF ENERGY. Waste oil: technology, economics and environmental health and safety considerations. Washington, US Department of Energy, Jan 1987. # 769

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