The Journal of the Institute of Hospital Engineering May 1981

HOSPITAL ENGINEERING

John Constable
The new Institute President

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HOSPITAL ENGINEERING

The Journal of the Institute of Hospital Engineering

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International Federation Congress Amsterdam — May 1982

Enclosed with this issue of the Journal is a leaflet relating to the International Congress, issued by the Congress organisers. It includes an invitation to anyone who is interested in presenting a paper during the Congress.

We take this opportunity to draw reader's attention to this and anyone interested should contact:
Gaston E Lam, Secretary, NVZT, Princess Ireneweg 7, 7433 DD Schalkhaar, Holland.

Nominations for the CEI Board

Nominations are now required from Chartered Engineers to fill the four places on the CEI Board which will become vacant at the conclusion of the 1982 Annual General Meeting.

Nomination forms are available from CEI, 2 Little Smith Street, London SW1P 3DL and will give details of the nomination procedure. Nominations must be supported by fifteen chartered engineers and forms must be received at CEI by 1200 hours on September 1981 at the latest.

The following elected Board Members will be retiring but all are eligible for re-election if nominated:

Sir Reginald Harland RAeS FIEE FIMechE;
Sir Charles Husband FICE FIMechE FIStructE FIHE;
Dr H. P. Jost FIMechE FIProdE;
Mr J. D. Sampson FIMarE FIMechE.

The By-laws require that no more than two elected members of the Board shall be identified with any one Corporation Member or the group of Affiliates. In consequence, nominations from members who are corporate members of IEE only, IMechE only or IEE and IMechE only cannot be accepted, as the elected members not retiring include two members identified with each of these two Institutions.

Board Changes at CEI

At the Council's Annual General Meeting on 26 March 1981, the following elections were announced:

Chairman — *Mr Bryan Hildrew* CBE FEng, Managing Director of Lloyd's Register and President of the Institution of Mechanical Engineers.

Vice-Chairman — *Mr Gerald James Mortimer* CBE MBE FEng.

Members of the Board:
Miss E G Dodd FIMechE FIEE
Mr M R Hannen MIEE
Mr J G Kapp MIEE MIMechE
Mr D H Pitcher FIEE
Mr K H W Thomas FRINA
Mr J D Ward FICE FIStructE

Honorary Librarian

Mr. R. G. Smith has been the Institute's Honorary Librarian since 1972. 'Reg' Smith is to retire from the National Health Service later this year and has decided that it might be appropriate in these circumstances to give up the post of Honorary Librarian. The sole reason for his decision, we are sure, is that he feels that once removed from the 'hospital engineering' environment he will be less well placed to continue to give advice which has formed such a large part of his duties as Librarian.

Reg Smith has done a tremendous job since he took up these duties and Council and, indeed, many members and other correspondents from every

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The Institute of Hospital Engineering

The Annual Five Branch Meeting
The John Radcliffe Hospital
Headington, Oxford
Saturday 6 June 1981

PROGRAMME

10.00 Coffee
10.30 OFFICIAL OPENING BY TONY COUCH Esq
Chairman Midlands Branch
CHAIRMAN for the day
JOHN CONSTABLE Esq CBE CEng FICE FRICS FIHospE
President The Institute of Hospital Engineering
10.40 DIVING IN THE RED SEA
Speaker: RON SWINDEN Esq CEng MIMechE MIHospE MIPlantE
Area Works Officer, Oxfordshire AHA(T)
Mr Swinden will describe his own exploits and illustrate his talk with colour slides.
11.35 MICROVASCULAR SURGERY
Speaker: D. H. HARRISON Esq FRCS
Consultant Plastic Surgeon
Mr Harrison will talk about his work in Microsurgery with particular reference to re-plantation of arteries and nerves using a microscope.
12.30 DISCUSSION
12.45 LUNCH
14.00 THE BENEFITS OF A TRADE UNION TO ENGINEERING IN THE NHS
Speaker: JOHN SAMPSON Esq MA CEng FIMechE FIMarineE
Secretary United Kingdom Association of Professional Engineers (UKAPE).
Mr Sampson will take a new look at the role of the trade union member in the future re-structured Health Service.
15.00 DISCUSSION
15.45 CLOSING ADDRESS BY THE PRESIDENT INSTITUTE OF HOSPITAL ENGINEERING
16.00 TEA AND DISPERSE

Will all members and guests of the IHE wishing to attend please advise their local Branch Secretary before 23 May 1981.

'corner of the globe' have much to thank him for.

The Institute is most fortunate that on losing his considerable services a volunteer has come forward to take his place.

He is David Hall, District Engineer, West Birmingham Health District. David Hall has a consuming interest in 'books' and 'libraries', amongst other things, and we are quite sure that members and others, will continue to receive the fine service they have come to expect from the retiring Honorary Librarian.

Products for the Disabled Exhibition

29 April–20 June

'Design and Disability' looks at British-made products available for the disabled, how well they are designed, and what can be done to improve the standard of design.

The exhibits range from domestic and gardening aids, to new walking devices, remote control systems and micro-electronic products.

Details from: The Design Council, 28 Haymarket, London SW1. Tel: 01-839 8000.

North Western Branch

On Thursday, 19th March, 1981 the branch held its Annual General Meeting at which 26 members attended. This was held at St. Mary's Hospital, Manchester and the principal guest and speaker was Mr. T. A. Nicholls, the Chief Engineer of the Department of Health and Social Security. He gave a talk on Hospital Engineering of the past which was most interesting and informative. The discussion after the talk was lively, Mr. Nicholls however managed to evade committing himself to the way engineering was going in the future, although questions were aimed at drawing him out on this subject. A most informative and entertaining evening.

Branch Officers for 1981–82

East Anglian Branch

Chairman
Mr R. G. Freestone, District Engineer, Cambridge Health District.
Vice-Chairman
Mr A. Bray, Senior Engineer, Norwich Health District.
Hon. Secretary/Treasurer
Mr M. Brooke, District Works Officer, Gt. Yarmouth & Waveney Health District.
Committee Members
Mr F. D. Blackburn, District Works Officer, Norwich Health District;
Mr J. Beaton, Area Engineer, Norfolk Area Health Authority;
Mr C. P. Le Breton, Senior Engineer, Norwich Health District;
Mr R. G. Kidsley, District Works Officer, Bury St. Edmunds Health District;
Mr J. A. Parker, Area Works Officer, Norfolk Area Health Authority;
Mr A. Lawn, Senior Engineer, Gt. Yarmouth & Waveney Health District;
Mr H. L. Hodgkiss, Engineering Officer, Norwich Health District.

East Midlands Branch

Chairman
P. H. Parker, Regional Engineer, Trent Regional Health Authority.
Deputy Chairman
F. P. Smith, District Works Officer, Central Nottinghamshire Health District.
Secretary/Treasurer
S. A. Lees, Principal Assistant Engineer, Trent RHA.
Committee Members
J. M. Hemes, Senior Engineer, Leicester North West District Health Authority;
T. A. Chamberlain, Senior Engineer, North Lincolnshire District Health Authority;
E. A. Hall, E. G. Phillips, Consulting Engineers;
P. F. Leivers, P. F. Leivers, Consulting Engineers;
J. R. Lee, P. F. Leivers, Consulting Engineers.

West of Scotland Branch

Chairman
D. E. Moss, Sector Engineer, Greater Glasgow Health Board.
Vice-Chairman
B. D. Edgar, Area Engineer, Greater Glasgow Health Board.
Honorary Secretary
T. M. Sinclair, District Engineer, Greater Glasgow Health Board.
Honorary Treasurer
W. Gormley, Divisional Engineer, Scottish Health Services Common Services Agency.
Minute Secretary
J. McMurtie, Sector Engineer, Greater Glasgow Health Board.
Committee Members
R. W. Gardner, Assistant Area Engineer, Greater Glasgow Health Board;
G. A. W. MacFarlane, Sector Engineer, Greater Glasgow Health Board;
A. C. MacFadyen, Technical Officer, Scottish Health Service, Common Services Agency;
G. J. Morpeth, Sales Engineer, B.O.C. Limited, Glasgow;
H. Waugh (Council Member for Scotland), Engineering Works Officer, Forth Valley Health Board.

Yorkshire Branch

Chairman
Mr J. R. Fielding, Assistant Area Engineer, Leeds AHA;
Vice-Chairman
Mr A. E. Horvath, District Engineer, Bootham Park Hospital, York;
Hon Secretary
Mr J. Bate, Wakefield Local Authority;
Hon Treasurer
Mr A. Duffield, Engineer, Leeds General Infirmary;
Joint Programme Secretaries
Mr A. Duffield and Mr J. R. Fielding;
Publicity Officer
Mr P. Gordon, Area Works Officer, Kirklees AHA;
Membership Officer
Mr A. E. Horvath;
Committe Members
Mr A. L. Sykes, Sector Engineer, High Royds Hospital, Menston;
Mr J. A. Gelder, Sector Engineering Inspector, Barnsley MDC.

Hospital Energy Conservation Year

'CHEN Posters'

Readers will recall that the Institute designated 1980 to be Hospital Energy Conservation Year and staged a competition. The Poster Section was won by a design which brought on to the stage a certain 'Mr. Chen' who will have become known to readers through his appearance in the December issue.

As a follow up it is interesting to note that the Norwich Health District, within which District the original poster was created, are reproducing it and making it available throughout the NHS in a most commendable effort to try to perpetuate energy savings.

The first two posters are now available. They are printed in four colours on size A3 paper (approximately $10\frac{1}{2}$ x $15\frac{1}{2}$) and cost 23p each — minimum order 50 posters (£11.50). A further six posters are planned for issue during the next heating season to ensure a continuous educational programme.

For further information, telephone: Mr Benham, Norwich (0603) 28377 ext. 268.

Filtration Society Conference

The 1981 International Conference of the Filtration Society will be held at the Cunard Hotel, London W6 on 15-17 September 1981, in conjunction with the FILTECH/81 exhibition at nearby Olympia.

The theme is 'Filtration and Separation Equipment Selection for Optimum Results' and the fee for the three days, including meals, refreshments and reprints of the papers given, is £150.

Full details from Derek Wyllie, Knights Place, Whichford, Shipston-on-Stour, Warwickshire. Tel: Long Compton (060 884) 341.

New Members List

Fellows

BAXTER, Jack, Bury Area Health Authority.
BROWNE, Rowland Herbert, Eastern Health and Social Services Board.
CHAPMAN, Brian Verinder, Static Systems.
GILL, John, Manchester Area Health Authority.
GRIFFITHS, Roy George, Richards Round and Partners.
HILL, Gordon Robert, Tuckey Ford.
McMASTER, William, Salford Area Health Authority.
MILLWARD, William Brian, North Western Regional Health Authority.
RICKELL, Peter Kevin, Maurice Baguley and Partners.
STOCKER, James Alfred, East Anglian Regional Health Authority.
WALTON, Roy David, R. W. Gregory and Partners.
WATLING, David, Peteric Engineers Ltd.

Members

ABBOTT, Ronald John, St. Peters Hospitals.
ATKINSON, William, Norman Blezard and Partners.
BALL, John Thomas, Birmingham Area Health Authority.
BANKS, Michael, Halifax General Hospital.
BARRETT, Alan Robert, East Anglian Regional Health Authority.
BENSTEAD, Alan, RAF Wroughton.
BLOCK, Alan Alfred, Hillingdon Area Health Authority.
BOLAN, Gordon, R. W. Gregory and Partners.
CALLINGHAM, William Peter, West Glamorgan Health Authority.
CHEW, Kim Seng, General Hospital, Kuala Lumpur.
CLARK, Stanley, Leicester Area Health Authority.
CURLEY, Graham, Parsons Brown.
DUNCAN, Andrew Dunlop, Royal Alexandra Infirmary, Paisley.
DUNMALL, Robin Philip, St. Philips Hospital.
FARLEY, Keith John, Gloucestershire Area Health Authority.
FLYNN, William Joseph, Kings Mill Hospital, Notts.
GOODWIN, Kenneth George, Smallfield Hospital, Horley.
GORVETT, Royston, West Glamorgan Area Health Authority.
HARGREAVES, Ian, Salford Area Health Authority (T).
HAY, David Allan, St. Crispin Hospital, Duston.
HAYWARD, James Douglas, Royal Hampshire County Hospital.
HORTON, Richard John Adair, Sandwell District General Hospital.
HUGGETT, Ronald, East Sussex Area Health Authority.
HUGHES, Maurice Sidney, North Birmingham Health District.
HUNTER, William Stanley, Sharoe Green Hospital, Preston.
KELLY, Paul John, Bedford General Hospital.
KNIGHT, Edward William, Brentry Hospital, Bristol.
LEIPER, James, Royal Alexandra Infirmary, Paisley.
LEWIS, Peter Martin, Humberside Area Health Authority.
LYONS, Colin Joseph, East Birmingham Hospital.
McDONNELL, Daniel Florence, Varming Mulcahy Reilly Associates.
MARDSEN, James, Fazakerley Hospital, Liverpool.
MAYES, Malcolm Richard, Groby Road Hospital, Leicester.
MITCHELL, Melvin Raymond, Bolton General Hospital.
MURRAY, Colin Paterson, RAF Wroughton.
NICHOLSON, Alan, Western General Hospital, Edinburgh.
NORMAN, Andrew John, Yorkshire Regional Health Authority.
O'CONNELL, Barry, Kings Lynn Health District.
OLOWOKERE, Gabrial Dada, University College Hospital, Ibadan.
PEACH, Leslie Roger, Kings Lynn Health District.
PENNINGTON, John Michael, St. Georges Hospital, Morpeth.
SANDERS, Andrew Charles, Maternity Hospital, Cambridge.
SCOTT, Hugh McConnell, Gartloch Hospital, Glasgow.
SMITH, Bruce Lindsay, Dept. of Works and Supply, Papua/New Guinea.
SMITH, Graham Kenneth, Bexley Health District.
STATHAM, Roderick Thomas, Royal Hospital for Sick Children, Glasgow.
STEEL, Michael John, Basildon Hospital.
STEPHEN, Iain Charles, Watford General Hospital.
TAYLOR, Stephen John, Fazakerley Hospital, Liverpool.
TOMORI, Olasupo, Ife University Teaching Hospital, Ile-Ife.
WEARMOUTH, Peter, St. Johns Hospital, Lincoln.
WRIGHT, Philip James, J. E. Greatorex and Partners.

Graduates

BLENCOWE, Paul Andrew, Oxford Regional Health Authority.
BURDETT, Geoffrey, Cheshire Area Health Authority.
FOWLE, Francis, City and Hackney Area Health Authority.
MARPER, Ian, Kettering General Hospital.
STEPHENS, John Nigel, Leavesden Hospital Main Site.

Associates

GBADAMOSI, Tunde Raheed, Ife University Teaching Hospital, Nigeria.
HARAKIS, Joseph Michael, El-Ali Central Est. Riyadh.
McGANN, Thomas Christopher, St. Stephens Hospital, Co Cork.
McMINN, Hugh Martin James, Eastern Health & Social Services Board.
MOULT, John Christopher, North Western Regional Health Authority.
ONYEKWELU, Thomp. Ozoekwe, Idechemists Ltd. Group, Anambra State.
POOPOLA, Olakunle Olayinka, Industrial Gases Ltd. Nigeria.
REDGEWELL, Robert Brian, The London Clinic.
SALUTO, Francesco, MIDEC (PTY) Ltd. Botswana.
WEBSTER, Peter Bryden, King Faisal Specialist Hospital, Riyadh.

The Editor talks to

As announced briefly in the last issue, the next President of the Institute is Mr John Constable, CBE CEng FICE FRICS FIMunE FIHospE, Regional Works Officer of the West Midlands RHA.

Mr Constable will take over as President from Mr Lawrence Turner at the Institute's Annual Conference in Sheffield in May. He talked recently to the Editor.

John Constable

The new President of the Institute

John Constable has been a hospital engineer for 26 years, and is grateful to have been involved throughout that time with major projects — originally the massive post-war expansion of the early 60s, and ever since with the many developments of more specialised requirements and new techniques. He is a quiet, rather shy man who has achieved much, and would hate to have to say so.

Mr Constable was born in September 1919 in Preston, Lancashire, but the family moved to Dover while John was still quite young. He had always been fascinated with machinery and in the reasons why things worked, and being reasonably numerate, it was a natural step for him to decide to become an engineer and to become an articled pupil with a firm of civil engineers. His initial work was however almost exclusively architectural.

After two years, however, Mr Constable's career was interrupted like so many others by the outbreak of the 2nd World War. He immediately joined the Royal Engineers, and was soon commissioned. He volunteered to go to Finland in 1940, but he ended up by being sent to India.

He returned home in 1945 as a major, having attended Staff College, which he holds to be the finest management school. He was demobilised in 1946, and, having married in 1940, had both to get a job and settle down to a hard slog of evening and weekend study for qualifications, which he still remembers with a wry smile.

He then spent 10 years in Civil Engineering, before making the move which turned out to be so significant to his entire career. He joined the Health Service in 1955, initially in Oxford, before moving to the Regional Hospital Board in Birmingham in 1958. Looking back, he cannot really give any special reason for the move. He was certainly conscious of looking for new experience, and the hospital service certainly seemed worthwhile. He was not conscious of any strong sense of vocation, although acknowledges that it was perhaps there.

He was of course joining the Service at just the right time. Not very much had been spent on capital building since the war, while other sectors of the economy had already received much needed investment. Then came the turn of the hospitals. He was selected to go on a study tour to the USA, to examine the Hill Burton programme, and the lessons learnt on this visit were of enormous value as the money started to flow.

It was clearly a most exciting and challenging time, huge investment programmes were being prepared, but with little overall guidance, and no Hospital Building Notes.

Mr Constable says that a great deal of first-class work was done, and gradually the administration and planning became more organised with more experience.

It was in 1960 that it became clear to him that one of the major problems in the Service was the almost complete lack of any training facilities. Many people today, he says, would be astonished at how little was done. Many of those in the Service were old hands, who had picked up their experience in the traditional way, and very few people had any thought for future succession. He was aware of the training schemes within the Post Office for telecommunications staff and suggested that engineering in the NHS required similar specialised facilities.

David Hughes, then Chief Engineer of the Ministry of Health, took up the suggestion and an Advisory Committee on Hospital Engineering Training (ACHET) was formed, with John as a member, to advise the Minister. The Committee was delighted when, after a long search, the premises at Falfield became available and the recommendation to establish the Hospital Engineering Training Centre there was accepted and implemented. John Constable feels that if this were his only contribution to the Health Service, it would be one he could be proud of.

Also in those days, he paid a considerable part, often behind the scenes, in the Institute's own famous series of Keele courses. He was always involved, either as a lecturer, or as an organiser, or seeing that someone participated. Even in the early 60s he was stimulating Group Engineers in his Region to obtain professional qualifications and attend senior management courses. The fruits of this became evident in the appointments of Area and District Staff in 1974.

In the late 1950s his main concern was the new Walsgrave hospital to replace bombed buildings in Coventry. This was followed in the 1960s and early 1970s by the waves of construction of operating theatres, accident and out-patient departments, maternity units, pathology laboratories and finally a large programme of geriatric units. In 1973/74 the chill economic blizzard and the reorganisation of the NHS led to considerable reappraisal. In the West Midlands, he says, they have been fortunate in their subsequent allocations and there is a lot of good work going on.

Since those heady days of rapid expansion, Mr Constable has found that life has become more formalised, although no less interesting. He finds it fascinating to look back over the last 20 years or so, although he regrets, perhaps, the inevitable loss of excitement that has come with more structure and organisation.

Again, perhaps John Constable has been fortunate, since his appointment as Regional Works Officer in 1974 has meant that the widening of his interests from pure engineering to the total works field was timely — it was here that he certainly found the early experience of architecture very helpful, as well as his qualification as Chartered Surveyor.

He has served the NHS in many ways, in preparing evidence for the Tyler Committee, the House of Commons and successive Secretaries of State. He was a member of the Collingwood Committee on Central Sterile Supplies and of the Woodbine Parish Committee on Hospital Building Maintenance. He became a member of the National Training Council and of the National Staff Committee (Works) when they were formed. He has sat as an expert member of two Public Enquiries into anaesthetic incidents. He found these remarkably interesting, despite their sad cause, for the technical and semi-legal nature of the exercise, and the very careful examination of evidence and sifting of facts. It is perhaps in this reaction that one gets further insight into John Constable's character. He is a careful, sincere man whose driving curiosity has always led him to dig deeply into the subjects that interest him. This indeed can be seen by his unusual spare-time interest in knots. He strongly recommends the study of this fascinating subject — which combines topology, the science of surfaces, with creativity. He is very proud to have invented a completely new knot to add to the 3,800 in *Ashley* — the standard work on the subject that is a constant pleasure to him.

His services to the NHS have been recognised by his appointment as OBE in 1968 and his subsequent promotion to CBE in 1976.

In his private life he is a family man, with two children, a boy — who is following in his father's footsteps as an engineer, and a girl, who is married and who, he is delighted to say, has recently presented him with a grand-daughter. His other great interest is music, particularly Opera.

The Institute is fortunate to have such a man as its President, and we wish him every success during his term of office.

Christopher Tanous.

The author is the Area Works Officer of the Trafford Area Health Authority, and many members will be familiar with him through his involvement in the Falfield Management Training Courses. This paper was presented at the Institute of Health Service Administrators Conference in London on 19 February, 1981.

The New NHS
Value For Money?

D MACMILLAN MBE CEng MIERE MIMechE FIHospE

The Works Department Today

Some 25 to 30 years ago the Health Service was little more than a technological wilderness. At hospital level the odd tradesman and a few handymen were sufficiently competent to ensure that always there was ample fuel for the primitive boilers of that era. Equally, they were able to deal with the simple repair and maintenance problems of the day. The Factory Inspectorate at the time were not enamoured (later the *Tyler Report* repeated these sentiments) of some of the arrangements, particularly in relation to the inspection and overseeing of steam-raising boiler plant. Eventually, and rightly, it became a condition that an experienced and qualified engineer should be appointed with responsibility for all engineering services.

During the quarter of a century since then, the growth in the application of labour-saving devices, coupled with the use of complex environmental, diagnostic, therapeutic and monitoring apparatus for patient care, plus the introduction of more and more legislation, has vastly increased that responsibility and the skills necessary to do the job.

Unfortunately, in relation to building expertise, it was not until the 60's that serious concern was being expressed about what was happening to our building stock. Over the years, because of local pressures to get things done quickly and understandable enthusiasm to keep up with medical progress, our old hospitals had been modified, extended and re-shaped, but not in accord with any orderly or rational plan. Walls had been demolished to provide more space, and blisters were being added to blisters.

The evidence that still remains today suggests a policy of haste and improvisation rather than value for money. Fortunately, following the *Woodbine Parish Report*, more qualified and experienced building officers appeared on the scene. The final and most significant advance in the application of building and engineering to health care occurred in 1974 when the two specialities were integrated to form a unified Works Department.

Moving on from there, let us remind ourselves for a moment of the job that the Works Department does today. For the sake of brevity and simplicity we will consider just two elements from the total task:

Capital and Minor New Works

Planning;
design & execution.

Operation and Maintenance

24-Hour Supervision of Plant;
statutory inspections;
energy utilization;
maintenance.

Under the heading of Capital and Minor New Works, there is the planning, design and execution of large maintenance works.

There is also a programme of small improvement schemes funded from the Block Allocation, and larger capital schemes delegated by the Regional Health Authority.

On the other hand Operation and Maintenance, as a service, is concerned with the efficient and safe operation of major plant 24 hours per day throughout the year, and the regular testing of contingency procedures to cater for any emergency which may arise. Finally there is maintenance in its various categories, which although bearing a rather unglamorous title, does set out to achieve the inseparable objectives of safety and reliability.

Operation and Maintenance in recent years has become a most demanding and onerous responsibility in view of the emphasis on more efficient use of energy and rising safety standards — especially in connection with sterilization, laboratory environments, pollution of operating theatres and medical gas networks.

Works at Units *vis-a-vis* Works at District

So far we have considered the background to the Works Organisation and the job it does today. Let us now examine those elements of the task which are better left with District staff, and those which can be the responsibility of the Unit. There can be little doubt, in general terms, that the range and variety of activities currently to be found in a Single District Area will occur in the new Districts of the future. Of course how the actual job will be done will vary from District to District depending on population, condition and size of the estate, and the work load.

For example, in a small District, greater value for money may be achieved by looking outside one's own organisation for this or that specialist service, rather than by appointing staff who could be underemployed. Similarly it follows that Units within a District may have to share services.

Setting these considerations to one side, it is apparent to me that the District Works Staff of the future would provide a centre of expertise for the benefit of all Unit teams, the District Team and the Authority itself. Included in their remit would be the planning, design and execution of all block allocation and delegated capital schemes. It would be neither practicable nor economic for Units to do this work irrespective of size.

The associated tendering procedures, maintenance of approved lists of contractors and design consultants, plus the subsequent contract management, must, in the interests of value for money and public accountability, involve a Works Officer whose authority is pitched at the highest possible level.

Playing a key role in strategic and operational planning would also be the lot of the District Works Staff with their knowledge of the Estate, its shortcomings and its potential.

At Unit level, provided there is the capability and sense of responsibility in terms of experience and management skill, a large part of operation and maintenance can be devolved to Unit Managers who would be expected to make local decisions within the parameters of the Authority's policy.

The Works Budget

Moving from the wider compass of Works, we can now concentrate on the practicalities of the budget. At this juncture it can do no harm to recall that the budget is a plan of intent with various objectives dotted here and there. Essentially of course it is a plan expressed in financial terms.

The Components

On assembling the list of components for inclusion in the Estate budget for an entire District or just one Unit, the following picture emerges:

Heading

Water charges;
sewerage charges;
rates;
rent of leasehold properties;
boiler fuel;
other fuel;
transport (works);
maintenance of grounds;
building & engineering maintenance:
Category A — planned maintenance.
Category B — irregular maintenance (including backlog).
Category C — day-to-day repairs.
Category D — minor improvements, adaptations and alterations.

Preparation and Planning

At the present moment preparing the Works budget in a Single District Area is relatively straight-forward. The Area Works Officer builds up a tentative plan based on surveys and information from hospital and community officers. Following extensive consultation, proposals are submitted to the Area Management Team which subsequently approves a budget. In the context of the pending re-organisation, one can only speculate on how existing arrangements can be modified to accommodate Units for the future.

Collecting and arranging the relevant information for inclusion in a Unit plan will be an on-going exercise with contributions from all disciplines. Estimates for water, sewerage, rates and rents will be provided by the finance department. Target consumptions for fuel will be calculated by the Works Officer using the method of regression analysis. Transport and travelling expenses similarly can be assessed with reasonable accuracy. Landscaping intentions and general maintenance of grounds will be agreed by the Unit team on the advice of the Works Officer, who will cost the proposals.

The major and the most intractable component in the budget is maintenance itself, which is sub-divided into four categories. Categories A and C can be derived from the Unit Works Department's records, but it is most likely that a member of the District Works Staff would draw together those larger items of maintenance for inclusion in the Category B section. These days, in this category, there will be a staggering back-log of outstanding defects for such things as replacement roofs, new calorifiers, boilers, autoclaves and possibly fire escapes — all of which are reaching the end of their useful and hazard-free lives.

Lastly Category D, unlike the others, embraces adaptations, improvements and alterations which in no way can be described as pure maintenance. These requests from all disciplines will be collected, possibly by the Unit Administrator, and given a priority by the Unit Team.

When all the necessary information has been amassed it could be summarised as shown in *Figure 1*: (Imaginary figures have been used).

Heading	Estimate £
Water Charges / Sewerage Charges	23,000
Rates:	86,000
Rent of Leasehold Properties:	9,000
Boiler Fuel:	221,000
Other Fuel:	80,000
Transport (Works):	10,000
Maintenance of Grounds:	33,000
Building & Engineering Maintenance:	
Category A — Planned Maintenance:	140,000
Category B — Irregular Maintenance (including backlog):	200,000
Category C — Day-to-day Repairs:	110,000
Category C — Minor Improvements, Adaptations and Alterations:	320,000
Unit Expectation:	£1,232,000
D.M.T. Approved Allocation: £750,000	

Figure 1

This summary, with supporting details, will be submitted, along with similar bids from other Units and other budget holders, for consideration by the District Management Team. Without doubt they will seek advice from the Works Officer. What is quite certain is that the eventual allocation will fall painfully short of the Unit's expectations, and so it will be necessary for both Unit and District staff to sit down and objectively separate essential needs from desirable, and some not so desirable, wants. Once the plan has been scaled down to match the allocation, and the budget has been finalised, there arises the question of accountability for its control during the forthcoming financial year.

The Management of the Budget

The decision on who is to manage the Works Budget in future must be left to the incoming Authority, but it is my view that the existing Single District Area model should be retained where the Works Officer is accountable, and there is the facility to take a wide angle view of needs and contingencies across all units. For example it would be uneconomic to make a Unit self-sufficient in all necessary technical skills merely to meet the criterion of neat administrative compartmentation. Secondly there are the important issues of Responsibility and Authority. Some identifiable individual must be accountable for the standard of maintenance and for its cost control, both to the employer and in law. To give an officer authority for the control of the budget without any legal responsibility for the resultant action is to pursue trouble as a deliberate objective!

Whatever the ultimate decision will be, it must be clear and without ambiguity. However, for the purpose of this paper I will postulate that the new Chief Works Officer with accountability for the combined District and Unit budget, will consult with the Unit Team, and will then delegate to a Senior Works Officer, according to his competence etc., a measure of authority for operation and maintenance. Regarding Category D improvements and alterations, one would look to the Unit Administrator in his overall co-ordinating role to play a prominent part in programming, and in ensuring that targets are being achieved.

More generally, on the subject of budgets, it would seem fundamental to the new concept that the Unit Management Team would have the power to *propose* the transfer from one Unit budget to another, those underspendings which by good management they had achieved — e.g. savings in specified services or savings in salaries and wages as a result of postponing the filling of staff vacancies — if circumstances allow.

Value for Money

Speculations on budgetary responsibilities will continue until some clear signposts to the definitive Units of the future appear. However, in the context of 'Value for Money' there can be no uncertainty about the problems begging solution. Foremost in my mind are our two main assets, the Estate and Manpower.

The Estate

It is a well-known fact that large stretches of health premises are wastefully under-utilised. Some clinics, to cite one from various examples, are in use for only short periods of time to suit clinical need, but are staffed, serviced and heated all day long, and often at weekends as well.

In contrast, and against this background of under-utilisation, there are numerous instances of over-crowding and failure to achieve minimum standards for staff as well as patients. In questioning this type of inconsistency, it becomes clear that our Estate and its buildings require a new management philosophy in which optimum utilisation in the widest sense is the central theme.

Manpower Planning

Not just in Works, but in all sections of the NHS there are several startling facts which speak for themselves. During the last decade or so, staff has grown in number by about a quarter, and today in the average Single District Area, 75% of the revenue allocation is consumed in salaries and wages.

Even more disturbing is that the trend suggests a rapid rise to 80%, leaving diminished funds to buy drugs, feed the patients and maintain our buildings. Inflation, while exacerbating the problem, does lay further stress on the need for urgent corrective action. For a start the time has surely come for the computerisation of all these out-dated staff-consuming procedures, particularly in the handling, storage and retrieval of information.

Carrying on in the same vein, there should be a continuing re-assessment of the work-load in every department, to evaluate the pros and cons of using either directly-employed staff or contract labour from the private sector. Between these two complementary ways of getting work done, there is a fine balance point which alters with changing technology and rising labour costs. For example, a major factor in the equation must be those exorbitant and carefully concealed overheads associated with NHS bonus schemes which are so out of touch with the economic realities of today.

Conclusion

I have skimmed lightly over a surface that merits deeper probing. Hopefully, however, the new management of the future, in its pursuit of better value for the patient as well as money, will use more wisely those interdependent assets, the Estate and Manpower.

The author of this paper is the Senior Engineer of the Northumberland Area Health Authority.

Developing the Works Structure

N L HESLOP TEng(CEI) MIHospE MIPlantE

The New Structure

After some $4^1/_2$ years of patient waiting, prolonged discussions, unproductive negotiations and working parties galore, Hospital Engineers have received — apart from a step in the right direction with pay and conditions — new job titles: 'Senior Engineer' or 'Engineer Officer', replacing the old 'Hospital Engineer' and 'Assistant Hospital Engineer'.

This is now 12 months old. The majority of existing staff, having been assimilated into new posts, are now reaping the benefits of additional staff. These have been appointed because management staffing levels up to 4th-in-line are now based on the volumetric capacity of health care buildings, with an added weighting for various plant. I feel sure that engineers in the above grades are now performing their duties in a more efficient manner, monitoring, and controlling staff and plant performance more effectively, with the imposed workload somewhat more evenly distributed.

Recruitment

To recruit men of sufficient experience in health care plant to fill these posts, who will move up the promotion ladder, eventually to perform leading roles in senior management, we must look at the organisation at shop floor level. The new Engineer Officers all too often double up as foremen and chargehands. This is, in many instances, due to the size and make-up of a direct labour force. It is a practical way of avoiding unnecessary supervisory grades, and also ensures that the staff available are gainfully employed. This ensures that the maximum number of staff performing manual work are available for maintenance work, and the department remains cost-effective. This situation, unfortunately, does not present an ideal experience in line management, from which an Engineering Officer can launch himself into a career of engineering/works management. The present Government policies covering 'in service', further education (e.g. day release to technical college) is presenting the young fitter or electrician with an opportunity to gain qualifications and progress to Engineer Officer posts.

However, these men will — if successful in qualifying and obtaining a post — be thrust into a vital first-line supervisory management position, without having had the advantage of progressing gradually up through the supervisory grades of chargehand and foreman. By so doing, he receives knowledge of management-to-shop-floor relations before taking over a role as a manager. Lack of such a career path is leaving an experience gap which prospective Engineer Officers will have to reveal at selection interviews, whereas the majority of candidates from industry will have had the opportunity of gaining some appreciation of management by progressing through these subordinate supervisory shop-floor grades, or from junior management at technical levels.

In the past, an Assistant Engineer — after initial appointment — was too involved in catching up and did not have the opportunities afforded his counterpart in industry. He lacked the chance of developing a management personality — an important feature of modern managers — thanks to the stress placed on works staff by workload, dealing with craft unions and in the co-ordination of a multi-disciplinary National Health Service.

This, I feel sure, is creating a gradual regression in the recruitment of engineers from existing works staff.

Grading Structures

The problem does not rest there. We have a grading system which grades engineering craftsmen from 1 to 5. 1 to 3 are semi-skilled grades, and 4 and 5 are time-served craftsmen, Grade 5 being supposedly the superior craftsmen with, in most instances, a qualification. This grading system may have been adequate at its inception, but it is now totally inadequate.

At present, the Engineering Profession of this country is dividing into Chartered and Technician grade engineers. The Health Service is recruiting engineers of all levels more and more from outside sources simply because the in-service training given in industry is vastly superior to that in the Health Service. No engineering factory would dream of employing a centre-lathe turner without demonstrated ability, yet we recruit engineering maintenance grades from varied backgrounds and expect them, in a very short period of time, to become proficient maintenance tradesmen, covering the varied plant and services contained in modern hospitals. So we promote the concept of 'Jack of all trades and master of none'. This has worked for a long time with varying degrees of success, depending on the expertise of management and the quality of tradesmen available regionally.

Engineering plant and services in a modern hospital are so complex and specialised that they can only be maintained effectively by a direct labour force. Intensive training and monitoring of performance must be developed and the senior grades of electrician and fitter must develop into technicians.

Proposed Structure

BELOW 4TH IN LINE

Senior Engineer

Engineer Officer **Engineer Officer**

Engineering Technicians
(with leading Technician acting much in the way of Foreman)

Common Grade Tradesmen
Electrical and Mechanical

Semi-skilled Grades

The present grade 1, 2 and 3 men would remain in a semi-skilled status performing routine tasks, and minor mechanical and electrical work. The present grade 4 men would remain as craftsmen, but would only perform work such as pipe-fitting, major boiler overhauls for insurance surveys, welding and fabrication work, replacement of services, mechanical and electrical, or major maintenance and minor capital work.

The engineering technician who would replace the present grade 5 man would be recruited from craftsmen — providing men of sufficient calibre were present in the workforce. In recruitment of the common grade tradesman the potential to become a technician should be borne in mind.

The Technician

The technician would be a man technically qualified to a stated level — possibly T4 City & Guilds. He would then be trained in an establishment such as Falfield Engineering Centre, also attending manufacturers' own training courses as a compulsory part of his job. Money would have to be allocated to the engineering budget to cover this intensive training. The technician then would perform a role much as do present electronics technicians, laboratory technicians and radiographers — acting as a trouble shooter and a plant maintenance technician. This would then form an ideal basis from which potential engineers could be recruited. Consultation with trade unions would naturally have to be made to establish demarcation lines etc., but some form of cross-over between electrical and mechanical would be envisaged. With the Technician grade concept, we are at least assured (providing the training programmes are applied and developed according to individual hospital needs) of employing a direct labour force capable of performing maintenance work at the high standard required by today's medical staff. This would ensure system reliability, therefore reducing the need for expensive, and all too often, inefficient contract labour.

Organisational Concepts

It follows, if we are to recruit and train highly specialised maintenance grades and encourage promotion to management and supervisory positions, that a comprehensive system of monitoring must be developed to record and direct the individual's progress.

The responsibility of any organisational management team is to gain effective results by utilising staff with the most effective use of resources in an organisation. Results must not be confused with objectives which do not exist or cannot be measured. All forms of work produce some form of result. This can only be related to an objective if a measurable standard exists. Therefore, results must be measured in terms of 'quality, quantity and time'.

In management, staff participation or motivation are uppermost in the desirable qualities of a group. In order to achieve motivation, staff recognition is essential. In determining contributions and potential to meet environmental needs, this must be achieved by work organisation. Maximum involvement of staff must be gained in order that they feel involved in achieving results.

In the majority of organisations there exist a varying number of procedures, rules and regulations, communication channels, objectives etc., all of which are designed to control the way things are done. The way things are done can adversely affect the personnel engaged in the doing, depending on how the rules and regulations were developed, and applied. Many are inherent, some are derived from external sources. To appreciate the effect the organisation of any group has, the ways in which its members react with each other should be analysed. Their effectiveness must be questioned, and organisational techniques must be changed if necessary — no organisational control method should be supported by neighbouring control methods.

Personnel Rating

If this form of works structure is to be successful, some form of monitoring must take place, i.e. personnel rating. A merit-rating system has value for management, the supervisor and the worker. The future performance of a person can be predicted from an accurate knowledge of his past performance. Recognition of merit is an outstanding factor in handling promotions, staff reorganisation etc. An organised and accurate system for rating will save much time in periods of reorganisation and staff recruitment. Such reports will locate good men within the organisation and help prevent deterioration of morale.

Preparation of a merit-rating calls for serious consideration and deep understanding on the part of the supervisor doing the rating. Careful decisions are respected by both management and workers — ratings should cover matters within the personal knowledge of the supervisor; guessing and impulsive recommendations are not acceptable. Every man regardless of rank, is concerned how his supervisors are reacting to his performance.

A rating sheet will provide answers to these questions (see example);
it shows appreciation for good points and encourages correction of shortcomings;
the knowledge of management's opinion is a morale builder;
standard rating sheets provide a constant measuring stick for fair ratings;
an accumulation of rating sheets prevents snap judgement and injustice.

Regular reviews of performance, measured by a fixed standard, are important to organisation/employee relationships. Ratings should be made as often as necessary to keep information current — about every six months for a new man; annually for longer term staff. Rating times should not be set for a specific calendar date. A specific time tends to build-in the so-called 'Santa Claus' complex. As the rating date approaches, the man's work shows considerable improvement; then, once the date has passed, he is inclined to relax and say, 'thank goodness that's over for another year.' The internal monthly rating, with a record on a specific date that does not require the rating to be made at that time, is much better.

Rating should not necessarily be discussed with the worker. This matter should be left to the discretion of the supervisor or the wish of the worker if the best results are to be obtained. Each should have the freedom to discuss but neither should have the obligation to do so. Of course, this implies a wise use of this discretion by the supervisor. The right to omit discussion when he can see no practical gain does not allow him to shirk his responsibility when discussion would be beneficial. After all, one of the duties of supervision is to correct the faults of subordinates and the best time to do it is not when a rating comes out, but at the time when an incident takes place. Not annually or semi-annually, but rather a day-to-day responsibility of supervision, and the supervisor should try to create a climate in which profitable discussion will occur at any time. This should not necessarily be confined to shop-floor grades, but can be developed to include management levels.

The Fundamentals of Personnel Rating

A merit-rating system should contain information concerning the

EMPLOYEE PROGRESS REPORT		Name:	
		Employee No:	
Department:		Job title:	
In present job:	Length of service:	Grade:	Salary:

Indicate on lines below N - if neither strong nor weak point W - if weak point S - if strong point	1. Rate all applicable factors 2. Make rating objective 3. Base opinions on the results of the employees efforts during the entire period	**In boxes below rate employee:** A - Excellent B - Good C - Fair D - Unsatisfactory

Quality of Performance

__________(A) Acceptability of work: thoroughness
__________(B) General dependability: accuracy
__________(C) Neatness and orderliness of work
__________(D) Skill employed or performance of job duties

Productivity

__________(A) Amount of work accomplished
__________(B) Promptness on completing assignments
__________(C) Utilisation of time by effective planning

Qualifications Demonstrated on Job

__________(A) Knowledge of job duties and related information
__________(B) Ability to learn and progress
__________(C) Judgement/sense of proportion/common sense
__________(D) Initiative and resourcefulness
__________(E) Co-operativeness/ability to work with others

Recommended Action ____________________

Supervisor's Signature: __________ **Date:** __________

Approved By: __________ **Date:** __________

This Progress Report will be returned for a review with this employee. It is important that at this stage you can support your conclusions with facts. Also, be thinking about a plan for this employee's improvement.

Returned to Department for	Date review held	Date returned to Personnel Dept.

performance, quality, contribution quality and general personal attributes of the person being reviewed.

The proper evaluation of Works Department employees is probably one of the most difficult tasks facing the Supervisor. It is particularly true of 3rd- and 4th-in-line managers, because a large portion of their work occurs within their mind and shows no tangible results for appreciable periods of time. The first section of the report covers the worker's diligence and the quality of work produced. The quality of work is equated here with the necessary reliability and accuracy. In addition to knowing how to do his job, a worker must meet the standards of execution set for his classification. A diligent worker, in the best interest of the organisation, should be busy at all times.

The second section of the report measures the quantity contribution of the worker. Speed is an important factor on any type of engineering work which must meet deadlines and maintain continuity of service. The management of time and the organisation of work to meet these deadlines is measured here.

The contribution of new ideas and worthwhile suggestions for improvement is particularly important. Notice the inclusion of the words 'worthwhile' and 'productive'. These factors determine the quality of a suggestion. No suggestion has any value unless it is communicated. The ability to communicate has been an under-rated requirement for works staff — the importance of communication cannot be overstated.

The third area for rating an employee is personal ability. These personal traits have little relationship to a particular job or position, but personality ratings give indication and basis for recommendation to change positions. This section of the report is intended to show capabilities which are basic to the individual.

The basis of rating

A man must be rated on the basis of the position he holds.

Example

Joe is a hard working engineer. He produces neat drawings and specifications as required by his supervisor. Joe's problem is that he is too inventive and is always trying to sell some new idea to his supervisor.

Comments

We must not consider how much better Joe would perform if he were doing something else and build these reflections into his ratings; these are matters to be taken care of in the conclusion, and not in the body of the report. A review is a study of the performance of a particular man against the particular basic requirement of a particular job. As a result of this strict approach, we will determine that Joe is a good worker in his job but he needs to be re-assigned to a position which can constructively use his natural ingenuity.

Conclusion

I hope I have illustrated that the Hospital Works Department, particularly the Engineering Department, has a great need to develop and become more efficient to meet the needs of today's Health Service.

No easy solution exists, neither will one present itself overnight. It is up to each and every works manager to promote and develop a professional approach to management. This will ensure that the art of directing human resources and activity is built from solid foundations, and is not allowed to graduate to higher levels without proven ability, with constructive and careful corrective monitoring of progress within the organisation. If these fundamental requirements are met, then perhaps the British Engineering Profession as a a whole will take the place it so rightly deserves in society — a place that is denied us at present.

EMPLOYEE ANALYSIS REPORT

Name: ____________________ **Job Title:** ________________

Date: ________________ **Review by:** ____________________

Rate employee on a basis of .... 1-5 Pts

(1) Performance quality

__________Accuracy
__________Neatness
__________General dependability
__________Sub total

(2) Contribution quality

__________Organisation of work
__________Completion of schedule
__________Contribution to group objectives
__________Ability to communicate
__________Sub total

(3) Personality

__________Ability to learn and progress
__________Skill employed in performance
__________of duties
__________Judgement (common sense)
__________Creativity
__________Initiative
__________Resourcefulness
__________Co-operativeness
__________Morale
__________Sub total

Grand Total__________

Remarks:

____
____
____
____
____

Mr Macmillan is Area Works Officer, Trafford AHA, Mr Watson is the Area Works Officer, Manchester AHA (Teaching) and Mr Wilson is District Works Officer, Manchester AHA South District (Teaching).

Works Incentive Schemes

Are they worth it?

D. MACMILLAN MBE CEng MIERE MIMechE FIHospE
A. WATSON MPhil CEng MICE MIMechE MRSH
R. D. WILSON CEng MCIBS FIMarE FIHospE

Introduction

Works Officers in the North West have, for some considerable period, been concerned with certain aspects of the Bonus Scheme.

Our concern has been reinforced by recent papers widely circulated by the Regional Work Study Officers, and North West Regional/Area Administrators and Regional Work Study Officer.

Works have lived with the advantages and disadvantages of the incentive bonus systems and are now encouraged, because of the interest shown by other disciplines, to examine the wider implications of their function within the NHS.

Following a meeting of District Works Officers and Area Works Officers in the North West, a Group has been established to examine the problems in some depth and report back.

History

Industrial incentive schemes have continued to expand and progress. Originally concerned largely with methods, improvement, work measurement, design and administration of wage payment systems, cost control, quality control, production control, and the like, these activities have progressed in many ways. They may be classified in the following categories:

Modification and improvement of existing techniques:

development and application of new techniques and procedures;

As a function begins to mature it is customary to find that the original techniques are constantly being modified, refined and improved, or discontinued, as circumstances dictate.

A large number of new techniques and procedures have been developed since 1963. It is self-evident that all procedures, old, new and proposed, should have as their objective the improvement of existing or planned activities. Improvement in most cases will mean increased productivity and reduced costs. Within the Health Service we should submit that improved service, quality and a reduction in response time should also be included within the benefits.

Background

The incentive bonus scheme was introduced originally at a time when the NHS was unable to recruit suitable staff because of strong competition from the private sector, and later to increase earnings at a time of nationally imposed wage restrictions within the political philosophy of increased productivity — this being the only way out of our national demise.

During this period the incentive bonus scheme resolved a lot of the short-term political problems, whilst at the same time helping with recruitment of better class tradesmen. It fine-tuned the labour force in a period when considerable expansion of services and legislation was imposing a great deal of additional work on the Works Organisation. In the early and late 1970's great changes had occurred within the NHS in both the method of financing and expectations of staff and management.

Prior to the introduction of the bonus scheme the philosophy was one of service. This philosophy was in keeping, and in complete accord, with that of health care in hospitals. Financial resources in the main were provided to turn this philosophy into reality. The ever increasing demands upon finance and higher expectations of NHS staffs, and increased legislation, would have put considerable strain on existing services.

The dilemma of service versus productivity would have been with us — bonus scheme or not. It is however obvious that the bonus scheme has highlighted the dilemma and provided the means of maintaining, or reducing, work forces in an expanding service.

Demands of a bonus scheme are such that they severely hinder the service that hospitals have previously been accustomed to. Likewise, the demands of a first class service are not conducive to high productivity. It can be seen that with the two sets of competitive demands of Service and Productivity, the ideal can never be reached, i.e., 100% productivity — 100% service, as the basic criteria differ in many aspects.

In considering service versus productivity, it would be prudent to observe that the Medical, Nursing and Clinical services, totalling approximately 90% of expenditure in the Health Service, are based upon service.

The complexity of buildings and engineering plant has increased. The dependance of the front line medical/nursing team on life support equipment and a first class environment, serviced in one way or another by Works Organisation, has increased. Bed occupancy and turnover has escalated and with it the pressures on the front line team has also increased. Should the works philosophy be *Service* or *Productivity*?

The main advantages and disadvantages of the bonus system can be summarised as follows:

Advantages

In the main, staff numbers have been reduced to a level that matches the job to be done;

productivity lost over the years has been brought back;

management systems have been introduced into the work environment;

logistics have been improved to match the increase in efficiency achieved;

the bonus scheme has been used as a vehicle to provide management improvement and information.

Disadvantages

Despite all the statistical and mathematical data, the question still remains of measuring productivity and quality in a maintenance organisation;

it has added to the industrial relations problems in the NHS, borne out by the number of meetings to resolve difficulties;

creation of tasks to fill the bonus need;

difficulties of the incentive bonus scheme in operational work as opposed to pure maintenance;

P.T.B. Staff have a vested interest in the scheme and, therefore, have difficulty in looking at its merits and application objectively and vigorously;

to fund the bonus scheme an allocation has had to be transferred from contract work to staff wages with the result that we tend to create work that the staff can do, rather than attend to needs which can only be done by contract;

increase in paperwork and bureaucracy;

large financial overheads to administer these schemes at District, Area, Regional and departmental level;

a further disadvantage arises from the fact that between 5 and 10% of the most highly skilled craftsmen have been appointed as Planner Estimators, which in general involves clerical routines. This loss of skill is something neither the NHS nor the nation as a whole can afford;

erosion of traditional workmanship and pride in standards.

Conclusion

We consider bonus schemes to be little more than a complicated and expensive method of calculating a man's pay, which have weakened works managements' financial control over an important part of their budget.

We would advocate a system whereby basic pay is more closely related to the rewards available in the private sector. The advantages, in terms of managerial control, information, etc., should be retained, while the disadvantages of bureaucracy — paperwork and excessive overheads — are minimised.

We are glad to see that these views are supported by the Chief Inspector of Audit in the *Local Government Audit Services Report, 31st March, 1979.*

The philosophy of RHA Work Study Officers and Administrators to centralise all work study data at Region is contrary to the policy of devolution, as advocated in *Patients First.* This philosophy is also too much akin to the central negotiated original bonus scheme, imposed on the Works Organisation on a national scale by agreement between DHSS and Unions, which gave the Unions the right to demand the implementation of the bonus scheme regardless of local management's requirements.

The political and industrial climate in the past was not conducive to buying out or alteration. However, the time is now ripe for management to innovate, as appropriate and particular to their own circumstances; not as dictated by some central Area, Regional or National working party, which has not even discussed the issues with the management and staff at the centre of the issue.

The author is a Superintending Engineer at the DHSS. This paper was given at the Institute's Annual Conference at Seaton Burn in May 1980 and is a companion paper to Progress in Laundry Heat Recovery, *published in* Hospital Engineering *in March 1981.*

Hospital Ventilation Systems

A review of the Progress of Heat Recovery

V E SKEGG CEng MIMechE MIMarE MCIBS MInstR

Introduction

At the risk of oversimplification, it may be stated that wherever air is discharged to atmosphere from a building ventilation system at a temperature higher than the external ambient, there is a potential for the application of heat recovery. Hospitals normally have a multiplicity of ventilation systems, and consequently there is considerable scope for the use of accepted recovery techniques on plenum installations serving Operating Theatre suites, Hydrotherapy pools, X-ray areas, Kitchen Ventilation systems and deep planned zones in concourse and podium areas etc.

Whilst the objective of this paper is to review the progress made in the application of heat recovery techniques to hospital ventilation systems in recent years, the opportunity is taken to consider whether it is possible to extend the use of the simple recirculation principle to a greater number of non-critical hospital areas. After discussing the recirculation aspect, the paper considers each form of heat recovery device in turn and gives a number of examples of recent applications with performance results where known.

Recirculation

The use of recirculation of air to reduce energy consumption has been accepted normal practice for many years in the design of air conditioning and plenum ventilation systems for all types of public and commercial buildings. The uninhibited use of this principle — which is the cheapest and most efficient form of heat recovery — has largely been precluded within health buildings due to the need to limit the spread of airborne infections and unwanted odours; and in certain specialist areas, to avoid the environmental hazards associated with anaesthetic gas pollution. The use of natural cross-ventilation is a basic feature of hospitals built and designed on *Nightingale* ward-plan principles and is the accepted form of ventilation in these older hospitals for all areas other than specialist zones.

The concept has functioned well over the years — any internal movement of air has been limited by the geometrical configuration of individual structures and a tendency to provide a multiplicity of interconnected buildings in the larger establishments. Doubtless however, a degree of air movement between individual ward units and/or adjacent hospital departments occurs when this type of hospital is 'closed up' during severe weather conditions. This internal movement of air amounts to the limited use of uncontrolled recirculation.

Modern designs either for the construction of completely new District General type hospitals or for the provision of additional maternity, geriatric, psychiatric ward units etc on existing sites tend to be much more deeply planned and to have — from the heat loss point of view — a much improved exposed surface area/enclosed volume ratio. These evolutionary considerations in conjunction with the escalating cost of energy provide ample justification for reviewing present policies towards the use of recirculation in hospitals.

Before discussing the relative merits of air recirculation and heat reclaim, it is necessary to categorise the environmental conditions normally found in hospitals. These may be summarised as follows:-

a. Air fit for recirculation — therapy areas, most non-clinical departments and some ward accommodation.

b. Air which is unsuitable for recirculation due to factors such as odours, level of bacterial contamination or high humidity; eg kitchens, laundry, lavatories, bathrooms, operating theatres, certain types of ward and clinical areas generally.

c. Air which is chemically and/or bacterially hazardous and must be discharged to atmosphere as soon as possible; eg post mortem rooms, fume cupboards in pathology laboratories, etc.

Category (b) air is normally suitable for heat reclaim, but no attempt should ever be made to install a heat recovery device on a category (c) extract installation.

Local recirculation of air occurs wherever radiators, convectors or any other conventional form of space heating is used. In naturally ventilated buildings there is a normally fairly rapid migration of this air from the windward to the leeward side of the building, and in tall buildings a much more dramatic movement of air due to the 'stack' or chimney effect. Likewise, the more deeply planned designs will inherently experience a greater amount of air migration and transfer to other departments than narrow-span plan forms.

The inference is that if air transfer is currently taking place in naturally ventilated and deep planned hospitals in the manner outlined above, then should we not openly recognise the fact and delineate those areas in which limited recirculation is permissible? It is accepted that medical considerations may well dictate that there should be no major transfer of air between certain hospital departments, but is there any valid reason why air should not be recirculated internally within such spaces as Physiotherapy, Occupational Therapy, Medical Records, Administrative Offices, or general concourse and communication zones.

All of these areas are 'low risk' cross-infection zones and the open acceptance of limited recirculation within specific boundaries would not constitute any significant change to current design, but would merely recognise what actually occurs in practice. Likewise, it is relevant to enquire whether there is any valid reason why limited recirculation should not be used in certain high grade Geriatric, Mental Illness, Mental Handicap or other broadly similar non-infectious ward units where odour problems do not predominate. Foul air from toilet, ablution or treatment spaces must necessarily continue to be extracted and separately discharged to atmosphere. Nevertheless it appears that greater use could be made of the principle of recirculation and of its energy saving possibilities in many areas of our hospital buildings.

There are encouraging signs that the particular merits of limited and controlled recirculation are being recognised. A recent study of the Environmental Ceiling System — widely used in educational buildings — resulted in the tentative acceptance of the concept both by Department of Health and Social Security and Area Health Authority Medical Advisers and Bacteriologists.

The system consists of a number of air heater batteries located above a false ceiling which acts as a plenum chamber. It thus provides low temperature ceiling radiation at about 75°F which is supplemented by thermostatically controlled fans supplying warm air to the room(s) below when and where required. The system is fundamentally a recirculation system since only a limited quantity of fresh air is provided via ductwork to the inlet side of the air heaters above false ceiling level.

This design approach offers useful energy savings in non-critical patient areas and is particularly suitable for installation during ward upgrading works — it also possesses an inherently high standard of local temperature control. A design study is now in progress — S E Thames Regional Health Authority for Bromley Area Health Authority — and it is hoped that this will proceed to the installation of a prototype trial unit. Operational experience of this design concept is awaited with particular interest.

Another example of the current use of direct recirculation relates to X-ray suites housing body scanners. These contain computer rooms which give off approximately 10 to 12 kW of heat, and it is a relatively simple matter to recover this heat and recycle it to other rooms in the suite as an integral feature of the accompanying building service design. The installation at the Christie Institute, Manchester has been designed on this basis and came into service in early 1980.

A further example — currently at the exploratory design stage — relates to an 11-storey post-war ward block at Norfolk and Norwich Hospital. This building has an extensive balanced supply and extract system serving the deeply planned core areas. The intention is to modify the ducting layout so that recirculation can be introduced on a trial basis. Provision is being made for the later incorporation of a heat exchanger, should in-service bacteriological testing demonstrate that even low rates of recirculation in the ward areas are medically unacceptable.

Heat Recovery Equipment

The various forms of heat recovery devices currently available for use in conjunction with ventilation plants are widely known and it is not proposed to deal with their constructional detail in this paper. Examples are, however, given of the application of each type together with service experience where this is known.

Plate-type Heat Exchanger

This device is particularly suitable where the hot air discharge is of high humidity, laden with odours or bacteriologically 'dirty'. It is necessary for the inlet and exhaust ducts to be located in close proximity.

Suitable applications are hydrotherapy pool ventilation plants of which a typical example is the retrofit installation at Leybourne Grange Hospital, Maidstone. On-site testing revealed that a heat recovery rate of just over 70% was achieved with a payback period of about 3 years at July 1979 energy price levels. The details of this installation were published in the October 1979 issue of this Journal and it is pertinent to point out that the actual payback period has been considerably reduced as a result of the recent increases in fuel oil prices.

A second example of the use of a plate heat exchanger is the plenum ventilation plant serving the new ward block at the Royal Edinburgh Hospital. This installation is now nearing completion and because the plate-type heat exchanger was installed as original equipment, the payback period should be considerably less than 3 years.

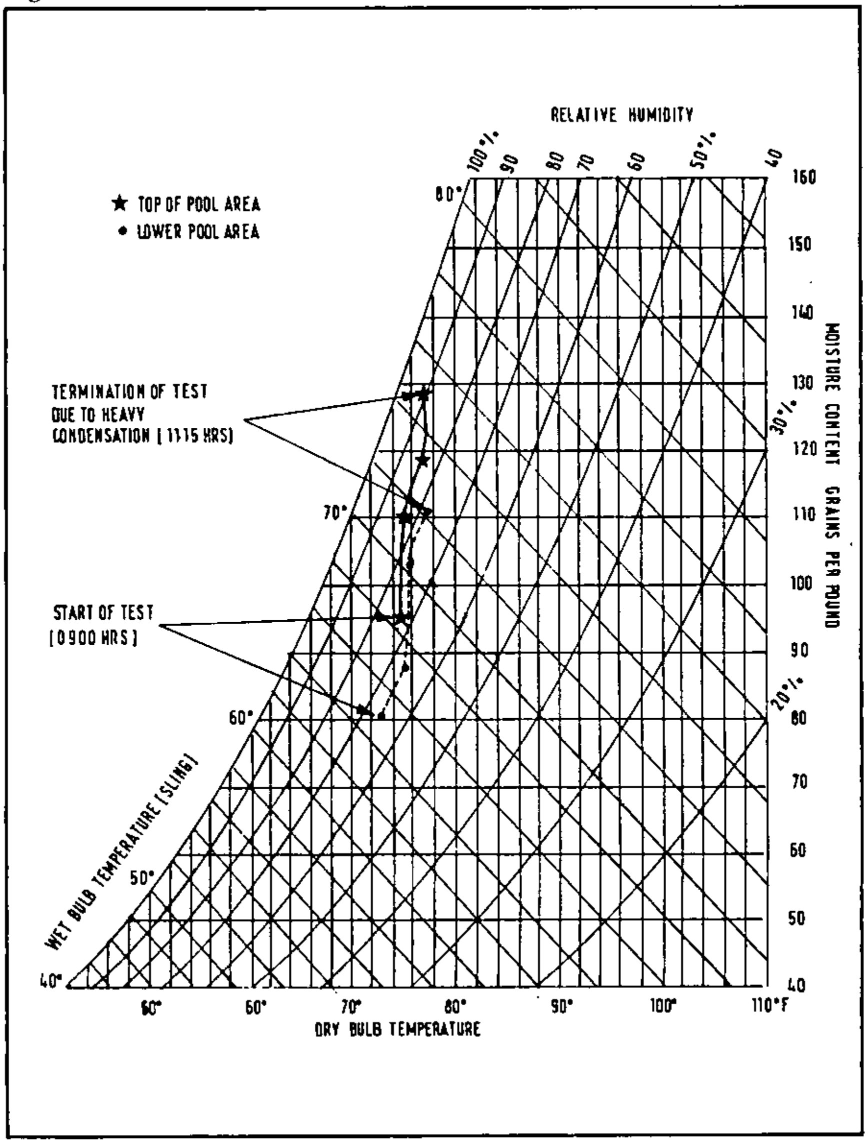
Thermal Wheel Heat Exchangers

This type of heat exchanger has been used on high temperature process installations for many years but has only been adapted in recent years for the lower temperatures associated with ventilation systems. One inherent disadvantage of this type of heat exchanger is that a small proportion of the discharge air is transferred to the inlet side of the system unless a purge section is fitted which represents a loss of efficiency. There is also a considerable degree of air migration from the dirty exhaust to the clean inlet side when the wheel is stationary, unless the pressure on the fresh air side of the wheel is always greater than that on the exhaust. Care is therefore necessary at the design stage.

My three examples include one successful, one unsuccessful and one installation as yet untested:

The installation on the operating theatre ventilation plant at the National Orthopaedic Hospital, London has been widely reported — *Hospital Service Engineering (May/June 1977), Heating and Ventilation Engineer (October 1977)* — and the

Figure 1



subsequent operational experience appears in the October 1979 issue of this Journal. In general, this has proved to be a successful installation despite the operational problems of bearing failure and media disintegration which have been experienced. Both the heat recovery performance and the payback period have been reasonable despite the increases in maintenance workload and maintenance expenditure.

The unsuccessful installation is associated with a hydrotherapy pool ventilation plant. The operational experience is that after 2 hours operation of the thermal wheel, the internal humidity within the building has increased to approximately 90% and heavy condensation commences to occur on all building surfaces — *Figure 1* depicts the psychometric process. The thermal wheel concerned is of Swedish manufacture and possesses an absorbent matrix composed of an inorganic fibre coated with a dessicant.

It is apparent from the tests which have been carried out that moisture is being progressively transferred from the hot air discharge and that an absorbent matrix is totally unsuited for this application. However, it should be noted that the use of a non-absorbent matrix such as corrugated aluminium would not necessarily have avoided this malfunction, since reports of similar sequence of events have been received from an installation using the alternative media in broadly similar circumstances. It is believed that this particular thermal wheel acts as a high efficiency moisture eliminator in the discharge duct, then transfers the accumulated water droplets into the incoming air stream.

The third example of the use of thermal wheels relates to St John's Geriatric Hospital at Peterborough. This 'all electric' hospital is a completely sealed building and is served by 'off peak' electrically heated floors and 20 'on peak' plenum ventilation systems. Seven of these plants are provided with thermal wheels to recover a high proportion of the heat discharged by the ward extract systems. The design objective was to reduce electricity consumption costs to a level which compares favourably with the fuel costs associated with a conventional oil- or gas-fired installation. The building was expected to come into use in the autumn of 1980 and will be the subject of intensive testing throughout the first year of operation. Since the discharge air is not moisture laden, there should be no repetition of the problems experienced in my second example.

Run-around Coil Heat Exchangers

This type of heat exchanger is particularly suitable for retrofit installations where the inlet and exhaust ducts are located some distance apart, and where the air in the discharge duct is potentially contaminated. The heat transfer media is normally a glycol solution to avoid winter freezing problems — it also poses no particular hazard should inadvertent leakage occur. Three examples of the use of this form of heat exchanger are given below:

a. St. John's Geriatric Hospital, Peterborough utilises 13 run-around coil recovery systems for plenum ventilation plants serving kitchen, toilets and ablution areas. The 'in-service' test results from this prototype 'all electric' hospital are awaited with interest.

b. A purpose-designed installation has recently been completed on the new hydrotherapy pool ventilation plant at the Royal Orthopaedic Hospital, Woodlands, Birmingham. It should be noted that moisture transfer cannot possibly occur with this type of heat exchanger and therefore there should be no repeat of the malfunction experienced elsewhere with thermal wheels. Formal performance testing of this installation has been deferred until certain constructional problems not associated with the ventilation plant or engineering services have been overcome.

Heat-pipe Exchangers

There is no known installation of this type of heat exchanger associated with hospital ventilation plants. One inherent advantage of this type of equipment is that it will recover a proportion of both the sensible and latent heat components of the exhaust air where the final discharge temperature is close to the Dew point condition without risk of direct moisture transfer to the incoming air. Limited experience of this type of equipment installed on tumbler drying machines has been gained — this was discussed in a companion paper dealing with heat recovery in NHS laundries *(Hospital Engineering, March 1981)*.

Heat Pumps

At present fuel price levels, economic studies of the use of heat pumps for general heat recovery purposes indicate that the associated pay back periods will be of the order of 8 to 12 years. In view of the large number of potential energy conservation schemes with pay backs less than 5 years, it is apparent that most design concepts using this form of heat recovery are not currently the most rewarding type of investment for the limited funds available. Nevertheless, the Department of Health and Social Security has sponsored two experimental applications of heat pumps to gain operational experience, and is also evaluating a commercially manufactured dishwasher with an inbuilt heat pump. These installations are described in the following paragraphs:

The Stierlen dishwasher — manufactured in West Germany — has an inbuilt heat pump which is used to extract heat from the mixture of hot air and vapour in the discharge airstream. This is then used to heat the self-contained wash water storage tanks up to normal operating temperature and to pre-heat the water for the final rinse stage. There are stated to be numerous hospital applications in Europe and a trial installation has been operated by British Home Stores in one of their large UK restaurants for over a year.

The reports received indicate that both energy and water consumption are significantly below the comparable figures for conventional machines. As a consequence of the inbuilt heat pump, the machine has a high capital cost but there is an offsetting advantage which makes it particularly suitable for use in deep-planned kitchens and wash-ups. There have been many complaints about the working environment created by conventional dishwashers and these have led, in some cases, to proposals to install air conditioning. The casing of the Stierlen heat pump type dishwasher is cool to the touch and there is a complete absence of radiant heat emission — additionally the discharge air has been dehumidified and is released into the wash-up area at about 60°F. The machine in effect provides a modicum of air-conditioning when in operation. This performance characteristic makes it particularly attractive for the environmentally difficult deep-planned location, since there is an offsetting reduction in the requirement for supporting extract ventilation services. It is hoped to arrange for a prototype installation in a hospital to ascertain the degree of improvement and reduction in energy consumption which occurs under NHS conditions of operation.

A heat pump is currently in the course of installation at Highfield Hospital, Droitwich — it will recover heat from the hydrotherapy pool air discharge and use it both for pool water heating and space heating. As a consequence of the dehumidification cycle on which the machine operates, it will be possible to recirculate a proportion of the extracted air without any attendant problems with moisture build-up and condensation. This design approach is now being utilised in large commercial and public swimming pools, and several successful retrofit installations have been made. It is intended to closely monitor the Highfield Hospital installation during the first year of operation so that the overall economics of this design can be determined.

The use of the heat pump cycle for the production of domestic hot water has expanded considerably in recent years and a number of manufacturers are offering standard equipment for this duty. A small installation serving a 6-bed villa in a large mentally handicapped hospital in East Anglia is now at the design stage. On completion performance will be monitored and compared with an identical villa which is to be provided with a conventional DHWS system.

Conclusions

When I elected to speak on this subject way back in October 1979, it was in the expectation that a greater number of the prototype trial installations would have progressed to the stage at which operational information was available. As always in this imperfect world, problems arise and slippage of programme dates occur. As a consequence a substantial amount of the information on which I had intended to base this talk has not yet emerged.

Nevertheless, the package of information which has been assembled constitutes a useful review of NHS progress in the field of heat recovery from ventilation systems. It is my hope that the pointers and brief case histories which have been described will act as stimuli and lead to an acceleration in the number of successful hospital installations.

In conclusion, may I say that there are many pitfalls to be avoided if the operational benefits and economic returns are to be realised from heat recovery systems. The key to success is careful and prudent engineering design.

The Author is the District Works Officer, Warrington Health District of the Cheshire AHA. This paper was a commended entry in the Hospital Energy Conservation Year Competition.

The Energy Economics of Hospital Refuse Disposal

ROBERT DAVID BUCKLEY FIHospE

Introduction

It is very appropriate in Hospital Energy Year that health care engineers should seek to find ways in which to reduce the 'Energy Consequences' of their engineering design and operational decisions. This is very important not only from the annual revenue-consequences viewpoint but also in terms of the size of the original capital investment in equipment and services. It is also equally very important that a thorough and detailed examination of operational policies should be carried out, to determine if they in themselves are wasteful of energy.

In this paper it is intended to re-appraise one such operational policy, and the one selected is that covering the safe disposal of hospital refuse. It will be seen in the case studies presented that there is probably a considerable saving in energy available, if health care engineers re-examine their existing refuse disposal policy.

It is important when operational policies of this type are reviewed, that a degree of 'lateral thinking' is employed. For example, the refuse disposal problem should be viewed as a series of interlinked activities in an overall process, rather than a problem that arrives regularly each morning at the rear of the boiler house.

Classifying the Problem

Hospital refuse is generated in each and every department in a hospital. Broadly speaking it may be classified into the following broad categories:

household;
industrial.

In considering the first category 'household' each local authority has a legal responsibility to remove it at least once per week, free of charge, from health service premises. If this waste (which will include newspaper, cardboard, paper cups, etc.) is correctly segregated at source by the use of a colour-coded bag system, it can be stored on site in dustbins, palabins or in compactors and containers ready for collection.

The second category 'industrial waste' may be broken down, again broadly, into two main constituents:

non-hazardous;
hazardous.

The second category, 'hazardous' relates to that very small percentage (under approximately 5%) of hospital waste that may be considered a public health risk because it could contain bacteria that could cause infection in both the hospital and general population. It is important, therefore, that a 100% foolproof disposal method is employed to eliminate this risk.

The remaining industrial waste will include engineering and building rubbish, old furniture and equipment, etc. This is normally disposed of by contractors using skips, or sometimes by special arrangement with the local authority.

Present-day Options for Disposal

In most hospitals at the present time the following methods of refuse disposal may be found in use:

Total incineration of all hospital waste with or without heat recovery;

incineration of infected waste only, the balance removed by the local authority or private contractor;

total removal from site by the local authority or private contractor.

Although the author is aware that maceration and wet disposal systems are in use, they have not been considered as a main method of disposal. Their use has, however, an important role to play and will be discussed later. Before considering the energy implications of each of the disposal methods just described, it is very important to clarify the criteria and objectives in relation to the safe disposal of all the material generated in a hospital. At first sight it may appear presumptuous or unnecessary to re-state the objectives that lie behind a refuse disposal policy. However, this re-appraisal is essential if the correct solution is to be found from an energy viewpoint.

In general terms the objective of any refuse disposal policy is '*to ensure the ecomomic and safe disposal of all waste in a quantity and at a time that meets other operational policies in the organisation.*' It is seen that the words 'safe disposal' are embodied in the definition set out. It is perhaps this main objective that has most singularly influenced the methods of refuse disposal that may commonly be found in National Health Service hospitals today. The remainder of this paper now examines in detail the energy consequences of current operational policies, particularly with regard to the use of incinerators. Finally, alternative methods for safe disposal are examined which indicate that the days of the traditional hospital incinerator may be numbered, from several points of view.

Disposal by Incineration

It can be seen that in many of the hospitals in the Service the main disposal method to date has been to totally incinerate all hospital waste. This particular policy has been largely advocated because it is often seen as the simplest, easiest and most foolproof method of disposal. It is a policy that has been supported by bacteriologists who appear to have little faith that other methods can be operated successfully and be guaranteed 100% safe. At first sight this guarantee of safe disposal appears to be a forceful argument for the disposal of all hospital waste by incineration, but incinerators themselves can create other health hazards. For example, it has beeen suggested by *McDowell*[1] that from the theoretical calculation on the chemical formula for the combustion of PVC, it can be seen that the proportion of this constituent in the refuse being incinerated is greater than 1.5% (approximately), the *Alkali Act* upper limit of 0.2 grammes ft^3 at S.T.P. (0.46 g/m^3 at 16°C and 1013 mb) for hydrochloric acid, will be exceeded in the effluent gasses. Under such conditions that plant is likely to be deemed by the Alkali Inspectorate as registerable under the Act.

Although the author knows of no Health Authority where a test case has been brought by the Alkali Inspectorate, it is likely that many hospital incinerators are operating on the borderline, if not indeed exceeding the limits laid down in the Act. In order to confirm and meet the spirit of this Act, it is likely that a more sophisticated breed of incinerator will be required which will need to incorporate wet scrubbers, water cleansing plant, cyclonic and electrostatic filters, etc. The capital and operational costs of such equipment certainly would be very expensive for the incineration of *all* hospital waste.

Case Study 'A'

The cost of total incineration of hospital waste without heat recovery

Hospital size — 800 bedded district general acute.

Waste generated — Approximately 3,000 lbs per day = 21,000 lbs per week

Estimated calorific value of waste — 7,500 Btu/lb.

Assumptions — Assuming that a five day operation of plant is envisaged, the refuse for daily disposal is 4,200 lbs per day. Assuming a seven hour plant run this means that 600 lbs per hour must be incinerated.

The cost to dispose of refuse in this manner *without waste heat recovery* would be:

Labour	— One full time ASC	44820 per annum
Energy	— Say auxiliary gas burner - 8 therms per hour x 7 hours x 5 days x 52 weeks = 14560 therms per annum at 26.1 per therm.*	£3800 per annum
Maintenance cost	— approximately	£1000 per annum
TOTAL COST — 100% INCINERATION		£9600 per annum

* Gas price based on normal industrial tariff @ August 1980. Energy consumption taken from operation cost of 600 lb/hr. incinerator

A further operational hazard from incinerators has been suggested by *Hartung et al*[2] in the Federal Republic of Germany. This relates to the ever present hazards due to incomplete combustion. This incomplete combustion of waste material, it is suggested, could leave harmful bacteria in their most virulent form in the incinerator chamber. This obviously presents a potential health hazard to both operators who daily clean plant, and engineering staff who have to carry out maintenance and repairs. Although both the operating problems described require further research and evaluation, it does appear that the use of existing designs of incinerators in hospitals must be questioned on safety grounds. With the added and ever-increasing pressure from the environmentalists in our society, it is likely that even more stringent operating parameters will be imposed, and existing legislation tightened in the years to come.

During the last few years incinerators have, however, received a considerable amount of attention because of their potential energy saving ability, when coupled to waste heat boilers.

It will be seen from *Case Studies A, B and C* that although the energy savings available are indeed becoming more ecomomically attractive every year, if the capital money is not available to install them, then other solutions must be found that are equally attractive and which are also capable of saving energy.

From this it is seen that the cost return in net terms to an Authority would be:

Labour	-£4820
+ Energy (useful)	+£18200
+ Maintenance	-£3500
net gain = £9880	

If added to the loss situation shown in *Case Study A*, the actual revenue saving would be:

£9620 + £9880 = £19500 per annum

From manufacturers data a 600 lb/hr. incinerator and waste heat boiler would cost to install: £90,000—£100,000, giving *a payback period of about five years.*

Case Study 'B'

The cost of total incineration of all hospital waste with waste heat recovery

Hospital size	— 800 bedded district general acute.	
Waste generated	— Approximately 3000 lbs per day — 21000 lbs per week.	
Estimated calorific value of waste	— 7500 Btu/lb.	
Assumptions	— As Case Study A, say 600 lbs per hour is required for disposal 7 hours per day, five days per week. The cost to dispose of refuse in this manner *with waste heat recovery would be:*	
Labour	One full time ASC	£4820 per annum
Energy	(i) Heat release available from waste is 600 lbs/hr. x 7500 Btu/lb x 7 hours, x 5 days x 52 weeks = 81900 therms per annum.	
	(ii) Heat from auxiliary burners — 8 therms per hour x 7 hour day x 5 days x 52 weeks = 14560 therms per annum	
	(i) + (ii) = 96460 therms per annum	
	Now allow say 60% waste heat boiler efficiency — waste heat available 57876 therms annually. This equates to 31.8 therms of useful heat per operating hour, which equates to 3277 lb/hr of steam from and at 212°F	
	(iii) To produce the same steam load from a boiler plant at 80% operating efficiency from and at 212°F would require a heat input of 39.75 therms at a cost of 25.4 per therm* = £10.00 per hour or	£18200 per annum
Maintenance cost	Incinerator + waste heat boiler — say	£3500 per annum

* Based on cost of heavy fuel oil (August 1980).

Summary of Case Studies

From these three case studies the following summary is shown giving the capital required if a replacement decision is to be taken:

Case Study 'A'

Cost of total incineration at typical 800-bedded acute hospital. Capital replacement cost of incinerator £50,000.

Annual revenue cost to authority £9,620 (loss).

Case Study 'B'

Cost of total incineration typical 800-bedded acute hospital with heat recovery — capital cost of incinerator & waste heat boiler £100,000.

Annual revenue gain to authority £19,500 (profit).

Case Study 'C'

The cost of refuse disposal with minimum incineration & local authority disposal

Hospital size — 800 bedded district general acute

Waste generated — Approximately 3000 lbs per day or 21000 lbs per week

Assumptions — Assuming that a five day operation is required the daily disposal of waste is 4200 lbs per day which may be classified –
a) 210 lbs will be hazardous industrial;
b) 3900 lbs will be household
If we can arrange to collect and dispose of all household refuse by compaction/container by the local authority weekly and incinerate the remainder the operating expense will be:

Labour	Half full time ASC	£2410 per annum
	The use of compactors and incinerators only takes half the time of the conventional methods.	
Energy	(i) Operation of the compactor for one hour each day — cost of electricity £150 per annum.	
	(ii) Operation of one small incinerator auxiliary burner for 1 hour each day 2-therms per hour at 26.1p. per therm £136 per annum.	
	Total energy cost	£286 per annum
Maintenance cost	For compactors & small incinerator	£600 per annum
	TOTAL COST OF DISPOSAL BY THIS METHOD	£3296 per annum

Case Study 'C'

Cost of local authority removal and minimal incineration of hazardous waste — capital replacement cost for small incinerator & compactors £30,000.

Annual revenue cost to authority £3,296 (loss).

It can be seen from the *Case Study 'B'* that energy saving from waste heat boilers is an attractive proposition. Calculations on larger hospitals show pay back periods down to 3-4 years (1750-bedded psychiatric). It should be emphasised, however, that a suitable load is important if duplication of capital investment in plant and equipment is to be avoided.

One problem in the Health Service at the present time is the restriction on the amount of capital available, another is that large capital sums expended on incinerators are not always seen as a pressing priority, particularly from the medical viewpoint. The service is operated, it must be remembered, to treat patients rather than for engineers to demonstrate their technical expertise.

Plant and equipment does eventually have to be replaced and at this time an ideal opportunity presents itself for a full evaluation of operational policies.

It can be seen from *Case Study 'A'* that any hospital which is currently totally incinerating all its waste, without waste heat recovery, should urgently review its operational policy. The introduction of compactors and a segregated bag system would provide savings quickly as well as save energy, this is clearly demonstrated in *Case Study 'C'*.

With regard to *Case Study 'B'*, 'total incineration with heat recovery', here is a good case for introducing this policy, providing the capital is available and the hazards referred to can be eliminated. Although present worth calculations have not been presented, they indicate that this method of disposal pays back well over a 20 year cycle.

Alternatives for Disposal

It was stated earlier that the main operational policy for the safe disposal of hazardous waste has almost entirely been based on incineration (although private contractors can be found to dispose of this category of waste which will conform to the regulations under the *Poisonous Waste Act 1974*). It has also been suggested earlier that there could also be certain health hazards associated with the incineration process itself.

As an alternative, work carried out by *Hartung*[2] shows that hazardous waste can be satisfactorily rendered safe by the process of steam sterilization. It has been shown that this is feasible and that pound for pound of waste the sterilization process can use up to 50% less energy, compared to disposal by incineration. After sterilization, waste can be re-classified as 'household' and disposed of by the local authority. This particular practice is not entirely new to hospitals — indeed pathology and other research departments use steam sterilization as the main method for disposing of material contaminated with harmful bacteria. There is, therefore, no reason why the remainder of the hazardous waste in the hospital should not be disposed of in this way. Human tissue can satisfactorily be disposed of safely by maceration — many research laboratories now use this method.

The capital cost to purchase sterilizers would not be too different to that required to purchase incinerators, indeed by the time chimneys have been added to the cost, incinerators would probably cost considerably more. It is also quite probable that the longer life of autoclaves together with a greater degree of control over the process would be two good reasons alone to pursue this idea further.

It is, therefore, suggested that the long term policy for hospital waste disposal should be developed on the following lines:

Household waste — removal by local authority;
Hazardous waste — sterilized prior to removal by local authority;
Remainder — building rubbish etc., remove by skip, as required, by contractor.

National Energy Implications

In this paper it has been seen that significant variations may be obtained in energy consumption depending on the operational policy selected.

If, in the next decade the trend towards incineration of all waste with heat recovery is pursued, then the following saving nationally could be available:

From *Figure 1* it will be seen that there are about 200 hospitals in the range 500-1100 beds. If we estimated that at each of these an average saving of about £15,000 per annum could be achieved, then an annual saving of about £3 million would accrue in revenue savings.

If, however, capital continues to be restricted, and a change of policy is introduced to incinerate or sterilize hazardous waste only, with the balance removed by the local authority the following national saving could be available:

If we calculate the same 200 hospitals allowing for about £6,000 saving per hospital on average, an annual saving of around £1.2 million could be achieved.

It must be noted that both the above options are conservative and relate to 200 hospitals only. It is seen from *Figure 1* that a large majority of hospitals are under 200 beds; savings of a lesser extent must be available from them also — perhaps another £1 million.

Conclusion

The examination carried out in this paper into one operational policy indicates energy savings are possible.

If, for example, there is a gradual replacement of traditional incinerators to those with waste heat recovery, then in the United Kingdom perhaps a minimum of £3-4 million in revenue could be saved annually. If this level of capital investment was not available then an alternative policy, and possibly safer long-term solution, would be the total removal by the local authority of the hazardous waste after sterilization. This policy could also save about £1.5 or £2 million in national terms. Local authorities could themselves save energy by using district heating schemes, as some do, or by utilizing waste heat from incineration.

It is very much hoped that this paper, although not exhaustive in depth, may stimulate further discussion and interest in Hospital Energy Year. The problem of the safe disposal of waste is not always seen as an attractive research area but it is a problem that will not disappear in the future.

Research is essential if the next generation of equipment is to be installed to match the optimum solution from an energy conservation viewpoint.

References

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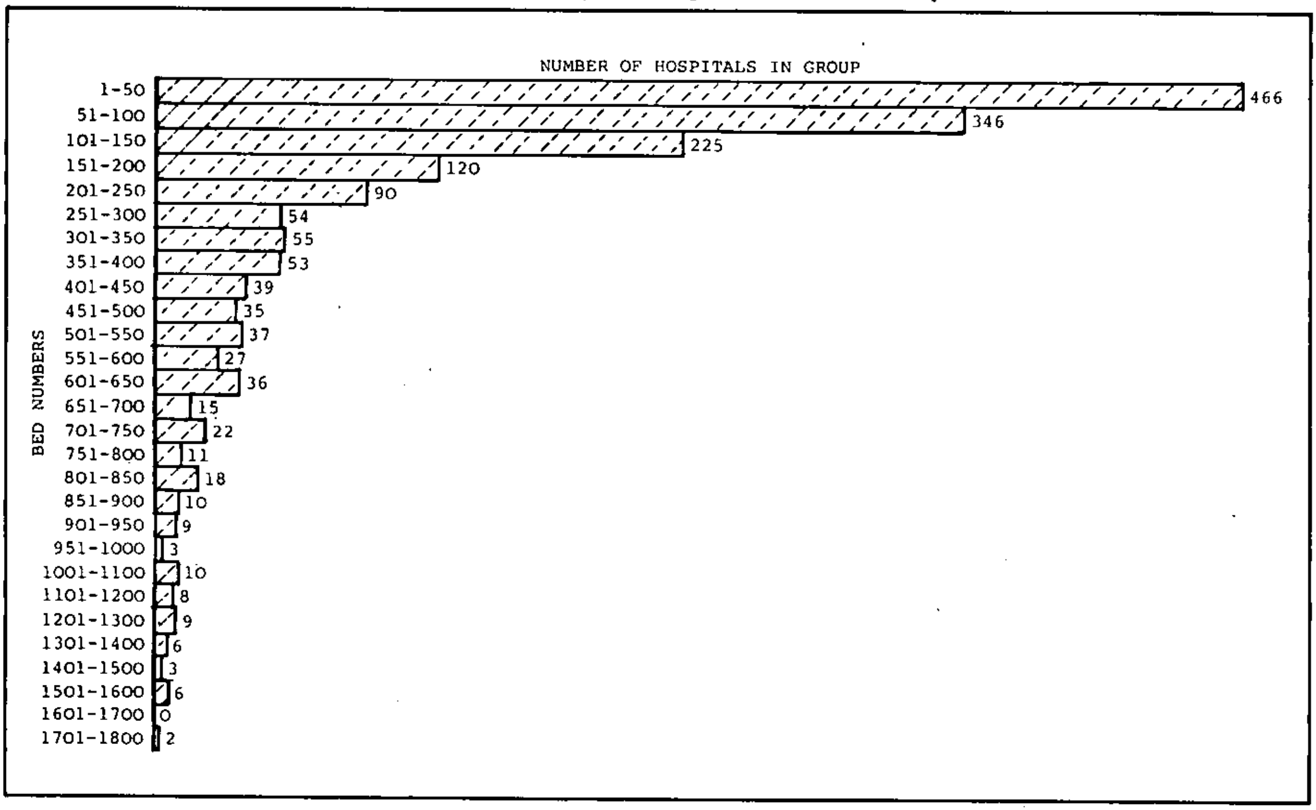
2. Hartung, E. et al. *Infective Waste in Hospitals.* Proceedings of the 6th International Congress of Hospital Engineering 1980 P.327-329.

Further useful reading — *Hospital Service Engineering Data—Disposal of Waste.* August 1973.

Figure 1: Hospitals in England and Wales grouped by bed complement. (Source: Hospital Year Book 1979).



The author is the Senior Engineer at Little Plumstead Hospital, Norwich Health District and this paper, which was a entry in the Energy Conservation Year Competition, was commended by the judges.

Blofield Hall — Effective Implementation of Management Techniques

J METCALFE

The subject of this example of fuel management is Blofield Hall, one of Norfolk's former premier country residences built in the grand style of the mid-nineteenth century. It is, veritably, a solidly constructed house of particularly high quality. Its present-day use is that of a home for some forty-five adult mentally handicapped patients. It is pleasing to note that its use as a residential home is much as it was in its Victorian heyday, with dining rooms, games rooms and amenity rooms located at ground floor level, whilst its first and second floors offer bedroom and associated facilities. The boiler room is housed in the basement of the Hall, befitting the building style of the era of its construction.

Heating is provided by aged, cast-iron radiators with pipework of indeterminate age serving a total of $5300m^3$. The system design goes back to the pre-pump era and, in all probability, was originally worked by gravity circulation. Thus all the heating flow rises to the highest point through a cast-iron pipe, with all radiators being connected to the return pipework to the boilers.

The boiler plant consists of two twenty-year old sectional cast-iron boilers, each rated at 500,000 Btu/hr (1500 KW) and fired by 35 second burners. The boiler outlet temperature was set at 170°F, which was used in the primary circuit for supplying domestic hot water and for the heating flow. Modulation of the heating flow is achieved by means of a Sarco ETO diverting/mixing valve controlled by an outside sensor.

A critical examination of the heating system was clearly essential in any major drive on energy conservation. The obvious aims would be to reduce fuel consumption by better control of plant, and by replacement of inefficient equipment. To this end, the following observations were made, and alternative solutions to each observation were considered:

(i) the boilers were designed many years ago for use with solid fuel, and had been adapted to oil firing. Consequently they were relatively inefficient;

(ii) the method of heating flow modulation was sluggish and controlled the inside temperature of the whole building from one outside sensor;

(iii) no night set-back was available;

(iv) the pipework was very old and had been designed to work as a gravity circulation system, which made local zone control very difficult;

(v) despite present-day circulation being pumped, some radiators remain oversized due to the original design allowing for slower gravity circulation;

(vi) local overheating occurred due to unoccupied bedrooms being closed for lengthy periods of time;

(vii) a large greenhouse (55ft x 12ft) provided winter cut-flowers and pot plants for both the Hall and its parent hospital two miles distant;

(viii) the propagation of bedding plants and geraniums in the greenhouse required all night heating during the winter months, notably from January to May.

The First Year

However desirable a scheme to replace obsolete plant might be, its effectiveness in terms of energy conservation had to be measured against the payback time for a new installation. The estimated payback time for installing new boilers, controls and pumps was around ten years so that as an energy conservation measure it fell far short of a positive rating on any priority list!

The pipework system was incredibly old, so much so that there was a clear choice between installing a completely new system or doing nothing to it at all. Sketch drawings were made of new heating circuits to provide better zone control but it soon became obvious that the estimated cost of installation would be greater than anticipated savings, so that this notion too became a low priority.

The problem of local overheating was considered at the same time and it was decided that the best solution would be to fit thermostatic radiator valves in all rooms. In the light of this decision a contract was let to fit forty-two thermostatic radiator valves at a cost of £1200. The expected savings were calculated, and it was hoped the payback time would be less than four years, but this was a 'guestimate', as overheating is mostly an immeasurable factor. The actual savings which resulted were calculated after the 1978/79 heating season.

	1977/78	1978/79
Degree day	2595	2809
Fuel Consumption	61585	59510
Utilisation (LT/DD)	23.732	21.185

The actual reduction in fuel consumption was minimal because of the unpredicted colder winter of 1978/79, but when calculated in the form of litres of fuel per degree day the savings amounted to 10.7%. The savings on fuel costs were calculated by taking the 1978/79 number of degree days and multiplying by the improved utilisation and cost of fuel.

2809 x (23.732 - 21.185) x £0.735 =£525.

With the price of fuel rising rapidly, the capital payback time was nearer two years than the four years originally estimated.

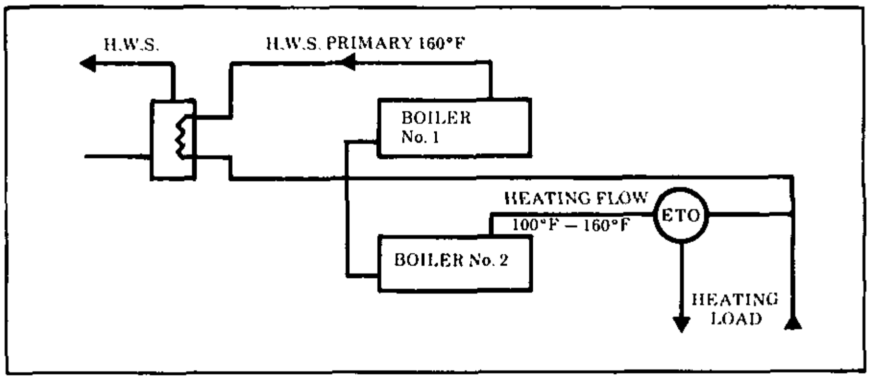
The Second Year

Having achieved something of a success by controlling the local overheating the original list of observations was reconsidered. The availability of capital had not improved during the previous winter, and therefore the only alternative was to consider implementing some form of night set-back.

The heating needs of the Hall were equated to the needs of a normal domestic household, where it is quite usual for the heating system to be shut down during 'sleeping hours'. The implications of implementing this decision were discussed with other departments, the most serious problem to be overcome being the need for all-night heating in the greenhouse. Discussion with the Gardening Superintendent took place and it was agreed that if the quantity of cut flowers and plants was reduced slightly, an acceptable service could be provided by better utilisation of space in existing greenhouses at the nearby hospitals of St Andrews and Little Plumstead. The co-operation between departments thus made it possible to shut off all heating from the greenhouse at Blofield Hall, allowing for more economic control of the boiler plant. A clock control was fitted to the heating circulating pump, and after consultation, the clock was set to shut off the pump from 11 pm to 5 am. The estimated savings resulting from the clock control were expected to be about 15% of fuel consumption in addition to the unmeasured saving from no longer supplying greenhouse heating.

The requirements of the heating and hot water system were examined and how they could be met in the most economic way from the existing boiler plant. The primary circuit for the hot water service needs to be approximately 160°F throughout the year, whereas the heating flow only needs to be so high for a few days of the coldest winter months. It was decided, as an alternative to running one boiler at high temperature, to run two boilers in a series mode. One boiler was set up with an outlet temperature of 160°F and used for the primary circuit of the hot water. The second boiler was used for heating with a lower outlet temperature. The flow and temperatures can be seen in the schematic drawing of the boiler room. *(Figure 1).*

Figure 1



The capital cost of the modifications carried out for the second winter was under £100, but the resulting savings were worth many times that value.

	1978/79	1979/80
Degree Days	2809	2563
Fuel Consumption	59510	40600
Utilisation (LT/DD)	21.185	15.841

The co-operation between departments to make it possible to close the greenhouse and thus reduce the heating during the night, achieved an improvement of fuel utilisation from 21.185 to 15.841 LT/DD — an impressive improvement of 25% over the previous year. The cost of the clock was recovered within the first month of the heating season.

Savings

The capital investment in thermostatic radiator valves and time control of the boiler plant has amounted to approximately £1300. The savings which have resulted can be illustrated by examining the improvement in utilisation of fuel, which has improved from 23.732 in 1977/78 to 15.841 in 1979/80, or a potential of 33% reduction in fuel consumption. At 1980 fuel costs this improvement can be shown as a saving of £2488, as shown in *Figure 2.*

Figure 2

Degree days 79/80	Improvement in Utilisation	Fuel Cost	Saving
2563	x (23.732 — 15.841)	x £0.123	= £2488

Conclusions

An examination of any management problem reveals certain specific ingredients:

consider the Aims of the exercise;

itemise the component elements of the problem;

consider *all* alternative solutions available;

cost these alternatives;

involve other people;

implement agreed action;

follow-up the implementation to satisfy oneself that the aims have been met, and that the solution provided to the problem really was the best available at the time.

In the above terms the Blofield Hall solution to energy conservation could be analysed as shown below:

Aim
to reduce energy consumption.

Elements of problem
old plant, overheating in closed rooms, greenhouse heating etc.

Alternatives
replace boilers, replace pipework etc.

Costings
in round figures would they justify the aim?

Involvement of other people
consult, seek views, share the problem, listen to opinions, seek co-operation etc.

Implement Action
implement those portions of a scheme that provide a viable return and meets with other people's approval.

Follow-up
Vital. Is the implemented scheme working to best advantage?
Measure it.

One's first impressions of energy conservation at Blofield Hall was to replace all the plant and pipe systems, but this was not possible. Changes had to be made in a different way.

In short, the Blofield Hall energy conservation programme had revealed the very epitome of the 'Serenity Prayer'.

God grant me the Serenity to accept the things I cannot change, the Courage to change the things I can and the Wisdom to know the difference.

Blofield Hall may be a relatively small unit, but effective saving of 33% on energy costs, even in a fragment of the exceedingly large National Health Service canvas, is something worthy of serious consideration. The effective use of well-proven management techniques in examining a nagging problem of the day, the involvement of other people in such an examination, and the determination to implement the rewards is an example worth following. We can but strive to effect an improvement in energy conservation — the problem is ever-present, and there can be no outright solution, but we certainly can try.

This paper was an entry in the Hospital Energy Conservation Year 1980 Competition and the authors are from the Preston Health District Energy Conservation Working Party.

Programmable Clocks and Optimiser Simulation

T FINCH
D JACKSON
I COX
C WOODS

Introduction

The entry is described in two sections:

The adaptation of the lastest type of programmable time switches, and

The development of circuit design that approximates to an optimiser at one tenth of the cost of a commercial model.

Programmable switches

By choosing a suitable modern type of time switch, i.e. with two dials — the outer unit having two hour intervals and the inner dial having 30 minute interval — a very cost effective heating control unit can be used. Effectively, two clocks are available, and by judicious connection of the clocks, viz. series or parallel, a high degree of programmability with regard to differing daily heating times can be met.

A particularly easy area for energy savings is the community property, along with other irregularly heated areas, such as health centres, residences, offices, etc.

In Preston Health District immediate tangible savings were effected after making such installations in the above types of properties, and for a capital outlay of under £1,000 an energy saving of 16% (approximately £6,000) was netted within a 12 month period.

All the members of the Energy Conservation Working Party are convinced that if such devices were applied across the whole NHS estate, literally hundreds of thousands of pounds and corresponding energy could be easily saved. From our knowledge of this region alone there are many such premises suitable for these energy savings.

Designing an Optimiser Circuit

Although no one would decry the use of commercially available optimisers,

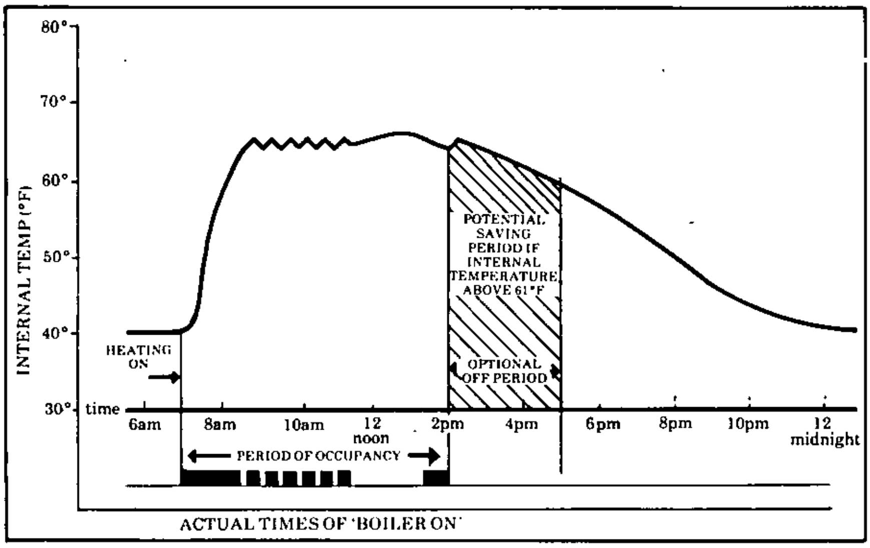


Figure 1 Graph plotting temperature/ time for a typical Health Centre.

the energy savings available from these devices is typically only 5% (if existing time controls are effective) and hence the viability of installation in the smaller premises is questionable with such units costing from £200 to £600.

The problem is one of cost effectiveness, i.e. if a cheaper model was available that effectively saved energy at the optimum periods, its use could be sanctioned.

Savings are possible in the morning and afternoons during the variable on and off periods. By keeping the heating starting times as late as possible, bearing in mind the minimum required temperature (plotting the thermal response of the building on a temperature recorder), the later times can be set, care being taken to give an earlier start on Monday mornings, etc.

Generally, then, the larger energy savings are to be made in the latter period of 'optimum off' when the temperature decays, and thus the circuit has been designed to accommodate this.

From *Figure 1* it can be seen that a typical community building with a spring/autumn external temperature of greater than 55° can retain its internal temperature above 61° when the heating is switched off at 2 pm. By the addition of a second time clock and two simple thermostats in series and by monitoring the internal and external temperatures from say 2 p.m. onwards until the time that the building is unoccupied, the heating can be switched off when conditions permit, in order to reduce energy demands.

These two thermostats could be set to 61°F and say 50°, thereby ensuring that minimum temperatures are retained in the event of a 'cold snap' in the afternoon.

Variations on the circuit are possible and thermostats could be used to select the optimum on the time frosts starts to control circulating pumps only etc. *(Figure 2)*

General Conclusion

Case a — day programmable clocks have been a resounding success.

Case b — is far more cost effective than commercial optimers and typically costs £50. It is at present being installed throughout the District and savings should be realised shortly.

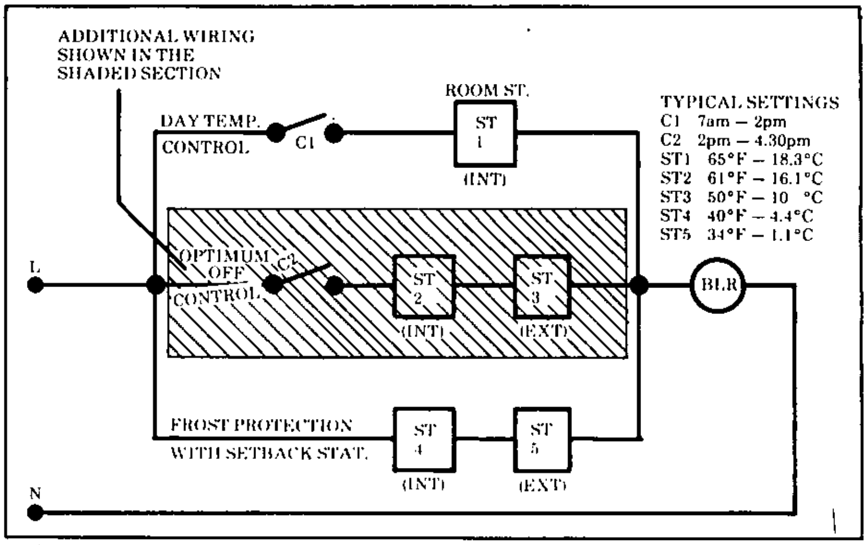
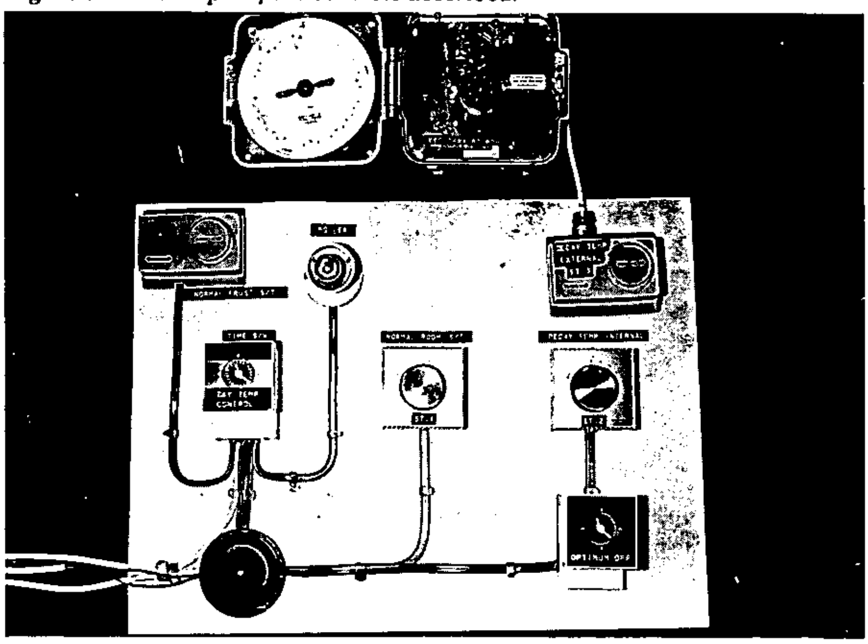


Figure 2 Schematic connection of Optimum off control.

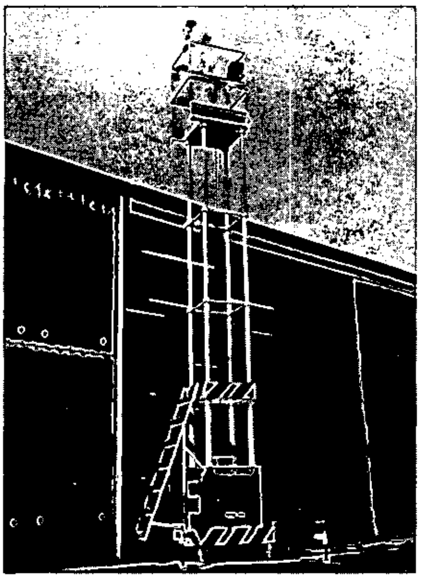
Figure 3: An example of the controls described.



Product News

Telescopic Platforms

Aero-Zigo Limited have recently announced their Series A Telescopic Work Platforms. A feature of the design is the use of 4 telescopic pillars to lift the cage to working height. The pillars are extended by air pressure supplied by a built-in mains driven air compressor. Control is by push buttons on the platform or by additional controls from the ground in case of emergency. To ensure safety in operation, stabilisers are electrically interlocked, preventing the platform from being raised without their extensions. Models are available with working heights up to 9.5 metres. Models up to 7.6 metres will pass through normal room size doors.



The Aero Zigo 6.5m model, fully extended.

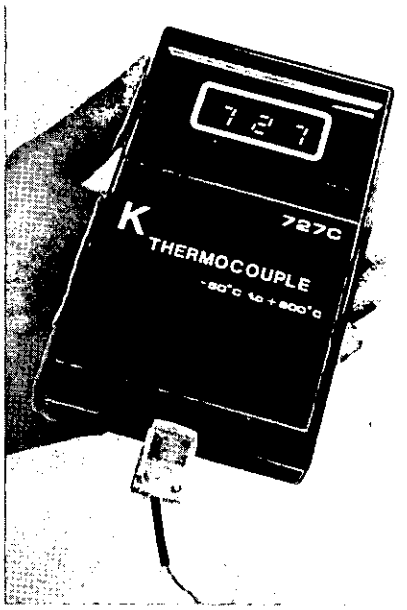
Alternative wheel arrangements are on option for varying conditions of floor.

For information: Aero-Zigo Limited, Binstead, Isle of Wight, England. Tel: (0983) 63691. Telex 86686.

Hand-Held Digital Thermometers

Two hand-held digital thermometers have recently been introduced known as the Models 727C and 737C for use with Type K thermocouple and platinum resistance thermometer sensors respectively.

The Model 727C has a bright 0.3" LED display and covers the range -50°C to +800°C with a resolution of 1°C; whilst the Model 737C has a 0.5" LCD display and switched ranges of -100.0°C to +199.9°C with a resolution of 0.1°C and 0°C to +850°C with a resolution of 1°C.



Digital Thermometer.

Both models are battery powered; but can be operated from a 240 VAC supply using an adaptor available as an optional extra. A wide range of hand held sensors are available for use with these instruments.

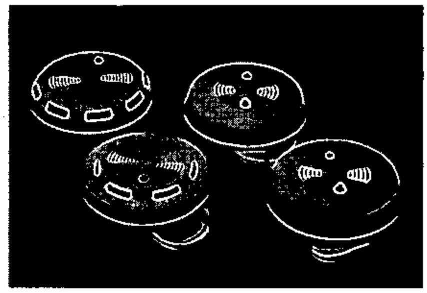
The prices of these instruments are Model 727C — £76.00 and Model 737C — £96.00 exclusive of VAT.

For further information: Holdbrook Heat Sensors, 2 Hoden Lane, Cleeve Prior, Evesham. Worcs. WR11 5LH. Tel. 078988 3559

'Red Alert' Smoke Detector range

There are two main methods of smoke detection, ionisation and photo-electric and the MK Electric range uses these two to suit most requirements. Features common to all models are an 85dbA alarm horn, an LED indicator to show the detector is functioning normally, and a 9-volt battery with an operational life of one year, complete with battery-low indication and a test switch.

Two of the models, list nos 1351 and 1353, work on the ionisation principle. The latter model incorporates a special escape light which works from a separate long-life battery and switches on automatically when the alarm is activated.



MK 'Red Alert' smoke detectors.

The second method is by a solid-state photo-electric sensor, list no. 1352 and no. 1350, combining both the ionisation and photo-electric principles and giving detection of most types of fire. A special feature of three detectors is a facility which enables up to six units to be linked together. When one detector operates, it automatically sets off the others.

For further information contact: MK Electric Ltd, Shrubbery Road, Edmonton, London N9 0PB. Tel: 01-803 3355.

Clamp Meters

The model PK220 Clamp Wattmeter will be found particularly suitable for assembly, maintenance and repair shops when electrical equipment and power consuming articles are handled. The measured circuit need not be disconnected during measurement as the conductor is encompassed by the jaws of the clip-on transformer. The conductor can be insulated and enclosed in a metal conduit; maximum conductor size is 54mm. Measurement can be carried out even in inaccessible places where reading is difficult as the needle deflection can be arrested at any point on the scale by the slide switch on the side of the instrument. Readings as low as 0.3 kW and as high as 300 kW can be taken; range selection and jaw opening can be effected with one hand.

Complimentary to the PK220 and similar to it in size and appearance, the model PK230 Clamp Phase Meter allows true consumption readings to be taken from capacitive and inductive loads by indicating the true vector, θ.

Both instruments have an accuracy of ±5% and are supplied with lined carrying case, shoulder strap and special test leads, and measures 290 x 102 x 56mm.

For information contact: Channel Electronics (Sussex) Ltd, PO Box 58, Seaford BN25 3JB Sussex. Tel: Seaford (0323) 894961.

Motorised Fire Dampers

A range of motorised, curtain wall fire dampers with a 2 hour rating, has interlocking curtain blades which are held in the open position by a stainless steel wire held taut by the motor, and fitted with a fusible link. If the ambient temperature in the air conditioning ducting exceeds a preset limit, the link fuses, and the curtain falls. Electrothermal links or quartzoid bulbs can be specified in place of fusible links.

A microswitch fitted to the damper can reveal when the damper is completely closed, and gives a signal to the remote building automation system control panel, to enable remote testing of the dampers.

Contact: Advanced Air (UK) Ltd, 3 Cavendish Road, Bury St Edmunds. Tel: 0284 701351.

Blood Transfusion Centre

Sterile Facility

A project which makes Liverpool the most advanced regional facility in the Service, is a pilot scheme for the 14 regional centres in England and Wales. The Liverpool sterile facility, known as the Blood Products Area, is used for the separation of whole blood into its major components. This enables the products of a single blood donation to be used in the care of several patients.

Planning the Blood Products Area at Liverpool started in 1975 after the Ministry of Health had decided that the NHS should no longer be dependent on separated blood products imported at considerable expense from overseas pharmaceutical companies.

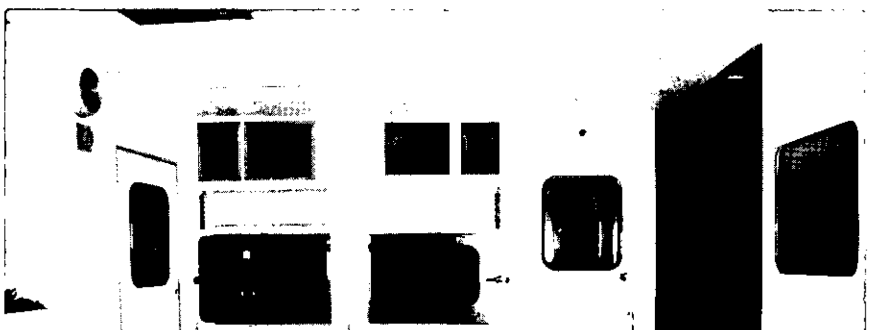
Architects and engineers employed by the NBTS were responsible for the layout and design of the Blood Products Area, working in consultation with the Medicines Inspectorate. Technical staff from Envair (UK) Limited, the clean air engineering company based at Haslingden, Lancashire, were called in at an early stage to assist in planning the clean rooms and to design major items of equipment, such as laminar flow sterile workbenches, pass-through sterilisation cabinets and associated handling equipment.

Blood arrives at the Centre in sealed plastic bags which have empty satellite bags attached by tubes. The bags are spun in centrifuges to throw the red and white cells to the bottom of the bag. Plasma remains at the top of the bag. Squeezing the bag transfers the plasma to the satellite bag, leaving only red and white cells in the main bag.

After this preliminary separation, the bags are loaded onto carrying racks and placed in a washing cabinet, two of which connect the outer classification and preparation rooms with a strictly controlled sterile suite. An automatic locking system ensures that the doors are closed and the automatically-controlled washing and drying sequences have been completed.

The sterile suite has an air-locked entrance with clothes hanging space and lockers for handbags and other personal items. It leads into a changing room where a barrier bench marks the transition from external conditions to the inner clean or 'grey' area.

A preparation area looking towards the sterile suite with its air-locked entrance on the right.



After changing into clean room garments the operatives enter the reception area on the clean side of the pass-through cabinets where the washed bags enter the suite. Leading off from the reception area are two sterile rooms or 'white' areas, containing the laminar flow workbenches.

The suite occupies about 120 square metres, and is maintained at positive atmospheric pressure by filtered air — humidity and temperature are strictly controlled. A plant room above the area allows lights, fans and other equipment to be serviced without requiring maintenance staff to enter the sterile suite.

In addition to designing and supplying the sterile suite, the pass-through cleaning cabinet and blood handling racks, Envair also supplied partitioning for other areas such as the centrifuge rooms.

Further information from: Envair (UK) Limited, York Avenue, Haslingden, Rossendale, Lancashire BB4 4HX. Telephone: Rossendale (070 62) 28416.

Brochures

Thermal Resistance Guide

A convenient A4 size guide designed to assist specifiers, contractors and buyers involved in the insulation of industrial or domestic buildings, is an aid in determining the thickness and type of glass fibre insulation products required in any of the common methods of wall, roof and floor construction.

The guide commences by explaining 'R' value (thermal resistance), why it is used, and how it can be calculated, and then goes on to explain by means of a worked example, how the 'R' values of common building materials can be used to calculate the 'U' value of the various constructions.

Available on request from: Gyproc Glass Fibre Insulation Limited, Whitehouse Industrial Estate, Runcorn, Cheshire WA7 3DP. Tel: 0928 712627.

Quartz time-bases

A brochure is available which details several of the more sophisticated quartz time bases, and includes the QM Masterclock range which, with no moving parts, provides a totally accurate and reliable time system.

The Telebox electronic quartz system — directly controlled by a radio signal from the Rugby transmitter to ensure absolute accuracy — is designed to monitor an army of slave clocks both in or outside buildings.

Copies available from: English Clock Systems, Industime House, Chase Road, Park Royal, London NW10. Tel: 01-965 9011.

Heat Conservation with Foam Insulation

BIP has published an eight-page illustrated brochure showing how and why UF foam insulation is a simple and cost-effective means of insulating a building constructed with cavity walls.

The brochure explains why cavities should be insulated and demonstrates the effectiveness of UF cavity foam by quoting government information and showing a variety of typical installations. The foaming process is described, and charts show the extent of the reduction in heat loss which can be expected in different buildings which have been insulated by this method.

Available free of charge from: British Industrial Plastics, Popes Lane, Oldbury, Warley, West Midlands B69 4NF. Tel: 021-552 1551.

Lighting Industry Federation 'Factfinders'

A short series of publications under the general title of 'Factfinders', scheduled to appear every two or three months, are intended to give help, information and guidance on a wide range of lighting topics.

Dimming (price £1.50), presents a thorough survey of dimming fluorescent lighting and points the way to possible future developments.

Lamp Guide (price 75p), details all types of light source available on the market today, their applications, and technical data.

Lighting and Energy and *Benefits of Certification* (this latter Factfinder will have particular relevance to the LIF's promotion of certification).

Details available from the Federation at Swan House, 207 Balham High Road, London SW17 7BQ. Tel: 01-675 5432.

Lift Maintenance Scheme

A new brochure describing the 'Superservice' lift maintenance scheme is now available.

An illustrated, gate-fold, A4-size colour publication, it discusses the scope of the H & C Superservice, a scheme designed to provide lift users with a planned maintenance programme and emergency breakdown service at a fixed annual cost. The scheme includes parts replacement costs and skilled labour costs and provides for regular maintenance inspection of client's lifts by trained lift technicians.

Obtainable free on request to: Hammond & Champness Ltd, 159-173 St John Street, London EC1U 4JQ. Tel: 01-253 4818.

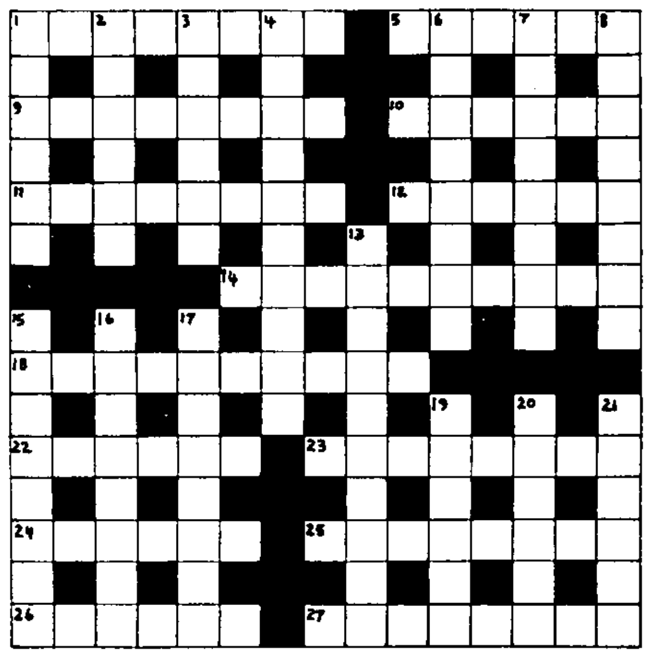
Reproduced from *Candlelight* by permission of the Manchester AHA.

Clues across

1. A lot of these are used to power the hospitals (8).
5. Grouse shooting boiler men do it all the time (4, 2).
9. Perhaps the coal's first route to the boiler house (4, 4).
10. No forests here to provide fuel, only snow and ice (6).
11. If no lees are confused, there might be a group of hydro carbons here (8).
12. It needs furnace treatment — positively (3, 3).
14. Not confused with us I nail a covering on the rafters (10).
18. See 6 down.
22. 6 and 18 down, and 26 across needs to be this for maximum efficiency (2, 4).
23. Useful in the hospital kitchen or on the Mississippi (8).
24. Flying in to save energy, perhaps? (6).
25. One kind of waste we accept (8).
26. See 6 down.
27. Demands that strain resources (8).

Clues down

1. Reflections in print? (6).
2. German Physicist — a nobler man? (6).
3. L.E.N. in a particular arrangement when you do this (4, 2).
4. The fuel merchant sells small coals (6, 4).
6. 18 and 26 across. Inside of organic material oxidised by a mechanical contrivance of many parts 8, 10, 6).
7. Devoid receptacle for coal perhaps, if thermostat is turned up (5, 3).
8. Span heat to give a tasty dish (8).
13. When this happens to North Sea Oil what do the future generations do then? (3, 3, 2, 2).
15. V.A.T. act i.e. made everybody participate in saving energy (8).
16. Sending forth a stream of heat (8).
17. You are allowed to do this at less than 19°C (4, 2, 2).
19. Invitation from the Energy Manager to those who have energy saving ideas (4, 2).
20. Used to measure energy (6).
21. Roman copper coin being the thing in question with the abbreviation for an old testament book (2, 2, 2).



Solution next issue or, if you can't wait, a stamped addressed envelope to Mallard Publications (marked Crossword*) will bring the solution by return!*