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Published monthly by the Institute of Energy
18 Devonshire Street, London W1N 2AU
Telephones: *Editorial:* 01-580 0008. *Administration:* 01-580 7124.
Membership, Education and Journal subscriptions: 01-580 0077.

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The Institute of Energy is in association with:
The American Society of Mechanical Engineers
The Canadian Institute of Energy
L'Institut Français de l'Energie (Paris)
The Fuel Society of Japan (Tokyo)
Verein Deutscher Ingenieure (VDI-Gesellschaft Energietechnik)
The Australian Institute of Energy

Advertisement representation
P Cottle Advertising Services Leatherhead 376884

Typeset by Trafford Typesetters and Printed by Trafford Print (Colour) Ltd,
Holly St, Doncaster Tel: (0302) 67509 and
108 Temple Chambers, Temple Avenue, London EC4.

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rsonal viewpoint

reply to Prof Thring

is *Personal Viewpoint* in the May issue, Prof M W Thring comments about nuclear power and underlines the importance of conscience. te so, but a proper moral judgement can be made only if the facts are known and quantified. The Institute has a responsibility to help ssembling those facts, and I felt I must briefly take up several points.

rgy efficiency

all agree that equipment for fuel economy should take priority over 'new power stations', current bias being the other way largely because nconsistent guidelines for economic appraisals. However, to say that *all* available capital must be spent that way is to assert that economy sures alone (without coercion or rationing by price) will balance the supply/demand equation: the figures do not bear this out. Each of fuel economy measures he lists has value, but their individual technical merit, cost effectiveness, and timescale, need to be quantified. nbined heat and power (CHP) does not 'double the fraction of the primary fuel which is utilised': that may be true of the plant itself, but heat that it supplies displaces what is already being obtained at high efficiency, eg from gas central heating. The net fuel gain is of the er of 1½ times. Moreover, the scope for *economic* CHP with district heating is limited by the capital costs of distribution pipes and by graphy.

clear power and the Third World

true that very poor countries cannot directly use nuclear power or central power stations. The factor that most limits growth in their living ndards is the price of imported oil, which holds them back to primitive energies, and wood is getting harder to obtain. Demand by rich ntries makes oil expensive, and we can best help by being less greedy. Nuclear and other efficient power stations at home reduce our pressure world supplies of oil.

ne three-quarters of the world's people have less than 1 kW of energy. Western countries use 5 to 10 kW per head. Readers are invited to ulate, for a world population of 5×10^9 (and growing), the increase in world energy production to bring even the minimum standard to ird of ours. The total UK consumption is a convenient unit.

idents

cussing accidents in terms of absolutes is not scientific. Some 30 years ago, when the nuclear industry was still young, the concept of the ximum credible accident' was dropped in favour of risk analysis, which relates the acceptable probability of the event to the seriousness ts consequences. It is then an objective process to formulate and argue the numbers, including those for the instances mentioned by Prof ing (Windscale, Flixbrough, and poor quality cars). To say that 'it couldn't happen here' merely gives the conclusions a popular interpretation. he real world, no probability can have the value zero (but some are indeed very small).

liation

he same value of equivalent dose, radiation from a nuclear accident (eg Chernobyl) is not inherently more dangerous than natural radiation. f Thring mentions some of the radio-nuclides and comments on their effect on the body. The short answer is that differences in behaviour in interactions with the body are taken into account in computing equivalent dose. So it is valid to compare directly the figures from man-le causes with those from natural radiation. The latter does not come 'mostly from the noble gas radon'; that contributes about 40%, the being in roughly equal proportions from potassium isotopes in our food, from cosmic rays, and from terrestial gamma rays. In any case, ough 'noble' in the chemical sense, radon does decay through a chain of other elements.

descendants

re is undoubtedly a nuclear waste problem, to be treated very seriously but with quantified perspective given the natural radioactivity of erals and rocks. We are allowing the rain forests to be cut down, we are rapidly using up fossil fuel reserves, we are putting combustion utants into the air, and we are increasing the CO_2 content of the atmosphere, which enhances the greenhouse effect in an apparently versible manner.

every age, industrial and energy activity leaves a bequest for descendants. Our age is the most intensive yet, but those who came before were perhaps more careless. It is a deep and difficult problem, undoubtedly one of conscience, and it requires the alternatives and their itions to be quantified and then considered in an evenhanded and objective manner.

Warner
st president)

Case-history — PEP awards

Electric infrared curing saves money and improves quality for Peugeot-Talbot

David Langley*

Peugeot-Talbot, Coventry were the 1986 winners of the electricity supply industry's PEP (Power for Efficiency and Productivity) award for companies with over 200 employees. The PEP awards are made annually to companies that show a significant improvement in performance as a result of adopting an electrical process. In this case the result of adopting a new electric finishing process resulted in savings in excess of £170 000

The Ryton, Coventry, car manufacturing plant of Peugeot-Talbot enjoys the reputation of achieving the highest standard of finished quality, with the lowest number of warranty claims, of all Peugeot's European factories. Peugeot worldwide prides itself on the quality of its cars and insists on vigorous inspection of all vehicles prior to delivery.

Nowhere is this inspection and quality consciousness more intensively applied than at Ryton, which specialises in the manufacture of the Peugeot 309 model.

To this end, the Ryton management have installed a new spray booth and electric infrared stoving panels at the inspection stage. The new systems were installed in 1984 and allowed total savings of £172 122, for a capital outlay of around £46 000, giving a four month pay-back. In addition, the new systems have enabled quality standards to be improved even further.

Finished vehicle inspection and repair

Every single car that comes off the Ryton production line is minutely inspected for any paint or bodywork defects.

Prior to 1984, identified defects were repaired in a purpose-designed, low bake spraybooth and stoving oven complex which was fired by natural gas.

The modern motor car features a great number of external, as well as internal, plastic components such as trims, overriders and bumpers. To prevent damage to these components during the vehicles, passage through the oven, it was necessary to remove them and store them for re-fitting when the bodywork repair had been effected.

This total operation was obviously labour-intensive, involving some 23 men. However, it also introduced an extra production cost as many of the plastic components were sufficiently damaged during removal to necessitate the fitting of new parts.

Furthermore, throughput difficulties were also encountered as the out-of-date stoving equipment simply could not cope with the number of repairs required to maintain Peugeot's quality reputation. This, together with the need to remove and replace many plastic components, fostered congestion and created a production bottleneck.

Consequently, during the first six months of 1983, the Ryton plant management decided to quantify the system's operating costs and to investigate alternative methods of carrying out repairs, which would at the same time eliminate the bottleneck situation.

The development of a new repair system

The investigations demonstrated that there was significant room for improvement, both in energy usage and production techniques. To realise these improvements, the company first installed a minor repair facility with a capacity of six units per hour. This facility consisted a 20ft by 18ft wide spraybooth, complete with hea filtered air replacement and extraction faciliti Complementary to this, was an enclosed, stoving ar partitioned into three bays, with a suspended ceiling. T area was air conditioned and all air plants were suppor by high pressure hot water or natural gas stoving ba

To replace the natural gas stoving system, Peugec engineers decided to use electric infrared curi Consequently, in conjunction with Heraeus Silica a Metals of Bromborough, Wirral, they designed a developed special infrared stoving panels, complete w individual switching and top panel angular adjustment cater for any side panel paint stoving schedule.

The stoving panels were based on Heraeus mediu wave units and the final system required detail development to achieve the correct stoving temperatur process times and finish hardness for the various repai panels such as wing panels, rear quarter panels and dc panels. In addition, system test and development had be carried out over a three month period to cater variations in models, paint colour, ambient temperatu and paint systems.

Based on the success of these first units, a further t systems were installed for window and door colur repairs and these were also developed and tested to sati the same process parameters.

Following further operational experience duri 1984/85, paint finish quality was improved even furth with the introduction of a more sophisticated conti system.

This incorporates up to eight programmes, the cho of which is dependent upon the car body panel bei stoved to select the correct temperature profile. Ea cassette of infrared emitters is equipped with a 250m^3 capacity cooling fan and energy output is controlled stepless thyristors. To avoid any possibility of solvent bc the temperature rise is regulated at a pre-determined ra via the thyristor control and by varying the level convected air movement over the infrared emitters.

The benefits of the new repair system

When approval was gained for the new repair system had been anticipated that there would be a significa reduction in warranty claims and in scrapped plas components. There was also an anticipated labour savi of two men and it was expected that the bottlene situation would be considerably relieved, with coincide improvement in environmental conditions. With all the

*Marketing development engineer, Industrial Processes, E Midlands Electricity

ors taken into consideration, payback on the allation was projected at around 18 months.
n fact, actuality far exceeded anticipation. On a total tal outlay of £45 900, savings of £172 122 were ised, giving a simple payback period of four months.
annual savings, as monitored during 1984, and firmed during 1985/86 were made up as follows:
ne staffing required for the repair system was reduced n 23 men to 15 giving a saving of £63 848pa.
he number of plastic components which had to be pped was reduced by 70%, saving £29 283pa.
is now necessary to operate the main line repair plant only one day per week, resulting in a net saving in gy costs of £21 316pa.
here has been a drop in subsequent paint warranty ms of over 50%, giving a further saving of £57 675pa.
n addition, a better quality paint finish has been ieved, which is harder, more durable and presents a ner gloss and the congestion in the rectification area been eliminated to increase output by up to six units hour.
The increased output and more streamlined operation greatly appreciated by the company's production ervisors and the operating personnel welcomed the provement in working conditions.

nclusion

e quality of finish of new cars is obviously of prime portance in a very competitive market. To achieve the ality of finish involves investment in plant, personnel l energy to institute quality control procedures to ntify defects and to install equipment to rectify these ects. The ultimate aim is to ensure that every car ving a manufacturing plant is in showroom condition, egards, engine, transmission, electrics and bodywork. The Ryton car plant is well on the way to achieving this al situation, as evidenced by the low level of warranty ims received annually. The introduction of the new air system has, in no small measure, helped them to ieve this position — cost effectively.

A car being prepared for stoving

Moreover, following their successful experience of infrared systems, Peugeot-Talbot are currently developing and committing investment to a revolutionary full body stoving plant which will significantly reduce overall process times.

Infrared curing

Infrared radiation is an indirect method of heating, as the electrical energy is transformed into heat by electromagnetic radiation.

Specifically, the object to be heated is subjected to the radiation emanating from electric heating elements. It absorbs the greater part of the radiation and this is then transformed into heat within the object.

Infrared radiation occupies that part of the electro-magnetic spectrum immediately adjacent to visible light, at a wavelength extending from 0.78μm to 200μm. The technically suitable part of this spectrum extends from 0.8μm to 10μm and this is then further sub-divided into short, medium and long wave radiation. In practical terms, short wave infrared radiators are designed in the 0.9μm to 1.6μm range, medium wave radiators in the range 2.2μm to 2.7μm and long wave radiators in the range 3.5μm to 6.0μm. Radiators of a longer wave length are unsuitable as only small amounts of energy can be transmitted. Furthermore, such rays are emitted for the surface of elements with resultant high convection losses, especially where installations require ventilation.

In industrial applications, the choice of short, medium or long wave radiator depends on the required heating time, the depth of penetration of radiation and the installation.

Selection also depends on the radiated objects capacity for absorption. The absorption maximum for most engineering products lies between 2.8μm and 3.6μm. To achieve optimum heating time, the radiator should be installed in such a way that the object to be heated is subjected to steady radiation penetration. By correct installation, outputs of up to 90kW/m^2 can be achieved with medium wave units and up to 150kW/m^2 with short wave units while this can be increased to 400kW/m^2 with water cooling.

Infrared energy can be focussed and reflected, just like light energy and, correctly specified and installed, infrared radiators can make important contributions to energy savings. For example, when curing lacquers or epoxy powder paints, only the lacquer or paint needs to be brought to drying or melting temperature while the object itself remains practically unheated.

Typically, electric infrared radiators consist of a filament which is contained in a vacuum by a quartz glass envelope to protect it from convective cooling. An optional pure gold, reverse-side coating gives a highly uni-directional radiation. Heating up time with a medium wave radiator is 30-90 seconds and the coil cools down in approximately 10-20 seconds. Short wave radiators can be switched on and off like any conventional lamp.

The flexibility, selectivity and efficiency of infrared electric heating made it an ideal choice for the paint stoving plant at Peugeot Talbot. □

*Electricity Council: Medium-term development plan 1986-93**

A bright future for the electricity supply industry?

The Electricity Council publishes this document annually. It is a general policy paper for the whole of the electricity supply industry in England and Wales outlining the future expected outlook over the years up to 1993. It attempts to focus on a number of key issues. These issues cover matters such as the nuclear industry *vis-à-vis* fossil fuel power stations, electricity prices, economies and performance, tariffs, environment, customer care and many others. The paper examines these from the point of view of explaining the Council's policy and objectives and how progress towards these goals will be monitored and achieved. Sir Philip Jones, chairman of the Electricity Council, in his foreword in this recent publication, says that it is important that there should be the widest possible understanding of the industry's long-term goals and of the key strategies for controlling costs and expanding sales. Thus the document is made available to all the industry's staff, unions, Consultative and Consumers' Councils, as well to as other interested parties†

The electricity supply industry in England and Wales has as its prime objective: to develop and maintain electricity supplies to meet consumers' needs on a continuing basis as cheaply as possible.

Over the period 1986-1993, the goal is to achieve a reduction in the real average price per unit sold, while at the same time maintaining high standards of service and meeting required obligations.

At present the performance aim agreed with the Government is for a real cost reduction of 6.1% over a four-year period to 1987/88. In the seven years to 1992/93, sales are expected to increase by 11%.

The other aims are to secure a long-term supply of coal at minimum cost, to increase the nuclear component of electricity generation to 25% and at the same time to sustain due care for the environment as well as being responsive to public concern.

Given that inflation is assumed to be in the range of 3.5% to 5% over the seven years, and that the above strategy is successful, the result will be a cheaper unit of electricity in 1992/93 than today.

The Electricity Council's document gives details of the objectives agreed with the Government for the industry's financial targets on an average annual rate of return on net assets, coupled with an agreed reduction of controllable costs. The latter for the years up to 1987/88 is 6.1% in real terms. Also shown is the value the Government places on the industry's external financing limit.

To put effectively into action significant cost reductions the industry is making vigorous efforts to change its organisational structure. At the same time it is said to be developing a better information and management system in order to improve productivity and efficiency. Although the ways of meeting these improvements are shown in the document, it is not at all clear how these improvements will be monitored and measured.

Some of the ways suggested appear self-evident. For example, almost regardless of changes in organisation, the price factor is vital. Here, much depends upon market forces, ie competitive position compared with all other fuels, coal prices, and the improved generation compo of electricity from nuclear energy.

On the basis of coal and uranium remaining the n competitive fuels to use for the generation of electric these fuels will form the main stay. Coal accounts on average for some 35% of the electricity price to custom

The Bulk Supply Tariff (BST) of the CEGB electricity prices is related to the thermal energy fron GJ on a net calorific value basis, expressed in term pence per standard tonne. Thus the expected trend in CEGB's BST fossil fuel price in outturn prices is expe to rise from its present value of 4745 p/tonne to 6 p/tonne by 1992.

For uranium supplies the market is grossly o supplied and therefore the fuel's depressed price is expected to increase in the short term. The CEGB's ne are fully covered by existing stocks and forw commitments.

The economics of nuclear energy are thought to l secure in the medium term and the view is ope expressed that abandonment of nuclear generation by premature closing of our existing nuclear capacity wo have severe implications for generation costs and there electricity prices.

Nuclear electricity is marginally cheaper and, once investment is made, significantly cheaper. Any decis to abandon the nuclear programme would, howe extend beyond economy of supply because the closur existing nuclear stations would impringe on securit supplies. However, the document expresses the view t the longer term expansion of nuclear capacity will dep not only on relative costs, diversity and flexibility in type, but also on public confidence in the safety of nuc plant in the aftermath of the Chernobyl reactor accid

Over the last twelve months or so there have occu major changes in the world economy, accompanied falling oil prices, and movements in the United St dollar, towards a more sustainable level, with reducti in world interest rates. Such changes have contribute a more buoyant view of world economic growth wh has encouraged UK growth prospects. Since last ye MTDP was issued, the economy of the UK is brigh profitability is increasing and inflation decreasing.

On the debit side, falling UK oil production, excha rate pressure and a deteriorating balance of payment combine to restrict our average GDP to around 1.

*Published in September 1986

†Copies of the *Medium-term development plan, 1986-93 (MTDP)* can be obtained free from: The Electricity Council, 30, Millbank, London SW1 (Tel 01-834 2333)

eral inflation is expected to average around 5%.
rom the industry's point of view, electricity's share he total energy market is expected to grow. Sales mates are put at 236.1 TWh against 216.3 TWh in 6/87. The commercial sector is expected to be the est growing consumer class, sales rising at 3.1% per um. In the commercial field, rapid growth is occurring air conditioning plants, off-peak heating and cellaneous appliances.
ales to the industrial sector are forecast to grow at %. These are determined by making assumptions on future structure of Britain's industrial arm and its uring output on world markets.
ales to the domestic sector are not expected to grow ificantly. This is mainly explained by the increased liance ownership being partly offset by improved liance efficiencies. Some space and water heating will tinue to be transformed to the Economy 7 tariff. This result in unrestricted sales rising only marginally above r 1985/86 levels in seven years' time. Overall the ximum demand on the CEGB system through all these tors leads to a growth rate of 1.4% per annun, but ause of the increase in the proportion of off-peak sales, supply system's load factor is expected to improve m 58.4 to 59.1% by 1992/93.
he MTDP sees Chernobyl as a key issue for future elopment in the industry. It has significantly increased blic concern and there have been some demands, not y for stopping any expansion in the industry's nuclear acity, but also for phasing out existing nuclear stations. hough the impact of the first demand on tariffs would be seen for 10 years or so, the latter could lead to newhat more immediate and significant increases in es as well as to generating capacity problems.
he closure of existing stations would increase eration costs directly because of the need to use higher- t fossil fuels, coupled with increased transportation ts of such fuels. Currently nuclear stations in England d Wales supply 17% of total electricity generation. sure of these stations would mean substantial asset te-offs and very much increased capital expenditure construct replacement capacity and new transmission velopment.
he document sees that such decisions to foreclose on nuclear capacity could conceivably lead to electricity ts 50% higher than present values. While there is little agreement that increases would accrue, it must be patable whether in the short term coal-fired replacement uld lead to such an increase. Coal-fired power stations n be constructed for capital costs considerably lower n those for nuclear stations and it must be seen that he light of the nation's economy, coal must continue play a major role in the UK economy until well into 21st century.
It is important to allay the public's concern over a mber of other issues surrounding nuclear power, luding the reprocessing of magnox fuel at Sellafield, posal or radioactive waste and the transport of adiated fuel.
The Electricity Council speaks about areas of sensitivity ich could have effects upon its medium-term plans and control on exercising stringency on unit costs of ctricity. For example, the introduction of proposed C legislation on stack emission would give an over 5% increase in real terms of the cost per kWh by 92/93.
To offset that increase a fossil fuel price increasing at % below the forecast rate would enable a 2% decrease occur in the unit cost. If the industry were able to keep eir controllable costs (other than fuel) down to an crease 1% below the forecast rate, that would apply a further 2% decrease in electricity unit costs. Further sales of electricity in excess of those forecasts would also make a positive contribution.

The electricity industry publishes annually a document entitled *Indicators of electricity supply industry performance,* which monitors the performance of the area boards (12) and the CEGB over a range of activities. These all help to pinpoint areas in which planned improvements might be possible. Some of these are given in the document as examples, such as electricity costs in p/kWh illustrating the effect of fuel costs, the expected trend in productivity, expressed as the number of employees/GWh sold, the proportion of units supplied from nuclear stations and the expected increased availability of high merit fossil-fuel-fired plant.

The industry's medium-term objectives and plans for the main areas of its activities are outlined in the document under 13 separate headings. It is not possible in this short article to do other than comment upon a number of salient points from some of these headings.

Fuel procurement and management covering coal, oil and uranium must have as its main objective that of having an overall policy which recognises that a secure, flexible and most economical supply is paramount for the economy of the system. Consistent with such a fuel policy must come a need for fuels to be efficiently matched to the generation sources available and efficiently used.

High availability and thermal efficiency improvements are the principal actions to be pursued in producing cost benefit improvements while ensuring that they are achieved within the constraints of modern safety criteria. On the generation side, the MTDP does not foresee any developments in pumped storage before the year 2000.

On alternative technology it seems that the scheme to harness tidal power is coming more into favour. It is believed that a scheme on the River Severn could not only provide a firm generating capacity, but that the economics could begin to rival the established systems.

The CEGB's present generation of some 52 000 MW will need to be enhanced by the year 2000 to take account of increased demand and the closedown of the older power stations. Because of improvements in load management capability and other factors, the MTDP announces a reduction in planned generation margin from 28 to 24%. The delay in Sizewell 'B' over the years of this decade has now, it seems, ensured that some new coal-fired plant will have to be constructed.

With the nuclear issue occupying such an important part in the public's viewpoint, it is forgotten that the electricity supply industry has 12 boards all with the principal objective of ensuring that electricity is distributed and transmitted at the minimum cost consistent with maintaining standards of security. Remembering that the area boards in England and Wales provide over 227 000 million units annually to over 22 million consumers, that fact alone is of such significance that the industry's forward plans in this area of its business are very important. The retailers are the area boards and as such are the public's main approach to their electricity service.

The main aim of the area boards is to promote customer care policies in line with local needs. Thus staff need specialist training in this contact with their customers. The area boards operate over 900 showrooms in England and Wales from which customers have direct contact with the industry.

These showrooms have three main aims which are (1) to advise on supply, connection and tariffs and on the safe and efficient use of electricity including Economy 7; (2) to provide facilities for the settlement of accounts; (3) to market safe, reliable and efficient appliances.

(Continued on p 9)

A case study of generation of electricity from refuse in Karachi

S Mahmood ul Haq MSc MInstE*
S N Sarwar MSc*
M A Quddus MSc*

As a partial solution to the energy shortage, electricity generation through combustion of refuse has been investigated in Karachi. In the city of Karachi about 6000 t of refuse is accumulated each day. About 60% of urban refuse is combustible. This combustible refuse contains 4000-5000 Btu/lb of energy which could be utilised for electricity generation. Each tonne of refuse can be converted into 0.025 MW of electricity. This means that a potential feedstock is available, in Karachi, for the production of 150 MW of electricity. The plant produces electricity at a price which is cheaper than lower grade coal and eliminates sulphur pollution problems which are normally encountered in electricity generation. On the basis of this study it was found that 0.5 Mt worth of furnace oil could easily be saved each year in power generation. This saving is based on 30% recovery of refuse that is 6000 t per day, an improvement in refuse management, may lead to 60% recovery which means an eventual saving of 1.0 Mt of fuel oil per year. The supply of refuse as fuel is well guarded: as the population increases refuse also increases. It means that refuse supply is more assured than conventional fuel. The potential for saving oil and gas by retrofitting existing boiler with burner that uses dry solid refuse fuel is technology possible. The study conducted in Karachi can be applied to other urban areas of Pakistan.

During the past few years the nation has faced a shortage of about 800 MW of electricity during the winter season, the gap is being bridged through load shedding and voluntary conservation measures. Government has given high priority to overcome electricity shortage problems through the installation of thermal power stations in the KESC and WAPDA networks, these power stations will however require fossil fuel which will add to the depletion of oil and gas reserves and also increase the foreign import bill due to purchase of furnace oil from abroad.

As a partial solution to this problem, and to improve the hygienic condition of urban areas of the country, electricity generation is possible through the combustion of refuse. Recovered energy is derived from the heat of combustion of refuse and any auxiliary fuel that is fired. This waste generally contains 4000 to 5000 Btu/lb of energy which could be utilised for electricity generation. In the city of Karachi about 6000 t of refuse is accumulated each day. This means there is a potential feedstock available for about 150 MW of electricity generation in the city of Karachi alone. (In those cities where a relatively larger percentage of industrial refuse is available as urban waste, the calorific value of potential feedstock will be relatively higher on weight basis).

This paper gives technical details of this system, characteristics of refuse in Karachi, highlights economic benefits which will accrue through such measures, experience of other countries in this field and potential of such utilisation in Pakistan.

Characteristics of refuse

Municipal refuse varies in composition by locality, season and weather conditions. The fuel portion of refuse comes from organic matter which consists of paper, wood, plastic and polymers, etc. The composition of a typically mixed domestic and commercial refuse is presented in Table 1, by category, on the basis of study conducted in November 1984 and refuse collected from different areas within the Karachi Metropolitan Corporation (KM

Table 1: Refuse composition by location (Wt (Karachi metropolitan area)

Location	Paper Hard-board	Plastic	Cotton Linen	Garbage	Green leaves Food	Non Comb tibl
Malir Colony	0.59	3.5	0.44	87.8	3.58	3.5
Orangi Town	8.24	3.77	27.96	17.31	34.35	5.74
Keamari	19.8	5.83	10.32	20.86	0.32	9.2
Quaidabad	6.66	1.66	4.66	17.0	59.6	4.6
Stadium Road	7.62	1.75	4.12	29.07	29.7	10.7
S M Society	1.93	4.27	4.19	10.01	59.50	1.1
New Karachi	0.83	0.55	1.67	53.62	7.10	32.8
Nazimabad	12.85	2.24	10.40	42.4	14.48	14.4
Liyari	30.86	13.86	10.35	28.65	8.68	0.5
Korangi	4.9	8.99	31.06	31.88	2.17	4.6
Saddar	21.46	4.6	2.36	63.08	2.0	6.2

Table 2: Typical characterisitic of refuse compon (Karachi metropolitan area)

Components	*Moisture*	*Calorific value (Btu/lb)*	*Sulphur (Wt%)*	*Ash (Wt*
Paper and Hardboard	15	7250	0.39	11.1
Plastic	5	17376	0.21	4.5
Cotton and linen	19	6633	0-0.08	12.7
Leaves/green food	45	4684	0.11	21.1
Garbage	75	1700	0.13	43.6

The overall average composition of refuse in the city 10.2% paper, 4.6% plastic, 9.8% cotton, 20% gr leaves and food, 8.5% non-combustible inorganics (me glass, debris, etc) and 36.5% garbage. Garbage unclassified matter which contain both organic a inorganic materials.

As expected there are many variations in proximate a ultimate analysis of various types of refuse. T experimental results of moisture, sulphur, ash content a calorific value of city refuse is given in Table 2 component basis. Comparing the result with USA ref fuel, the moisture content is higher than those of the U and consequently the heating value is lower than for refuse obtained in USA as per Table 3. Sulphur cont is also low, therefore, the use of trash does not pose a pollution problems for the city. Proximate and ultim

*Hydrocarbon Development Institute of Pakistan

alysis of a representative refuse sample of USA is given Table 4, it is evident from this table that raw refuse was duced in particle size and large inorganic materials ie ass, metal and debris had been removed. Typical

able 3: Typical characteristics of refuse component USA).

mponents	Moisture (Wt%)	Btu/lb As fired	Sulphur (Wt%)
per, hardboard, cartons, bags	3	7660	0.001
ood, boxes, scrap	7	7825	0.001
aves	30	7140	0.0025
rbage	75	1820	0.03
tton, linen	10	6440	0.002
een stuff	50	4000	0.001
astics and synthetic			
llophane plastic		12000	0.004
lyvinylchloride		17500	—
lythene		19840	—

able 4: Analysis of refuse

ategory	Raw refuse	Refuse fuel
roximate analysis (Wt%)		
oisture	25.00	24.14
olatile matter	45.89	58.50
ixed carbon	6.64	8.07
on-combustibles	22.47	9.29
ltimate Analysis (Wt%)		
arbon	26.18	32.73
ydrogen	3.51	4.38
xygen	22.08	28.79
itrogen	0.58	0.55
ulphur	0.10	0.11
hloride	0.08	0.01
on-combustibles	22.47	9.29
leating values (Btu/lb)		
rganic	4622	5858
artial oxidation of metal	78	8
otal Btu/lb	4700	5866

ualities of refuse derived fuel in USA and Pakistan are sted in Table 5, it is obvious from this table that the alorific value of Karachi's refuse is lower because smaller uantities of packing material are used in daily life, and ecause of the low quality refuse management system.

Table 5: Specification of refuse derived fuel

	USA	Pakistan
Calorific value	6300 Btu/lb	4500
Particle size	90% through 0.5 in	90% through 0.5 in
Moisture content	10%	15-30%
Total ash content	8-14%	5-25%

Typical properties of refuse fuel

Compared with fossil fuels it was found that refuse is ower in sulphur, density, heating value and higher in ash nd moisture. It can, however, be compared with lignite oal with an advantage of lower sulphur pollution value Table 6). The disadvantages of refuse as a potential nergy source are its hetrogeneity and variability. The harge to furnace may vary from wet leaves, with a egative heating value, to a plastic or hydrocarbon soaked abric with heating values of 19 000 Btu/lb. This variation an be overcome by a shredding operation.

Refuse management

Linking refuse from a house bin to the energy generation system is the most important part of refuse management

Table 6: Characterisitcs properties of refuse and selected fossil fuel

Fuel	Moisture %	Ash %	Btu/lb gross	Sulphur %
Fuel oil 6	0-2	001-0.05	18 500	0-3.5
Motor gasoline	nil	nil	20 000	0-0.2
Methane (N gas)	—	—	23 000	0-0.2 (ppm H_2S)
Lakhra coal	5-14	8-36	8500	4-9
Refuse	15-35	5-25	4500	0.1-0.16

modelling and planning. The delivery of the refuse to storage and the pattern of processing must be coordinated in order to fulfil the boiler demand on a 24 hours, seven days a week basis. Fortunately a compaction system has been introduced in the city by the Government and private agencies. Through this system, the average density can be increased by simple application of pressure so as to deform or to break boxes, bottles and cans which could otherwise lead to large spaces in the final product (Fig 1). This would also help to transport most of the refuse to the resource recovery centre. In the USA, where most of the world refuse electricity generation stations are functioning, collection of about 60% of total refuse solid waste produce, is recoverable for useful utilisation. From our model case of the urban area of Karachi the total collection of refuse (solid waste) is 30% of the total refuse produced in Karachi ie 6000 t per day.

Through more effective refuse management, if recoverable refuse is improved to the tune of 60% then a similar increase in electricity generation is possible.

Energy conversion process

Shredding

The object of shredding is to produce refuse particles that will pass through a screen. Shredding increases the density of mixed refuse and makes particles much easier to handle. It also helps to remove the non-combustibles from refuse such as metals, etc by drum or belt magnetic separator.

Resource recovery processes

Resource recovery, as the term implies, involves the separation and recovery of combustible materials from the mixed refuse stream. The objective of any waste combustion system is to oxidise the organic components in the waste to carbon dioxide and water vapour. Resource recovery (Fig 2) can be accomplished in the form of energy product by:

(i) Direct combustion.
(ii) Conversion into gas.
(iii) Conversion into oil.

Conversion of solid refuse into low Btu gas

Union Carbide developed a process called *Purox* producing low sulphur, low Btu gas, which could be used as a substitute for coal, oil or natural gas for industrial and domestic usages. However, it was not commercialised due to high cost of production.

Pyrolysis to produce oil and gas

Fig 3 shows the route of producing oil from solid refuse and recycling processes. It can process 2000 t/d of refuse

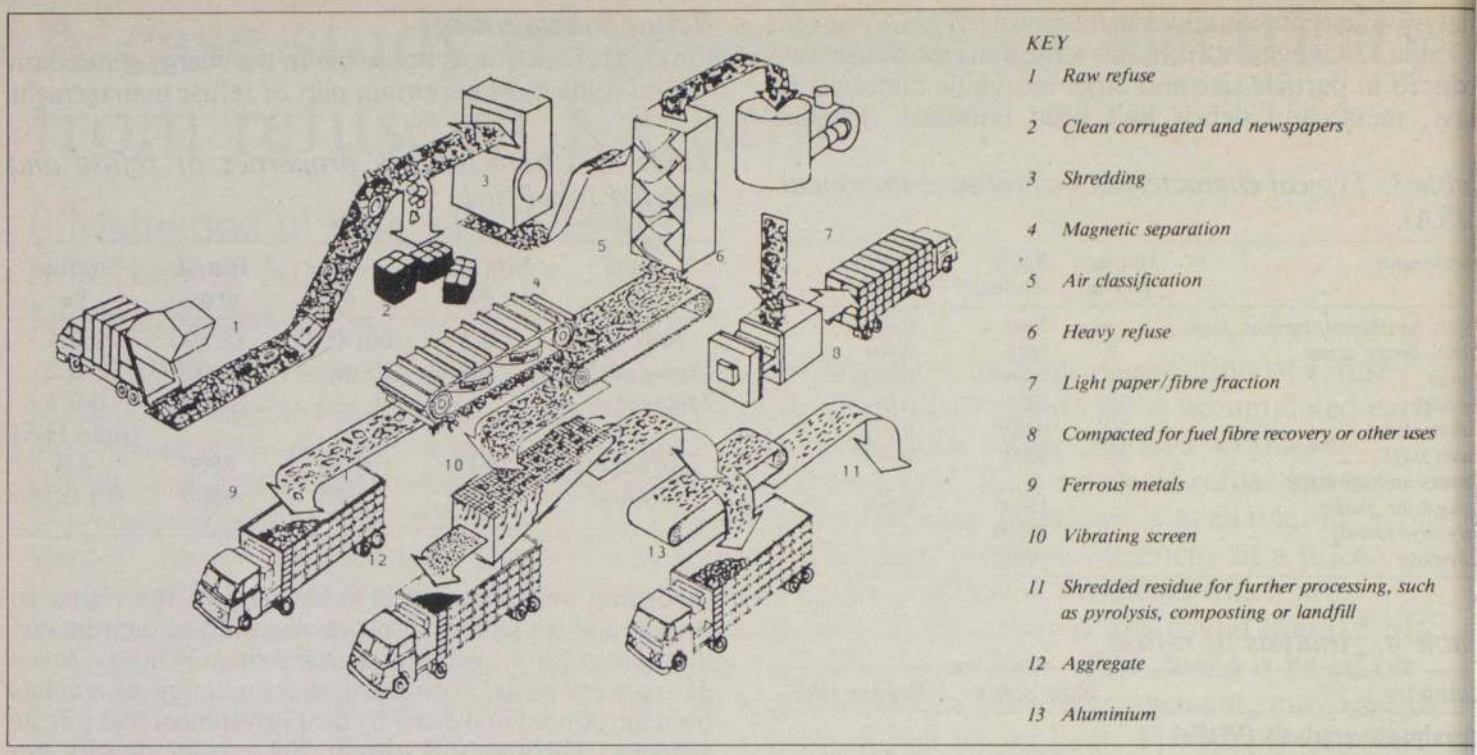


Fig 1: Refuse fuel shredding system

in order to recover 200 barrel/d oil equivalent to Fuel Oil No 6.

This process also produces residual char and combustible gas which play a significant role in the economics of the system. The typical characteristics of derived gases fuel are given in Table 7.

Table 7: The typical fuel gas analysis (Vol %)

CO	—	40-50
H_2	—	25-30
CO_2	—	10-20
CH_4	—	3-6
Higher hydrocarbon	—	0.5-2
Heating value	—	270-320 Btu/cu ft

Conversion of solid refuse into energy by direct combustion

The simple energy conversion process is to use an incinerator boiler for steam generation. Incineration provides an approach where the polluting properties are destroyed and heat energy for steam/power generation is obtained. The flue gas characteristics dictate the selection and design of the energy recovery system.

In water walled, continuous feed incinerators, a part of the refuse is burned in suspension. The amount of steam that can be recovered from incineration is about 2.5 lb steam/lb of refuse.

Fluidised-bed is a recent development in solid waste treatment for energy conversion. About 6900 — 8000 Btu/lb of refuse is obtained by this method. This corresponds to a low rank coal with a low sulphur content. Calculations have shown that 75% of the input enthalpy can be recovered as power or steam from a fluidised-bed incinerator.

Combined plants

These combined plants incorporate refuse and fuel oil in a single installation for power/electricity generation. The economics are most favourable in these cases. Any fluctuation in the quality or any disruption in the supply of refuse, can be readily made up by the conventional fuel, thus overriding one of the major disadvantages of the use of refuse as a fuel. Two possible ways of burning th refuse are:

- Two separate water walled combustion chambers, on for refuse and the other for conventional fuel, discharg their gases to common superheater, economisers, stac and air pollution control system (APC).
- A simple combustion chamber in which shredde refuse is burned largely in suspension together with fu oil.

Economics

On the basis of this study it was found that 0.5 Mt wort of furnace oil could easily be saved each year in the powe generation sector and, through effective refuse collectio management, this amount could be doubled with a yearl saving of 1.0 Mt of furnace oil. This would be a ne saving, if such plant was commissioned in Karachi. It ma be said that the total energy supply from refuse coul contribute at least a 20% share of the Karachi energ requirement, which is the largest energy consuming zon in Pakistan *per capita* consumption basis.

The recovery of potential energy from refuse become more economic when performed on a large scale becaus the cost of processing is decreased. A graph can be plotte that shows the trend of increase in refuse productio against the rise in population. This also indicates that th future supplying of refuse fuel is brighter than th conventional fuels.

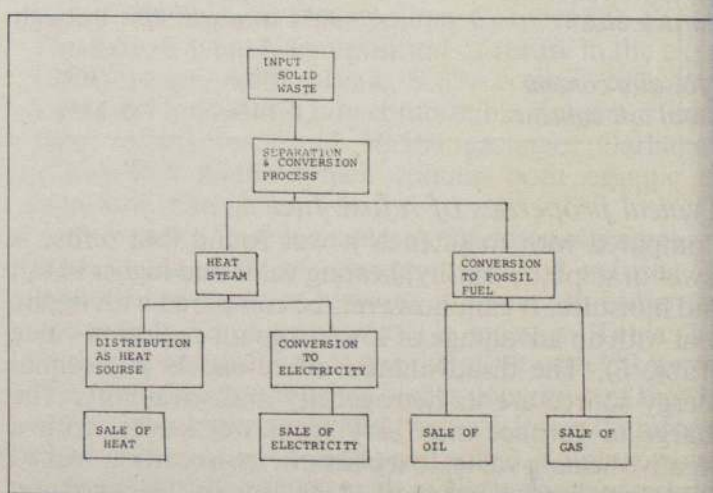
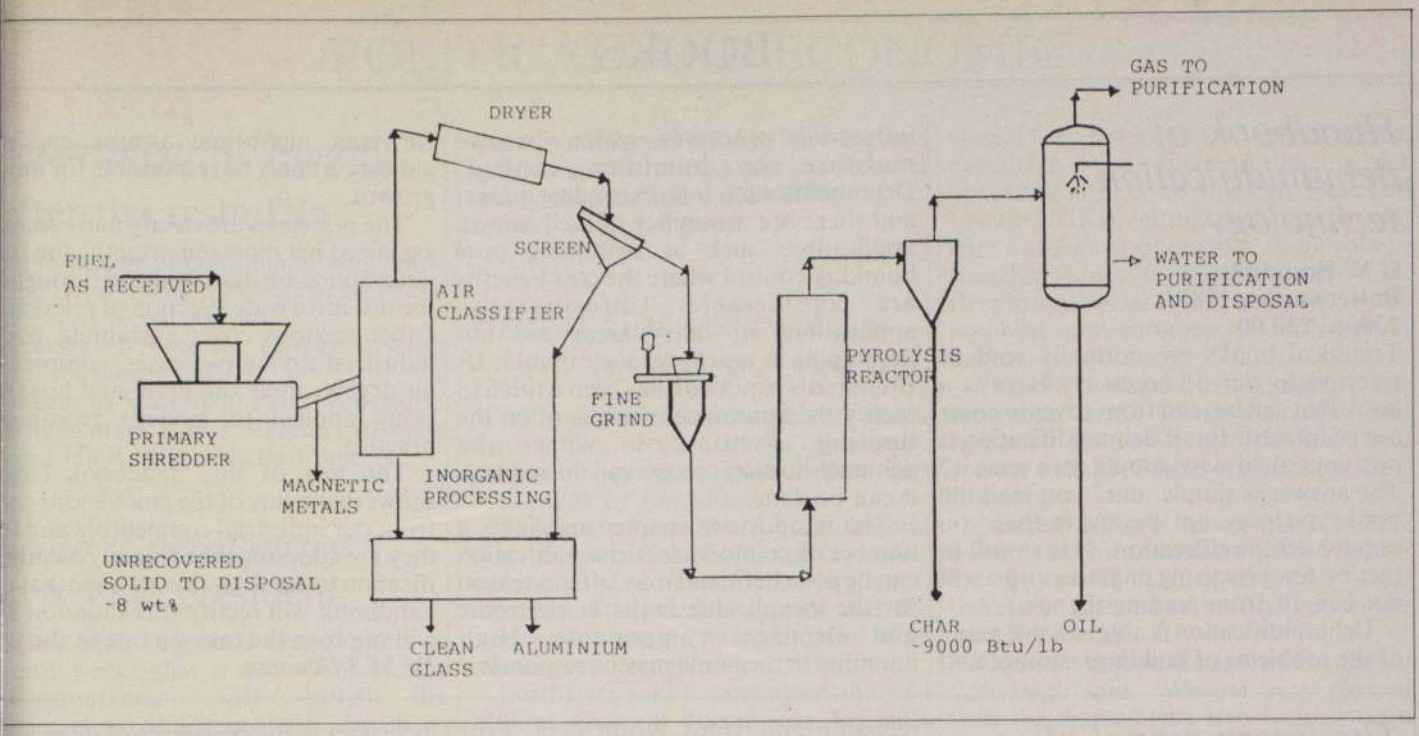


Fig 2: Resource recovery



3: Recycling of solid refuse via *pyrolysis*

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bright future for the electricity supply industry (continued)

In all these customer-related areas the industry monitors performance carefully so that it pursues its general jective of maintaining customers' satisfaction with the ality of electricity service.

In electricity marketing the MTDP tries to show the ategies employed in the three key areas of domestic, mmercial and industrial application of its service. The ea boards' marketing objective is to encourage more use be made of electricity by cost-effectiveness. They empt to identify the particular requirement of each stomer.

Sustained electricity marketing effort is crucial to the erall achievement and success of the whole industry, cluding the wholesaler, the CEGB, if its performance er the medium term as specified in the plan is to be met.

The MTDP covers a number of other areas including e environment, tariffs, research and development etc, l of which clearly show the general objective that has be achieved if the whole of the electricity supply dustry is to perform in line with its statutory quirements.

Finally, if the industry is able to reach an annual return 2.75% on the existing financial target up to 1987/88, en profits after interest and Corporation Tax should be cured for the period as a whole, provided that there is unforeseen major disruption. In fact, it is stated that e industry expects to extinguish its total debt during the ar 1990-91 and, as a result, the interest would change om being a charge to being a receipt in the following ar. This latter position was not foreseen in the Electricity Acts and Parliamentary legislation will be required to deal with it.

All this is based upon figures using current cost accounting (cca) methodology, which the Electricity Council appears to favour. The medium-term future for the industry and all its customers appears from the contents of this document to look extremely bright, with, for example, retail tariff increases set below the rate of general inflation.

One important issue left unmarked in this document is the significant question of the possible privatisation of the whole industry. For in the medium term up to 1992/93, there will have been at least two parliamentary elections.

On the present soundings and acclaimed policies of the main political parties one cannot rule out a continuation of a Conservative administration. Their policy is to pursue with vigour the privatisation of all Britain's nationalised industries.

Given the general pointers for the financial success of the electricity supply industry then it will be a most attractive industry for the public to invest in. It is therefore very negative and a 'burying a head in the sand' not to demonstrate the industry's approach to such a change before 1993.

Following British Telecom, British Gas and others it is inevitable that, under Conservative rule, electricity is certain to follow and one hopes that at least the MTDP covering the seven years up to 1993/1994, to be published late in 1987, will address itself to this most important issue.

F John L Bindon (Member)

BOOKS

Handbook of dehumidification technology

G W Brundrett
Butterworths, 1987
230pp. £30.00

Technical books are normally read or referred to out of necessity. Here is a book that can be read from cover to cover out of interest. But if dehumidification is not your field why should you read it? The answer is simple, until you read the book you may not be aware that you require dehumidification. (There will in fact be few practising engineers who will not benefit from reading the text).

Dehumidification is able to solve many of the problems of buildings, storage and industrial processes which involve moisture or humidity control. Dehumidification is an expanding market and there are a number of well known applications such as swimming pool humidity control where the cost benefits are considerable. Unfortunately, applications in other areas are not developing as quickly as they should. Dr Brundrett's handbook has been written to rectify the ignorance which is often the limiting factor of what the dehumidification process can do and how it can be done.

The intoductory chapter highlights a number of points where dehumidifcation can be of benefit and may offer a reason for the inexplicable faults in electronic and electrical components. High humidity in the home may be responsible for your night-time asthma and w almost certainly be responsible for mou growth.

The principles are clearly and concise explained but more importantly, the late innovations are described and througho the text are a wide selection of reference Other sections cover swimming poo industrial drying processes, compress air drying, food and grain and how it being applied to modern greenhou practice.

The text of this handbook clear shows that many of the innovations cor from our industrial competitors and th they are adopting more readily dehumi ification technology. Let us hope that th handbook will rectify this situation a will improve the take up rate in the U

Dr M J Denman

The international oil industry — an interdisciplinary perspective

Eds: Judith Rees and Peter Odell
Macmillan Press 1987
181pp. £25.00

A large number of books have been written about the international oil industry and about its pivotal role in propelling the world into a series of inter-related crises — energy scarcity, economic recession and Third World debt. Prof Odell has contributed to the literature by writing *Oil and World Power*, *The Pressures of Oil* and *The Future of Oil*. I was therefore interested to read this new 'interdisciplinary perspective' which he has edited with Dr Judith Rees. This book provides an understanding of the untidy complexity of factors influencing the international oil market and of its inter-relationships with other elements in the world political economy. It not only draws on studies from economics, political science, law, international relations and geography, but also incorporates the experience of oil indust practioners.

The contributors number among the internationally known academ commentators as well as experts from t oil companies and from governme institutions.

This is an extremely frank a uninhibited collection of essays on a to that has affected (either directly indirectly) every nation of the world.

I hope this book will find its way on many library shelves and on to studen reading lists.

Andrew W Cox

LETTERS

Government rapport

From my personal knowledge the question of the best way of putting over to governments and to the public at large the views of members and the Institute as a body has exercised the minds of Council members even before a Royal Charter was granted in 1946 and reference to 'The Institute of Fuel: the First 50 Years' by Roy Hayman indicates that close links have existed between the Institute and governments from our earliest days.

The Institute through its charter and its pursuit of professional standing has achieved worldwide recognition and has, particularly in recent years, made a substantial contribution to national and international energy matters. It can claim creditable success in achieving dialogue with successive governments through presentation of carefully reasoned argument put forward by those whose reputation is enhanced by their professional qualifications.

Much of this would be destroyed if we were to follow the exhortation by Prof R D Langman 'Personal Viewpoint' (*Energy World*, April 1987) to scrap the Royal Charter and to engage in 'clamouring for effective lobbying mechanisms'. It may be that Prof Langman as a non-member of the Institute is not fully conversant with the rapport which has been built up over the years and which would be lost for all time were we to engage in a vociferous and somewhat pointless campaign.

The Institute's position is summed up perfectly by Prof J Swithenbank in his Presidential Review in the 1986 Annual Report (incidentally how fortunate to be distributed with the April issue of *Energy World*) when he says: 'But our responsibility extends even further since we also fulfil a crucial role in communicating a professional view on energy matters to a wider public and government'.

I would especially commend the whole of this paragraph by Prof Swithenbank to all readers of *Energy World* as representing the role that members individually and the Institute as a corporate body should follow.

JOHN H FLUX (*Past president*)

Nuclear fuel, for security

Although I sympathise with 'Personal Viewpoint' (*Energy World*, May 1987), it is flawed because it is inclined towards a academic, rather than a pragmat solution to the energy supply problem

Firstly, no practical engineer believ that we in the west, will ever reach position in which we can do without ma made, centrally-generated electric powe For long term security, it is essential th this is provided by the least valuable our scarce resources. U235, is one of t earth's least promising elements and h no alternative large scale use, unli carbon based fuels.

Secondly, relative to the quantity heat released, the quantity of waste small so that expensive engineering a scientific resources can be devoted dealing with it.

To recommend the continue combustion of coal and oil to genera electricity is only one step further alo a spectrum which includes burni natural gas, pine trees or the Chippend furniture to the same end. They will the job, but in my perceived scale values should be given preferential u elsewhere.

P H SPARE *(Member)*

See also *Personal viewpoint* this issue - *Ed.*

)epartment of Energy
\fter the reshuffle

ıe following appointments were made
the Department of Energy in the Prime
inister's recent reshuffle:
:cretary of State for Energy Rt Hon
:cil Parkinson MP.
inister of State Hon Peter Morrison.
ırliamentary Under Secretary of State
avid Hunt MBE, Michael Spicer.

Jo to superministry
ays Past president

t has been suggested several times in
:ent weeks that a new Conservative
dministration will abolish the
epartment of Energy and absorb its
:sponsibilities into some other
ıperministry,' Ian Fells, Past president
f the Institute of Energy wrote in a letter
) the *Times* recently.

He went on 'But burying energy inside
)me superministry will surely be unwise
nd counter-productive. Energy
roblems have not gone away; they will
:t worse in the next 10 years or so as oil
rices rise again, with no North Sea to
ıshion the blow. Nuclear accidents will
ccur, pressures to protect the
ıvironment will become irresistible and
ıe health of the economy will depend
pon having a broadly based and flexible
nergy strategy.

'The Department of Energy should
:tain its autonomy and take advantage
f the present lull to prepare for the next
nergy storm.'
ource: The Times

3ritish industry
\wards for the best

:ompanies making products ranging
rom miniature castles to the world's
mallest cellular telephone and equipment
ow treating heart disease in China were
ailed as 'British successes in London
ecently reports the *Daily Telegraph.*

The firms were singled out by the
:onfederation of British Industry in its
atest attempt to draw attention to what
s best, rather than worst, in business.

David Nickson, CBI president, says:
There are always plenty of people who
re ready to sell Britain short overseas.
Vhen it comes to the success of UK
ndustry they are not so forthcoming.

'It is time we changed our perspectives.
Nothing succeeds like success. If we don't
)low our own trumpets no-one else will
lo it for us'.

Examples of British successes include
3ritannia Refined Metals, of Northfleet,
Kent. The company pioneered a method
)f extracting silver from lead.

The process, involving the injection of
)ure oxygen into liquid metal in a specially designed tilting furnace, has speeded up the process and has reduced energy costs by more than 60%.
Source: Daily Telegraph

British Gas accused....
....of 'predatory' pricing

A call to industrial consumers to attack British Gas because of its 'predatory pricing policy since privatisation' has been made by Lord Ezra.

The former Coal Board chairman said that British Gas had taken unfair advantage of its new found strength and freedom. The prices it quoted and the contracts it was prepared to offer were causing concern all over the country.

Lord Ezra told a meeting of the Ten Million Club, a forum for Britain's largest energy users, that industrial and commercial customers must attack by forming a consortium to negotiate with the gas industry from a position of strength. The meeting agreed to set up a working party to pursue the matter.

'Getting long term contracts is particularly difficult and, although about 50 viable combined heat and power schemes have been identified which could increase energy efficiency significantly, none of them can proceed.

'They need uninterruptible gas supplies at sensible prices and long term arrangements because of the capital investment involved in CHP,' he said.

British Gas would only offer short term contracts and the price quoted for uninterruptible supplies showed it was abusing its strong market position.

'The legislation allowing competition is a dead duck and industrial and commercial organisations must work together to ensure that a proportion of gas from the big fields is reserved for bidders other than British Gas.'

Lord Ezra also urged the Government to support the introduction of private finance without restrictions to enable the public sector to embark on major energy-saving projects.

'Energy efficiency is still on the back burner because there are plentiful supplies of fuel,' he added, 'but we must not relax our efforts and must continue to identify and spend money on schemes which will give a good return'.
Source: Ten Million Club

Gas technology
New US/UK trading agreement

British Gas and the Gas Research Institute, USA have taken the first step in establishing a new Anglo-American trading relationship in R&D technology.

An agreement has been signed by British Gas HQ director of research, Gerald Clerehugh and Dr Stephen D Ban, executive vice-president and chief operating officer of the Gas Research Institute (GRI), setting up the framework for future cooperative technology transfer and licensing agreements. Previous research exchanges have involved non-commercial information only.

The GRI, located in Chicago, is the centralised body for coordinating and financing gas research in the USA and spends over $150 M every year on R&D projects.

Discussions are taking place on the possible licensing in the USA of British Gas industrial heating technology and these are expected to be finalised in the next few weeks.

Commenting on the agreement Gerald Clerehugh said, 'We are very pleased with this agreement. It will open up a much wider market for British Gas technology overseas, and we are certain it will prove a potential dollar earner for Britain'.

Dr Ban added: 'This agreement establishes a framework for cooperation and cost effective development of new technology in both the USA and the UK, by promoting more effective commercialisation of gas technology'.
Source: British Gas

Landfill gas utilisation
A new test rig

A Liverpool company* has been engaged by the Lancashire County Council, to carry out gas exploration at their Rowley Landfill site in Burnley. The results so far obtained are very encouraging.

The company has developed a low cost portable test rig, complete with blower and flare stack. The test rig was developed in response to increasing vandalism at landfill sites. It is trailer mounted and is designed for one man operation. The test rig has proved to be successful at the Rowley site and there is considerable interest in its use for site survey and gas migration control.
Source: Matan and Partners

Cogeneration equipment
Sales will go up says report

In the ebb and flow of world oil, the high tide (and low price) for consumers has just peaked and that is largely why, says a new study, European firms will be girding themselves with more than $12 billion in cogeneration equipment by 1995.

Cogeneration plant market in Europe is an analysis of equipment designed to use more than one form of energy derived

*Matan and Partners

from a fuel (eg, heat and either electricity or mechanical energy from burning a fossil fuel). It notes that the low point in oil prices seems to have passed in mid-1986, a recent OPEC accord on production has steadied the market, and a continual but probably slow rise in oil prices is likely over the next decade. Given that even the best modern central power stations are only about 40% efficient in capturing the energy released in using a fossil or nuclear fuel, 'and the greater part of input energy may leave in the exhaust gases' during production of process heat for industry, the spectre of industry once again over a barrel when energy prices rise will help push sales of cogeneration equipment about two-thirds higher by 1995 than they were in 1986.

The report discusses the various industrial end users, and on average finds that commercial/institutional establishments; food, beverage and tobacco producers; fuels processors; and the pulp and paper industry each represent between 10% and 15% of cogeneration purchases. Public utilities will exhibit the most rapid gains in buying this equipment, nearly doubling 1986-95.

By equipment, gas turbine sales are shown to be growing faster than steam turbines, waste heat boilers will be replacing fired steam generators, and other waste heat recovery gear and diesel-engine generators will grow rapidly. Suppliers to the market are also discussed.

The report is available from: Customer Service, Frost & Sullivan, Sullivan House, 4 Grosvenor Gardens, London SW1W 0DH. Tel 01-730 3438. Price $2600.
Source: Frost and Sullivan

Battery power
Computer model

A computer model developed by the US Department of Energy's Pacific Northwest Laboratory (PNL) is being used to identify suitable candidates for use of battery energy storage systems.

The computer model has identified the Princeton Plasma Physics Laboratory in New Jersey as a good candidate for using the system which may save the facility up to $1 M annually in energy costs. PNL is operated by the Battelle Memorial Institute.

'The model is used to determine whether installation of the system is economical', said Linda L Fassbender of Battelle's Office of Technology Planning and Analysis.

'We will continue using the computer technique to identify other potential customers who can benefit from battery energy storage, including small rural utilities', Fassbender added. 'Eventually, the technology may be used to reduce electricity bills for both residential and business consumers'.

The model analyses user energy requirements, utility rates and the use of potential battery systems to estimate the cost and performance of a battery system.

Princeton is the first government-owned site to investigate installing a battery energy storage system in an effort to better manage electricity use. 'Currently, their annual electrical energy costs are $6 M which includes a $3 M surcharge for energy used during peak demand periods', Ms Fassbender said. 'Although the battery system will not reduce the amount of electricity required by the laboratory, this technology will help reduce the amount of energy required from the utility during peak demand periods, thus reducing the laboratory's electricity bill'.

A feasibility study is currently being conducted. If the results are favourable, battery installation at Princeton could be completed by 1990.

'Customer and utility energy use varies with the time of day, day of week and time of year,' she explained. 'To provide reliable service to its customers, a utility must install sufficient equipment to meet the peak demand for electricity as well as provide sufficient reserve to cover equipment outages. Consumer rates reflect the costs of installing and operating this equipment.

The development of a high-power, solid-state device for converting alternating current power to direct current power, and back again, has made it possible to store energy in large storage batteries and reduce energy demand during peak demand periods.

With these systems, energy is purchased and stored in lead-acid batteries during periods of low energy consumption, usually at night or on weekends, when the utility has excess power and when energy costs are lower. The energy can then be used during the daytime and other periods of high consumption, reducing the power required from the utility.

Studies have shown that these battery systems, when installed on site, can provide benefits to both the utility supplying the electricity and to its customers. Customers can save money on their electricity bills while utilities can reduce their dependence on expensive fossil fuels, defer the construction of new power plants and avoid the installation of equipment needed to meet energy requirements during peak demand periods'.
Source: Battelle

Fuel cells
Latest US tests

An advanced power generation device based on the technology that provided astronauts with electricity in space is being installed by the US Department of Energy at its Morgantown Energy Technology Centre (METC) to provide electricity and hot water for several office buildings. This tool-shed sized, 40 kW power plant will be monitored for its operational reliability, performance, and overall suitability as a future small-scale power generating unit.

The device, a phosphoric acid fuel cell, is being field tested in cooperation with the US Department of Defence. Th initial research programme also include the Gas Research Institute (GRI) and th National Aeronautics and Spac Administration (NASA). This is the la of some 46 phosphoric acid fuel cell te units that have been installed across th United States for varied power generatio uses. The units have been tested in variety of climatic, business, an environmental settings.

The heart of the small power plan consists of a stack of fuel cells, or man individual ones piled on top of eac other. Each cell uses the electrochemica process to combine hydrogen with oxyge to produce electricity, heat, and steam Direct current electricity from the fu cells is converted to alternating curren The heat from the process is captured an used to heat water in the office building
Source: US Department of Energy

Tidal barrage
Further studies begin

The Severn Tidal Power Group (STPG) comprising several of the country' leading power and constructio companies, has started the preliminar offshore investigation work connecte with further detailed studies of the Sever Barrage which could ultimately harnes the tidal power of the Severn estuary.

The site investigation, costin £700 000, consists of limited sub-se profile and borehole work to explore th nature of the sea-bed and underlyin rock. This will assist in the preliminar design of a barrage and will help in th appreciation of any environmental effect that a barrage may have on the estuary

A local survey boat, the Angeline, an a flat bottomed barge equipped to tak rock samples, will work fo approximately two months each in th area between Cardiff and Weston-Super Mare.
Source: STPG

Scottish trade mission
Returns from USSR

Companies who took part in the Scottis Development Agency (SDA) led trad mission to the USSR have returned to th UK voting the trip an outstandin success.

The 29 Scottish oil service companie returned to the UK at the weekend afte taking part in a four day conference an exhibition in Moscow entitled *Neftegaz – Scotland '87.*

Around 1000 high level representative from the various Soviet Ministrie attended the conference and exhibition This culminated in the visit of delegation led by V S Chernomyrdin Minister for Gas Industries and M Baibakov, senior adviser on Energ Matters to the Central Committee of th Communist Party.

John Condliffe, the SDA's North Eas director said, 'The Soviet oil and ga

xperts were extremely impressed at the evel and range of technology on display.

'The mission met with senior epresentatives from the Ministries of Gas, Foreign Trade, Oil, Geology, Shipbuilding, Coal and the State Committee for Science and Technology' dded Mr Condliffe.

'We are delighted with the results of the nission so far and are confident that urther contact with Soviet Ministries ver the coming months will lead to the irming up of a number of prospects', he aid.

Source: Scottish Development Agency

Looking for flaws
Inspectors put to the test

Sir Alan Cottrell, Britain's foremost metallurgist and a former chief scientific adviser to the Government, has just opened a £3.5 M laboratory which, through an intellectual game of hide and seek, will raise the quality of UK engineering, reports the *Financial Times.*

The inspection validation centre at Risley in Cheshire ensures that inspectors searching for flaws in highly stressed engineering structures have the necessary instruments and skills to find any weakness. To achieve this a battle of wits takes place between centre staff, who hide miniscule faults in full-scale sections of a pressure vessel, weighing up to 50 t, and inspectors who are out to convince the centre that they can locate the defects without fail.

The centre's specific purpose is to make sure of the safety of the pressurised water reactor (PWR) destined for the Sizewell nuclear power station. But as researchers uncover better and cheaper ways of testing, the centre is expected to find wider applications in British engineering, for example in avoiding catastrophic collapses of off-shore structures and boiler plant.

To maintain independence, the UKAEA pays half the cost and Cottrell has become chairman of the management advisory committee. This body of scientists, including experts in fracture mechanics, certifies both the inspectors and their methods as capable of finding any significant flaw, both before and during operation of the plant. This could be a hairline crack only 5 mm long or a porous patch only 5 mm in diameter, buried deep in solid steel 25 to 50 cm thick.

Each flaw is manufactured in a rectangular block of steel identical to that used for the forged pressure vessel. Some 17 kinds are simulated, including fatigue cracks, hydrogen cracking, slag inclusions and porosity.

The steel block containing the dummy flaw is then machined into the shape of a bobbin for implanting into the test section. This bobbin must be welded in so perfectly that there is no possibility of an inspector spotting the site and thus narrowing his search. The centre is collaborating with the Electric Power Research Institute in the US to develop a method of diffusion bonding by hot isostatic pressing that may simplify the implanting process.

The inspection technique required by the CEGB is pulse echo ultrasonic, similar to the navy's active sonar. The inspector fires pulses of ultrasonic energy, from many angles, into the metal and from the echoes tries to characterise any target they bounce off.

The centre first validates the technique he is using and the way he is using it. Then it sets him the task of finding and characterising specific flaws: Where and what? How big? Rough or smooth? How they lie? Whether he thinks they matter?

The centre has satisfied Sir Alan Cottrell and his board that it can reproduce all the flaws that may occur during manufacture of the Sizewell B pressure vessel. Now it is turning to the other parts of the reactor's primary circuit, such as steam generators, pressuriser and pumps.

Its client, the CEGB, knows that the validation process is putting a premium on the price of the pressure vessel. But the centre believes it has a method within reach of dramatically cutting the cost of validation.

This uses computer simulation of flaws. Characteristics of the dummy flaws are recorded on a computer program. Any flaw can be played back on demand, located anywhere in any component and obscured with 'noise' — all without risk that the inspector may spot tell-tale signs that something has been implanted.

What remains is for the scientists to speed up the program to give the inspector an authentic response from his computer screen.

Once it is armed with computer simulation of flaws, the centre believes its validation costs could fall sufficiently to attract others in the business of building highly stressed structures.

Source: Financial Times

Castings industry
New demonstration foundry

An all-electric demonstration foundry is being commissioned at the Steel Castings Research and Trade Association (SCRATA) in Sheffield by the end of the year, with the aim of improving the competitive position of the British castings industry.

The foundry is being established with the support of the Electricity Council, and as well as being used to further the development of energy efficient foundry processes, the facilities will also be available to founders for their own evaluation trials.

Capable of 1 t/h output, the project will use the SCRATA integrated casting system (ICS) now at an advanced stage of development. The ICS, which can be associated with SCRATA's replicast process, is a highly mechanised, automated system designed to demonstrate the production of high quality castings for an optimum capital investment.

The system, which will include a three-dimensional computer aided design facility, has been developed in collaboration with the Department of Trade and Industry and the Department of Energy. Primary melting will use the latest solid state medium frequency coreless induction plant. Electric furnaces and ovens will be used in all stages of production.

The processes being used in the foundry, while developed for steel casting, are also applicable to other areas of the cast metals industry such as aluminium, bronze and cast iron.

Source: Electricity Council

Japan
New steelmaking process

What is claimed to be a highly productive steel smelting process, eliminating the uses of coke ovens and blast furnaces, has been developed in Japan.*

The new process can reduce drastically the scale of steel production facilities, company officials said.

The smelting reduction process directly reduces fine ore and thermal coal at a cost some 20% lower than the conventional blast furnace production process, the officials said.

The company plans to start full-scale studies on the new process at a pilot plant at its Chiba Works shortly.

An experimental furnace with a daily capacity of 10 t has produced steel at exhaust gas temperatures of only 800 to 1000°C, compared with more than 1500°C needed at similar furnaces being developed by other major Japanese steel companies, company spokesmen claim.

The smelting and reduction furnace is of a vertical type and blast furnaces can be remodelled to build this type of furnace.

Source: SEAISI Newsletter

Battelle
A new industrial combustor

A new and improved industrial heating combustor with rotary valve pulse features is being developed by Battelle for the Gas Research Institute. Possible applications would be for use with boilers, water heaters, and chemical processes such as kiln operations and batch heating.

The rotating valve is expected to improve upon both current valveless combustors that have limited applications, and flapper-valved combustors that are susceptible to valve wear and fatigue.

In the proposed design, the pulse combustor would be controlled with a motor-driven rotary valve. Starting and

*Kawasaki Steel Corporation

combustion air is provided by a blower.

The key element of the rotary valve is a slotted disc that rotates to either open or closed positions. Rotation is controlled by a computer in such a way that the valve opens when the air-source pressure exceeds the combustion-chamber pressure and closes when the chamber pressure exceeds the source pressure.

'The rotary design should increase overall system efficiency,' says Battelle's Dr Paul George. 'Such a system can be controlled readily and can operate over a wide range of frequencies. The valve is noncontacting, resistant to dirt, and has a long life'.

Additional expected advantages include: active control of excess air; enhanced heat transfer; pressure gain in the exhaust gases; self-pumping of combustion air; low system cost; and low nitrogen oxide emissions.

Researchers have constructed a gas pulse combustor and rotary valve to use in studying the valve's characteristics, dynamics, and design parameters. The combustor, based on a simple Schmidt tube design, is rated at 100 000 Btu per hour.

The rotary valve is computer controlled to allow proper coupling between the valve position and the pressure pulse in the combustor. The control system responds quickly to changes in firing rate, fuel/air mixture ratio, and operator commands. It is implemented in a high level language on a microcomputer but it is expected that commercial varieties of the control will be based on microprocessor technology. The experimental control system allows studies of control philosophy to be made easily.

Researchers are in the process of conducting basic experiments with the rotary valve pulse combustor to provide operating data for scale up and design refinement tasks to be conducted later. Results to date indicate that the computer controlled valve system operates better than expected. The rotary valve pulse combustor possesses all of the attributes normally associated with pulse combustors including increased heat transfer and exhaust pressure boost while operating more quietly and dependably than current pulse combustors.
Source: Battelle

Coal/water mixes in diesel engines

The feasibility of developing a diesel engine fuelled by a coal/water slurry mixture was presented by Battelle in a planning programme for the US Department of Energy.

If successful, this engine would provide a new, efficient means of coal utilisation by US industry and could be used for stationary, industrial power generation. Such an engine would have high thermal efficiency over a wide operating range that produces a relatively flat fuel consumption profile.

During the programme, a report DOE officials could refer to in planning for the centre was prepared. In the report, technicians covered engine design and configuration factors, such as how to select an engine type for a development programme, engine performance on coal slurry fuel, and engine development facilities. Also, they described forms of wear in diesel engine components and alternative materials to retard that wear.

Additionally, technical approaches and economic considerations necessary to achieve an acceptable coal slurry fuel were discussed. Next, they outlined a development programme, from test engine experiments to commercial prototype design and testing.

Finally, they provided information on a test facility configuration, estimated capital equipment and operating costs, and provided options for facility ownerhip, operation, and funding.
Source: Battelle

Korean nuclear power US gets $200M contract

A US company* has signed contracts valued in excess of $200 M to provide steam supply systems and fuel components for two nuclear power generating units to be built in the Republic of Korea.

Under terms of the contracts, the company will design and supply two System 80 1000 MW advanced light water reactor nuclear steam systems, fuel components and associated nuclea technology for the Korea Electric Powe Company's nuclear power generatin units (KNU) 11 and 12, to be located a Yongkwang.

Heavy components for the KNU 1 and 12 plants will be built in Korea Construction of the plants is scheduled t begin in 1989, with operations expecte to begin in 1995 and 1996, respectively

The contracts represent the firs nuclear orders placed with a US compan in almost a decade.

The company claims that its System 8 nuclear steam system is the only U standardised advanced light wate technology which has been fully license and is in operation. The system i currently in operation at Arizona Publi Service Company's Palo Verde station
Source: Combustion Engineering

Oil exploration World Bank loan for Pakistan

The International Finance Corporatio (IFC) will invest approximately $4.3 M i an oil exploration venture in the Thatt concession in south eastern Pakistan.

IFC is an affiliate of the World Bank and the leading private sector agenc which provides equity financing and long term loans without governmen guarantees to private enterprises i developing countries.

The exploration programme consists o seismic acquisition, drilling of thre exploration wells and one appraisal well The concession area is adjacent to and ha the same geological configuration as th Badin and Tando Alam areas where 1 field discoveries made since 1981 hav determined recoverable reserves of 150 M barrels of oil, and where productio currently averages 23 000 barrels a day The project, which is expected to cos $16.9 M, is scheduled for completion b December 1988.
Source: World Bank News

*Combustion Engineering

Institute of Energy conference notice:

1st European Conference and Exhibition on The influence of inorganic constituents on coal combustion

(in small-to-medium sized boilers)

24/25 September 1987 at Imperial College, London

For more information telephone 01-580 0008

High-efficiency air filtration equipment for industrial applications

The Enviro-Chem Systems division of **Monsanto** have launched a new range of high-efficiency dust collection equipment which has wide potential in a variety of critical applications. These dust collectors have, it is claimed, exceptionally high collection efficiency, especially for submicron particles which are normally so difficult to capture.

The essential operating principle relies on the use of modified HEPA 'high efficiency particulate air' filters, in combination with a specially designed reverse air-cleaning system. Each filter element is individually tested and certified to collect more than 99.97% of 0.3μm particles. The dust collector casing is designed to accept an additional back-up or safety filter element. These would be used in critical applications, for example, where air is being recirculated after the removal of toxic or harmful dusts.

Contaminated air is drawn through the main filter to extract the dust particles. At a predetermined pressure drop or time interval, an integrated cleaning system, based on low-pressure compressed air, is automatically brought into operation. This blows the dust into a hopper from where it can be discharged into a dust bin or a conveying system. Purified air then passes through the second filter to ensure fail-safe operation. Any pressure drop over this back-up filter automatically triggers an indication of main filter failure. Replacement of the element is, it is claimed, quick and simple, offering maximum integrity with minimum disturbance to the process.

Reader enquiry no 7/1

New range of steam generators

A new G range of steam generators designed and built by **John Jeffreys Engineering** was launched on the European market in May. 16 outputs are available from the smallest, the G50 oil-burning unit at 500 lb of steam an hour, to the largest, the G550 at 5500 lb an hour.

New features introduced are: a fully automatic machine; remote control for starting and stopping; very high efficiency from burning gas oil, natural gas or bottle gas; an improved payback through more cost-effective energy management; a new flexible design for easy up-rating; and a combustion chamber designed to the European DIN standard.

Reader enquiry no 7/2

New incinerator introduced by Hamworthy

The **Hamworthy** Series 40 incinerator is the latest development in waste disposal plant specifically designed for the incineration of hospital, hotel and factory wastes and sewage screenings.

A highly efficient cyclone-type combustion chamber gives a long gas retention resulting in low stack solids and low ash contents. A double shell with centre air insulation maintains surface temperatures at a low level.

A specially developed sludge burner will burn sludge oil, water and sewage sludges either independently or mixed. An auxiliary oil-fired burner is used to ignite the refuse and oil sludge and a thermocouple reduces fuel consumption to a minimum.

Loading and ash removal doors are interlocked with auxiliary burners, sludge burners and forced draught fans to prevent them from operating if they are not fully closed. The loading door is also interlocked to prevent it from opening when the combustion chamber temperature is above a safe level. The incinerator is protected against normal temperature and pressure conditions by automatic shutdown and alarm systems.

The Series 40 is capable of burning up to 100 kg/h of solid waste and 60 litre/h of sludge. It will also burn solid or liquid waste with a water content up to 50% without the need for alternative dosing of supply oil.

Reader enquiry no 7/3

Windmill generator

A 3 kW wind turbine, designed by Energy Services, incorporates a 240 V synchronous generator supplied by **Mawdsley's.** The Curlew wind turbine has now completed a series of successful tests at the National Wind Turbine Centre, a division of the National Engineering Laboratories, East Kilbride.

Output of the 2 kW single-phase generator is controlled by a microprocessor which matches the load to the wind power to give a constant frequency (±5%) with variable voltage output. Thus the wind turbine is very suitable for space and water heating loads which, in the UK, represent about 80% of the domestic power used. When employed in this way, an installation would pay for itself in 3-5 years depending on the site conditions. Where the Curlew replaces diesel generators on a remote site the payback period could be as short as one year.

The turbine has a three-bladed fixed pitch 3.5 m diameter rotor, held into the wind by an extended tail turning it on a free yaw bearing at the top of a 7 m steel tower. A 20-year life is forecast.

Reader enquiry no 7/4

Compact condensate dehydrator

CJB Developments have recently provided a specially designed, compact condensate dehydrator for Arco British for their Thames Complex development project in the southern North Sea. The plant dehydrates condensate continuously to produce a hydrocarbon stream containing less than 50 ppm water. It incorporates recently developed plate technology to meet tight space restrictions and is housed in a pressure vessel.

Reader enquiry no 7/5

First UK manufacture of zirconia blanket

Marganite Ceramic Fibres have added a zirconia-stabilised blanket to their Kaowool range of ceramic fibre products. Although the introduction of zirconia into alumino-silicate ceramic fibres is not new, Morganite is the first company to offer this type of ceramic fibre product of UK manufacture.

The introduction of zirconia into alumino-silicate ceramic fibres significantly improves their resistance to high-temperature devitrification and the resultant shrinkage. The traditional method of doing this has been to increase the alumina content or to use chrome stabilisation. The introduction of zirconia offers a higher shrinkage than either of these methods.

Linear shrinkage after a 24-h isothermal soak at 1400°C is specified at less than 3.5%, but in practice is well below this figure. Thermal conductivity ranges from 0.060 at 300°C to only 0.260 at 1200°C. Superior tensile strength means that it is easier to install and the product's composition means that it suffers less damage from chemical attack.

Blanket of 25 mm x 128 kg/m^3 and 25 mm x 96 kg/m^3 is already available in standard roll sizes. Other thicknesses and densities are available to order.

Reader enquiry no 7/6

Low-cost CO/CO_2 analysers

The development of new domestic and commercial solid-fuel fire designs has become more economical with a new series of CO and CO_2 gas analysers. These are used to test the fires for flue gas content to meet BS specifications for emission. **Westinghouse Electric S.A.** have introduced the Maihak FINOR — a low-priced and rugged instrument.

The new analysers operate on the NDIR (non-dispersive infrared) principle and eliminate much of the regular maintenance and replacement of consumables necessary with older models. Typically, the measurement ranges for CO are from 0-5% and CO_2 from 0-20% to within an accuracy of 2.5% full-scale output. A measurement system based on the FINOR will use two instruments — one for each gas component.

Reader enquiry 7/7

Trade publication

Motorspeed controllers: technical data sheets. A series of technical data sheets has recently been produced by **Stock Electronics,** a company specialising in motor speed control for propellor, axial and centrifugal fans used in the Hevac industry and centrifugal pumps used in heating and water cooling. These data sheets have been specifically designed to help customers select the most appropriate motor speed controller to suit their requirements. The data sheets aim to set out clearly and precisely all technical specifications relating to motor speed control such as current/time graphs on triacs and fuses, control parameters, motor wiring options etc.

Reader enquiry no 7/9

The Thermopoint 4000, one of a new range of fixed radiometers introduced by AGEMA Infrared Systems

New radiometer range

AGEMA Infrared Systems, manufacturers of infrared imaging and temperature measurement equipment, have now incorporated the Thermopoint fixed radiometers into their product range. These devices are used for temperature measurement, process and quality control throughout manufacturing industry. The principal advantage is that it offers management the opportunity to gather continuously precise and revealing temperature data about a manufacturing process without contact.

The range comprises four instruments, each geared to provide accurate temperature measurements. There is a choice of different signal output to allow interface with any common process control requirement. A wide temperature range and an advanced four wire signal transmission arrangement (to reduce electrical noise) combine to produce a measurement system which is both flexible and accurate in all models.

Reader enquiry no 7/8

ENERGY WORLD — COMMERCIAL
(Photocopy acceptable)

Please send me further information against the reader enquiry no(s) listed below (please tick)

7/1 7/2 7/3 7/4 7/5 7/6 7/7 7/8 7/9

Name .....

Address .....

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Organisation .....

An international council of engineering institutions?

An account of the inaugural meeting of the International Congress of Mechanical Engineering Societies (ICOMES), held in Boston, Massachusetts, 15-16 May 1987.

In late 1986 the Committee of Mechanical Engineering Society Presidents (COMESP) comprising the American Society of Mechanical Engineers, the Canadian Society for Mechanical Engineering and the Institution of Mechanical Engineers (UK) decided to expand the committee, to rename it the International Congress of Mechanical Engineering Societies (ICOMES) and to invite other societies which had an agreement of cooperation with one or more of the three societies in COMESP to become founding members.

Whilst not a mechanical engineering society, the Institute of Energy has had a formal agreement of cooperation with the American Society of Mechanical Engineers (ASME) for many years; indeed the agreement was signed on behalf of the then Institute of Fuel and ASME in 1971 to formalise an earlier understanding. Consequently, the Institute of Energy was invited to participate in the inaugural meeting of ICOMES held in Boston, Massachusetts on Saturday, 16 May 1987.

The invitation from ASME, the 1987 host society, invited the president and secretary to attend. Owing to his heavy schedule, however, the president was represented by Prof A Williams, a past president of the Institute and currently its honorary secretary.

Arriving in Boston on Thursday, 14 May 1987, Prof A Williams and Dr H M Lodge dined that evening with Prof J M Beér of the Department of Chemical Engineering at the Massachusetts Institute of Technology (MIT), a Senior Fellow of the Institute, a former vice-president and currently chairman of the American branch or US Chapter.

The following day, Prof Williams and Dr Lodge visited the Department of Chemical Engineering at MIT, where they were welcomed by Prof Beér. They discussed the affairs of the American branch, toured the department, attended a colloquium and lunched with Prof Beér.

On the evening of Friday, 15 May 1987 Prof A Williams and Dr H M Lodge attended the informal reception and dinner of ICOMES hosted by ASME and attended by representatives, from a total of 10 countries.

Mrs Nancy Fitzroy, president of ASME, welcomed the representatives attending the inaugural meeting of ICOMES. The evening which was of a social nature paved the way for an effective meeting on the following day. ICOMES settled down to its formal meeting at 9 am promptly. (See panel for a list of those attending the meeting).

After the formal opening by Mrs Fitzroy the meeting was chaired by Dr Walter W von Nimitz, chairman of ASME's Board on International Affairs. Opening comments were also made on behalf of the two other sponsoring societies (of the former COMESP) by Prof Bernard Crossland, president of the Institution of Mechanical Engineers and Dr Earl H Dudgeon, president of the Canadian Society for Mechanical Engineering.

Left to right: Prof A Williams, Dr H M Lodge and Xu Shaogao

Each of the invited societies or institutions then gave a brief presentation on their history, scope and activities.

After the presentation made by Xu Shaogao, vice-president of the Chinese Mechanical Engineering Society, it was the turn of the Institute of Energy. Prof Williams introduced Dr Lodge who made a formal presentation on the history, scope and activities of the Institute. Presentations followed from the other societies.

In the course of the presentations, it became increasingly evident how similar the societies and institutions were. Throughout the meeting the representatives spoke as engineers in an engineering forum, discussing topics of relevance to all engineering societies. Aging profiles of membership, failure to attract students and difficulty in converting students to corporate membership were common themes. In the light of popular perceptions of Japan, it was initially surprising to hear Prof Hideo Ohashi, JSME, voicing concern on the above issues. There were many smiles around the table as it was learned that Japan has the same problems that the UK and other countries have. In short, the institutions had similar backgrounds, similar objectives, similar aspirations and faced similar problems. They appeared collectively to be analagous to a world council of engineering institutions — a world CEI — having few if any differences.

Of the societies invited to participate in the first meeting of ICOMES, the Verein Deutscher Ingenieure (VDI) and Indonesia had been unable to attend owing to other commitments.

In preference to entering into a formal, written agreement on ICOMES, required to be formally ratified by our respective

List of participants International Congress of Mechanical Engineering Societies 15-16 May 1987, Boston, Massachusetts, USA

Chinese Mechanical Engineering Society (CMES)
Xu Shaogao, vice-president
Zhang Ziang, staff

The Institute of Energy (United Kingdom)
Prof Alan Williams, past president
Dr Hilary M Lodge, secretary

The Japan Society of Mechanical Engineers (JSME)
Dr Masaharu Kunieda, president
Prof Hideo Ohashi, executive board member

The Canadian Society for Mechanical Engineering (CSME)
Earl H Dudgeon, president
David L Harris, executive director

The Philippine Society of Mechanical Engineers (PSME)
Antonio Ro Herrera, president

The Institution of Engineers, India
Dr A Bhattacharyya, past president

Polish Society of Mechanical Engineers and Technicians (SIMP)
Andrzej Lipinski, vice-president
Witold Kawecki

The Institution of Engineers, Australia (IE Aust)
Martin Thomas, chairman, Mechanical College

Scientific Society of Mechanical Engineers (Hungary)
Prof Zeno Terplan, president
Dr Laszlo Matay, managing secretary general

The Institution of Mechanical Engineers (United Kingdom)
Prof Bernard Crossland, president
Alex McKay, secretary

The American Society of Mechanical Engineers
Nancy D Fitzroy, president
Paul F Allmendinger, executive director

uncils, there was an informal nanimous) agreement by show of hands at the meeting had been successful, nstructive and worthwhile, that obably meeting at intervals of three ars (the pattern of COMESP) OMES would next meet in London in 90; a meeting to be hosted jointly by the stitute of Energy and the Institution of echanical Engineers. The format of the eeting in 1990 was likely to be similar to at in Boston; a workshop to discuss eas of mutual interest and concern, om an engineering society viewpoint. opics would probably include creditation, student needs and levance and mutual recognition of alifications to facilitate the mobility of gineers worldwide.

A number of points of interest arose in e course of the meeting. The gineering profession in Canada, for example, was celebrating its centenary in 1987; indeed a number of representatives at ICOMES planned to travel the short distance from Boston to Montreal to take part in that celebration.

A number of the societies represented tabled leaflets and other material; Dr Lodge presented each of the presidents with a copy of the Institute's policy document, *Energy for the Future.*

An issue of concern to some societies was that of the possible decreasing relevance of their activities to students and young members, a feeling that many of those who played a major part in engineering societies were liable to be out of date or out of touch. Societies were concerned to combat this apparent tendency. Concern was expressed at losing contact with members; the need to maintain a record of both home and business address being emphasised.

In Australia, there is one body for engineers with four colleges for the four primary engineering disciplines. It was a particular pleasure to Prof Williams and Dr Lodge to find that Martin Thomas, chairman of the mechanical college of the Institution of Engineers, Australia, was a Fellow of the Institute of Energy.

Prof Williams and Dr Lodge, came away with the impression that the Institute's involvement in ICOMES was valuable and worthwhile and represented a unique opportunity for the Institute to participate in the engineering community on a global scale. They felt that through ICOMES the Institute had an opportunity not only to stengthen its existing links with relevant organisations overseas but to make new contacts with societies in China, Japan and elsewhere.

H M LODGE

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nnual Luncheon

SI — entering a period of uncertainty

he Annual Luncheon of the Institute of nergy was held at the Inn on the Park, ondon on 28 April 1987. After esenting the Institute of Energy awards e then president, Prof J Swithenbank ent on to introduce Sir Philip Jones, airman of the Electricity Council as the incipal guest.

Speaking in reply to Prof Swithenbank r Philip expressed his gratitude for the portunity to share some of his thoughts n the current energy scene with one of e most knowledgable and respected therings in the energy field.

He went on to say that the energy dustries hold a central position in the onomic and social fabric of the untry. Inevitably, he thought, we face ajor challenges, some of which were mmon to us all: for instance, the velopment of major capital-intensive ojects against a background of tight nancial and skilled labour resources, ightened environmental awareness and e frustrations surrounding the so-called ig inquiries'. Other challenges, of urse, had a particular relevance to dividual energy sectors, some examples at Sir Philip cited were:

- The sharp oil price fluctuations which made the long-term planning of the oil industry more difficult.
- The newly-privatised gas industry.
- The continuing, and commendable, efforts of the coal industry to improve productivity and reduce production costs.
- The challenge faced by his own industry in winning greater public confidence and support for the nuclear power programme which the industry saw as being so important for the security and pricing stability of electricity supplies.

Sir Philip was concerned that the dustry should not be daunted by such allenges. Provided the objectives were

Sir Philip Jones CB

clearly identified, ways would be found of achieving them. Uncertainty, by its very nature, was much more difficult to handle. The electricity supply industry had entered, not for the first time just such a period of uncertainty and there had been considerable press speculation about whether the industry would or would not be privatised. That decision would be taken by the Government of the day and would therefore be decided at the ballot box. It was not his job, Sir Philip said, to enter the political debate. His job was to run the industry in as an efficient, profitable and socially-responsible manner as possible, whatever the form of ownership.

However, he could not stand idly by and allow to go unchallenged some of the wilder and potentially damaging attacks on the industry which had been fuelled by the current wave of political speculation. He referred in particular to a recent Centre for Policy Studies report which, he said, utilised highly selective material to damn the industry as inefficient.

Sir Philip welcomed constructive criticism. He said that he would be the first to admit that, like any industry, the electricity supply industry was far from perfect. There was plenty of room for improvement. But he hoped that any debate would also recognise the real strengths and achievements of the industry. He asked that the facts be allowed to speak for themselves.

It was a fact, for instance, that electricity prices, charged to both domestic and industrial customers, were among the lowest in Europe. During the past five years electricity prices had fallen by 10% in real terms. Taking a longer perspective, whereas the cost of living had increased by a factor of 23 over the last half century, the cost of electricity had risen by only a factor of 10.

It was a fact that there had been some quite notable achievements in efficiency; improvements, he pointed out that had been achieved without the industrial strife experienced in other industries. So, in the past 25 years, electricity sales had risen 122%, the number of customers had risen by 36% to 21.5 M, while the number of employees had fallen by 32%.

The industry was financially successful and, Sir Philip said, it had met challenging targets set by the Government; it was profitable and it was producing a substantial net surplus of funds which was being used to repay borrowings; appliance sales and contracting activities were also running profitably.

The industry was not a secretive one, he said. We publish, for all to see, our *Medium Term Development Plan;* one of the few industries to do so (see F J L

Bindon's review in this issue — *Ed.).*

Sir Philip made no apology for reciting these achievements because, he said, they were among the points that would have to be considered by any government contemplating the reorganisation of the electricity supply industry, either within the public sector or by means of privatisation.

But there were other, perhaps even more fundamental issues, that would need to be considered. First, of course, there was the size of the industry, it had over £36 billion worth of net assets and an annual turnover of some £11 billion. In engineering terms it was fully integrated, yet in business terms it operated on a federal system with the Electricity Council coordinating the activities of the CEGB and the 12 Area Boards in England and Wales.

Finally, and crucially for any consideration of the future, he pointed out that those in electricity supply sat right in the middle of the overall energy sector, linking oil, gas, coal, nuclear and the renewables, either as a user or as a competitor. The industry's relationship with the coal industry as well as its involvement in nuclear generation would require special consideration in any reorganisation proposals.

Sir Philip then went on to discuss the broader arena of energy policy which had exercised the minds of the Institute of Energy. He referred to the report, *Energy for the future,* published last year, which pointed to the complexities of energy questions; to the risk of emotional overtones; the deep concern of public opinion on various issues, and the need for dispassionate thinking and objective policy assessments. The Institute pointed to the need for policy integration at the national level. In Sir Philip's days in the Department of Energy he was partly responsible for shaping energy policies and so he had a good deal of sympathy with the Institute's views.

If planning was left purely to market forces and if the energy sectors were continued to be compartmentalised and their interdependence was not recognised, then we might fail to gain the maximum advantage from the country's resources.

In saying this Sir Philip said that he was not advocating an energy blueprint in which forecasts were set out as if in tablets of stone. Events had shown that that degree of planning, while popular in some quarters, was a futile exercise. But the very importance of the energy sector, their inter-relationship and long development lead times made it essential that there should be at least a general planning framework.

He did, of course, have a vested interest in seeing that sound energy policies were adopted in this country. All the signs indicated that electricity would play an increasingly large part in meeting energy needs of the future. It was already happening. He noted from provisional EEC figures that between 1980 and 1986 final energy consumption in the European Community that is all energy, fell by 0.5% compared with a growth in GDP of 9%. Electricity consumption, on the other hand, grew by 14% during the same period.

What did these figures tell us he asked, apart from the fact that demand for electricity continues to grow? The decoupling of energy demand from economic activity clearly indicated real structural change in the way we use primary fuels. In essence, we were becoming more energy efficient.

Sir Philip believed that a change of focus on energy issues had brought about this welcome improvement in energy efficiency. The public were now paying far greater attention to how energy was used rather than how it was supplied.

The electricity supply industry, as the provider of a particularly versatile, refined form of energy, was playing its full part in promoting energy efficiency. He encouraged members to take a look at the published *Medium Term Development Plan* to see that energy efficiency l at the heart of the industry's corpora thinking and marketing philosophy.

For many years, now, the supp industry has been operating a number award schemes to encourage a great awareness of energy efficiency. Sir Phil mentioned in particular the Power f Efficiency and Productivity Awar (PEP), which in a way mirrored Briti Gas's efforts in this area with its GE Awards. PEP, of course, was designed highlight the efficiencies, high productivity and improved worki environment that can be achieved using modern electrical technology.

In the past three years the 84 region winners of PEP Awards made annu savings totalling about £6M. About ha the savings came about as a result of direct reduction in energy costs. T remaining savings arose as a result reduced unit labour costs and improvement in product quality; the has been less wastage.

Sir Philip mentioned these benefi because he thought it was wrong to thi of energy efficiency as purely a negativ switch-off and conserve activity. He w pleased that this has been recognised the Government in its recent Ener Efficiency Year promotion which had marked change in emphasis from previous *Save It* campaign.

There could be little doubt that such view, especially as it related to electric uses, was helping to reshape ener balances. Indeed, there is a ne phenomenon — particularly marked countries like France, Germany a Sweden — termed the boomera syndrome.

Sir Philip explained that tho countries substituting electricity for fos fuels can be identified by the distincti shape of a graph. Plot a curve relati electricity consumption to the use of fos fuels. When fuel substitution occurs t curve turns back on itself — into boomerang shape.

The Institute of Energy Awards 1986. *Prof Swithenbank presented the Institute of Energ Awards at the Annual Luncheon on 28 April 198 Here are some of the winners receiving their award Top far left: Dr A Mohammed-Ali (Universit College, Cardiff); top left: Dr D Tidy (CERL bottom far left: Dr D P Jenkins (BSC); bottom lef S D Patel and S F Denye (Imperial College); above P R Waller (University of Leeds).*

Annual Luncheon
(continued)

Given our wealth of fossil fuels it was perhaps not surprising that the UK was not yet identified by this signature. Electricity, excluding the requirements of transport, accounts for between 14 and 15% of the energy we consume in the UK. Within the OECD generally the share was nearer 16% and in some countries much more. But, Sir Philip said that our time would come, for it was an important long-term objective to help smooth the transition of energy demand from diminishing reserves of oil and gas towards electricity produced predominantly from the more plentiful resources of coal and nuclear power.

In conclusion Sir Philip returned to his opening theme. Encouraging this transition in parallel to promoting energy efficiency was one of the challenges confronting the industry. It was a task which has been undertaken within the framework of a general energy policy for this country. Defining the right shape for this policy was a task for everyone in the energy field.

New members

Fellow

Philip Coles Few, School of Mech and Prod Eng, Leicester Polytechnic
David James Bevan, King Cathery and Partnership, West Midlands *(transfer)*
David William Wragg, NIFES, Nottingham

Member

Ian Christopher Cowley, Improvair Tvl Pty, South Africa
Maurice Everett, University of Birmingham, Birmingham
Steven Derrick Fawkes, London Borough of Tower Hamlets *(transfer)*
William Melville Gillen, Northern Health and Social Services Board, Coleraine, Co Antrim *(transfer)*
Robert Kenny, South of Scotland Electricity Board, East Lothian

Associate

Daniel Garard Canniffe, NW Thames Regional Health Auth, Paddington, London

Student

Ikechi Amadi, University of Newcastle upon Tyne
Colin Stuart Harper, Teesside Polytechnic
Paul Jeffrey, Middlesex Polytechnic
Robert Andrew Rainey, University of Ulster

Collective

Imperial Chemical Industries, Engineering Dept, Billingham, Cleveland
Durham Coliery Mechanics Association (NUM), Durham

The Engineering Council

'Guinea pig' companies praise technical reviews

The Engineering Council has backed up its campaign to persuade British companies to review their technical strengths and weaknesses by demonstrating the success achieved by ten 'guinea pig' organisations which carried out Technical Reviews.

The ten companies — ranging from bakeries to aerospace — praise the benefits of the Technical Reviews which were carried out in their businesses by external consultants as part of a demonstration project run by the Engineering Council in conjunction with the Department of Trade and Industry.

In a brochure *The Technical Review* just published the Engineering Council says: 'A Technical Review is a continuing appraisal of technical objectives and capabilities in the context of overall business and marketing plans. It focuses attention on the importance of engineering resources and their effective use throughout the design, production and marketing processes'.

The Engineering Council is promoting Technical Reviews as a means of ensuring that full weight is given to technical matters in companies' strategic planning. It believes that the development of a long-term technical strategy is a vital part of competitiveness.

The Technical Review provides directors and managers with a clearer view of the company's operations and, specifically, encourages them to:

- ☐ Develop new products which properly anticipate market opportunities at home and abroad.
- ☐ Plan for the exploitation of new manufacturing technologies.
- ☐ Be alert to future skill requirements.
- ☐ Plan recruiting, training and retraining to meet changing needs.

Thus the competitive strengths and weaknesses of the company are highlighted. The discipline involved in integrating marketing and technical information assists directors and managers in strategic planning and target setting.

The ten companies which carried out demonstration Technical Reviews to illustrate the technique were: *British Bakeries, Windsor; Stanton PLC, Nottingham; NEI-APE Limited Belliss & Morcom, Birmingham; Gullick Dobson Limited, Wigan; TI Hollow Extrusions Limited, Birmingham; Robert Morton D G Limited, Burton-upon-Trent; Davy Morris Limited, Loughborough; Pratt Burnerd International Limited, Halifax; Myson Copperad Limited, Milton Keynes; Short Brothers PLC, Belfast.*

All ten companies gained benefits from their Technical Reviews. For example, *Sir Philip Foreman,* FEng, chairman and managing director of Short Brothers PLC, Belfast, said: 'We have no hesitation in recommending the Technical Review procedure to other companies as a valuable management tool in increasing their competitiveness'.

Eric Jones, managing director of Myson Copperad Limited, Milton Keynes, said: 'The result of the Technical Review has been to equip Copperad with a workable re-structuring of the entire front end of the business and has succeeded in achieving a much improved image and service level to our customers'. *Graham Mackensie,* CEng, chairman of Specialised Tube Businesses, TI Group PLC, Birmingham, referring to TI Hollow Extrusions Limited said: 'The review concentrated the company management's minds on strategic technical issues which are often put to one side because of the heavy demands of day to day management'. ☐

Personal

Sir Andrew Bryan FEng (Senior Fellow), a former Member of the then National Coal Board, has this year celebrated his 94th birthday. He joined the Institute of Energy in 1944 and was the first chairman of the Scottish branch.

He is a past president of the Institution of Mining Engineers and is also an Honorary Fellow of the Institution.

G Clerehugh FEng, formerly British Gas HQ director of research, was appointed HQ director of technology with effect from June 1987. Mr Clerehugh will continue to direct the research and development programme and be responsible for the advancement of the relevant technologies. His further duties include responsibility for the International Consultancy Service. He has been made a member of the company's Executive.

P J Waite (Member) has been promoted to the position of associate director at Cremer and Warner (consulting chemical engineers and scientists) and is managing the Hazards and Safety Group in London.

In addition, he had been elected to Membership of the Institution of Gas Engineers and has been awarded CEng status by the Engineering Council. He has also been elected a Member of Council of the Institute of Mathematics and its Applications.

Obituary

D Jenney (Fellow), who had been a member of the Institute since 1937, has now died. He was chairman of the North-Eastern branch in 1963-65 and continued to serve on the North-Eastern branch committee until 1976.

Institute news continued on p 20

Student presentations excelled even those of previous years

Our third Young People's Papers Evening was held at the Polytechnic of Wales, Treforest on 11 March. As in 1986 we had five short papers by students.

Multiple burner control by an expert system

Justin Griffiths is on a sandwich course at Aston University and is currently in his final industrial training period with the Department of Fuel and Energy at the Port Talbot Works of the British Steel Corporation. His paper described how computer expert systems, which are rapidly growing in many areas, were now being investigated for on-line control of gas burners on a continuous strip connecting furnace at Trostre. A single burner with independent fuel and air supplies, operating at a certain power level, can be in one of nine states — fuel low, correct or high with air weak, correct or rich. Two modes of control are necessary — one to obtain correct power and the other to obtain best efficiency which occurs near stoichiometric conditions. Monitoring excess oxygen and/or carbon monoxide can be used to trim the fuel or air supplies. Too high a value of excess oxygen would require an increase in fuel or a reduction of combustion air. A competent fuel technologist, knowing the quality of the combustion, would be able to adjust the burners correctly or to readjust them as conditions changed. The relevant knowledge of the fuel technologist is encapsulated in a program on a microcomputer to form the rule base of an expert system, the computer aiming to produce stoichiometric balance by means of continuous experimentation on the combustion system variables with the ultimate goal of maximum efficiency.

Justin described his test results from a five burner experimental furnace and the work on a 24 burner strip annealing furnace, using visual aids to enhance his description. The energy savings from such a scheme will depend on circumstances but could be as high as 20%.

Justin chose a very difficult topic for his talk. Expert systems are not everyone's cup of tea and applying an expert system on-line is an extremely difficult exercise to describe. In spite of these difficulties he got his message across admirably.

An analytical model of a cyclone combustor

Stewart Lancaster is a final year undergraduate in the Department of Mechanical Engineering and Energy Studies at the University of Wales, Cardiff. Much work has been done at Cardiff on cyclone combustors, particularly for burning low calorific value gases. Stewart's exercise was on the development of an existing model of the flow in a coal fired cyclone combustor/gasifier and is based on a sophisticated aerodynamic flow model which, in addition to the combustion processes, includes the effects of boundary layer flow and momentum coupling between the flow and particles. The combustor is modelled in five regions *(i)* an outer boundary layer region in which most of the combustion occurs, *(ii)* a top boundary layer region in which some of the coal and ash particles are convected towards the exhaust nozzle, *(iii)* a bottom boundary layer in which coal and ash particles are convected towards the central ash collector, the larger particles being collected while most of the fine particles escape to the exhaust flow, *(iv)* the main body of the cyclone where centrifugal flow fields dominate and a power law is used to describe the tangential velocity distribution with radius and *(v)* the central region which is essentially a region of plug flow.

The developments made by Stewart were to include realistic models of the boundary layer leakage and the loss of circulation over the flow field together with a better model of the coal combustion in the core. Stewart also described the results of tests on pilot plant combustors of 300 kW and 1MW ratings and compared these with the model predictions.

Once again this was a difficult topic to describe to a general audience. It is hard to accept new work on modelling of aerodynamic flow and combustion behaviour but Stewart's presentation, accompanied as it was by well considered visual aids, got home the bones of the argument.

Cooling a 2.3MW electrical generator — an experimental study

Mark Atkinson is in his second post-graduate year in the Department of Mechanical Engineering at the University of Wales, Swansea. He described the early part of his research: electrical machines are becoming smaller in physical size for a particular power output consequently cooling the machines to remove heat generated due to currents passing through the conductors (I^2R losses) is becoming more important. Increases in temperature cause electrical breakdown of the insulation and a 5-10°C rise in temperature can reduce the machine life by up to 50%. Mark described the construction of one type of machine where a cylindrical rotor runs with a small air gap inside a stator. This stator is made with passages allowing cooling air to flow from the air gap radially outward through the stator over the offending conductors. These passages are located at several places along the stator and similar passages are included in the rotor. Heat picked up by the cooling air is removed in an external heat exchanger and the air is recirculated by a forced draught fan. The paths taken by the cooling air are complicated: *(i)* outside the stator laminations; *(ii)* in the rotor/stator air gap and radially outward through one of the passages to join with *(i)*; *(iii)* into the centre of the rotor and radially outwards through one of the rotor cooling passages to the rotor/stator air gap and hence joining *(ii)*. A knowledge of the air flow patterns is necessary before heat transfer calculations can be made. After specifying his problem Mark described his rig which simulates the rotor/stator air gap and just one of the stator flow passages. His problem is to measure presssure drops and air flow rates on the stationary and rotating parts of the rig. He also intends to use flow visualisation techniques over the simulated conductor in the stator cooling passages.

This was an interesting problem well described. Although these are early days of the study Mark gave a good technical description of the problems of studying heat transfer in such equipment. It will be interesting to have another paper in a year's time to see how the work develops.

Paramins distillate cloud-point blending programs

Shefkat Chaudry was on home ground as he is a final year undergraduate student in the Department of Chemical Engineering at the Polytechnic of Wales, Treforest. He described work which was part of his industrial training experience. The title of his paper frightened everyone in the audience! However, Shefkat very soon clearly explained that Paramin is a trade name of one of the oil companies for any component in the blend of a fuel for a particular application. Various measures of behaviour of distillates are used such as pour-point. Cloud-point is one of these and is very relevant to wax depositions in fuels, something which was extremely important in lorry diesel engine operation during the past winter. Hence the problem was to select a blend of components for a fuel, the measure of performance being taken, in this case, as the cloud-point. The laboratory measurement of cloud-point of a component, or a blend is made by very slowly cooling a specimen in a thermostatically controlled bath and using visual inspection to note the temperature at which clouding occurs. As the temperature may need to be taken as low as −50°C (the freezing point of kerosene) this is clearly a time-consuming process. However, once this information has been collected for all the individual components, the cloud-point of a blend of these components can be calculated. Shefkat explained the calculation which involved an iterative process from graphical presentations of cloud-point data and substitution into a mathematical expression. Although this is currently done it is a tedious and time-consuming process and prone to human error. It is, however, ideal for adaptation to a microcomputer and Shefkat demonstrated two computer programs he has written for this process. CLOUD1

REGISTER OF ENERGY COURSES

Members are invited to make use of the Institute of Energy's national register of energy courses, through which we can supply salient details of forthcoming courses of all types. As well as the member's name and address, we need to know (a) the specific subject in which he is interested; (b) his present level of technical qualification; and (c) the preferred geographical location. Only details of suitable courses will be sent in reply.

We take this oportunity of listing a selection of courses due to start in the near future, and details of each can be obtained by quoting the reference number shown against the entry. Please enclose a stamped addresed envelope.

Course No 9-358

Title: Instrumentation, measurement and control in chemical engineering.
Duration: 5 days.
Location: Leeds University.
Starting: 14 September 1987.
Content: Lectures and practical sessions on instrument selection, installation and operation, dealing with devices for flow, pressure, level, weight and temperature, plus a review of on-line chemical analysis, and consideration of intrinsic safety and instrument reliability.

Course No 00-355.7

Title: Economic evaluation of petroleum projects.
Duration: 5 days.
Location: Heriot-Watt University, Edinburgh.
Starting: 14 September 1987.
Content: Evaluation concepts. Measures of value. Role of government. Finance. Risk analysis. Decision analysis. The future.

Course No 9-359

Title: Practical distillation.
Duration: 5 days.
Location: Leeds University.
Starting: 21 September 1987.
Content: Optional first day on the basic theory of distillation. Lectures and exercises on the selection, design, control, commissioning and operation of distillation plant.

Course No 14-360

Title: Plant layout.
Duration: 5 days.
Location: University of Nottingham.
Starting: 28 September 1987.
Content: Layout principles. Exercise. Modular construction. Operator's view on layout. Safety and emergency considerations. Explosion and fire effects. Release and dispersion calculations. Hazard exercise. Packaging and warehouse layout. Solids handling plant. Batch and housed plants. Layout organisation. Computer-aided layout methods. Computer demonstrations and exercises. Area classification with exercise.

Branch report (continued)

calculated the cloud-point of a known volumetric blend of a number of different components. CLOUD2 calculated the volumetric mix of certain components (within specified ranges) which would result in any specified cloud-point, thus giving the operator a range of blends from which to choose. Shefkat also described how the programs could be developed to calculate other measures of the performance of a blend.

The audience had its fear of the complicated title dispelled by the end of the demonstrations which were included in a competent presentation by Shefkat.

Heat transfer from electronic devices by natural convection

David Postlethwaite a student in the fourth and final year of a BEng course in the Department of Chemical Engineering at the University of Exeter was the last speaker. In his talk he described work on a project he carried out in the third year of his course. Electronics manufacturers are packing more components into smaller spaces and, although components are becoming more efficient, waste heat is generated and must be dissipated from these more confined spaces. This frequently involves the use of forced convection using fans, but many manufacturers are interested in natural convection, and one manufacturer supported this work. David described his test rig in which an electronic package was simulated by a heated bar firmly attached to a back plate with a film of silicon conducting jelly ensuring good thermal contact. A parallel front plate with two transparent end covers represented the walls of the enclosure and these were supported vertically. Covers at top and bottom were of various configurations which either restricted or directed the flow of the natural convection air currents. Thermocouples were used at strategic points to provide temperature measurement. The whole rig, about 150 x 150 x 50mm, was hung by fine twine so that free air circulation was achieved and tests were carried out in a sealed room to prevent extraneous air currents affecting the convection process. Data was recorded by microcomputer, of power and average temperatures after sufficient time had been allowed for the completion of transient heating. Graphical results of Nusselt number versus Rayleigh number showed, with conviction, the effect of changing the top and bottom cover or baffle spacing. David also described the flow visualisation system using Schlieren photography to examine the natural convection flow pattern and showed a series of photographs which, with increasing clarity, indicated the flow patterns and temperature gradients. One photograph showed the *radiator and shelf* effect in which the top baffle deflected the convective air stream away from the vertical plate just as a shelf does with a radiator or a mantelpiece with an open fire.

An excellent piece of work, with convincing results well presented with clear visual aids. As with Mark, David showed that the solutions of many of the exciting problems of electrical equipment do not lie in the realms of electrical engineering.

Following the presentations, and in the absence of the judges, the five presenters were invited to become the target of questions from the audience. Although this was not regarded as part of the competitive nature of the evening, all speakers handled a number of questions with competence.

The judges for the evening — Roger Martin and Brian Birtles — had the unwelcome task of judging between five excellent presentations. It was a difficult decision. All agreed that this was the best set of presentations we have had on the three occasions on which this event has been held. The prize of £25 was awarded to Mark Atkinson.

My personal thanks go to our branch chairman, Alan Rogers, for allowing me to chair this event and also to the judges for taking on their more onerous jobs. I look forward to next year's event and also to further news of our five young people and hope that some of their work is submitted to our journal.

R G Herapath
MEMBER

SPECIAL ANNOUNCEMENTS

The Queen's birthday awards

We congratulate the following whose names appeared in the list of the Queen's birthday awards:

Knights Bachelor
Archibald William Forster, chairman and chief executive, Esso UK.

CBE
M F Reidy, assistant secretary, Department of Energy.

Members who receive awards in Honours Lists are reminded that they should let the staff at The Institute know as soon as possible so that records can be altered.

1987 Robens Coal Science Lecture

The British Coal Utilisation Research Association's 1987 Robens Coal Science Lecture will be presented by *Dr John A Lacey* (programme director, SNG, British Gas. He will speak on *Gasification: a key to the clean use of coal.* The lecture will be presented at the Royal Institution, 21 Albemarle Street, London W1X 4BS on Monday 5 October 1987 at 1730 h (tea 1700 h). *See loose insert, this issue.*

Admission by ticket only. Please apply to Dr J C Whitehead (lecture tickets), British Coal Corporation, Coal Research Establishment, Stoke Orchard, Cheltenham, Glos GL52 4RZ.

Retirement of Dr T N Marsham CBE FRS FEng

As we were going to press, we were informed that *Dr T N Marsham* CBE FRS FEng (Fellow) will be retiring on 31 July from his post as managing director of the United Kingdom Atomic Energy Authority's Northern Division. This is also the end of his term as a Board Member of the Authority. A fuller account of Dr Marsham's career will appear in the next issue of *Energy World.*

The provision of resources to support technical staff development: Conference, Newcastle University, 29 September 1987

Much of industry and many professional engineers are probably not aware of the full range of schemes and funds available for the education and training of technical staff from such bodies as MSC, DTI, EITB, OU, SERC etc. The North East Coast Institution of Engineers and Shipbuilders are organising a one-day conference on this subject at Newcastle University on 29 September 1987. The opening speaker will be *Prof J Levy* of the Engineering Council.

Further information from Mrs Alexa Rainsford, acting secretary, North East Coast Institution of Engineers and Shipbuilders, 12 Windsor Terrace, Jesmond, Newcastle upon Tyne, NE2 4HE (tel (091) 281 3272).

New technologies in coal-fired power generation: Symposium, London (Imperial College), 29 September 1987

Even in this age of nuclear power, the electric utilities of the world are still the largest single consumers of coal. However, the future of coal in power generation will depend not only upon economics but also on the relative impact of its use on the environment. New technologies are constantly beir developed to improve both aspects of coal utilisation in pow generation and this one-day symposium has been arranged b the Coal Utilisation subject group of IChemE to revie progress in these developments and to identify the problen that lie ahead.

Programme

0900-1000	*Registration*
1000-1015	Chairman's opening address, by *Prof Ji Swithenbank.*
1015-1045	Developments in solids handling techniques, b *Babcock Power.*
1045-1115	Emission control in power generation, by *th CEGB.*
1115	*Coffee*
1130-1200	PFBC — the Grimethorpe experience, by *J Harrison (British Coal).*
1200-1230	Achievements and potential for combine cycles in power generation, by *Dr R Garstan (British Gas).*
1230-1400	*Lunch*
1400-1430	The use of coal water slurries in pow generation, by *Snamprogetti.*
1430-1600	*Questions and discussion.*

Registration: Mrs Julie Tayler, IChemE HQ, 165-17 Railway Terrace, Rugby. CV21 3HQ.

Fees: £25 for members (incl lunch and refreshments £30 for non-members (incl membership fee)

Small firms eligible for heat transfer technology service

Membership of HTFS — the international Heat Transfer an Fluid Flow Service — is now available to 'small' U companies. Since April, specialist firms who design an manufacture heat exchangers have become eligible for a ne category of HTFS membership. This category applies to firm employing less than 50 people and who have an annu turnover under £2 million.

Known as the HTFS Small Companies Scheme, it provide microcomputer programs for the rapid design of hea exchangers, and a copy of the internationally recognised HTF Handbook. In addition, members will have access to othe HTFS services, such as literature searches and consultancy and may attend the HTFS *Research* symposium and th technical meetings.

HTFS is operated by the Harwell laboratory (UKAEA) an the National Engineering Laboratory in the UK and the Chal River Laboratories of the AECL in Canada. Its services ar fully funded by the subscriptions of its 200 member worldwide and it is underpinned by an extensive researc programme supported by the Department of Trade an Industry and the Canadian Government. Companies may joi the Small Companies Scheme by paying a signing-on fee o £400 and an annual lease fee of £1800.

Further information from D Butterworth, HTFS manage Harwell Laboratory, Oxfordshire OX11 0RA (tel (0235) 2414 ext 2862).

Exergy analysis and its applications: Course, London (QMC), 15 and 16 September 1987

A two-day course on thermal and chemical plant analysis an optimisation using the *Exergy method,* organised by th Department of Mechanical Engineering at Queen Mar College, will be held at the College premises on 15 and 1 September 1987. This course is a more comprehensive versio of two one-day courses which were run in January and i

ptember 1982. The contents of the present course are based the book *The exergy method of thermal plant analysis* utterworths, 1985) whose author, Dr T J Kotas, is both the urse director and the main speaker. All course participants ll receive a copy of this book as part of the course package. ie course has been granted 'Approved' Status by the stitution of Chemical Engineers and is sponsored by the ergy Group.

The course is intended for design engineers, R & D gineers, project managers, plant managers, energy anagers, university and polytechnic teachers and anyone who concerned with the efficient use of energy and material sources.

Further information and registration forms from: Dr T J otas, Exergy course director, Department of Mechanical ngineering, Queen Mary College, Mile End Road, London 1 4NS (tel 01-980 4811 ext 4261). *See loose insert.*

Energy management: Course, Portsmouth Polytechnic, 21-25 September 1987

five-day full-time study short course will begin on 21 ptember 1987. The course content concerns the principles nd practice of *Energy management* including familiarity with mputer-based systems.

Further information from Dr M R I Purvis, Department of lechanical Engineering, Porstmouth Polytechnic, Anglesea uilding, Anglesea Road, Portsmouth, Hants PO1 3DJ (tel 705) 827681 ext 227).

University of Sheffield, Centre for Continuing Vocational Education: Health and Safety courses

he following courses have been arranged from October to ecember 1987:

October. Deadly maintenance in the process industries.
9 October. Deadly maintenance in the construction industry.
0 November. Safe storage of hazardous chemicals.
December. Accidents and the law.
5 December. COSHH regulations update.

Further information from Frances Wells, course organiser, entre for Continuing Vocational Education, University of heffield, 65 Wilkinson Street, Sheffield S10 2GJ (tel (0742) 68653).

Economics and operations of bunkering

A five-day course (course code SP3) will be held in Oxford rom 5-9 October 1987.

Further information from College of Petroleum Studies, Administrative Offices, Sun Alliance House, New Inn Hall treet, Oxford OX1 2QD (tel Oxford (0865) 250521; tlx 838950 COLPET-G *or* 83147 VIAOR Ref COLPET).

The Energy Spectacular 1987 Barbican Centre, London, 12 October 1987

The *Energy Spectacular 1987* will comprise a domestic xhibition, a programme of seminars — backed by an energy dvice centre — and other activities presenting energy fficiency at work and in the home in new and exciting ways.

Organised by the Central London Energy Management roup, in association with the Energy Efficiency Office, this vent is non-profitmaking and net proceeds will be donated o the Cancer Research Campaign.

The event is planned to appeal to the widest possible udience, including:

- ☐ Managers with specific energy responsibilities in their companies — whether members of an Energy Management group or not.
- ☐ Architects, designers, engineers, property and building services managers, buyers and others professionally involved with energy purchasing and use.
- ☐ Members of the public and local authority representatives concerned with energy efficiency in the home.
- ☐ The partners of professionals in the energy sector, thus helping to stimulate energy efficiency in the home environment.

Programme

Domestic exhibition 1300-2230 h
(Open to the public)
Seminars 1330-1730 h
Energy advice centre 1200-1830 h
Evening game show 1900-2100 h

A charge of £25 covers the entrance fee to all seminars and a double ticket for the evening game show. A £6 double ticket for the evening game show can be obtained separately.

Further information from Reg Harrison, controller, Energy Conservation, Health Safety and Fire Prevention, British Home Stores PLC, Marylebone House, 129-137 Marylebone Road, London NW1 5QD (tel 01-262 3288; tlx 261209).

Joint-venture at ENVIROTECH 88

The Engineering Industries Association (EIA) and the British Overseas Trade Board are mounting a joint-venture at *ENVIROTECH 88,* the 3rd international exhibition and conference on *Pollution monitoring, control and industrial safety* to be held in Bombay, 18-23 January 1988.

Held every two years, *ENVIROTECH* is sponsored by the Environmental Management Centre of the Chemtech Foundation, whose secretariat are organising the event. Product sectors will include *industrial safety, pollution control, solid waste management* and *related instrumentation.* Held in conjunction with the exhibition, a conference will cover such topics as *air quality monitoring and control, liquid effluent treatment* and *industrial safety.*

Britain's technology for the monitoring, prevention and control of all forms of environment pollution is as advanced as any available, and remembering the impetus given to pollution control by the Bhopal disaster, Indian authorities concerned in environmental and safety matters will be receptive to British ideas and technology.

Under the joint-venture terms, the BOTB will provide space and a fully fitted shell stand at a cost of £87/m^2 and travel grants of £390 per person for two UK-based stand personnel. Applications to exhibit in the joint-venture must be submitted before *9 September 1988.*

Further information from Anna Small, export director, Engineering Industries Association, 16 Dartmouth Street, Westminster, London SW1H 9BL (tel 01-222 2367; tlx 8814718/EIA).

Royal Society of Chemistry: research fund 1988

The Royal Society of Chemistry has a limited number of grants of up to £300.00 available to assist Society members in their research. Grants may be used, for example, to purchase chemicals or for expenses involved in chemical education research. Members of the RSC who work in a university outside the UK, or in a polytechnic, college, or school anywhere, may apply. Preference will be given to those in less well-endowed institutions. Additional funds have been made available for 1988 to provide grants in particular to members in developing countries.

Further information from S Langer, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN (tel 01-631 1355). The closing date for applications is *1 November 1987.*

CONFERENCES

The following conferences, courses and meetings are organised by bodies other than the Institute of Energy. For Institute conferences please see IFC.

August 1987

Recod 87

International conference on nuclear fuel reprocessing and waste management, Paris (France), 23-27 August 1987.
Details from *Recod 87,* SFEN, 48 rue de la procession, 75015 Paris, France (tel 1-45 670770).

September 1987

Uranium Institute annual symposium

Twelfth symposium, London, 2-4 September 1987.
Details from Uranium Institute, New Zealand House, Haymarket, London SW1 (tel 01-930 3526).

Hydrothermal treatment of waste materials

International symposium, Columbus (Ohio, USA), 17 and 18 September 1987.
Details from Ms Renate Siebrasse, manager — Operations, Battelle Institute, 15 Hanover Square, London W1R 9AJ (tel 01-493 0184).

The future of nuclear power after Sizewell B

Conference, London (Park Lane Hotel), 21-23 September 1987.
Details from Miss Louise Marriott, IBC Technical Services, 3rd floor, Bath House, 56 Holborn Viaduct, London EC1A 2EX (tel 01-236 4080; tlx 888870).

Process control in the water industry

Conference, Swansea (University College), 22 and 23 September 1987.
Details from Conference Section, Institution of Chemical Engineers, 165-171 Railway Terrace, Rugby CV21 3HQ (tel (0788) 78214; tlx 311780).

Polynuclear aromatic hydrocarbons

11th international symposium, Gaithersburg (MD, USA), 23-25 September 1987.
Details from K C Stang, National Bureau of Standards, A345 Physics Building, Gaithersburg, MD 20899, USA.

Heat pipes — principles and application

Meeting, Essen (FRG), 24 September 1987.
Details from Haus der Technik eV, Hollestraße 1, Postfach 10 15 43, 4300 Essen 1, FRG (tel 0201/1803-1; tlx 857 669 hdt).

Porosity in carbon materials — measurement and applications

Conference, University of Bath, 28-30 September 1987.

September 1987 (continued)

Details from: *(technical programme)* Dr N D Parkyns, British Gas, Research and Development Division, London Research Station, Michael Road, London SW6 2AD (tel 01-736 3344; *(general)* Meetings Office, Institute of Physics, 47 Belgrave Square, London SW1X 8QX (tel 01-235 6111; tlx 918453 instp g).

October 1987

Oil loss control

Conference, London (Cavendish Conference Centre), 7 October 1987.
Details from Miss Caroline Little, conference officer, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR (tel 01-636 1004; tlx 264380).

Coke

Fuel Society of Japan's 83rd annual meeting, Nagoya (Japan), 15 and 16 October 1987 *(in Japanese).*
Details from Naoya Imano, Coke Division, Fuel Society of Japan, Kairaku Building, 6-5-4 Sotokanda, Chiyoda-ku, Tokyo 100, Japan (tel (03) 834-6456).

Separation science and technology for energy applications

Fifth symposium, Knoxville (TN, USA), 26-30 October 1987.
Details from Dr J S Watson, Oak Ridge National Laboratory, PO Box X, Oak Ridge, TN 37831-6224, USA.

Materials for nuclear reactor core applications

International conference, Bristol, 27-29 October 1987.
Details from British Nuclear Energy Society, 1-7 Great George Street, Lond. SW1P 3AA (tel 01-630 0726).

Coal ash utilisation

Eighth international symposium, Washington, DC (USA), 28-31 October 1987.
Details from American Coal Ash Association, 1819 H Street NW, Suite 510, Washington, DC 20006, USA.

November 1987

Coal research

Second conference, Wellington (New Zealand), 2-4 November 1987.
Details from conference secretary, 2nd *Coal research* conference, Coal Research Association of New Zealand, PO Box 3041, Wellington, New Zealand (tel 662-289; tlx 3814).

Coal technology 87

Tenth international coal utilisation and transportation conference and exhibition, Pittsburgh (PA, USA), 17-19 November 1987.

November 1987 (continued)

Details from Industrial Presentation West Inc, 12371 East Cornell Avenue Aurora, CO 80014, USA (tel (303 696-6100).

Steaming coals testing and characterisation

Workshop, Newcastle (NSW, Australia) 17-19 November 1987.
Details from Prof Terry Wall, Institute o Coal Research, University of Newcastle NSW 2308, Australia (tel (049) 685489 tlx AA28194).

Combustion Institute fall meeting

Honolulu (HI, USA), 22-25 Novembe 1987.
Details from Don Hardesty, Combustio Research Division, Sandia Nationa Laboratories, Livermore, CA 94550 USA.

December 1987

Microprocessor-based protectio systems

Symposium, London, 10 December 1987
Details from Institute of Measuremen and Control, 87 Gower Street, Londo WC1E 6AA (tel 01-387 4949).

January 1988

Middle East electricity 88

Trade exhibition, Dubai (UAE), 10-1 January 1988.
Details from: *(UK)* Helen Wright, Fair and Exhibitions, 51 Doughty Street Gray's Inn, London WC1N 2LB (te 01-831 8981; tlx 299708 Efanee G) *(Dubai)* Indrika de Silva, Fairs an Exhibitions Dubai, c/o Bin Dhah Enterprises, PO Box 773, Deira, Dubai United Arab Emirates (tel 236155; tl 48423 Dhahi Em).

March 1988

Industrial furnaces and boilers

First European conference, Lisbo (Portugal), 21-24 March 1988.
Details from Secretariat of *INFUB,* c/ Prof Albino Reis, Praca Dr Pedr Teotónio Pereira, 125-Esc. 33, 430 Porto — Portugal (tel 564849 (Porto); tl 26261 ENTEC P).

June 1988

Gas turbine and aeroengine

33rd ASME international congress an exposition, Amsterdam (Netherlands) 5-9 June 1988.
Details from international Gas Turbin Institute (ASME), 4250 Perimeter Par South, No 108, Atlanta, Georgia 3034 USA (tel (404) 451-1905; tlx 707340 IGT ATL).
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