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## COVER STORY

The cover photograph shows a twilight view of the new combined heat and power (CHP) plant now being constructed beside the River Thames at Greenwich for Tunnel Refineries Limited, a major manufacturer of glucose syrups and starches. The project is currently the biggest in the UK to be engineered, funded and operated by a third party energy management company.

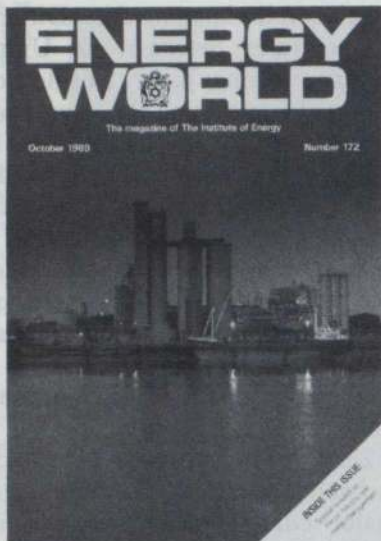
The latter company is Emstar Limited, the energy management subsidiary of Shell UK, who are investing £8 million in the project and providing services over the contract period to the value of £50 million.

The contract will enable Tunnel Refineries to generate enough electricity and steam to satisfy all of its needs and will create a surplus which will be made available for export to the London Electricity Board. It is also estimated that the investment will lead to a 10 per cent reduction in Tunnel's energy costs — worth an annual saving of £500,000.

The project involves the installation of two 6 MWe gas turbines with generators, linked to two new waste heat recovery boilers. The new plant will work in conjunction with an existing 2.2 MWe steam turbine driven generator. The contract also includes provision of other new ancillary plant in the power house complex such as a new water treatment plant, water storage tanks and motor control centres.

Photograph by courtesy of Emstar Limited.

\* See our series of feature articles on contract energy management, beginning on page 17.



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## TERMS OF CONTROL

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# Energy management and the environment

Government, in plural, over the past 15 years, can justifiably take credit for the founding and development of the "energy manager" as a specifically identified job function, the national organisation of energy managers (at least, as it existed until recently) and the development of energy management as a recognised discipline.

As a general observation, it is probably true to say that energy management has become fairly well developed and applied, in large organisations which have adequate staff and adequate budgets, but in a large proportion of all others, particularly small production units, energy management still amounts to the adoption only of low cost "good housekeeping" techniques. Capital expenditure criteria continue frequently to eliminate the adoption of significant energy conservation measures.

At the National Energy Managers' conference of 1978, I managed to put a question to the Minister: "Will there be any form of financial incentives for energy conservation?" No, there would not. But Government would expect industry to invest prudently in energy conservation. In other words, this would be left to market forces. (These could be the words of the present government — but who was the Minister then? The Rt Hon Anthony Wedgewood Benn...)

Market forces have produced building management systems, but have certainly not stimulated, for example, investment in industrial waste heat recovery. Why? Because fuel costs are so low, relatively, it remains cheaper to throw energy away. The capital return for an industrial waste heat recovery project is typically 2-3 years. With a typical investment criterion of two years minimum capital return, or compared with improving production plant, with a one year return, it will remain at the bottom of the list.

If, according to a recent report, the Government is satisfied with the trend in national energy consumption, energy management as controlled by market forces must be operating satisfactorily and we can all sit back. So there is no demand for any further improvements in energy economy.

We know this is a simplistic conclusion which must be wrong, as it does not take current environmental considerations into account. We might hope the Government also knows this, but is probably waiting for, among other things, the report of the inter-governmental panel on climate change before taking any action. That report will almost certainly support the increasing pressure of informed opinion which believes that wider adoption of energy conservation measures which reduce or lead to the reduction of atmospheric pollution, is now essential.

In his "Viewpoint" in the August issue of *Energy World*, the President of the Institute highlighted the failure of the publicity campaign on lead-free petrol, but the immediate success of a reduction in price.

Market forces, publicity and education have taken energy management as far as it will go — although education, and some publicity, must continue. For further significant reductions in energy demand and in particular, for the

general adoption of energy conservation measures that are necessary to reduce atmospheric pollution, the only practical alternatives are either some form of positive financial incentive, or legislation.

Legislation must be the solution, because it can be agreed and applied internationally. Governments resist new legislation, but could existing regulations be used? For about ten years building regulations in Norway, Sweden and Germany, have required energy recovery for ventilation discharges above a given flow rate, I have been told.

In the United Kingdom, it has taken more than five years campaigning by Andrew Warren of the Association for Energy Conservation, and others, just to bring the insulation limits up to date. Differences in average ambient temperatures between the United Kingdom and, say, Germany cannot justify a neglect of conservation measures: they only determine the degree of economic viability, not the basic need.

Much more significant are the discharges from industrial plant, and this has been recognised by the Energy Efficiency Office — within the limits within which it has been able to operate. Regulations exist for the control of atmospheric pollution from all plant. These could be extended, even to include carbon dioxide, if necessary. Hot gases can be classified as pollution. Minimum levels of energy recovery could be required for all plant, based at least, on intake air flow.

Heat recovery from drying and curing plant can condense out vapour pollution, as a bonus to energy savings. Even if major climatic change is not imminent, it cannot be acceptable that, for example, 300mm natural gas main feeds plant producing throw-away packaging, with insignificant energy recovery or conservation measures. And this is one of many.

The demand for energy conservation measures to improve the environment will increase and on this subject, a large proportion of informed opinion is beginning to show that it agrees broadly with lay environmentalists. The changes must come: it is only a matter of time and degree.

In the near future, then, we can expect energy management to be revitalised. Energy managers will be back in the limelight.

In the meantime, the government must have guidance, even if it does not ask for it. Energy managers, and their new Energy Efficiency Association will undoubtedly make an important contribution to this, but they inevitably represent the interests of users who would be the target of legislation.

The Institute of Energy, however, is in a unique position to offer balanced professional opinion to Government on this subject and the time to do so must be now, or as soon as possible, while changes are being considered.

**Charles Hillyer**  
*Member of Council*  
*Energy and Industrial Consultant*



## Texaco bids to reopen coal gasification plant

TEXACO INC announced that Texaco Syngas Inc, their wholly owned subsidiary, has been awarded the rights to negotiate with Southern California Edison (SCE) for the purchase and operation of the Cool Water coal gasification plant located in the Mojave Desert. The plant, which generates electric power from coal using a proprietary Texaco technology, is considered to be the world's cleanest coal-fed utility plant.

During an initial five-year demonstration, Cool Water utilised a wide variety of coals as the feedstock for the gasification process. The technology used at Cool Water is known as an integrated coal gasification combined-cycle process. The plant turned coal into a natural-gas-type substance and used this synthesis gas to drive a gas turbine; it also captured the left-over heat generated during the gasification process to create steam to produce electric power from a steam turbine.

Between June 1984 and June 1989, Texaco, with its partners, ran this successful five-year demonstration programme. Under the terms of the operating agreements, ownership passed to SCE at the conclusion of the programme.

Upon acquiring the plant at this time, Texaco intend to utilise a new application of Texaco's technology which will permit Cool Water to convert sewage sludge to useful energy by mixing it with the coal feedstock. Sewage sludge has been disposed of for many years in landfills and by ocean pumping, methods that are now becoming unacceptable for either overcapacity or environmental reasons. Texaco has demonstrated in pilot studies that sludge can be mixed with coal and, under high temperature and pressures, gasified to produce a clean synthesis gas.

Texaco officials emphasise that its gasification process results in no harmful by-products.

Acquisition of the plant is conditional upon finalising the terms of the purchase agreement and the completion of negotiations with SCE for the sale of electricity to be produced at Cool Water.

## Orimulsion: a report on a new fuel

A NEW fuel which has been specifically geared for use by the electricity and industrial sectors is set to create an important impact on the international commercial energy market.

Orimulsion, a bitumen-in-water emulsion, the most competitively priced fuel on offer to power and industry, it is claimed, is being produced in Venezuela from the country's large bitumen reserves. Sales contracts for the fuel are being negotiated in the UK, the US, Canada, Japan and mainland Europe.

*Orimulsion — The revolutionary new fuel for power and industry*

defines what exactly Orimulsion is and describes how it is being produced, transported and handled. The report assesses the fuel's combustion performance in electricity and in industrial boilers and its market potential worldwide, particularly in Europe where a joint venture with BP is concentrating primarily on selling fuel into the EC countries.

The report also includes detailed tables on the costs of conversion to Orimulsion, the results of tests conducted during the past three years in Venezuela, the US, Canada and Japan. It also

outlines the current state of negotiations in countries which have expressed immediate interests in the new fuel, such as Sweden, Denmark and the UK where a commercial test is in progress.

Orimulsion is forecast to claim around 10 per cent of the incremental demand for steam coal in the international market but, as this management report illustrates, the fuel has the potential to take a larger share of the world coal market than anticipated.

For further information please contact: Vivien Korn, Publications Dept, FTBI, Fifth floor, 50-64 Broadway, London SW1H 0DB.

## Sizewell B faces capital cost increases



A recent aerial photograph showing the Sizewell B construction site in the foreground and the Sizewell A magnox nuclear power station in the background.

LATEST estimates of the capital cost of Sizewell B pressurised water reactor (PWR) power station indicated that it could be higher than expected arising from the fact that the project is a 'first of a kind', National Power reported.

The rise in the cost of Sizewell B was likely to be about 10 per cent. But as the extra cost was principally associated with developments in the design, including additional requirements to meet safety commitments during the plant's construction, the majority of the increase should not carry over to follow-on PWR stations.

This was claimed by Mr Brian George, National Power's PWR Power Projects chief executive, in evidence to the Public Inquiry

into the proposed Hinkley Point C PWR in Somerset. Mr George stated that the limited extent to which the cost increases were likely to follow through to the cost of the replica PWR stations was such that it was not expected it would be necessary to modify Hinkley Point C's central estimate, including an initial fuel charge of £1550 million.

He said that the review of the capital cost of Sizewell B was not complete and the PWR Project Board and the National Power Advisory Board would be exploring every possibility for minimising or offsetting cost increases. Some 80 per cent of the hardware contracts were secure and would remain within estimates. These contracts represented about 60

per cent of the sanctioned costs. A number of remaining contracts, particularly with cost reimbursable elements, had, however, shown a significant potential increase.

The projected increases in the £1691 million capital cost of Sizewell B, including initial fuel, fell into three main areas: the cost of civil works, the nuclear steam supply system and control and instrumentation costs. Mr George said that there was a common theme running through all these changes, namely the costs of establishing a 'first of a kind' design in full detail, and, in particular, the costs that were consequent on design developments to meet safety commitments while construction was in progress.



## New timetable for electricity sell-off

ENERGY SECRETARY John Wakeham agreed a new contractual package and revised timetable for privatisation of the British electricity industry at the end of September.

Speaking after a meeting with representatives of the industry he confirmed that the Government remains on target to complete privatisation of the industry within this parliament.

Previous plans to vest the industry by January 1990 have been shelved until the end of March 1990, and will be brought to the market in the first half of 1991. However, the precise timing for this and the flotation of the Scottish companies have yet to be decided.

## British Coal's restructuring

AFTER the biggest restructuring of any major UK industry in recent history, the British coal industry has become by far the most efficient in Europe, with performance continuing to improve.

In a state-of-the-art industry review British Coal Chairman Sir Robert Haslam told an audience in Manchester that British Coal have emerged in better shape than at any time in the past to meet the challenges of rival fuels and coal imports.

He said that one of the most concentrated phases of the industry's essential restructuring had just been completed. Over the past eight months a further 20 collieries had closed and the number of employees had been reduced by a further 25,000.

This meant that in the past four-and-a-half years:

- The number of collieries had more than halved — with 98 having closed or merged — and coal output had been virtually unchanged. There were now 74 producing collieries.
- The number of employees had more than halved — having been reduced from 221,000 to a current total of 88,000. That had been achieved without any compulsory redundancy.
- Productivity had increased by over 90% and was continuing to rise.

## Combating the greenhouse effect

MEASURES which can be taken now to help combat the Greenhouse Effect were spelt out by John Wakeham, Secretary of State for Energy, to the World Energy Conference in Montreal in September.

These called for phasing out CFCs as quickly as practical, fuel prices reflecting full cost of energy production, increasing efficiency, greater use of renewable energy, and more use of nuclear energy.

Mr Wakeham said: "It is possible that the developed world will have to turn increasingly to nuclear energy to protect our environment in the years ahead, making room for a greater use of fossil energy in countries with a less suitable infrastructure.

"For our part, the UK has already taken the decision to maintain nuclear energy at least at its existing levels, and given it the fullest opportunity to prove itself under the new Electricity Act."

Mr Wakeham highlighted four basic aspects of the Government's approach to the environment. These were to establish a sound scientific base for effective policies and remedies to environmental pollution.

That growth alone could generate the wealth to tackle environmental problems, although it should be "green" growth. Failure to do so would damage not only industrialised countries but be likely to bear even more heavily on poorest nations now suffering the extremes of drought and floods.

Working for a better environment also meant accepting the costs involved. In proposing remedies which can be taken without delay, Mr Wakeham said we should clearly phase out CFCs as quickly as practicable. We should price fuels to reflect their full costs, including environmental costs. That meant eliminating subsidies, and developing the principle of the 'polluter pays'.

Mr Wakeham added: "We should continue to increase the efficiency with which energy is used. This is not just a question of saving energy for its own sake, but of industry and private citizens saving money in their own self-interest."

We should make greater use of natural gas, utilise more renewable energy sources and step up

viable research and development efforts.

Mr Wakeham said we needed to recognise that some backs were broader than others. "Costs which are simply an inconvenience in the developed countries may be the difference between life and death in the Third World," he said. "It is clear that the global community will have to find a way to share the burden equitably."

Ultimately the right decisions would be reached only with the help of more information, which was where the World Energy Conference and its huge range of ongoing work and research came in.

"There has never been a more important World Congress than this one," he said, "for the obvious reason that environmental pollution is a global problem which is only susceptible to global solutions."

Finally, Mr Wakeham warned: "We may yet have to brace ourselves for the possibility that the world's energy economy cannot continue as it has done in the past ... and I suspect that a market approach which mobilises economic self-interest may point a more effective way forward than massive bureaucratic intervention."

## UK and Yugoslavia to collaborate on wind energy

UK and Yugoslavian wind energy experts have been discussing ways of promoting industrial collaboration between the two countries.

The talks, which took place during a two-day seminar at the National Engineering Laboratory in East Kilbride, were held as part of the UK Yugoslavian agreement on science and technology.

The Yugoslavian party visited the UK on a fact finding trip organised jointly by the National Wind Turbine Centre and the Department of Trade and Industry. Other venues on the tour included NEL's test site at Eaglesham, wind turbine installations on the Orkney Isles and National Power's facility at Carmarthen Bay in South Wales.

## New reactor designs

A NEW generation of reactor designs now under development promise a period of renewed growth for nuclear power, according to a United States Department of Energy spokesman, addressing a special session of the Uranium Institute's annual symposium in London to mark the bicentenary of the discovery of uranium. At the same session, the director-general of the International Atomic Energy Agency, Hans Blix, highlighted the role that nuclear power could play in achieving sustainable growth on a global basis.

Jerry Griffith, acting Assistant Secretary of State for Nuclear Energy, told the symposium he believed that advances in reactor design, together with other positive developments, pointed to steady growth in the nuclear industry.

He also gave details of the national energy plan being developed by his department for presentation to President Bush in December 1990. "This plan, designed to establish domestic energy priorities for the next several decades, is likely to include nuclear energy as a key component," he said.

He described three types of new reactor system: evolutionary light-water reactors (LWRs); high-temperature gas-cooled reactors (HTGRs); and liquid metal reactors (LMRs). Each offered the potential for significant improvements in safety through emphasis on passive systems. "The technologies we are developing feature modular, factory-fabricated, standardised designs that provide for lower construction costs and shorter construction schedules, improve quality assurance, and give greater flexibility for utilities to meet load growth," he said.

Evolutionary LWRs built on the large amount of operating experience with existing LWRs, and included passive safety features and standardised construction. HTGRs were likely to create interest because of their potential for generating high-temperature process heat as well as electricity and the unique characteristics of the LMR fuel cycle offered the possibility of destroying long-lived radioactive waste in the reactor core.



## Cleaner coal-fired technology

BRITISH COAL Chairman Sir Robert Haslam welcomed the announcement by Secretary of State for Energy John Wakeham that the Government is to provide 50 per cent of the costs — up to £8 million — of a programme of work aimed at speeding up development of cleaner coal-fired technology.

Sir Robert said: "This is a substantial contribution towards developing and proving technology which will improve even further the efficiency of coal-fired electricity generating plant. We are convinced that the topping cycle technology will prove to be a winner for the coal industry and the environment, and its success could open the door to major technology export potential."

In addition to research development work at Grimethorpe, Yorkshire, development of coal gasification technology, an important element of the topping cycle operation, will continue at British Coal's Research Establishment at Stoke Orchard, Cheltenham.

Sir Robert added: "It is particularly significant that the Government's decision to offer financial assistance was made after a careful analysis of studies comparing the topping cycle with other advanced coal-based power generation options."

British Coal announced in February that Finland's A Ahlstrom Corporation, through their British subsidiary Ahlstrom Pyropower Ltd, were prepared to fund £5 million into the topping cycle research. One of the two successor companies to the Central Electricity Generating Board, PowerGen, have also agreed in principle to fund the research programme.

## Nuclear partnership

BABCOCK & WILCOX, a major operating unit of McDermott International Inc, have announced the signing of an agreement with Framatone SA to form B&W Nuclear Service Company, a general partnership dedicated to providing a broad range of high-technology products and services for US commercial light water reactors of all designs. Both firms will have equal shares in the new company, with B&W acting as the manager.

## N Sea oil industry must be more cost effective

THE OIL industry is being challenged to find, develop and produce oil and gas more cost effectively than ever before, or face the possibility of not being able to realise fully the high potential of the North Sea, according to Mr Julian Darley, chief executive of BP Engineering.

Mr Darley, delivering the Presidential Address to the Pipeline Industries Guild said: "Operating margins are under pressure as maintenance costs of ageing facilities rise, and produc-

tion declines from mature fields. The industry also faces abandonment expenditure in the next decade."

He added that as the large reserves in the UK sector of the North Sea had already been discovered and developed, the challenge for the industry now was to develop successfully much smaller fields, while at the same time maintaining profitability and high standards of safety and environmental care.

Mr Darley cited examples of major cost-saving improvements in the offshore industry being exploited today, including platform construction and installation techniques, pipelaying and drilling, and emphasised the lead role which the contracting and service industries had played. He said that in the drive for increased competitiveness, BP will in future give greater attention to contractor buy-in, with a focus on fewer, selected suppliers chosen for capability and quality as well as cost. Operating and design practice for the smaller North Sea fields must also be made less complex and expensive.

Mr Darley said among his concluding remarks: "In the phase which we now face, the focus must be on competitiveness. That includes reduced overheads, a sharper approach in operating and design practice and use of manpower, and more effective use of contracting and service industries."

## Renewed interest in hydrogen motor

A SAFE and practical way to run a car on hydrogen gas instead of petrol, achieving virtually "clean" exhaust, has been developed by engineers at the University of Melbourne, Australia.

The project, begun in the early 1980s during the oil crisis, has been resurrected because of the threat of the greenhouse effect.

A test car completed in 1982 had a modified combustion system which, for the first time, enabled a hydrogen-fuelled car engine to run smoothly throughout its load range.

There was a 60 per cent improvement in fuel economy over similar-sized petrol engines. There were almost no unwanted emissions and the fuel tank could be crashed or riddled with bullets without risk.

An engineer with the original research group, Mr Bill Martin, said cars running on hydrogen would emit virtually none of the greenhouse gases.

"Until we fully tested our prototype, no-one had a car engine which could be shown to run on hydrogen without pre-ignition or backfiring under load," he said.

"We have our system running sweetly in a two-litre four-cylinder vehicle. With an up-to-date automotive electronic control system and additional testing, the engine could be developed commercially."

Advances in the engine's combustion system included a two-stage intake in which the air in the air-fuel mixture was admitted ahead of the hydrogen.

## Fish restored to former acid lake

CO-SPONSORS British Coal welcomed the successful outcome of the first five-year stage of the Loch Fleet Project in Scotland, and said the techniques developed to transform the quality of water in acid lakes could be used anywhere in the world. The Loch Fleet Project was undertaken jointly by the Central Electricity Generating Board, British Coal Corporation, South of Scotland Electricity Board and North of Scotland Hydro Electric Board.

British Coal scientists played a major part in the successful joint project by developing a method of pelleting limestone to make for easier distribution and more effective treatment of surrounding land, and by applying specialist analytical procedures to soil, rock and sediments. About 15 tonnes of pellets were spread by helicopter over a 2-hectare test area of the Loch Fleet site. They will continue to work with the Loch Fleet team in monitoring progress at the site.

Mr Jim Harrison, director of the Corporation's Coal Research Establishment, said: "The main programme has now ended successfully. We have shown that fisheries can be restored and land improved by liming to counteract acidifying effects — some of which are attributable to industrial activities and the combustion of coal, oil and gas, and transport fuels."

## 400th post graduate in energy conservation

THE CRANFIELD Institute's Department of Applied Energy last year produced its 400th "Energy" graduate passing out with an MSc or PhD. Their first course entitled *Energy conservation and the environment* started in October 1973 when, until November of that year, environmental considerations were more important than conservation.

Today conserving the environment goes hand in hand with conserving energy, and so the course title is even more appropriate.

Since 1973 four further related MSc courses have been developed: *Energy and buildings*, the *Design of energy efficient buildings*

run in conjunction with the Ecole Supérieure d'Ingenieurs de Marseille, *Applied energy studies* in conjunction with the Université de Technologie de Compeigne and Thermal Process Engineering. All but one of these are SERC supported and the double-degree courses with France enables the student to obtain the degree of MSc and the European Dipl Ing.

Further information can be obtained from: Prof Doug Probert, Department of Applied Energy, School of Mechanical Engineering, Cranfield Institute of Technology, Bedford MK43 0AL.



## Electricity's watchdog appointed

STEPHEN LITTLECHILD has now been formally appointed as Director General of Electricity Supply, following the Royal Assent to the Electricity Act on 27 July. John Wakeham, Secretary of State for Energy, and Malcolm Rifkind, Secretary of State for Scotland, confirmed the appointment on 1 September. Professor Littlechild was designated as Director General on 22 May.

Professor Littlechild will continue preparations for the establishment of the Office of Electricity Regulation, which will begin work when the electricity industry is reorganised before privatisation.

As Director General he will have a key role in making the privatised industry function in a competitive, customer sensitive way. He will have a duty to promote competition and protect the interests of the consumers. He will ensure the relevant provisions of the Electricity Act and various licences are observed, and, if necessary, the licences modified.

Professor Littlechild has extensive experience of regulatory issues both in the UK and abroad. He has worked on the regulatory regime for British Telecom, was a member of the Monopolies and Mergers Commission for six years, and has a wide knowledge of regulatory systems both here and in the USA. He has also advised the Secretary of State for Energy in the privatisation of the electricity industry.

Professor Littlechild is 46 and is currently head of the Department of Industrial Economics and Business Studies at the University of Birmingham.

## Engineering Fellowship

Two Fellows of The Institute of Energy were among 50 new Fellows elected to the Fellowship of Engineering at the recent annual meeting. David Jefferies, the Chairman-designate of Gridco, and Professor Brian Spalding, a director of Concentration Heat & Momentum (CHAM) Ltd of Wimbledon, were both elected to the Fellowship at the July meeting.

## First recipient of student project prize



The Institute of Energy in association with Hamworthy Combustion Systems Ltd of Poole, Dorset, have introduced a new award for the best energy studies project undertaken by a final year mechanical engineering degree student at Portsmouth Polytechnic's School of Systems Engineering.

The first winner is Andrew Dance who graduated in July this year and gained the award with his project entitled: "An Assessment of Computer Modelling for Fluidised Bed Combustion". Mr Dance is pictured above receiving his award from Mr Jim Champion, engineering and development manager of Hamworthy Combustion Systems Ltd.

## Renewable energy skills acknowledged

THE PRESIDENT, Professor Brian Brinkworth, was among the guests on 19 September when IT Power Ltd was presented with the Queen's Award for Export Achievement by Sir James Scott, Lord-Lieutenant of Hampshire.

Based at Eversley, Hants, IT Power Ltd is a firm of consultants specialising in rural development projects involving renewable energy technologies. It works on behalf of the World Bank, UN agencies, government departments and commercial firms, and has completed over 300 projects in 60 countries since its founding in 1981 as a spin-off from the Intermediate Technology Development Group. The Queen's Award reflects the exceptional growth in export earnings by IT Power over recent years.

The firm has worked in many developing countries. Current projects cover most of the renewable energy technologies: bio-

mass in Ethiopia and Mali, solar photovoltaics in China, Morocco and Sudan, wind power in Kenya and Mongolia, and hydropower in India, among others. More than half its work during the past three years has been commissioned by previous clients, a sure sign of the satisfaction being given, and permanent project offices are now being established in several countries to service the growing range of activities.

The citation for the award referred to the sustained hard work by the firm's dedicated core of professional engineers, scientists, economists and development workers, which had been necessary to reach this level of achievement. The firm's quick response and wide range of expertise is obtained by backing the eight permanent staff with a dozen or more self-employed experts and contract staff, and a network of specialists in the universities.

Managing Director Bernard McNelis described the applications of renewable energy technologies with which they are concerned as 'proven but not mature'. They are able to provide effective and practical solutions to development problems by calling upon the depth of real experience in the field which has been built up by the staff, backed by thorough scientific analysis, computer simulation, testing and hardware under realistic conditions, documentation and training programmes. They are demonstrating in the most convincing way the capability which can be mustered in the UK for tackling the problems of rural development with technologies which are appropriate to the situation and largely free from environmental damage.

Further information may be obtained from IT Power Ltd, The Warren, Bramshill Road, Eversley, Hants.



## Cardiff's research excellence

AN ENGINEERING department at Cardiff has retained its status as a centre of international excellence following a nationwide review of research work in Britain's universities.

The Department of Mechanical and Aeronautical and Production Engineering earned the highest grading — level five — in the review carried out in the last academic year by the Universities Funding Council and published in August. The department is headed by Professor Brian Brinkworth, the current President of The Institute of Energy.

"We have a long track record of success in this department and the review grading is further recognition of our strengths and status," said Professor Brinkworth.

"Our expertise in the fields of energy and friction and our close working relationships with industry are all factors that will have assisted us in achieving this accolade."

The majority of subject areas at Cardiff were acknowledged as attaining a standard of national excellence, in the review.

On a scale ranging from five down to one, four Cardiff departments were assessed as four, with a further 17 as three, and 13 as two. Two departments achieved grade five. Only four had a one grade. The results will influence the distribution of grant from 1990-91 onwards.

Commenting on the assessment Cardiff's Principal, Sir Aubrey Trotman-Dickenson, said: "The fact that so many of our research groups are rated three or above is a very tangible indicator of the success of the new college in establishing itself as a centre of excellence through the formation of large and well resourced academic departments.

"This success is all the more remarkable when one remembers that many of the Cardiff units have only been formed since the merged college came into being on 26 September 1988. Yet they were being judged against research groups in other universities which had been together for the full five year period of assessment.

"Of course not all research at Cardiff is of equally high standard. This review serves to make us even more aware of our strengths and weaknesses, and the low ratings awarded to some units, while disappointing, did not come as a surprise. In many cases the disruption of the difficult pre-merger period, when UCC lost 140 full-time equivalent members of its academic staff, is still having its effect," said Sir Aubrey.

"However, we are very encouraged by the ratings which the college has achieved. They will serve as benchmarks for the future in our continuing efforts towards academic excellence."

## Watt Committee on the Greenhouse Effect

AN IMPARTIAL study of how energy users and producers can help combat the Greenhouse Effect is being conducted by the Watt Committee on Energy. Backing for the initiative is being provided by the major British energy industries, representatives of which serve on the working group set up by the Watt Committee. Organisations in West Germany, Spain and France are also taking part.

The chairman of the working group is Dr George Thurlow, a Senior Fellow and past President of The Institute of Energy.

The study will concentrate on the opportunities for reducing the build-up of Greenhouse gases in the atmosphere, the commonest of these being carbon dioxide (CO<sub>2</sub>). Ways of reducing emissions of CO<sub>2</sub> by the energy industries (such as from power stations) will be one of the chief

topics. The working group will look at ways of using fossil fuels more efficiently, possibilities for switching to fuels that emit less CO<sub>2</sub>, combined heat and power opportunities and substitutes for fossil fuels including nuclear power and renewable energy sources.

Summing up the purpose of the study, Dr Thurlow, the working group's chairman, said: "Given that we could experience the serious consequences of the Greenhouse Effect within a few decades, it is essential to know positively what action can be taken at least to delay its onset. Energy producers in Europe acknowledge the vital role they will have to play in tackling the problem of global warming."

A conference to announce the findings of the working group will be held in London in April 1990.

## New members

### Fellow

**Stephen Chee Woo Ling**, West Wiltshire District Council (transfer)

**Robert Malpas**, British Petroleum, London

**Edward Norman Williams**, Costain Engineering, Manchester (transfer)

### Member

**Stephen Michael Allum**, British Petroleum, London

**Phillip Stuart Allen**, Babcock Energy, Crawley, Sussex

**Kenneth William Buck**, CEBG, Bedlington, Northumberland

**Jonathan Bruce Cooper**, Clifford, Talbot & Jaehme, Bristol

**Maureen Rosalie Davis**, British Gas, Training Dept, London

**Stephen Peter Flood**, Babcock Energy, Crawley, West Sussex

**Stephen Gregory**, NIFES Ltd, Altrincham, Cheshire (transfer)

**Jeremy Guy Hardwick**, British Gas Northern, T.C.S., Newcastle-upon-Tyne

**Peter John Sidney Jenner**, West Glamorgan County Council, Swansea (transfer)

**David Spencer Lawton**, Stoke-on-Trent City Council, Hanley

**Ronald Geoffrey Loram**, Merseyside Waste Disposal Authority, Liverpool (transfer)

**Alan James Mason**, Buckle & Partners, London (transfer)

**David Richard Slack**, Boiler Operations & Management, Notts

**David Graham Stuart**, CEBG, Dartford, Kent

**Andrew David Sparrow**, John Laing Technology Group, London

**John Wilson**, Greater Glasgow Health Board (transfer)

**Associate Member**

**Darren William Ashton**, British Gas North Western, Altrincham

**Karl David Miller**, British Gas North Western, Altrincham

**Associate**

**Lionel Max Little**, Prismo Ltd, Crawley, West Sussex

**Philip Mark Rose**, Emstar Ltd, Leamington Spa

**Student**

**Andrew Allen**, Leeds College of Building

**Ye Pan Chan**, Singapore Polytechnic of Wales

**Alastair Rowell Fells**, Middlesex Polytechnic

**David Christopher Monkman**, University of Leeds.

## Creating goodwill in Sri Lanka



Dr John Hardman (left) and Mr Rohan Amarsinghe (right).

ON a recent working visit to Sri Lanka, Dr John Hardman, the Institute's chairman of South Coast Branch, presented Mr Rohan Amarsinghe with an Institute of Energy membership certificate.

Mr Amarsinghe, who is the

Institute's sole representative in Sri Lanka, is engineering manager of the Colombo Gas and Water Company. Dr Hardman was carrying out his activities as technical adviser to branches of the Sri Lanka activated carbon industry and the World Bank.



THIS autumn marks the 25th anniversary of a momentous, if still relatively unsung milestone in Britain's post-war industrial and economic history.

The first government licenses to begin exploring for oil and gas in the UK sector of the North Sea were issued to oil companies in September 1964. The challenges confronting them were enormous; involving an exploration of the unknown in some ways akin to space travel and the preparations for the moon landing five years later. No one in the industry's history had ever previously searched in such an unrelentingly hostile environment.

Yet the intimidating physical and technological challenges of exploring in the North Sea were met and overcome one by one — Britain still owes a debt of gratitude to a number of leading US companies for their part in making it possible. Within a year the first discovery of natural gas had been made. Three years later the gas was being brought ashore to herald a massive operation to convert Britain's domestic gas grid from manufactured gas to natural gas.

### First discovery

In 1969 the first major oil discovery was made. The discoveries of the giant BP Forties and Shell/Esso Brent Fields — the biggest fields to have been found so far in the US sector — followed in 1970 and 1971.

Towards the middle of the 1970's the first of the awesomely large oil production platforms appeared. It is a sight which has now become increasingly familiar, with over 150 fixed platforms currently located in the UK offshore sector. But at the time the size of the first platforms as well as their alien appearance — making them resemble something which had strayed out of H.G. Wells' "Wars of the

# A quarter century of the offshore oil and gas industry

by the Rt Hon Peter Morrison MP

**An important milestone in the progress of Britain's offshore energy industry was celebrated early in September to mark the 25th anniversary of the issuing of the first licences for North Sea oil and gas exploration. In the following article, the Rt Hon Peter Morrison MP, Britain's Minister of State for Energy, reviews the progress and the problems of Britain's offshore oil and gas industry over the past 25 years.**

Worlds" — still excited considerable media and public interest.

At the same time a vast network of oil and gas pipelines was also growing up around Britain's north eastern coastline. And what is now the world's biggest trans-shipment oil terminal, Sullom Voe in the Shetland Islands, became operational in 1978.

Yet today it still comes as something of a shock to recall that until the first North Sea oil was produced 14 years ago, Britain possessed virtually no oil of its own. Six years later, in 1981, we were already self-sufficient in oil, and subsequently became a net exporter and one of the top half-dozen oil producing countries in the world.

All this reflects an extraordinary transformation. Britain has now been successfully estab-

lished as the offshore capital of the world — even ahead of Houston in the research and development of new offshore oil and gas technology. And this position should be further reinforced during this year by the establishment in Edinburgh of the new Institute of Petroleum Science and Technology.

The Institute will be centred on the Heriot-Watt and Edinburgh Universities and very largely funded by the offshore industry itself, with the result that its research will be specifically directed towards finding practical solutions to current and future development needs.

In the next few months I hope to announce the appointment of a Director of the Institute, which will offer higher degrees and short training courses as well as undertaking research in areas such as oil and gas field exploration and



## The author

**PETER MORRISON** was appointed Minister of State for Energy in June 1987. He has responsibility for the oil and gas industries, the offshore supply industry and the Department's international affairs unit.

Mr Morrison was educated at Eton and Keble College, Oxford where he gained an honours degree in Law. He then followed a career in business and farming.

Since 1974 Mr Morrison has been a Member of Parliament for the City of Chester. From 1975-76 he was the Secretary of the North West Members' Group and Joint Secretary of the

Conservative Smaller Businesses Committee.

Following the general election in 1979 Mr Morrison was appointed a Lord Commissioner of Her Majesty's Treasury. In January 1981 he was appointed a Parliamentary Under Secretary of State, Department of Employment. He moved in June 1983 to take up the post of Minister of State, Department of Employment. Two years later he was appointed Minister of State at the Department of Trade and Industry.

In September 1986 he was appointed Deputy Chairman of the Conservative Party, a post he has since relinquished. He was appointed a Privy Counsellor in July 1988.

appraisal, development planning and offshore production technology.

## Piper Alpha

But the offshore industry's technological triumph in the North Sea has also tragically become associated with appalling human cost. Last summer's fire on the Piper Alpha platform resulted in the loss of 167 lives and was a terrible reminder of the price our society can still pay for the extraction of energy. It has inevitably cast a shadow over the 25th anniversary of the offshore industry.

Following the tragedy, new regulations involving pipeline emergency shutdown systems on offshore installations will be introduced shortly. Further regulations embodying requirements for the assessment of sub-sea isolation systems will follow. The Government has also said that it will implement any recommendations leading to improvements in safety which emerge from the current public inquiry into the accident, whatever the costs involved.

We shall never of course succeed in making the North Sea completely safe. But we have an overriding duty to ensure that safety is always paramount, and that everything possible is done to prevent such a tragedy ever occurring again.

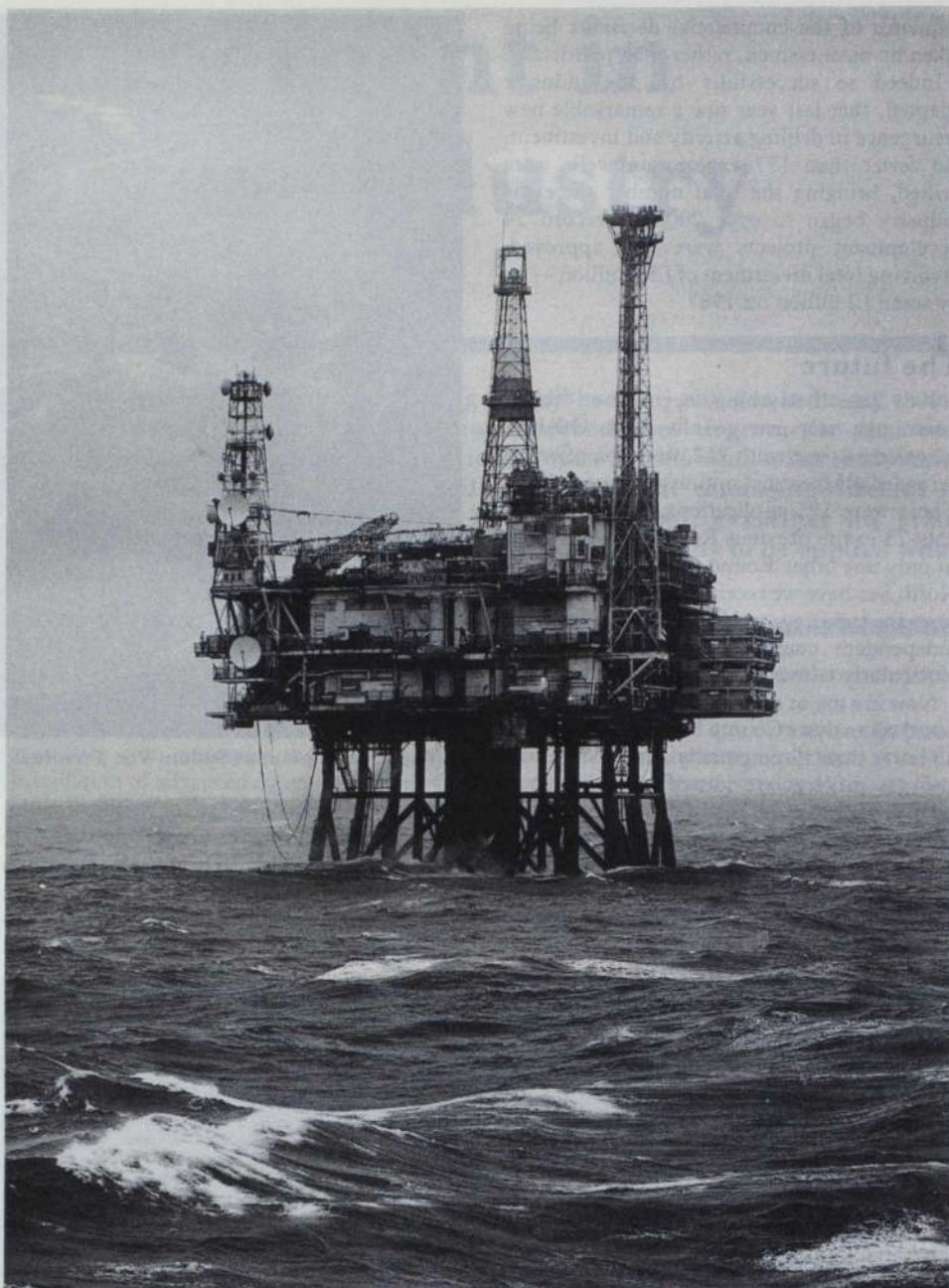
## Economic benefits

Looking to the future, it is clear that Britain will remain a leading producer of oil and gas well into the next century, and that very substantial benefits will continue to accrue to our economy. Since the first exploration licences were issued in 1964 well over one billion tonnes of oil and some three-quarters of a billion cubic metres of gas have been extracted from the North Sea. Together they are worth over £145 billion, with nearly £70 billion of that going directly to the British Exchequer.

At its peak in 1985 the oil surplus on our balance of payments reached over £8 billion, with government revenues from oil for the financial year 1984/85 touching a record £12 billion. Subsequently the surplus on the UK's trade in oil has declined quite sharply: to just over £4 billion in each of the two succeeding years, and a further fall to £2.3 billion in 1988. Production levels have also fallen: from 123 million tonnes in 1987 to 114 million last year. But to a very large extent these figures reflect the earlier fall in oil prices and some temporary production losses rather than the beginning of the end for the offshore industry.

In fact oil production from the North Sea now looks set to decline considerably less rapidly than was once generally believed. Although recent production levels have inevitably been affected by the shutdowns involving Piper Alpha — and following an accident in which thankfully no one was hurt this spring, Cormorant Alpha — this has been partly offset by improved output from established reserves.

A continuing high discovery rate means that despite the substantial depletion in the meantime, proven and probable reserves have shown only the most marginal change from their level of three years ago. The most



Platform FA in the Forties oilfield, 110 miles east of Aberdeen.

Photograph by courtesy of British Petroleum

informed guess at the moment is that only around a third of recoverable oil reserves and a quarter of recoverable gas reserves have so far been brought ashore, so most of the energy in the North Sea still remains to play for.

A new forecast by my Department has upgraded the projected range of oil output over the next five years by up to 15 per cent compared with last year's forecast, confirming suggestions that Britain will remain a major producer into the 21st century.

## New technology

This improved outlook is partly a reflection of the oil industry's admirable refusal to be "frightened off" the North Sea by the period of depressed oil prices after 1986. The industry's immediate response, helped by a tax regime sensitive to changing commercial realities, has

been to cut costs sharply and to speed up its efforts to develop and introduce ever more sophisticated cost-saving technologies.

The major breakthroughs which have continued to be made in technology at the very frontiers of science have substantially reduced the costs of new offshore developments and made it possible to develop fields previously thought to be uneconomic.

This has been achieved through close co-operation between the Government, research institutions, and the oil companies and their suppliers. The oil companies' faith in Britain as a centre for the development of new offshore technology is evidenced by their spending over £80 million a year in the UK on research and development in this area.

All this has provided a perfect illustration of the advantages of a free market and the speed at which the private sector oil companies have been able to adjust to lower oil prices as a con-



sequence of the commercial decisions being taken by businessmen, rather than politicians.

Indeed so successfully has the industry adapted, that last year saw a remarkable new resurgence in drilling activity and investment. No fewer than 177 exploration wells were drilled, bringing the total number since the industry began to over 2000. A record 24 development projects were also approved, involving total investment of £3.2 billion — up by some £2 billion on 1987.

### The future

1989 has, if anything, begun even better. The huge response to the 11th Offshore Licensing Round with 212 blocks on offer has exceeded all the most optimistic expectations. There were 125 applications, compared with only 75 in the previous Round two years ago. In only one other Round in the history of the North Sea have we received more applications from the industry, and the number of smaller, independent companies involved has been particularly encouraging.

Now in a major new study by the Edinburgh-based oil analysts County NatWest WoodMac, no fewer than 42 potentially attractive new oil and gas projects are identified which could involve some £14 billion of capital investment over the next four years and contribute to a “second peak” in oil output in the mid-1990’s. This would contribute up to 2.5 million barrels a day compared with the previous peak of 2.6 million bpd in early 1985.



The process plant at Sullom Voe Terminal, Shetland.

Photograph by courtesy of British Petroleum

So the 25th anniversary of the offshore industry — which is also being celebrated by a new permanent exhibition on the UKCS at the Geological Museum in London — has coincided with an infectious new wave of optimism

about the future. New discoveries are continuing to be made — a good number already this year — investment is being maintained at a high level, and drilling activity shows no sign of slackening.

The growing demand for gas in new electricity generation schemes is also making prospects for North Sea gas development particularly exciting. And of course the strengthening in oil prices so far this year has been a major bonus for the offshore industry — though much will inevitably continue to depend on whether world economic growth can maintain its recent momentum.

### New markets

A little further over the horizon, it is probably inevitable that the offshore supply industry’s future will begin to turn increasingly on its ability to translate the technology and expertise developed over a quarter of a century in the North Sea to the growing number of newer offshore industries now emerging around the world. These markets can offer major opportunities, and the UK offshore supply industry, with its advanced and proven technology, is well-placed to exploit them.

The lessons of the Piper Alpha tragedy must never be forgotten, either in the UK or elsewhere. But they have only served to strengthen the offshore industry’s resolve on safety matters. The industry has begun to look forward again, and is in a buoyant mood to face the challenges ahead.

Twenty-five years ago a flourishing offshore industry in Britain was still only a distant dream. The subsequent history of energy development in the North Sea — with all its inherent difficulties, dangers and opportunities — will, I believe, eventually become widely recognised as one of the greatest technological success stories in the whole history of the present century. □



The refinery at Grangemouth.

Photograph by courtesy of British Petroleum



# Crisis management in the oil and gas industry

by William A Murie, BSc (Chem), MIMC

MAJOR accidents and crises seem to be all too familiar these days. The list of recent disasters involving football stadia, ships, railway stations or trains, aeroplanes, nuclear and chemical plants, is lengthening all the time.

The oil and gas industry has also seen numerous incidents and emergencies, with the Piper Alpha disaster of July 1988 resulting in the greatest loss of life of any offshore incident.

Thus in the offshore oil and gas industry, Piper Alpha and the numerous other recent emergency incidents have led companies and emergency services organisations to closely examine the roles and responsibilities of all groups when faced with such a situation.

At the beginning of the 1970's, early incidents in the North Sea prompted the introduction of legislation designed to ensure that companies operating there were ready and able to shoulder the burden of support to a stricken offshore installation. However, the industry has grown, installations and activities have increased in complexity but the legislation has remained the same. In the absence of an expanding legal framework, responsible companies have tried to ensure that their response capability has grown, not only to support the ever increasing number of people offshore, but

The growing list of disasters affecting the offshore oil and gas industry in the past few years has intensified, to an unprecedented degree, the attention given to safety and crisis management issues in this and other industrial sectors. In the following article, William Murie, the managing director of specialist oil and gas consultants, TM Services Ltd, examines the crisis management issues and describes the correct philosophy to be applied when establishing effective crisis management procedures.

also to reflect the size of their management organisations onshore. However, as these companies became more sophisticated in their approach, for example through training, installation of advanced communications, and other facilities, so the boundaries between their expertise and that of the police and coastguard particularly became steadily less clear.

## Inconsistent response

The bigger players in the field, with multiple installations and substantial onshore support organisations reached a point where their response capability was as well advanced and supported by extensive financial resources that their need for outside support in emergencies was small. Their communications, transport and other essential services were so extensive that even an uncontrolled well blow-out, possibly the emergency most feared by off-

shore personnel, was not beyond their response capabilities.

This picture is not however consistent throughout the industry and there are still many small operators carrying out short term exploration programmes with mobile drilling rigs, whose organisation and resources have not changed significantly from those typical at the advent of North Sea development.

Regular emergency response exercises have always been a feature in the industry with companies of all sizes being tested by emergency scenarios of all complexities and the emergency services have always been willing participants when the opportunity arose. Without consistent company policies and abilities their involvement varied from "watch and wait" to significant roles in co-ordination of support to the installation and dealing with interest from the media and general public.

## The author

Bill Murie is the managing director of TM Services Limited, a leading consultancy firm in the field of crisis management, emergency training and loss prevention. He has participated over the last 10 years in a wide range of emergency planning, training and exercise activities for the offshore and onshore oil, gas and process industries, aimed at strengthening the preparedness of all involved to handle potential incidents.

He is currently also responsible for business development and management of the wide range of consultancy activities carried out by TM Services, activities which involve him extensively in travel in Europe, the Middle East, Far East and elsewhere.

Mr Murie was educated in Australia, where he graduated as a chemical engineer from the University of Sydney. After graduation, he joined the Nestle Company where, after an

initial period in project and product development, he became involved in the fields of quality and manufacturing. After working for the company at numerous locations in Australia, Europe and the USA, he became production manager of a major food processing plant in Sydney.

A period of seven years with PA Management Consultants then followed, in Europe and the USA, where he carried out a wide range of general management, energy conservation and human resources assignments. During this period he also implemented a number of significant assignments for the oil and gas industry, and played a key role in developing the company's capability in crisis management and safety consultancy.

In 1980 Mr Murie became a founding member of TM Services Limited. He established the company's capability in the emergency planning field and has overseen its development to embrace a very wide range of crisis



management activities covering strategic studies, organisation planning, facilities and equipment advice, procedure preparation, training, exercises and audits.

Recent developments, the Piper Alpha tragedy more than others, have finally focussed attention on questions such as:

- who is the best equipped to co-ordinate an evacuation?
- who can provide and co-ordinate aircraft at the scene?
- who should co-ordinate the activities of onshore medical and other support?

There is no question that, historically, all groups involved have understood clearly the order of priorities for the overall response, these being:

- 1, the protection of life;
- 2, the protection of the environment; but the companies' interests extend beyond this to:
- 3, the protection of the installation;
- 4, the protection of the assets and reputation of the company.

Whilst no company would ever consider 3 and 4 as being on a comparable level to 1 and 2, in the longer term they will ultimately determine the future activities of the company, from the winning of licensed acreage from the Department of Energy to the recruitment of the best personnel.

It would therefore seem that there should be a thorough re-evaluation of all roles — the company should be the main source of information and therefore should have the key co-ordinating role. The company also has most to lose in terms of "perceived" image. However the company should use the emergency services in those areas where they are "subject experts", in an atmosphere of co-ordination.

### Further questions

Whilst the issues discussed in this article have particular reference to the offshore oil and gas industry, similar problems have also surfaced following onshore disasters; witness the comments in parliament regarding the need for a centralised disaster agency to handle crises.



Fire fighting training in progress during an exercise on one of the North Sea oil production platforms. *Picture courtesy of Marathon Oil*

This proposal is resisted by local authority officers and emergency services; moreover further conflict is bound to arise from inevitable future or existing EEC directives.

The article so far has also looked at one critical aspect of crisis management and response. There are, of course, many other issues concerning people in the industry, issues that range across the people, equipment and procedures which must be the foundation for sound crisis management. Such issues include those of reviewing current systems and plans,

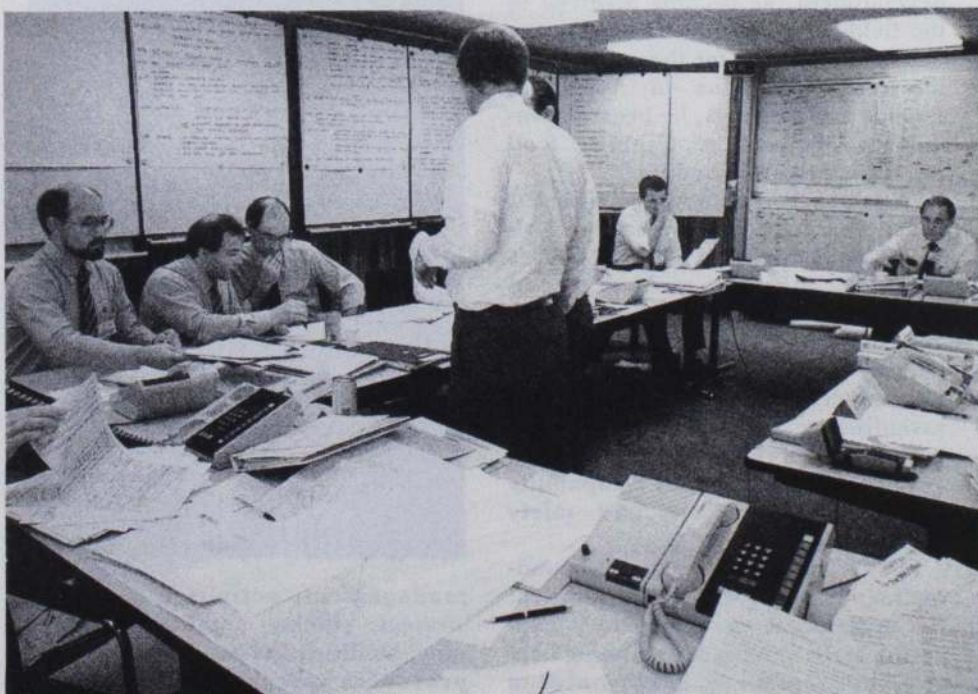
as well as conducting training and exercises to implement them effectively.

### Reviews and plans

In order to plan for adequately handling potential crises and to mitigate their effects, sound crisis management planning is essential. Well run organisations are seeing the logic and benefit of conducting and assessing the results of safety and risk assessments and then planning how to handle effectively the consequences of an emergency occurrence, however unlikely that is.

A starting point for this is a crisis preparedness review or audit which looks critically at all key aspects of an organisation's preparedness: Has it assessed the risks? How is it organised to deal with them? How good are the people in that crisis organisation? What resources are available, both inside and outside the organisation? How is information flow to be handled and controlled during the crisis? What communication methods are to be used? Are there clear plans and procedures documented? How will the organisation deal with the media, shareholders, relatives or endangered employees, the emergency services, contractors, technical support, the government? Have all the relevant people in the organisation been trained to carry out their tasks? Has the organisation as a whole put its plans into practice through a graded series of realistic exercises? Have all the lessons learnt been implemented?

An effective crisis preparedness review will address all the above questions and more. Effectively prepared organisations will then ensure that they highlight all areas where they can improve their performance to cope with a potential crisis.



Emergency control centre during an exercise involving an offshore platform. *Picture courtesy of Marathon Oil*



## Emergency training and exercises

Organisations may efficiently address issues such as those described in this article. They may conduct comprehensive reviews of their preparedness for a crisis. What is also vital is that all plans made and implemented should be practised and tried out by all personnel and groups, both inside and outside the organisation, responsible for implementing them.

Any emergency requires personnel to respond rapidly and effectively to prevent escalation and minimise risks to personnel, the environment and property. This requirement goes beyond personnel directly involved with the site or installation. It also involves staff from all parts of a company's organisation who will be called upon to assist site personnel with logistics, technical assistance, materials etc. Such staff within a normal operating organisation are normally engaged in duties which only touch the fringe of what they must do in an emergency. Furthermore, they are not usually engaged in interfacing with other personnel in this fashion, neither are most of them involved with the external organisations which assist with the response.

Experience shows that most personnel are adequately exposed to routine drills but not to more complex emergency situations. They also feel uneasy about responding to a true emergency, and feel insecure with regard to the efforts made on their behalf by other company staff and external organisations. Other company staff are usually concerned about the details of how they should respond to an emergency, and how they should interface correctly with their colleagues.

Effective emergency training uses classroom sessions to make personnel familiar with emergency plans and to illustrate how various personnel should interface. It then tests this knowledge in realistic training exercises which provide a test of present capabilities as well as providing useful experience for everyone taking part. Such training is applicable to site personnel as it is to other staff, who can be trained either separately or together.

The exposure to realistic exercises can be very useful in terms of:

- Encouraging team effort.
- Exposing problems in existing emergency procedures.
- Identifying areas for further investigation.
- Providing a boost to the existing level of confidence within the group.
- Understanding the roles of everyone involved in an emergency, including external organisations.

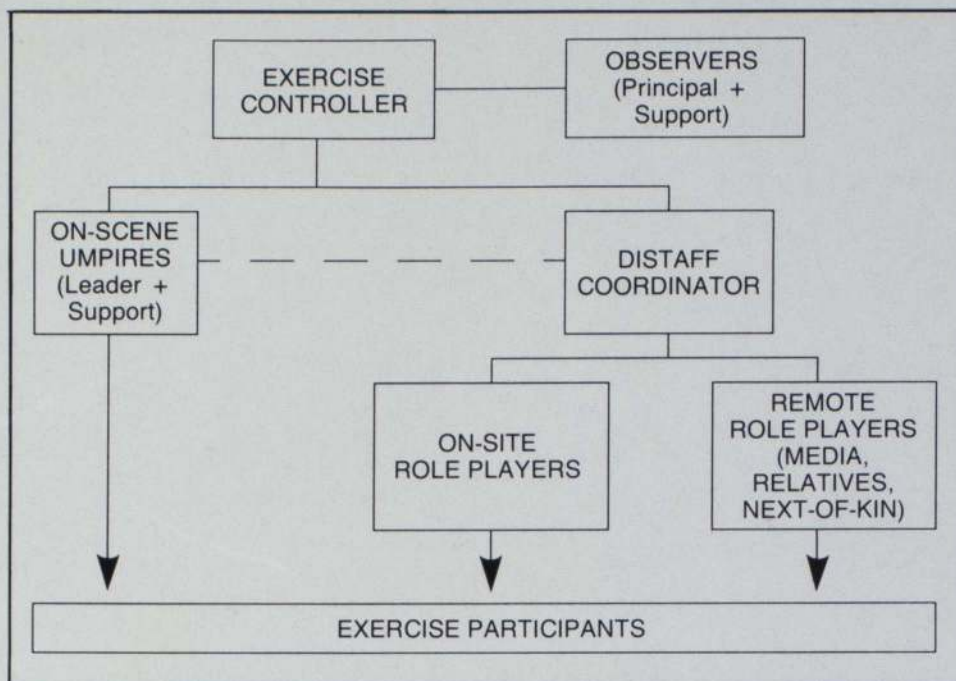


Fig. 1: a typical organisation for a major exercise involving both internal and external participants.

## Primary objective

The primary objective for such training and exercises is to ensure that the participants are fully familiar with the emergency procedures, know their roles when dealing with an emergency and practise these roles in a series of realistic scenarios.

Achievement of this main objective should result in all involved being able to:

- Recognise the different types of emergencies and appropriate response to each.
- Appreciate the need for a concerted team effort when dealing with emergencies.
- Appreciate the results of failure if the emergency procedures are not carried out correctly.
- Understand the separate roles and actions when dealing with an emergency, and their relationship with each other.
- Critically examine their own role in the procedures and its relationship with other actions, both of company personnel and of outside personnel and organisations.
- Identify of all the communications systems used in various emergencies.
- Appreciate the need for good communications and understand how the procedures can fail through poor communications.
- React flexibly and sensibly so that they deal with variations to the emergency as they occur, e.g. combinations of incidents, or unforeseen

problems which are outside the scope of the written procedures.

The aim throughout is to build the confidence of trainees in meeting possible emergency situations. It is also to get them to think more deeply about their emergency responses and to appreciate that the variations which occur in practice require a flexible approach.

In practice, the above requirements are seen increasingly as requiring a graduated series of training and exercises, building up the organisation and its personnel to achieve a high level of crisis preparedness and response capability.

In descending order of complexity, such training and exercises include:

- Major emergency exercises, involving the full range of emergency services and other outside agencies, and using actual or simulated movement of physical resources and people.
- In-house exercises, both small and large scale, run on a more regular basis to meet specific development needs.
- Training exercises for specific groups in both operational and support roles to focus on their particular responsibilities.
- Basic exercises packages, containing all the materials needed to conduct an exercise at very short notice.
- Training courses in the basics and practise of emergency planning and response, often integrated with the exercise programme. □

The Institute of Energy

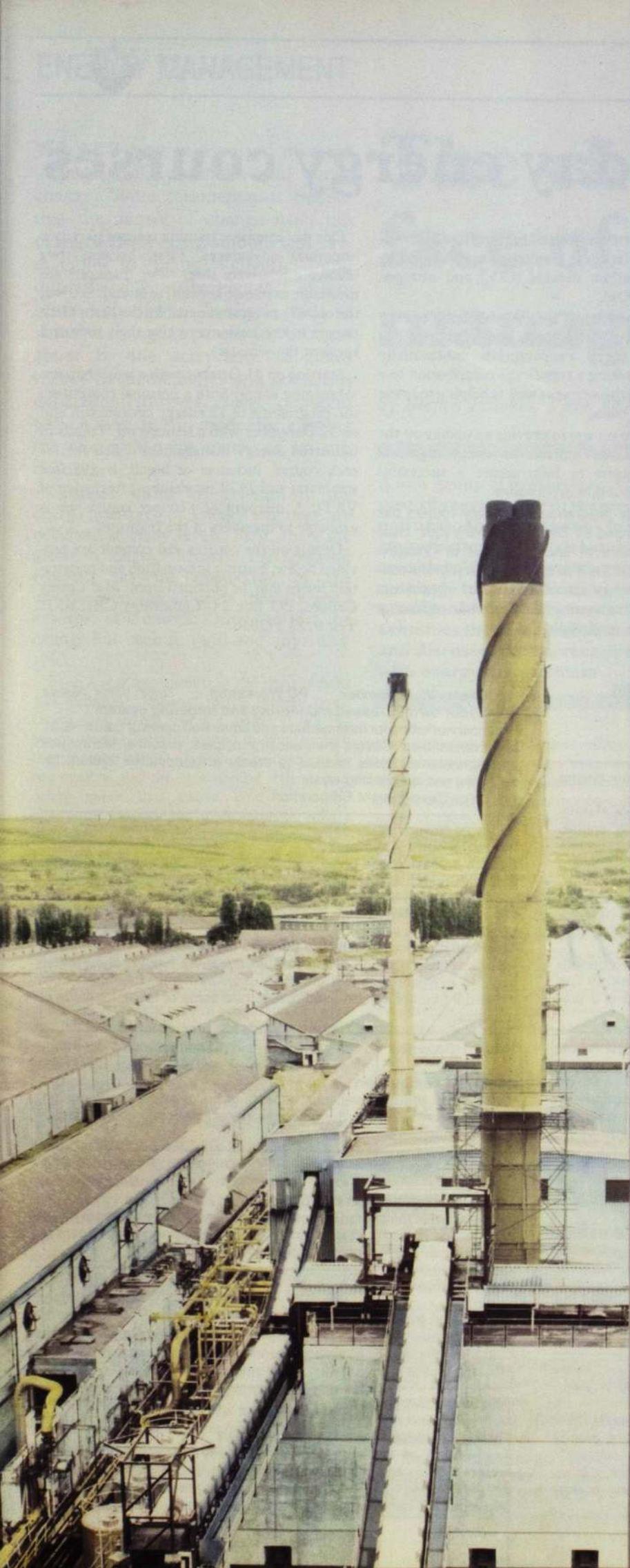
## BENEFITS OF MEMBERSHIP

Various benefits of membership were advertised in the **February 1989** issue of *Energy World*. One such benefit referred to discounts available to members on car hire from Hertz. The Institute has now received a supply of Hertz Business Partners Club cards and any member wishing to obtain a card should write to: The Membership Office (Ref MB), The Institute of Energy, 18 Devonshire Street, London W1N 2AU (Tel: 01-580 0077).



**HIS ENERGY SEEMED TO BE BOUNDLESS.**

**But what did it cost him?**



**THE** cost of raw materials, the cost of plant, the cost of heating and electricity. Containing them, understanding them, predicting them, day by day, leaves managers exhausted.

Just imagine being able to guarantee these costs over the next 10 years. Yet electricity prices for industry and commerce will remain in doubt until privatisation is settled and probably - beyond.

Fuel oil prices will continue to ride the Opec switchback. Gas will tend to follow oil with perhaps the occasional nasty shock from the regulator.

So who could possibly predict fuel costs?  
Quite simply, British Coal.

The restructuring of the industry has been going on apace since 1985. Productivity has increased by 90%. Operating costs are down 34% and prices have fallen more than 25% in real terms. Add to this startling improvement in performance the certainty of hundreds of years of reserves and British Coal looks a sound bet for the future.

That's why British Coal can offer the electricity supply industry long-term contracts, with prices no greater than the UK inflation rate. These attractive terms are also available to our industrial customers.

You can benefit from burning low cost fuel in clean, environmentally friendly, fully automatic plants and predict your future energy costs.

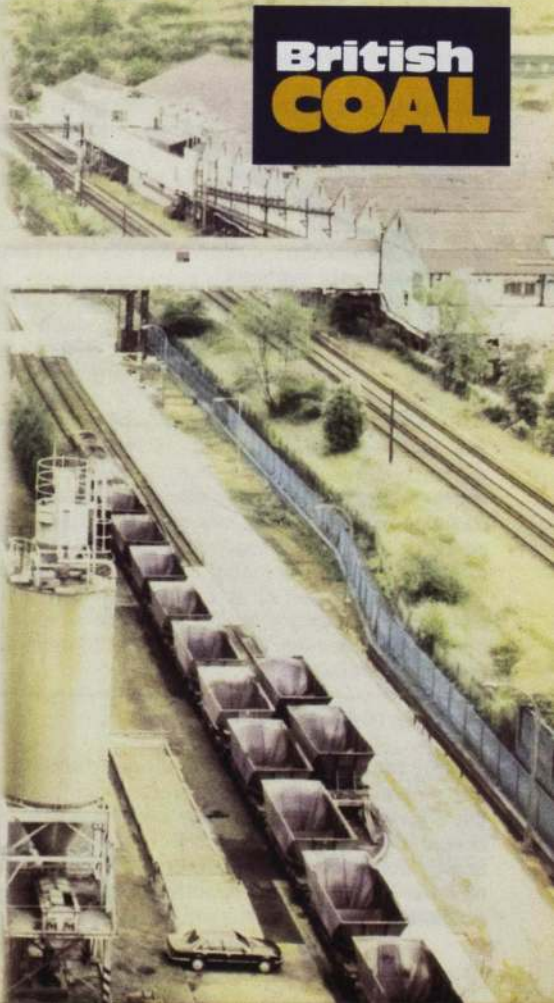
Forecast the future accurately by switching to coal and don't let uncertain fuel prices sap any more of your valuable energy.

For more information contact British Coal Industrial Marketing Department on 01-235 2020.

**WAKE UP TO THE NEW AGE OF**



**British  
COAL**





# Series of one-day energy courses

A NEW series of one day courses and workshops on key aspects of energy management begins this month at The Institute of Energy's London headquarters.

Organised for The Institute of Energy by Mid Career College, Cambridge, the series of courses will be of particular relevance to the energy professional in mid career.

The subject matter will range from the measurement and control of electrical energy and industrial control systems, through to energy recovery, process integration, plant efficiency, fuels and combustion, and computer programs for energy monitoring and targeting. Other courses will provide an overview of energy policies and options, and cover the effective motivation and management of staff.

This new training initiative coincides with intensifying international concern over the

environmental effects of burning fossil fuels — in particular those resulting from the production of carbon dioxide (CO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>).

Implementation of established energy management technologies and techniques can reduce energy consumption substantially thereby making a significant contribution to a cleaner environment as well as helping to lower operating costs.

The courses aim to provide an update on the latest methods available to energy engineers and managers to help secure a successful energy reduction programme.

The new programme of energy courses has been prepared by Dr Cleland McVeigh, visiting professor of energy studies at Glasgow College and the Technical University of Budapest, who has assembled a team of speakers who are prominent in The Institute of Energy and in the profession.

One day intensive training courses have two important advantages. First, because they involve a relatively short time, managers are more able to release key staff to attend. Second, the one day programme enables the best practitioners in the business to give their time and speak at the seminars.

Starting on 31 October with a workshop on: 'Managing energy with a personal computer', the programme of 12 energy courses will end on 12 December with a seminar on 'Trends in industrial energy management'. The fee for each course, inclusive of lunch, is £95 (for seminars) and £179 (workshops) (inclusive of VAT). A discount of £10 per course fee is available to members of the Institute.

Details on the courses and content are provided below. Further information and registration forms may be obtained from: Mid Career College, PO Box 14, Cambridge CB1 3UT. Tel: 0223 312850.

## Programme — Energy Studies Courses (Oct-Dec 89)

Director — Dr Cleland McVeigh

All courses: 10.00-16.30hrs

*Tuesday 31 October*      **PC Workshop**      *Tutor: Vilnis Vesma*  
**Managing energy with a PC**

A beginners introduction to computing for energy professionals. Hands-on workshop using PCs with database, spreadsheet and special purpose programs. Covers monitoring and targeting, combustion efficiency, insulation thicknesses, U-values, project appraisal, hardware and software, terminology, functions. Criteria for selection.

*Thursday 2 November*      *Lecturers: Alex Henham*  
*Andrew Bainbridge*

### Motivation and methods for managing energy

If you are going to manage resources, including energy, in an organisation it is essential to have the commitment of your staff and to use effective methods. This course suggests means of initiating a programme incorporating both aspects.

*Tuesday 7 November*      *Lecturer: Charles Hillyer*  
**Energy recovery systems**

Energy recovery for building services and industrial air or gas-to-air systems. Basic principles, economic viability, current equipment, system design — examples for both building services air handling systems and typical industrial discharges, with overall emphasis on practical considerations.

*Tuesday 14 November*      *Lecturers: Peter Hutt*  
*Robin Boddington*

### Measuring and controlling electrical energy

Basic power and energy measurement theory. Electronic kWh meter operation, current transducers, voltage transformers, summation meters, maximum demand, individual and group metering systems. Tariff structures load surveys, load factor optimisation. Control applications, including maximum demand load shedding controllers and the benefits and methods of switching and controlling power factor correction capacitor banks.

*Thursday 16 November*      *Lecturers: David Jones*  
*Dr Cleland McVeigh*

### Energy resources, policies and opportunities

The development of energy resources, types of growth, limiting factors, the S-curve (logistic curve) applications to resource depletion, energy consumption trends, alternative resources. Governmental concerns, energy policy issues in OECD countries and the UK, the work of international agencies and opportunities for industry, handling energy relations.

*Wednesday 22 November*      **PC Workshop**      *Tutor: Vilnis Vesma*  
**Build your own PC-based monitoring and targeting system**

Practical workshop for intermediate and advanced users of Lotus 1-2-3\* and compatibles. Covers theoretical principles, practical techniques and spreadsheet skills needed to create an automated system for detecting and diagnosing waste.

\* © Lotus Development Corporation.

*Friday 24 November*      *Lecturer: Andy Self*  
**Industrial control systems**

System modelling and basic concepts. Control loops and controllers. Modern Control. Control systems CAD techniques. Design studies.

*Wednesday 29 November*      *Lecturers: Dr John Lamb*  
*Alex Henham*

### Thermodynamic analysis and process integration

Plant involving a range of temperatures may be analysed in various ways to evaluate potential efficiency improvements. Examples from industrial practice will be used to illustrate some of these methods of optimisation.

*Friday 1 December*      *Lecturers: Dr Mike Purvis*  
*Bill Webb*

### Fuels and combustion

Comparison of fuels available, aspects of boiler and furnace design, matching burner to boiler/furnace, the characteristics of modern gas, oil and coal burning equipment.

*Tuesday 5 December*      *Lecturers: Dr Steven Fawkes*  
*Brian Mallalieu*

### Energy management in practice

The first part of the course will examine what the energy manager needs to know and how to get that information. The afternoon will be spent on monitoring and targeting, with detailed case studies.

*Friday 8 December*      *Lecturers: Dr Mike Purvis*  
*Bill Webb*

### Boiler plant efficiency

Basic combustion calculations, the importance of air supply, use of charts in efficiency calculations, energy balances and overall plant efficiency, case study on waste heat recovery.

*Tuesday 12 December*      *Lecturers: Michael Roberts*  
*Dr Steven Fawkes*

### Trends in industrial energy management

Examination of the changing scene today's energy environment, current government attitudes, technical advances and management issues, followed by an industrial energy management workshop with an opportunity to develop solutions to real problems.



WE ARE now in a period of rapid technological, economic and social change. Some commentators believe that the nature of change itself has changed from being smooth and predictable to being "chaotic" and unpredictable. Whether this represents a change in "reality" itself or simply a change in perception brought about by the acceptance of chaos theory in mathematics and science is debatable. However, chaos does seem to be a more useful model for viewing the world than the model of smooth changes.

Changes which are relevant to the energy manager or energy engineer are occurring at many levels. First, there are global changes, notably the growing concern for the protection of the environment. As an aside this is a good example of a chaotic change in that the change has been so swift and unpredictable.

Even a year ago interest in the environment was minimal compared to the present level. Given that energy use is a major, if not the major cause of environmental impact through the emission of CO<sub>2</sub>, which is believed to be responsible for the greenhouse effect, and other gases that cause acid rain, the environmental issue has implications for energy managers. Energy conservation, which is the province of the energy manager, is the most cost effective way of cutting CO<sub>2</sub> output according to a recent study by the Science Policy Research Unit at the University of Sussex.

### Technological changes

Next there are technological changes, or more accurately changes in economics brought about by developments in technology. Amongst many four stand out as having a major impact on energy managers. First, there is the technology of Building Energy Management Systems (BEMS) in which advancing technology, and increasing production volumes, is lowering the price of equipment to levels comparable to conventional, discrete controls. This means that even buildings with small energy bills, possibly as low as £2,000 per annum can benefit cost effectively from advanced control strategies and remote monitoring and/or control.

A second technology that is now beginning to have a wider effect is combined heat and power (CHP). Various forms are available ranging from micro-combined heat and power systems using automotive type engines to combined cycle and gas turbine plants. Again, the economics of these techniques are changing as relative prices change. The imaginative use of CHP and the potential it brings for private generation of power is a major change facing energy managers.

A third technological change is the increasing demand for electricity. Despite conserva-

# The changing face of energy management

by *Steven Fawkes, PhD, MInstE*

**A new group of professionals has emerged onto the industrial scene during the past 10 years — that of the energy manager or energy engineer. Given the high political and economic priority that is now being placed on energy conservation and environmental issues, this group seems destined to exert a considerable influence over government, corporate and institutional decision making. In the following article, Dr Steven Fawkes, a pioneer energy manager in the local government field and member of the Institute's Council, examines the global influences that are leading to the expansion of this sector and discusses the current professional issues facing every manager involved with energy management.**

tion measures such as more efficient lamps, energy managers in many sectors are faced with rising electricity demand caused by the proliferation of electrically powered devices such as personal computers, faxes, photocopiers and new electronic telephone exchanges. Individually these devices do not consume much power but when added together they are significant.

Overlaying all other technological change is the relentless progress in computing and information technology that affects all our lives. This has allowed much improved monitoring and targeting systems from which information can be disseminated to the people that actually affect energy use daily.

### Institutional changes

The third set of changes can be labelled institutional. Over a period of ten years or less we would have seen the privatisation of the gas board, the privatisation of the electricity supply industry and possibly the privatisation and break up of the coal industry. Monopolistic, or near monopolistic, suppliers still exist, and will continue to dominate the markets but this institutional change has opened up new opportunities for alternative suppliers of fuel and electricity. Although the changes have yet to be fully realised the privatisation of the electricity supply industry will come to be seen as a major turning point in the UK energy scene.

The way that companies and other organisations operate and the models and assumptions on which they are built are also rapidly changing. The global change in environmental awareness is being translated into environmental policies and programmes within companies. Major companies without credible environmental programmes aimed at reducing the impacts of both products and processes in the mid to late 1990s will face consumer resistance and even revolt.

Another change in the way that organisations are run, namely the reduction in the number of layers of management, is being brought about by the economic forces of global competition and the advance of information technology. Layers of middle managers who previously passed and processed information are being surgically removed from large companies, leading to wider spans of control and a flatter organisational structure. This trend, coupled with increasing employee expectations and demands is contributing to organisations becoming less hierarchical and more participative. The old military model of organisations as

## The author

**Dr Steven Fawkes is a director of Energy Partnership Ltd, a company dedicated to commercialising new products and services in the energy conservation and environmental fields.**

**Prior to establishing Energy Partnership Ltd he worked as the energy manager for the London Borough of Tower Hamlets. In 1984 he was awarded a PhD by the University of Stirling for a thesis entitled "The potential for energy conserving capital equipment in UK industries" and in 1980 he was awarded a first class honours degree in Science of Resources, from the University of Birmingham.**

**Dr Fawkes has been a member of the Institute since 1982 and elected to the Institute's Council in 1988.**



places where people throughout the chain of command follow orders blindly is no longer appropriate, if it ever was. The pressure to recruit the best brains from a diminishing pool of qualified young people will force this change through completely.

Marketing is still widely misunderstood by many people, even many people in business. Its principles of determining and then supplying customer wants, and being market rather than product orientated apply to all organisations, even those in the public sector but this has not been totally accepted in UK industry. Again global competition will force the trend towards market orientation through, organisations without it will fail. Information technology again offers incredible opportunities for becoming closer to the customer and conducting constant, almost instantaneous market research. All functions within the company, including engineering and energy management must be subservient to true marketing.

### Opportunities

It is a cliché to say that change brings with it opportunities, but it is true. If we are truly living in turbulent, chaotic times then there are many more opportunities that will lead to new industries, new businesses, new ways of running organisations and new social patterns. Within the kaleidoscope of change I see major opportunities for energy managers, opportunities that offer increased effectiveness of energy conservation programmes within organisations, improved viability of organisations, reductions in environmental impact and increases in the productivity of all resources.

Central to the exploitation of these opportunities is the development and implementation of both environmental and total resource management programmes. Given that the principles behind these are similar to those of energy management the energy manager has a pivotal role to play in their implementation. The basic process of audit, monitoring and identifying no cost/low cost and high cost measures can be applied to all resources including quality, safety and environmental improvement to form systematic resource management programmes.

So what are energy managers doing, or what can they do in the light of the changing scene and new opportunities? First of all they must make the link between energy conservation and environmental protection explicitly clear to top management. This should free new resources for energy conservation measures.

Next they should press for their organisations to implement systematic programmes aimed at reducing environmental impact. To successfully carry this out energy managers must improve their skills in lobbying and presentation. Before they have something to present, however, they must familiarise themselves with the corporate objectives (assuming these exist!) and develop arguments about how environmental programmes can contribute to those objectives.

Given the similar nature between energy and environmental programmes there is a case for putting these under the responsibility of an

expanded energy, environmental resource management function. Environmental programmes should look at products as well as process, thus energy/environmental specialists should be used during new product or existing product development programmes to keep the issue explicit. Energy/environmental managers must therefore familiarise themselves with the process of new product development, which is well documented in the management literature, and the company specific approach and programmes.

Energy managers should increasingly take a systematic resource view and look for projects that increase the productivity of all resources, not just energy. For example, one recent project by a major car manufacturer reduced energy use<sup>1</sup> but also, and more importantly, increased quality, reduced scrap rates, saved space, improved the environment within the factory and removed entirely a bottleneck that was stopping a doubling in production. In the final analysis the energy savings were almost incidental to the other benefits. This project resulted from taking an overall resource view and considering the best way of carrying out the process, rather than just accepting an incremental improvement to the existing plant.

### Major improvements

Increasingly energy managers must move away from accepting marginal improvements and aim for significant, fast improvements in the productivity of energy and other resources. This requires a willingness to take up an unreasonable, and some will say stupid, position and stick to it. If there is any doubt about this approach it should be noted that the Japanese frequently practice accepting an unreasonable target, such as a 50% reduction in energy per unit of product within 2 years, and then think creatively to see how this target, which many "reasonable" people will say is "impossible", can be achieved. Setting unreasonable targets does often seem to unleash more creative thinking than marginal targets such as a 5% reduction in energy use.

Energy managers will increasingly find themselves working in teams of other specialists and managers such as product development teams, new building design teams or environmental improvement teams. Therefore energy managers need to improve their teamwork and communication skills. The team approach needs to be devolved as far down the organisation as possible and people at all levels need to be involved in problem solving.

As total resource management becomes accepted the energy manager can use his/her skills to develop, alongside other managers, total resource management information systems based on energy M&T systems. These can be developed for physical resources or non-physical characteristics such as safety and quality. Energy managers need to take a lead in developing, and offering, resource monitoring and targeting systems that will be usable and useful to operational people. If a characteristic can be measured then the availability of new sensors and computing power allow it to be

monitored, and hence targets can be set. Simply knowing that such a system exists often help motivation of line managers keen to attack the problem but uncertain where to start. To successfully develop such systems the energy manager must use the best principles of new product development and work closely with the customer, in this case the line managers, at all stages. Failure to do so will result in the production staff failing to take responsibility for any system that is developed.

### Key elements

So what are the key elements of future energy, environmental and resource management programmes? Firstly they have clear, measurable targets and a monitoring and targeting system that feeds information back to the people who can actually make a difference. These systems will measure variables such as energy per unit of product, pollutant emissions per unit of product, hours of operation between accidents and, customer complaints and present the information in a simple, clear way as frequently as is practical, sometimes even on-line.

The recipients of this monitoring information will be small teams of people that can use it, probably a production team on the shop floor itself. These people will be trained in interpreting the information, problem solving and teamwork, and most importantly be directly responsible for meeting their own local targets. They will have time set aside when they can meet to solve problems and work out improvements to the process or service that will lead to productivity improvements.

Backing up these teams will be specialist staff who both help to provide monitoring and targeting information and act as "in-house consultants". As well as coming in to assist the teams when requested they can create possible improvement projects themselves that, working with the production teams' co-operation and input, they implement.

### Conclusion

The title "energy manager" in many ways is mis-named. He or she cannot manage energy used by other people, only a programme that leads to energy productivity improvements. The energy manager must become a resource/environmental consultant or specialist acting within an organisation where operational, production people are provided with the information and motivated to manage energy and other resources rationally.

There is no reason why industrial and commercial organisations, as well as the private sector, cannot implement environmental/resource management programmes as well as energy management programmes. Contrary to popular opinion these need not cost money, in companies where such programmes have been implemented the approach has brought with it financial savings as well as environmental and resource consumption benefits. What is needed is a shift in the conventional way of looking at the problem. The existing and future energy managers can play a vital role in bringing about this shift. □



**CONTRACT** Energy Management or Energy Performance Contracting, as it is sometimes known, is an established route for the implementation and finance of major energy conservation measures in the industrial, commercial and public sectors.

This type of energy related contract has been in operation for some ten years but it is over the last five years that CEM companies have been actively marketing their services in this country.

The authoritative body for CEM in the United Kingdom is the Contract Energy Management Sub Group of the Energy Systems Trade Association (ESTA), which is a recognised body for energy related specialist companies.

### CEM concept

In most organisations, energy is one of the last controllable costs and normally represents between 2 per cent and 10 per cent of total overheads. In order to achieve significant inroads into energy cost reductions, this requires considerable effort, time, expertise and invariably finance.

There are three basic requirements which must be available to any company before major energy savings will be achieved. These are: 1, Time; 2, Commitment; 3, Finance.

If all three are not available, the tendency is to do nothing and retain the existing inefficient plant until replacement is essential. Indeed, many organisations in the industrial, commercial and public sectors have commissioned summary and/or extended energy audits in recent years under Government sponsored energy programmes but it is our experience that many have not implemented the recommendations and have not realised the full potential savings available.

As companies' management and personnel structure become leaner and fitter, there are

# The developing role of the CEM company

by Mervyn Chapman, CEng, MInstE\*

It is common knowledge that Britain's national energy expenditure is some £40 billion per annum and, of this, some 30 per cent is allocated to the industrial, commercial and public sectors with the remaining 70 per cent being used in the two largest energy consuming sectors. It is largely accepted that 20 per cent is a responsible overall indication of the potential for improving the energy efficiency in the economy. The following article examines the contribution that contract energy management (CEM) companies are beginning to contribute towards the achievement of this potential.

limited manpower resources available for non production related projects such as identifying energy saving schemes, assessment of scheme potential, implementation of the correct schemes to fruition and the ongoing management of new energy systems to attain target savings levels year after year.

In larger organisations with 'in-house' expertise and those employing an energy manager, the CEM company works closely with energy managers to upgrade and refurbish energy systems when time resources are shared to maximum benefit. Even when energy saving schemes have been identified, there is a need to "drive" the energy management pro-

posals forward in any organisation, particularly in local authority where bureaucracy is well established.

### Achieving savings

Commitment is the belief that the energy savings predicted are to be realised and that the new energy systems operate to their target levels. This is particularly important for organisations where 'in-house' capital is employed which must produce a guaranteed minimum return and in the case of energy conservation projects, there are a number of variables which could affect the overall pay-back period.

Finally, investment capital tends to be limited in many organisations and in general capital is set aside for new production machinery, new products or sales drives. Investment into major energy saving schemes to replace existing plant which operates, albeit inefficiently, is normally given a low priority.

A CEM company will overcome all of these problems by providing the time and expertise to identify the energy saving potential, undertake the installation of new energy efficient equipment, project engineer the installation fully, commission the new system and, if necessary, finance the installation as an off balance sheet investment to the client. In addition, the CEM company normally accepts the full responsibility for maintenance and operation of the 'new system' over a fixed contract period.

The energy conservation measures which can be undertaken are wide ranging. For

## The author

Mervyn Chapman is a director of First Energy (UK) Limited, an independent company established specifically to carry out contract energy management (CEM) business.

Before establishing his company he was employed as a senior consultant engineer undertaking CEM business for a privately owned energy specialist company for four years, and worked with the same company as an energy consultant engineer for six years previously, undertaking summary and extended energy audits covering all aspects of industrial, commercial and public sectors. He has a total of 23 years' experience in the energy conservation field covering a wide range of energy consuming equipment.

Educated at Frederick Gough

Grammar School, South Humberside, Mr Chapman is a Chartered Engineer and a Member of the Institute of Energy. He started his career at British Steel Corporation, Scunthorpe, in 1966, as a chemist before becoming a senior fuel technologist responsible for the efficient operation of all energy consuming plant in three very large rolling mills. He was involved in the technical appraisals of tenders and selection of new multi-million pound energy consuming plant, including large reheating and normalising furnaces and undertaking performance and acceptance trials on all new energy plant installed.

As senior consultant engineer, from 1985, he was jointly responsible for establishing a new CEM business for a new division within his previous company, which became one of the market leaders in this field.

\*Director, First Energy (UK) Limited.



example, new lighting installations and automatic lighting control, new compressed air generation plant, new and efficient space heating and domestic hot water systems (including hot water and steam boilerplants, individual gas fired radiant and warm air heating systems), process heating equipment, heat recovery systems, CHP plant for small, medium and large sites, computerised energy management systems and improvement to building fabric standards, including insulation and automatic roller shutter doors, etc.

The basis of a CEM contract is to establish the existing operating costs of energy consuming plant, environmental standards and energy usage patterns. This is achieved through a detailed site survey of energy utilisation and feasibility study.

At this time, engineering alternatives are also evaluated to meet the client's energy requirements at optimum operating costs and the selected schemes to meet this end are finalised in terms of design and costings.

The 'new system' is controlled under the dictates of a state of the art computerised energy management system (EMS), or building energy management system (BEMS) which is vital to the success of all CEM schemes. The selection of the correct hardware equipment and software packages is essential for individual CEM schemes as it is our experience that control requirements vary from say straightforward heating controls on one site to the remote control or complicated process plant or air conditioning plants, boilers and domestic hot water systems in numerous plantrooms located nationwide.

The remote meter reading function of the EMS is also a standard feature which is incorporated to provide continuous monitoring and targeting facilities for the CEM contractor. In this way, anomalies are identified immediately and corrective action can be taken before operating costs are allowed to increase unnecessarily.

The CEM contractor would take full respon-



**Computer-based energy management systems are considered essential as support systems to provide monitoring and control of all services.**

sibility for the selection of the most appropriate EMS and would provide full training to the client's designated personnel to ensure that the system on site is used to maximum benefit. The selected EMS would also be used to provide the required reporting systems for alarms (on a 24 hour basis) and access to equipment to ensure efficient plant operation, including maintenance. Indeed, the on site "head end" equipment is available for use by the client for other purposes such as cost centre accounting, PPM, etc; which is an added benefit.

## Two options

The packaging of energy conservation measures to a client are offered as two options:

- (1) A CEM agreement where the CEM contractor takes full responsibility for the design, specification, installation, professional project management, ongoing management and operation of the 'new system' for the contract period (usually seven years), including full maintenance and finance of the project through a share of guaranteed energy savings, OR

- (2) A turnkey installation where the CEM company undertakes all responsibility as in (1) for a fixed fee and, if necessary, a guarantee of annual energy savings.

The energy savings are defined as the difference between the operating costs of the existing energy consuming plant and the 'new system', under the same operating variables. The total savings are shared between the client and the CEM contractor in a fixed ratio for the contract period and, the first slice of savings are taken by the client. The share of savings is variable and depends upon the ratio of capital invested against the target energy savings level which is assessed on a project by project basis. Clearly, the larger the "savings cake", the larger the rebate to the client.

In the event that the target energy savings are exceeded, we ensure that the client would receive the "lion's share" of the additional savings to provide a major incentive for the client to generate maximum co-operation and commitment to the scheme, on an ongoing basis.

## Guaranteed savings

We, as a company, guarantee that after our involvement the client would not pay any more than the existing operating costs, allowing for any changes in energy and labour costs, and in return, the client would receive a guaranteed annual savings level which is generated by the installation of new energy and control equipment, financed and maintained by the CEM contractor.

Therefore, the CEM contractor accepts full responsibility for the performance of the "new system" during the contract period and any shortfall in the predicted energy savings is borne by the CEM contractor. Clearly, there is a significant incentive for the CEM contractor to perform and generate the target savings year on year if cash penalties are not to be incurred. It must be stressed that energy savings are generated as a result of the installation of more energy efficient plant and controls and *not* to the detriment of environmental standards or comfort conditions.

Traditionally, CEM companies have generally provided their services for upgrading refurbishment projects for existing industrial, commercial and public sector locations but as the market place for CEM continues to broaden, there are new opportunities where CEM technology is being applied, such as new buildings and green field sites.

From our experience, the majority of CEM contracts currently in operation have involved the replacement or major upgrade of space heating systems in the manufacturing and converting industry but recent relaxation of the rules regarding prescribed expenditure allowing CEM in the public sector has enabled inroads to be made in this area. Indeed, whilst the Audit Commission has given the "green light" towards CEM in the public sector, there is still more reluctance by local authorities to proceed in this direction. Perhaps the ongoing requirements for competition within local authorities and the introduction of local financial management have created artificial barriers towards CEM but as the more forward



**Heating systems designed specifically for each factory have the advantages of low cost and high efficiency plus greater flexibility.**

thinking authorities undertake CEM contracts, it is hoped that this scepticism will eventually disappear.

As stated previously, one of the most fundamental requirements for a successful CEM contract is accountability. This explains the fact that most CEM contracts in operation are for replacement of inefficient space heating systems. In most organisations, existing space heating costs and the operating costs of the "new system" can be readily reconciled against operating variables, which in this instance include:

- energy costs;
- degree days;
- heated floor area;
- operating hours.

The following is a guide to the operation of a CEM contract for a new space heating system. The client's existing operating costs (Base Year Costs) are paid to the CEM contractor in 12 equal instalments and in return the CEM contractor would pay the new operating cost for the system, including energy and maintenance costs. At the end of each operational year, the guaranteed savings level is paid to the client and any average above target is heavily rebated back to the client.

The Base Year Costs are amended at the end of each operational year, in line with changes in the variables, eg, increased energy unit costs and these are applied during the contract period. In effect, the client pays only his "existing" operating costs modified by the variables and no more, during the contract period.

Many companies have already gone down the CEM route and continue to enjoy improved environmental and comfort conditions whilst receiving a share of actual savings achieved. These include blue chip companies and large organisations with the capability of providing finance and, in some cases, expertise for such projects but have preferred to "off-



Factory space equipped with a modern, computer-controlled environmental system, which includes heating and air conditioning functions. Such systems are typically saving from 30-50 per cent on previous operating costs.

load" or "contract out" the total responsibility for energy engineering expertise, project management and finance to a specialist CEM contractor. Indeed, one such company is currently negotiating a second CEM contract on the same site, for additional energy conservation projects.

Finally, much public and Government interest is now being given to "green issues" including the "greenhouse effect" and ways of ameliorating global warming. Whilst there are many different opinions on this issue, it is widely accepted within the industry that energy efficiency is viewed as the major option for reducing CO<sub>2</sub> levels. This is supported by

recent statistics showing approximate percentage contributions in the main areas to reducing UK's CO<sub>2</sub> emission by the year 2020, taking reasonable account of market considerations, viz:

- Energy efficiency — 40%
- Nuclear power — 23%
- Substituting gas for coal — 15%

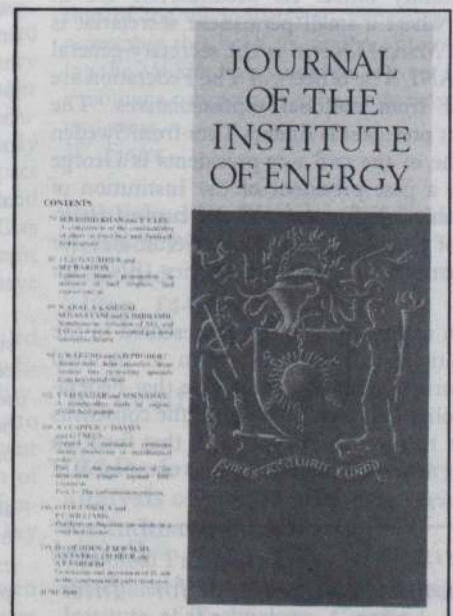
Clearly, energy efficiency is to play a major role in improving the bottom line profitability within the industrial, commercial and public sectors and improve environmental conditions but actions are needed at this time and there must be real Government incentives to all sectors to achieve these objectives. □

## Are you missing out on the Journal?

The *Journal of the Institute of Energy* is the technical journal of record for the Institute. Published quarterly, it carries refereed technical papers on a wide range of subjects and it is available to members of the Institute who register their wish to receive it. To put yourself on the mailing list, simply write to the Membership Secretary at The Institute of Energy, 18 Devonshire Street, London W1N 2AU, stating your preference to receive the Journal (please include your membership number in all correspondence).

To those outside of membership, it is available on subscription jointly with *Energy World* — price £110 (UK), £115 (overseas subscribers).

Examples of papers recently published include: *A comparison of the combustibility of chars in fixed-bed and fluidised-bed reactors* (M Rashid Khan and YY Lee); *Laminar flame propagation in mixtures of fuel droplets, fuel vapour and air* (JED Gouthier and MF Bardon); *Steady-state heat transfers from vertical fins protruding upwards from horizontal bases* (CW Leung and SD Probert); and *A comparative study of engine-driven heat pumps* (YSH Najjar and MN Nahas).





# Becoming a European Engineer

by P J Hector\*

In October 1987 the European Federation of National Engineering Associations, or to give the international abbreviation, FEANI, opened its new Register of Engineers (see *Energy World*, March 1988). This launch followed four years of negotiation and international collaboration in which British engineers played a prominent and significant part. Initially the register was open only for the listing of those engineers who had, in British terms, achieved chartered status or were qualified for Stage 2 registration in Britain. Those Chartered Engineers registering with the Federation fall within Group 1 of the Federation register and may qualify for the title of European Engineer or Eur Ing

The second part of the register however has not been opened until recently. This is Group 2, and provides for, to quote the *Guide to the FEANI register*, those of a more practical bent who can effectively bring to bear a detailed knowledge of established technology. In terms of UK qualifications Group 2 corresponds to our Incorporated Engineers.

## What is FEANI?

The Federation was founded in 1951 and represents engineers in 20 member countries of Europe, including all the members of the European Community. It is *not* however a European Community office. Its headquarters are in Paris, where a small permanent secretariat is based. Marcel Guerin is the secretary-general of FEANI. The officers of The Federation are elected from national representatives. The current president is Anders Thor from Sweden and one of the two vice-presidents is George Adler, a past president of the Institution of Mechanical Engineers and the current chairman of the British National Committee for International Engineering Affairs (BNC for short).

Each national profession represented in the Federation is required to form a 'national monitoring committee' to ensure that Federation policy and standards reflect the consensus in that nation. The BNC fulfils that function for the United Kingdom, being composed of

representatives of the Nominated Institutions, the Fellowship of Engineering and the Engineering Council.

## The FEANI register

A Federation register has existed since 1970, when it was introduced to set and equate qualifications standards in the member countries. Registrants were provided with a certificate of registration, or 'passport', to facilitate their freedom of movement to practise their profession in Europe.

A major problem in administering that register was the widely differing engineering educational systems in Europe. Our own British system had particular problems because our formation process, involving as it does not only education but also supervised training followed by professional experience, was unique and did not equate to any other European system. Other countries posed different but still difficult problems, and as a result only a few thousand of the million or so engineers in Europe became registered.

These difficulties have largely been resolved by the concept of the 'end product', suggested by the BNC some time ago. This simply says that the quality of the formation process is demonstrated by the quality of the engineer it produces — the end product. The Federation has accepted this maxim and used it to define formulae for the acceptance of candidates for the register.

The formulae for Group 2 engineers are shown in the box. The formulae may appear daunting at first glance, Incorporated Engineers will probably quickly see how their own formation fits with the rules. The formulae in practice match well with the Engineering Council's Stages 1 and 2 for registration, whereby Stage 1 denotes appropriate academic education, and Stage 2 that appropriate training has been received. There is however as yet no European equivalent to the title of 'Incorporated Engineer' which in this country may be awarded following the gaining of appropriate professional experience.

Although registration is not at present an official European Community procedure, the Certificate of Registration acts as a professional passport practicing in any of the 20 European countries forming the affiliated nations.

The passport provides proof of professional standards that are international, as well as a common measure of competence to practise. In some countries such a proof is necessary before being permitted by law to practice a profession or trade.

Even if you do not intend to base yourself abroad, your firm may well be looking for business in Europe, or to the expansion of its existing European business, especially post-1992 when there will be considerable incentive to do so. As an Incorporated Engineer holding a document recognised by profes-

sional institutions throughout Europe proving your competence, you will be better placed to take advantage of these opportunities.

## How to apply

Simply contact the Membership Department of The Institute of Energy on 01-580 0077, asking to apply for FEANI Group 2 registration. You will receive an application form, a Certificate of Registration and an information sheet explaining how to complete them. Fill the forms in as completely and clearly as possible, and then send them with your cheque for £25 back to the Institute. The £25 fee is renewable every five years, and the certificate is only valid for that period. The forms will then be sent to The Engineering Council for entering in the UK section of the FEANI Group 2 Register. The certificate will be stamped and signed and returned to you.

## Questions and answers

- Q** What if I am already on the old FEANI Register?
- A** You may remain on it until your current period of registration expires. At any time during that period you may apply to transfer to the new Register on payment of the appropriate fee.
- Q** Are all Incorporated Engineers automatically eligible for Group 2 registration?
- A** No, though this may become so in the future. In the early stages it will be prudent to check education and training details to ensure that the standards of the Register are maintained.
- Q** How long will registration, and the passport, remain effective?
- A** Five years, after which renewal with payment of a further fee will be necessary.
- Q** Can I apply now?
- A** Yes.

$$A + = ET$$

or

$$A + 2ET + 1T$$

or

$$B + 2ET$$

where

- A** represents a good secondary education validated by the award of a recognised certificate at about the age of 16 years.
- B** represents a high level of secondary education validated by one or more official certificates awarded at about the age of 18 years.
- ET** represents a year (full-time or equivalent) of approved engineering education, either supervised and approved by a technical school, college or similar body, as part of a programme of engineering formation.
- T** represents a year (full-time or equivalent) of technical engineering training, supervised and approved by a technical school, college or similar body, as part of a programme of engineering formation.

\*Assistant Secretary, British National Committee for International Engineering Affairs.



## An EWEA workshop

### 'Wind Energy and the Environment'

Edited by Prof D T Swift-Hook

The scope of this small but very informative volume is wider than suggested by the title. It brings together 17 papers presented at a workshop held in London in March 1988 under the auspices of the European Wind Energy Association.

A foreword and an introductory chapter by the editor sets the scene and discusses the technical and economic status of wind energy arguing that there "seem to be no technical or economic barriers to the widespread installation of wind power plant. The only remaining problems are environmental and institutional". Given that this volume is devoted to examining the environmental problems, one might be tempted to conclude that these problems are daunting, but this is not so. Most of the papers set out the problems and solutions clearly and one concludes that a lot of work is in hand to identify and overcome the difficulties.

The coverage of the environmental aspects of wind energy is very thorough. The way in which all the various effects — noise, safety, ecology, TV and radio interference — impinge on the overall resource is well documented in a Dutch study and other papers address particular topics in more detail. The topic of noise is very well covered in five papers; these discuss the International Energy Agency's recommended practices for measurements, the theory of propagation, actual data from operation of a vertical axis machine and the use of variable speed machines as a means of limiting noise. A similarly authoritative paper discusses the likely problems of TV interference and, again, one is struck by the useful presentation of real data from operating installations. Other technical papers cover the safety angle, including the formulation of standards, and an analysis of blade throw from wind turbines. The important aspect of public attitudes to wind is also tackled in an interesting analysis of a limited but useful study carried out close to three wind turbine sites. This reinforced the general view that, by and large, attitudes are favourable or neutral towards wind energy and that this enthusiasm does not diminish in areas where they are installed.

The biggest obstacle to the installation of privately owned wind turbines in Britain has been the penal level of local authority rates levied on wind turbines and the experience of the Wind Energy Group in trying to overcome this difficulty is documented. The author, sadly, concludes that their experience has been a "triumph of beaurocracy over common sense", but ends on a hopeful note, now that the end of the present rating system is in sight.

The final paper, again by the editor, examines the prospects for offshore wind power, emphasising the large resource and, again, forecasting attractive generation costs. This appraisal is possibly a little rosy, given the lack of operational experience.

Nevertheless, offshore wind energy is an attractive long-term option, given that one of

the authors notes that, even in Denmark, enthusiasm for wind turbines may be waning.

Overall, the volume is packed with hard facts and a general air of optimism and is an invaluable guide for both specialist and non-specialist.

*D J Millborrow*

**Published by Peter Peregrinus Ltd on behalf of The Institute of Electrical Engineers, Stevenage, England, 1989**  
170pp. £38.00

## Air pollution control

### 'Emission standards for coal-fired plants' by Jan L Vernon

This report provides information on current and proposed air pollution emission standards applicable to coal combustion plants. It focusses on three major pollutants currently covered by legislation: sulphur dioxide, nitrogen oxides and particulate matter. Additional information concerning other pollutants is also included where national or regional emission standards exist.

The data on air pollution control policies are organised for each of the fourteen IEA Coal Research countries plus two other significant coal-using countries. International agreements and standards (such as the Convention on Long-Range Transboundary Air Pollution on EEC draft legislation on Limitation of Emissions from Large Combustion Plants) are described in a separate section.

The general legislative approach of each country, together with source of regulations, implementation and enforcement methods and other key activities relating to air pollution emissions control, is described within the text. These factors may have an important modifying influence upon the impact of emission standards. For example, a general requirement for the "best available (control) technology" to be used may require plants to adopt certain control measures even though they can meet the stated emission standards by other means. In some countries, emission limits are issued only as guidelines rather than as statutory limits, but they are used as a test of whether plant operators are meeting general requirements for control of air pollution. Obviously emission standards will have little impact unless they are adequately implemented and enforced; other government measures such as loans, grants or tax concessions for investment in air pollution control may also help to achieve emission standards.

The report has also examined the detailed framing of standards as this can have a significant effect on their impact and enforceability. Whether standards apply only to new or also to existing plants, the method of measurement and averaging period, and the interaction of different requirements such as fuel specifications with emission standards, are all key factors.

In order to facilitate comparison between countries, the emission standards and the sizes of plants to which they apply have been con-

verted to a broadly comparable basis as well as expressed in the original form in which they are given in the country's legislation. Further details of the conversion methods used by the author are given in an appendix to the report.

IEA Coal Research maintain a comprehensive computer database on emission standards. Future editions of this report will reflect the evolving regulatory framework on emissions in the major coal consuming countries. This report will therefore be a valuable source of information for individuals and organisations who are interested in emission standards and the control of pollution.

*Dr Andrew W Cox*

**Published by IEA Coal Research, London, 1988**  
52pp. £60.00 (to member countries of IEA Coal Research); £180.00 (to non-member countries)

## The diary of Venezuelan oil

### 'Venezuelan Oil-Development and Chronology' by Anibal R Martinez

Venezuela has produced a seventh of the crude oil used by man. With its abundant oil resources, it will continue to be an important oil producer well into the twenty-first century. The history of the Venezuelan oil industry is therefore a significant subject.

This book is quite unusual in format in that almost the whole text is in diary form — a series of dated statements concerning the commercial and political development of the oil industry in Venezuela. There is no discussion of the events listed, leaving the reader free to make his own unbiased deductions from them. The only possible sources of editorial bias is that certain significant events may have been deliberately omitted, but your reviewer has no evidence that this has been done.

In short, anyone wanting to study the evolution of the oil industry in Venezuela should remember this book. A similar volume covering the Middle East would be of great interest, enabling a comparison to be made between the two areas.

*W Tipler*

**Published by Elsevier Applied Science Publishers, Barking, England, 1989**  
248pp. £44.00

## Recently published

### 'R&D for the 21st Century: An analysis of trends affecting strategies for industrial innovation'

Cranfield Press. Price: £19.50.

Available from Cranfield Press, Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL. Tel: (0234) 752727.



## Boy's industrial aid wins 'Young Engineer for Britain' title

A MIDDLESBROUGH boy carried off the title of "Young Engineer for Britain 1989" this year.

Nigel Herbert won the coveted trophy and £1250 for the school he attended — South Park Sixth Form College, Normanby, Middlesbrough — with his invention "Viscometer", a device to measure and read out the viscosity of fluids.

Nigel (aged 19) was one of 52 national finalists, aged 11 to 19, competing in the competition organised by The Engineering Council at the National Westminster Hall in the City of London. They had been selected from 450 young people at 11 regional finals staged throughout the country.

The great benefit of Nigel's invention — a project he devised for his A-levels — is its portability so that it can be taken on site, for instance oil and chemical sites, to give a rapid read-out. It is also low cost — about £170 in retail — which means that it should have wide application in schools, too.

The winning projects also include an electronic device to warn of defrosting conditions in deep freeze systems, a computer management system for motor vehicles and a device to

monitor supplies in TV production.

The Engineering Council's Women into Science and Engineering (WISE) award of £200 for the best project by a girl was won by 14-year-old Sarah Millington with her invention "Spear-A-Ball", a kitchen device which gives effective separation of fats or oils from other liquids. Sarah attends Wyndham School, Egremont, Cumbria.

A special £600 prize, awarded by the Department of Education and Science for the best school entering the competition for the first time with the most imaginative project, was won for his school by Jon Crook, aged 19, of Colchester Sixth Form College, North Hill, Colchester. His project was "Agri-Jac", a hydraulic cylinder jack powered by a tractor's hydraulic pump.

● The competition, in which youngsters can enter projects based on any branch of engineering, is designed to foster and strengthen links between education and industry and so develop the interests of young people in engineering and technology and in careers in industry.

● The two principal sponsors are directory publishers Dial Industry Publications and National Westminster Bank. Other sponsors include: the Department of Trade and Industry, British Aerospace, BP, Courtaulds, GEC, ICI, Ove Arup Partnership, Shell, TI Group, Unilever, Vickers and Wimpey.

## All about The Engineering Council

THE ENGINEERING COUNCIL has published a corporate leaflet which gives a wealth of information about the Council and its activities.

Carrying the headline *Shaping Britain's future*, the four-page document explains the structure of The Engineering Council, its initiatives on education and training, with industry and across the engineering profession.

The Engineering Council is an independent organisation with 300,000 Chartered Engineers, Incorporated Engineers and Engineering Technicians on its register. It also has more than 250 employers of engineers — including most of the leading companies in the land — affiliated to it.

The Council, established by Royal Charter, is required to set the standards for the engineering profession, create awareness of engineering and technology and secure the supply of the next generation of engineers and technicians to ensure the competitiveness of British industry.

Copies of *The Engineering Council: Shaping Britain's future* are available free from the Resources Section, The Engineering Council, 10 Maltravers Street, London WC2R 3ER. Tel: 01-240 7891.

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Application forms are available from the Personnel Department, Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL, telephone Bedford (0234) 750111 extension 3335 (answerphone) quoting reference number 9182E.

Closing date for applications: 8th November 1989.

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## Portable flow logging system

Micronics, manufacturers of the Portaflow MKII portable liquid flowmeter, now introduce the Portalog data logger which, when integrated with the Portaflow MKII, offers, it is claimed, a flexible and cost-effective portable flow metering system.

The system is battery powered, lightweight (combined weight of both units 2.5 kilos), and totally flexible in its application and the use of the data obtained. It offers instantaneous access to process flows, the data from which can be stored and retrieved later for analysis whenever required.

The Portaflow MKII uses "Clamp-on" sensors and can operate on any pipe from 15 mm upwards at a temperature from  $-35^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  ( $200^{\circ}\text{C}$  optional extra).

The Portalog is available with a memory store capable of taking either 8000 or 32,000 readings from the Portaflow over a 10-h period (Portaflow operating battery life) or over a six-month period if the Portaflow can be mains operated. Data are processed by an IBM or equivalent PC using analysis software available from Micronics.

For further information contact Micronics, Unit 6, Slaidburn Crescent, Fylde Road Trading Estate, Southport.

## Contract won for low-emission burners

Airoil Flaregas have recently installed nine of the Venturi 5000 series burners on one of the main boilers at BP Chemicals, Baglan Bay Works, in Port Talbot, and have received an order for a further nine to be installed later in the year.

These fully automatic burners — developed to operate on a variety of liquid and gaseous fuels — are designed to reduce flue gas particulate emissions. Utilising the F Jet atomisation technique, in conjunction with precise flow model studying of the combustion air approach ducts and windbox, it is anticipated that emissions will be reduced by up to 40 per cent. The turnkey project includes supervision of installation and commissioning.

For further information contact Airoil-Flaregas Limited, PO Box 92, Hexton Road, West Drayton, Middlesex UB7 8BG.



Lightweight and battery-powered, this portable flow logging system is highly flexible.

## New instrument measures hydrocarbon dewpoint of natural gas

The composition of natural gas includes a broad spectrum of potentially condensable components and when cooled at a constant pressure the heaviest component condenses first, followed progressively by lighter components as temperature reduces. The fractional nature of this process has traditionally made the accurate measurement of the hydrocarbon dewpoint difficult to achieve. Michell have therefore a new instrument which employs a radical approach to the detection and measurement of the dewpoint in natural gas.

Introduced as the Condumax™ hydrocarbon dewpoint-meter, it uses a special detection technique to provide extremely high repeatability and reliability in a variety of on-line hydrocarbon dewpoint measurement applications. Known as the Dark Spot™ optical detection principle, it represents a variation on the fundamental chilled mirror principle and has been developed by the Shell Thornton Research Centre, in conjunction with Michell, specifically to address the inherent problems in such applications. Sensitive to 1 ppm (molar) of condensate, the Dark Spot sensor enables the Condumax to detect the films of condensate characteristic of hydrocarbon gases at dewpoint which, as a result of their low surface tension, are almost invisible to the human eye.

The sensor operates by the cooled mirror principle, using

Joule-Thomson cooling of a novel, patented condensation detection system comprising a stainless steel mirror and fibre optic loop. Dewpoint temperature is measured by a thermocouple embedded in the mirror. The key to the special function of the mirror which has a semi-matt surface and a V-shaped conical depression in the centre on which is focused a well-collimated beam of visible red light.

In the dry condition, most of the incident light beam is reflected from the optical surface to form an annulus ring of light, at the centre of which is the Dark Spot; optical detection is dependent upon light dispersed from the semi-matt surface into the centre of the Dark Spot. During a measurement cycle, as hydrocarbon condensation forms on the optical surface its optical properties are modified, such that the reflected light intensity at the annulus ring increases while that in the Dark Spot region is significantly reduced. This effect is monitored through a fibre optic loop and interpreted by the associated circuitry in terms of mV signal change.

Since the detection system is essentially quantitative, the measurement sensitivity of Condumax may be set to meet the precise requirements of the user.

For further information contact Michell Instruments Limited, Unit 9, Nuffield Close, Nuffield Road, Cambridge CB4 1SS.

## Combat introduce new boilers

Turbomatic wet system boilers are now available from Combat Engineering. As they only measure 625 mm depth  $\times$  625 mm wide  $\times$  1600 mm height, they occupy very little production space and are therefore suitable for decentralisation schemes.

These gas-fired boilers are manufactured in integral condensing (RX) and high efficiency (BTR) models. The Turbomatic RX is the only integral condensing boiler available. It has a continuous annual operating efficiency of over 90 per cent GCV, making it suitable for all types of normal or mixed temperatures circuits. It does not require low return water temperatures to raise its efficiency, fuel costs can be reduced by as much as 60 per cent and Independent Certified Audits are available. Heat outputs range from 70 to 320 kWh for the RX models and from 95 to 495 kWh for the BTR range.

For further information contact Combat Engineering Ltd, Oxford Street, West Midlands WV14 7EG.

## Keeping demand within limits

Merlin Gerin has launched a new load shedding relay. This device monitors the total load drawn by an electrical distribution system, and temporarily disconnects specified non-essential loads in the event of the total current drawn at any time exceeding a set limit. This will help electricity consumers save money in one of two ways:

- 1) it allows a consumer to set a limit to the amount of power drawn from the mains supply, and so contain his energy costs;
- 2) it allows savings to be made in a system at the design stage if the maximum demand can be assured.

Single and three phase versions of the relay are available. The three phase version allows independent load shedding on each phase. The device is rated at up to 90 A, with twelve setting thresholds between 5 A and 90 A.

The relay is DIN rail mounted, and can be installed in any enclosure designed for DIN-standard equipment.

For further information contact Merlin Gerin Limited, Stafford Park 4, Telford, Shropshire TF3 3BL.



## Gas fired heaters for contaminated air environments

Powrmatic now has available in its proven PGUH range of gas fired heaters, units specially designed for use in environments where the air is contaminated by dust, solvents or other causes.

Known as PGUH DCA (ducted combustion air) units, the heaters do not utilise air from within the space in which they are mounted to complete the combustion process, as do the standard PGUH units. Instead, they duct in fresh air from outside, using either a natural draught flue for vertical flue installations, or a fan assisted flue for horizontal flue installations.

In the first of these alternative forms, a double skin flue system

is connected to the top of the unit where the annulus between the tubes conveys the fresh air from outside to the heater, and the inner tube exhausts the products of combustion.

In the second form, a single wall flue is fitted to exhaust the products of combustion, these being assisted by a flue exhaust fan assembly and a second duct is fitted to allow entry of the fresh air.

PGUH DCA types of unit are available with a range of outputs covering 14-58 kW.

For further information contact Powrmatic Ltd, Winterhay Lane, Ilminster, Somerset TA19 3PQ.

## Noise control

The Gas Turbine Division of Industrial Acoustics Company (IAC) has been awarded a contract by ABB STAL AB of Sweden to supply a complete noise control package for their Mars gas turbine. It will be installed in a combined power and district heating plant station in Hirtshals Kraftvarmeværk (Denmark).

IAC is required to meet a demanding technical specification. The station is being built in a coastal and environmentally sensitive part of Denmark, so keeping noise levels at the minimum was a major requirement. The plant will emit noise levels of no more than 45 dB(A) at 15 m and 80 NR at 2 m. 45 dB(A) is considerably less than the noise level experienced in a normal open plan office.

IAC's project responsibility includes the provision of combustion air intake and exhaust ductwork, and ventilation air inlet and outlet ductwork. It will use its own power-flow silencers and quiet-duct silencers, and provide accessories such as fans, dampers and the instrumentation. An IAC moduline acoustic enclosure will be used to cover the complete machine train. The total project requires a combination of multidisciplinary skills and familiarity with large-scale project handling.

For further information contact Industrial Acoustics Company, Walton House, Central Trading Estate, Staines, Middlesex TW18 4XB.

## Wolf boilers

The West German-made Wolf range of oil/gas-fired boilers is being introduced by the sole UK distributors, Delrac. With a range of units available in capacities up to 160 kW, the Wolf boilers are suitable for a wide variety of commercial and industrial applications.

Sectional cast iron and welded steel boilers are available, each with the option of a built-in stainless steel calorifier. A range of factory-fitted control systems enable the Wolf boilers to satisfy a broad spectrum of heating and hot water requirements. Delivery on all standard boilers is ex-stock from the Wolf factory.

For further information contact Delrac Limited, 128 Malden Road, New Malden, Surrey KT3 6DD.

## Multi-gas monitor conforms to EEC directives

In response to COSHH legislation Bruel & Kjaer are introducing a highly accurate, stable multi-gas monitor which provides quantitative analysis of up to five components and water vapour in an air sample. In October 1989 UK employers became subject to legislation, based on EEC directives, related to the control of hazardous substances. The legislation created a need for precise measurement of gases and vapours by both employers and the inspectorate.

The Type 1302 multi-gas monitor, first product on the

## Textile industry to cut fuel bills

The British Textile Technology Group has been awarded a major contract by the Government's Energy Efficiency Office to help the textile industry cut its fuel bills by £6 million pa over the next eighteen months. The work is fully funded by the EEO, and participating firms will receive the expert help required to make these savings entirely free of charge. Further penetration into the industry of the principles involved could eventually save £33 million, or 13 per cent of the industry's annual fuel bill.

The aim of the project is to establish energy monitoring and targeting systems at about fifty locations, mainly in the wool, spinning and weaving, knitting, carpet manufacturing, and clothing production sectors of the textile industry. A previous project undertaken by BTTG concentrated on the finishing sector

and demonstrated the great potential of this approach to energy saving.

Companies wanting to participate in the project will be visited by BTTG staff who will explain monitoring and targeting in detail and examine the existing methods of monitoring energy consumption and production. Where appropriate, modifications to the standard system will be made to accommodate any particular needs of the host organisation. The companies' attitudes towards energy management and requirements for improved control of site energy costs will be explored, and a nominated person instructed in the collection and interpretation of data. Once monitoring is established, attention will turn to setting an appropriate consumption target and working towards it.

For further information contact British Textile Technology Group, Shirley Towers, Didsbury, Manchester M20 8RX.

## Nu-way signs marketing agreement with British Gas

Nu-way has signed an agreement with British Gas to market a new ceramic radiant tube system. This is already used for a variety of industrial process heat applications and has, it is claimed, led to energy cost savings of more than 60 per cent compared with more conventional systems.

The ceramic radiant unit, mounted horizontally between the walls of the furnace or kiln, is heated by a recuperative burner which fires along an internal tube arrangement to recirculate the combustion gases. Ancillary equipment associated with the

burner and the tube supplies air and gas at the desired flow rates and pressures in the correct ratio for the low and high fire operating range.

The system was designed for indirect heating at process temperatures up to 1250 deg C and had been used on a kiln at H & R Johnson Tiles — one of the winners in the 1987 gas energy management awards competition.

For further information contact Nu-way Ltd, PO Box 1, Vines Lane, Droitwich WR9 8NA.

market from Bruel & Kjaer's new Gas Analysis Division, is a portable, easy-to-use instrument designed to perform the measurement tasks required by the legislation. The measurement principle is based on photoacoustic infrared detection, a technique which offers advantages over existing methods in terms of speed of response, sensitivity, calibration interval and immunity to interferents.

The Type 1302 can be used to measure virtually any gas which absorbs infrared light; it can also be equipped with the appropriate

optical filters to enable measurement of the concentrations in an air sample of up to five component gases and water vapour. The detection threshold is gas dependent and of the order of  $10^{-3}$  parts per million. Addition of the Type 1303 multipoint sampler and doser enables air sampling at six locations within 50 metres of the instrument, with delivery of tracer gases if required.

For further information contact Bruel & Kjaer (UK) Ltd, Harrow Weald Lodge, 92 Uxbridge Road, Harrow, Middlesex HA3 6BZ.



- Title:** **HAZOP study**  
**Location:** The Old Swan Hotel, Harrogate.  
**Duration:** 4 days.  
**Starting:** 12 November 1989.  
**Content:** Safe working practices, criteria of risk management and principles of systematic hazard identification. Property-related hazards of process materials. Principles and application of basic HAZOP technique with demonstration exercises.  
**Contact:** Conference Section, IChemE on 0788 78214.
- Title:** **Diffraction methods**  
**Location:** University of Surrey, Guildford.  
**Duration:** 5 days.  
**Starting:** 20 November 1989.  
**Content:** Reciprocal lattice, Bragg's law, cameras and the diffractometer. X-ray powder, oscillation, rotation and Laue back-reflection methods. Stereographic projection.  
**Contact:** J M Towner on 0483 571281.
- Title:** **Heat recovery**  
**Location:** University of Surrey, Guildford.  
**Duration:** 1 day.  
**Starting:** 22 November 1989.  
**Content:** Basics. Equipment: heat exchangers and heat pumps. Economic analysis and project appraisal. Things that can go wrong. Combustion-based applications.  
**Contact:** Alex Henham on 0483 571281 x 2382.
- Title:** **The implication of CFC reduction in the refrigeration/air conditioning industries**  
**Location:** IoEE, South Bank Polytechnic, London.  
**Duration:** 2 days.  
**Starting:** 27 November 1989.  
**Content:** Review of common refrigerants used in domestic and commercial refrigeration systems. Discussion of the advantages and disadvantages of various refrigerants. To show the relationship between CFC refrigerants and the ozone. Discussion of the Montreal Protocol and the subsequent political commitment by various countries. Evaluation of the possibility of using alternative refrigerant. Discussion of the practical problems associated with converting existing refrigerant systems to utilise ozone friendly refrigerants. Prediction of the loss in system efficiency if alternative refrigerants are used to replace CFC. Evaluation of the increased use of heat transfer medium. Practical refrigerant recovery demonstration in the laboratory. To show the absorption refrigeration systems for domestic application as a practical alternative to vapour compression systems.  
**Contact:** Director of the Centre for Continuing Professional Education on 01-928 8989 x 2052/2112.
- Title:** **Understanding heat treatment**  
**Location:** Aston University, Birmingham.  
**Duration:** 3 days.  
**Starting:** 28 November 1989.  
**Content:** Basic metallurgical theory of heat treatment. Quenching principles and practice. Surface hardening theory and practice. Furnace types, materials and heating methods. Salt bath heat treatment. Atmosphere theory, production and control. Temperature measurement and control. Quality control, specifications and defects in heat treatment. Laboratory testing of heat-treated materials.  
**Contact:** Wolfson Heat Treatment Centre, Aston University on 021-359 3611 x 5212.
- Title:** **MSc Environmental Acoustics**  
**Location:** Institute of Environmental Engineering, South Bank Polytechnic.  
**Contact:** Dr Max Vuillermoz on 01-928 8989 x 2109.
- Title:** **Process plant start-up**  
**Location:** Caransa Crest Hotel, Amsterdam.  
**Duration:** 3 days.
- Starting:** 6 December 1989.  
**Content:** Introduction. Start-up problems. Start-up planning. Start-up cost prediction. Minimising equipment problems. Start-up management. Start-up manpower. Start-up leadership. Technology. Start-up safety. Construction inspection. Commissioning — the heart of the start-up. Start-up operations.  
**Contact:** The Centre for Professional Advancement, The Netherlands on 010 31 20 662 30 50.
- Title:** **Applied pump technology**  
**Location:** Novotel Alpha, Amsterdam.  
**Duration:** 5 days.  
**Starting:** 11 December 1989.  
**Content:** Characteristics of centrifugal pumps and systems. Centrifugal pump performance and energy conservation measures. Classification of centrifugal pumps and introduction to design features. Centrifugal pump design features. Pump specification and selection. Maintenance and maintenance problems. Trouble shooting. Special problems on centrifugal pumps. Rotary pumps, design and performance characteristics. Reciprocating pumps, design and performance characteristics.  
**Contact:** The Centre for Professional Advancement, The Netherlands on 010 31 20 662 30 50.
- Title:** **Gaseous effluent control**  
**Location:** Loughborough.  
**Duration:** 3 days.  
**Starting:** 12 December 1989.  
**Content:** Control of particulate and gaseous components. Overview of legislation and of design strategies. Methods of sampling and analysis. Removal of gaseous components. Treatment of sulphur oxides and of odours. Removal of particulate components. Consideration of dusts, smoke and aerosols.  
**Contact:** Conference Section, Institution of Chemical Engineers on 0788 78214.



### November 1989

#### Cost Reduction Offshore — The Way Ahead

Conference, 16 November, London.

Details from Miss Caroline Little, Conference Officer, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, England. Tel: 01-636 1004, Tlx: 264380, Fax: 01-255 1472.

#### Exposure Monitoring in Industry

International symposium, 16-17 November, Antwerp.

Details from Ms. Christine Mortelmans, Desguinlei 214, B-2018 Antwerpen, Belgium. Tel: +32/3/216.09.96, Fax: +32/3/216.06.89.

#### NUTECH, Certainty For Industry

Conference, 16-17 November, London.

Details from Phillipa Sudlow, First Business Environments, Genesis Centre, Birchwood Science Park, Warrington WA3 7BH, England. Tel: 0925 830 007.

#### World Electricity

Conference, 16-17 November, London.

Details from the Financial Times Conference Organisation, 126 Jermyn Street, London SW1 4JU, England. Tel: 01-925 2323, Tlx: 27347 FTCONF G, Fax: 01-925 2125.

#### Automotive and Industrial Fuel Combustion

Conference, 22 November, London.

Details from Miss Caroline Little, Conference Officer, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, England. Tel: 01-636 1004, Tlx: 264380, Fax: 01-255 1472.

### December 1989

#### Energy for the 21st Century

Seminar, 2 December, London.

Details from Edwina Hughes, c/o WILPF, 29 Great James Street, London WC1N 3ES. Tel: 01-242 1521.

#### Coal Firing in the Process Industry

Lecture, 5 December, Birmingham.

Details from T J M Evans, Howden Sirocco Ltd, The Pensnett Estate, Kingswinford, West Midlands DY6 7PP. Tel: 0384 401021.

#### Power-Gen '89

Conference and exhibition, 5-7 December, New Orleans, USA.

Details from Power-Gen '89 Committee, 3050 Post Oak Blvd., Suite 200, Houston, Texas 77056. Tel: (713) 621-9720, Tlx: 244667 PPUBUR, Fax: (713) 963-6285.

#### IGT's Second International Symposium on Gas, Oil and Coal Biotechnology

International symposium, 11-13 December, New Orleans, USA.

Details from Dr Cavit Akin, Associate Director, Biotechnology Research, Institute of Gas Technology, 3424 South Gate Street, Chicago, IL 60616, USA. Tel: 312/567-3724, Tlx: 25-6189, Fax: 312-567-5209.

#### Incineration — An Environmentally Acceptable Means of Waste Disposal?

Seminar, 13 December, London. Details from Vanessa Whitehead, The Institute of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. Tel: 01-222 7899 Ext: 222.

### January 1990

#### Middle East Electricity Exhibition

Exhibition, 14-17 January, Dubai, United Arab Emirates.

Details from Fiona Parkin, Project Manager — MEE, Fairs and Exhibitions Ltd, Suite 12, Accurist House, 44 Baker Street, London W1M 1DH, England. Tel: 01-935 8537, Tlx: 299709 Efanee G, Fax: 01-935 8161.

#### 13th Energy-sources Technology Conference and Exhibition

14-18 January, New Orleans, USA.

Details from Frank Demarest, ASME, P.O. Box 59489, Dallas, Texas USA 75229. Tel: (214) 764-4901.

#### The Architect, Energy and Global Responsibility

One day conference, 24 January, London.

Details from Barry Lennox, RIBA Environmental and Energy Committee, St Paul's Gate, Cross Street, Winchester, Hants SO23 8SZ. Tel: 0962 60095.

### February 1990

#### Electrex '90

Exhibition, 26 February-2 March, Birmingham.

Details from The Administrator, ASEE, Wix Hill House, West Horsley, Surrey KT24 6DZ. Tel: 0483 222383.

### March 1990

#### Chemical Waste Incineration Materials Management and Control

Conference and exhibition, 12-13 March, Manchester.

Details from Sara Mountford, IBC Technical Services Ltd, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2AX. Tel: 01-236 4080, Tlx: 888870, Fax: 01-489 0849.

#### Design Criteria for Offshore Installations

Conference, 14-15 March, London.

Details from Nadia Ellis, Conference Organiser, Bath House (3rd Floor), 56 Holborn Viaduct, London EC1A 2EX.

#### British Wind Energy Association

12th Annual Conference, 28-30 March, Norwich.

Call for papers. Details from BWEA 12, Climatic Research Unit, University of East Anglia, Norwich NR4 7TJ, England. Tel: 0603 592994, Fax: 0603 507784.

### April 1990

#### Power Cable Conference for Users

Conference and exhibition, 4 April, London.

Details from Mrs Carol Jopling, Conference Organiser, Tel: 0372 374151 Ext: 2461.

#### Steam Plant for the 1990's

Conference, 4-6 April, London.

Details from IMechE HQ, 1 Birdcage Walk, Westminster, London, England.

#### Energy Management in Industry and the Tertiary Sector Engineering and Services

Seminar, 23-27 April, Paris, France.

Details from Agence Français pour la Maîtrise de L'Energie, 27 rue Louis Vicat F-75015 Paris, France. Tel: (33-1) 47 65 20 00.

### May 1990

#### First International Symposium on the Biological Processing of Coal

1-3 May, Florida, USA.

Details from Dr Kee H Rhee, US Dept of Energy, Pittsburgh Energy Technology Center, P.O. Box 10940 MS 141/L, Pittsburgh, PA 15236 USA. Tel: 412/892-5913.

#### Hannover Fair Industry '90

International trade fair, 2-9 May, Hannover, Denmark.

Details from Mr A Rustemeyer, Hannover Fairs Information Centre, 25 Hurst Way, South Croydon, Surrey CR2 7AP. Tel: 01-688 9541.

#### 1990 Incineration Conference

14-18 May, California, USA.

Details from C Baker, University of California, EH&S, Irvine, CA 92717, USA. Tel: (714) 856-7066, Fax: (714) 856-8539.

#### Cerl 90

Exhibition and open days, 15-17 May, Leatherhead, Surrey.

Details from Westrade Fairs Ltd, 28 Church Street, Rickmansworth, Herts WD3 1DD. Tel: 0923 778311, Fax: 0923 776820.

#### European Energy Week

PetroTech 90, European Petroleum and Gas Conference 90, Energy Economy 90, Coal and Power Technology 90, conferences and exhibitions, 21-23 May, Amsterdam, The Netherlands.

Details from European Energy Week, RAI Gebouw bv, Europaplein, 1078 GZ Amsterdam, The Netherlands. Tel: +31 20 5491212, Fax: +31 20 464469.

#### The European Applied Research Conference on Natural Gas

Conference, 28-30 May, Trondheim, Norway.

Details from Norwegian Petroleum Society, Gas Group, P.O. Box 6050, N-7003 Trondheim, Norway.