The Journal of the Institute of Hospital Engineering October 1981

HOSPITAL ENGINEERING

Building Services Management
Installing a Computerised System

'Hospital Engineering' is published monthly, except in January and July, by Mallard Publications

Individual copies cost
£2.95 UK postage paid

The annual subscription is UK: £24.00
Overseas: £30.00 Americas: $60

Average circulation per issue
(January-December 1980): 2799

ABC

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'Hospital Engineering'
Mallard Publications
48 Southwark Street
London SE1 1UN, England
Telephone: 01-403 6166

UK ISSN 0309-7498

Printed by JB Offset Printers
(Marks Tey) Ltd
Station Approach, North Lane
Marks Tey, Colchester, Essex

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HOSPITAL ENGINEERING

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Volume 35 No. 8 **October 1981**

Front Cover:
The nerve centre of the Honeywell Building Services Management System (see page 4).

Institute News

Midlands Branch

The first technical meeting of the Branch for 1981/82 was held at the West Midlands Regional Health Authority on Tuesday, 15th September, when a paper on *Combined Heat and Power* was presented by Mr Stan Whitehead, Power Station Superintendent at the new Leeds Infirmary.

Over 70 members and guests from CIBS and IPlantE attended this meeting, which included an animated slide presentation of the installation, prepared by Leeds Polytechnic.

Closed circuit television was used to relay the lecture to another room, and a video tape recording made of the proceedings.

Refreshments were provided by courtesy of the Regional Health Authority and the evening was considered very worthwhile by all those who attended.

An invitation to visit the installation has been offered by Mr. Whitehead, and it is proposed to arrange a coach trip to Leeds shortly for all those members interested in seeing this 'engineering giant'.

West of Scotland Branch

Branch Meetings 1981/82

24th September 1981:
Restoration of Classic Motor Vehicles by Hamish Dickie, Scottish Secretary, Daimler and Lanchester Owners Club.
29th October 1981:
Medical Gases/Anaesthetic Gas Scavenging by A Black, Scottish Health Service Common Services Agency — Building Division.
26th November:
Developments in Private Branch Exchange Equipment by D T Dunn, Assistant Executive Engineer, British Telecommunications Board.
1st December 1981:
Boiler Air Heaters — Joint meeting with Institute of Energy.
28th January 1982:
Maintenance Management Techniques in the Off-Shore Industries by R Yorston, Industry Services International Limited.
25th February 1982:
Incineration by Mr G M Priest, Managing Director, Beverly Chemical Engineering Limited.
25th March 1982:
Annual General Meeting.
29th April 1982:
Visit to B.O.C. Liquid Oxygen Tonnage Plant at Carfin.

All meetings, except 1st December 1981 and 29th April 1982, will be held in the Lecture Theatre, Glasgow Royal Maternity Hospital.

IPlantE Vice-Presidency for Institute Fellow

Mr Cyril S Watkins, has recently been elected Vice-President of the Institute of Plant Engineers.

As a long-standing member of the South Western Branch of this Institute, he is at present Vice-Chairman, having previously held the offices of Committee Member and Branch Chairman.

Diary Note

The London Civil Engineering Construction Show and Conference, organised by the Institution of Civil Engineers will take place from 2-5 November at the London Olympia.

The papers will cover subjects which include *Administration and Management of Engineering Works* and *The Repair and Maintenance of Engineering Works.*

Enquiries on the conference should be sent to The Conference Officer, Institution of Civil Engineers, Great George Street, London SW1P 5AA.

Reliability Technology

2-day Course

This course for practising engineers is jointly organised by the Safety and Reliability Society and the University of Bradford, and is to be held at the Floral Hall, Southport on 29/30 October.

Among the speakers is Dr Malcom Green of the Department of Health and Social Security, and the subjects covered are electronics; nuclear; telecommunications; and safety.

The cost is £125 plus VAT, and attendance at the course counts as qualification for membership of the Society. Registration forms are available from: The Secretary, Postgraduate School of Studies in Industrial Technology, University of Bradford, Bradford, Yorks.

Fellow's Appointment

Mr P. F Pike, TEng, (CEI), FITE., FIHospE. has been appointed an Associate of MEDA (Mechanical and Electrical Design Associates), Building Services Consulting Engineers of Headingley, Leeds. The Practice continues with Mr D. L. Bedford, Mr. P. Scott and Mr. C. D. Round as partners, and Mr J. Robinson, Mr W. R. Johnson, Mr J. Parkinson, Mr P. D. Clifton and Mr S. L. Beverley as Associates; its principal office being in Leeds and branch offices in London and Al Khobar.

Fellow's Directorship

Len Hornby MCIBS FIHospE has joined How Air Limited of Bolton as Director in charge of the newly formed Clean Air division. His task will be to augment and improve the existing range of systems and products used in medical, pharmaceutical and electronic fields.

A new office has been established in Bolton offering a complete technical service whilst overall control of the Company's Air Handling Division including Clean Air Systems remains with David Forrest at Head Office in Oldbury.

Obituary

It is with the deepest regret that we have to record the death of H. Tomlinson at the age of 67. Mr. Tomlinson was one of the very early members of the old Institution and his interest in its progress was entirely ceaseless. In addition he had the proud record of 41 years service as the hospital engineer at the Chesterfield Royal Hospital.

He is survived by his wife to whom goes our deepest sympathy.

Letter to the Editor

Bonus Schemes

Dear Sir,

I have read with interest over recent months several articles concerning Works Departments' Incentive Bonus Schemes in your journal. It appears that at all levels of works management there are opposing views on what has been an emotive topic since its conception.

It could also be said that views of first-in-line officers are as varied as 2nd to fourth-in-line officers. Many works managers have a financial interest in the successful running of these schemes, although from my experience this financial aspect does not deter these officers from voicing their professional opinions on the subject, as illustrated in recent editions of the journal.

The question as to whether it was right or wrong to pay some works managers a bonus, in the form of a percentage of their salaries, will no doubt be discussed at some future pay round — or perhaps as part of the NHS reorganisation when the new DHA may rationalize the system. In the meantime, whether managers like it or not, we will be running a Bonus Scheme in NHS works departments for some time to come.

Nevertheless there are several worrying factors surrounding Bonus Schemes in general, partly highlighted by Mr Shand of Inverness. In his letter to the Editor appearing in the July Issue, he quotes (like many more of our colleagues) the usual list of advantages acruing from Bonus Schemes. Such advantages read:

Increase in productivity;
better financial planning;
increased consultation with Trades Staff leading to better Industrial Relations;
increased staff utilisation.

I will briefly analyse each of the four points:

Increase in Productivity

Prior to the introduction of Bonus Schemes, tradesmen filled out a weekly job sheet where each task, along with each requisition number, was listed. With this system it was the manager's responsibility to account for the 40 hour week plus any overtime where applicable. In those days maintenance was carried out effectively with the minimum of paperwork, and engineers were not being 'chased' for that elusive 1/100th of an hour. As managers, we have to be very careful to carry out maintenance in an orderly manner and according to a system of priorities. Such a system can only come from experience and the ability to recognise the needs of hospitals large and small, along with all other health service properties. There is a danger, particularly with the less-experienced engineer being misguided into believing the Bonus Scheme comes first in this list of priorities — causing him to become bogged down with the trivia of the system, and leaving no time to take an objective view of the whole field of maintenance.

Better Financial Planning

Before the last reorganisation, financial planning had been given a high priority by Senior Works Officers, and systems were further improved with the introduction of District and Area Headquarters and Estmancode. Below-the-line spending was being controlled to the point where managers were able to instantly categorise various types of works, and consequently forward looks and all elements of budgets could be planned. It follows that above-the-line spending was not just linked but more integrated in this system. In other words, getting expenditure on procurement items and contract work right results in manning level requirements becoming clearer. In practice it is evident that prior to the introduction of Bonus Schemes, manning levels were changing in many areas and, as a direct consequence of this, a relatively new approach was emerging.

Increased Consultation with Trades Staff Leading to Better Industrial Relations.

There appears to be a consensus among pro bonus scheme officers that, because a Bonus Scheme is in operation and that because running such a scheme dictates that regular meetings take place, there has been a marked improvement in industrial relations.

From a national standpoint this certainly cannot be true. We must all recall the recent dispute between EEPTU/AEU and the DHSS, following the breakdown of pay negotiations, of which bonus payments were very much a key factor. Secondly, from a local standpoint, bonus payments can be a source of grievance and frustration for some Works Departments' Staff, where they feel they have been underpaid and there is a time-consuming examination in an attempt to resolve the situation. Certainly there has been an increase in consultation, but as to whether this has led to better industrial relations is a matter for individual opinion.

Surely, the key to good industrial relations must lie fairly and squarely with Works Managers. It is they who must design a format for the works organisation as a whole, and built into that format must be a local system to take into account the working relationships — rather than looking to the Bonus Scheme for all the answers.

Increased Staff Utilisation

I made the point earlier that following the introduction of Estmancode, it was possible to have a clearer picture of overall expenditure and as a result (in many cases) staffing levels were being adjusted. Managers were able to assess staffing requirements, and at the same time, deploy the various trades at their disposal according to their level of skill and the needs of the service.

When bonus schemes were introduced, this balance was upset because, for viability, it had to be shown on paper that tradestaff had been reduced in number. Some Works Officers cannot help being a little sceptical when they see that in some instances, by transferring one competent craftsman per skill to the post of Planner Estimator, the staff left in post matched up to the staffing level requirement recommended by the initial study. If this is the case then it must throw some doubt on the credibility of Senior Works Management. On the other hand, perhaps works planning departments were set up regardless of local requirement, thus leaving some organisations to function with skeleton staffs.

What is essential of course, is that managers must continually question the merits of such systems, particularly in relation to the quality of work and excessive paper work.

K. P. Doyle,
Senior Engineer, Cheshire.

The author of this paper is District Engineer, Central Middlesex Hospital, Brent Health District, and his paper was a commended entry in the Hospital Energy Conservation Year Competition. The article was written in 1980.

Installation of a Honeywell Delta 1000 Building Services Management System

Savings through central control

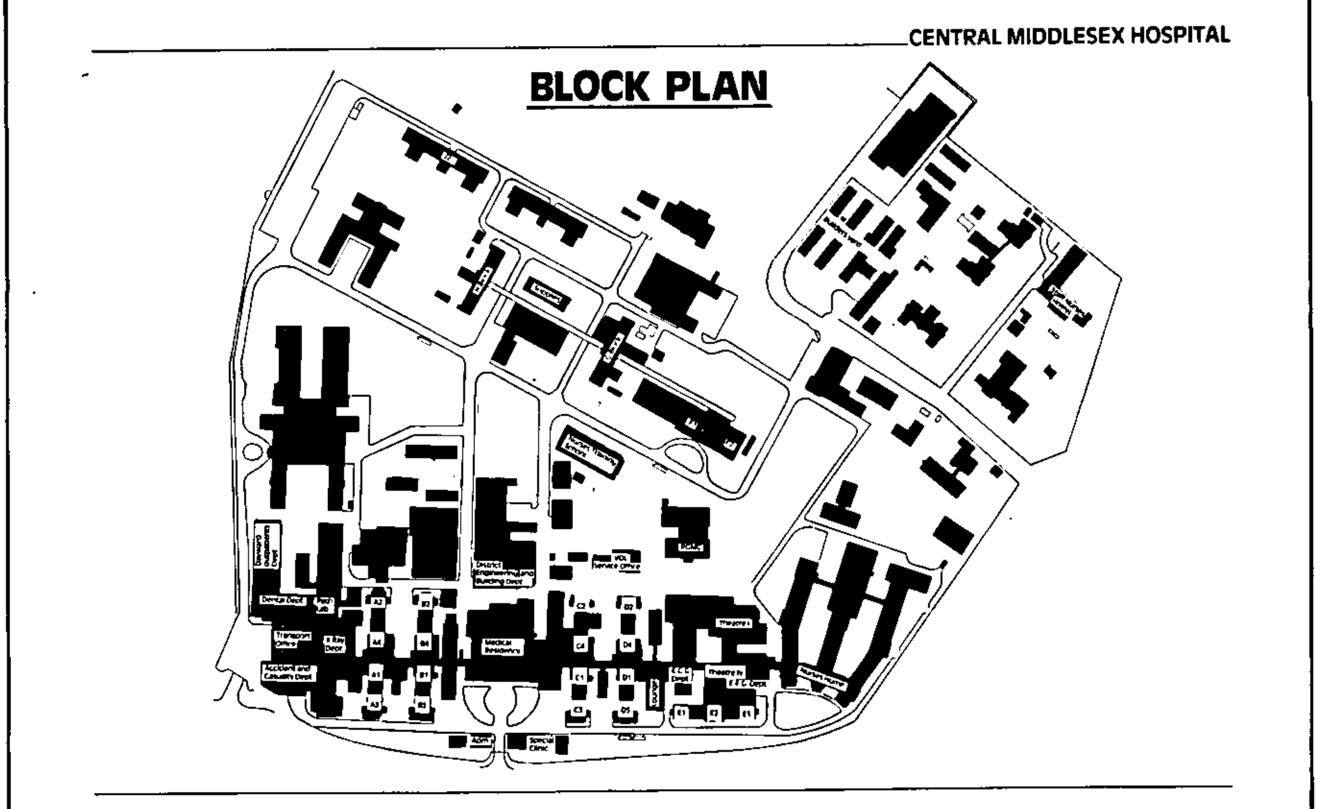
M WOODROOFE Tech(CEI) MIHospE

Introduction

Some two and a half years ago, it was planned to install a form of Building Services Management System, not primarily because of energy savings, but to manage effectively and efficiently plant and services from a central control.

Central Middlesex Hospital is a 732-bed, mainly acute, District General Hospital (*Figure 1*) with the majority of its buildings constructed at the turn of the century. The estate consists of a collection of single- and multi-storey blocks spread across a site of approximately 63 acres. The engineering plant and services were designed and installed many years ago, when fuel was plentiful and relatively low in cost.

Figure 1: Plan of Central Middlesex Hospital.



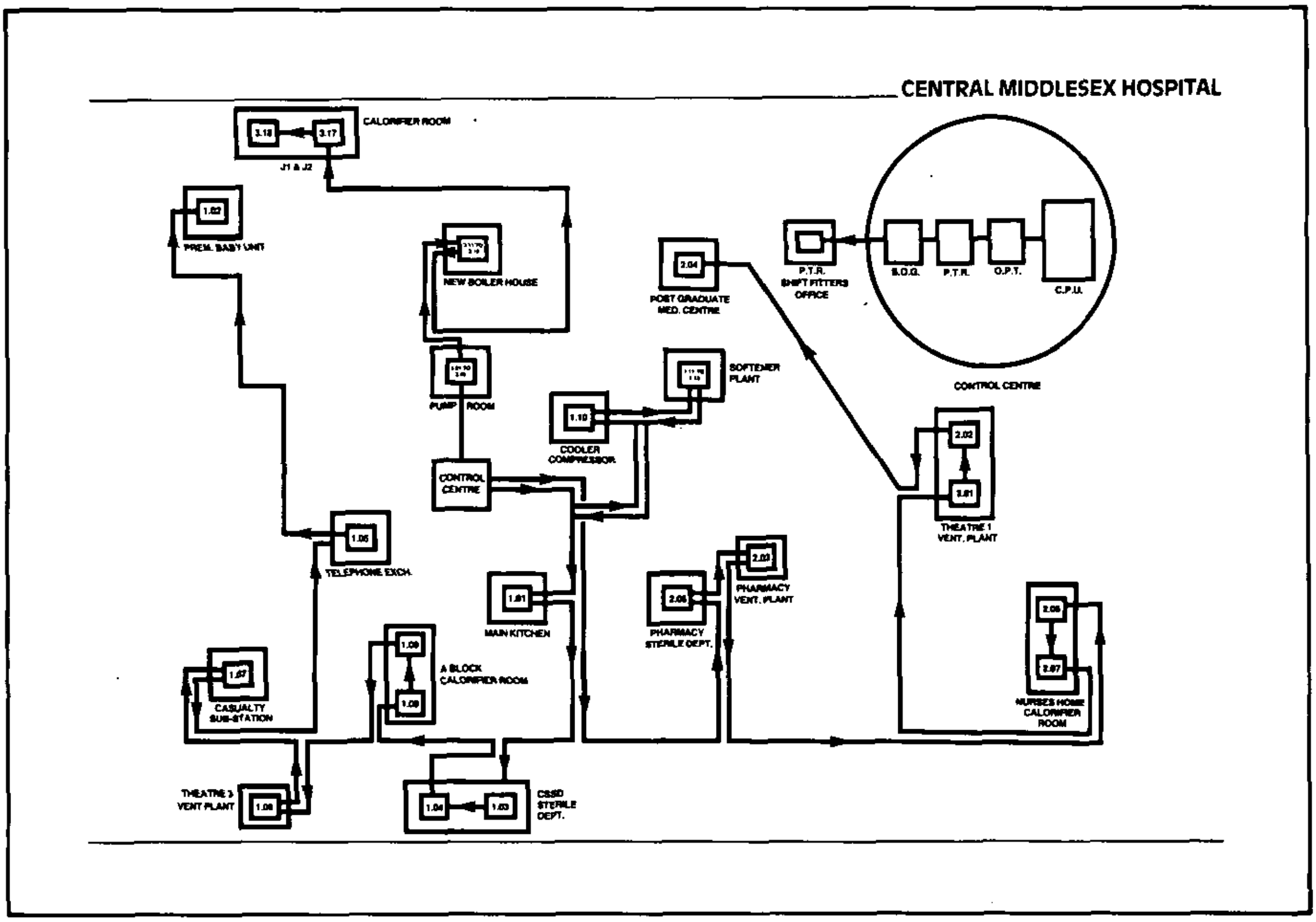


Figure 2: Control System diagram.

The Hospital is situated within an area where labour is very difficult to recruit, and because of the age of the plant and services, the day-to-day maintenance problems associated with other activities can present the Engineering Manager with an impossible task.

Fortunately, consistent with the decision to install a management system, capital development work was taking place which involved the upgrading of many Calorifier Rooms, Boiler Houses and Plant Rooms. As a result, it was possible to supply and install the necessary pressure switches, sensors, DGPs etc, ready for connection to the Delta.

The installation of the Delta System started in April 1978, and to-date with an expenditure of £80,000 it now controls approximately 70% of the complex.

The areas covered up to now are Main Boiler House, Main Pumping and Calorifier plant Rooms, Theatre Ventilation, Main Kitchen, Main Pharmacy, C.S.S.D., various other Calorifiers Rooms, Main Ducts, Monitoring Maximum Demand, Laundry and the Nurses Home.

Figure 2 gives information of the channels and the areas connected to the system. Some of the areas through central control have given very good energy savings: Manpower savings have been achieved through the deletion of three posts i.e. two shift fitters and one plant attendant.

There was a rotating shift of four fitters on duty at C.M.H. The remaining two shift fitters are now on an alternating shift covering nights and weekends only. This is still essential as within the Brent Health District

Figure 3: Typical list of points monitored and controlled on a boiler.

CH/GP/PT	Plant/Equipment	Function
3.11.01	Burner	On/Off/St/Alarm
3.11.02	Blower	Status
3.11.03	Burner Hi Fire/Lo Fire	On/Off/St/Alarm
3.11.04	Feed Pump	,,
3.11.05	Boiler Lock Out	Reset/Nm/Al
3.11.06	First Lo Water Alarm	Nm/Al
3.11.07	Second Lo Water Alarm	,,
3.11.08	High Water Alarm	,,
3.11.09	Oil Control Valve	Status
3.11.10	Boiler Selector Switch	Status
3.11.11	Steam Pressure	Pressure indication
3.11.12	Flue Gas CO_2	CO_2 Indication
3.11.13	Flue Gas Temperature	Temp Indication
3.11.14	Feed Water Flow	Flow Rate
3.11.15	Oil Flow	Flow Rate
3.11.16	Oil Return	Flow Rate

there is no 'On Call' system utilising tradesmen; Engineers cover this aspect, and therefore it is necessary to provide a station for analysing the calls and contacting those responsible.

Although not the first area to be connected to the computer, the Main Boiler House was modified to incorporate boiler sequencing and monitoring of combustion conditions. This boiler plant was built and commissioned in May 1979 and included 4 boilers fired with 3500 sec oil with a total installed load of 43000 LBS/hour from and at 212°F.

The points monitored and controlled by Delta are given in *Figures 3 and 4.*

Auxiliary Services		
CH/GP/PT	**Plant Equipment**	**Controlled**
3.15.01	Standby Water Feed Pump (1)	St/Stop/Status/Al
3.15.02	Standby Water Feed Pump (2)	,,
3.15.03	Standby Water Feed Pump (3)	,,
3.15.04	Heating & Pumping Set (1)	,,
3.15.05	Heating & Pumping Set (2)	,,
3.15.06	Oil Flow Pressure	Nm/Al
3.15.07	Oil Return Pressure	Nm/Al
3.15.08	Oil Flow Temp.	Temp. Check
3.15.09	Oil Return Temp.	Temp. Check
3.15.10	Oil Temp. before Heating & Pump Set	Temp. Check
3.15.11	Oil Tank No. (1)	Oil Qty 00 0400
3.15.12	Oil Tank No. (2)	Oil Qty 00 0400
3.15.13	Feed Water Tank No. (1)	Water Qty 00 0801
3.15.14	Feed Water Tank No. (2)	Water Qty 00 0801
3.15.15	Feed Water Tank No. (3)	Water Quantity
3.15.16	Feed Water Temp.	Temp. Check
3.15.17	Chemical Dosing System	St/Stop/St/Alarm
3.15.18	Main Steam Flow	Flow Rate
3.15.19	Low Gas Pressure	Nm/Al

Figure 4: Typical list of points monitored and controlled in the steam generating Boiler House.

Main Steam Generating Boiler House

The Boiler House was connected to the System in January 1980 and became operational on 1st February 1980. The fuel savings achieved in the Boiler House may be divided into the following categories:

Savings due to close monitoring of the boiler efficiency; savings due to sequence operation of the boilers.

Close Monitoring of Boiler Efficiency

Delta System closely monitors the thermal combustion efficiency of the boilers, and alarms if this efficiency falls below a certain predetermined value — which is set at 83%. If the efficiency falls below this level, immediate steps are taken to correct it.

Though the saving achieved by this technique is difficult to quantify, it is felt that the boiler efficiency has been improved by about 3% since commencement of close monitoring by the system.

Sequence Operation of the Boilers

Before the boilers were controlled by the Delta System in the sequential manner, two large boilers were on-line all the time during the winter months. Since sequencing the boilers, only the large boiler has been on-line between 10.00pm and 5.00am, and during the week-ends.

It should be noted that steam to the laundry is shut-off during this period, and that 80% of the time during the winter months (February, March and April), the small boiler and the one large boiler are quite capable of coping with the total hospital steam load.

Therefore, when looking at the savings achieved during the year ending 30 June 1980, it was assumed that if the Boiler House was not controlled by the Delta System, two large boilers would have been on-line all the time from 1 October 1979 to 31 May 1980. However, since the control of boilers by Delta commenced on 1 February 1980, the savings only reflected the four months commencing 1 February 1980.

Total hours run by three large boilers, 1 February — 31 May 1980: 2,951

Hours run-time saved by the large boiler: 5,808 - 2,951 = 2,857

Hours run-time by the small boiler during this period: 1,002

Electrical Energy

Electric load of each large boiler: 20 kw to 16 kw
Electrical load of small boiler: 13 kw to 10 kw
Electrical energy saved: (2857 x 18) - (1002 x 11) = 40404 kwh
Projected yearly savings: 80808 kwh

Radiation Loss

Radiation loss from each boiler is approximately 2% of the full load output of the boiler.

The radiation loss from a large boiler: 5600 x .02 kg = 112 kg

Radiation loss from the small boiler: 3000 x .02 kg = 60 kg

It is assumed that when a boiler is kept hot without being on-line the radiation loss is only 1/2% if its full load capacity.

The saving in radiation loss: 2857 x 112 x .75 -1002 x 60 = 239988 - 60120 = 180 tonnes

The projected yearly savings: 180 x 2.5 = 450 tonnes

Financial Savings (Present Day Costs)

Steam:	£1,260.00
Electricity:	£1,090.90
Total:	£2,350.90

Projected annual savings

Steam:	£3,150.00
Electricity:	£2,424.00
Total:	£5,574.00

N.B. Delta monitors Thermal combustion efficiency. Improvement in efficiency performance approximately 3%.

Main Pump Room

The Main Pump Room was the first area to be connected to the Delta and the plant consists of the following:

Low-Pressure Hot Water Heating System

This provides heating to about 50% of the hospital, and is controlled by a local weather-sensitive compensator. The Delta System controls the plant by load cycling.

Operational hours between 1 October 1979 and 30 April 1980: 4,563

Hours saved: 5,112 - 4,563 = 549 hours

Electrical Energy

Capacity of the pump:	20 kwh
Energy saved:	10,980 kwh

Steam Energy

Average steam consumption:	400 kg/hr
Savings in steam consumption:	400 x 549 = 220 tonnes

Domestic Hot Water System

This provides water to 97% of the hospital and is generated by two L.P. storage calorifiers. The steam to the calorifiers is controlled by a simple proportional control system, driving two modulating valves fitted onto the steam supply line. The Delta System monitors the DHW systems in the following manner:

It monitors the temperature continuously. In the event of temperature exceeding the high limit, the system immediately alarms and drives the control valve to shut position, thus over-riding the local control;
it shuts off the steam to the calorifiers daily between 11.30 pm and 5.00 am. The system also ensures that the temperature does not fall below a certain limit during this period.

Since this method of control was started on 1 October, 1979, the saving only reflects 9 months of the year, commencing 1 July, 1979. Since the steam consumption was measured and monitored by the System, it is possible to make a direct comparison between last year and this year.

Steam consumption during the period 1 July 1978 to 30 June 1979:	8,973 tonnes
Steam consumption during the period 1 July 1979 to 30 June 1980:	6,719 tonnes
Savings achieved in steam consumption:	2,254 tonnes
Projected savings for the year:	2,504 tonnes

Financial Savings

L.P.H.W. — Steam saved:	220 tonnes
Savings:	£1400
D.H.W. Steam savings:	2254 tonnes
Savings:	£15,778
Total:	£17,178
Projected yearly savings at present day cost:	£17,528

Laundry

The Delta System was connected to carry out the following tasks on the services supplying the laundry:

To open the steam service to the laundry when in use;
to automatically operate the laundry air compressors.

Before the System was assigned to carry out these tasks, shift fitters were instructed to carry out these duties. However, in practice these tasks were neglected.

Steam Supply to the Laundry

To calculate the savings achieved in the usage of steam consumption, two consecutive years are analysed.

1 July 1978 to 30 June 1979:	7205 tonnes
1 July 1979 to 30 June 1980:	6160 tonnes
Reduction in steam usage:	1045 tonnes
Financial savings:	£7,315

It is worth noting that there has been a large reduction in steam usage in spite of the fact that actual laundry output has increased by 18½%.

Main Kitchen Ventilation Plant

This plant is monitored and controlled by the Delta System and serves the main kitchen. The plant is switched off at night when the kitchen is not in use.

Furthermore, when the kitchen is in use the operation of the supply fan is controlled by the System depending on the condition of the inside temperature.

Operational hours during the period I July 1979 to 30 June 1980.

Main supply fan:	3512 hours
Extract fans:	5350 hours

Hours saved due to intermittent operation.

Main supply fan:	8,760 - 3,512 = 5,248 hours
Extract fans:	8,760 - 5,350 = 3,410 hours

Electrical

Electrical capacity of the plant:

Main supply fan:	4.30 k.w.
Extract fan:	2.80 k.w.
Electrical energy saved:	4.30 x 5248 + 2.80 x 3410 = 22,566 + 9,548 = 32,114 k.w.h.
Financial savings:	£867.07

Steam

Since no steam or any other form of heating is used in the ventilation system there are no other fuel savings.

Main Kitchen Food Trolleys

The Delta System switches off the power to all socket outlets used to the food trolleys in the main kitchen for about 17 hours a day. Previously the food trolleys were left switched on all the time apart from the time they were taken to the wards.

Though the trolleys can be thermostatically controlled it has been found by experiment that a normal trolley consumes power for 66% of the time it is plugged into a socket outlet.

Electrical Saving

Total load — 20 Food Trolleys: 20 kw
Hours the food trolleys were on 1 July 1979 to 30 June 1980: 2505
Hours saved: 8784 - 2505 = 6279
Electrical savings: ⅔ of 6279 x 20 = 83720 kwh
Financial savings: £2,260

Theatre I Air-conditioning Plant

This air-conditioning plant is monitored and controlled by the Delta System, which serves four operating theatres. The Dew Point Method of control, which is wasteful in terms of electrical energy, is used to control this plant.

The CPU of the System over-rides the local control system to shut-off the refrigeration plant during the night when the theatres are not in use, and during the day when the temperature and relative humidity is within the comfort limits.

The over-riding control was installed on 20 May 1980 and the readings taken for the periods 20 May 1979 — 20 July 1979 and 20 May 1980 — 20 July 1980 are given in *Figure 5.*

The quantity of electrical energy saved between 20 May 1980 to 20 July 1980 was 21,785 kwh. The predicted yearly saving is approximately 65,000 kwh and financial savings of £1,755.

Theatre III Air-conditioning Plant

This air-conditioning plant is monitored and controlled by the Delta System and serves two theatres in the accident and emergency department.

The plant is switched off at 9.00pm daily and started at 7.00am with adequate over-riding facilities.

Operation hours p.a. prior to Delta: 8,760
Actual operational hours from 1 July 1979 to 30 June 1980: 5,125
Hours saved due to intermittent operation: 3,635

Electrical

Electrical capacity of fans including chilled water pumps: 5.5 kw
Capacity of the chilled water unit: 20 kw
Electrical energy saved on fans: 19,992 kwh

Assuming the plant was not switched off in the night, the chiller would run 30% of the time for six months of the year.

Electrical energy saved on chiller unit: 0.3 x 20 x 3636 = 21,810 kwh
Total electrical energy saved: 41,802 kwh
Financial savings: £1,128.65

Steam

Operational hours between 1 October 1979 to 30 April 1980 prior to Delta: 5,112
Actual operational hours from 1 October 1979 to 30 April 1980: 3,131
Hours saved due to intermittent operation: 1,981
Average steam consumption per hour: 48 kg/hr
Savings in steam consumption: 95 tonnes
Financial savings: £665

Nurses' Home Calorifier Room

This low-pressure hot water heating calorifier room serves the Nurses' Home. It is controlled by a weather-sensitive compensator using flow and outside temperature sensors.

This building was connected to the Delta System during November 1979, and became operational on 1 December 1979. The Delta System controls the heating system by switching off the plant in the night, via an optimum start/stop program in the CPU.

Also, during the period of occupancy, it load-cycles the heating system.

Operational hours between 1 December 1979 and 30 April 1980: 2,366
Hours saved: 3,648 - 2,366 = 1,282 hours

Figure 5: Comparison of electrical consumption of compressors in Theatre I ventilation plant.

Hours Run					
Compressors	Capacity	20.5.79 to 20.7.79	20.5.80 to 20.7.80	Hours Saved	Electrical Energy Saved Two Months
No. 1	16.5 KW	792	672	120	1980
No. 2	16.5 KW	1001	455	546	9009
No. 3	20.0 KW	650(E)	254	396	8316
No. 4	20.0 KW	250(E)	126	124	2480
TOTAL:	73 KW			1186	21785

Electrical Energy

Pump capacity:	2.4 kw
Energy saved:	3,079 kwh
Financial savings:	£83.13

Steam

Average steam consumption:	180 kg/hr
Savings in steam consumption:	180 x 1283 = 231 tonnes
Financial savings:	£1,617

Summary of Fuel and Manpower Savings Achieved

The total fuel and manpower savings achieved are:

Savings of electrical energy:	264499 kwh
Cost of a unit of electricity:	0.027p
Savings:	£7141.00
Savings on steam:	4532 tonnes
Fuel costs of a tonne of steam:	£7.00
Savings:	£31,724.00
Summary of total savings:	£38,865.00
Manpower Savings:	£15,000.00
Total:	£53,865.00

Figure 6: Summary sheet of fuel savings — 'X' is the Actual Savings achieved during the year commencing 1 July 1979, up to 30 June 1980. 'Y' is the Projected Yearly Saving based on the actual savings.

	'X'		'Y'	
	KWH	Metric Tons	KWH	Metric Tons
Post-graduate Medical Centre	26361	136	26361	136
Theatre I Plant	21785	–	65000	—
Theatre III Plant	41802	95	41802	95
Pharmacy Plant	—	98	—	98
Main Kitchen Plant	32114	—	32114	—
J1 & J2 Calorifier Room	2643	130	3700	182
'A' Block Calorifier Room	1611	143	2820	250
Nurses Home Calorifier Room	3079	231	4310	324
Main Pump Room Heating	10980	220	60000	350
DHW	—	2254	—	2504
Main Boiler House	40404	180	80808	450
Laundry	—	14045	—	1050
Kitchen Food Trolleys	83720	—	83720	—
TOTAL:	264499	4532	400635	5439

The total projected yearly fuel saving is as follows:

Projected savings on electrical energy:	400,635 kwh
Cost of a unit of electricity:	0.030p
Therefore, financial saving:	£12,019.00
Projected savings on steam:	£5,439.00
Fuel cost of a tonne of steam:	£7.60
Savings:	£41,335.00
Manpower savings:	£20,000.00
Fuel savings:	£53,354.00
Total:	£73,354.00

* These figures include increase labour cost and further minor manpower savings, and details of these are given in *Figure 6.*

Degree Days

Finally, as matter of interest, Degree Days are recorded, via the Delta, on a daily basis. National Degree Days are published for the N.W. 10 area which are recorded at Heathrow.

Readings taken locally, plotted against the National figures, show a remarkable difference. These readings are given in *Figure 7.*

	September 78 to August 79		September 79 to August 80	
	Local	National	Local	National
September	—	—	31	61
October	67(E)	105	68	106
November	154	186	185	250
December	265	319	225	279
January	379	461	331	390
February	346	375	205	263
March	261	307	252	304
April	161	207	139	181
May	87	144	92	121
June	19	49	13	50
July	13	20	22	—
August	14	34	—	—

Figure 7: Degree Days Comparison Chart. These degree days are calculated to a base temperature of 15.5°C.

Conclusion

I would summarise by saying that this system was originally purchased in order to control and monitor the Building Services on a hospital site. However, as a result of its installation and by experiment, we have found that the pay-back on capital expenditure through energy savings and manpower is 1.1 years.

In my view, this exercise has proved that in future every large user of energy should consider some form of computerised Central Management Control — not only to monitor the performance of his plant and equipment, but to conserve the nation's dwindling supply of energy.

The author of this paper is a retired industrial engineer who has acted in an advisory capacity on electrical safety.

Unauthorised Tampering with Hospital Equipment

GEOFFREY MARSHALL CEng FIEE

The majority of acts of interference with hospital equipment occur without any serious malicious intent. Nevertheless, they can cause trouble far beyond what was originally anticipated, and this is especially so in the case of electrical equipment.

These acts do not, as a rule, involve personal gain, nor revenge for some fancied grievance, but are committed out of sheer boredom and a desire to create some disturbance. However, they can play havoc for the staff intent on carrying out routine maintenance schedules, and attending to any normal faults that might arise.

Fiddling with hospital equipment can be carried out by delivery boys, office staff or messengers employed by the hospital; or by young members of the public attending as out-patients or visitors. A certain amount of waiting is unavoidable and young people, after the initial visit has been made and the novelty of the building has worn off, become bored and look around to see how they can occupy their time.

In one hospital corridor, a very bored young messenger noticed that the lid of a fuse box on the wall was not properly closed, and decided to do a little meddling. On his next visit he came prepared, and after withdrawing the normal fuses he substituted meccano bars! Such an act of folly is hard to understand. In all probability this situation would not be discovered until a fault in the lighting circuits suddenly developed. As the system would no longer be properly protected, a dangerous condition would be set up. It would be very likely that the young man would not be on hand to observe the consequences when the trouble did appear. In point of fact this instance of foolish fiddling was spotted during routine maintenance tests a few days later.

Some young visitors to the hospital, while filling in time in the waiting room, took a delight in removing bulbs from their light fitting sockets, and inserting coins before replacing them; thereby ensuring that as soon as the light switch was operated, the fuses would blow. They would consider this as a form of sport, and look back with relish to see the trouble their actions caused. These same boys however would consider it quite dishonest to remove a lamp from its socket to take home, and would never dream of such action themselves.

Telephone systems in hospitals are particularly liable to suffer from meddlers with time on their hands, and a distorted sense of humour. If they can gain access to an apparatus case, it will take them only a second to slip a scrap of paper between two contacts on a selector unit. Chaos can easily result, giving the unfortunate maintenance man a real problem, until the trouble is traced.

The unscrewing of the top of a telephone hand set receiver, and removing the vibrating disc, can be carried out in a matter of a few seconds, making the unit useless — but such action can cause confusion which is often the aim.

Petty theft takes place so often in hospitals, not for any personal gain, but just because it is something to do. A youth will delight in removing small screws holding down inspection lids and junction boxes on conduit runs, probably using his pen knife for the purpose, and will pocket them with no real idea why he has done it.

Butterfly nuts, that sometimes fitted to fuse boxes to enable technical staff to open them quickly in an emergency, act like a magnet to those with a craze for petty pilfering.

In one hospital, considerable inconvenience and worry was caused to the technical staff by malicious reporting of faults that did not exist. An intermittent electrical fault is one of the most difficult to discover for technical staff, as for most of the time they are testing equipment that is perfectly sound. Complaints were made by a member of the public that she had received shocks when operating an automatic coffee dispenser situated in the corridor adjacent to a waiting room. Considerable valuable time was wasted before the conclusion was reached that the alleged fault was non-existent.

What steps then can hospital authorities take to prevent these incidents, which are so petty in themselves, and which can so easily escalate to major proportions that were never for a moment envisaged by those who were responsible for the original meddling?

Careful recording of all malicious acts, and keeping the maintenance staff fully alert to such possibilities can do a lot to assist.

In areas where the general public circulate, such as waiting rooms, and passages, all items of electric control gear, fuse boxes, and distribution cases should be under lock and key. If this is not practicable, they should be re-positioned in safer areas, which are outside the reach of meddlers. In addition, visual inspection in these situations should be made more frequently than in other parts of the hospital.

If the fiddling and pilfering is, however, carried out by those employed in the hospital, the problem is easier to solve. Those responsible probably regard their action as a form of sport, rather than intending to inflict serious damage. They will be so pleased with their efforts that they will be inclined to talk about them. It is obvious that only by doing so will they get maximum pleasure.

In addition, if the meddler on the staff is unsuspected, it is practically certain that he will be encouraged to repeat such tomfoolery in due course, leading to earlier detection.

The author is the Managing Director of Flameless Furnaces Limited and he gave this paper to the International Environment and Safety Conference in September 1980.

Circulating Fluid Bed Combustion

Energy from Waste Materials and Coal

P H RAVENHILL BSc MIChemE MInstE

Introduction

These days, we are daily reminded of the energy crisis which the world is said to have. This crisis takes different aspects, depending on the continent under consideration and the state of the local economy.

In the UK, we may think we have been fortunate in that North Sea Oil will provide self-sufficiency by 1981, due to the recent increase in energy prices. However, this has not protected us from the ravages of the price increases. This is mainly because of our high reliance on oil as the major source of energy. *(Figure 1).*

Figure 1: UK energy sources 1979

Oil	39%
Coal	36%
Gas	20.5%
Nuclear/Hydro	4.5%

In energy terms, the annual tonnage of waste materials from Industry in the UK is equal to 7 million tonnes of coal. Local Authorities collect domestic refuse, which after processing, has a potential energy yield of about 4 million tonnes of coal equivalent. In addition, over the next 10 years, the annual consumption of coal will probably rise by 15 million tonnes.

Sources of Energy

Waste Materials

Energy-containing waste materials differ generally from prime fuels in three ways:

A high momentary variability in energy content, rate of burning and ease of ignition;

a greater tendency to make smoke and cinders;

a higher content of incombustibles, principally ash and water.

The energy content of waste materials cannot always be recovered. For example, if a waste has a high water content, the energy released by burning goes to vaporise the water, which appears as part of the combustion gases. As such it can only be recovered by cooling the exhaust gases to uselessly low temperatures.

Also, whilst a waste material may have a net recoverable amount of energy, supplementary prime fuel may be needed to burn the waste cleanly. This is because the energy content of waste can be insufficient to attain an adequately high combustion temperature. Again, a high water content is the usual reason for this behaviour.

Generally speaking, if the water content of a waste material is such as to reduce its gross calorific value below 3 MJ/kg, it will have no recoverable energy. Similarly, a waste will require supplementary prime fuel for clean combustion if its gross calorific value is less than 4 MJ/kg. Once this factor is appreciated, housekeeping measures can often be put into effect to improve the recoverable energy content of waste. Some examples of typical materials are given in *Figure 2.*

Material	Gross Calorific Value (MJ/kg)	Fraction Recoverable Energy	Energy Content Ratio	
			Oil	Coal
Paper	16	0.85	0.38	0.57
Plastic	35	0.80	0.83	1.25
Solvents and Adhesives	28	0.7 - 0.8	0.67	1.00
Wood	16	0.80	0.38	0.57
Coal Tailings	11	0.5 - 0.7	0.26	0.39
Vegetable Waste	3	0.5 - 0.6	0.07	0.11
City Refuse	7	0.70	0.17	0.25
Coal	28	0.80	0.67	1.00

Figure 2: Energy characteristics of typical waste materials.

The potential for extracting energy from such waste materials depends, in addition to the water content factor described above, on ash content, consistency or lump size, and chemical composition.

A high ash or inert content poses problems for ignition and maintenance of adequate combustion temperatures. Sticky waste may need to be treated with powders or to be partly frozen. Large lump size may mean size reduction to achieve good burning. Metallic items, hazardous materials and corrosive salts may cause maintenance problems in burning equipment.

Economic feasibility of waste usage also depends on the availability of waste where energy is needed, because wastes can be bulky in relation to their energy content. In industrial plant there is a natural coincidence between waste production and energy need.

Coal

The other energy source that can be burnt advantageously in the fluid bed is coal. The circulating fluid bed offers a number of advantages over alternative coal firing methods:

A wide range of coal fuels can be burnt in the boiler, which includes low calorific value, high ash and highly caking varieties.

Good quality ash produced with low carbon content and no danger of clinkering.

Continuous automatic ashing-out facilities.

Small physical size for boilers in the 10,000 lbs/hr to 20,000 lbs/hr size range compared to mechanical grate firing.

Good turn-down and control of heat output.

Technological Basis

Complete, clean combustion requires that a burnable material be given an adequately high temperature/time exposure to oxygen. Generally, a higher temperature permits the use of a shorter exposure time and vice versa, subject to a minimum temperature threshold below which ignition does not occur.

Also, in the process of burning the mechanical structure of materials weakens and melts, or disintegrates giving rise to small particles and droplets which leave the burning zone before being completely consumed. These unburnt fragments end up as smoke and cinders or in the residual ash, and represent potential pollution and a significant loss of energy.

In traditional furnaces, materials are exposed to a peaked temperature profile, and a large furnace volume is required to give sufficient time for burn-out. Cyclone burners and a high level of turbulence can be used to partly mitigate this effect.

Combustible materials, particularly those of small or non-uniform size, and those that melt before burning, give trouble, because combustion air flow follows preferred paths, thereby by-passing sections of the firebed. Certain types of grate can be used to mitigate these effects, but grates are troublesome because moving parts are needed in regions of high temperature.

The Fluidised Bed

The fluidised bed is a technology developed over the past 10 years, in which burning takes place within a hot bed of sand kept turbulent by the passage of hot combustion gases. The turbulence keeps temperatures and gas flows uniform, and complete combustion is achieved at the moderate temperature of 800–850°C.

Burning particles are supported and retained by the sand, and all combustibles are retained in the bed for longer and at higher average temperatures than in a conventional furnace of the same volume. The heat storage capacity of the sand smoothes any momentary variability in the energy content of materials.

These features make the fluidised bed a compact, controllable and efficient means of extracting energy from a wide variety of combustible materials. Its inherent attributes result in a lower capital cost furnace; reduced maintenance through absence of moving parts and lower operating temperatures; high heat extraction rates by tubes immersed in the bed; and the flexibility to burn a wide range of combustibles in a single furnace.

The basic principle is that a granular inert substance, such as sand or ash, lies in a vessel on a perforated floor through which air is blown. As the air emerges, it bubbles through the sand which is suspended in a turbulent mass that behaves like a boiling liquid. This is the fluidised state, and as combustible material is fed into an initially heated bed, it burns in the turbulent sand, releasing heat and maintaining temperature.

The turbulent sand causes rapid movement, particularly upwards and downwards, thus ensuring even mixing of incoming combustible material and the air in which it will burn. Sideways mixing is much slower, and limits burning capacity in other than small bed area furnaces.

Heat is released in an even pattern and is absorbed by the combustion gases and turbulent sand, keeping the whole of the bed at an even temperature. Under these conditions, a bed temperature of 800–850°C achieves complete combustion because materials are exposed to a higher average temperature and a uniform airflow for appreciably longer than in a conventional furnace — where much higher temperatures are needed to ensure efficient combustion. If heat extraction surfaces are immersed in the bed, the moving sand comes into rapid and intimate contact with these, and high heat transfer rates result.

Moderate temperatures in the bed retain volatile salts, which would otherwise escape to be deposited and cause corrosion in the exhaust system. Significant quantities of particulate material are blown from the bed under normal operating conditions, but these particles are clean and not sticky and do not foul heat recovery equipment in the exhaust gas system.

Circulating Fluidised Bed

The circulating fluidised bed is a variant of the principles above, in which two overall circulation patterns are imposed on the mixing circulation which exists in the fluidised state. These patterns are induced by the use of deflectors and partition walls, and by using a non-symmetrical airflow pattern across an angled floor to the bed. *(See Figure 3).*

This gives four advantages which are additional to those of the non-circulating fluidised bed, and also overcomes its two inherent disadvantages — poor sideways mixing and particle carry-over.

Firstly, entering feed material is spread evenly over a large bed area from a single feed point. Secondly, entering material is buried under downflowing sand to suppress dust and cinder formation. Thirdly, particles carried from the bed are thrown to the wall in the downflowing un-fluidised sand region and returned to the bed. Fourthly, ash is removed selectively, taking only a small proportion of bed sand with it.

In the circulating variant of the fluidised bed, overbed and immersed baffles are used in conjunction with sloping floors and an assymetric air flow to induce overall circulations and maintain a number of zones of different fluidisation in a single furnace vessel.

An overbed baffle is fixed over the deep end of the combustion zone to provide a deflector plate, against

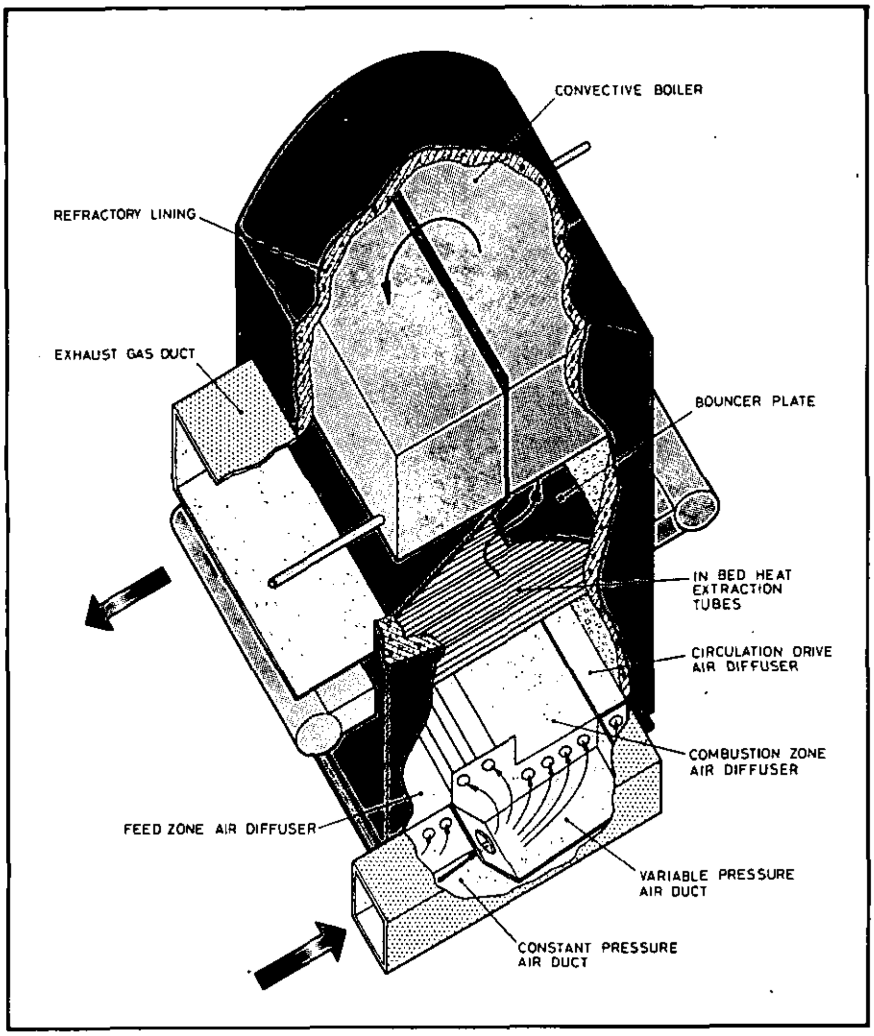


Figure 3: Size 1 Combustor: Integral convective unit.

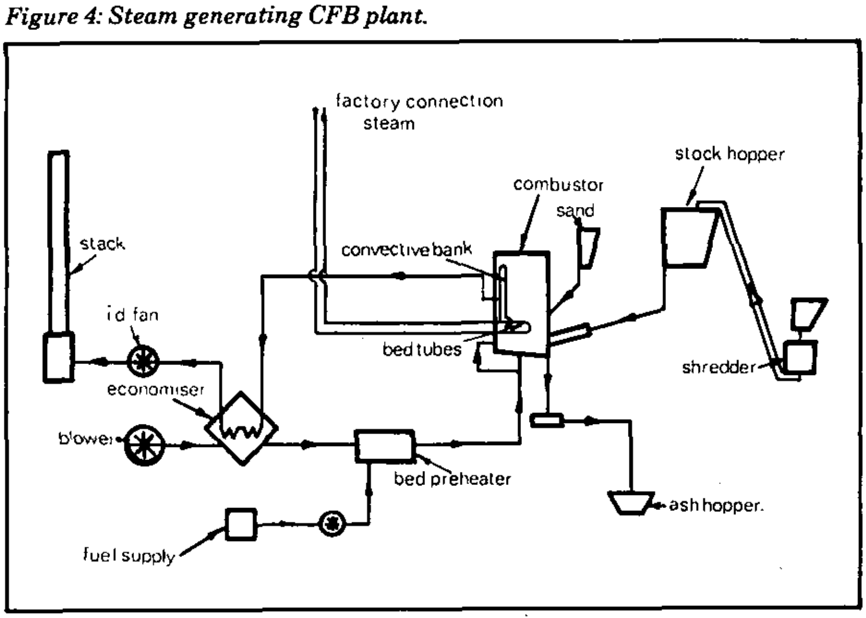
which sand is thrown vertically from the bed and then deflected horizontally across to drop into the shallow end and the adjacent feed zone. This effect combined with an assymetric air flow, greatest at the deep end and smallest at the shallow end, induces the combustion zone/feed zone circulation pattern.

Historical Development

The circulating fluidised bed process for recovering energy by burning wastes and low grade fuels was conceived by a UK consulting engineer, Mr Arnold Pearce, and his associates in the early 1960s. At that time there was no economic justification for its development.

With the increasing cost of energy and waste disposal, and the increasing anxiety over availability of energy supplies and waste disposal facilities, laboratory development work was started in the early 70s culminating in the construction of a pilot plant on the M.P.A.B. site in Brisbane during 1977–78.

Figure 4: Steam generating CFB plant.



This plant provided the essential proof that the process could work on a commercial-size plant, and running trials were completed on a variety of wastes and low grade fuels during 1978–79. The way was then open for the preparation of full commercial designs and the proof of economic viability. Active commercial exploration of the process was begun in the autumn of 1979.

C.F.B. Process and Energy Recovery from Wastes

The circulating fluidised bed process is particularly suited to burning low-grade fuel materials. Selective ash separation (as distinct from the conventional bed, where ash is removed by an offtake of the average bed inventory of 98% sand, 2% ash) ensures that ash disposal volume is minimised, and disturbance of the bed heat balance is negligible — even when a fuel material has a high ash content.

The separate feed zone ensures that the high bulk density structure of low-grade fuels is disintegrated, before feeding to the combustion zone. This prevents non-uniform fluidisation and combustion air distribution, which make the bed vulnerable to clinkering.

A complete flowsheet comprises material feeding, energy production and effluent disposal sections. In the example shown in *Figure 4*, a steam generating plant burning waste paper is described.

The material feeding section would typically include an air-handling train, comprising: air blower; an in line prime fuel; fired air heater for start-up; a waste-handling train, comprising reception and stockholding hoppers with conveyors; size reduction shredders or granulators; a screw feeder system to the fluidised bed furnace; and a sand hopper with loading gear and outlet to the furnace.

The energy production section would typically include steam generating coils in the bed, a convective boiler to recover heat from the furnace exhaust gases, steam and water drums, a superheater and water treatment plant if appropriate and the combustor itself.

The effluent section would typically include an ash disposal train comprising a screw feeder and disposal hopper; and an exhaust gas disposal train comprising a stack with connection to the convective boiler.

The C.F.B. process is controlled in a similar manner to a normal boiler by an air/fuel ratio system, in conjunction with a heat demand system controlled by steam pressure. An additional very rapid response in output can be obtained by by-passing the convective boiler. *Figure 5* gives some examples of plant recently quoted to customers.

Combustibles are propelled by the screw feeder into the feed zone under a hot descending unfluidised bed of sand, which raises materials to bed temperature and drives off volatiles deep under the surface. The combustible/sand mixture floods into the combustion zone at the high end of its sloping floor, and quickly spreads over the whole bed area by the combined action of its own speed, the sloping floor (which acts as an air-slide), and the mixing patterns in the combustion zone.

The combustion zone is intensely fluidised and well mixed by air entering, in part through the distributor that forms the zone floor, and partly entering from below through slots between the distributor sections. The preheated combustible and its content of volatiles instantly ignites and burns in this zone, which contains an immersed heat extraction tube bundle inserted from the side.

Sand and ash from the combustion zone drain through an unfluidised downflow zone continuously into the ash separation zone beneath, which is gently fluidised to promote segregation. The larger ash particles fall to the bottom and collect in an ash-rich layer which leaves by the ash duct; whilst the remaining sand, with the lighter unburnt combustibles in suspension, is lifted in the strongly fluidised upflow zones to drop over weirs into the combustion zone.

Figure 5: Examples of circulating fluidised bed plants.

Material	Output Medium	Heat Output (kw)
Paper, adhesives	Heat transfer oil	1,760
Tyre waste	Steam	2,900
Wood offcuts	Heat transfer oil	1,000
Solvents	Steam	2,050
Mushroom compost	Steam	1,400
Municipal refuse	Superheated Steam	4,100
Laminates and resins	Hot water	1,200
Coal	Hot gases	2,000

Economics

The economic case for installing a waste energy producer is the trade-off between capital cost and the saving in prime fuel and waste disposal cost. Unlike a conventional boiler, a waste burning plant has a payback period, that is, it pays for itself over a short period.

The payback, on a simple return basis, ranges within the period of $1^1/_2$ to 4 years. However, savings on these plants continually increase with increasing energy costs. This means that the plants themselves become significant profit earners once the initial investment has been repaid.

The author of this paper is a member of the National Monitoring Committee for Engineering Incentive Schemes and of the Productivity and Technical Services Department of the Electrical, Electronic, Telecommunication & Plumbing Union.

Incentive Bonus Schemes for Works Departments

H M PETTY

Effective Works Departments

There are a number of ways of assessing the effectiveness of Works Departments, but two criteria cannot be denied if we apply cold logic to an analysis:

The maximum effective use of the labour force;

the rate at which that labour force works.

Associated with these two criteria is the more emotive consideration of providing an acceptable service. Unfortunately, criteria for 'acceptable service' are usually set according to past standards, type of hospital and the general management philosophy. Because we are dealing with largely subjective aspects in determining 'acceptable service', I do not intend venturing into discussion on this criterion.

Let it not be assumed that this is deliberately ignoring this important consideration of the maintenance work in hospitals, because that is not the case. The standard of service is something which is determined by influences outside Works Departments, but it is within the control of Works Departments to influence the first two criteria.

What must be said is that Works Departments, in general, have been very inefficient in the past.

This statement is not made without evidence, because I do not know of any Management Services Reports which have indicated otherwise. The performances of maintenance departments within reference periods frequently feature fifty or below. Where the services of consultants have been employed, they too report that savings are available from existing practices.

Personal Attitudes

These comments follow naturally from the preceding paragraph, and the first implication for readers will be that works department management have not been doing their job properly. That is distasteful to any person who has been genuinely trying to do his best, and it is quite understandable if feelings of resentment (amounting to opposition) are generated.

I am not yet aware of any serious challenge by PTB staff to reference period performance figures, although in many cases I have good cause to doubt their validity.

However, at this stage I want to consider a number of points contained in Hospital Engineering May, 1981: *'Works Incentive Schemes — Are they worth it?'* which deals with peoples' attitudes.

1. It is alleged that incentive schemes have added to industrial relations problems in the NHS. In my experience I have never encountered the introduction of an incentive scheme, in *any* industry, which did not involve some form of pressure on industrial relations. I must make the point that it is not the incentive which normally produces the problems, but the *changes in practice* which have to be introduced in order to improve the performance, and earns a bonus, which cause the problems.
2. *'PTB staff have a vested interest in the scheme . . .'* is considered as a disadvantage. In other industries, lack of commitment on the part of lower and middle management has proved to be a severe impediment to the successful introduction and operation of an incentive scheme. Let me say quite clearly that it is my opinion that the problem with the NHS scheme is: That PTB allowances are paid irrespective of whether the PTB staff perform their functions within the scheme or not.

Attitudes of individuals have an almost disproportionate affect on the successful application of incentive schemes. If people are not convinced that an incentive scheme is designed to improve the effectiveness of the department to which it is introduced, and that payments can only result as a measure of that improvement, then the wrong attitude is being adopted.

Does the NHS Need a 'National' Scheme?

The present National Financial Incentive Scheme was not the first excursion of the Health Service into the realm of improving efficiency in Maintenance Departments. Some parts of the Health Service had chosen to tread the path in the late 1960s, in keeping with the then current vogue in a number of other major industries. The political and economic climate at that time was suitable for adopting this policy. Surplus labour could be shed without any real hardship to those leaving the industry.

During the same period, it was also possible to introduce bonus schemes which increased earnings with minimal change of effort on the part of employees. One industry which suffered considerably from this type of scheme was Local Government (further comment will be made on this industry later), and the Health Service did not escape its fair share of these types of schemes.

But, as *D Macmillan et al* clearly demonstrate, significant changes have taken place in the Service since then. To identify all the changes is not necessary; we only need to consider the closer monitoring of expenditure and to ponder on the questions:

Why do some authorities pay 25% bonus, and others in excess of 50%?

Is the 50% bonus earned as a result of twice the effort being employed by those earning 25%?

One answer to these questions could be identical to the findings of the Chief Inspector of Audit in Local Government in 1979, a number of facts not quoted by *Messrs Macmillan, Watson and Wilson.* They found that there was substantial abuse of bonus schemes, arising from inadequate supervision and almost non-existent maintenance of schemes, amongst others. Their conclusion was that Local Authorities (who had the option of choosing from two types of bonus schemes) had almost universally chosen the performance-related type of scheme — but had not been competent in controlling what they had chosen; ergo. In hindsight, the ordinary productivity deal for changing work practices would have been less inflationary.

There was an obvious need in the early 70s to avoid the pitfalls which were apparent in Local Government Schemes even at that time. One requirement which could stop this, was a universal system of measurement — instead of a range of different work-measurement practices. To accompany this, one would also need standard rules of application, ensuring some measure of consistency in the results obtained from the application of work measurement. The aim of the DHSS Scheme was to obtain this objective.

The final point I must make here is that negotiations must involve the Trade Unions. We had experience (at the appropriate time) of the application of industry-based incentive schemes operating reasonably well in major industries concerned with maintenance and servicing — Electricity Supply, Gas, Water, British Rail, MOD (Navy, Army, and Air). So why not the Health Service? Fragmented applications in the Health Service were a source of embarassment to negotiators on both sides in this particular industry.

What Lies Ahead?

It is a fact that all incentive schemes must be dynamic. They must be continually adjusting to meet the needs of the industry in which they are employed. Various factors govern the rate at which change can take place. First and foremost is the rate at which an incentive scheme achieves the original objectives for which it was introduced.

Secondly, we must be aware of the rate of change of overall management philosophy affecting the scheme, and thirdly, cognisance must be taken of the ability of the scheme to motivate the workforce. Finally, the cost of operating the scheme must be weighed against the possibility of simplification and resultant losses of control.

The position in the Health Service at the start of 1981 was not sufficiently attractive for anyone to consider change. There were many obstructions preventing management from realising the maximum potential of the scheme. These occurred in pockets across the country and included:

- Local (non-national) schemes in operation;
- outdated, conditioned overtime arrangements still in existence;
- schemes unable to achieve 85% coverage and some below 60% coverage;
- financial constraints upon Works Departments;
- locations where no scheme existed.

From the Trade Union point of view, we could not countenance any change until the first, third and fifth of these items had been removed. We were also concerned that many of the schemes operating in hospitals on full scheme conditions were not being consistently operated, and false performances were being achieved.

In case it is assumed that some gigantic 'fiddle' was being played to obtain false performances, I had better indicate some of the malpractices I have discovered:

- Insufficient description of work content producing either 'guesstimation' by Planner Estimators, or extensive post evaluation;
- locations where all Work Order Cards *not* associated with PPM work were 'post-evaluated' to the elapsed time;
- Work Order Cards not 'grouped' for issue, but actually executed as grouped jobs with no amendment of allowances;
- incorrect application of allowances;
- trouble-shoot cards used to find out more detail relating to inadequate Work Requests;
- waiting-time cards not used, but other job cards made available to cover 'missing' time.

All these can grossly inflate both the coverage of measured work and the pay-performance figures.

To move into a new phase of development of the National Scheme requires considerable thought at an early stage on what controls are required, what management information derived from the scheme is essential, and in what format it can be presented for management control purposes. Such information cannot be assessed on a localised basis, as the Health Service required standardised reporting procedures for monitoring purposes.

Once control criteria have been established, it is this base which will determine how the application of work measurement data and practical control of work flow will develop. This can be an extended phase of statistical analysis and practical evaluation at the workplace. The trade unions will certainly want to be involved in this phase of the work, because they will resist any move which has the effect of reducing the payment potential of the existing scheme.

I applaud wholeheartedly one of the conclusions stated in the previously mentioned article; namely the need to minimise paperwork and excessive overheads. But I cannot accept that incentive schemes weaken works managements' financial control of the labour element in their budget, nor that individual managements can now develop their own particular innovations of a nationally devised and negotiated agreement. (A close examination of the 1981 revision to the local Authorities' Incentive Schemes will reveal restrictions which have been incorporated to prevent further local variations of their schemes. These have been incorporated as a direct result of the Chief Inspector of Audit's Report.)

In order to move successfully along the path of scheme simplification, considerable work is required if the transition is to be as painless as possible. The current wage agreement has precipitated a situation on the Health Service which otherwise might have been delayed a couple of years. As a result, the time is now ripe to consider how we will approach the years ahead — but before we do, we must get all works departments to the optimum level of effectiveness.

This, in turn, requires that no authority should delay the application of the National Scheme as it exists at the moment, and that all existing schemes should be thoroughly checked, and (if necessary) overhauled to ensure that there are no abuses developing. It will then be up to a body such as the Maintenance Advisory Panel (or a Working Party from that body) to begin charting the way ahead, with the objectives of maintaining and improving the effectiveness of Works Departments, and paying your craftsmen a high, consolidated rate of pay in return for their increased output and efficiency.

Product News

Energy Management System

The third largest general district hospital in the country, East Birmingham, will make savings of over £40,000 on this year's energy costs, following installation of energy management system which became operational in February. The Micropower 100 system automatically monitors and controls air and water temperatures in the majority of buildings on the 43 acre site at Bordesley Green.

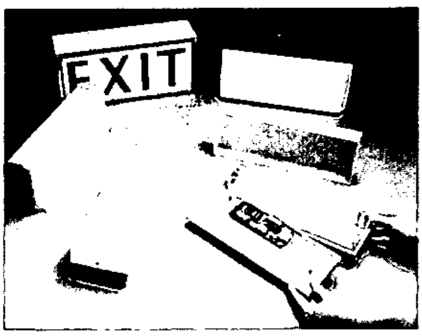
The microprocessor-based system has a central station with a visual display unit and teleprinter linked to an integral computer which controls a series of outstations installed in areas of high energy usage. The outstations are instructed to control the energy demand based on the computer program and readings from temperature sensors within the Hospital.

A self-adjusting optimum stop/start control automatically compensates to suit the conditions in the building, and ensures that the heating systems are switched on and off at exactly the right time to maintain temperatures within the buildings only during the occupation periods. The system is also fitted with Time of Day Control, which ensures equipment is switched off when it is no longer required. The annual fuel bill for the East Birmingham Hospital is £386,000, and it is estimated that the installation of the Transmitton system should create at least a ten per cent (£40,000) saving in 1981 with a pay-back period of 18 to 22 months.

For further information: Energy Control Division — Transmitton Limited. Smisby Road, Ashby-de-la-Zouch, Leicestershire, LE6 5UG. Tel: 05304 5941.

Fluorescent slave luminaires

Chloride Standby have introduced a new range of Keepalite 8-Watt fluorescent luminaires that will work equally well from an AC or a DC power supply. This dual input means that it is now possible to use fluorescent and tungsten, without the need for additional central DC supply equipment. Central battery systems using the new AC/DC luminaires will need only an appropriate voltage transformer to supply power for maintained operation.



Keepalite luminaires

The makers say that the much higher light output (2 or 3 times that from the same wattage tungsten lamp, increasing to 5 or 6 times at end of discharge when battery voltage is reduced) enables statutory illumination levels to be met with a smaller central battery installation.

Luminaires are available in 24, 50 or 110 Volt versions. The input circuitry is not polarity sensitive and solid state input sensing circuitry detects whether the input is AC or DC. All the electronic circuitry is carried on a hinge-out gear tray for easy installation and access during testing and maintenance. They are available with a variety of housings, including exit signs and weatherproof types.

Technical data available from: Chloride Standby Systems Ltd., William Street, Southampton, SO9 1XN. Tel: 0703 30611.

Chart Recorders

The M7000 SERIES galvanometer and M6000 SERIES Potentiometer recorders offer one, two or four channels dotting and one channel continuous trace respectively, each with the option of up to three event channels. Readout is on 100mm. wide pressure sensitive chart paper and models are available for panel mounting or portable use, either mains or battery powered.

A wide selection of plug-in range cards enable readings of DC volts/amps, and temperatures and special plug-in signal conditioners are available for the Model M6400 to measure temperature plus AC and DC power.

Chart speeds can be altered by means of clip-in, interchangeable gear boxes and, subject to the drive motor fitted, can provide chart speeds of 1/32 inch to 300 inches per hour; operation can be re-roll or tear-off.

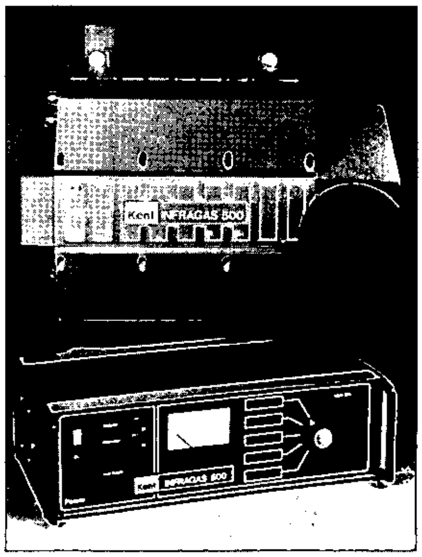
Housed in a charcoal grey case with a suede-like epoxy finish, the M6000 and M7000 Series are suitable for field or factory use and require no routine maintenance other than replacement.

Full details from: Channel Electronics (Sussex) Ltd, PO Box 58, Seaford BN25 3JB Sussex. Tel: Seaford (0323) 894961.

Multi-component Infra-red Gas Analyser

Industrial Measurements Ltd. announce the introduction of the first of a series of infra-red gas analysers, to their already comprehensive range of gas monitoring equipment.

The Infragas 500, is an industrial non-dispersive infra-red gas analyser which allows up to five components in a single gas stream to be continuously monitored either for independent analysis, or electronic compensation for their effect on a particular measurement. Use of the latter technique enables a more searching analysis of complex gas streams and can, in some applications, make possible measurements once difficult or unreliable due to cross-sensitivity effects.



Infragas 500 Analyser

In the past, the measurement of the component gases in a complex sample stream has usually involved more than one analyser, with a possibly complicated sampling system. GKEP believe the Infragas 500 to be unique in that its comparatively low cost, compact size and simple installation revolutionise the problems of multi-component gas stream analysis.

Information from: D.J. Baker, Kent Industrial Measurements Limited, GKEP Analytical Instruments, 4 Rosemary Lane Colhams Lane, Cambridge CB1 3LQ. Tel: 0223 49121.

Air Filter Cell

Universal Filters are pleased to announce a new panel to add to their wide range of high quality filter products — The Unipleat Air Filter Cell: a competitively priced high efficiency disposable panel with a high dust-holding capacity. The Unipleat will slot directly into systems previously using the less efficient glass or synthetic disposables, increasing the efficiency immediately.

Available in all standard sizes, the Unipleat can also be manufactured — subject to production limitations — to fit non-standard units, providing a welcome relief to those difficult jobs.

The media used is a synthetic Teklan fibre which is both non-hygroscopic and flame retardent, this is pleated with a wire mesh support and sealed within a heavy duty card frame which is tape sealed and incorporates a flow direction indicator.

For further information, please contact: Mr. D. Ellison, Sales Manager, Universal Filters Ltd., Unifil Works, Windmill Lane, Stratford, E15 1PG. Tel: 01-555 5128.

Treatment Tank

A new system for the treatment of internal walls of large diameter storage tanks has been developed by a specialist corrosion engineers and surface coating consultants.

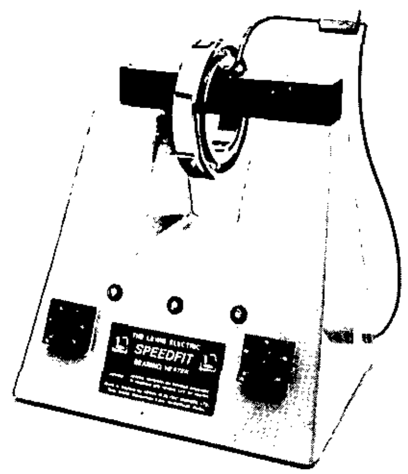
Once applied, the finished smooth coating measures just 750 microns thick and is designed to resist corrosive attacks and abrasion from chemicals, powders, minerals, acids and clays, as well as providing protection against contamination. As the highly finished surfaces do not allow product to stick to the walls, wastage is kept to a minimum and cleaning time and labour costs are considerably reduced.

More details from: R.M. Arnold & Co. Ltd., Harberton, Totnes, Devon, TQ9 7SJ. Telephone: 0803 865353.

Bearing Heater Saves Time and Money

A comprehensive range of bearing (or any other type of metal ring including pulleys, brake discs, etc.) heaters which heat by induction in just a few seconds, starts with portable 110 and 240V and 3KW models and goes up to permanently sited units of 415V with 8KW output.

The Unit heats through induction, the bearing being heated becoming part of the induction circuit. Heating time is a matter of seconds, and can be controlled to very precise parameters to enable exact tolerances when fitting the bearing to the shaft, and accurate positioning prior to the bearing shrinking on to the shaft.



Portable bearing heater

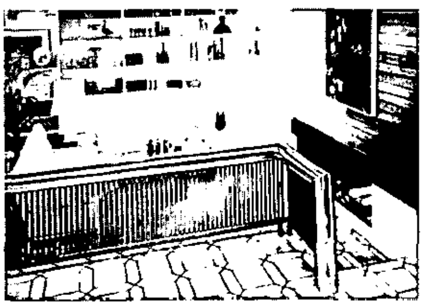
Timers, thermal sensors, extra induction bars, portable trolleys, gloves, and temperature chalks are included in the range of optional extras. Continuous throughput units for production line applications and 'specials' are also available.

The range starts at £349.00. The company claim that their product is the most cost-effective method of heating bearings, and despite its competitive prices, are greatly superior to competitor models.

Enquiries to: Terry Vasey Group Managing Director, The Lewis Electric Group, Bell Street, Maidenhead Berkshire. SL6 1BR. Tel: 0628 23499.

Radiators Save Space

Temfix Engineering Company Limited, Farnborough, Hants. have noticed a trend amongst the progressive architects to get away from the standard practice of mounting radiators on outside walls. Instead they are using them as an architectural feature of the room. They are using the 'Zehnder' slim (30mm deep) one-column radiator as room or office dividers, also as extra protection to glass partitions.



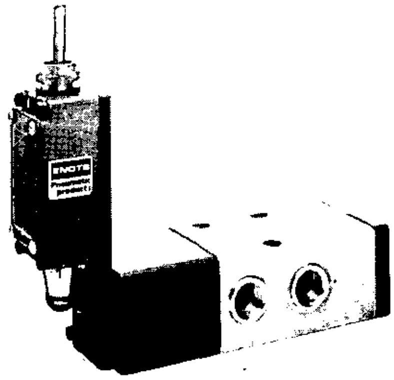
Temfix decorative radiators

They are proving very useful where wall and window space is at a premium; they have also been used very successfully in stair wells. This type of radiator allows the natural light to penetrate through. The columns can be arranged in various ways to suit the design of the room, and there are over 100 radiator sizes listed in the catalogue.

Information available from: Temfix Engineering Co. Ltd. Farnborough, Hants, GU14 7LD. Tel: 0252 5151521.

Monitor Valve Interlocks Pneumatic and Electrical Circuits

A valve designed to allow pneumatic and electrical circuits to be interlocked, is now available to customers requiring sufficient quantities.



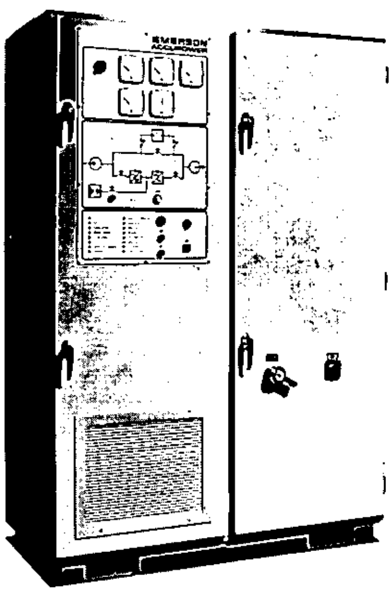
Circuit interlocking valve

This pilot/spring model incorporates a heavy-duty safety limit switch, which monitors the spool position. Accordingly a number of switching functions are now available via the movement of the spool.

For further information contact: IMI Enots Limited PO Box 22, Eastern Avenue, Lichfield, Staffordshire WS13 6SB, England. Telephone: Lichfield 54151. Telex: 338555.

Smaller UPS Systems Protect Data

Just enough power to protect the average computer installation against the effects of electrical disturbances or mains failure is provided by two new Accupower uninterruptible power supply (UPS) systems. Rated at 50kVA/45kW and 40kVA/36kW, these latest Accupower units are developed for use with computer systems handling mainly process control, hospital, bank, chain-store, business and local government data. All supply interruptions, even if they last only a fraction of a second, result in loss of vital data — in a hospital, the result could be loss of life. The changes in voltage that cause interruptions include momentary surges — due to switching local heavy electrical equipment on and off, for example — and voltage-fluctuations due to changes in demand, as well as complete power cuts.



UPS data protection system

The UPS units take their power from the 50Hz mains, a battery or a generator and give a higher-stability, interference-free three-phase a.c. supply. Where required, they can convert the input frequently to 60Hz or 400Hz — 400Hz being used by many more central processors nowadays.

In common with existing Accupower UPS units, the new models can be operated in parallel to provide either UPS systems of greater power or systems which, in the unlikely event of an UPS module failure, automatically switch out the faulty module without interrupting the supply to the computer installation.

The new Accupower units are all-solid-state in construction, and housed in self-contained cabinets which are less than door height and occupy just one square metre of floor space. The batteries are charged automatically to reduce 'gassing', thereby eliminating the need for a special battery room.

Further information from: Emerson Electric Industrial Controls Limited, Elgin Drive, Swindon SN2 6DX England. Telephone: 0793 24121, Telex: 449101.

Low Cost Digital Multimeter

The new Model TM352 is a battery operated 3½ digit hand held multimeter with a large 0.5" liquid crystal display.

With an input impedance of 10M ohms, the instrument will measure 100uV to 1000V dc; 100mV to 1000V ac; 100nA to 10A dc; and 1 ohm to 20M ohms with a buzzer warning below 130 ohms, plus diode and continuity test.

Push button controls allow fast and easy operation, whilst small size, robust construction and long battery life — typically in excess of 150 hours from a single low cost PP3 size 9 volt battery — make the Model TM 352 truly portable.

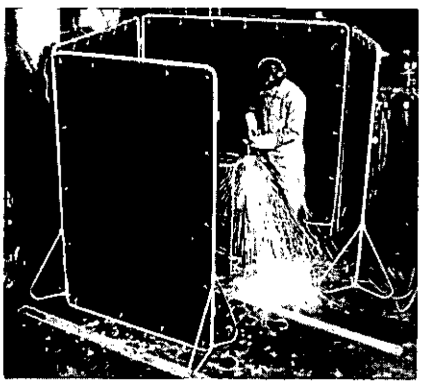
The instrument is supplied with battery and test leads, dimensions are 172 x 90 x 36mm (6¾ 3½ x 1⅜ and total weight is 0.28 kg. (9 ozs.). Optional accessories include Universal test lead set, 40KV high voltage d.c. probe, Service Manual and carrying case.

Please contact: Channel Electronics (Sussex) Ltd PO Box 58, Seaford BN25 3JB Sussex. Telephone: 0323 894961.

Welding Framed and Caged

Neoprene-coated welding curtaining to protect operatives from arc eye flash is now avaiable in a lighter weight of 16 oz. per square metre. Known as Neoglass 120 the new material has the same thickness of Neoprene coating as Neoglass 180 which, with a heavier inner layer of woven glass fabric, weighs 26 oz. per square metre. The curtain acts as a tough screen, withstanding sparks and droplets of molten metal. Resistance to spread of flame is Class I (BS 476 part 7).

Both types of Neoglass are now available on self-standing frame sections of 6 ft. by 6 ft. or 4 ft. by 6 ft. which link to form a cage around the welder. Frame supports are of 19 gauge galvanised steel tube one inch in diameter.



Welding Curtaining

Contact: Tutor Safety Products, Sturminster Newton, Dorset. Tel: 0258 72921.

Boiler Installation Time Reduced

A mobile boiler house, complete with a Hoval 1,000,000 BTU/hr boiler, and recently purchased by the Wiltshire Area Health Authority, has already been used as a stand-by system while old cast iron oil fired boilers have been replaced at the Seymour Clinic, a 35-bedded unit and day hospital facilities in the Swindon Health District, by two New Hoval Boilers.

The mobile self contained boiler house, complete with generator, circulating pump oil and supply, is capable of producing 264 gallons of domestic hot water per hour.

Heating levels in the hospital are controlled by a Hoval RTK 3 compensator and 3 way mixing valve. Each boiler has an output of 800,000 BTU/hr with a delivery of 320 gallons per hour of hot water on a continuous rating.

Information from: Hoval Farrar Ltd, Northgate, Newark, Notts. NG24 1JN. Tel: 0636 72711.

Storage Heater Consumption

A microelectronic-based controller which optimises the electricity consumption of storage heaters in both commercial and domestic premises has been introduced by Pactrol Controls.

The controller automatically adjusts the amount of heat stored in an off-peak heating installation in response to changes in weather. It can be used with any system based on off-peak or white-meter tariffs which, in addition to storage heaters, also include electricaire or under floor heating.

The Weatherwatcher is simple to install and operate, and consists of an indoor heating control unit and an outdoor temperature sensor. Heating is regulated for part of the off-peak hours, ranging from 100% (maximum stored heat) down to zero, the percentage depending on the control setting and the outside temperature.

For further information: Pactrol Controls Limited, PO Box 123, 46 Greenhey Place, Skelmersdale, Lancs WN8 9SA. Tel: 0695 22191.

Classified Advertisements

Appointments and Situations Vacant

BEAUMONT WATER HEATERS

Capacity 400 gallon 1m BTU; 300 gallon 600,000 BTU; and 200 gallon 400,000 BTU.
In first class condition, several unused. For further details contact:

GEORGE COHEN MACHINERY LIMITED
23/25 Sunbeam Road, London NW10 6JP
Tel: 01-965 6588. Telex: 922569

Trinidad & Tobago

Hospital Engineer

The Ministry of Health requires a Hospital Engineer (Electrical) who will hold a degree and have professional and supervisory experience in design, installation operation and maintenance of engineering and allied services. A knowledge of modern methods, practices and principles of engineering applicable to operation and maintenance is required as is some experience in purchasing materials. The officer will be responsible for implementing and directing all electrical engineering services in an assigned area supervising a large group of technical and unskilled workers.

Salary which will be between £10,000 and £12,000 p.a. attracts a 25% gratuity on completion of the two year contract. Benefits include subsidised accommodation, free passages, generous leave entitlement, car loan and free medical treatment.

For full details and application form telephone Glenys Smith 01-222 7730 Extn 3535 or write quoting HP/0210/HE.

Crown Agents

The Crown Agents for Oversea Governments & Administrations, Health Services Division (Staffing), 4 Millbank, London SW1P 3JD.

KINGSTON and RICHMOND AREA HEALTH AUTHORITY

SENIOR ENGINEER (OPERATIONAL MAINTENANCE)

Based at Normansfield Hospital, Teddington. Salary scale £7788 – £8927 p.a. inc. (incentive bonus allowances payable.)

Required for managment duties associated with maintenance and operation of mechanical and electrical engineering services. Duties include implementation/operation of planned maintenance and bonus schemes.

Applicants should have completed an apprenticeship in mechanical or electrical engineering or have acquired a thorough practical training. A minimum qualification of HNC in engineering required or an appropriate equivalent with 5 yrs relevant experience.

Candidates must have experience in management of mechanical/electrical plant, up-to-date maintenance planning, control and deployment of staff, preparation of maintenance estimates/reports and carrying out directly or by contract small engineering construction or renewal works.

Further information tel: Mr Price, Asst. Area Engineer 01-546 7711 Ext 485. Application forms/Job descriptions from Area Personnel Dept, South Wing, Normansfield, Kingston Rd, Teddington, Middx. Tel: 01-977 8833 Ext 312.

Closing date: 23rd October, 1981.

WELSH HEALTH TECHNICAL SERVICES ORGANISATION

ASSISTANT CHIEF ENGINEER

£11,690 – £13,903 per annum

PRINCIPAL ASSISTANT ENGINEER

£10,395 – £12,567 per annum

MAIN GRADE ENGINEER

£5,673 – £10,338 per annum
(Entry point dependent upon age, qualifications and experience)

Applications are invited from suitably qualified and experienced mechanical, electrical or building services engineers for the above posts in our Chief Engineer's Division. These posts, based in Cardiff, offer varied and interesting work providing engineering services in Health Service premises throughout Wales.

Applicants for the posts of Assistant Chief Engineer and Principal Assistant Engineer must be chartered engineers and corporate members of a senior engineering institution. These are senior posts for which health service experience, extensive in respect of the former post, is required.

Applicants for the Main Grade Engineer post should preferably be chartered engineers and corporate members of an appropriate engineering institution but graduate members (or equivalent grade) of a major institution may also be considered.

Application forms and further particulars available from:
Personnel Division,
Welsh Health Technical Services Organisation,
Heron House, 35/43 Newport Road, Cardiff CF2 1SB
Tel: Cardiff 499921 Ext. 144.
Closing Date: 23rd October, 1981.

South West Thames Regional Health Authority

Regional Engineer

Salary: £17,089 – £20,676 plus London Weighting

Applications are invited for the post of Regional Engineer which becomes vacant due to retirement on 31st December 1981.

Applicants should be corporate members of one of the Institutions of Civil, Mechanical, Electrical or Electronic and Radio Engineers or of the CIBS, and have had several years' experience in the design, construction and management of major engineering works. Knowledge of computer applications and operational efficiency would be an added advantage.

Applicaton form, further details and comprehensive job description from the Headquarters Personnel Officer, 40 Eastbourne Terrace, London W2 3QR. Telephone: 01-262 8011 Ext. 508.

Closing date: 16th October, 1981.

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Telex: 667325 COMCAB G ROTATOOLS

CONSULTING ENGINEERS

SENIOR ELECTRICAL ENGINEER

Applications are invited for the above post which will be based in our London office.

Applicants should be corporate members of the Institute of Electrical Engineers. They should have a firm background in the design and specification of installations normally related to hospitals.

The post represents a key position within the practice which could ultimately lead to partnership.

Applications in writing giving brief details of experience and qualifications to:

The Secretary,
HDP Engineers,
89 Southwark Street,
London, SE1 OHX

WELSH HEALTH TECHNICAL SERVICES ORGANISATION

TECHNICAL ASSISTANT Grade I

Salary Scale: £7031 — £8293 per annum

Applications are invited from suitably qualified persons for a Technical Assistant (Operations and Maintenance Section) post on Grade 1 in the Engineers' Division of our Directorate of Works.

The successful applicant will be employed on one or more of the following tasks:

1. Carrying out Specialist testing on sterilizers and assessing and reporting on the results.
2. Carrying our site surveys and energy audits of buildings and engineering services, plant and equipment.

The successful candidates will be graded on appointment in accordance with their qualifications and experience.

Technical Assistant Grade 1 applicants should normally offer an ONC and 10 years' relevant experience or an HNC and 8 years' relevant experience.

Alternatively, candidates may be appointed to this grade if they have obtained a Diploma in Environmental Engineering of the Polytechnic of the South Bank or exceptionally posses another qualification approved by the Secretary of State.

For an application form and further particulars please apply to:—

Personnel Division,
Welsh Health Technical Services Organisation,
Heron House,
35/43, Newport Road,
Cardiff.
CF2 1SB
Tel: Cardiff 499921 Ext. 18.

Closing date: 23rd October, 1981.

Clarke Nicholls + Marcel

CN + M
Consulting Engineers

Public Health Civils Group

GROUP LEADER (BRISTOL) to head team dealing with estate roads, drainage, cold water supply, and some public health engineering from initial design through to contract completion. Should be chartered. The position has important career prospects of advancement, has fringe benefits, and a substantial contribution to relocation expenses.

ENGINEERS + TECHNICIANS (BRISTOL & BIRMINGHAM) for varying levels of responsibility within the group described above. These are additional posts in established groups. Day release for further studies for the more junior posts.

Apply in writing to appropriate office:
10 Apsley Road, Bristol BS8 2SR   44 Frederick Road, Birmingham B15 1HN