The Journal of the Institute of Hospital Engineering March 1982

HOSPITAL ENGINEERING

International Federation Issue

7th International Congress
Amsterdam 9–14 May 1982

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HOSPITAL ENGINEERING

The Journal of the Institute of Hospital Engineering

I.F.H.E.

International Federation Issue No. 41

Contents

Volume 36 No. 2 March 1982

Front Cover:
The flower market on the Singel canal, Amsterdam, where the 7th IFHE Congress will be held in May — see page 20.
Photo — Royal Netherlands Embassy.

International Federation News

7th International Congress

The 7th Congress of the International Federation of Hospital Engineering will be held in the International Congrescentrum RAI in Amsterdam, Holland from 9-14 May, 1982.

During this International Congress, organized by the Dutch member association of the IFHE, the 'Nederlandse Vereniging van Ziekenhuis Technici', one of the topics will be energy and energy saving systems. Leading specialists from America and Europe will present lectures on this theme, varying from quantitative and qualitative analysis of the various energy streams in the institution, to a Hungarian contribution on the application of geothermic energy in hospitals.

From the large number of registrations, coming in from all over the world, a great interest for this congress is apparent.

Many organizations and institutions are showing their interest by offering technical visits for the congress participants to their hospital, and by sponsoring the congress.

Further information can be obtained from the Congress Secretariat: Organisatie Bureau Amsterdam BV, Europaplein, 1078 GZ Amsterdam, the Netherlands.

12th IHF Special Study Visit 18-29 April 1982

USA — Health Care Planning and Delivery in Big Cities

Between 1978-1981, the IFH have organised a number of special study visits in different countries. Three more such visits are planned for 1982: one in Hungary on co-ordination of hospitals and primary health care; one in France on computerised hospital information systems; and one in USA, which is being organised in collaboration with the American Hospital Association and the American Health Planning Association.

The purpose of this visit will be to study problems and progress in the planning and provision of health care in big cities, with particular reference to New York and Detroit. The main emphasis of the visit will be not so much upon the immensely complicated organisational aspects of US city health planning and financing (although these will certainly be discussed), as upon what our American colleagues see as the major health care problems of these cities, and what they are trying to do about them. Special attention will be paid to innovations and developments in hospital and community care that other cities might usefully consider adopting, adapting, or studying for their own benefit.

This will be a single-language visit, in English. Accommodation will be provided in single rooms, with bath or shower, in medium-cost hotels in New York and Detroit. The cost of the visit, from arrival in New York on Sunday, 18 April until departure on Thursday, 29 April, will be *approximately US$1660.* This covers accommodation for 12 nights, most but not all meals, documentation, and transportation in New York and Detroit. It does *not* include the cost of the flight between New York and Detroit, as it will be cheaper for each participant to include this flight in a continuous ticket purchased in his/her oun country.

Applications should be made on the enclosed form, which should be completed and returned as soon as possible. Please do not send any payment now: *invoices for deposit and balance will be sent later to those selected to attend.* If there are more applications than vacancies, we shall have to ballot for places.

For more information, please contact Mr Miles Hardie, IHF, 126 Albert Street, London NW1 7NX, England.

Portuguese Association

The 1982 calendar of activities of the Portuguese Association of Hospital Engineering is:

26 March Workshop on 'The Communications in a Hospital', in Oporto (C.I.H.P.).

10 to 14 May Excursion to Amsterdam: 7th International Congress of Hospital Engineering.

2 July Visit to new Santarem District Hospital, followed by debate.

12 November Workshop on 'Engineering in the Hospital Emergency Department'.

Le programme des activitées de l'Association Portugaise des Ingénieurs Hospitaliers pour l'année 1982 est le suivant:

26 Mars Table ronde, à Porto (C.I.H.P.) sur 'La Comunication à l'hôpital'.

10 to 14 Mai Voyage d'étude à Amsterdam pour le 7 ème Congrès Internationale de la F.I.E.H.

2 Juillet Visite d'Etude -- Nouvel Hôpital de Santarem. Débat.

12 Novembre Table ronde, à Lisbonne (I.N.S. Dr. Ricardo JorGe) sur 'L'ingenieur au service des urgences'.

News from Spanish Association (AEDIAH)

Post-Grad Course: Energetic Systems in Hospitals

This course, organized by AEDIAH, was held in the University of Barcelona from the 9th November to the 3rd December 1981.

The programme included all consumer energy systems in Hospital.

The successful course was directed by Prof. Antonio Bonnin and by Francisco Castella of AEDIAH's Council, with a total of 20 assistants including Architects, Engineers and Maintenance Heads of Hospitals.

A 300 page book has been published covering the various subjects of the course.

Curso de Post-Grado: Sistemas Energeticos En Los Hospitales

Organizado por AEDIAH, se realizó este curso, en la Universidad Politécnica, del día 9 noviembre al día 3 de diciembre de 1981, con una duración de 25 horas.

El programa abarcó todos los sistemas consumidores de energía en el Hospital.

Fué dirigido por Prof. Antonio Bonnin, y Master Francisco Castella, del Consejo de AEDIAH, y asistieron 20 inscritos entre Arquitectos, Ingenieros y Jefes de Mantenimiento de Hospitales, alcanzando un — notable éxito.

Con este motivo se confeccionó un libro de 300 págs, en el que — están desarrollados en diferentes capitulos los temas del curso.

Fourth Round Table Meeting

The IV Round Table of AEDIAH was held in Madrid on the 5 November 1981, on the theme 'The Laboratory in the Hospital'. The Round Table was presided over by the President of the IFHE, Mr Vinson Oviatt, who presented a paper related to 'W.H.O. Guidelines for Laboratory Bio-safety'. It was excellent in both its contents and presentation. The General Secretary of IFHE, Mr Joáo Lopes Galvao acted as Vice-president.

In the evening, a dinner was given in honour of the President Mr Oviatt, and he was made an 'Honorary Member' of the Spanish Association, in gratitude for his work within the Hospital Engineering field.

El día 5 de noviembre de 1981, se celebró en Madrid la IV Mesa Redonda de AEDIAH, sobre el tema 'El Laboratorio en el Hospital'. Presidió la Reunión el Presidente de IFHE, Mr Vinson Oviatt quién dió la conferencia Inagural 'W.H.O. Guidelines Laboratory Biosafety', excelente en su contenido y en su exposición. Actuó de Vicepresidente el Secretario General de IFHE, Mr Jôao Lopes Galvâo.

Por la noche se celebró una cena homenaje al Presidente Oviatt, en el transcurso de la cual se le hizo entrega del 'Título de Socio de Honor' de la Asociación Española en reconocimiento de su labor dentro del campo del Hospital Engineering.

Danish Association Conference

Foreningnen af Sygehusmaskinmestre i Danmark (FSD), The Association of Danish Hospital Engineers, has held its annual autumn conference. This year's topic was conservation of energy in hospitals, and one of the aims of the conference was to discuss the possibilities of energy management in hospitals. Energy management is of immediate importance in Denmark after it has been recommended by the government. Energy management comprises:
Administration, planning, recording, control, distribution, information and technology.

The aim of energy management is to secure optimum utilization of energy resources.

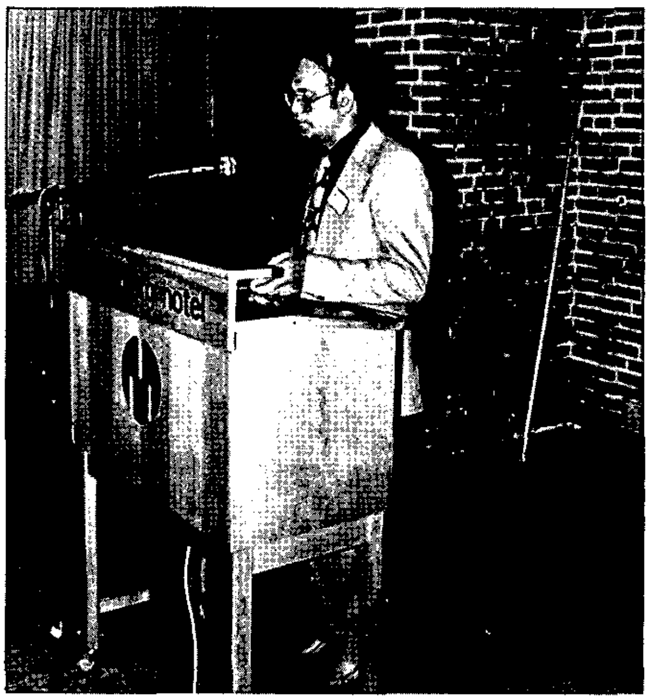
Consequently, the objective of the conference was to discuss how such an organisation can be adapted to hospitals, including the question of which functions have to be carried out, and by whom.

There was a panel debate during the conference in which a politician, an administrator and a technical manager gave their views on energy management. The IFHE was represented at the conference by the president; Mr Vinson R. Oviatt, USA, who gave the delegates the best wishes from the IFHE. The FSD had also invited colleagues from Norway and Sweden.

The topic of the next autumn conference of the Danish Hospital Engineers will be maintenance and administration of buildings. With experience acquired with regard to building defects and insufficient maintenance of hospital buildings as a starting point, one of the aims of the conference will be to illustrate the need for maintenance regulations, criteria for choice of materials, with a view to minimising maintenance costs, planning tools, and organisation of building administration. Participants are expected to be administrators and technicians.

Mr Vinson R. Oviatt, President of the IFHE at the IFHE at the Danish Association Conference.

Mr Aage Olesen, Chairman of the Association of Danish Hospital Engineers.



Institute News

38th Annual Conference

Hilton International, Stratford upon Avon, May 19-21 1982

The Conference
is the 38th Annual Conference of the Institute and will be held at the Hilton International, Stratford upon Avon.

The contributions being made by the Department of Health and Social Security are noted with appreciation.

Conference Registration
may be effected by completion of the separate application form and return to the address at the foot of this page.

VISITORS from other societies and organisations, and from the Hospital service, are welcome to attend any session of the Conference.

Payment of expenses — Hospital Service.

In accordance with the authority given in Circular HM (54) 55, officers may be granted special leave with pay to attend conferences on work with which they are concerned. Travelling and subsistence allowances at the usual rates may be paid to officers, provided that approval to attend has been obtained from the Employing Authority.

Conference Dinner and Entertainment
will be held at the Hilton International on the evening of Thursday, 20 May 1982.

Ladies Programme
A special Ladies Programme has been arranged. An introductory meeting will be held in the Hilton International on the first morning of the Conference.

Hotel Accommodation
Special arrangements and terms have been agreed with the Conference Hotel in regard to accommodation *for delegates and wives. For details* see Conference Application Form.

Tickets
for the Conference and the Conference Dinner, and registration for accommodation at the Hilton International, should be obtained by application to: The Secretary, The Institute of Hospital Engineering, 20 Landport Terrace, Southsea PO1 2RG.

CONFERENCE PROGRAMME

Wednesday 19 May

9.30 a.m. OFFICIAL OPENING by
SIR DAVID PERRIS MBE JP HonLLD
Chairman, West Midlands Regional Health Authority
Introduced by J. CONSTABLE Esq CBE CEng FICE FRICS FIMunE FIHospE, President The Institute of Hospital Engineering

10.15 a.m. THE FUTURE OF HEALTH SERVICE TELECOMMUNICATION SYSTEMS
(a) Telephones
Speakers: G. C. McCONKEY Esq CEng MIEE
Principal Engineer, DHSS — NI
J. K. CLARK Esq TEng(CEI) AMCIBS FIHospE
Main Grade Engineer, Common Services Agency
(b) CB Interference
Speaker: D. A. S. DRYBROUGH Esq BSc CEng MIEE
Technical Director, Drybrough Communication Services Ltd
(c) Mobile Radio Communications
Speaker: R. MORGAN Esq BEng(Tech) CEng MIEE FIHospE
Principal Assistant Engineer, WHTSO
Chairman: R. M. CUTCLIFFE Esq CEng FIMechE FCIBS FIHospE
Regional Engineer, West Midlands Regional Health Authority

2.00 p.m. THE USE OF COMPUTERS IN NHS WORKS ORGANISATIONS
(a) Assessing the needs of the Works Officer
Speaker: B. C. OLIVER Esq CEng MIMechE MInstR
Superintending Engineer, DHSS
(b) Applications in Maintenance and Estate Management
Speaker: DR. M. F GREEN PhD BSc CEng MICE MIMechE
Professional and Technical Officer, DHSS
(c) Designing with a Mini Computer
Speakers: DR. C. SMITH BSc MSc PhD MCIBS
Principal Lecturer, Polytechnic of the South Bank
DR. D. J. HARDY MPhil PhD CEng MIMechE MCIBS
Senior Lecturer, Polytechnic of the South Bank
General Forum/Discussion
Chairman: D. L. LEWIS Esq CEng MIMechE MCIBS
Regional Engineer, South Western Regional Health Authority

Thursday 20 May

9.30 a.m. ALTERNATIVE CONTRACT METHODS IN USE IN THE NHS
(a) Traditional Contracting
Speaker: B. W. EAST Esq FRIBA
Regional Works Officer, NE Thames Regional Health Authority
(b) Management Contracting
Speaker: G. BROOKE Esq MSc(Eng) CEng FICE FBIM FIHospE
Regional Works Officer, Mersey Regional Health Authority
Coffee
(c) Measured Term Contracting
Speaker: R. YORKE Esq BSc DMS CEng MIEE FCIBS
Area Works Officer, Tameside Area Health Authority

Chairman: K. W. HUDSON Esq FRICS
Chief Surveyor and Director of Works Construction and Cost Intelligence, DHSS

2.00 p.m. (d) Joint Venture Tendering
Speaker: C. HOWARD Esq FRICS
Regional Quantity Surveyor, Oxford Regional Health Authority
(e) Single Source Responsibility
Speaker: A. P. NEILL Esq
Estimator/Surveyor, Modular Support Systems (International) Limited
DIRECT LABOUR IN COMPETITION
Speaker: M. SMITH Esq CEng MIERE MCIBS
Area Works Officer, Barnsley Area Health Authority
General Forum/Discussion
Chairman: D. P. ECCLESHALL Esq MA CEng MICE
Regional Works Officer, Oxford Regional Health Authority

7.30 p.m. for 8.00 p.m. CONFERENCE DINNER

Friday 21 May

10.15 a.m. A REVIEW OF PROGRESS ON SYSTEM HOSPITAL BUILDING
(a) The Oxford Method
Speaker: J. J. GIBBONS Esq BSCE MSE BArch
Assistant Regional Architect (Systems)
Oxford Regional Health Authority
(b) Nucleus
Speaker: S. RATCLIFFE Esq CEng MICE MIMechE FIHospE
Assistant Chief Engineer, DHSS
Chairman: H. GOODMAN Esq RIBA(Hons)
Director of Works Development and Chief Architect, DHSS

12.30 p.m. CONFERENCE CLOSURE
by
THE PRESIDENT, THE INSTITUTE OF HOSPITAL ENGINEERING

New Members

Fellow

LENIHAN, Michael Alexander, M. A. Lenihan and Associates.

LOWSLEY, Michael Neville, Yorkshire RHA.

McCAUSLAND, Martin Robert, Western Health and Social Services Board.

MILLS, Bernard Joseph, West Midlands RHA.

MORIMURA, Peter Takeo, P. T. Morimura & Associates, Japan.

NEWTH, Michael Rafael, Presland and Partner.

WHITTAKER, William Cecil Gilbert, Whittaker West Associates.

Member

BUCHANAN, Peter Healy, Royal Hospital for Sick Children.

BURNS, Robert George, Western Health and Social Services Board.

BUTLER, David Anthony, Merton Sutton & Wandsworth AHA.

CAMPBELL, Julian.

CHILVERS, Henry Dominic, H. D. Chilvers and Associates.

CONNELL, John Joseph, Kensington and Chelsea and Westminster AHA.

CROSSLEY, Keith, Alan G. Usher and Partners.

DAVIES Roy Stephen, Cramp and Frith.

EMANUAL, Lester Charles, Inglis Flett and Associates.

FILLINGHAM, John Edward, Bahrain Military Hospital.

FORD, Raymond William, Cambs AHA.

FYFFE, Ronald, Tayside Health Board.

GARDENER, Alan Richard, Berkshire AHA.

GIBSON, Peter, Tayside Health Board.

GOODHEW, Robert William, MDSS Wroughton.

HALLEY, James Patrick, Bro. of St. John of God.

HAYNES, Maurice Arthur, Northamptonshire AHA.

HENRY, Colin Malcolm, University College Hospital.

JAMES, John Frederick, Queen Elizabeth Medical Centre.

LEE, Malcolm Ivor, Essex AHA.

LOVEDAY, Martyn, Oxfordshire AHA.

McELVENNY, Barry Anthony, North Warwickshire AHA.

McKNIGHT, John Thomas, Gloucester AHA.

MANLEY, John Francis, St. Helens and Knowsley AHA.

PICKERING, Richard James, Essex AHA.

ROBINSON, Michael Frederick, East Anglian RHA.

St.GEORGE, Phillip, West Sussex AHA.

SEGAR, Jeffrey, Pashler and Partners.

SMITH, Dennis James, Norman Blezard and Partners.

STEVENS, Jongopie Siaka,

TOWNSEND, Roger Vaughan, Birmingham AHA.

WITCHALLS, Brian Frederick, Christian Medical College Hospital.

YOUNG, Trevor, Hull Royal Infirmary.

Graduate

JONES, Joseph Michael, Clwyd Health Authority.

Student

BEAMAN, John Michael, West Midlands RHA.

Obituary

Mr Stanley Reynolds, who retired last October, died suddenly on Sunday, 7 February 1982.

He was a well respected Engineer with 46 years' service in the Health Service (36 years of which were as Hospital Engineer at Whixley Hospital) and loved by all who came into contact with him. He will be sadly missed.

Letter to the Editor

Dear Sir,

We should very much like to comment on the article 'Gas Scavenging at Queen Alexandra Hospital, Portsmouth' by Mr E C Boyland. (Feb 1982). Whilst we found the article most interesting, we are concerned that it gave the impression that 'assisted passive systems' using an air-break and discharging into ventilation exhaust systems were ineffective.

In particular we should like to raise some points. Firstly, what was the extract flow rate derived from the exhaust system which was scavenging the air-break and how did it vary during opening and closing of doors etc? We understand that the flow-rate originally specified for the air-break was a minimum of 30 litres per minute. Our experience indicates that this is inadequate and we specify 100 litres per minute.

Secondly, although Graph 1 shows some quite high levels (averaged) of pollution, unless a similar graph of pollution without scavenging is shown, surely it is unfair to suggest ineffectiveness.

Thirdly, comparison of Graph 1 (air-break normal) to Graph 2 (air-break sealed) is made and conclusions drawn about the effectiveness of passive systems. Assuming there was adequate suction from the exhaust duct to meet the design air flow for the air-break, then the sealed system producing Graph 2 could not be considered as a 'passive' system and the reduced pollution from this arrangement is to be expected.

Finally, if Graph 1 was averaged between 0900 hours and 1400 hours again, but more drastically, it would appear that the average pollution level would be about 35 parts per million for N_2O, which must be a considerable improvement. Unfortunately the DHSS has suggested limits with no indication of whether an average low value is acceptable even though high, short duration, peaks are present.

Peaks 7, 8 and 9 of Graph 1, we suggest should be ignored, since they appear to have been taken too close to the air-break. Our experience with measurements using the Miran analyser is that it can 'suck-out' gas mixtures which might otherwise have been scavenged and therefore would not have contributed to the pollution level in the theatre.

There is no doubt that air-break system exhausting into the ventilation duct are vulnerable to lack of suction under certain circumstances. Where this is likely, assistance should be provided by means of a separate fan.

A J Huelin
D F Coleman
Oxford RHA

Northcroft Silver Medal

The Northcroft Silver Medal for 1981 is awarded to Mr M. Woodroofe for his paper entitled 'Installation of a Honeywell Delta 1000 Building Services Management System' which appeared in the October issue of *Hospital Engineering.*

The Institute of Hospital Engineering

The Distribution and Use of Gases in Medicine

at

Kensington Town Hall
Hornton Street, London W8

Symposium — Wednesday 31st March, 1982

Despite the issue of Hospital Technical Memorandum 22 and a 'Permit to Work' system there have been unfortunate incidents in a number of hospitals. The time is right to examine requirements for gases in medicine, systems for distributing and employing them in patient areas and laboratories and the relative responsibilities of the professional and technical disciplines involved. This is an opportunity for anaethetists, pharmacists and other users of gases to discuss with manufacturers and works officers the current problems and future developments.

PROGRAMME

10.00 Coffee

10.30 OFFICIAL OPENING by
JOHN CONSTABLE Esq. CBE CEng FICE FRICS FIMunE FIHospE, President The Institute of Hospital Engineering
CHAIRMAN for the day
DR. O. P. DINNICK FFARCS
Consultant Anaesthetist, Middlesex Hospital; Chairman, BSI Committee SGC/44

10.35 REQUIREMENTS FOR GASES IN MEDICINE
Speaker: DR. J. G. WHITWAM MB ChB PhD MRCP FFARCS
Reader in Clinical Anaesthesia, Royal Postgraduate Medical School; Hon. Consultant Anaesthetist, Hammersmith Hospital

11.20 MEDICAL GASES DISTRIBUTION SYSTEMS
Speaker: L. W. M. ARROWSMITH Esq, BSc(Eng)(Hons) CEng MIMechE, Principal Professional and Technical Officer, Department of Health and Social Security

12.10 QUALITY CONTROL OF GASES
Speaker: DR. D. J. ANDERSON BPharm PhD MPS MIBiol
District Pharmaceutical Officer, Hammersmith Hospital

12.45 LUNCH

14.15 EQUIPMENT—USE, DEVELOPMENT, MAINTENANCE AND POTENTIAL HAZARDS
Speaker: L. F. S. SMALL Esq LBIST MIST
Professional and Technological Officer, Scientific Branch, Department of Health and Social Security

15.00 SAFETY FROM STANDARDS
Speaker: PROFESSOR JOHN S. ROBINSON MD FFARCS
Head of Department of Anaesthetics, University of Birmingham

15.30 DEVELOPMENTS IN LOCAL GENERATION OF OXYGEN
Speaker: GROUP CAPTAIN JOHN ERNSTING OBE BSc MB BS PhD MFOM FRAeS RAF
Deputy Director of Research, RAF Institute of Aviation Medicine, Farnborough
16.00 OPEN FORUM
16.30 CLOSE

Reduced Rate Rail Fares and Hotel Accommodation — substantial rail fare reductions are available for delegates attending this Symposium. The following are example of second class return fares to London (for first class add 50%). Grampian Region — £43; Glamorgan — £17; Cornwall — £26; Oxfordshire — £6.
Grand Metropolitan Hotels in London are prepared to offer delegates a reduction on their normal rates.
Application forms to obtain these reductions may be obtained ONLY from The Hospital Engineering. (Tel: Portsmouth (0705) 823186).

N.B. Please note that tickets are available ONLY from The Institute of Hospital Engineering, 20 Landport Terrace, Southsea, PO1 2RG. (Tel: Portsmouth (0705) 823186).

North Western Branch — news

On Wednesday, 20 January 1982, a Branch meeting was held at St. Mary's Hospital, Manchester when the topic was 'Energy Conservation'. A paper was given by two members of the NWRHA staff, Mr B. Hardacre (Assistant Regional Engineer) and Mr B. Kendrick (Principal Assistant Engineer). The talk was separated by film and slides and as such, was a very enjoyable and informative one. The meeting was well attended and question time after the talk proved the interest shown by members present. At the meeting, we also had the pleasure of the company of Mr Blackburn who is a past chairman of the Norwich branch and who was in Manchester on a management course.

Forthcoming Branch Meetings

London Branch *Hon Sec: P C Vedast 01-807 7340*

30th March	AGM, followed by paper; 'Have computers a place in Works Departments?'	Wolfson Lecture Theatre, National Hospital for Nervous Diseases, Queen St., London WC1

Southern Branch *Hon Sec: R P Boyce 0243 781411*

11th May	Branch Meeting	Winchester
13th July	Branch Meeting	Southampton

South Western Branch *Hon Sec: A J Graver 0242 21361*

15th March — 7.30 p.m.	AGM	Brentry Hospital Committee Room

Midlands Branch *Hon Sec: W Turnbull 021-378 2211 Ext. 3590*

11th March	AGM	Birmingham Room, West Midlands Gas, Wharf Lane, Solihull, West Midlands

North Western Branch *Hon Sec: J Sunderland 061-236 9456 Ext. 588*

18th March	AGM, followed by paper on Static Engineering	Bolton Medical Institute
21st April	Visit	Alexandra Hospital, Cheadle, Nr Stockport
12th May	Talk by IMI Bailey Valves Ltd	Hope Hospital Post Graduate Centre, Salford

West of Scotland Branch *Hon Sec: T M Sinclair 041-332 9696*

25th March — 7.30 p.m.	AGM	Glasgow Royal Maternity Hospital, Rotten Row, Glasgow
29th April	BOC Liquid Oxygen Tonnage	Carfin

Numbers will be limited at the meeting on the 29th April. Those wishing to attend should notify the Branch Secretary before 31st March.

6 Branch Meeting

12th June — 10.00 a.m.	6 Branch Meeting	John Radcliffe Hospital, Oxford

Those wishing to attend any of the above meetings please contact the relevant local Secretary.

This paper was presented at the Institute's symposium Designing for Reduced Hospital Energy Consumption, *held in June 1981 at the Institution of Mechanical Engineers in conjunction with the DHSS.*

Energy Conservation — Crisis or Conspiracy?

Professor Patrick O'Sullivan
Frederic A. Romig

Introduction

A nation's fuel mix has been an important factor in its economic development and strongly affects its future options. Substituting one fuel for another has become a vital component of energy policy often necessary for the use of more indigenous resources, less imported oil, more renewables and the more 'efficient' use of all available energy resources.

Most European countries are now diversifying both their energy trading partners and their fuel mixes. Diversified energy trading partners can give greater security of energy supplies in the short term. In the medium to long-term energy conservation coupled with interfuel substitution can keep vital options open.

Some economic sectors are more fuel specific than others. For example, barring a major break-through in battery technology, transport will continue to require liquid fuels. Some industrial processes such as glass-making and ceramics also require particular fuels.

However, low-temperature heat mainly for use in building is the largest non fuel-specific sector in European countries. National energy options can be greatly enhanced by careful attention to the design and use of industrial, commercial, institutional, agricultural and residential building.

This paper examines some of the main issues of interfuel substitution in building. First, it takes a broad look at past trends. These show how total energy consumption has increased greatly in some countries since 1950 while it has risen for less in others. How Western European countries have substituted oil and gas for coal in buildings over the last twenty years. The resulting fuel mix for 1978 in the Western European buildings is given. This is compared with the 1976 fuel mix in four Eastern European countries.

Secondly, the paper looks at one country, the United Kingdom as an example of what can be done in others. It shows how fuels have been substituted one for another in the United Kingdom's built environment since 1950. It gives a detailed breakdown of 1978 energy consumption and points out that more than half the nation's energy goes to the built environment.

Thirdly, it examines some of the specific issues affecting interfuel substitution in buildings for the future. It explains how buildings can

Figure 1: Increase in energy consumption per capita 1950-1976.

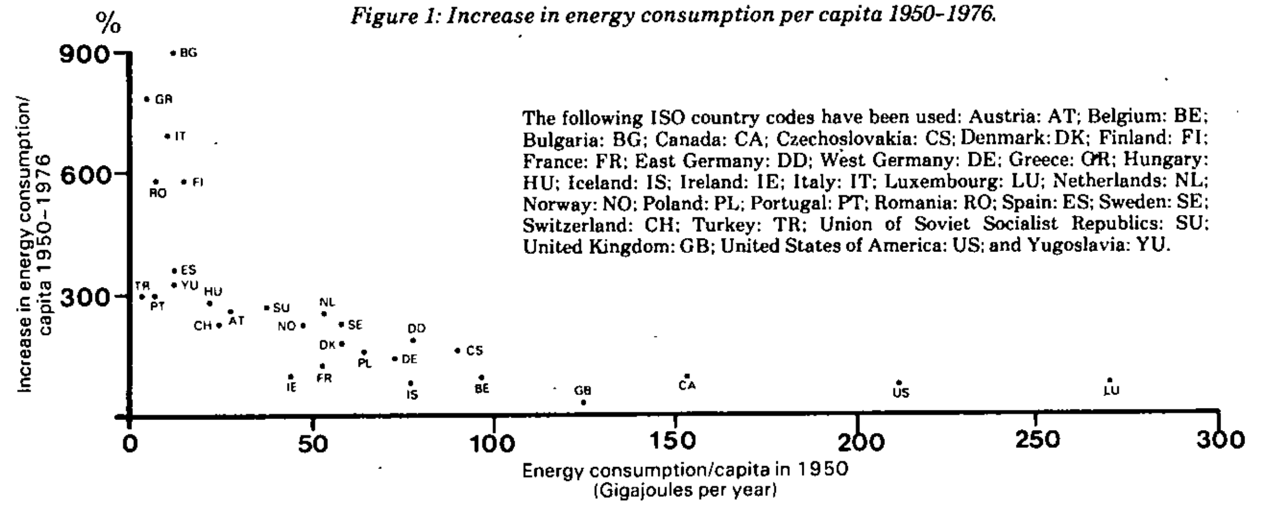
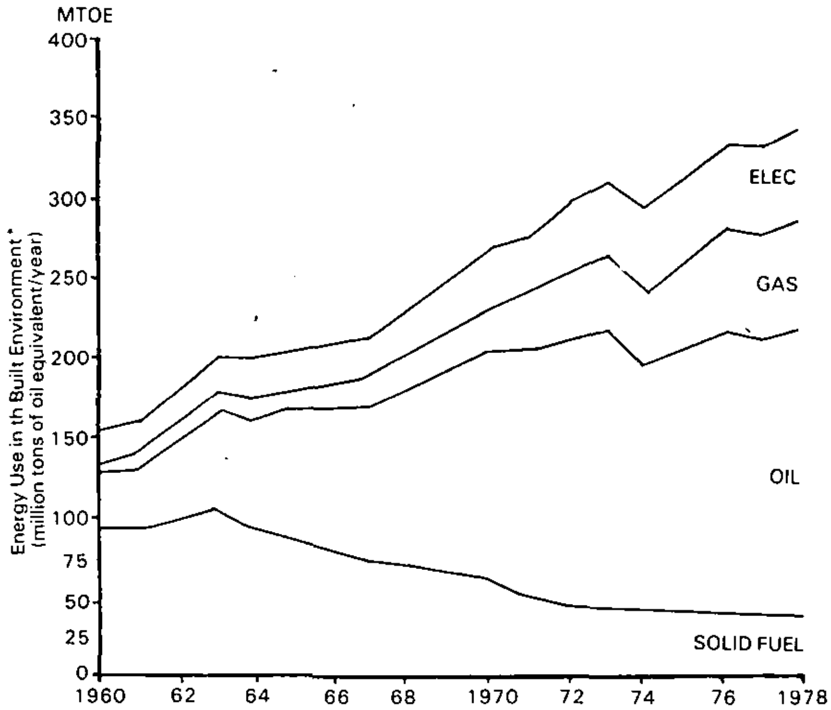


Figure 2: Built Environment Energy Consumption by Fuels in OECD Europe— 1960-1978.



* includes Agriculture which made up 5 per cent of energy use shown here in 1978

be assessed, designed, rehabilitated and managed so that different fuels can be used in them and looks at the lead times for such fuel substitution.

Past Trends

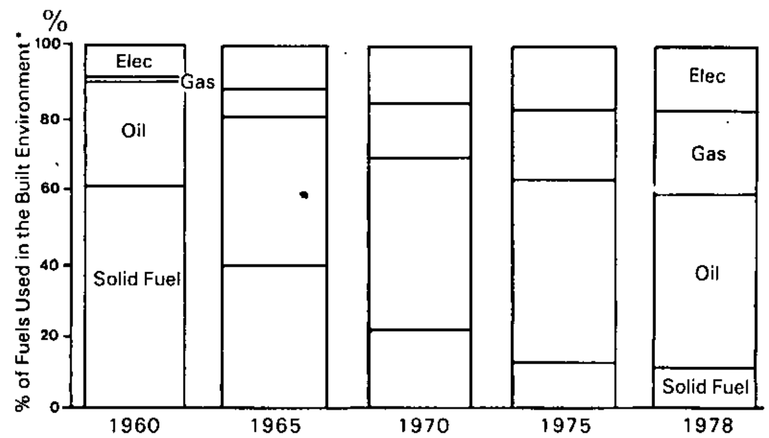
Energy and economic development in European countries

Productivity and material standards have risen sharply (by any measure) in European countries during the last thirty years. Factories, roads, houses and railways — the energy-using infra-structure — were built up rapidly. Between 1950 and 1976 the length of railways for example has increased by 100 percent. From 1960 to 1976 alone the dwelling stock has increased by 36 percent and the length of roads by 10 percent. Related activities and services increased apace. Iron and steel productivity rose by 77 percent and automobile ownership by 150 per cent.

This unprecedented rise in energy consumption has been uneven among European countries. Certainly their usage in 1950 varied much more than it does now. Energy consumption per person was for example thirty times greater in the highest using nations than in the lowest then, whereas now it is only nine times as great. The maximum rate of increase has occurred in those countries designated low energy users in 1950 i.e. countries with an average per capita primary energy use of less than 60 GJ. Bulgarian energy use per capita rose more than nine times from 1950 to 1976. Italy also had a rise of well over six times and Romania one of nearly 5000 percent. Conversely large energy users such as France, Poland and West Germany increased by a relatively small 100 percent. *Figure 1* illustrates this development pattern. Heavier energy users generally increased less. Indeed, nearly half the total increase in energy consumption came from countries that were low energy users in 1950 even though they only took 25 percent of 1950 energy consumption. This suggests that much of the rise in energy demand was 'needed' to acquire the energy-consuming infrastructure in use today and more over, that as energy activity increased in some countries, increases in energy efficiency held down consumption in others. Certainly as car ownership increased overall, in many countries cars were on average driven less.

Ultimately, such differences between countries can always be interpreted and explained in terms of climate, state of development, energy efficiency, size of domestic energy reserves and other factors. But this very large rise in energy use in some countries and small increase in others does raise the question of whether in the future, therefore, energy growth may slow down, or even flatten out, as population growth and the energy-

Figure 3: The Fuel Mix in the Built Environment in OECD Europe 1960, 1965, 1970 and 1978.*



* includes Agriculture which made up 5% of the energy use shown here in 1978

using capital stock reach saturation in many countries.

Developing multifuel economies

European energy systems underwent other important transitions as the relevent countries · economies developed. In particular such countries used more energy per person and diversified the mix of fuels that they used. In 1950 many had virtually single fuel economies based on coal. Certainly coal accounted for 85 percent of the 1950 European primary energy consumption, liquid fuels provided 4 percent of the fuel mix while gas accounted for 11 percent and the rest, about 2 percent, came from hydro and nuclear electricity.

This switch in the fuel mix was closely linked to the speed with which many nations developed, as it provided the means by which they could build up new and better services more quickly. Oil and gas were used to provide more extensive transport services, improved home heating and more efficient industrial processes. Very large shifts in the energy using infrastructure occurred and fuel consumption shifted accordingly.

In 1950, the energy used in buildings in Western European countries was dominated by coal. In 1960 coal still provided 61 per cent of the delivered energy consumption (oil provided 24 percent, gas 6 percent and electricity 9 percent).

From 1960 to 1978 the energy consumption in Western European buildings increased by 116 percent to 345 MTOE. During this period however per capita energy consumption increased by only 85 percent because of increasing population.

In the same period (1960 to 1978) the fuel mix changed considerably (*see figure 2*) the proportion provided by coal reducing to 11 percent, that by oil increased to 52 percent, by gas to 21 percent and by electricity to 17 percent. *Figure 3* shows the rate of this transition.

Eastern European countries

The fuel mix and its distribution by end use sectors has developed very differently in the Soviet Bloc over the last thirty years. Three important features stand out. First, the shift away from coal to oil and gas started much later and has progressed more slowly than in Western European Countries (*see Figure 4*). Secondly, the Soviet Bloc countries use less energy in the transport sector (more goes to industry). Thirdly, total energy use is less efficient. Soviet Bloc total energy consumption per unit of GNP or NMP was nearly twice that of the EEC countries. The total delivered energy consumption per capita was nearly 50 percent greater than in Western European countries.

Figure 4: Solid fuel consumption in Eastern European Countries 1950-1974 (percentage of total primary energy).

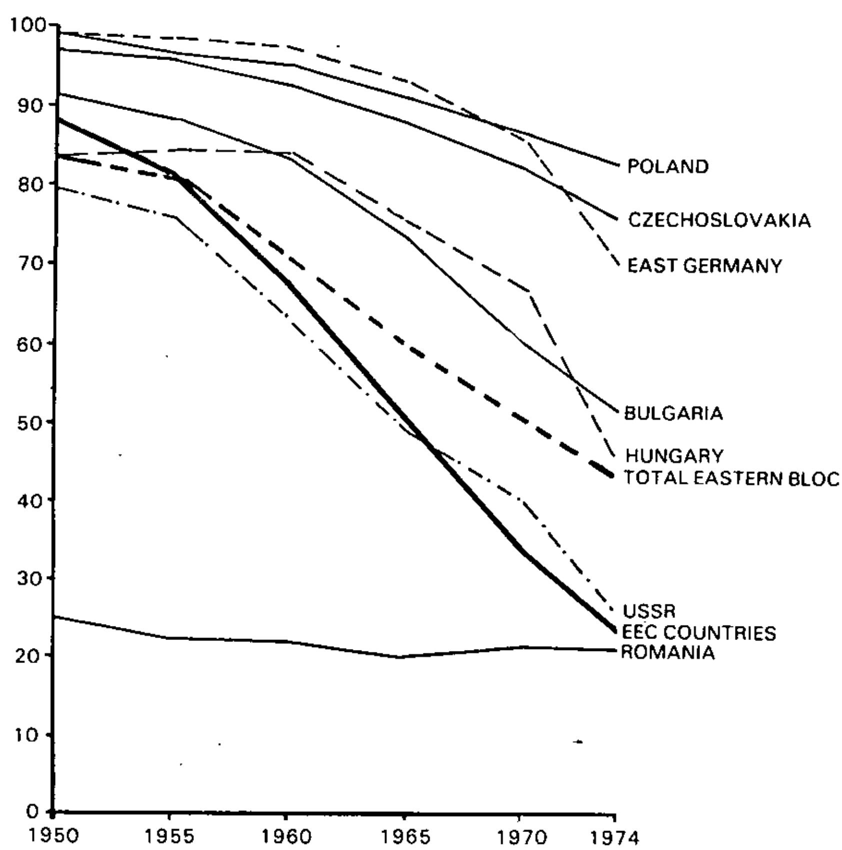
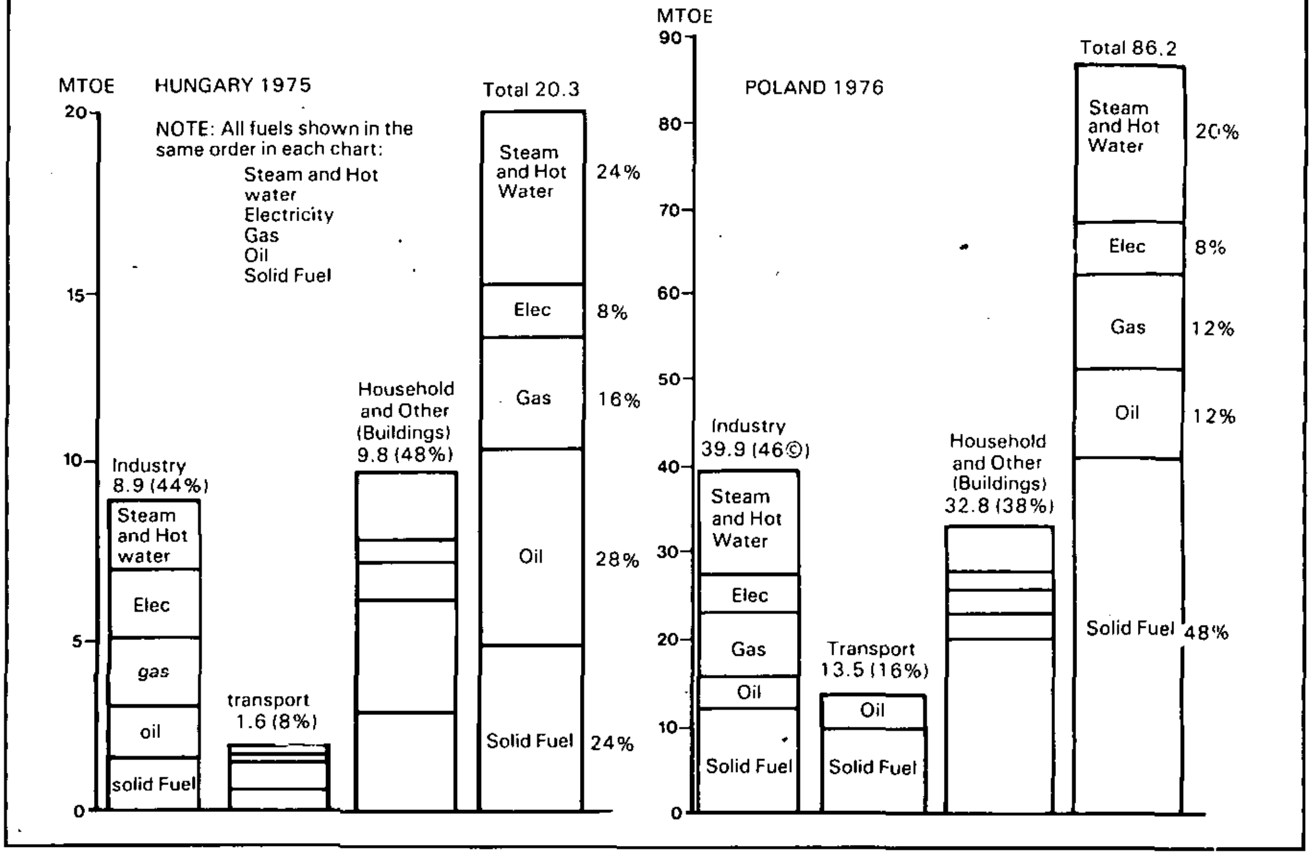


Figure 5: Delivered Energy use in Eastern European Countries 1975-1976.



Today Eastern European countries still use a greater proportion of coal because of the slower shift towards oil and gas during the 1950's and 1960's. As a result, their fuel mix in building differs very greatly from western countries. Coal use as a percentage of total *primary* energy is shown in *Figure 4*. A *delivered* energy breakdown is more revealing *(see Figures 5 and 6)*.

The direct use of coal makes up over half of the energy consumed in the buildings of East Germany, Czechoslovakia and Poland. In addition, district heating and combined heat and power, mostly from coal, provide another large source of energy for buildings. Taken together, coal and steam and hot water provide 61 percent of the energy used in buildings in Czechoslovakia, 61 percent in East Germany, 50 per cent in Hungary and 78 percent in Poland.

Delivered energy use per capita in the buildings of Eastern European countries is about 65 per cent of that in Western (OCED Europe) nations, but standards are very much lower. This is partly because fewer services are provided, houses and flats are smaller and energy is used less efficiently.

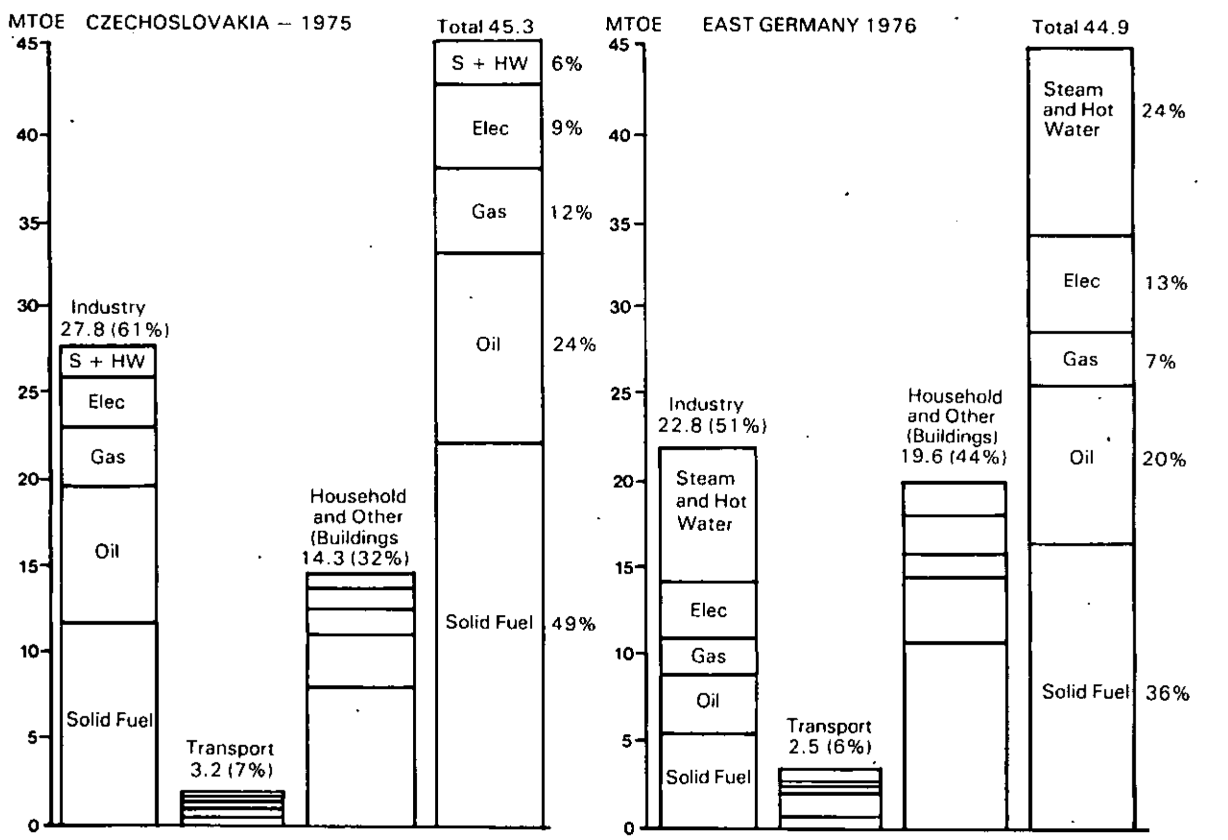
Although Eastern European countries use less *delivered* energy per capita in buildings, they use more *primary* energy per person because much of their electricity generation and district heating is very inefficient. Specific fuel consumption of electricity generation measured in Kcal/kWh is 10 to 25 per cent higher in Eastern European nations than the average for the EEC. Energy consumption of the power stations themselves is 60 per cent higher in several Soviet Bloc countries. Transmission losses are between 60 and 115 per cent greater than in the EEC.

In Poland 66 per cent of all dwellings were flats in 1976 and the rest houses. In contrast, 18 per cent of United Kingdom dwellings are flats and some 72 per cent are terraced, semi-detached houses. Only 67 per cent of Polish houses have piped water, only 79 per cent have electricity supplies and only 44 per cent have fixed bath or shower facilities, while all United Kingdom houses have these as do most Western countries. In Poland, 20 per cent of dwellings have only one room, 35 per cent have two rooms and another 30 per cent have three rooms. Dwellings in the United Kingdom are larger with 30 per cent having four rooms, 34 per cent with five, 13 per cent with six and 7 per cent with seven or more.

One of the reasons for this disparity is that Soviet Bloc countries have devoted far more of their resources to industry. Indeed, many of their dwellings are flats built from industrial building components which generally have higher air leakage and heat losses than do conventional masonry construction techniques.

The lower standards in Eastern European countries are partly a result of their fuel mix coupled with the relatively limited services provided. In Poland, for instance, only 38.7 per cent of dwellings were connected to the gas grid in 1978. A further 19.0 per cent of dwellings used bottled gas. In all, some 48 per cent of Polish towns had gas supplies in 1978. All towns had electricity supplies, but many rural dwellings did not. As mentioned above, only 80 per cent of dwellings were connected to the electricity grid in 1978.

Figure 6: Delivered Energy use in Eastern European Countries 1975–1976.



Steam and hot water made up 20 per cent of Poland's national delivered energy use in 1976. About 22.7 per cent of total dwelling floor space had space and water heating from these sources.

In contrast, 70 per cent of United Kingdom dwellings had gas supplies in 1979. About 52 per cent of dwellings had central heating. Only 8 per cent of dwellings had solid fuel central heating, while 14 per cent had oil and 25 per cent had gas central heating. About 4 per cent had electric storage heaters, 20 per cent fan heaters, 27 per cent gas space heaters, 29 per cent liquid oil heaters and 70 per cent of dwellings had electric space heaters i.e. many United Kingdom dwellings already use more than one type of heating system and more than one type of fuel.

Western European countries

By 1977 the fuel mix for buildings in OECD Europe was far more dependent on oil than on any other energy source. Solid fuel had fallen to about 12 per cent of delivered energy use from 61 per cent in 1960, while oil use had more than doubled from 24 per cent to 51 per cent, gas 21 per cent and the rest, some 16 per cent, was electricity. Buildings also took a significant proportion of total OECD Europe delivered energy. In 1977, they accounted for 37 per cent of total delivered solid fuel, 29 per cent of oil, 50 per cent of gas and 45 per cent of electricity. The built

Figure 7: Energy Use in Commercial, Institutional and Residential Buildings in OECD Europe — 1977 (excluding industrial buildings).

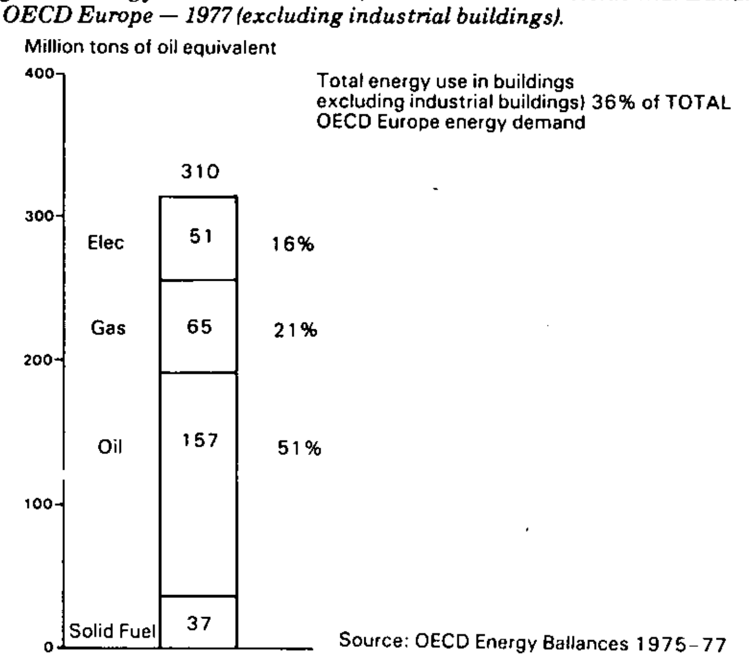
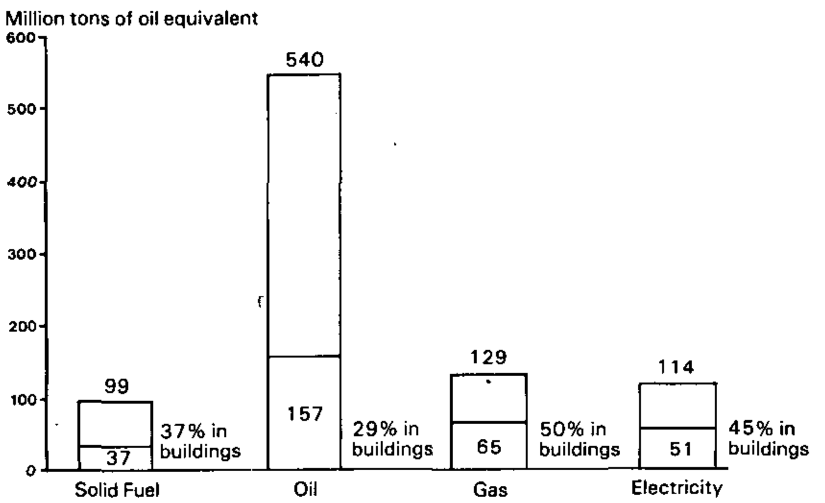


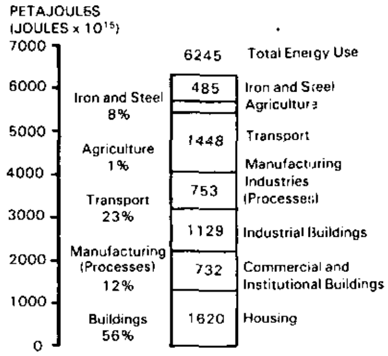
Figure 8: Proportion of Fuels used in Housing, Commercial and Institutional Buildings in OECD Europe — 1977 (excluding industrial buildings).



Source: OECD Energy Balances 1975–77

Figure 9:

Breakdown of Delivered Energy Use in the United Kingdom — 1978



Source: Digest of United Kingdom Energy Statistics

Energy Use in Buildings:

Domestic —	1620 PJ
Public Administration —	386 PJ
Miscellaneous Category —	346 PJ
(60% of — Other Industry or Manufacturing	1129 PJ
Total Buildings	3481 PJ (56%)

Total Energy Use in 1978 = 6245 PJ

environment's fuel mix and the share of fuels they used are illustrated in *Figures 7 and 8.*

The United Kingdom

The delivered energy fuel mix for the United Kingdom's built environment has undergone a transition similar to that of western europe as a whole, but moved rather more to gas than oil, as solid fuel use declined. The total delivered energy use did not rise greatly *(see Figure 9).* As shown in Figure 1, total primary energy usage was beginning to saturate in 1950. Indeed, primary energy use per household has been roughly constant since 1955, the well documented result of a decline in the use of solid fuel in inefficient open fireplaces and a rise in the use of more efficient oil and gas appliances.

The fuel mix changes shown in Figure 9 are for Housing, Commercial and Industrial buildings only. However, recent studies by the British Gas Corporation and the CBI suggest that much of the energy used in industry is in fact used in the Buildings rather than in the Process.

Buildings dominate energy use in the United Kingdom. In 1978, 57% of the Nation's energy went into housing, commercial, institutional, and industrial buildings, at a cost of £8,000 million *(Figure 10).*

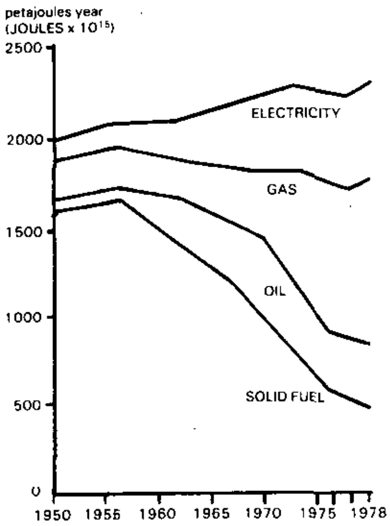
On a regional level, over half of OECD Europe's energy goes to the built environment if roughly the same calculation is done *(see Figure 11).* This means that at least 36 per cent and possibly as much as 52 per cent of delivered energy in Western European countries goes to heating, cooling, ventilating and providing hot water and services in buildings.

In other words, Western European Countries have generally realised and maintained higher standards, and this has been based in part at least on inter-fuel substitution. Although these countries may now be paying a high price for this development in terms of oil dependency, they have as a result of this same development many options for the future. In particular the continued practice of inter-fuel substitution in the building sector, as part of a programme of energy conservation provides a way of maintaining the availability and flexibility of fuels to allow further development and change in those critical industrial, transport and other sectors.

The implications of this option are next explored in terms of the United Kingdom and thus by implication for all European countries.

Figure 10:

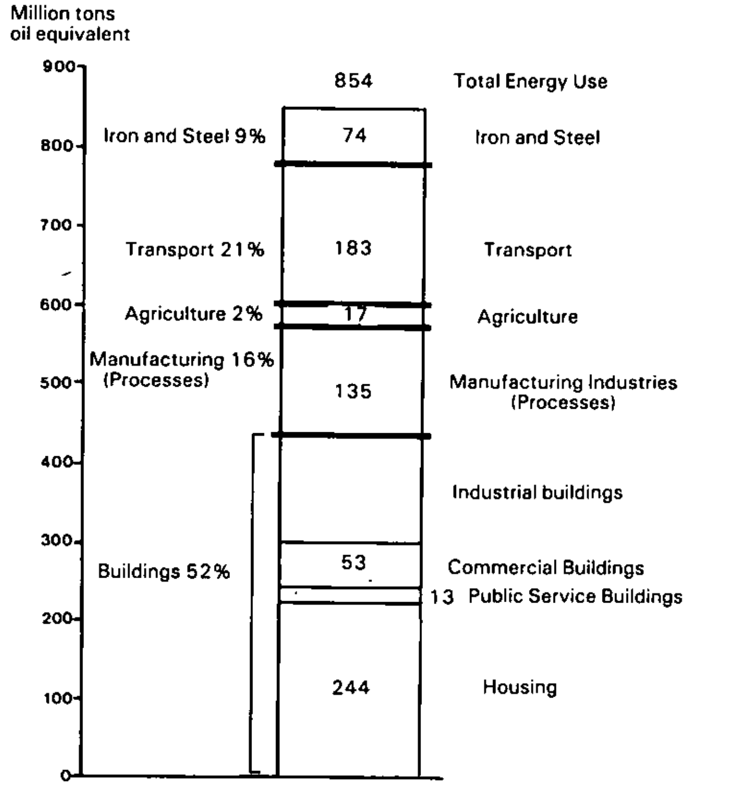
CHANGES IN THE BUILT ENVIRONMENTS FUEL MIX — UNITED KINGDOM 1950–1978 (Housing, Commercial and Institutional buildings)



Fuel Switching in Buildings

Buildings are principally designed built and operated by only six main groups of professionals and already have an existing mechanism for controlling the 'product' namely the Building Regulations. The majority of our buildings exist, such that the problem in the short to medium term is largely the 'realistic' one of management rather than one of prediction. In whole sectors of our built environment the energy consumed is not simply related to GDP production. Further the energy is used for only four main purposes and nearly two-thirds of this usage is in the production of low grade heat. Since the production of this heat is not fuel-critical, buildings can in principle be used as a 'buffer' against any particular fuel shortages which may otherwise have a far greater impact in other sectors.

Figure 11:



* OECD Europe includes 20 countries — seelist given on the table of contents.

Notes:
Total Delivered Energy Use does not include feedstocks or petroleum consumed for non-energy uses.

Energy use in industrial buildings is estimated to be ½ of consumption in other industry, chemical and petrochemical industry sectors. British Gas estimate that 60% of industrial energy use goes to buildings. An estimate for energy use in agriculture for buildings has not been made.

Buildings could, for example, be used to act as a buffer against oil shortages, or indeed to reduce oil demand. In 1979, a 5 per cent cut in oil consumption was called for in the United Kingdom. In transport, British Rail were alarmed and concerned about cutbacks in train services. Industry was equally anxious about reducing production.

Yet a 5 per cent cut overall is itself unlikely to produce permanent savings. It could mean purely a temporary inconvenience, possibly a reduction in industrial output and a lowering in material standards. This is where buildings offer a choice. For example, the equivalent of a 5 per cent national cut in oil consumption could be achieved by 30 per cent savings in all oil heated buildings. These savings are large enough to be permanent and not rejected as inconveniences to be abandoned once temporary shortages are gone. Oil could also be switched out of some buildings altogether to alleviate shortages in transport and industry, while permanent measures in those sectors have time to bite. Actually, some switching from oil in buildings has occurred already. At least 16 per cent and possibly as much as one-fifth of Britain's oil goes to buildings. The 1973 energy crisis resulted in a 10 per cent drop in fuel oil for central heating in all building types. But central heating oil consumption climbed back up to its 1973 level by 1977. However, in 1978, consumption fell by 5 per cent despite the coldest winter since 1973 and a slight rise in total oil consumption.

Energy options in buildings for the future

What then are the questions associated with adopting such a policy in order to keep our energy options open for industry and transport.

Many technical studies have been carried out to demonstrate the potential for and the actuality of energy savings in the building environment. (Ref. 9 & 10). The potential and the reality is large indeed, and the evidence in favour of energy conservation investment is clear. However, the unfortunate fact is that until recently the price and availability of fuels has been such that only the very large users, the wealthy, the committed and the far sighted, have felt able to take the necessary decisions. The success of energy conservation to date has been by no means small, neither has it been overwhelming. It is only now, i.e. in the summer of 1980, that industrial organisations (for example) are finding that their fuel bills are equalling their profits, and that in their next financial year their fuel bill will be going up at a rate considerably higher than the rate of inflation. No doubt historic cost conventions have added to this time delay.

In the United Kingdom the majority of our existing buildings stock, is owned by Government (in its various forms and manifestations) for example, fifty per cent of our domestic premises are owned by public authorities, two-thirds of our commercial buildings are rented by public authorities, and over fifty per cent of our industrial buildings are owned by state undertakings. The majority of new buildings are commissioned one way or another by Government, and it is said that in the United Kingdom over ninety per cent of the average architects design fees come from some form of State organisation. Perhaps in part for these reasons, there has been a tendancy over the past decades for the building industry to be used as an economic mattress from which many things may be sprung. Such a situation has certainly resulted for whatever the reasons in an industry of warring barons, large and introspective, with an almost inevitable mismatch between availability of materials, labour, money and opportunities.

The energy used in the building sector is so large, that even a relative change in tariff structures between fuels, such as occurred in the United Kingdom in 1979, can rapidly produce a swing in demand such that a particular fuel supply 'runs out'. Such a situation tends to feed on itself escalating very rapidly, so that the shortage of the particular fuel is soon matched by a shortage of the components necessary to use that fuel in our buildings.

If it is accepted that no one particular Government can control fuel prices for long, then can this option of interfuel substitution coupled with energy conservation in the building environment ever be realised in practice. Or is it inevitable that swings in fuel prices will occur and produce a swing in demand for the fuel itself followed by a shortage of the components necessary to use that fuel efficiently itself followed or *proceeded by a shortage of the fuel* itself etc. etc.

The answer lies we believe in two factors, both of which lie at the economic/technical interface, and it is in effect these that we offer for perusal and comment to this IAEE Conference.

If the Government cannot control fuel prices, it can, we would argue, and indeed has been shown to be able to have major effects on the price margins between various fuels. This is of critical importance in the United Kingdom which is a multifuel economy. For it is in effect the margins between the fuels, and the *anticipated future trends of those* margins that determine individual (and corporate) decisions on particular fuel use. If the margins change too widely, and too quickly then there is a large movement of 'use' from one fuel to another. If the margins change slowly and over a longer time this fuel use change can be controlled. This one fact is supported or complicated by another namely the 'time-availability' for change. This latter may be explained best by an example, namely, if an industry has just committed itself to a new electric furnace and indeed installed one, it would take an enormous swing of *marginal price to persuade* that industry to change that furnace in the short term. If however the same industry were only considering the question of furnace change, then a much smaller change in price margin could cause them to take the same decision.

The argument is sometimes put another way. If one decides that we have a future then that future is concerned with electricity. The further one looks ahead the larger the role that electricity would play. Almost everything that we wish to do to conserve energy in our buildings increases our dependence on electricity. Therefore a planned process of energy conservation, could be regarded as being concerned with the times scale at which we will move sectors of our buildings over to electrical usage. It would seem therefore that a better knowledge of the time scale potential for change of fuel use in our buildings is an important element in this process. This potential/opportunity for change can be regarded as occurring at three scales, namely,

Individual buildings
Urban areas
Regional areas.

Individual Buildings

It is now common knowledge that whereas the fabric of a building lasts for a hundred years, the system of heating/cooling within a building lasts for a much shorter time perhaps fifteen to twenty years.

We actually know a lot about the fabric age of our building stock, and also a great deal about how to improve that fabric. Improving the fabric does of course improve the potential for energy saving such that the return on investment tends to be longer than people have thought, as to fully realise the rate of return, the heating *system itself also needs to* be improved.

Whereas a long steady programme of improvement of our building fabrics is necessary to conserve energy, both because of the number of buildings that we have, and because of the problems associated with the building industry, this for the reasons given above is not enough.

It is important to know what the age is of the heating system when the fabric is being improved, or whether there is a system installed in the building at all. In terms of 'return' it is better if the fabric and the system are improved together as the potential *for energy saving* can be realised much more rapidly than if the fabric is altered first and the system altered ten years later. Clearly also the fabric must be improved first otherwise the improved system will be of the wrong size (e.g. the GLC problem). Now data is becoming available (Ref. 11) on the numbers, types and ages of heating systems in our buildings, and by 'using' the fuel margins it is possible to determine in which fuel they will occur. The problems are twofold. First, the data is only *beginning* to appear, such that if this idea was felt to be valuable, it would be necessary to put considerably more time and effort into collecting this data. Secondly, the analysis and predictions necessary following from the accumulation of this data are not purely technical in their nature and the economic skills necessary to parallel the technical predictions are not those normally found in the building industry. An example of such data is that the domestic night storage heaters installed fifteen years ago which needed a lunch-time 'boost' are now nearing the end of their lives and are being thrown out. These systems are currently (because of the fuel price margins) being replaced by *gas systems.* Thus the lunch-time 'valley' be taken up by an increased gas load in our buildings, should new electrical tariffs be introduced to use up this peak or should the DeNorvic Pumped Scheme be used to 'take-up' this valley. Opportunity with many options exists ... the households be encouraged to go back to coal.

District mains

It has been said that some of our district electrical mains are ageing and up to capacity, that we are for example currently depending on copper put in the ground by a previous generation. It is also argued that similarly some of our gas district mains are coming up to capacity. Again marginal changes in fuel prices can either impose or relieve additional strains on these mains. Marginal changes in fuel price which result as the opportunity occurs in heating appliances being changed in individual houses will themselves in turn have a 'knock-on effect' on the mains. An interesting conundrum in which the real costs/benefits of, for example, district heating have their place. As once knowing the opportunities for change in the heating systems in any area, and knowing the capacity of the mains in that area, it is possible to present the economics of district heating in a very different light than at present.

Urban/Regional Scale

The biggest opportunity for change occurs when either a local or the national authority decides to redevelop an area, for example the inner city areas. Such re-development necessitates the taking of large numbers of energy/fuel decisions. Knowing the time scale for such developments (and even if all the lights are green it takes between five and seven years to get a building of any magnitude off the ground) it becomes possible to significantly alter the fuel mix in a particular location. For example the introduction of an MD tariff for Commercial Buildings in Eire 're-altered' electricity for industrial use elsewhere.

The purpose of this paper has been to encourage those with skills not generally available in the building industry but in our view very necessary to it to consider the role energy conservation in buildings associated with a process of inter-fuel substitution may play in maintaining the flexibility of the fuels so necessary for industrial and transportation development. Such views if accepted of course require new multi-disciplinary and we suspect fairly expensive and long term studies to be carried out. The problem is however tractable and the rewards in our view worthwhile.

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Managing the Engineer Function

A Case for In-House Service in Small Hospitals

ORLAND O. HARTFORD

Introduction

My paper was prompted while interviewing a man for a job in my department. The man had worked for two or three years in another hospital maintenance department. When I questioned him about mechanical and electrical repairs on sterilizers, he stated, "All I did was fix leaks and things like that. The important things were repaired by a man from the company. They wouldn't let us touch them." A little exaggerated no doubt, but there appears to have been an element of truth.

Since the above incident took place, I have taken advantage of every opportunity to encourage other Engineers to take stock of their operation, to look at their in-service education and training programmes, to ask themselves "Could this man have come from my hospital?" If we honestly answer that question that "he may have", "it is possible", or "I am not certain", then you are the man to whom I direct my remarks. If your answer is an immediate "no" or "impossible", then you are either a little dishonest or doing a superb job. I will let you decide which.

Since in-house service is dependant entirely upon you, your expertise and the competence of your staff, it is important that we begin with you.

Role of the Hospital Engineer

Since the majority of hospitals are small (300 beds or less), what I have to say will apply to most Hospital Engineers. I use the term Hospital Engineer, but he is more likely to be known as the Director of Engineering, Plant Superintendant, Chief Engineer or any one of a dozen other titles. It really doesn't matter what we call you, the important thing is that you measure up to the job. Your duties and responsibilities vary greatly according to established traditions, your attitude, proven ability and the past performance of either you or your predecessor.

While a number of basic responsibilities fall upon each of us, such as the operation of the power plant, mechanical and electrical services and utilities, most will have a wide range of other responsibilities from groundskeeping to painting and the *maintenance of almost every piece of* equipment in the building. I like to see a broad scope and a heavy responsibility placed on you. This is as it should be. No one else is better qualified to look after more areas of responsibility than you. If you don't have all this responsibility now, I suggest you try to obtain more.

Unique Individual

Your services are required by every other department and every area in the Hospital. Usually you are a resourceful person when other departments want to make any changes, additions, alterations, buy new equipment or just improve their lighting or decor. *You are the* In-House Consultant, the environmental manager, the energy conservationist, the fire and safety officer, a key person in relation to the ultimate goal — *Patient Care.*

I want you to realise that your position is unique. You control the lives of everyone in your hospital more than you know. All of the senses are controlled to a greater or lesser degree by you. For example, the painting scheme, selected by you, controls what they see (*sight*). *Noise, the lack of it* or pollution by it, is your responsibility. *Temperature,* too hot, too cold or just right, you get the credit or the blame (seldom the credit, but always the blame). If there is any doubt *about who controls* the *sense of smell* in your hospital let me remind you. If there is an odour like smoke the word goes out, "Call the Engineer". If there is a smell of gas or oil, "Call the Engineer". If the paint smells too much, "Call the Engineer". If the ventilating system is not working properly and some of those other odours seem to be overwhelming, "Call the Engineer". How you respond to these and other calls will determine the *taste* you will leave in the minds of patients, visitors and *staff.* Yes, whether you are aware or not, you control all of the senses, sight, sound, touch, smell and taste.

Your influence and your opportunities are unlimited. You should be an example in leadership. A dedicated individual with a positive attitude. Your opportunities are restricted only by your imagination. I can think of no better group of people from which to draw Administrators, even the Chief Executive Officer. Your experience with the total operation of the Hospital, with a little educational training, make you an ideal candidate. Think about that for a moment and I am sure you will agree.

The Engineer — a Teacher

In order to have a good In-House Service programme we must learn to teach, and teach well. To be a teacher we must first be a good student, learning new techniques, methods, new skills and keeping abreast of new products, be receptive to new ideas and willing to implement new pro*grammes, to* take advantage of new technology and other changes. You need to teach that your hospital, and in particular your department, is a good place to work and you need to make *sure it is. No one should ever* be bored with the diversity of jobs that must be carried out by a man in the Maintenance Department of a small hospital. Teach and train individuals to think, to fix and repair, and to accept responsibility. Take time and be an inspiration to your men. Our most important resource is our human resource. Without the full support of these people we will accomplish very little. I like the slogan of one of our local steel companies that advertises "Our *Product is* Steel. But our Strength is People". I would like to paraphrase this for the Hospital Engineering Department. I like, "Our Product is Service. But our Strength is People." *Be good to them.*

Outside Service

Outside service, either by service contract or *time and material,* has become very popular and though it is very popular it just does not help you or your staff to grow and expand your knowledge. It will give no feeling of satisfaction or accomplishment to you or your staff, but it is easy and it only costs money. It may even be a means of taking care of many of your problems and not having to answer for them. It may appear to be the solution for an overworked, understaffed Engineering Department or Hospital Engineer and may be justified on that basis but should not be.

Service is often given to outside firms because Administrators are impressed with a Sales Engineer's professional presentation and seldom know that the man who comes to carry out the actual service may be an incompetent, with much less training and skill than a member of his own staff. You need to be especially wary of the companies selling service that only want to talk to the Administrator. Often salesmen have a great deal of trouble trying to justify *outside service* when dealing with someone who knows the equipment. They much prefer dealing with an Administrator, Purchasing Agent or other Administrative Executive.

The major objection *to all outside* services, as far as I am concerned, is the exorbitant cost. Secondly, frequent policing is always required to ensure you are actually getting the service that you pay for. Security can be a problem because you seldom get the same serviceman twice. Service Contract Salesmen, I have found, are like insurance salesmen. They play on the old fear approach. Some outside service and some service contracts are justified but certainly not to the extent that some Engineers have *gone.* Some manufacturers like to train in-house personnel and encourage self-service. Then too, there are occasionally, circumstances that make it economical and wise to use outside service. You *have to* weigh the facts and decide, but while you are weighing the facts let's talk about what you offer with In-House Service.

In-House Service, The Best For Less

There are a number of positive things that in-house personnel can offer. Here is a list of some that come to mind:

Service for a nominal charge;

Instant service (when conditions warrant);

Repair service during evening and night hours within minutes;

Preventative maintenance during off hours at regular rates;

A co-ordinating service (when several trades are involved);

A consulting service;

Estimating and planning assistance;

By-law and code information service;
Fire Protection service;
Fire instruction and training;
Colour co-ordination assistance;
Security assistance.

The thing which comes to mind most quickly when we talk about in-house service is usually the jobs and equipment that require an experienced tradesman, technician, technologist or engineer. Depending upon your attitude, your desire and willingness to tackle difficult tasks, the list of items requiring experts can be extremely long or reasonably short. For some hospitals the list is so long that it appears the maintenance/engineering department can't do anything. They are just there for others to tell their troubles to, and to call someone from outside to fix and repair everything but the mop handles and the wringers. I encourage every hospital engineer to take an in depth look at their operation. See if you can be doing more and contracting less.

A national magazine looking into problems confronting institutional and industrial maintenance departments, conducted a survey which revealed that 44% of department heads felt they lacked skilled staff. If you fall into that category, then I suggest you train your staff, rather than look to an outside service agency for help.

Here are a few in-house services that we perform in our hospital and in almost every instance we have trained our people to perform these skilled tests:

Refrigeration repairs
Air conditioning repairs
Sterilizers and stills
Operating lights and tables
Boilers and controls
Fire alarm systems
Laundry equipment.

Some hospitals contract things out that require much less skill. For instance, window cleaning, and care of lawns and gardens. It appears at times we would rather pay more and make our job easier, have less responsibility. It annoys me when I am confronted with professional men, "Hospital Engineers" that are not carrying a good measure of responsibility, when they should. When I discuss fellow Engineers with hospital people, I like to be able to brag a little about our accomplishments. That is much nicer that having to listen to someone complain, or belittle a fellow engineer, however justifiable it may be.

Often a shortage of staff is a deterent to more and perhaps better in-house service. This should not be, for it is the duty of every hospital engineer to make valid and appropriate presentations to management to obtain sufficient staff to meet his needs both present and future. I have found that if we do our homework in this regard they are willing to co-operate.

Cost Containment through In-House Service

There is no better way to control and even reduce costs than by doing it ourselves. A good example of the economics of In-House Service is found in servicing refrigeration equipment. I have seen a good mechanic spend eight hours making a repair on a piece of equipment that might have been repaired in just three hours by a refrigeration technician from an outside service company. At first this might appear costly but it is not so. Three hours service at local rates would cost a minimum of $75 while eight hours of the mechanics time at $8 an hour will still only be $64. The very next day our man might save over half that cost if the same problem occurred on another machine of the same. It happens when you have ten or twelve units the same, as many of us do. This is perhaps a little over simplified, but it works. We need only a little imagination to see other areas where this same principle can be applied. This is one of those areas where you the "Hospital Engineer" can take advantage to teach the members of your staff.

Another good example of the economics and advantage of In-House Service can be found when we consider the number of pieces of equipment for which local service is not available. My hospital is located one-hundred and thirty-five miles from Metropolitan Toronto from where much of our service would have to come. I think particularly of sterilizers and laundry equipment. The costs would be very high and the downtime is prohibitive.

Preventative Maintenance — Essential Teaching Aid

A good preventative maintenance system can help you accomplish your job and teach and train your men at the same time. The system I have is simple. It requires a bit of care but it really works. It is a three-card system custom designed by Acme Seeley. Here is how it works. The first card (*Figure 1*) is the Equipment Record Card.

This first card is the master record and must not leave the file under any circumstance. Pertinent information regarding make, model, serial number and maintenance requirements are recorded here, along with the equipment number (B-34) assigned to and labelled on the machine.

Figure 1

EQUIPMENT RECORD

MFG NAME			MFG ORDER NO	SERIAL NO	9706
EQUIP NO	B-24	TYPE OR MODEL 561-1	DRAWING NO	OUR PO NO	5406
VENDOR	Webster Air Equipment Ltd London	APPROP NO Equip 167232		SHOP ORDER NO	
EQUIPMENT COST	$1035.34	INSTALLATION COST	DATE INSTALLED June 73	LOCATION	Boiler Room
EQUIPMENT DESCRIPTION	Webster Air Compressor and Tank Assembly, complete				

MAINTENANCE REQUIREMENTS	ELECTRICAL EQUIPMENT				
1. Manually operate safety valves	EQUIP	Motor received Jan 13 1975			
2. Clean and replace air cleaner pads	MAKE	General Electric			
3. Inspect valves	SERIAL NO	J K 3335 Model 1879541			
4. Check and Tighten all belts	TYPE FRAME	K		184T	
5. Check "V" belts and replace	VOLTAGE	575			
	PHASE				
	HP				
INSPECTION REQUIREMENTS	RPM				
6. Blow our electric motor	DRIVE	3			
7. Dismantle, clean, varnish etc	CIRCUIT				
all moving parts for wear	DATE INSTALLED	Jan 73			April16
9. Check operation of compressor	COST	160.00			
10. Crank case checked weekly					
11. Electrician to repack motor bearings					

Figure 2

HISTORY OF REPAIRS

DATE	W O NO	DESCRIPTION OF REPAIRS	DOWN TIME	MAN HOURS	MATERIAL COST	
April	18 1974	6 only filters			6	28
June	14 =974	1 only WO2-3 Filter			14.	10
		1 only W -19 3 Regulator			11	50
		1 only b 5ol guage			4	00
		Postage on above items $.75 PST 7%			2	33
Jan 3	1975	1 only GE HP 1800 RPN Electic motor 575 volts frame 184r			160	00
March	25 '75	1 only GE HP 1800 RPN Electic Motor 575 volts frame			162	00
~~March~~	~~26 '75~~	~~12 only Felt intake filters~~			~~6~~	~~02~~
February 79		Service and material to repair GE motor			140	00

TAG NO	DESCRIPTION	WEEKLY CONTROL	MONTHLY INSPECTION CONTROL
B 24	Webster Air compressor Model 651-1		JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

A second card (*Figure 2*), History of Repairs is filed with the first card and is used as the title suggests. A quick glance at the recorded expenses on this card indicates if you should be looking at replacing this piece of equipment or if abnormal service or repair parts are being used. There is provision for down time and man hours but I have not kept this accurate a record.

Again this card is identified by the equipment number (B-34). The bottom line on this card is exposed in the filing drawer and is used to schedule the maintenance on the machine. Note the section on weekly control and the one for monthly inspection control. Plastic coloured and sliding tabs are used to indicate and schedule the preventative maintenance service.

While these two cards remain in the office and in the file, a third card (*Figure 3*) is given each week, month, quarter, etc., as required, to the maintenance mechanic or tradesman for the work to be carried out. It is entitled "Preventative Maintenance Work Order" and is printed on both sides. On the reverse side, the clerk issuing the card shows the date of the issue and indicates the work items to be carried out during this inspection and service. The person inspecting the equipment signs the card, shows the date the work was completed and adds any comments necessary under the heading "special remarks". There is provision here for him to record the *time spent on each service.* When repairs or service is necessary between regular preventative maintenance service the mechanic requests the card and makes the appropriate entry with as much detail as possible.

The system is relatively simple but it works well. It requires a consistent effort but is not laborious. A company selling computer maintenance scheduling service once looked at this system in detail and advised they could offer very little more without considerably increasing the cost and labour required. More recently a computer program analyst *against putting it on computer, too* costly and labour intensive. This system has been in use for 14 years and presently has 3000 items recorded.

Conclusion

Will you take a good look at your operation and see if there are services

Figure 3

MACHINE NO	MACHINE NAME	LOCATION	DESCRIPTION
B-34	Webster Air Compressor	Boiler Room	Model 651-1 Serial 9706

CHECK INSPECTIONS REPORTED ON REVERSE

NO	WORK TO BE DONE	A	A	S	Q	M	W
1	Manually operate safety valves					X	
2	Clean and replace air cleaner pads					X	
3	Inspect valves	X					
4	Check and tighten all belts				X		
5	Check "V"belts and replace, if necessary	X					
6	Blow out electric motor	X					
7	Dismantle clean ,varnish etc electric motor	X					
8	Check parts and other moving parts for wear	X					
9	Check operation of compressor	X					
10	Check crankcase					X	
11	Electrician to repack motor bearings			X			
12	Change oil				X		
	INSPECTIONS:--ANNUAL - June						
	QUARTERLY - March, June, September December						

AVAILABILITY	CODE
SUNDAY	A 1st 6 Mos
MONDAY	A 2nd 6 Mos
TUESDAY	S Semi Ann.
WEDNESDAY	Q Quarterly
THURSDAY	M Monthly
FRIDAY	W Weekly
SATURDAY	

844 0080 6 1M AE 6/75

PREVENTIVE MAINTENANCE WORK ORDER

being performed by outside service agencies that you could take over and look after with In-house personnel? If outside service is being considered in a particular area in your hospital, determine ways in which you could look after it, if given the opportunity. Then make appropriate plans and presentations so that your administration or board will be anxious to give you that opportunity.

As we teach and train our own staff we create an atmosphere of respect and mutual understanding, co-operation and high moral. Trained skilled maintenance men are an important asset. They know it and feel good about it. I try to engender the feeling that our hospital is like a ship at sea, and everyone is depending on the maintenance and engineering department to take them safely from harbour to harbour. We must operate, maintain and repair every piece of equipment with our own staff and with our own resources.

I am firmly convinced the next decade will take us in the direction of increased in-house service and more self-reliance. I foresee challenging and exciting times ahead. We need to get excited about them for never was there a time when men of good judgement and common sense — The Hospital Engineers — were more needed than they are right now. The captain may steer the ship, he may have command, but without you and your staff *it just won't go.*

The Veterans Administration, whose central office is in Washington DC, operates 172 Medical Centres, 220 Out-Patient Clinics, 91 Nursing Home Bed Care Units, 16 Domiciliary, 18 Spinal Cord Injury Centres, 2 Supply Depots and supporting administrative Regional Offices, and Data Processing Centres.

This paper was given at the 6th International Congress, held in Washington in 1980.

Clinical Engineering in the Veterans Administration

ARNOLD B. BIERENBAUM

Introduction

The Veterans Administration (VA) has extensive experience in Clinical Engineering Management. Much has been accomplished but many challenges remain. Certain trends suggest directions for Clinical Engineering in the future.

Historical Perspective

The VA's Clinical Engineering programme was established in 1972. This decision was based both on the increasing acquisition of medical instrumentation, and on the need to effectively maintain and safely use medical equipment. As the initial step, a graduate engineering based programme was established for several specific reasons. First, medical device technology was accurately forecasted to increase complexity and magnitude. Second, a graduate engineering based programme was the most readily acceptable to medical practitioners, and therefore, the Clinical Engineering programme would develop more rapidly. Third, many prestigious Engineering Colleges and Universities were graduating Clinical Engineers; organisations with well-developed programmes would attract better graduates. Finally, Clinical Engineering was an emerging field and the VA had both the need and opportunity to be a pioneer and a major training resource for this allied health discipline.

VA affiliations with Universities and Colleges were established, offering degrees from the Associate to the Masters level. Programme directives were developed and clinical engineers were hired at the VA. A continuing education programme to upgrade skills of existing technicians was initiated.

Scope of the programme

The VA's clinical engineering programme capabilities vary widely among its 172 medical centres. However, all VA medical centres are required to provide the following activities and services:

Conduct an electrical safety programme to initially inspect all medical equipment prior to clinical use, and conduct reinspections based upon frequency and location of equipment use;

Review all medical equipment acquisitions prospectively to assure compliance with electrical safety requirements, compatibility with existing space and utility systems, and conformity with manufacturers, medical and FDA standards;

Perform preventive maintenance consistent with equipment usage and JCAH requirements;

Provide technical assistance and advise physicians, nurses and administrators on the cost, effectiveness, installation, application, safety and replacement of medical equipment.

Clinical Engineering programmes at university affiliated medical centres usually provide the following additional activities and services:

Provide continuing education for medical personnel in equipment usage;

Conduct, collaborate and support research activities;

Participate in safety, Intensive Care Unit, infection control and equipment committees;

Serve as the technology representative for the medical centre.

Resources assigned to clinical engineering programmes at 172 medical centres include over 80 engineers and 600 technicians; 162 technicians are certified as Biomedical Engineering Technicians (BMETs) by VA or the Certification Commission.

The Clinical Engineering unit reports to the Medical Centre Director through the Medical Centre's Chief Engineer. National resources are provided to assist each medical centre's Clinical Engineering programme. The Office of the Chief, Biomedical Engineering, a major division reporting to the VA's Director, Engineering Services, provides overall programme direction and centralised management. System trends are identified and corrective actions initiated. Technical support is provided and effectiveness is evaluated.

Supporting this office are the Engineering Training Centre at the North Little Rock, VA Medical Centre and the Engineering Service Centre, at the St. Louis VA Medical Centre. The Engineering Training Centre is primarily responsible for the continuing education of the BMETs, administers the BMET certification programme, and also co-ordinates the VA's excess spare parts exchange programme.

The Engineering Service Centre provides technical information and service manuals to medical centres upon request. It provides consultation on difficult troubleshooting and technical problems to each clinical engineering unit. The Engineering Service Centre is now developing a medical equipment reporting system to identify medical device usage and performance trends, as well as safety characteristics. Conversion of each Clinical Engineering Programme's technical library to microfiche is also in progress.

Accomplishments

The Clinical Engineering Programme at the medical centre level has improved the delivery of health care. Such achievements have been made in three general areas: equipment, facilities, and staffing. Significant improvements have also been made in acquisition, installation, use, preventive maintenance, safety, and disposal of equipment.

All medical devices are inspected for safety and usually for efficacy before use. Devices now receive routine preventive maintenance consistent with JCAH requirements and good engineering practice. Competent technical personnel now review equipment acquisition requests to ensure compliance with published VA and FDA standards. Advice for medical personnel about the desirability of an equipment purchase and its suitability for the intended application is provided.

The Clinical Engineering Unit is involved with the facility's activities for planning and supervising the installation of equipment. Modifications are provided to accommodate specialised equipment. Equipment is now installed faster and used better. The Clinical Engineering Unit often assists in the space design of medical care units. Clinical engineering personnel are in an ideal position to translate medical needs into technical specifications. This involvement usually results in close collaboration between medical and administrative personnel.

An effective Clinical Engineering unit improves the communication between the hospital's administrative and medical staffs. Clinical Engineers and BMETs are usually involved in continuing education activities. They provide required electrical safety training, and conduct formal and ad hoc education on device utilisation. Technical requirements are determined for non-medical, as well as medical devices. Medical personnel are assisted in proper measurement techniques and device limitations. Clinical Engineering programme personnel are not viewed as important participants in decision-making situations where technology is involved; many serve on safety, infection control, ICUs and equipment committees.

The Clinical Engineering programme at the national level has made major accomplishments in better defining and addressing the practice of clinical engineering. VA preventative maintenance guides for medical devices were developed and published in 1976. Continuing education programmes and a BMET Certification programme were developed to improve staff capabilities. A major development was the acquisition of documentation and service manuals from manufacturers. This activity is continuing and much progress has been made. A specification defining acceptable levels of documentation has been published. These manuals are being made available to the VA and private institutions by manufacturers as a result. The concept of using clinical engineers in a medical environment has been successfully demonstrated in the VA.

Costs

Extensive data to identify the costs associated with the Clinical Engineering Programme have been collected since 1977. The Federal Government's Cost Comparison Handbook was used to calculate costs, and while analysis is still proceeding, certain trends are apparent.

The acquisition cost of VA medical equipment was $553 million according to the most recent and complete data from 1978. Fifteen percent of the equipment by cost was maintained by contract. Eighty-five percent was maintained by Clinical Engineering staff assisted by the manufacturer.

The VA's 1978 Maintenance Costs are described in *Table 1* for use by other Clinical Engineering Programmes.

TABLE I
1978 Maintenance Cost Distributions

Cost Item	Cost in Millions of Dollars	% of Total Cost
Salaries	14.2	47
Service Contracts	6.3	21
Supplemental Manufacturer Services	5.0	16
Spare Parts	3.7	12
Space	0.6	2
Test Equipment	0.5	1.4
Training	0.2	0.6

Relative costs for staff provided services compared with contractual services, the ratio of maintenance costs to acquisition cost of equipment, shown in Table II.

Service contracts provide only for maintenance and repair of equipment. Staff services provide for maintenance and repair of equipment, as well as assistance in the acquisition, installation, inspection and safety of the equipment, training of medical personnel, technical support to

TABLE II
1978 Maintenance Cost Compared to Equipment Acquisition Cost

Mode of Maintenance	Contract Cost in Millions	Cost of Associated Equipment in Millions	Maintenance Cost as a percent of Acquisition Cost
Contract	6.3	84	7.5
Inhouse	24.2	469	4.1
Total	30.5	553	5.5

clinical and research activities, and improved attitudes and communication among medical and administrative staffs. Throughout the VA, equipment maintenance and these other services provided by VA Clinical Engineering staff cost 45% less than contracted services for maintenance and repair alone.

Effects of Facility Size

Current cost data indicate significant differences between large and small VA Medical Centres. VA Medical Centres with more than $3 million of medical equipment usually have a clinical engineer and at least two technicians. Although the number of technicians varies widely among the medical centres, one technician is usually provided to support $800,000 worth of equipment. Larger medical centres provide more extensive services at a proportionately lower cost than smaller medical centres. Larger medical centres also have a wider range of staff skills that provide for development of special expertise and cross-training opportunities. Larger medical centres are usually located at metropolitan areas; thus offering better training opportunities, improved availability of spare parts, and a larger pool of applicants for recruitment. Larger medical centres also have more sophisticated equipment.

Smaller medical centres are usually far from urban centres. While they do not have large amounts of more sophisticated equipment, they do have a wide diversity of equipment and must meet all requirements and standards. Smaller medical centres do not require a large clinical engineering staff but do require their personnel to provide a wide range of skills. Small medical centres frequently have difficulty obtaining services, spare parts, and training from manufacturers. At smaller medical centres, costs are proportionately higher due to the basic fixed investment that is required to provide space and test equipment. However, small VA Medical Centres probably do not have many of the problems of similar sized private hospitals because assistance is available from larger VA Medical Centres and at the national level. Smaller private hospitals would probably benefit by initially sharing services or contracting services for clinical engineering activities. After experience is gained, the scope of staff activities can be better defined.

Emerging Trends

Medical instrumentation is increasing in complexity and magnitude. Its increasing role is certain in providing future health care. Medical equipment is also a major driving force in increasing health care costs. Major accreditation organisations are requiring proper medical device maintenance and safety, and their documentation requirements have significantly increased. Litigation involving questionable maintenance and safety of medical equipment are on the rise. Inflationary pressures and government concerns over increasing health care costs demand cost containment.

These trends clearly indicate the need for better management of medical equipment. Hospitals must properly select, operate, maintain and assure the safety of their medical equipment. They will require professional engineering support to assist in better defining and managing these technological problems if they are to achieve and deliver effective modern health care.

Clinical Engineering activities provide the best approach to addressing the dramatic increase in the magnitude and complexity of modern medical technology. Clinical Engineering programmes must be determined by each hospital's needs. In developing a Clinical Engineering programme, key medical and administrative personnel must be aware of the problems involved, and understand them. They must be able to recruit and retain competent people, and provide extensive continuing education. Test equipment, spare parts, and space will be needed. Sharing services or using contractual services must be based upon meeting medical needs cost effectively.

Future Directions

Experience since 1972 focuses attention on several areas that require further development. These include:

- ☐ Developing an equipment reporting system to help indentify system wide variations in equipment performance and safety, and better correlate equipment and staff utilisation.
- ☐ Developing effectiveness measures of services provided, related to costs.
- ☐ Determining staffing guidelines for various sized medical centres and programme complexities.
- ☐ Identifying key maintenance criteria for better allocation of resources.
- ☐ Improving user education programmes for better use and acquisition of equipment.
- ☐ Identifying critical success factors for programme management.
- ☐ Developing improved spare parts inventory control and distribution methods.
- ☐ Sharing management and technical information and establishing programme models among various VA Medical Centres.

To achieve these tasks would permit the VA to significantly contribute to and improve the use and management of medical equipment technology, and provide further needed information and assistance to private institutions.

Conclusions

The VA experience has demonstrated that a well managed clinical engineering programme can significantly improve the selection, installation, operation, maintenance and safety of medical devices. Better use of medical technology has been delivered cost effectively by using competent Clinical Engineers and BMETs. VA patients, medical and administrative personnel have benefitted from the programme's achievements. Clinical Engineering programme results closely depend upon management's ability to selectively address the key issues of new technology, cost-effectiveness and staff capabilities.

Sommaires en Français

Conservation de l'Energie — Crise ou Conspiration?

Professeur Patrick O'Sullivan et Frederic A Romig

Cet article examine quelques unes des principales issues de remplacement des combustibles dans les immeubles.

Premièrement, il examine les tendances passées en général. Celles-ci montrent comment la consommation de l'énergie totale a largement augmenté dans certains pays depuis 1950 pendant que dans d'autres pays elle a beaucoup moins augmenté. Comment les pays de l'Europe de l'Ouest ont remplacé le charbon par l'huile et le gaz dans les immeubles durant les 20 dernières années. Le combustible mélangé produit pour 1978 dans les pays de l'Europe de l'Ouest est donné. Ceci est comparé avec les résultats du combustible mélangé dans quatre pays de l'Europe de l'Est en 1976.

Deuxièment, l'article cite un autre pays, le Royaume Uni, comme un exemple de ce qui peut-être fait dans les autres pays. Il montre comment le combustible a été remplacé par d'autres, dans les immeubles du Royaume Uni depuis 1950. Il donne une coupure détaillée de la consommation d'énergie en 1978 et attire l'attention sur le fait que plus de la moitié de l'energie de la Nation va aux agglomérations urbaines.

Troisiément, il examine quelques unes des issues spécifiques concernant le remplacement des combustible dans les immeubles, à l'avenir. Il explique comment les immeubles peuvent être évalués, dessinés et dirigés de telles façons que différents combustibles y soient utilisés et examine quelles seront les meilleures périodes pour leurs substitutions. *Page 9*

Service Intérieur 'Mieux pour moins cher'

Orland O Hartford, Canada

Cet article commence par examiner le rôle de l'ingénieur chargé de la responsabilité de l'ensemble du matériel de Service dans un petit hôpital (300 lits ou moins), puis discuter l'effet de sa responsabilité sur les utilisateurs: malades et personnel.

L'auteur soutient que, ou le matériel de service est affecté par les fournisseurs extérieurs dans les lieux du personnel interne, plus les prix pourrait monter, que l'homme qui actuellement s'occupe du Service peut-être moins compétent que votre propre personnel. 'Faire la police' est nécessaire pour s'assurer que le service marche correctement et rarement vous aimez continuer à cause du changement de personnel dans le service.

Il a été suggéré que quand vous croyez que vous manquez de personnel formé pour vous occupez de la maintenance interne, l'ingénieur de l'hôpital devrait adopter un role de professeur et former son personnel.

Le Service intérieur, pense l'auteur, peut démontrer le coût effectif et au travers, l'ingénieur de l'hôpital peut atteindre un sentiment de 'talents supérieurs' et sa maintenance du personnel peut expérimenter de meilleurs satisfaction au travail. *Page 17*

La Mécanique Clinique dans l'Administration des Vétérans

Arnold B Bierenbuum (USA)

L'auteur explique que la décision d'établir un programme de mécanique clinique en 1972 était basé sur l'accroissante acquisition des instruments médicaux et le besoin de les entretenir, et de s'assurer que cet équipement est utilisé en sûreté.

Pendant des années, l'Administration des Vétérans a développé la principale ressource de formation pour l'Ingénieur de la Clinique.

Les services pourvus par l'Ingénieur de la Clinique inclus l'entretien, la surveillance de la sécurité du systéme électrique, les tests d'acceptation de l'équipement, la compatibilité avec les associations d'équipement, l'entraitement des utilisateurs et les conseils techniques aux personnels des cliniques sur l'efficacité du matériel et leur application, etc....

L'article conclut en attirant l'attention sur le fait que l'instrumentation médicale augmente en volume et complexité, et soutient que les activités des ingénieurs de l'Administration des Vétérans offrent le meilleur moyen de s'assurer que les ressources sont bien utilisées. *Page 21*

Product News

Bed Pan Steriliser

A new brochure describes the advantages of the Stanbridge MW Series bed pan washing machines. The unit, which is said to be easy to use, maintain and clean, has been designed for cramped sluice rooms and measures only 168 cm high x 70 cm wide x 46 cm deep.

High temperature steam generation ensures effective disinfection and optional energy saving kits contribute towards efficient operation.

Further details and copies of the brochure are available from Stanbridge Ltd, 4 Horsley Road, Bromley, Kent. (Tel: 01-464 0521).

New Range of Electric Motors

Rishton-Automation Limited of Haslingden, Lancs., has introduced a range of low-cost AC voltage/speed control 'packages' aimed at substantially reducing the energy costs incurred in the operation of any industrial or domestic installations that require positive, continuous speed regulation.

Based on a range of high-quality, single- and three-phase electric motors, newly introduced into the UK by Rishton-Automation, the voltage control 'packages' provide an answer to the age-old problem of how to match AC induction motors and voltage regulators to give reliable, low-cost speed control.

The new range of motors, manufactured by Kaiser GmbH of West Germany, inlcudes variable speed motors, which are used in the voltage control 'packages'. These motors range from 0.18kW — 7.5kW for three-phase motors and 0.09kW — 0.8kW for single-phase motors. Constant torque speed control can be obtained at de-rated values when used with voltage regulators.

In addition, the range of motors includes standard single- and three-phase models giving up to 18.5kW output, two- and three-speed motors up to 3.7kW, synchronous reluctance motors and double-shafted motors (giving double the motor output). A number of specially-designed motors is also available within the Kaiser range including extremely low noise motors for elevator/lift duties and oil burner motors, with low start current characteristics, for use in those applications requiring speed control up to 3000 rpm.

All motors within the Kaiser range have dynamically-balanced rotors and are capable of operation at 120Hz as standard. Fitted with roller or friction bearings to give smooth, quiet running, the motors use thermal switches or thermistors as a standard feature, providing for high overload capacity. Disc brakes can be supplied for any motor in the range.

The motors are available to IP11 or IP54 standards of protection. A wide variety of mounting configurations are possible, thereby making the motors extremely adaptable for installation purposes.

The introduction of this range of motors means that Rishton-Automation can now provide a control 'package' designed specifically to meet the operational demands of the customer, whether the requirement is for a simple motor/controller or for a more sophisticated programmable system.

Ideal for environmental control applications such as full or partial heating, ventilating and lighting systems, the control 'packages' offer an effective means of reducing energy losses caused through inefficient systems by ensuring maximum compatibility of control unit and motor to give reliable, economic speed control.

Rishton-Automation can also provide control 'packages' that are equally suitable for the many diverse speed control applications that exist throughout industries such as Petrochemicals, Chemicals, Textiles, Food, Brewing, Packaging, Processing, Agriculture and Domestic Appliance manufacture.

For further information contact Rishton-Automation Ltd, Haslingden Lancs. Tel: Rossendale 229435.

The photograph shows the 'component parts' of the low-cost voltage/speed control packages now available from Rishton-Automation Limited.