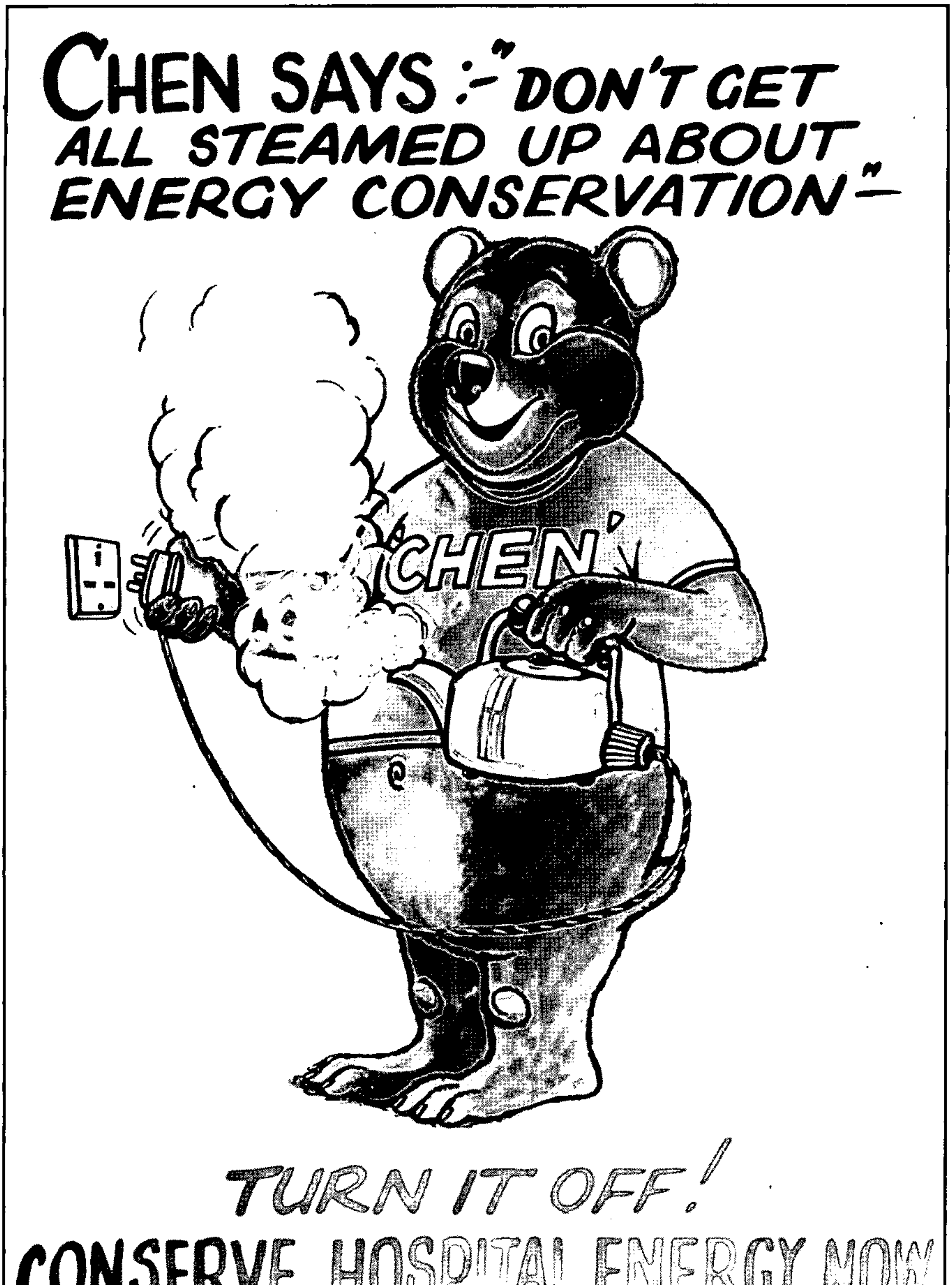
The Journal of the Institute of Hospital Engineering December 1980

HOSPITAL ENGINEERING

International Federation Issue

Hospital Energy Conservation Year
The Competition results



Conservation Year Competition
The Winning Poster

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HOSPITAL ENGINEERING

The Journal of the Institute of Hospital Engineering

International Federation Issue No. 36

I.F.H.E.

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December 1980

Volume 34 No. 10

Front Cover:
Against the backdrop of the winning posters in the Conservation Year Competition, Mr Norman Lamont MP, Parliamentary Under-Secretary of State for Energy talks to Mr Lawrence Turner, President of the Institute (on far right) and Mr John Bolton, Chief of Works, DHSS. See pages 6-9.

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Conservation Year Competition
The Winning Poster

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Conservation Year Competition — Poster Section
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International Federation News

Vincent R Oviatt The New President of IFHE

Mr Vincent Oviatt has succeeded Eduardo Caetano as President of the International Federation. Mr Oviatt is a United States citizen, at present working in Switzerland for the World Health Organisation, where he is Programme Co-ordinator of a special programme on Safety Measures in Microbiology in the Organisation's Division of Communicable Diseases. He is based in Geneva, where he lives with his wife, and is enjoying his time in Europe very much.

Mr Oviatt has been involved with IFHE since he became the American Society of Hospital Engineering's first Council member. He believes the prime value of the Federation, as with any international body, to be the bringing together of people, to discuss common problems, and to share their solutions. This process has already been of clear value over the years, and the more that Mr Oviatt has seen of the Federation, the more he appreciates the benefits it brings.

Until now, he says, the Federation has naturally enough been occupied with the interchange of technical information between relatively developed countries. It is perhaps time for a change of direction, and he hopes to see a greater degree of assistance to the emerging nations — perhaps, initially, in helping them to establish a sound basis for their own national hospital engineering associations.

Within the IFHE he sees his own role as being to build on the foundations that have been successfully laid in the first ten years, and to examine carefully the Federation's administration methods to see that they can continue to function smoothly as the load on them increases.

Mr Oviatt was born, raised and educated in South Dakota, USA. He is the son of a store-keeper, and finding engineering appealing in all its aspects, took a Bachelors Degree in Civil Engineering from the South Dakota State University, and a Masters Degree in Environmental Science from the University of Michigan. He is married, has two sons, and his hobbies include photography, swimming, and (especially since he moved to Switzerland) skiing. He is also deeply involved in church work, and has been an elder in the Presbyterian Church for a long time.

His interest and involvement with hospital engineering began when he was appointed Public Health Engineer to the County Health Department in Hastings, Michigan in 1950.

In 1954 he transferred to the Michigan State Department of Public Health, Lansing, Michigan, as the agency's first Hospital Engineering Consultant.

From 1969 to 1979 Mr Oviatt served as Chief of the Environmental Safety Branch of the National Institutes of Health, US Public Health Service.

His current activities at WHO are centred around the development of laboratory and hospital facilities, equipment and operational procedures related to highly infectious diseases. This work is in co-operation with the developing nations and related research facilities and institutions.

Mr Oviatt is active in professional organisations, having served on several committees of the American Society for Hospital Engineering, and as the Society's first Council member of the International Federation of Hospital Engineering. In the USA he also served as Chairman of the Section of the Environment of the American Public Health Association and president of the Conference of Federal Environmental Engineers. He is a registered professional engineer and the author of 23 technical publications.

Le Nouveau Président

Monsieur Vincent Oviatt a succédé à Eduardo Caetano comme Président de la Fédération Internationale. Citoyen des Etats-Unis, M. Oviatt travaille actuellement en Suisse en qualité de Coordonnateur de Programme à un programme spécial pour les Mesure de Sécurité en Microbiologie au Départment des Maladies Contagieuses de l'Organisation. Il réside avec sa femme à Genève où il se plaît beaucoup trouvant le séjour en Europe agréable.

Les rapports de M. Oviatt avec l'IFHE datent de l'époque où il devint le premier membre du Conseil de la Sociéte américaine du Génie sanitaire des Hôpitaux. Il estime que le mérite essentiel de la Fédération, comme de toute autre association internationale, est premièrement de réunir ses membres pour discuter de problèmes qui leur sont communs et d'en arriver ensemble à leurs solutions. Cette façon de procéder a déjà fait ses preuves depuis des années. Et plus M. Oviatt a vu la Fédération à l'oeuvre, plus il en est venu à apprécier les heureux résultats dont bénéficient ses membres.

A son avis, jusqu'ici, la Fédération s'est naturellement occupée de l'échange de renseignements techniques entre les pays jouissant d'un même degré de développement. Le temps semble mûr à présent, pense-t-il, d'opérer un changement de direction et il espère voir grandir l'aide aux nations émergées en leur accordant peut-être au départ une aide qui leur permattra d'etablir une base solide pour leurs propres associations nationales de Génie sanitaire des Hôpitaux.

Le rôle personnel qui lui incombe au sein de l'IFHE lui paraît être de bâtir sur les bases établies avec succès depuis dix ans; d'étudier sérieusement les méthodes administratives de la Fédération et voir si elles peuvent continuer à foctionner sans heurts vu l'exigence de l'accroissement des charges.

M. Oviatt est né dans le South Dakota aux USA où il a été élevé et a fait ses études. Fils d'un magasinier, attiré par la mécanique et la technique sous toutes leurs formes, il a pris ses titres universitaires d'Ingénieur-Civil à South Dakota State University et une Licence en Science de l'Environnement à l'Université de Michigan. Il est marié et a deux fils. Ses distractins préférées sont la photographie, la natation et, depuis son transfert en Suisse, le ski. Il prend également une part active aux oeuvres de l'Eglise Presbytérienne dont il est membre et Ancien depuis longtemps.

L'intérêt qui le poussa vers le Génie sanitaire se développa avec sa nomination au poste d'Ingénieur-civil au Service de Santé de l'Etat du Michigan, à Hastings, en 1950.

Il passa ensuite en 1954 au Service de la Santé Publique de l'Etat du Michigan, à Lansing, comme premier Ingénieur-Conseil de Génie sanitaire des Hôpitaux.

De 1969 à 1979 il assuma la charge de Directeur de la Sécurité de l'Environnement, Branche de l'Institut national de la Santé du Service d'Hygiène Publique aux USA.

Ses activités actuelles à WHO — World Health Organisation — Organisation Mondiale de la Santé) ont comme objet de développer les installations au laboratoire et l'hôpital, la marche des appareils et du matériel par rapport aux maladies infectieuses graves. Ces travaux sont effectués en coopération avec les nations en voie de développement et reliés aux institutions et établissements de recherche.

M. Oviatt est aussi actif dans le cadre d'organisations professionnelles, ayant été membre de plusieurs Comités de la Société américaine du Génie sanitaire des Hôpitaux et premier membre du Conseil de la Société à la Fédération Internationale du Génie sanitaire des Hôpitaux. Aux USA il a aussi été Président de la Section de l'Environnement des Associations américaines de la Santé Publique et Président de la Conférence Fédérale des Ingénieurs de l'Environnement.

Il est inscrit au Registre des Ingénieurs civils professionnels et il est l'auteur de 23 publications techniques.

Bruno Massara Retires

It was with regret that members of the International Federation of Hospital Engineering heard at the General Meeting in Washington that Cav. Bruno Massara had decided to resign as General Secretary.

Bruno Massara, DrIng was born in Naples in 1923 and graduated in civil engineering at the University of Pisa in 1948. He began his engineering career in Yemen where he was charged by King Ahmed ed-Din to plan water searches in the plain of Tihama which is a district along the coast of the Red Sea.

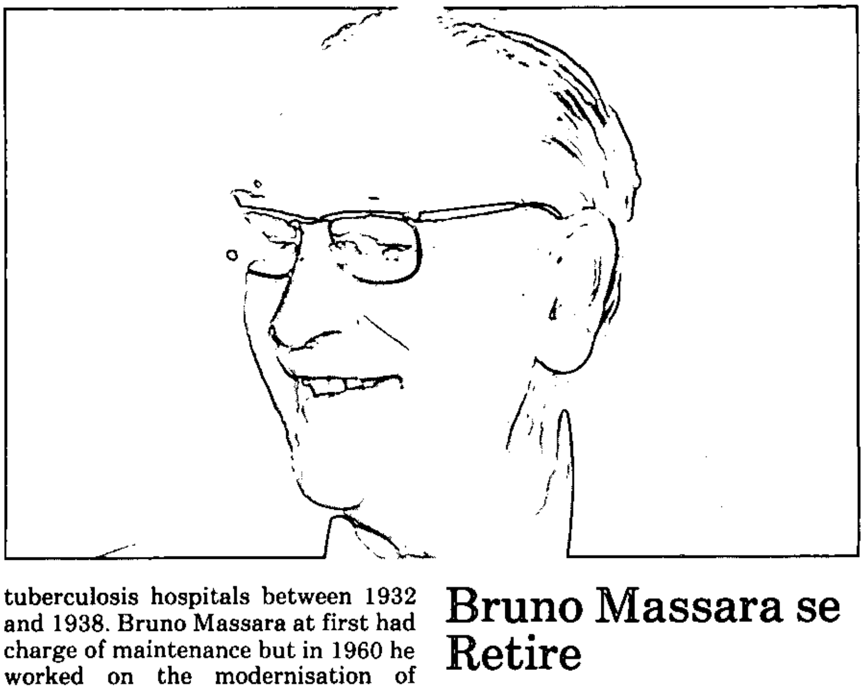
In 1950 he joined the Instituto Nazionale Previdenza Sociale (INPS) which is controlled by the State. The Instituto built about 70 tuberculosis hospitals between 1932 and 1938. Bruno Massara at first had charge of maintenance but in 1960 he worked on the modernisation of hospital installations until in 1979 he became Chief of INSP 4 Technical Services. He retired in February 1980.

He has been a Member of the Federazione Nazionale Tecnici Ospedalieri (FeNATO) from its inception. It was FeNATO which staged the First International Congress of Hospital Engineering in Rome in 1970 which led to the formation of IFHE. It was his charming personality, his ability to co-ordinate and his command of languages which made him the natural choice for the first General Secretary of IFHE.

In 1977 the President of the Italian Republic conferred on him the honour of Commander of the Order of the Merit of the Italian Republic, an honour which must have been richly deserved.

Bruno, as he is affectionately known in at least 32 countries throughout the world, has travelled extensively in the Middle East and Central Asia and has become fond of the Islamic culture, religion and architecture. His main activity now is in politics.

The rapid expansion and success of IFHE over its first ten years stems a great deal from Bruno's influence. He will be sadly missed for sometime and his friends in hospital engineering the world over will wish him good health and happiness in his retirement and success in his future ventures having handed over as General Secretary to Joao Galvao of Portugal.



Bruno Massara se Retire

C'est avec regret que les membres de la Fédération de "Hospital Engineering" ont été informés au cours de l'Assemblée Générale à Washington que Cav. Bruno Massara avait décidé de renoncer à ses fonctions de Secrétaire Générale.

Bruno Massara est né à Naples en 1923 et a obtenu son diplôme d'ingénieur à l'Université de Pise en 1948. Il a commençé sa carrière au Yemen où il était alors chargé par le Roi Ahmed Ed Din d'organiser les sondages aquatiques dans la plaine de Tihama qui longe la Mer Rouge.

En 1950 il rallia l'Instituto Nazionale Previdenza Sociale —INPS) qui est controlé par l'Etat. L'Institut a construit environ 70 hopitaux destinés aux tuberculeux entre 1932 et 38. Bruno Massara a tout d'abord été chargé de leur entretien mais en 1960 il a travaillé à la modernisation du matériel hospitalier et en 1979 il a été nommé Chef des services techniques INSP 4. Il s'est retiré en Févrie 1980.

Il a été membre de la Federatione Nazionale Tecnici Ospedalieri (FeNATO) depuis ses débuts. Ce fut FeNATO qui a organisé le premier Congrès International des Techniques Hospitalières à Rome en 1970, qui a mené par la suite à la création de IFHE.

Ce furent ses qualités toutes personnelles, son habileté à coordonner et sa commande des langues qui ont rendu évident le choix de sa personne pour la nomination de Secrétaire Générale de IFHE.

En 1977 le Président de la République Italienne lui a decerné l'honneur de Commandeur de l'Ordre du Mérit de la Républic Italienne, un honneur dûment gagné.

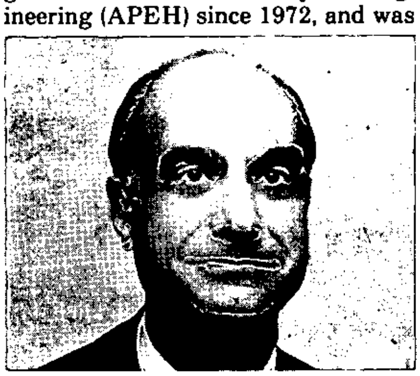
"Bruno" comme il est amicalement connu dans plus de 32 pays à travers le monde, a voyagé intensivement au Moyen Orient et en Asie Centrale. Il est devenu très proche de la culture Islamique ainsi que de sa religion et de son architecture. Dernièrement son activité principale a été d'ordre politique. L'expansion rapide et le succès de IFHE au cours de ses dix premières années d'existence, est dùe en grande partie à l'influence de Bruno. Il sera sincèrement regrétté de tours et à travers l'univers ses amis dans le monde de la technique hospitalière s'unissent pour lui souhaiter santé, bonheur et prospérité dans sa retraite, ainsi que succès pour l'avenir, maintenant qu'il a renonçé au Secrétariat Général en faveur de Joao Galvao de Portugal.

Joao L. Galvao Succeeds Bruno Massara as General Secretary of IFHE

Joao Galvao has become the General Secretary of the IFHE. He is well prepared to take over, as he has spent the last two years assisting Bruno Massara. He was nominated by President Oviatt at the Council Meeting in Washington this year.

He became Vice-Secretary of IFHE at the Amsterdam Council Meeting and assisted President Caetano during his term of office; he is a member of the Organising Committee of Portugal's First National Congress of Hospital Engineering, Architecture and Equipments, to be held in Oporto in 1981.

He has been a member of the Portuguese Association of Hospital Engineering (APEH) since 1972, and was



a member of the Organising Committee of the 5th International Congress of Hospital Engineering held in Lisbon in 1978. A number of IFHE members who attended the Congress and delegates to the Council Meeting may remember his contribution to that successful event.

After obtaining his degrees in mining and civil engineering from the University of Lisbon, Joao Galvao first joined the Shell Royal Dutch group of oil companies, spending some time in the UK — so his links with the British and international engineering world started a long time ago ('Alas' says he 'only too long!).

He fully shares the enthusiasm and determination of the other members of the Board of our Federation and would like to be instrumental in increasing IFHE's resources and activities and furthering its continued expansion.

In this international issue of Hospital Engineering, he takes the opportunity to warmly salute every member of IFHE,whose support and collaboration the Federation relies upon.

Joao L. Galvão succéde à Bruno Massara

Joao Galvão est devenu Secrétaire de la FIIH. Il est bien prépare de succéder à Bruno Massara, parce que il là secondé pendant les deux dernières années de son mandat à fin de contacter les activités liées à son poste. Il s'est ainsi préparé à devenir éven tuellement son successeur, ce qui eut lieu à la Réunion du Conseil à Washington, où le Président Oviatt l'a nommé Secrétaire Général avec l'approbation du Conseil.

Joao Galvão est devenu Vice-Secrétaire de la FIIH lors de la Réunion du Conseil à Amsterdam et de ce fait a secondé le Président Caetano pendant son mandat. Sous la présidence du Premier Congrès National d'Ingénierie, Architecture et Equipments Hospitaliers que l'APEH va tenir à Porto en 1981.

Membre de l'Association Portugaise d'Ingénierie Hospitalière (APEH) depuis 1972, il était un des quatre membres de la Commission d'Organisation du 5ème Congrès de la Fédération Internationale qui s'est tenu au Portugal en 1978 et bien des participants au succès de ce Congrès venus de nombreux pays l'ont connu, et notamment les Dédégués et Associés présents à la Réunion du Conseil de la FIIH à Lisbonne à lacquelle il participa.

Ingénieur de mines et ingénieur civil par l'Université de Lisbonne, Joao Galvão a travailleé avec le groupe de compagnies "Shell — Royal Dutch" dans une première phase de sa vie professionnelle et a vécu quelque temps au Royaume Uni. Aussi son contact avec l'ingénierie britannique et internationale vientil de longue date ("hélas!", dit-il).

Joao Galvão partage à fond l'enthousiasme et la détermination des autres membres de la Direction de notre Fédération et voudrait aider à promouvoir le développement des ressources et des activités de la FIIH qu'il souhaîte voir poursuivre le processus d'expansion dû à prédécesseurs et notamment à Bruno Massara.

Mais il estime absolument nécessaire le soutien et la collaboration de chaque membre de la FIIH où qu'il se trouve: à chacun il est heureux de saluer amicalement depuis cette fenêtre ouverte sur le Monde de l'ingénierie hospitalière qu'est le numéro international de notre "Hospital Engineering".

Institute News

The Institute of Hospital Engineering JCT Contract 1980 and the Engineer Symposium — Wednesday, 18th March 1981

at The Institution of Civil Engineers, Great George Street, Westminster

Most contracts for capital developments in health-care premises in the United Kingdom are entered into on the Joint Contracts Tribunal Forms. The new forms now coming into use, known as JCT 80, have a considerable effect on those who have to determine contracting methods especially where engineering sub-contracts and minor works are involved. The main changes and the effect that they will have will be explained and discussed.

10.00 Coffee
10.30 OFFICIAL OPENING BY LAWRENCE F. TURNER ESQ. BSc CEng FIEE FIHospE FRSA
President of Institute of Hospital Engineering
CHAIRMAN for the day
GEOFFREY TRICKEY ESQ. FRICS ACI Arb
Davis, Belfield and Everest
10.40 AN OUTLINE DESCRIPTION OF JCT 80
Speaker: B. W. EAST ESQ. FRIBA
Regional Works Officer N.E. Thames Regional Health Authority
RIBA representative on the Joint Contract Tribunal
11.45 JCT 80 — THE SUB-CONTRACTOR'S VIEW
Speaker: T. H. MOSS ESQ.
Committee of Association of Specialist Engineering Contractors (CASEC) representative on the Joint Contracts Tribunal
12.45 Lunch
14.15 TO NOMINATE SUB-CONTRACTORS OR NOT
Speaker: B. W. WRIGHT ESQ. FCIBS
President of Heating & Ventilation Contractors' Association
15.15 OPEN FORUM
16.15 Close

REDUCED RATE RAIL FARES AND HOTEL ACCOMMODATION — Substantial rail fare reductions are available for delegates attending this Symposium. The following are examples of second class return fares to London (for first class add 50%): Grampian Region £36; Glamorgan £14; Cornwall £22; Oxfordshire £5. 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 Institute of Hospital Engineering.

N.B. Please note that tickets are available ONLY from The Institute of Hospital Engineering.

To: The Secretary, The Institute of Hospital Engineering, 20 Landport Terrace, Southsea, PO1 2RG.

Please send to me .... ticket(s) for the ONE-DAY SYMPOSIUM on JCT CONTRACT 1980 to be held on Wednesday March 18.
I enclose £............ to cover cost at £24 each (includes Morning Coffee and Lunch). No fees will be returned for cancellations (in writing please) received after midday on Thursday March 12, 1981.

NAME (in capitals please) ....

ADDRESS ....
....
Position ....

Southern Branch 200th Meeting

The Southern Branch recently reached a notable milestone in its existence, when members celebrated the occasion of its 200th meeting.

To mark the event, a special programme was arranged at Herrison Hospital, Dorchester on September 13. Some 30 members and guests attended lunch and guests of honour included Mr. L. Turner (President of the Institute) and Mrs. Turner, Mr. J. Ogg (Consultant Ophthalmologist, Salisbury Health District) and Mr. S. Riisager (District Administrator, West Dorset Health District).

After lunch, Mr. Ogg presented an illustrated talk *The Application of the Laser in the treatment of Eye Disease*, Mr. Ogg started by describing the anatomy of the eye and the means by which optical signals are transmitted to the brain. He explained how the brain interprets or mis-interprets information received from the eye according to preconceived expectations.

It is thus possible for an individual to 'see' things that do not exist, or conversely not to see things which do.

Mr. Ogg then went on to describe the high incidence of eye disease amongst diabetics. He explained that the use of insulin has now prolonged the life expectancy of diabetics so that many more now live to experience a further complication — eye disease. Minute blood vessels at the back of the eye haemorrhage and vision is progressively impaired.

Classical treatment of such disease involves general anaesthesia and surgery, with all the trauma entailed. With the advent of the Medical Laser, patients can now be treated as outpatients. Treatment comprises a number of ½ — ¾ hour sessions under local anaesthesia, where a low-power laser beam is used to seal blood vessels at the back of the eye. Mr. Ogg explained that a number of diseases, other than diabetes, could also be successfully treated by this method.

The talk, and the lively questioning which followed, were chaired by Mr. Turner, and a vote of thanks was proposed by Mr. R. Boyce, Branch Secretary.

After the talk by Mr. Ogg, members and guests were able to see a Medical Laser which had been set up in another room by Mr. D. Levey of Sigmacon Ltd. Individuals were

G. Brookbanks — Chairman Southern Branch. Mr L. Turner — President, Mr J. Ogg — Consultant Opthalmologist.

able to aim the laser beam at a cardboard image which simulated the view of the back of the eye as seen by the comsultant. Firing the laser resulted in small holes being burnt into the cardboard, which graphically illustrated the effectiveness of the technique.

Finally, members and guests attended an informal tea before dispersing.

Midlands Branch

20 January 1981
At the General Hospital at 6.00
Building Regulations
17 February 1981
Selly Oak Hospital — 6.00
Special Mechanics applied to Geriatrics

March 1981
(Venue to be agreed)
Pharmacy Manufacturing Units and Requirements of the Medicines Inspectorate

Mr K. W. Ashton was elected as Chairman of a Sub-Committee for the 1982 Conference to be held in Stratford-upon-Avon.

It was announced that the following had been elected as members of IHE:
Mr Robert Morgan
Mr J. M. Hinckes

The Secretary advised of the death of Mr Bob Watson on 14 October 1980 who had been a Committee Member for many years and been Chairman in 1976. A letter had been sent to his widow and it was agreed that the Branch make a contribution to The British Heart Foundation of £25 in memory of Mr Watson.

Energy Conference

The Second Ambient Energy and Building Design Conference, organised jointly by the CIBS, RICS, IofH, DoE and the Dept of Energy is to be held at the University of Nottingham, 19/20 March 1981.

Fees £100; Accom £25. Bookings received by 1 January 1981 qualify for £10 discount. For details contact CICC Ltd, POB2, West PDO, Nottingham NG8 2TZ. Tel: 0602 282257.

Interhospital '81 and the 11th German Hospital Conference

The 11th German Hospital Conference will be held under the slogan *The Hospital of the Eighties* from May 19 to 22, 1981, at the Munich Trade Fair Center. The organiser of this event, which is undoubtedly the most important forum for German hospitals, is the Association of German Hospitals.

In a series of half-day lectures, the future of hospitals will be analysed during the Conference. In particular the manner in which the medical, social, nursing and political aspects are examined will cast a light on the main perspectives for hospitals in the eighties.

The Conference is combined with INTERHOSPITAL 81, the largest hospital fair in the world, which will be held at the same time at the Munich Trade Fair Center.

Contact the Association of German Hospitals, Postfach 12 10 09 D-8000 München 12.

Hospital Energy Conservation Year 1980

The Competition Winners

As mentioned briefly in the October issue of Hospital Engineering the competition entries received were most encouraging. A full description of how the Competition originated and of the prizewinners is given on pages 7 and 8. On the inside front cover and back cover we show the winner and runner-up in the Poster Section of the competition.

The judges found the standard of entries most impressive, as Mr Norman Lamont MP, Parliamentary Under-Secretary of State for Energy, commented when presenting the prizes. He was kindly standing in for the Secretary of State at the final symposium of Hospital Energy Conservation Year, held on Wednesday 12 November at the Institution of Mechanical Engineers. Mr Lamont's speech is reproduced below.

Mr Lamont's speech

The importance of energy conservation *should* be self-evident. Unfortunately many individuals and organisations act as if it is far from self-evident. We are often asked why there is so much talk of energy difficulties at a time when the UK is rich in energy resources, when we have substantial reserves of oil and gas, considerable nuclear expertise and large reserves of coal. What is often not recognised is that we cannot isolate ourselves from the world energy position. While we should remain self sufficient in energy terms through the 1980s, we could become net importers of energy in the 1990s at a time when energy will be increasingly scarce and expensive. Our reserves do not provide us with a cosy habitat from which we can simply sit and watch blizzards sweeping other less well endowed countries. We face the same general outlook as other nations, and we must make the same efforts to adapt to meet the challenge of a future where the use of energy will have to be managed by all of us much more rigorously than hitherto.

Energy conservation clearly has a major part to play in closing the gap between the available energy resources and the demand for energy which will need to be met in the medium to long term. It also has an important part to play in the much shorter term. Industry can become more competitive if it uses energy more efficiently, and public sector costs can be kept down more easily if we, too, practise careful use of energy and continue to invest wisely in energy conservation measures.

The key to energy conservation, its very cornerstone, is the rational pricing of fuels. Present day prices must take account of the long run costs of maintaining supplies. We need to give the proper signals about the time value and scarcity of energy. If we do not, people will not be motivated to use energy efficiently, and the incentive to invest in energy saving technology will be lost.

That would be an extremely serious loss of opportunity. It has for example been suggested that the potential for energy saving in our building stock — of which hospitals are of course part — could be more than 20% of consumption. This scope for improvement exists because many of the existing buildings are *"energy guzzlers"* dating from the previous era of cheap and plentiful energy supplies. Their adaptation to meet the changed circumstances is rarely a simple task.

Roughly half the NHS estate dates from 1918, and a third was built in the 19th century. I am told there is one heating installation still in use which is over one hundred years old. Both the size and constant usage of the NHS estate rule out, the rapid replacement of old energy guzzlers by new energy efficient buildings. To deal with the situation, we must look to the full range of energy management techniques, such as analysis of building use, and the setting of targets for fuel consumption and monitoring performance. And I am encouraged in this because much is already being done. The use of energy *is* being monitored and managed. Various authorities have in hand, some in collaboration with the DHSS, a wide ranging series of research and development projects. Modern conservation technologies — thermal wheels, heat pumps, and heat pipes (to transfer heat from where it is not required, to where it can be used) and computer controls — have been or are being installed, and you have in Leeds a large combined heat and power installation.

I think it inevitable and natural that professional meetings such as these should have a penchant for considering advances in technology. I see that this afternoon's session will be devoted to the first public review and discussion of DHSS's Low Energy Hospital project. Everything I have heard about this exciting project suggests that dramatic energy savings could be made possible through new developments in hospital building. Hopefully the project will not only point the way to a new generation of inherently energy efficient hospitals but also will provide a great deal of information about conservation measures which could be cost-effective if introduced into the existing NHS estate.

My Department is naturally very interested in this work. And international interest is amply demonstrated by the substantial EEC grant of over £600,000 promised towards the project.

A successful conclusion to the project will of course have an increasingly profound effect on future fuel costs in the NHS — and such an effect is most certainly desirable given that NHS fuel costs this year could reach £200m. And a successful conclusion will have other benefits too: it will demonstrate the standards of excellence, the skill and the expertise of our architects, designers and service engineers, both in the public and private sectors.

There is much being done, and more to be done, to implement energy conservation in the NHS. It is very clear that the Institute is well seized of the importance of this challenge, and that the NHS contains many people with ingenious ideas on how the challenge should be tackled.

Hospital Energy Conservation Year 1980

The Editor and Institute Secretary are always pleased to hear from members who feel that they have something to say or offer to the benefit of the Institute, either by way of criticism or new ideas. Sometimes, a comment or idea is offered which explodes like a starburst and contaminates everyone within its fall-out area with enthusiasm.

Such a 'letter bomb' was received by the Secretary in July of 1979 just at the time when the Publications Committee were discussing ways in which to interest Institute members in contributing more actively to the Journal.

Mr. John R. Fielding, a member of the Yorkshire Branch of the Institute was the author of this letter and suggested that the Institute be the sponsors of a Hospital Energy Year and organise competitions related to this subject. John Fielding had done a great deal of ground work on mechanics of organising such a competition, and Publications Committee were quick to realise the significance of such a suggestion, and unanimously agreed to adopt the idea, subject to Council's approval.

After consulting with John Fielding regarding amendments to the time scale, classes of entry etc., a paper was put before the August '79 meeting of Council who reflected the same enthusiasm as the Publications Committee had done in July. After agreeing costs, rules of the competition etc., and obtaining the Department of Health's approval to the Institute declaring 1980 as Hospital Energy Conservation Year, the publicity drive began.

The object of the publicity was to make everyone who either works in, with or uses hospitals, aware that 1980 was Hospital Energy Conservation Year and that a competition was being run during 1980 with classes of entries designed to cater for non-engineers as well as works discipline. All NHS hospitals, private hospitals, RHA's, and allied professional institutes were circulated. Announcement in the March International Issue of the Journal even publicised the campaign overseas.

Widespread publicity was achieved through the good offices of Journals and other allied periodicals and the compositors employed by the regional newspaper in Yorkshire and Humberside must have been working overtime in setting up type describing energy conservation measures employed in hospitals and telling the readers about the Institute's campaign.

The Institute received a letter from the Hospital Energy Task Force of the American Hospital Association in Chicago, describing how one of their publications, 'Energy Users News', published an article on our Institute's activities in connection with Hospital .ıergy Conservation Year. Their Staff Associate responsible for Energy Policy interests in American health care has suggested an information sharing network between the American Hospital Association and the Institute of Hospital Engineering. This is an exciting proposal and Council will be examing how best to effect this suggestion.

Complimentary to the campaign and competition, the Education Committee organised four Symposia on the subject of energy conservation, the last one being the stage for presentation of prizes to the winners.

The Rt Hon Patrick Jenkin MP, Secretary of State for Social Services agreed to open the first Symposium and the Rt Hon Norman Lamont, Under-Secretary of State for Energy, agreed to open and present the prizes at the last Symposium held on 12th November 1980.

By the time the competition closing date arrived, a total of eighty-seven entries for all the five classes had been received at the Institute Office. This response was very encouraging and reflected the interest of not only members but of other disciplines.

Two entries were received from the USA and the Competition Posters did not escape the attention of patients.

Some of the entries for class 3 of the competition (non-engineering suggestion) were brief but illustrated other discipline's concern about the energy used in our hospitals. One lady excused the brevity of her entry by explaining that her submission was based purely upon the observations of a housewife interested in domestic economies. Surely this is the kind of reaction and interest in energy savings that we are looking for from the non-works disciplines. If the engineer has taken care of the technological aspects of heat generation and distribution etc., then all that is asked of every other DHSS employee (and ourselves) is to treat the facility of heat and electricity as though we were paying for it directly, and not to take it for granted.

It was obvious from the entries in class 3 that the lay person has an in-depth knowledge of the benefits that can be expected from proper insulation and controls. Therefore we should be demonstrating by example how seriously the works discipline treats the subject of energy conservation by implementing such measures before we can ask and expect the co-operation of other disciplines.

The unenviable task of adjudicating was undertaken by a willing number of 'volunteers' who were approached on behalf of Council to decide on a winner for each class. The President, L. Turner BSc, who, at the 1980 Annual Conference said *'Until I became President, I had no idea of the extent and breadth of the labours and responsibilities of Council'* took an extra burden by serving on each adjudicating panel.

The Institute is extremely indebted to the following persons for their services in connection with the adjudication:

Class 1
Modifications to Plant which have been implemented and proved.
Class 2
New ideas for Plant Modifications etc., which have still to be evaluated.
The President,
F. H. Howorth OBE, Howorth Group of Companies
Past President IHospE
H. Dixon BSc, Late Assistant Director Property Services Agency.
Class 3
Non Engineering suggestions for Energy Conservation Measures.
The President
A. Monks LLB, Nominee of Health Service Administrators.
D. Poole, Nominee of the Royal College of Nursing
Class 4
'In-House' Publicity Schemes.
Class 5
Poster Design.
The President
Dr. B. G. B. Lucas JP, University College Hospital Past President of IHospE
C. Tanous TD, Editor, *Hospital Engineering.*

Within two weeks of the closing date for entries, the adjudicators had completed their task and reported back to the Institute Secretary.

The Award Winners
Class 1
T. Finch, Assistant District Engineer, Lancashire Area Health Authority.
Whittingham Hospital Power House Scheme.
Class 2
R. C. Ames, Foreman Engineer, Bristol Royal Infirmary.
Use of Land Water for Low Grade Heating/Cooling Source at Bristol Royal Infirmary.
Class 3
A. K. Small, Sector Administrator, Lancashire Area Health Authority.
The Case for a District Energy Conservation Policy and a sample document.
Class 4
D. Welch, Senior Engineer, Salford Area Health Authority (T).
Class 5
R. Carter and Haydn Benham, Artist /Designer, Energy Services Engineer, Wymondham, Norfolk.

Those whose entries were commended were:
Class 1
J. S. Corbett, Leeds AHA
D. Hargreaves, Derbyshire AHA
J. Metcalfe, Norfolk AHA
P. H. Davies, Liverpool AHA
Class 2
A. W. Lough, Lothian Health Board
E. Newton, Norfolk AHA
G. F. Reynolds, Wolverhampton AHA
Class 3
V. Yule, Grampian Health Board
Class 4
Nil.
Class 5
R. C. Osguthorpe, Barnsley, S. Yorkshire
C. R. Hayton, Lancaster District HA

It is intended to reproduce many of the papers in forthcoming issues of *Hospital Engineering.*

List of Donors of Prizes
Class 1
L. F. Turner BSc, CEng, FIEE, FIHospE, FRSA, President of the Institute of Hospital Engineering.
Class 2
Mallard Publications Editor *Hospital Engineering.*
Class 3
King Edwards Hospital Fund for London.
Class 4
The Institute of Hospital Engineering.
Class 5
The Institute of Hospital Engineering.

The Institute cannot hope to measure the success of Hospital Energy Conservation Year in terms of energy saved in the Health Care Estates, but, in terms of response reflected by formal entries for the competition and the publicity the campaign received, then Councils' high hopes and optimistic expectations have been fulfilled, if not exceeded.

Not every entry 'made it' to the prize status and it is safe to assume that not every idea even progressed as far as a written entry. Nevertheless, those people who decided that their idea or comments on the subject were not worthy of entry (and there must be dozens for each entry received) were encouraged to 'think about energy in hospitals' — that is all we ask.

It is very appropriate that it was during Hospital Energy Conservation Year 1980, (when the Government and Private Sector Consortiums, set up in 1979 to design a Low Energy

Hospital), unveiled their project in the presence of Dr. Gerard Vaughan, Minister for Health. The Institute offer their congratulations to the DHSS on this major significant achievement.

The Institute is proud to have been the sponsor of Hospital Energy Conservation Year and expresses its thanks to all who have been involved in the campaign or acknowledge the same by submitting an entry, attending the symposia or just by answering the call to 'save it'.

To conclude, one lady began her entry for Class 3 by example;

'Give two identical children an identical bag of sweets each and what happens? One will probably gobble the lot straight away. The other will say *I will have some now, some tomorrow, and save some for the next day.'*

That opening paragraph to that entry says all that needs to be said in respect of what energy conservation means.

Letters to the Editor

Dear Sir,

A more relevant Journal?

The October issue of the Journal was the first one for the past few months with some articles of interest for the majority of readers.

With such a wide number of disciplines involved in hospital engineering there should be no shortage of articles and papers which you could publish that would be of interest to readers. May I suggest you reprint selected papers from other engineering journals. The Journal should aim to educate and inform readers in the function of Hospital Engineering. I say this because three years ago when I joined the ranks of hospital engineers, I soon discovered that it was a 'teach yourself' profession, training appears to be one of those activities which will happen one day when management can afford it. The Journal should aim to fill this gap.

Perhaps other readers have some comments and suggestions on how to improve the contents of the Journal.

Yours faithfully,
K. Hill
106 Early Road, Witney, Oxon.

Dear Sir,

An appreciation from Washington

I would like to thank you for printing *Margaret Ratcliffe's account of her* experiences at the IFHE meeting last July in Washington DC. As I wrote and told her, it is a charming account like hers that makes an impersonal-sounding meeting become warm and personal and human.

In answer to her query about the meaning of the PEPCO signs she saw on the 'dustbins', (what a marvellous genteel name for trash cans!) it does not indicate that Pepsi Cola is on tap but instead is an advertisement for the local Potomac Electric Power Company.

The American women who worked under the capable direction of Mrs Judy Foulkes are all, I'm sure, grateful for Mrs Ratcliffe's kind words.

Sincerely,
Carla B Oviatt
(Mrs Oviatt is the wife of the new President of IFHE.)
19 October 1980.

Further to Mrs Oviatt's letter above, we are pleased to include a photograph (left) which the President of the Institute, Mr Lawrence Turner has kindly lent us. It shows a cheerful group of Institute Representatives at the Americal Association's annual barbecue and socialising at a farm in Virginia. The President is on the right, nearest to the camera.

Un Nouveau Rôle pour l'Ingénieur Hospitalier.

L'Administrateur Technique

(à la page 12)

Cet article a été présenté au 6° Congrès International à Washington, USA et exprime les vues de l'auteur en ce qui concerne le rôle qui devrait être celui de l'ingénieur en milieu hospitalier aux USA.

Il propose que l'ingénieur ne soit pas seulement considéré comme un technicien responsable des installations et des services, mais qu'il lui faudrait aussis s'intéresser à la pratique, être en mesure de dominer les aspects administratifs et les problèmes de gestion, et être reconnu aussi dans l'exercise de ces disciplines. Les rôles complémentaires de l'administrateur sont examinés et l'auteur décrit comment l'administrateur technique doit rester en rapport avec le Chef Exécutif de l'hôpital.

Hôpital de Whittingham

Project de Centrale Electrique *(à la page 10)*

Cet article met en lumière les importantes économies financiéres obtense durant les mois d'été par un grand ensemble hospitalier Psycho-Gériatrique, dans le Lancashire en Angleterre, avec l'aide d'un systéme électrique fourni par l'"Electricity Supply Board".

A cause de la position rurale de cet hopital, 75% de sa production électrique a été engendrée sur place par l'usage d'engins à vapeur qui fonctionnaient à 43% de leur capacité en hiver quand la vapeur d'acchappement pouvait être employée pour l'eau chaude et le chauffage central, mais était seulement efficaces à 13% en été, quand il n'y avait pas de besoir de vapeur d'acchappent.

Après des négociations avec l'"Electricity Supply Board" ils ont obtenu leur rendement electrique du "National Grid" pendant l'été, quand il y avait une capacité supplémentaire disponible, éliminant ainsi le besoin de l'hôpital à employer ses propres géné rateurs pendant la periode de leur efficacité minimale.

Cet article a obtenu le prix en Classe 1 dans le Concours de l'Institut de Technique hospitalière, en 1980, année de la Conservation de l'Energie Hospitalière.

Winning entry
Class 1

This paper is the winning entry in the Hospital Energy Conservation Year 1980 Competition, Class 1. The authors are from the Preston Health District Energy Conservation Working Party, and they have expressed their wish for the prize money to be donated to the Whittingham Hospital Patients' Endowment Fund.

Whittingham Hospital Power House Scheme

T. FINCH
D. JACKSON
I. COX
C. WOODS

Introduction

Whittingham Hospital is a large 1200 bed Psycho-Geriatric Hospital, located in rural surroundings on a 430 acre site. It has traditionally generated almost all of its own electricity requirements since its original inception. The reason for this was the prohibitive costs in installing the Electricity Authorities cabling and control gear.

During World War II, the operating theatre in St. Margarets division, meant a small Electricity Board supply was brought into the Hospital grounds to cover it on a standby basis. This was the only other electrical supply within the Hospital up to 1972.

In 1972 the need for a more substantive Electricity board supply for the whole Hospital was recognised and a small 300 KVA transformer was installed. The supply was only adequate for up to 1/3 of the Hospitals' electrical requirement.

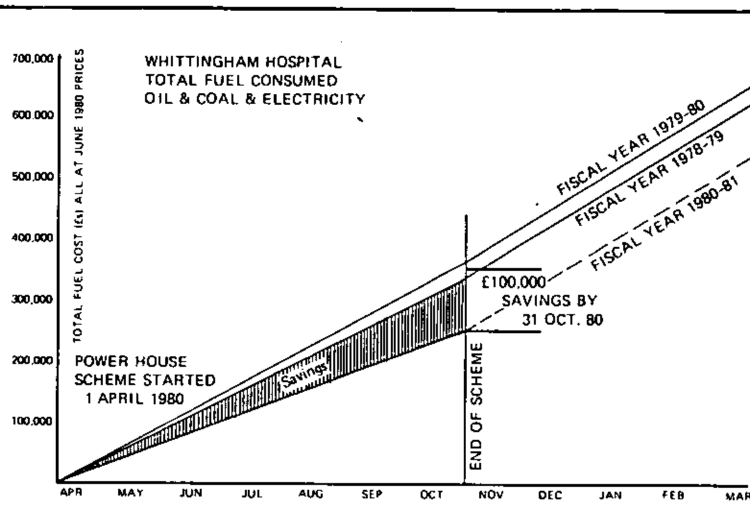
The main proportion of the Hospitals' electrical load is met by the steam driven alternators, up to 75%, depending on the season and time of day. The steam engines are of the reciprocating 'piston' pattern and are supplied by steam from the main boiler house across the road opposite the power generating station. The power house uses a conbined electrical power and heat recovery cycle, whereby exhaust steam is used to heat the domestic hot water and heating calorifiers. During the winter period, the system appeared efficient. The problem was that in summer when there is no use for the exhaust steam, it has to be blown to waste.

The task of the energy conservation party was to evaluate the economics of the existing system and propose/implement an alternative scheme with energy and cost saving results.

The Scheme

A heat balance equation on the system was carried out and surprisingly the thermal efficiency was 43% during the winter period. This compares favourably with a modern power station of say 35% (which of course allows for hot water running to waste). The summer efficiency in the Hospitals' power house however, could be down to 13%, depending on the heating and the domestic hot water load. The problem was seasonal, we could generate electricity in winter cheaper than it could be purchased, but in summer it was costing twice the buying-in amount. We understood from previous communications with the Electricity Board that their rural H.V. lines could not supply the Hospitals' load, and so there appeared to be no solution to the problem — but what about a summer only larger supply, when the Electricity Board had spare capacity? "Yes", they said and ironically this requirement worked in our favour, the Board would be delighted to sell us the additional KWH's in the summer and the 300 KVA transformer would be changed to an 800 KVA unit, with only partial contributory costs.

It was estimated the scheme would save £30,000+ per annum for a capital outlay of £13,000. The scheme was approved by DMT and suitable alternative local staffing arrangements



LANCS AHA – PRESTON DISTRICT – "POWER HOUSE SCHEME" were made for the summer period, after lengthy negotiations with the unions had taken place. By April 1980, the scheme was ready to start. Three further savings could also be introduced with the scheme at the same time.

the need to have a boiler on constant standby, in order to provide a back-up steam supply for the generators and thus avoid total power loss, was subsequently not required in the summer;

the boilers can now have a constant summer load and hence a higher operative efficiency, i.e. laundry steam load 7 am — 4.30 pm then heating 4.30 pm — 7 am;

as the Hospital has both 3500 sec. heavy oil and coal as fuel sources, the most cost effective fuel was computed and the more suitable fuel chosen accordingly.

It was hoped that savings from the latter three items would acrue at least a further £20,000 to the scheme.

The Results

An outstanding success!!

Almost immediately from day one of the scheme, a dramatic reduction in overall fuel consumption resulted. Daily fuel consumption figures, including electricity purchased, were logged and the mini-computer was used to record and plot the results.

A table of therms, made up of oil, coal and electricity purchased, showed a massive saving of 30% for each month that the scheme was running. In money terms this meant an average saving of over £1,400.00 per month, after the additional electricity consumed had been included.

It could be seen that the £50,000 target was to be teached ofter 3½ months, but the scheme was set to run for six months and thus savings of £84,000 could be predicted. Could a target of £100,000 be achieved? — this would be a true incentive to the energy team — would the Electricity Board supply us for an extra month, before the heating is fully back on-line? — "Yes", they answered, our agreement was until the end of October and not until the 1st of the month. The District Finance Officer was elated.

The present position (at the end of October 1980) is that unfortunately, due to the severity of the weather, only £93,000 had been saved. However, the team is confident that by the end of the financial year, £100,000 will be netted.

A formal report will be presented to the District Management Team, once the complete savings have been realised, but in the meantime the District Works Officer and the District Finance Officer have announced the scheme as a resounding success!

The Future

Further savings above the £100,000 target should be realised after the conclusion of the scheme, by continuing to opt for the most cost effective fuel and considering not banking a boiler throughout the winter, but connecting an emergency diesel generator as a standby. These savings are to be examined in the winter of 1980/81.

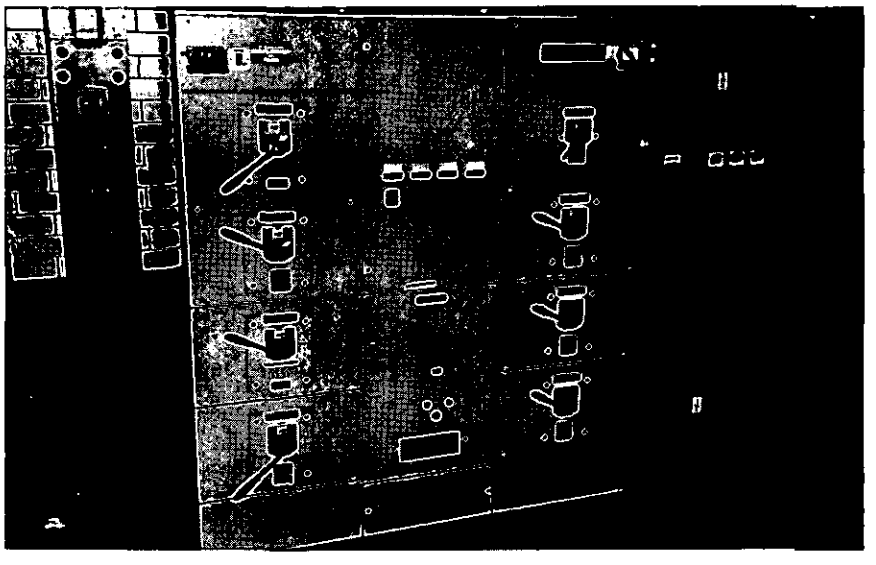
This year's energy conservation allocation is being used to fit automatic heating controls and removing the steam driven boiler pumps.

In the long term, consideration to cavity wall, further loft insulation and more lockable zoned heating controls is being made. Even fluidised boilers could be considered once field trials have proven their viability.

Conclusion

It can be seen that this entry would only be applicable to other similar hospitals and it may well be that Whittingham is unique in this way. It may be helpful though to realise that wherever a combined heat and power system is being run or considered, that a suitable all year load is required.

The Powerhouse blowing full steam ahead for the last time.



The existing NWEB panel extended to take the increased 'summer only' electrical load purchase.

The author is a professional engineer and holds a Master of Administration Degree. He is employed by a 1000—bed teaching medical centre as Assistant Vice-President for Facilities Planning and Engineering Services. This paper was given at the 6th International Congress of IFHE in Washington in July 1980. More papers will be included in future international issues.

A New Role for the Hospital Engineer

The Technical Administrator

MARVIN J. FISCHER PE

The Hospital, its functions, physical plant and practice of medicines has changed over the last century. The original function of the Hospital was to provide the poor with a place to die. Wealthy individuals usually found more comfort, cleanliness and service in their own homes. With the development of modern medicine, the function of the Hospital changed and instead of a place to die, it became a place where good effective medical cures could be obtained. Many illnesses can be better diagnosed and treated in a hospital. Some procedures such as transplants and radiation therapy can only be effectively performed in a hospital.

These changes were brought about by many forces, amongst which were technological advances both in therapeutic as well as diagnostic devices. This then caused an expansion of health care delivery (created by an increased demand) which necessitated larger and more complicated health care centres. The day to day operation and providing of services has become more technical. The word "technical" throughout this paper is in the engineering sense rather than the medical sense. Out of this, a new concern has developed for the hospital administrator — the technical aspects of health care administration. Are we then saying that a requirement also exists for a person on the administrative team who can function both as an engineer and an administrator — a technical hospital administrator? If so, what departments should this person be responsible for and why — what are the technical aspects of health care administration? For the most part, I suggest they are the service departments of the hospital as differentiated from the medical or "professional" departments, and include the following functions: Facilities Planning, Construction, Engineering (code conformance, plant operations and maintenance,) Biomedical Engineering, Systems Engineering, Communications, Safety and Fire Prevention and Security. In these areas, specially trained technicians or engineers are required or should be available. This need developed as the Hospital became more technically oriented, buildings and systems became more complicated and greater numbers of codes and regulations were inflicted on the Hospital.

In discussing this concept — this new role, many questions must be answered.

In what way does the traditional hospital engineer differ from this new technical administrator? Where in the table of organization does this person sit, and to whom does he or she report? What has been the traditional role of an administrator and administration in these technical areas? Does the size and functiion of the Hospital have an impact on the position itself? What educational and experience requirements should this person possess? We will see that as the size of the institution increases, the need for this type of person becomes greater and more affordable; that this person sits as an administrator— more of a manager and less of a technocrat; that depending upon the size and function of the institution, the person may be required to possess at least a Bachelors Degree in Engineering and, in many cases, graduate degrees in Engineering Management, Business Administration or Health Care Administration. Finally, this discussion will lead us into a consideration of the future of the technical administrator (nee hospital engineer).

Let us look first at the traditional makeup of the hospital administrative staff and their relationship to the engineering function. It must be stated that my references are based solely on practices in the United States. I should be most interested in hearing not only reactions and comments but also the practices today in hospitals throughout the world on the topic related in this paper.

The chief executive officer of a hospital has many titles; Executive Vice President, Director, Administrator, etc. Naturally his assistants bear similar titles such as Assistant Vice President, Associate Administrator, etc. For simplicity and uniformity I will refer to the chief executive officer of the hospital as the Administrator. This person usually has an undergraduate college degree but more often than not, also has a graduate degree. In many cases it is a Master's Degree in Health Care Administration, in Public Health, in Business Administration or in the Allied Health Professions. We also find doctors and nurses assuming the administrative function. I have found that very few people in this position have an engineering background or have been exposed to engineering in a formal sense. This is not to say that they should, or that their proper functioning requires it. After all we do not expect the President of General Motors to be capable of designing an automobile engine. We only expect that his assistants cumulatively have the knowledge to carry out the corporate function and goal. Doesn't the Administrator have assistants who report to him, bring him the necessary information from the various departments which form the basis of his many decisions? Of course he does. In most cases these assistants have the same or at least partially the same educational background as does the Administrator, and their job experience is following along the same path. In other words we have a non-technical person advising another non-technical person on technical subjects. This may or *may not be as bad as it seems.* Let us examine for a minute the technical information we are talking about. What technical or engineering information is required for the proper functioning of the hospital? At the beginning of my paper, I mentioned seven departments or areas requiring technical knowledge, the first two being Facilities Planning and Construction and Engineering — a good place to start.

The physical plants of hospitals have been increasing in size over the past decades. There is a cry now that we have an excess amount of beds in the United States and there should be a moratorium in hopital construction. This may result in an ever-increasing need for proper facilities planning. There will always be a need for better utilization of existing space to accommodate a new program that has been approved or an expanded existing program. This need arises out of new advances in health care delivery as well as increased demands of services from the community. A person with adequate training and understanding will be needed to analyze architectural requirements as well as the demands to be met by existing mechanical and electrical systems. To this we should add the analysis of the projects' effects on the environment of the community (air pollution, traffic, etc.). For large projects someone representing the hospital will be required to work with consulting architects and engineers. Lastly, let us not forget the regulatory agencies — both in new construction or the day to day operation of the hospital. The New York State Department of Health requires conformance to more than 77 codes and standards for existing as well as new construction. Our Federal Government through its many regulatory agencies and the Joint Commission on Accreditation of Hospitals add additional codes and standards of a technical nature. This not only adds a physical burden for conformance, but also an economic one. With each new set of rules, the cost of conformance increases. This constant pressure is always upon the Administrator.

There is another side to the increasing complexity of the hospital physical plant and that is its engineering department — the plant operation and maintenance. This included the heating, ventilation and air-conditioning systems, electrical systems, plumbing systems and their general repairs. Also we must include general repair of the hospital such as painting and repair of equipment (beds etc.) as well as preventive maintenance. We all know what is happening to the price of oil. Energy conservation measures are a number one priority. Decisions must be made on capital expenditures for energy conservation.

Biomedical Engineering

Here again I will define a term for the purpose of uniformity of understanding. A Biomedical Engineer is a person, who through professional training, applies engineering principles to the life sciences and thereby aids in the delivery of health care. A Biomedical Engineering Department provides the following services:

Functional testing of medical equipment, repair and maintenance of all equipment, purchase consultation and evaluation, education of staff, in-service training of staff, design engineering and technological consultation. Within this area many administrative decisions must be made affecting patient care and its cost.

As Biomedical engineering found its way into the hospital when it was needed, so did systems engineering. We are only now beginning to see systems engineers being used in hospitals. Model making, maximizing manpower and resources, materials management, increasing productivity are terms that are commonplace today in private industry. They are comparatively new in hospitals. Pressures due to cost increases, energy crisis, pollution and solid waste management requirements and unionization of personnel are all factors leading to the use of systems engineering in the hospital.

Communications is one branch of the hospital services that is often not only misunderstood but misused, to the detriment of the proper operation of the facility. In the hospital there are ever increasing demands to communicate, to provide more and more information at greater speeds than ever before. The communication system that anticipates frequent changes and growth allows for the control of rising costs and produces efficiences leading to improved patient care. Depending upon the size, function, location and age of the institution, the following equipment and functions may be included under the jurisdiction of the Communications Department:

Nurse Call System, Paging System, Alarm Systems, Telephone Systems, Television Systems, Dictation, Intercom, Audio-Visual Equipment, Mail Distribution and Printing.

The last two functions noted on my list are Safety and Fire Prevention and Security. With insurance premiums rising on all fronts (professional liability, general liability, workmen's compensation), the hospital safety program has become more significant. Many institutions have various degrees of self insurance. With the passage of our Occupational Safety and Health Act, safety has become a full time job. The task of complying with the volumes of rules and regulations leaves one spellbound.

Fire safety and fire prevention has always been of great concern to hospital administrators. Here too the administrator must become familiar with basic procedures and have an understanding of the problems in order that he might be the final arbitrator in designating priorities to work or procedures which directly affect the fire safety of the institution. Importance of fire drill procedures, fire retardent materials to be used, sprinkler and other extinguishing equipment are but a few of the topics of concern.

The last function noted on my list is security. This function is mentioned here because of the equipment that can be used by the department which is of a technical nature (alarm systems, electronic surveillance, communications) as well as traffic flow and control. These devices and principles are used to aid the department in performing their function of maintaining security of personal items, equipment and personal safety for the hospital, hospital staff, patients and visitors.

I have only briefly touched these areas. I am sure the readers can all add to the list recalling experiences from his/her own institutions.

We have briefly examined what I refer to as the technical or engineering information required for the proper functioning of the hospital. What about the traditional hospital engineer? First let us talk about the use in the United States of the term *engineer.* A person does not need a formal engineering college education at all. There are laws however in each state that require an engineering college degree, and internship and the passing of an examination to use the title *Professional Engineer.* Most of our states use the following definition of Professional Engineering or one with the same intent: — A person practices Professional Engineering who holds himself out as able to perform, or who does perform a professional service such as consultation, investigation, evaluation, planning, design or responsible supervision of construction or operation in connection with any public or private utilities, equipment, processes, works, or projects wherein the safeguarding of life, health or property is concerned or involved, when such professional service requires the application of engineering principles and data. Naturally, a person who engages in the practice of professional engineering is or is required to be a Licensed Professional Engineer. This definition might seem to apply to all engineers but it does not. It is usually applied to and required by law only of engineers who design (prepare plans), consult (opinions and expert testimony), and supervise construction when required. Therefore the hospital engineer may not be a professional engineer; he may not be a graduate engineer. This does not mean he is not capable of performing the function for which he was *originally* hired. Years ago, and even today in many small institutions, his position required only that he maintain the physical plant in proper operating condition. This meant the heating, ventilating and air conditioning systems, which were probably fairly simple; a small electrical system and a few additional minor systems. For new construction, outside expert consultation was available. This is a far cry from the technical knowledge I described in the beginning of my paper. The traditional hospital engineer was given many titles as he rose in stature, salary, usually culminating with the title of Director of Engineering. He then reported to an Assistant Administrator who reported to the Governing Body of the hospital. I do not mean to downgrade the traditional hospital engineer or his role in the institution. He is a person skilled in his craft and necessary for the proper operation and functioning of a hospital. I feel however that technology needed for the modern hospital now requires a person with a formal engineering education as well as managerial and administrative skills. Who will this person be?

The Technical Administrator that I envisage is a person who reports directly to the Administrator and is therefore an equal in the table of organization with the Assistant Administrators. He should be responsible for the functions I described earlier. As such, he cannot be directly responsible for the detailed day to day operation of any one function, which belongs to the Department Director, but rather the overall responsibility of all functions. He must be both an engineer and a manager. He will therefore understand the technical problems of the hospital and be able to relate to them and the staff directly concerned with them. He will also be able to understand the problems of management and the overall problems of managing the entire hospital and thereby relate in a better fashion to the Administrator. In this way, the Administrator will be better advised and will have an assistant who has a direct knowledge and understanding of the technical problems, but just as important, an understanding of the administrator's overall managerial problems.

It is easy to see that the person I am talking about should be sitting as one of the assistants and advisers to the administrator. He should be an equal with the other assistant administrators in the hospital and, as I have mentioned, be an equal in the table of organization. This position requires a person who can interact with the technical as well as the managerial staff of the hospital.

It would appear that a formal education would be required for a person to hold this position; in all probability a Bachelors Degree in one of the engineering disciplines and also a Masters Degree. The Masters Degree could be in Engineering Management but might better be in Business Administration or Health Care Administration.

Many years ago a combination like this was unheard of. Engineers were classified as individuals who were very precise and as such could not look at the overall picture as was required of managers. This situation has changed. Engineers are now aware of the management function — we even have a discipline which includes this as one of its specialities — Management Engineering or Industrial Engineering. Managers are also aware that the precision and discipline which characterised the engineer is now a necessary tool for the good manager. We see many chief executives of large industrial corporations or their assistants as people who started in industry in the engineering function and then took their skills on to the managerial function. Why not have the same benefits in the health care field, especially when the engineering function is not remote from the managerial function?

This does not rule out a qualified person without degrees. Many people through years of experience as well as having taken specialised courses will be eminently qualified. This can only be judged on an individual basis; evaluating the qualifications of the applicant as well as the needs of the institution.

In order for this position to become an active part of today's hospital hierarchy we must obviously have people who want to serve in it. Engineers have to want to move into this new role. It means broadening one's horizons, leaving the pure world of engineering and even engineering management and standing in both worlds — the world of engineering and the world of administration. I can almost hear some of the critics saying — as part of the administrative team I will have to compromise good engineering judgement. To those people I can only say that their entire engineering career has been one of indirect, if not direct, compromise. They have compromised quality for economy, maintenance for economy, cost to insure uninterrupted care and so forth. They have done this knowing what they have done was still correct and above all they have never compromised safety and patient care. In this new role they will still be able to maintain their engineering integrity.

Let us assume we now have the people who are qualified and are willing to work in this role. Will there be an opening of this type in every health car facility? The answer to that question would have to be a resounding no; no at least at the present time. There are many factors that enter into this. I would think that the size of the institution is the major one with all other considerations rising out of it. A large institution with many departments and a large staff naturally would both have a need and be able to afford such a person. Since this type of institution has many assistant administrators one could fit this role. The smaller institutions might find it more difficult both in funding this position as well as having it appear in the table of organisation. I do feel however that if any institution has at least two assistant administrators and between them they are responsible for all functions of the hospital, then one could certainly be the person I have been talking about.

I have been discussing the engineer turned manager. What about the acceptance by the administrator and the staff of this engineer turned manager in his new role? This I feel, will take time. There will surely be a certain amount of reluctance on the part of administrators to truly accept this person in his role. This reluctance might even go beyond to the governing boards of the hospitals. Time will change this. When Biomedical Engineering first appeared on the health care scene, there was great reluctance by the medical and nursing staff to accept this person as a full member of the health car team. Even today some institutions do not have a Biomedical Equipment Technician on their staff. When they do, he is still often thought of as merely a repairman. This has changed remarkedly during the past decade. It is not uncommon for large medical institutions to have large Biomedical Engineering Departments headed by persons holding a Doctorate Degree and have the department taking part in direct bedside patient care.

What of the future? This new role or function will appear more and more as time goes on. It will be born of necessity and it will grow for the same reason. Many of my colleagues have risen from Director of Engineering Departments to Administrative roles in the hospital. I am employed by a 1000 bed teaching medical center as the Assistant Vice President for Facilities Planning and Engineering Services. I am responsible for the facilities planning, construction, engineering, biomedical engineering, communications, safety and fire prevention and security at the Center. A director of each of these departments reports to me. I am one of five Assistant Vice Presidents who reports to our Executive Vice President. The others are in charge of Administration, Medical Affairs, Financial Planning and Finance. I have a Bachelor of Electrical Engineering Degree, am a licensed Professional Engineer and hold a Master of Business Administration Degree. I hold the position I have been discussing and am here to tell you it has arrived but not without difficulty. It is accepted and it works — to the benefit of the engineer, the chief executive officer of the hospital, the hospital, and therefore, most importantly, to the benefit of better patient care.

The author is Applications Manager, Transmitton Limited. The company is part of the BICC Group.

Microprocessor Techniques in Energy Conservation

MICHAEL REYNOLDS BSc CEng MIERE MIHospE

In this year of 1980, the Hospital Energy Conservation year, we should all be asking ourselves the question '*How best can we utilise the tremendous breakthroughs that have been made in science and technology and in particular Microprocessor techniques to reduce both Energy usage and its related costs within the Health Service?*' The following paragraphs are intended to provide some of the answers to this question.

With the ever increasing cost of Energy to the Health Service currently exceeding £150 million per annum, it is apparent that urgent measures need to be taken to harness this new technology and thus achieve the desired objectives.

ENERGY MANAGEMENT SYSTEMS

In recent years as the 'state of the art' in microprocessor applications has progressed we have seen the emergence of the comprehensive Energy Management and Building Automation Control and Monitoring systems. Several progressive British companies have leapt to the fore in the face of strong overseas competition and produced systems that are extremely reliable and cost effective. Later developments employing the latest techniques in solid state memories (e.g. the bubble memory) have now made the need for servicing and regular maintenance of equipment almost a thing of the past. They also eliminate the need for battery back-up protection in the event of power failure, thus reducing capital costs and maintenance even further.

Figure 1 shows how a typical system consisting of a Central Control Unit coupled to remotely situated outstations via a sophisticated and reliable telemetry system can control and monitor items of plant in all parts of a large building or a group of buildings from a central point.

It is apparent from *Figure 1* that any item of plant connected to its nearest outstation can be controlled in any desired way by means of the system program within the Central Station.

Whilst the system offers control facilities which are really only limited by the imagination of the users and the manufacturers, most companies offer a range of standard software packages which allow for a wide range of control facilities. These facilities tend to vary dependent upon the manufacturer but in general the following should be offered:

System Facilities

Self-Adjusting Optimum Start/Stop

This simply self-compensates to suit the building parameters and ensures that the heating systems are switched on and off at precisely the right instant to maintain temperature levels within a building only during

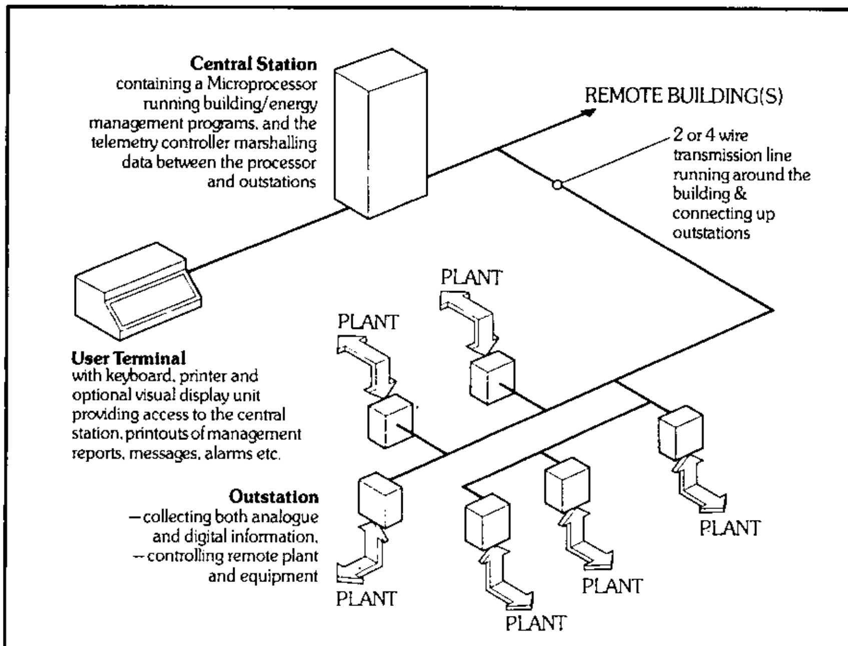


FIGURE 1. SCHEMATIC SHOWING LAYOUT OF A TYPICAL STANDARD ENERGY MANAGEMENT SYSTEM

the period of occupation. Zones can be given different optimum start and stop times to suit the various occupancy times of selected areas.

Within hospitals this facility offers tremendous savings in areas such as day hospitals, health centres, X-Ray units, pharmaceutical and pathology areas, laundries, kitchens, staff living quarters and several other areas.

Time of Day Control
Substantial amounts of energy may be saved by ensuring that equipment is simply switched off when it is no longer required. Several stop/start times per day for each item of equipment being controlled should be offered to allow for equipment to be controlled during all the parts of the day and during breaks etc. Facilities should also be included to cater for the different requirements of different day types, e.g. normal weekday, Saturday, Sunday etc. to be programmed into the system.

Typical applications in hospitals include time control of pumps, dinner trolleys, lighting control giving reduced levels during certain specified periods and many other applications.

Cyclic Control
A typical hospital application of this type of energy saving facility is simply to switch off either ventilation systems of air conditioning systems serving general areas for short periods of time at frequent intervals — say 6 minutes every half hour. These times should obviously be infinitely variable to suit both the design criteria and to meet the users requirements.

Maximum Demand Control
Although the use of automatic maximum demand control cannot be widely used in hospital environments, there are however several areas such as a large laundry where the implementation of this type of control would be beneficial.

Temperature Compensation and Override Control
These facilities allow the control of modulating valves to achieve:
temperature compensation, thus eliminating the need for separate compensators;
temperature override control. This simply either modulates the valve or alternatively opens and closes the valve to ensure that temperatures within rooms are maintained at their desired levels. Lowered room temperatures can quickly be achieved by issuing an instruction at the central station.

Feedback for this type of control is received via solid state temperature transducers and not thermostats, which enables room temperatures to be reported at the central station and also makes the system tamper-proof.

Boiler Step Control
Simply ensures that the correct number of boilers are working at a given time to suit the load conditions.

Plant and Alarm Monitoring
The systems allow for the monitoring of any desired piece of plant for either status or fault conditions. It follows that other alarm systems such as fire alarms, medical gases or security monitoring may also be incorporated if desired.

Report Facilities
Typical reports should include:
Room temperatures;
half hourly and daily MD and consumption reports;
monthly energy summaries;
log of alarms activated;
control point status report;
self-diagnostic fault reports.

Customer Interface
The customer is usually allowed to input data regarding the system parameters and desired conditions via a keyboard. This device also prints out the above reports and alarm conditions.

In the more sophisticated types of system this information is input into the memories using a simple interactive language to enable any authorised operator to use the system without having to learn computing language.

Most companies producing energy management systems will provide many of the above strategies as standard facilities. Many other strategies can be employed to serve the particular needs of the individual user. These are usually available at extra cost.

Whilst many of the facilities listed above would make the installation of a system in a hospital of any size a very desirable acquisition it is very obvious that systems costing in the range of £20,000 — £80,000 can only be cost effective in the larger hospitals. For this reason *Transmitton* has developed an exciting new system aimed at controlling energy in not only the larger hospital buildings but also in the small and medium sized buildings.

WHAT DO THE HEALTH AUTHORITIES REALLY WANT FROM AN ENERGY MANAGEMENT SYSTEM?

Many engineers within the Health Service would agree that ideally an energy management system should possess the following virtues:
Be reasonably priced and above all cost effective;
it should be able to encompass ALL BUILDINGS WITHIN A HEALTH DISTRICT, AREA OR REGION;

it should offer many of the control and monitoring facilities listed in the previous chapter;

it should be self-diagnostic and maintenance free;

breakdowns should be very rare events. Repairs should be possible within minutes by plug-in replacements of faulty modules;

the running costs should be very low;

it should be simple to operate. And there should be no need for a permanent operator;

it should possess high intrinsic reliability with secure data transmission;

it should have enough flexibility to start small and grow big;

it should be simple to interface with existing machines and equipment;

the system should be designed to allow for the eventual monitoring and control of all engineering plant and equipment within a district from one central control point.

A UNIQUE ANSWER

We have recently developed a system which we believe achieves all the above ideals for a reasonable cost. We believe that this system is unique in this respect and that no serious competition yet exists.

Figure 2 shows the schematic layout of a typical system.

Briefly, intelligent outstations which are self-contained microprocessor based control units, are installed in the plant rooms of the various buildings to be controlled. Local wiring is then carried out back to the outstation.

To minimise both wiring costs and running costs the outstations are then connected to the central station (presumably situated at District Headquarters) via the normal GPO telephone STD system.

Two-way intercommunication is possible between the central station and outstations by means of automatic dial-up facilites. The objects of this communication are two-fold:

It enables control data and set point adjustments to be input at the central point;

it enables information at the outstations to be transferred to the central station, e.g. fault conditions, status reports, etc.

Financial Considerations

This system has obvious advantages over the standard system mentioned earlier for the control of a large number of remotely situated buildings. These advantages include:

The cost is greatly reduced. The initial cost for a small system capable of being eventually extended to cover a complete district, area or region may be less than £20,000. Additional outstations can then be purchased to control additional buildings from as little as £2,500 each. Even a complete system of say 50 outstations to control all the buildings within a district would not exceed £150,000 for the equipment cost.

Installation cost are very small. Due to the fact that communication is achieved via the telephone lines the only wiring required is from the outstation to the adjacent plant.

Running costs are low. The outstation running costs compare with the costs of running a normal telephone. The usual rental charge is made plus a charge for all calls made. In many cases the calls will only amount to a few minutes per week for the average outstation. If desired, the calls can be made during off-peak periods to reduce costs.

Maintenance costs are negligible. The system employs solid state memories which means that only the keyboard requires maintenance. Failures are quickly reported via the self-diagnostic techniques and repairs quickly carried out by Hospital Electricians replacing plug-in printed circuit modules.

General. The control strategies offered for use with the dial-up system include:

Optimum start/stop — self-adjusting;
time of day control;
temperature override;
temperature compensation;
plant monitoring;
report facility;
boiler step control.

HOW DOES THIS BENEFIT THE PATIENT?

Anyone who has ever worked within the Health Service knows only too well that the last person to ever be considered in many grandiose schemes is the patient. The readers of this journal will undoubtedly ask themselves the question — *Is the installation of an Energy Management System something that we would like, but the money could be better spent elsewhere* — or *Is there any direct benefit to the patient if we install such a system.*

The answers to these questions should become clear when one considers:

the cost savings achieved by a system can be ploughed straight back into patient care thus making more funds available for the health services primary purpose;

a better controlled environment;

the improved monitoring and control facilities would enable engineers to have earlier warnings of dangerous or faulty situations, carry out much earlier repairs and generally be in much more control of the situation. This can only be reflected in a better service to doctors and nurses, and ultimately the patient.

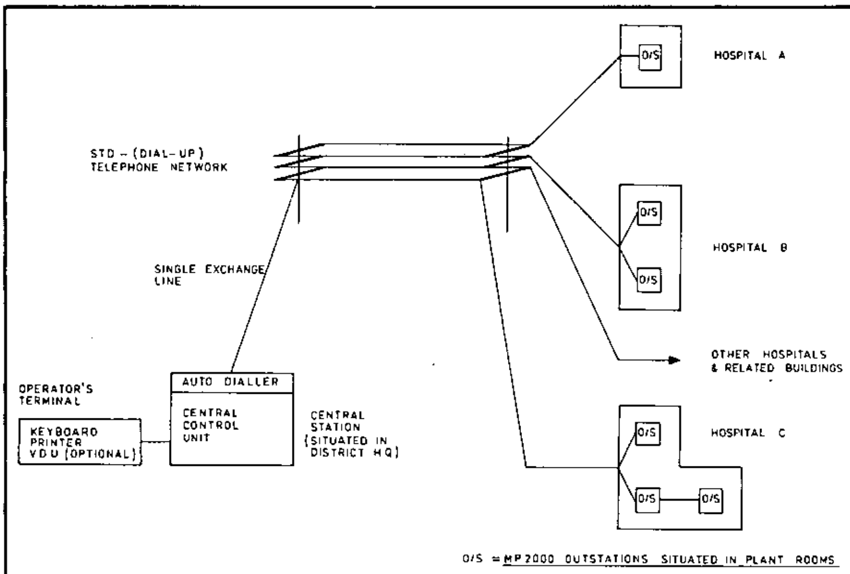


EXHIBIT 2.1 BLOCK DIAGRAM OF TRANSMITTON MICROPOWER 2000 SYSTEM EMPLOYING AUTO-DIAL UP TELEPHONE TECHNIQUES.

The author is Energy Conservation Engineer for the Hillingdon Area Health Authority and the paper was an entry in the Energy Year competition.

Heating Control Systems for Small Buildings

PAUL SMITH MIHospE

In these times of financial cut-backs and strict cash limits the pay-back period for any energy conservation scheme is of the utmost importance. For any given fraction of the annual energy consumption saved, the maximum project cost is limited by the annual energy bill which for a Clinic of some $1000m^3$ is about £1,000 per annum and for a Health Centre of $4300m^3$ is about £5,000 per annum. Therefore schemes costing more than a few hundred pounds are not likely to be considered acceptable investments since the return for a 10% energy saving is from £100 to £500 per annum.

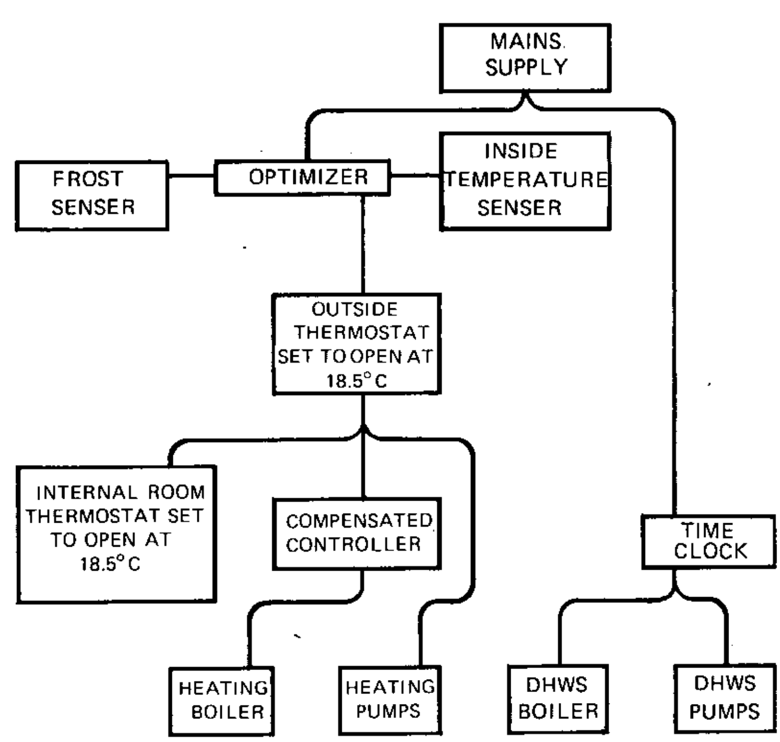
The existing heating control systems installed in the Community Health Buildings of the Hillingdon Area Health Authority, include a compensated controller, simple seven-day time clock and external frost protection thermostat.

Such a control system is inefficient in the use of energy in a number of ways:

1. Since the heating water flow temperature is at a compensated level during the warm-up period, an extended warm-up period is required in all but the coldest days.
2. The heating system is switched on at the same time each week day so during the Spring and Autumn periods the occupation temperature is attained earlier than necessary.
3. Where a combined DHWS and Heating Boiler System is installed, if the control valve does not completely shut off when heating is not required in the Summer months, energy is wasted.
4. Energy is expended in running heating water circulating pumps unnecessarily on hot days in the Summer.
5. The frost protection system causes the building to be heated to occupation temperatures when the outside temperature is below 3°C.

To overcome these deficiencies a control system using a low cost optimizer and two thermostats was designed, which is shown in schematic form below and these are now being installed in ten health centres and clinics within the Area.

If a combined system is in use then the heating boiler in the above diagram is replaced by a control valve and the DHWS boiler becomes the combined boiler.



SYSTEM BLOCK SCHEMATIC

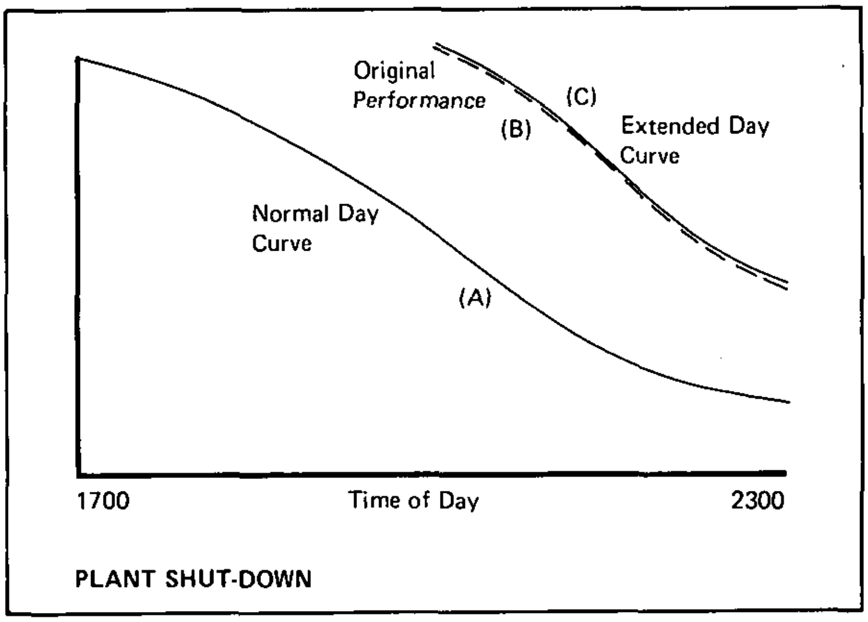
The system operates as follows:

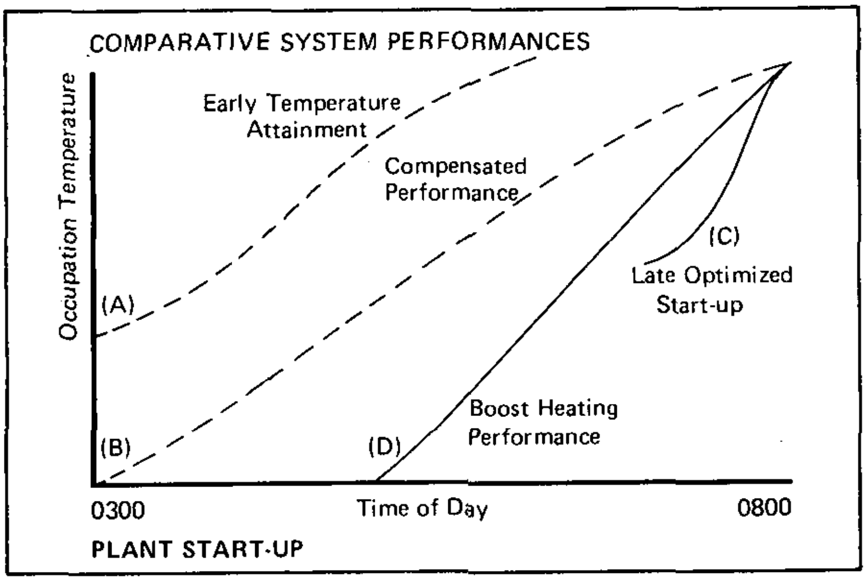
High Ambient Temperature Thermostat

This thermostat is sited on a North facing wall. The contacts open when the ambient temperature exceeds 18.5°C, thereby switching off the heating water circulating pumps and the heating boiler (or closing the heating control valve). This avoids *running the pumps unnecessarily and* heat losses from an 'almost closed down' control system.

On/Off Time Control

A Horsmann Economiser 'E' Optimizer energises the heating boiler Control circuit at a time dictated by the internal temperature of the building. This ensures the building air temperature does not reach occupation temperature earlier than necessary. The Economiser incorporates a seven day time clock with the occupation time for each day individually programmable which enables the regular evening occupation to be accommodated just for the one day per week, and similarly half-day Saturday working.





Boost Heating Thermostat

A second thermostat sited within the building ensures that the minimum time is taken to raise the building temperature for occupation. This is achieved by using this thermostat to by-pass the compensated controller and thereby making the heating system operate at full output until the internal temperature reaches 18.5°C when the thermostat contacts open and the compensated controller takes over to maintain the building at the required temperature.

From the above comparison between the existing and modified systems it can be seen that the greatest energy saving is normally achieved at the beginning of each week-day during the Spring and Autumn months when the Optimizer delays the start-up of the heating plant and thereby avoids early attainment of occupation temperatures (curves A and C, mild weather conditions). However an additional reduction in energy consumption is achieved by the action of the boost heating thermostat in reducing the period that the heating *boiler is required to fire and, by heat*ing the building up faster, the total heat loss from the building during the warm-up period is reduced (curves B and D) in severe weather conditions.

In some cases the inability of the time-clock unit to switch off the heating at different times at the end of the day, led to the heating system running until late evening each weekday (curve B) because on one day a week the Clinic was used for one late session, and where a Health Centre was open on a Saturday morning it remained on for the whole day, this is avoided using the Optimizer because the switch-off time is programmable for each day individually (curve A normal operation, curve C extended day operation).

Financial Analysis

The materials required to modify the control system include an Optimizer, one additional thermostat, cable, clips etc., which cost approximately £130. These are being installed by direct labour staff and although the initial installation took two men four days to complete, the average cost of an installation is expected to be about £100.

The predicted reduction in energy consumption resulting from using the improved control system is 6%. This gives a payback period of 3.8 years for one of the smaller Clinics and *nine months for the larger* Health Centres.

The total project covered the modification of ten control systems in the Community Health Buildings of the Hillingdon Area Health Authority.

At present day prices the annual *energy costs for the ten buildings is* £23,000 and the saving from the project is anticipated to be £1,380 per annum. At an installed unit cost of £230 the expected pay-back period is some twenty-months or two heating seasons.

Jan Thorp is an associate member of IFHE. For several years he has taken part in the Swedish official work for medico-technical safety. He is chairman of an advisory committee for medico-technical safety under the Swedish National Board of Health and Welfare.

Medico-Technical Devices Reporting of Accidents

JAN THORP

The Swedish National Board of Health and Welfare (Socialstyrelsen) adopted in 1977 an Advisory Committee on Medico-Technical Safety. The aim of the committee was to study the development of safety measures in the medico-technical field and to contribute to a higher safety level.

According to a memorandum from the Board of Health and Welfare, *SoSFS (M) 1977:50*, serious defects in medical equipment and installations should be reported to the Advisory Committee. The same goes for accidents where such equipment is involved. The reporting is not limited to defects which have resulted in actual harm to patients of staff. It is important also to report potentially dangerous cases where harm was avoided. The idea behind this memorandum is much the same as that behind the reporting system used in Great Britain.

When a report on an accident or any other untoward occurence has reached the Advisory Committee it decides which measures should be taken in order to avoid a repetition. Members of the Committee often contact the user, the seller and/or the manufacturer of the product to discuss possible improvements regarding the design, the usage etc. of the product. The Committee also circulates warning notes with immediate information to the hospitals and others concerned when a risky repetition of an accident seems to be specially considerable. The Committee may also recommend the National Board (the authority) to act in special cases regarding safety measures. Examples of such cases are:

analgesia apparatuses;
medical gas installations;
risks of fire and explosions when anaesthetic gases are used;
risks of burns at surgical diathermy;
responsibility allocation regarding medico-technical devices.

The Swedish National Board has recently published a report dealing with the results of the memorandum mentioned above. The report covers the period from the latter half of the year 1977 to the end of 1979.

Twelve typical cases are described and 118 reports have been condensed to short comments.

According to the report eight patients have been killed and about 30 have suffered severely. In more than 40 cases the patients have not suffered at all even if the situations have been clearly risky. Mechanical faults dominate in the x-ray departments. Within the anaesthetic and surgical department the reports mainly deal with:

wrong volumes of gases;
wrong flows of gases;
insufficient control of the heat supply to patients;
basic electrical faults.

Regarding the different apparatuses the following are most commonly involved in injuries: gas mixers, blood warmers, baby incubators and diathermy apparatuses.

The Committee finds it necessary to strengthen the technical safety by extended efforts in the following fields:

procurement specifications preferably based on international standard specifications;
co-operation between the buyers before and at procurement;
type testing (including utilizing of international test results);
checking of the equipment before delivery by the manufacturer, and at the hospital before use;
periodical inspections;
easily accessible and easy-to-read instructions in Swedish (usage, maintenance) for equipment in use and for new equipment;
maintenance measures;
education and training of all staff categories;
improvements in organization and administration;
responsibility allocation among all the parts involved;
accident reporting;
information within the hospital regarding accidents and how to avoid them;
special safety steps regarding some of the fields reported, for example:
- **heat/energy supply to the patient;**
- **interchangable and noninterchangable gas connections;**
- **basic electrical safety;**
- **incubators;**
- **blood warmers.**

The author is a Student Medical Physics Technician at Northgate Hospital, Great Yarmouth.

Acoustic Power Measurement of Medical Ultrasonic Probes using a Strain Gauge Technique

T. QUINN

Introduction

The following article describes a radiation force technique which has been used to measure the output power of Physiotherapy Ultra-Sound equipment. It was considered necessary as it has been found that equipment under regular use does not always deliver the same acoustic output power as registered on the panel meter. The main cause for this is the lack of good calibrating facilities in situ.

The method follows that developed by Bindal, Singh and Singh published in *Ultra Sonics* January 1980 (28-31) which uses a strain gauge attached to an arm at the end of which is a target deflected by the Ultra Sound. The exercise was part of a training programme at the hospital for a student of Bio-Medical Electronics from Lanchester Polytechnic, it consequently filled two functions; supplying a useful piece of test equipment needed for the Department of Physiotherapy; and numerous constructional techniques to be mastered by the student.

It was decided to use the above system for reasons of cost, mobility and accuracy with the cost as part of the exercise being cut further by the use of materials found, or scrounged, around the hospital.

Constructional Details

A tank was made using perspex found in the Histology Department of the Pathology Lab., where it was utilised for mounting specimens. Perhaps the best results for the assembly can be obtained by recruiting the talents of the hospital's tropical fish enthusiast as otherwise attempts to strengthen the resulting box tend to be messy (see Fig. 1 for dimensions).

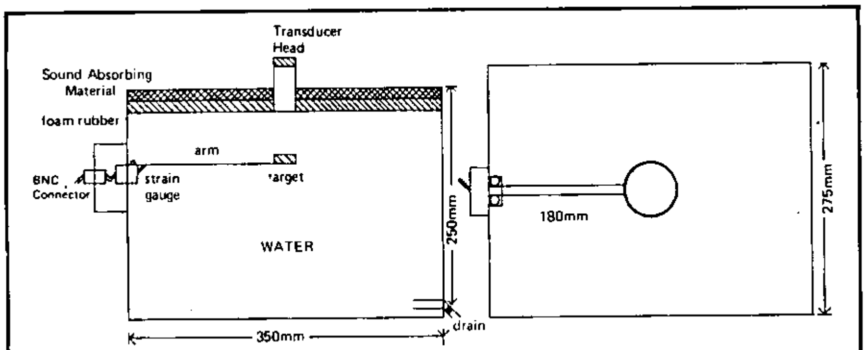


Fig. 1

The arm, shown in Figure 2, was constructed from brass shimming, available from the Hospital Engineers Workshop, on to the end of which was fixed a hollow, cylindrical target also made from the same material with its top surface as near as possible to an angle of 30° between the normal of the surface and the ultra sound wave axis, to prevent standing waves damaging the transducer head. An SP2 battery proved invaluable to shape the cylinder, the metal being sufficiently soft to solder together. The original article recommends phosphor bronze for all the above metals but it was not available in the hospital and brass shimming has a similar coefficient of Linear Expansion of properties of malleability.

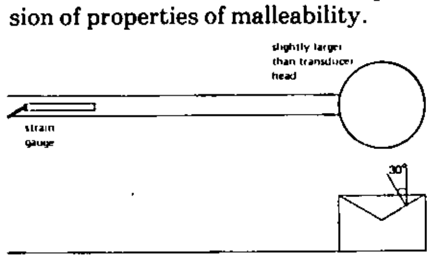


Fig. 2

Attached to the arm was a strain gauge obtained from R.S. Components (Catalogue No. 388-102). Difficulty was at first found in obtaining a sufficiently water-tight and aesthetically pleasing terminal box for leads out of the tank, this was eventually solved by using the rubber bung from the top of a fish tank heating unit which incorporates leads in the manufacturing, the bung needs to be held in place in the side of the tank using a short piece of lightweight piping. The top of a small transformer housing was used to incorporate the necessary B.N.C. Connection to the electronics.

The drain from the tank used tubings from a Givings Set which has the advantage of coming complete with thumbwheel valve.

The lid need to be lined underneath with sound absorbing foam rubber to prevent reflections (see article for reasons only lid lined) and to get the best results from local materials one needs several attempts to isolate a satisfactory substance. E.M.S. obtain their supplies from Medcraft Ltd., Woking and is suitable for 1 MHz region. Samples were tried from scraps the Supplies Department used for packing, from the local Ministry of Fisheries Department where Sonar was used, and various other Departments thought likely to be helpful. Eventually a mixture of foam rubber and material from the Ministry of Fisheries was used.

The electronics used a bridge, strain gauge, and a simple high gain amplification system with a stabilized d.c. power supply and battery check as shown in Figure 3.

The bridge contains a coarse adjustment, R4, which remains on the p.c.b. and a fine adjustment, R2, which is to be taken to the panel.

The signal from the deflection of the arm is then taken from the imbalance of the bridge through two amplifying stages, using LM308's, to reach a voltmeter.

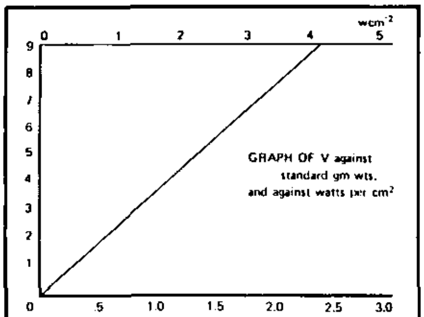


Fig. 3

The d.c. power supply was stabilized to give ± 6.8v and its state was monitored by a zener diode controlled battery check.

Theory

This is just a brief outline of the above papers theoretical section. The original researchers use the relationship:

$$P = \frac{F.C.\,10^{-7}}{2\,\mathrm{Cos}^2 a} \qquad \underline{1}$$

where P = Accoustic Power of the transducer

F = Total radiation force acting downward on the free end of the arm (in Dynes)

C = Speed of sound in water

A = The angle between the normal to the target Surface and the probe axis

They then obtain the relationship from this of:

$$P = \frac{C.\,10^{-7}\,E.K\,.\,\Delta V.\,b.t.^3}{24\,\mathrm{Cos}^2 a.\,G.\,V.1^2.\,lg} \qquad \underline{2}$$

Where E = Modulus of elasticity of the arm

K = Proportionality constant

V = Change in output voltage of bridge

b = Width of arm

t = thickness of arm

l = length of arm

lg = length of strain gauge

G = Gauge factor

V = Applied Voltage

However the only variables are P and V therefore

$P \propto V\Delta$

Which can now be calibrated.

This is done by standard gram and milligram weights placed at the centre of the target and the relationship in equation 1 is then used to draw Figure 3 from which the relevant power can be measured off (see below).

Calibration

It was found to be important to use the same materials, e.g. brass, when calibrating the system as the differing density of metals is a considerable influence at the sensitivity required.

This led to consideration of the effect of the specific weight of the metal used and the consequence was that the equation 1 was multiplied by a factor related to the specific weight of the metal used, e.g. brass.

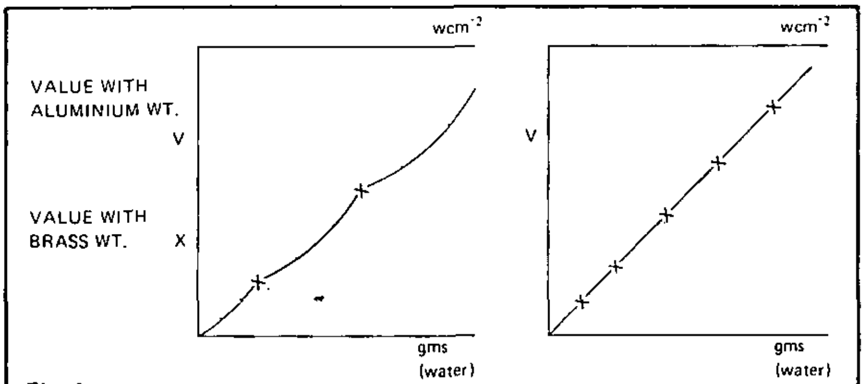


Fig. 4

$$\frac{Dm}{Dw} = \text{s.w.} = \frac{MB/VB}{Mw/Vw} \quad \text{but DW} = 1$$

$$\therefore \text{s.w.} = \frac{MB}{VB}$$

$$\therefore 8.1 = \frac{1}{VB} \quad \text{for 1gm}$$

$$\therefore VB = \frac{1}{8.1} = .12345$$

$\therefore$ 1gram $-.12345 = .877$gm in water now multiply equation 1 by .877 to get true reading.

Dm = Density of metal
Dw = Density of water
Mb = Mass of brass
Mw = Mass of water

Results and Discussion

The results shown in Figure 3 are very satisfactory being repeatable over a series of readings both up and down the scale and with the battery levels close to the limit of the power supply. The sensitivity being $.46\,VW^{-1}$.

The author did not have time to experiment with smaller size tanks but cannot see untoward problems in reducing the size with respect to the results obtained and would be interested to know if this is tried.

Conclusion

A technique has been used to measure the power output of a Physiotherapy Ultra Sound unit, it has to be an interesting and constructive project for a student training programme and the end product has been inexpensive, portable and accurate enough to be used for calibrating the physiotherapist's units.

Acknowledgements

The author is indebted to Messrs. A. Williams and C. P. Dennis of the E.B.M.E. Department, Northgate Hospital for their suggestions and criticisms and Messrs. M. Brooks and G. Tarlton of the District Works Office for allowing the author time and opportunity to fulfil the project.

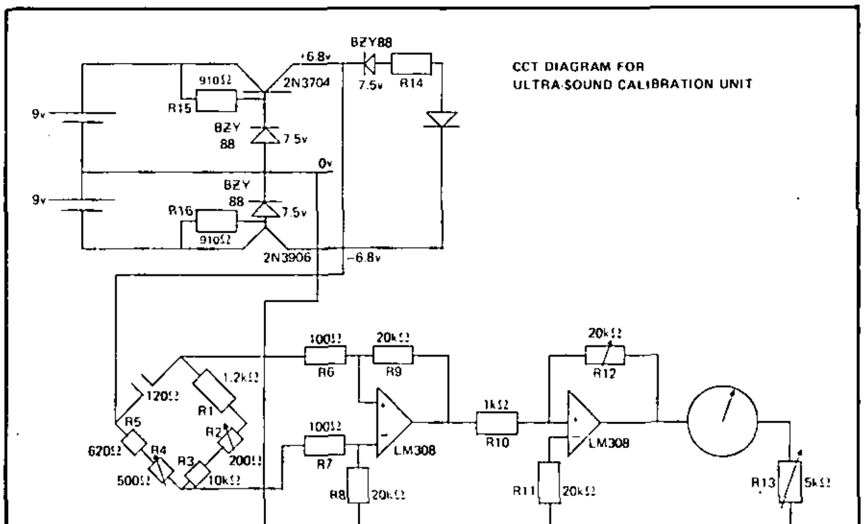


Fig. 5

Product News

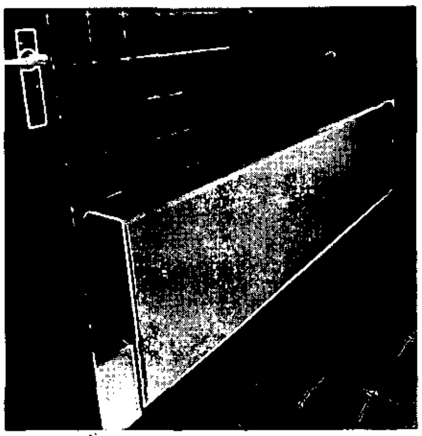
Safe, High Heat Output for Geriatric Ward

Geriatric patients in Windsor Ward at Goscote Hospital near Walsall will now be warmer but completely protected against accidental radiator burns followng the installation of low surface temperature (LST) enclosed radiators from *Hudevad Britain*. All but one of the thirty-three units in this ward are enclosed by 2mm steel protective front plates, aluminium top grilles, and where necessary end plates. Thus, although heat output is high, surface temperature is low and the emitters inside cannot be touched. A feature of this installation is that it contains the longest continuous of Hudevad LST radiators so far installed (23 metres), and that nine different lengths of emitter, five heights, and two thicknesses have been employed.

Increased temperature required

The heating installation was upgraded because the room temperature required for such wards has been increased to 21°C (70°F). Existing corroded pipework and ageing boiler had to be replaced. Furthermore, the cast-iron 'hospital type' radiators could only have given the heat output required whilst remaining safe to the touch if an excessive number had been installed.

Apart from safe heat output, Hudevad LST radiators were chosen for their robustness. The steel protective front plate is 2 mm thick and will therefore withstand one of the main causes of mechanical damage to radiators in hospitals, namely impact from bedsteads being moved during cleaning. Furthermore, the totally enclosed nature of the new units keeps out waste paper, and the natural convection of warm air between the ribbed sections of the emitters prevents accumulation of dust inside. Pipes and connections carrying water at an average temperature of between 150° and 160°F, sometimes as high as 180°F, are fitted behind the protective front plate.



Windsor Ward, constructed in the 1930's, is in fact two linked wards called familiarly the 'long ward' (200 m²) and the 'short ward' (105 m²). In between them are the sister's office, a single-bed ward, a dressing station and a kitchen. At the far end of each ward are WC's, sluices, and bathrooms, while leading from the far end of the long ward is a 500 m² day room. One enters the area by a 30 m long corridor, which will eventually connect Windsor Ward with another ward now being upgraded.

Longest run

The longest continuous runs of radiator are on either side of the long ward. Along one wall there are four 5.75 m long front plates behind each of which are two 2420 mm long emitters (eight in all); together they provide an output of 18 kW. The opposite wall has six elements behind three front plates to give an output of 13.5 kW. The emitters in this ward are 300 mm high and the front plates 500 mm high.

In smaller rooms, space has been saved by installing higher, less long radiators: for example, one 1556 mm long x 400 mm high (output 0.816 kW) have been installed in each of the two sluice areas.

Further information from: Hudevad Britain, 262 Hook Road, Chessington, Surrey, KT9 1PF. Tel: 01-391 1327.

Flow Rate Switch

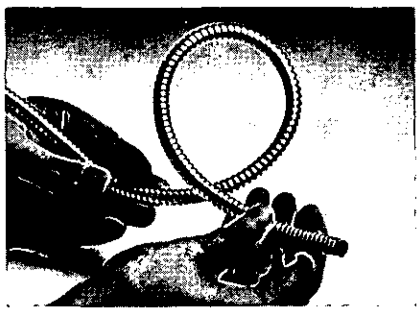
A combined flow switch and indicator for monitoring very low rates of flow in liquid or gas systems is now available. The unit measures flow down to 50 cc per minute. Maximum pressure rating is 20 bar or 130 bar, depending on the model.

An important feature of the new unit is that it can incorporate 15-amp micro-switches with direct electrical connection to control systems, remote warning lights, failsafe mechanisms etc.

Manufacturers are C.C. Meters Limited, Chatsworth Terrace, Harrogate HG1 5JH. Tel: 0423 69550.

Armouring

Flexible small bore armouring, ideal for leads, cables, optical fibres and tubes which might be vulnerable to damage, is highly flexible yet ensures really positive protection. Manufactured from carefully selected materials ina square lock configuration, it is available in various grades either uncovered or with PVC covering to suit the widest range of environments, and is supplied with internal diameters ranging from 3mm to 10mm in a wide range of materials, including stainless steel and brass.



Uni-Tubes Limited, 189 Bath Road, Slough, Berks. Tel: Slough (0753) 34931.

Dual Fuel Burners

Burners capable of burning both LPG and 35 secs oil are supplied for outputs from 2,500,000 Btu/h down to 250,000 Btu/h. It is understood the 250,000 Btu/h unit is the smallest industrial dual fuel burner on the market. Change over from one fuel to another is effected manually, by simply turning a key, with interlocks to prevent incorrect fuel usage, and equal efficiency is obtained with both fuels.

Radiant Superjet Limited, Clapgate Lane, Woodgate, Birmingham. Tel: 021 422 7221.

Classified Advertisements

APPOINTMENTS AND SITUATIONS VACANT

Dudley Area Health Authority

Senior Engineer

£6822 – £7896

In 1982 we are opening a new District General Hospital in Dudley. We are now looking for a Senior Engineer to be involved in the commissioning of the engineering plant and services and in scheduling for the setting up of planned preventative maintenance.

After handover the successful applicant will take responsibility for the management of the hospital and other properties attached to the sector.

Applicants (m/f) must hold an appropriate HNC or City and Guilds qualification, have completed an apprenticeship or other practical training and have had five years relevant experience part of which should be in a health service or related environment.

Application forms and job descriptions are available from the Area Personnel Officer, Dudley Area Health Authority, Falcon House, The Minories, Dudley, West Midlands DY2 8PG, telephone Dudley 56911, exts. 204/219. If you would like an informal discussion on the post please ring Mr. J. Harding, Area Engineer, on Dudley 56911 ext. 265.

Closing date for return of applications 19 December 1980.

Harrow
HEALTH DISTRICT

**NORTHWICK PARK HOSPITAL
& CLINICAL RESEARCH CENTRE**
Brent & Harrow Area Health Authority
HARROW DISTRICT
Watford Road, Harrow, Middx. HA1 3UJ
Tel. 01-864 5311.

SENIOR ENGINEER

**£7349 – £8423 incl. L.W.A.
(plus bonus of 13%)**

To be responsible for the maintenance of all electrical and mechanical plant and equipment within the Health District which includes two small geriatric units, a Health Centre, community clinics and residential units at Northwick Park Hospital.

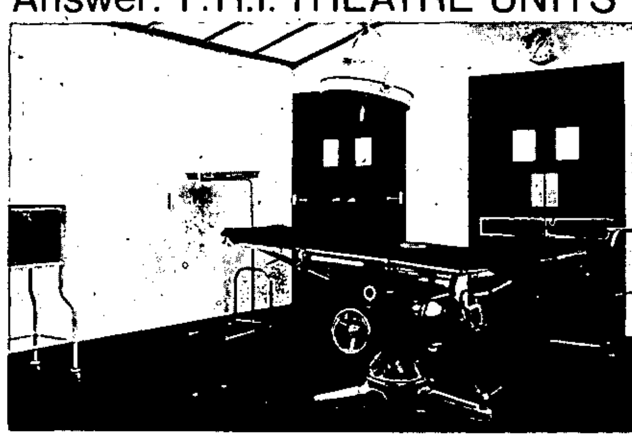
Applicants should possess HNC in Mech.Eng or C & G Full Tech. Cert. (Plant Eng) which includes Industrial Administration and have served appropriate apprenticeship.

The District Works Officer Ext. 2494 will be pleased to discuss the post and duties with prospective applicants.

Application forms and Job Descriptions are available from the Staffing Officer — Ext 2001.

Theatres closed.. Surgery as usual?

Answer: P.H.I. THEATRE UNITS



SAVE CAPITAL AND MAINTENANCE COST
Complete Theatre Suites installed in a ward or exterior building with the minimum disruption of services in as little as 7 days. Rental or Purchase from :–

P.H.I. PAUL HANFORD INSTALLATIONS LTD
Unit 2, Industrial Estate, Boston Road, Horncastle, Lincs. Tel. Horncastle (06582) 7383/4

Northern Ireland
Eastern Health and Social Services Board

Professional and Technical Staff Vacancies

NORTH AND WEST BELFAST DISTRICT
(a) Senior Building Officer
Salary: £6,822 – £7,896 p.a.
Applicants must (i) hold an H.N.C. in an appropriate subject or an alternative approved qualification and (ii) have completed an apprenticeship followed by appropriate experience OR have 5 years' continuous experience in the building trade.

(b) Senior Engineer
Salary: £6,822 – £7,896 p.a.
Applicants must (i) hold at least H.N.C. in an appropriate subject or an alternative approved qualification and (ii) have completed an apprenticeship in mechanical or electrical engineering OR have 5 years relevant experience.

(c) Building Officer
Salary: £6,210 – £7,005 p.a.
Applicants must (i) hold at least O.N.C. in an appropriate subject or and alternative approved qualification and (ii) have completed an apprenticeship and have 5 years relevant experience.

(d) Engineers (4 posts)
Salary: £6,210 – £7,005 p.a.
Applicants must (i) hold at least O.N.C. in Engineering or an alternative approved qualification and (ii) have completed an apprenticeship in an appropriate trade and have 5 years relevant experience.

Application forms for posts (a) to (d) from the District Personnel Department, King Edward Building, Grosvenor Road, Belfast, BT12 6BA (Telephone Belfast 40503) for return by December 19.

SOUTH BELFAST DISTRICT
(e) Senior Building Officer
Salary and details as for post (a)

(f) Senior Engineer
Salary and details as for post (b)

(g) Building Officer
Salary and details as for post (c)

(h) Engineers (3 posts)
Salary and details as for post (d)

Application forms for posts (e) to (h) from the District Personnel Department, Belfast City Hospital, Lisburn Road, Belfast BT9 7AB (Telephone Belfast 29241) for return by December 19.

EAST BELFAST AND CASTLEREAGH DISTRICT
(i) Senior Building Officer
Salary and details as for post (a)

(j) Senior Engineer
Salary and details as for post (b)

(k) Building Officer
Salary and details as for post (c)

(l) Engineers (3 posts)
Salary and details as for post (d)

Application forms for posts (i) to (l) from the District Personnel Department, Forster Green Hospital, Saintfield Road, Belfast BT8 4HD (Telephone Belfast 793211) for return by December 19.

NORTH DOWN AND ARDS DISTRICT
(m) Building Officer
Salary and details as for post (c)

(n) Engineer
Salary and details as for post (d)

Application forms for posts (m) and (n) from the District Personnel Department, James Street, Newtownards (Telephone Newtownards 812661) for return by December 19.

LISBURN DISTRICT
(o) Senior Building Officer
Salary and details as for post (a)

(p) Engineer
Salary and details as for post (d)

Application forms for posts (o) and (p) from the District Personnel Department, Lisburn Health Centre, Linenhall Street, Lisburn (Telephone Lisburn 2733) for return by December 19.

DOWN DISTRICT
(q) Senior Building Officer
Salary and details as for post (a)

(r) Engineer
Salary and details as for post (d)

Application forms for posts (q) and (r) from the District Personnel Department, Downshire Hospital, Downpatrick (Telephone Downpatrick 3311) for return by December 19.
All posts open to men and women.

Camden & Islington AHA (T)
ISLINGTON HEALTH DISTRICT

ENGINEERS

Salary: £6737 – £7532 inc. London Weighting plus 5% bonus allowance

To assist Senior Engineers with the day-to-day operations programme, maintenance and small works in three hospitals. The work includes full involvement in planned maintenance and an incentive bonus scheme and will provide the successful applicants with a broad and varied health care engineering experience.

Applicants (male or female) shall have an ONC in Engineering or a suitable alternative and shall have served a recognised apprenticeship in mechanical or electrical engineering.

Application form and job description may be obtainded from Community Health Personnel, 159 Upper St., London N1 1RE. Tel: 01-226 4488 ext. 280/228.

Staffordshire Area Health Authority
NORTH STAFFORDSHIRE HEALTH DISTRICT

SENIOR ENGINEER
District Works Department

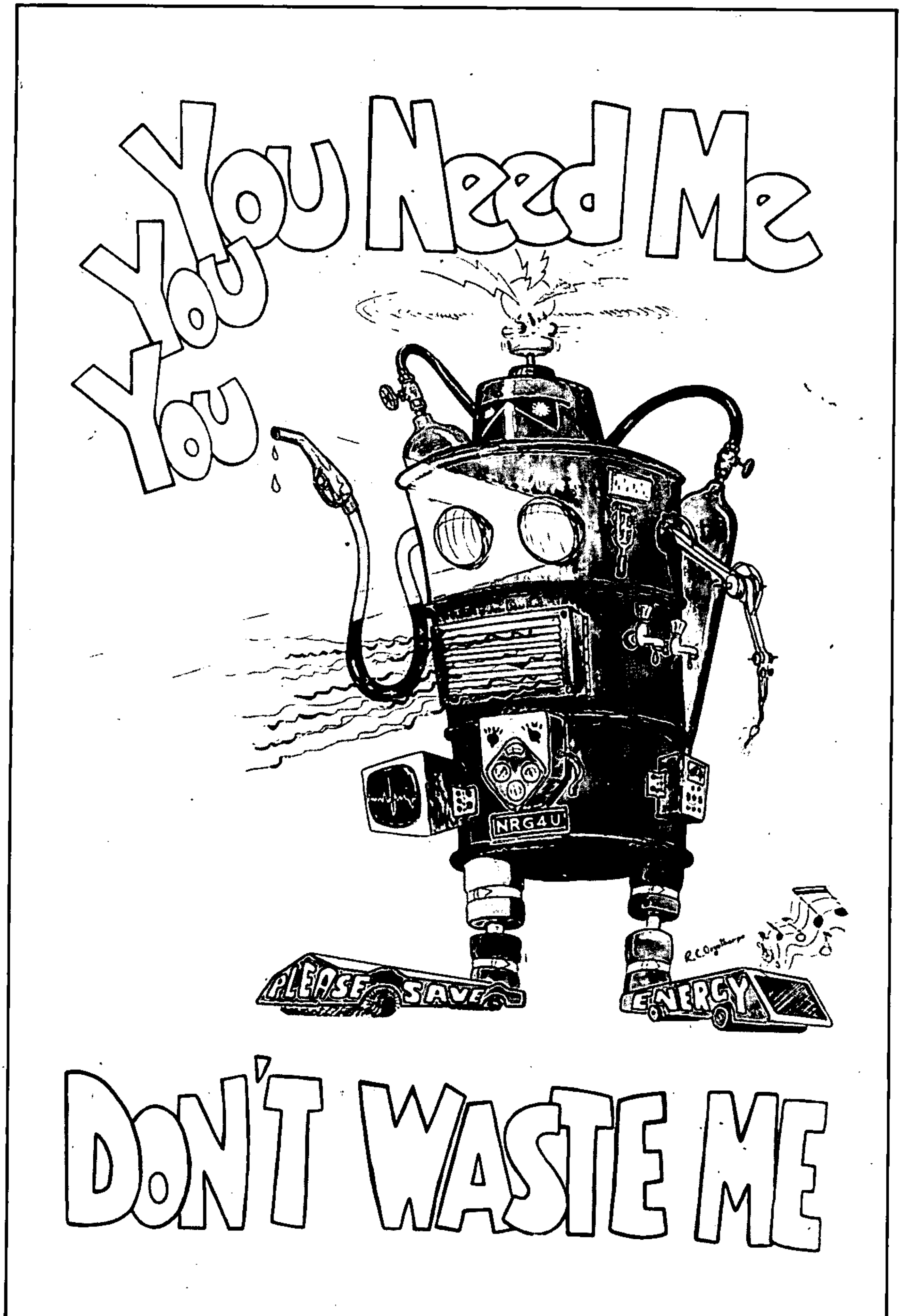
Applications are invited for the above post at the City General Hospital, Newcastle Road, Stoke-on-Trent.

The successful applicant will have served a recognised apprenticeship in Mechanical or Electrical Engineering and have wide experience in the operation and maintenance of modern steam raising plant, heating, ventilation and electrical services, along with sound managerial experience in the control of directly employed and contract labour.

Applicants should normally possess a Higher National Certificate in Mechanical or Electrical Engineering with appropriate endorsements or an equivalent qualification.

The salary scale is £6,822 rising by five annual increments to £7,896. An additional allowance of 15% is payable for participation in the control of Incentive Bonus Scheme which is in operation.

Application form, job description and further information relating to qualifications, etc. may be obtained from the District Works Officer, District Administration Offices, North Staffs. Health District, Princes Road, Hartshill, Stoke-on-Trent. Tel. Stoke-on-Trent 49144 ext. 4011 to whom completed applications should be returned by 15 December, 1980.



Conservation Year Competition — Poster Section
The Runner-Up