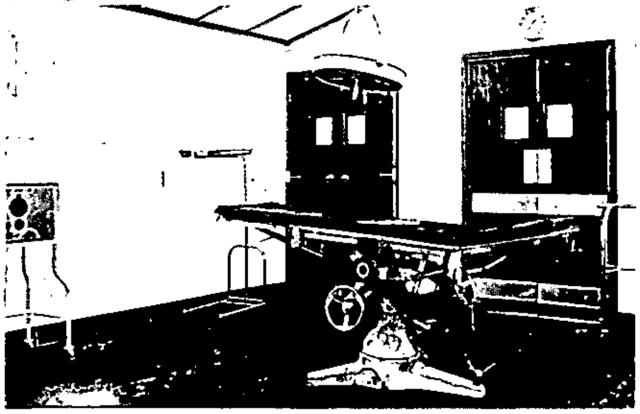
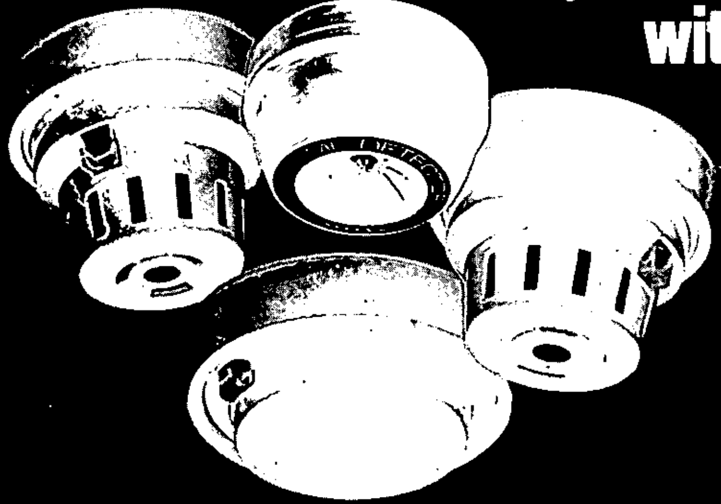
The Journal of the Institute of Hospital Engineering May 1980

HOSPITAL ENGINEERING

Medicine and Machines





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HOSPITAL ENGINEERING

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Institute News

Hospital Energy Conservation Year 1980
Second Symposium — Wednesday June 11, 1980

at The Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster

PROGRAMME

10.00 Coffee

10.30 OFFICIAL OPENING by
LAWRENCE F. TURNER BSc CEng FIEE FIHospE
President, Institute of Hospital Engineering

CHAIRMAN for the day
RICHARD BURTON RIBA ADiplHons
Ahrends, Burton and Koralek

10.40 INSULATION OF BUILDING STRUCTURES
Speaker: PROFESSOR PATRICK O'SULLIVAN BSc PhD FCIBS
The Chair of Architectural Science
The Welsh School of Architecture

Professor O'Sullivan will speak on the theoretical approach to insulation of the structure of existing hospital buildings.

11.30 INSULATION OF BUILDING STRUCTURES
Speaker: P. GREGORY
Cape Insulation Limited

Mr Gregory will speak on the practical approach to insulation of the structure of existing hospital buildings.

12.15 INSULATION OF ENGINEERING SERVICES
Speaker: J. GILLETT BSc MBIM
Market Development Manager, Fibreglass Limited

Mr Gillett will show the latest film in the Managing Energy Series, entitled "Pipe Insulation" which has been made in conjunction with the Thermal Insulation Manufacturers and Supplies Association, and advise on the difference in materials, finishes and applications.

13.00 LUNCH

14.15 EXTERNAL CLADDING OF HOSPITAL BUILDINGS
Speaker: CERI DAVIES RIBA
Assistant Director of Works Operations, DHSS

Mr Davies will describe the work undertaken by DHSS and the potential for further savings.

15.00 ECONOMIC THICKNESS OF PIPEWORK INSULATION
Speaker: P. J. RATTUE BSc CEng FIEE, Principal Engineer, DHSS

Mr Rattue will advise on the current standard laid down by DHSS for pipework insulation and comment on the future development in this field.

15.30 DISCUSSION

16.00 CLOSE

Report of the Council for 1979

Council has pleasure in submitting the audited accounts and report of activities during the year.

Finance

The Income and Expenditure account shows a surplus of £5,487 for the year. This surplus is added to the Accumulated funds brought forward, £20,396 to make a total of £25,883 at December 31, 1979.

Activities

Council and Council committees, met on thirty occasions during 1979.

The membership again showed an increase with 150 new members being elected whilst the category of a further twenty members was revised.

In regard to the structure and categories of membership Council set up a special Working Group to study this in light of changing and developing circumstances. The report and recommendations of the Working Group were submitted to, and approved by, Council and has been distributed to branches and has appeared in the Journal as part of consultative process with the Institute membership.

The Institute is now, of course, an Affiliate of the Council Engineering Institutions and continued its membership of each of the three Section Boards of the Engineers Registration Board dealing with registration as Chartered Engineer, Technician Engineer and Technician respectively.

The 1979 Annual Conference was held near to London and once again a varied technical programme, the Conference Dinner Dance and the separate Ladies' programme were much enjoyed.

Three separate One day Symposia were held on the subjects of "Noise Pollution — its effect on the Health Service", "Electricity and Health Buildings in the 21st Century" and "Health Buildings — Fire Precautions". The last of these attracted so many applications to attend that arrangements were made to "repeat the whole event" three weeks after the original date.

The Institute continues to play its role in the affairs of the International Federation of Hospital Engineering, being a Founder Member and member of Council of the Federation. 1979 saw the introduction of a new venture in that, at the request of the Council of the International Body, the Institute staged the first International Seminar for senior engineering managers. The Seminar ran for three weeks, was held at the NHS Hospital Engineering Centre, Falfield and the Institute is deeply indebted to DHSS for the extent of the input by the Department into this Seminar.

Again, each quarterly issue of the International Journal *Hospital Engineering* continues to be the official organ of the International Federation.

The Northcroft Silver Medal for 1979 was awarded for the Paper entitled "Guidance to Good Boilerhouse Practice and Management" by J. R. Fletcher.

Towards the end of the year plans were put in hand for the Institute to declare 1980 to be "Hospital Energy Conservation Year". Four separate One day Symposia will be held on different aspects of Energy Conservation/Energy Savings and as a separate but parallel endeavour a Competition will be launched. The Secretary of State for Social Services will open the first of the Symposia and the Secretary of State for Energy will attend the last when he will present the Competition prizes.

In the Autumn of 1979 to mark "International Energy Conservation Month" the October issue of *Hospital Engineering* became a special issue. Again the Institute would wish to express its appreciation of the contribution of DHSS in producing this special issue which won plaudits from many areas.

The Institute Honorary Librarian again reports an active year and, in particular, there was much demand for certain cassettes which he had added to the Institute Library.

In peripheral activities, the Institute was invited to offer nominations for service on certain CEI Committees and continued to have representation on the Watt Committee for Energy and on the numerous BSI Committees. In addition the Institute was invited to offer comment in a number of areas, not least on the NHS Consultative Document *Patients First* and to the Department of Industry on the Report of the Committee of Inquiry into the Engineering Profession.

Council hopes that members will share the view that 1979 was a year of consolidation and progress.

Nominations for the CEI Board

Nominations are now required from Chartered Engineers to fill the six places on the CEI Board which will become vacant at the conclusion of the 1981 Annual General Meeting.

Nomination forms are available from CEI, 2 Little Smith Street, London SW1P 3DL and will give details of the nomination procedure but briefly nominations must be supported by 15 chartered engineers and forms must be received at CEI by 1200 hours on September 30, 1980 at the latest.

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

Miss E. G. Dodd **FIMechE** FIEE
Mr M. R. Hannen **MIEE**
Mr A. W. Jacomb FICE **FIMunE** FIHE
Brigadier T. B. Palmer **MIMechE**
Mr D. H. Pitcher **FIEE**
Mr J. D. Ward FICE **FIStructE**

The Institution with which each retiring Board Member was identified for the purpose of election is in bold. Nominations need not however be confined to members of these Institutions. Any Chartered Engineer may be nominated.

New Chairman and Vice-Chairman at the CEI

The Board of the Council of Engineering Institutions — the professional organisation which is responsible for the country's 195,000 Chartered Engineers — has elected Dr Percy Allaway as Chairman and Mr Bryan Hildrew as Vice-Chairman for 1980–81.

Dr P. A. Allaway, CBE, FEng, is Chairman of EMI Electronics Ltd, and a Past President of the Institution of Electronic and Radio Engineers.

Mr B. Hildrew, CBE, FEng, is Managing Director of Lloyd's Register and Senior Vice President of the Institution of Mechanical Engineers.

East Midlands Branch

A meeting of the East Midlands branch was held in the Lecture Theatre at the Rotheram District General Hospital on March 25 when Mr R. Foster presented a paper entitled "Introduction to the Microprocessor". Thirty-four delegates attended what transpired to be a most enjoyable and interesting meeting.

The East Midlands branch proposes to continue this series of meetings at the Recreation Hall, Groby Road, Hospital, Leicester on May 22. Tea and biscuits will be available from 1700 and the meeting proper will commence at 1730 when a paper entitled "Development in Laundry Plant and Mechanical Handling Systems" will be presented jointly by Mr D. Smith and Mr D. Bower. Following the meeting there will be an opportunity for members to visit the Leicester Area Laundry at Groby Road Hospital to view the Batch Tunnel Washer and associated moisture extraction and drying plant which has been installed recently.

It is to be hoped that once again there will be a good turn out to encourage those who are doing their utmost to revive interest in the activities of the East Midlands branch.

Branch Officers 1980

East Anglian Branch

Chairman: F. D. Blackburn; *Vice-Chairman:* R. G. Freestone; *Hon Secretary/Treasurer:* M. Brooke, 21 Private Road, Ormesby St Margaret, Great Yarmouth.

North Western Branch

Chairman: A. W. Schaffel; *Vice-Chairman:* R. Richards; *Hon Secretary/Treasurer:* J. Sunderland, The Calliards, Smith Bridge Road, Littleborough, Lancs.

South Western Branch

Chairman: J. W. Barnes; *Vice-Chairman:* K. J. Lucas; *Treasurer:* H. Stiddard; *Hon Secretary:* A. J. Graver c/o Spirax Sarco Ltd, Charlton House, Cheltenham, Glos GL53 8ER.

Midlands Branch

Hon Chairman: A. Round; *Hon Vice-Chairman:* A. L. Couch; *Hon/Secretary/Treasurer:* Vacant.

Second Annual Reunion of Spanish Association

This will be held in Madrid on May 26 and 27. The theme of the reunion is 'how energy conservation can be built into the design and maintenance of hospitals' and is of particular interest to attending delegates in view of their experience and knowledge.

Based on a talk to the NE Branch at Newcastle upon Tyne, February 13, 1979. Doctor Lucas is a past President of the Institute.

Medicine and Machines

DR B. G. B. LUCAS JP FFARCS CEng CIMechE PPIHospE

In this article I propose to examine some aspects of the human body as a machine, give a few examples of how medicine is rapidly becoming more mechanised, and suggest what the relationship between the doctor and the hospital engineer may be like in the future.

Firstly that most important bit of human mechanics, the heart. Everyone knows that the left side of the heart pumps oxygenated blood via the main arteries to all the tissues in the body, where the blood gives up its oxygen, and then is returned, through the veins, to the right side. From there the blood is pumped round the lungs, picks up oxygen, and returns to the left side of the heart where it is pumped out again.

The amount that the heart can pump is up to one gallon a minute, and this can vary moment by moment according to the needs of the body. Obviously the two sides must be ganged together sufficiently well to make sure that they both pump exactly the same amount, otherwise blood would collect either in the tissues or in the lungs. But how this is managed is not clear. Although both sides beat at the same rate the two ventricles are of different size and have different working pressures, so there must be some complex control system somewhere; more especially because there are no flow sensors in the body, only pressure ones.

For years doctors accepted this fact and did not worry about the actual control mechanism, but when they began to contemplate heart transplants it obviously became relevant. In order to take a heart out of someone it would be necessary to divide all its nervous connections with the rest of that body and when it was put into a new recipient there could be no control from outside. The answer had not been discovered when the first operation was carried out, but it was found that the transplanted heart worked perfectly normally. So the control, whatever it is, must be inside the heart itself. Although several hundreds of transplants have now been done successfully, no explanation for this remarkable mechanism has been found.

One fact that is known is that the amount of blood pumped out is governed by the amount returning to the heart and that this is controlled by the pressure in the great veins. If a lot of blood is returning, then the pressure in the veins will be high and, correspondingly, the amount of arterial blood pumped will increase. Conversely, if the pressure in the veins is low, the amount of blood pumped out is reduced. This is a straightforward engineering control principle and one doesn't have to have any medical knowledge to understand it.

The human blood vessels are elastic pipes and it is known that flow in pipes is dependent amongst other things upon the pressure in the system. Medically one measures the arterial blood pressure in millimetres of mercury. In the erect position the pressure necessary to pump blood up to the brain must, of necessity, be greater than the head of liquid between the heart and the brain. When a person feels faint it is because some nervous control fails, so that some of the blood vessels in the body dilate and blood collects in the lower limbs. Hence the pressure in the veins drops, so the amount of blood pumped out falls, as does the arterial pressure. If the latter is not enough to overcome the pressure in the column of liquid between the heart and the brain, which in the human amounts to about 40 cm of water, or 30 mm of mercury, then no blood will get to the head and the subject faints.

Imagine how much worse the situation is in the case of a creature with a long neck, such as a giraffe. Here the blood has to be pumped up maybe 3 metres or so, that is the equivalent of about 220 mm of mercury. Some while ago there was much publicity concerning the sick giraffe Victor. He was ill and collapsed on the ground, where he lay for several days. It was said that the only solution was to stand him up on his legs. This was finally accomplished and Victor died. There was a photograph of the giraffe being hoist up and looking down at his feet very sadly, as if saying to himself "I'll never be able to pump my blood all that way up to my head".

Venous return, or rather lack of it, is also relevant to the problem of immersion hypothermia and possible death from getting cold in the water, the rationale behind this being similar to the reason for poor Victor's death.

There are all sorts of fascinating facets to reducing the temperature of a living organism. Everyone knows that freezing prevents organic material from going bad, and the deep freeze is becoming as much a piece of standard equipment in the home as a vacuum cleaner. Fishes, reptiles and other cold blooded creatures can survive low temperatures and always recover from the state of torpor into which they go when they are cold, but it is not a natural state of affairs for the temperature of warm blooded animals to be reduced.

Warm blooded creatures maintain a steady temperature so that their various metabolic, or energy producing, processes can go on at a controllable rate. It is well known that the energy production from most processes is temperature sensitive, the higher the temperature the greater the energy production in a given time. Heat loss is dependent upon environmental conditions and if the body, which has many heat producing systems, is to control these systems easily, then a constant environmental temperature is desirable. In man this is 37°C, in dogs a degree higher, and in birds even higher.

But a lowering of temperature per se need not have a deleterious effect on the body, except to slow

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Wire and Cable Chart (Labfaculty Ltd), April, p.26.

down the metabolic processes. It is true that people who have died in a cold environment have had a lowered body temperature, but it does not follow that the hypothermia was directly responsible for the death.

It used to be thought that this was the cause, but it is now known that it is only so indirectly. What happens is that the human body does its best to maintain a normal temperature in a cold environment, so it uses up all its reserves trying to make heat, usually by shivering, and then dies from exhaustion.

Another thing which was discovered, almost by accident, was that if people were unconscious before they became cold they didn't shiver and they survived, even though their temperature had dropped 10 degrees or so. In the late 'forties when interest was being taken in the deliberate use of hypothermia for certain surgical procedures it was noticed and commented upon that drunks on Saturday nights during the winter in Scandinavia and America were often found unconscious in the snow on Sundays with their temperatures down to as low as 24°C, yet they came back to life when they were rewarmed. Investigation of this revealed that the key to successful cooling is the production of unconsciousness first, with alcohol, drugs or anaesthesia.

However, none of this explains why immersion hypothermia is considered to be so lethal. The reason has nothing to do with temperature, it is more related to hydraulics. When man has been in cold water for a while his temperature drops, his circulation slows down a little, and his blood vessels lose some of their elasticity due to the cold. But the vessels in the lower limbs, and the limbs themselves, are compressed by the water pressure surrounding them, so the blood returns to the heart in the normal manner and, although cold, the victim is conscious, or semiconscious, and can usually make some response just before he is rescued. As he is pulled out, head uppermost, he loses the protection of the water on his lower limbs, so blood pools in them, none returns to the heart and the victim collapses as he is dragged aboard the ship; often he dies. Because his temperature is low, it is this that is blamed for his death. The solution is that people rescued from the sea should be kept horizontal as much as possible.

All this is simple hydraulics, a subject with which doctors are not necessarily familiar, but some understanding was vital when it came to designing artificial heart lung machines for cardiac surgery. It was difficult enough to devise a pump for pumping blood, because blood is a living liquid and full of protein, which gets injured very easily by mechanical forces. Even how it is damaged matters, one way will alter the protein quite differently from another. At the beginning all sorts of pumps were tested, including some which were used in the jam making industry, the argument being that if they could shift strawberry jam without bursting the strawberries they might be quite good for blood. And, in fact, they were not bad. In the end, however, a simple roller type, which squeezed sequentially elastic tubing containing the blood, so moving it along the tubing, was chosen. This pump is now standard for heart lung machines all over the world, as well as being used for a number of other medical purposes.

This may seem to be all medicine and nothing to do with engineering, but there are many problems in medicine that can be solved by engineering know-how and it is a mistake for the engineer to think he cannot help.

For instance, there is one sector of industrial life where there has been complete collaboration between the two disciplines, without which one would not have the product, and that, of course, is North Sea oil. In addition to the engineering problems of how to get oil from the sea bed there were a number of medical difficulties to be solved.

Briefly, when oil is to be delivered from the bottom of the sea divers have to go down and connect up pipes and carry out various other jobs on the sea bed at a depth of perhaps 900 feet. Since the pressure of 30 feet of water is the same as one atmosphere, 900 feet equals 30 atmospheres. This is a far greater pressure than man had been accustomed to working under and enabling him to do this without a special armoured suit has required great ingenuity.

Whatever depths men dive to there is always the problem of decompression when they return to the surface, because, in order to be able to breathe under water, the air, or breathing gases, have to be pressurised to the equivalent of the pressure of the sea. This means that the amount of gas normally dissolved in the tissues of the body will increase in proportion to that pressure, and unless this excess gas is allowed to disperse gradually before returning to atmospheric pressure, it will come out of solution too quickly and may collect as bubbles in the body, which can be harmful. (The 'bends'). In shallower water the diver can overcome this by coming up to the surface in a series of stages, stopping for a while at predetermined levels to allow the bubbles to disperse slowly. But to come up in this way from great depths would literally take weeks, so it was not practical. Instead, doctors and engineers between them worked out what is known as saturation diving.

With this method divers require no more decompression time whether they stay on the bottom for a day, a week, or a month. In practice, they go down to the sea bed in a bell which is pressurised to that depth. They then leave the bell, wearing their underwater breathing apparatus, and get on with whatever job they went down to do. On finishing, they return to the bell and this is kept at pressure as they are brought up to the surface, where it is locked on to a special chamber compressed to the same depth. The divers climb into this chamber, which is just big enough to allow them to eat and sleep, and after a suitable rest period they get back into the bell, go back down to the sea bottom and start work again. In this way the men live at high pressure for many days at a time until their period of duty is up, when they are decompressed slowly, over a matter of days, in the chamber before going on leave.

To return to the theme of this talk. There is another facet of the body which is mechanistic and that is locomotion, or movement of the muscular skeletal system in medical phraseology.

When one compares the mode of movement by humans and other living creatures with those of self propelling machines made by man one finds one striking fundamental difference. Most of the engineering inventions of mankind depend upon rotation; the moving parts operating against the outside environment are constantly turning in circles, relative to some other part of the machine. The wheel is considered to be man's greatest invention, but there is no such thing in nature. Nature uses rods and levers and these can move up and down and from side to side, but they never make a complete revolution about a stationary axis. The reason for this is that in nature all parts of the system, including blood vessels and nerves, must be connected together in some way or another and continual rotation would twist and break the connections.

In terms of energy production man, and some other living organisms, are much better off than machines in as much as they have the ability to obtain energy temporarily without oxygen. This, in physiological terms, is called contracting an oxygen debt. With machines, the mixing of certain quantities of fuel will result in a definite amount of energy. Where biology is lucky is that, in addition to this simple equation, there is a more complex one, which enables energy to be produced from the fuel without the addition of oxygen. True, it is only a temporary measure and oxygen has to be provided later, but it is an enormous help, a sort of biological hire-purchase which can be called upon in certain situations. For example, during his 100 metre race the sprinter does not have to waste his energy breathing, but can use it all for moving and then, after it is all over, pant and take in his oxygen.

Turning now to how medicine itself is becoming more mechanised due to engineering expertise. The advances made with artificial joints are a good example. These days many engineers are working in the orthopaedic field and they are not only making useful contributions, but are pointing out the errors of some of the medical concepts about joints. For example, doctors always believed that the knee was a straightforward hinge. In fact, it rotates as well, so their primitive answer to the sports injury of a torn cartilage of removing the cartilage probably has done more harm than good.

A useful contribution has been the work done on bone cements as a means of securing the fixation of artificial joints. This has made it possible to fix metal implants into long bones with the aid of acrylic cements. They act more as keys than glue, but using them, together with a rod-like implant, one can replace the middle of a long bone, say in a limb, that has a malignant growth in it instead of having to amputate the limb.

An engineering contribution to heart disease has been the development of artificial valves. These work almost as well as the natural ones and people who have been given them are able to lead a normal, if noisy, life. Noisy because with some patients, who have had three of their four heart valves replaced, one can actually hear them working from outside.

Something else which must be mentioned is the lung ventilator, or life support machine as the Press likes to call it. Most people are familiar with the principles involved, namely that instead of the patient expanding his chest voluntary, taking air in and then letting it out, the machine is coupled to his windpipe in some way or other and air is pumped in intermittently from outside and then allowed to escape to the atmosphere. Really all very simple, but the engineering problem is one of reliability, the medical one that of sterility and the patient sometimes has trouble in accepting the idea of being breathed by it.

From an engineering point of view the question of reliability is easy, but planned preventive maintenance is something the rank and file of the medical and nursing professions seldom understand. The standard reply of most nurses when told that a piece of apparatus doesn't work is "well it was alright a moment ago". Not only do breathing machines have to be 150% reliable, they have to be nurse proof.

What about the future relationship between doctors and hospital engineers? Unlike most people I think it is rosy, because more and more engineers are being integrated into medicine and hospitals. A new breed of hospital engineer is emerging who is capable of standing on his own feet and talking with the medical profession at its own level. Works officers and management teams can do nothing but good, and they will point out to the doctors, and to the administrators, the value of the engineer. The only sad thing is that there isn't yet a breed of doctors with a genuine desire to understand the engineering side.

In any case collaboration will not happen by itself, both sides will have to make an effort. The hospital engineer must get himself known in the hospital environment. I will end by repeating what I went round telling you all when I was your President.

Everyone is reasonably tolerant about the jobs other people do if they know these people and have a glimmer of what they do. But if they know nothing of the other person or his job they polarise their views and see everything in black or white; the job is either beyond them or beneath them. How many of us condemn politicians out of hand without really understanding what they do, apart from what we gather from the garbled accounts we see and hear via the media? Similarly, most doctors and nurses know nothing about hospital engineers. If you are going to help health care, and I know you can, you have got to get out of your workshops and offices and go and meet the dentists, the medics, and the nurses. As a class they are no more bright or stupid than you are. As a corollary, doctors should poke their heads round your doors.

This paper was presented to the London Branch at a meeting devoted to Practical Energy Conservation.
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The Efficient Utilisation of Steam

ALAN J. GRAVER MIHospE

Steam Raising

We must start at the very beginning and ask why we generate steam at all. Steam is not an end in itself. It is produced solely to serve as a convenient carrier of energy in the form of heat and pressure.

We are all familiar with steam tables, which show the very definite relationship between steam pressure and temperature and also give us the sensible and latent heat units at varying pressures.

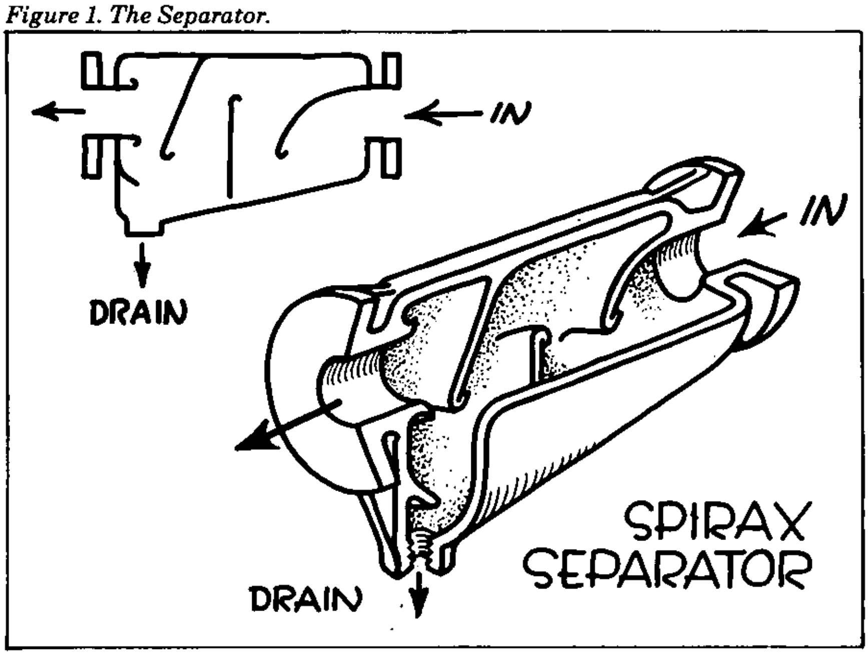
The tables show the heat content of dry, saturated steam but steam is seldom dry. Steam which contains particles of water in a finely divided state is called wet steam. If 1 lb of wet steam is made up of, say, 95% dry steam and 5% water particles, it is said to have a dryness faction of .95.

The total heat of 1 lb of wet steam is less than the total heat of dry steam because the water particles have escaped without receiving any latent heat. The total heat of wet steam is made up of the sensible heat and the latent heat units, multiplied by the dryness faction. The important effect of the small percentage of wetness in the steam leaving the boiler will be realised when we consider that steam at 200 lbs psig, if it contains 6% of water particles, has less total heat than dry steam at atmospheric pressure.

So where does all this wetness come from and how do we remove it? — for clearly we must get rid of it as a first step towards improving steam quality and making the best use of the heat units that have added through burning valuable fuel. Let's go back to our boiler. When steam is generated there is considerable turbulence and drop-lets of water are thrown out into the steam. Particularly when steam is being extracted from the boiler at a high rate, the movement of steam towards the outlet will carry these droplets away and into the steam system. The water level in the boiler varies and the top row of tubes may not even be in the water. Anti-priming pipes are not always effective — the priming pipe can be below the top level of the water.

The first step is to run the boiler at the maker's recommended pressure — with modern packaged boilers, usually between 100 and 150 psig. This dampens down the splashes on the top of the water level and helps to prevent boiler carryover — wet steam. However, in addition it is also important to fit separators after the crown valve to improve steam quality by removing 'carryover'. The separator (*Figure 1*) is designed to throw water and droplets from the steam and allow the dry steam to pass on. It is a series of baffle plates, designed to give a sudden change of direction to the steam. The heavy wet particles impinge on the baffles which then guide the water down to a sump. From there, the water is drained away via a steam trap. In addition to a separator after the boiler, it is also very worthwhile fitting them at the entry to a plant room or at a point of usage. Steam will begin to cool and get wet along the distribution system before it reaches the plant. Let's return again to the boiler (see *Figure 2*). The boiler feed water is treated to minimise or prevent scale which retards heat transfer *ie* scale forming salts are converted to sludge forming salts. Solids in the water must be kept down, otherwise foaming can occur, due to turbulence and agitation. Overdosing can cause carryover of boiler feed compounds and can cause 'cocoa' deposits on plant surfaces internally — such as traps. The brown 'cocoa' deposits are usually pherous-oxide. Boiler blowdown keeps solids down to a pre-determined level and most modern boilers have continuous blowdown via an orifice

Figure 1. The Separator.



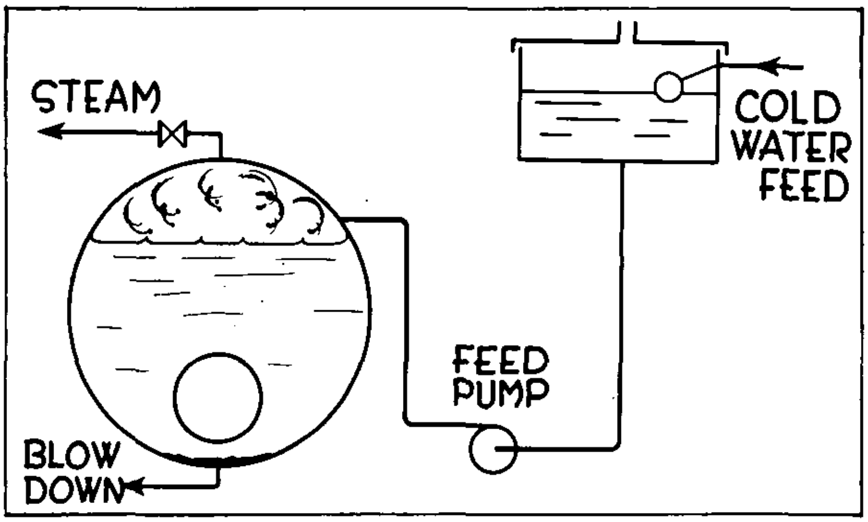


Figure 2. The Boiler.

in the blowdown line, *Figure 3.* This allows the release of some 5-10% of the total hourly evaporation. The waste heat in this continuous blowdown should be recovered.

The wet particles in the steam and boiler feed compound carryover all form part of what we call resistant films, which retard the heat transfer process.

Stagnant products — baked on product. Regular cleaning is the cure for this.

Scale film — film of oxides or 'cocoa' due to carryover of feed water chemicals. Correct dosing is the answer here.

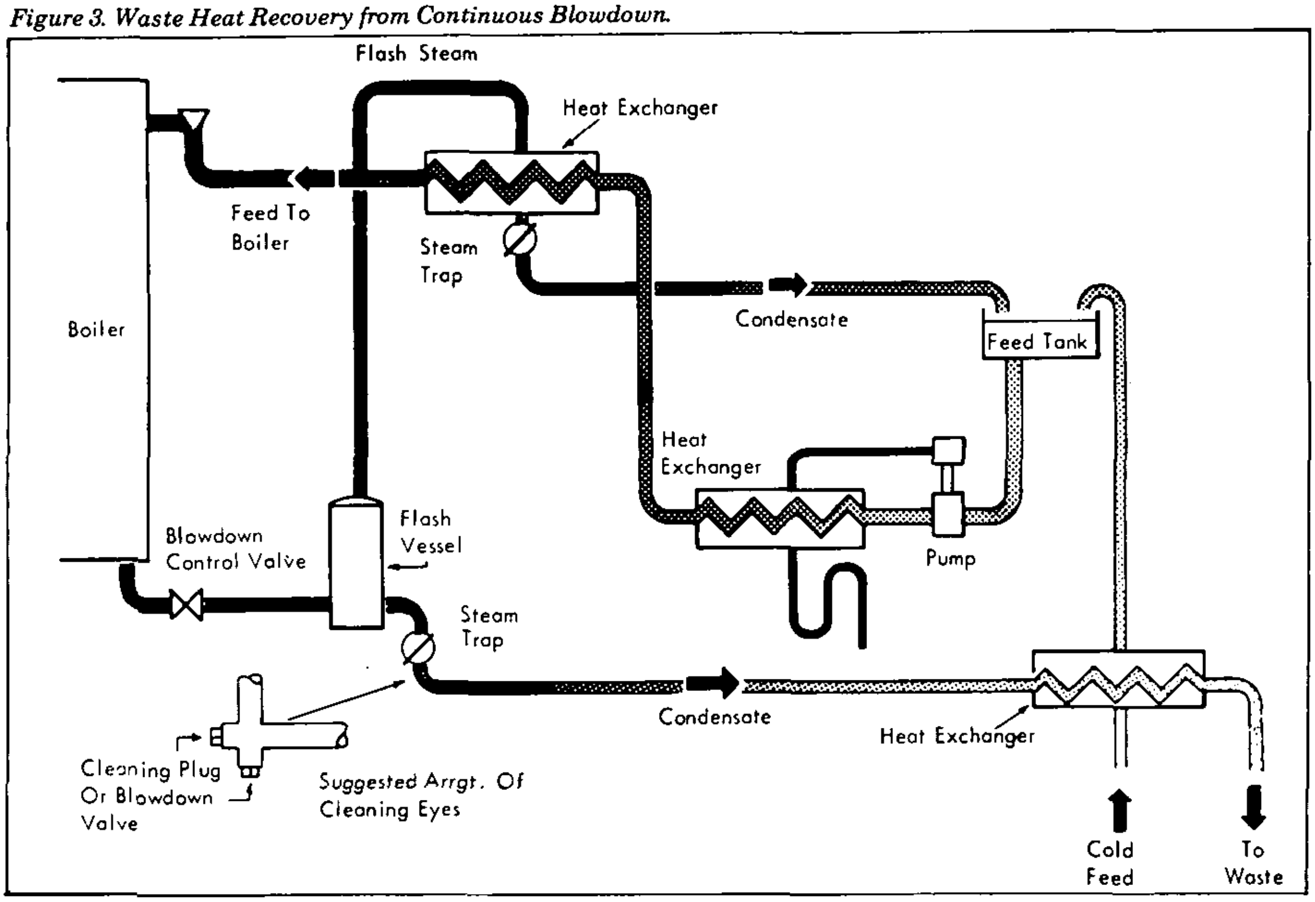
Water film — condensate due to condensing of steam and added to by carryover. This film is kept to a minimum by attention to steam quality and to correct steam trapping.

Air film — air is a very bad heat conductor. It enters the system from raw water (oxygen O_2) and from the feed water exchange process (O_2+CO_2). These are comparatively small amounts as far as the air film goes but they are important from a corrosion aspect. By far the largest amount of air enters when the plant is shut down.

Air reduces temperature and, as an example, in a mixture of air and steam, total pressure is, say, 20 psi absolute. The mixture is made up of three parts steam and one part air. The partial pressure of the steam is $\frac{3}{4}\times20=15$ lbs psig absolute. The partial pressure of the air is $\frac{1}{4}\times20=5$ lbs psig absolute. The temperature of dry saturated steam at 20 lbs psig absolute is 228°F. But with our mixture, we in fact have steam at only 15 psig absolute, and its temperature now is only 213°F. The air must obviously be removed and since air is heavier than steam, the air is driven ahead of the steam to a point most remote from it and can be removed.

Many traps incorporate an integral air vent but others need a separate air vent installed in parallel around

Figure 3. Waste Heat Recovery from Continuous Blowdown.



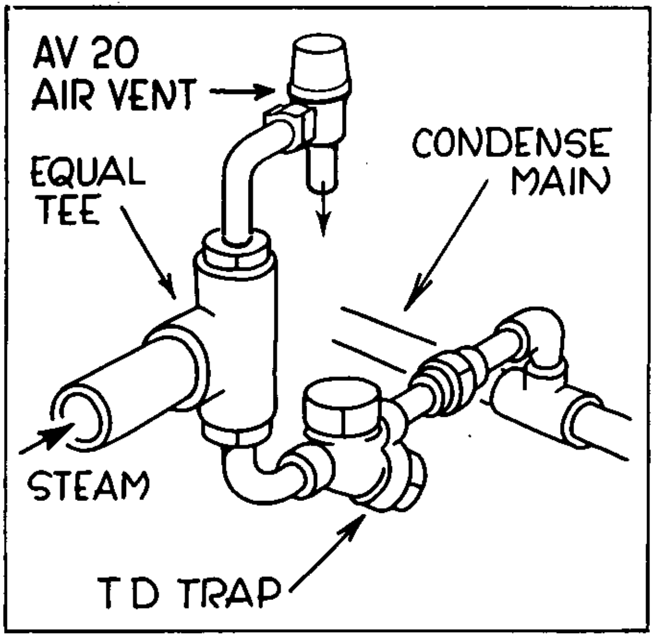


Figure 4. Air Vent at terminal point of Steam Main.

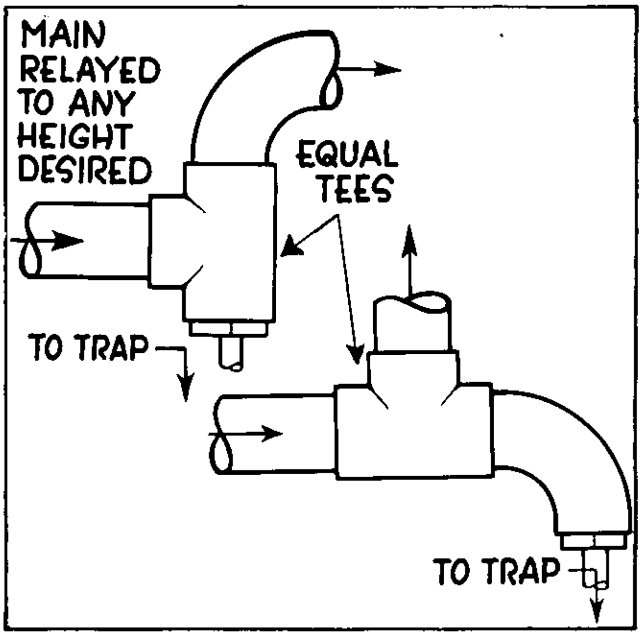


Figure 5. Relay Points.

them. Some pieces of plant should have a quite separate air vent fitted to them. There are many factors involved in deciding the best position for the air vent and the obvious position is not always the best. Some expertise and experience should be sought in deciding the best place to install an air vent.

With today's emphasis on fuel economy, there is a move to closing down boiler plant whenever possible — overnight, for instance. On start-up next morning, the pipework will be full of air which, unless removed quickly, will lead to very long warm-up times. An air vent at the terminal end of each branch main will greatly reduce warm-up times (see *Figure 4*).

An air film only one-thousandth part of an inch thick puts up the same opposition to heat flow as a wall of copper 13 in. thick.

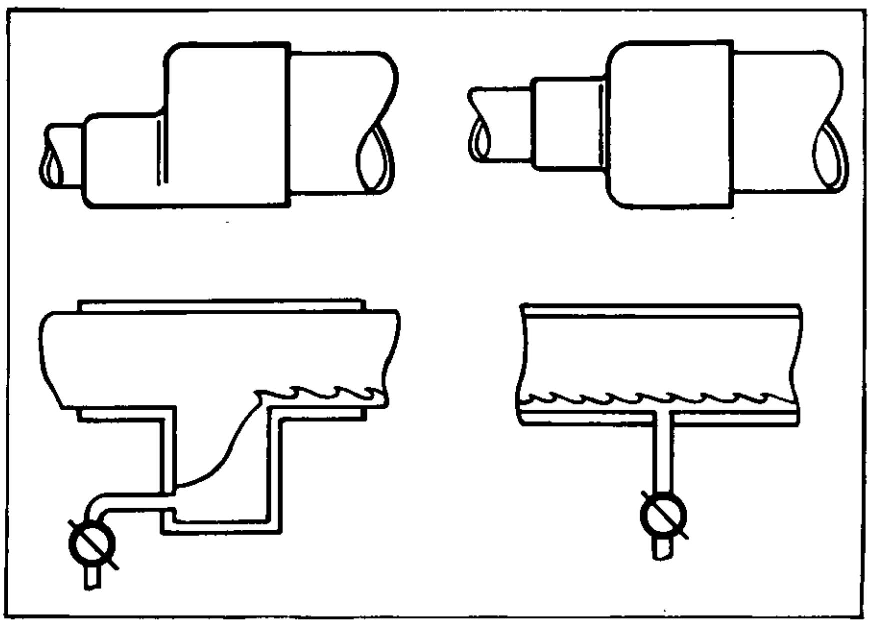
Steam distribution

We now have to get good quality steam distributed around the site to our points of usage. This we do via a steam distribution pipework system which must be sized correctly. If the pipe is too small, there will be a high pressure drop but too large a pipe is uneconomical, with high capital costs and also high radiation losses. Sizing can be based on velocity — generally 80 ft per second for long main runs and 50 ft per second for short branch runs. Saturated steam can be carried at up to 130 ft per second but this is a maximum velocity and exceeding it will result in noise and erosion of pipes. The disadvantage of sizing on velocity is that the pressure drop will increase over the length of travel, *ie* there will be a low pressure at the end of the system and high pressure nearer to the boiler.

It is in fact preferable to size pipework for steam distribution on a pressure drop basis. A wealth of sizing charts, slide rules and monographs are available. A pipe size selected to carry a known load will result in a pressure drop of around 1% per 100 ft of travel.

The piping should fall in the direction of flow or waterhammer will occur *ie* steam at 40-50 miles per hour will force water uphill ahead of it until an obstruction is reached — a bend or valve. Relay points may be necessary to maintain pipe levels with a trap to drain the low point (*Figure 5*). Mains should be drained at 100 ft intervals and drain pockets must be of adequate size (*Figure 6*). It is quite useless expecting a $\frac{1}{2}$ in. drain pocket to cope. Branch mains should be taken off the top of the main pipe and if the main is to be reduced, an eccentric reducer should be used — not a concentric type which will allow a low point for water

Figure 6. Drain Pockets.



to exist. On a steam line, strainers should be fitted on their sides to present the greatest screening area. Strainers should be fitted before each control valve, pressure reducing valve or piece of plant. The price of a strainer is little to pay for protecting expensive equipment from costly and inconvenient breakdown due to pipe scale swarf that one finds in piping systems, especially after its first installation.

In the piping system, provision for expansion must be allowed and pipework supports must be adequate and properly maintained (*Figure 7*).

Pressure Reduction

One reason to generate at a high pressure is to reduce priming in the boiler, giving better quality steam. The higher the pressure at which steam is generated, the less space 1 lb of it takes up and the smaller the pipe needed to carry it. By keeping the size of pipe to a minimum, not only is the capital cost reduced but the heat losses from it are also minimised. But 1 lb of steam at high pressure is not so valuable for process work, since the higher the pressure the lower the latent heat per lb. Process plant is generally designed to give a certain output at a certain steam pressure and temperature. There must be some temperature difference between the steam and the process material. This will determine the lowest possible steam pressure. The higher the pressure above this limit, the greater the temperature difference will be and, within limits, the greater the rate of production. But high pressure produces less latent heat which is available per lb, so more pounds of steam are required to give the same heating effect.

The steam pressure for any given process job is therefore a choice between output and fuel consumption. The steam pressure for transmission is quite another matter. Within the permissible limits of the plant, the higher the pressure the better. So we distribute steam at high pressure, keeping mains losses and mains sizes to the optimum and reduce at the point of usage. This, in addition to all the other factors discussed so far, will also help to ensure that dry steam is available at the process end.

So far we have discussed generating steam, transmitting it correctly to the points of usage, removing the air, reducing the pressure etc. The next stage is to deliver it at the correct pressure and temperature and in good quality to the plant.

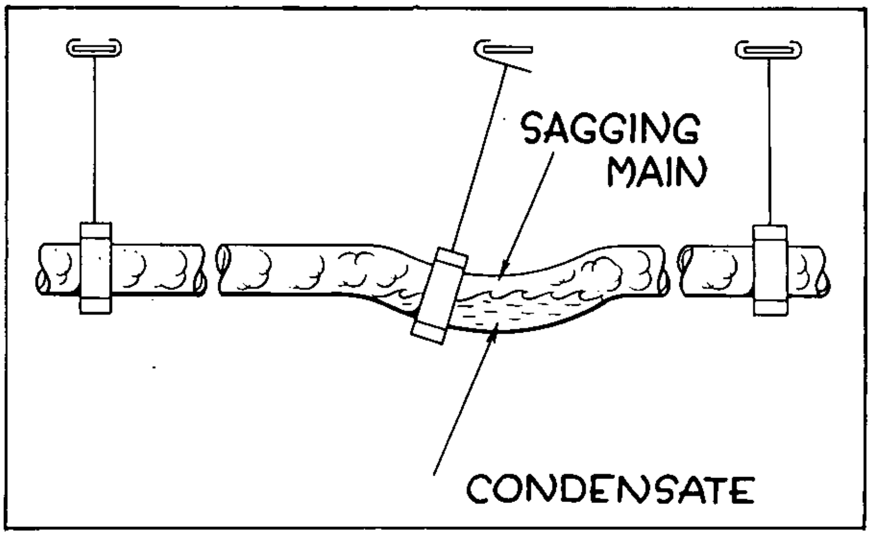


Figure 7. Pipe-work supports.

Steam Trapping

It is the latent heat that we use in steam plant and we need a device to hold back steam until it has given up its latent heat and then discharge the resultant condensate — hot water. This could be carried out manually by using a drain cock or valve but it would take a very skilled operator to do this correctly through what is virtually a fixed orifice. What is needed is an automatically varying valve which will allow condensate to be discharged at the rate at which it forms — a steam trap.

The duty of a steam trap common to all designs of trap, is to discharge condensate while not permitting the escape of live steam, but there are several methods by which this may be achieved.

The steam pressures at which the traps must operate may be anywhere from vacuum to the highest pressures in practical use. The quantity of condensate to be discharged may vary from a trickle to a flood. They may have to discharge condensate at steam temperature as soon as it forms, or they may have to discharge it below the steam temperature after it has given up some of its sensible heat units.

To suit these various conditions, so many types of steam trap have been produced, each having its own advantages and disadvantages, that the choice can be bewildering. A closer look at steam trap operation should clear away some of the bewilderment but no one type of trap has all the advantages and no disadvantages.

Having established the need for steam traps and having seen some of the varying conditions that give rise to so many types of trap, let us put the whole matter into perspective by saying that there are only three basic characteristics that differentiate the behaviour of steam and condensate as they arrive at the point where a steam trap has to be fitted. Firstly, the density of steam and hot condensate is different, therefore a float or bucket can be used that will sink in steam and rise in water. These we call mechanical steam traps.

Secondly is the type that differentiates between steam and condensate by temperature difference which operates a thermostatic element carrying a valve — thermostatic traps.

The third group works on velocity and distinguishes between steam and condensate because of the very much higher velocity of steam as it passes through the trap — thermodynamic traps.

Mechanical Traps

Ball Float Type

This consists of a valve, float lever and float as shown in *Figure 8*. The position of the valve is varied according to the level of the condensate in the trap body, the amount of valve opening varying according to the amount of condensate flowing into the trap giving a continuous discharge. Steam is turned on and the float is in its lowest position. Condensate collects in the body. This does not begin to lift the float until the valve seat is covered. After this level, any further condensate will raise the float and condensate will be discharged. The amount of valve opening depends upon the position of the float. Unless some means is provided for releasing air, condensate is prevented from flowing into the trap which then becomes air bound. To overcome this, float traps are available with an automatic air vent consisting of a small balanced pressure thermostatic element carrying a valve. The valve is wide open when the element is cold but as soon as steam is present this valve closes.

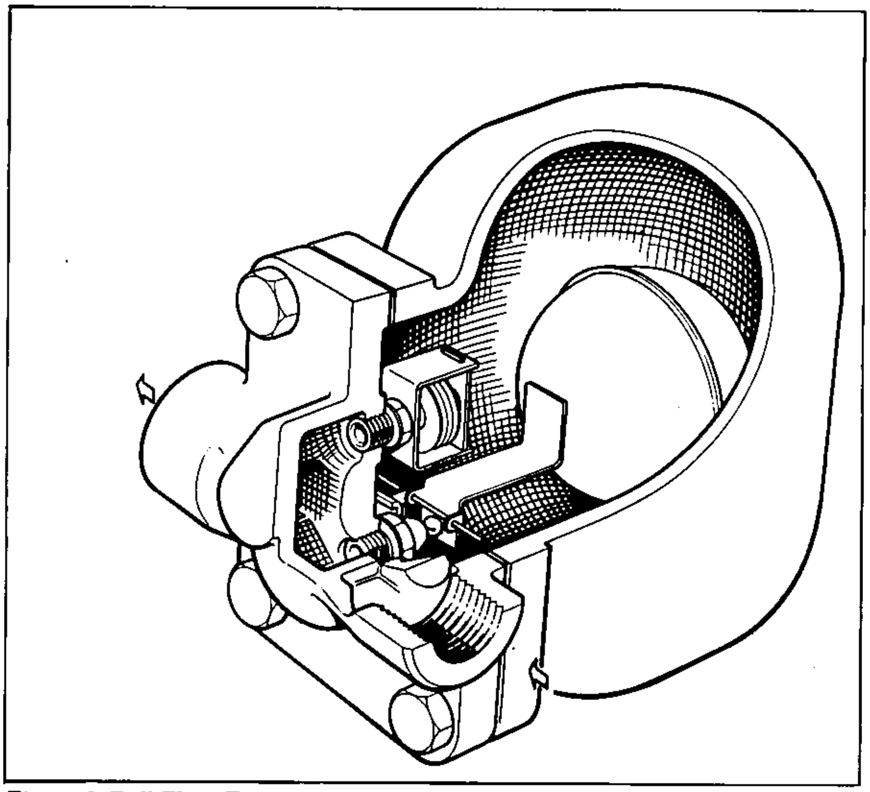
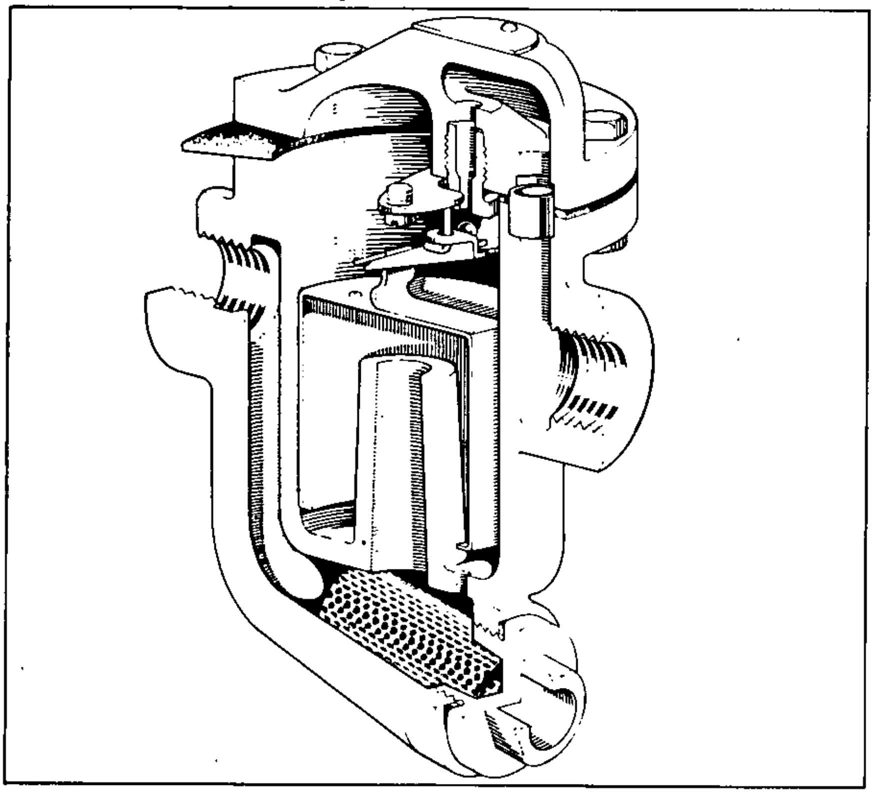


Figure 8. Ball Float Trap.

Inverted Bucket Trap

The operating force is provided by steam rising into an inverted bucket, see *Figure 9*, causing it to float in the condensate with which the trap is filled. The water in the trap is generally known as the "water seal". If no condensate reaches the trap for a while, some of the steam in the bucket condenses, the bucket sinks and the valve is opened. Inverted bucket traps discharge intermittently. To generalise on the uses of bucket traps, they can be used on similar applications to float traps, where waterhammer cannot be avoided. Initially, the bucket lies on the bottom and the valve is opened. Condensate fills the body and bucket, the valve is still open and condensate is discharged. Steam reaches the trap and passes into the bucket. Steam displaces the water inside the bucket so that the bucket floats and shuts the valve. Condensate gradually fills up the bucket until the buoyancy is lost, the bucket sinks, pulls the valve off its seat and condensate is discharged.

Figure 9. Inverted Bucket Trap.



Thermostatic Traps

There are three basic types, metallic, liquid expansion and balanced pressure type (*Figure 10*). In the latter, the thermostatic element is made of stainless steel. On the bottom of the element is a valve which is free to enter the valve seat if the element moves downwards. The element is held rigidly at the top so that any movement of expansion or contraction must take place only at the free end. The element is filled with a spirit mixture which has a boiling point lower than that of water so that (being sealed in the element) if it is heated to the boiling point of water at any pressure, a pressure will be generated inside the element greater than the steam pressure outside it. The element will, therefore, expand until further movement is stopped when the valve reaches the valve seat. The pressure in the element will then hold the valve firmly in its seat. The trap will automatically adjust itself to variations of steam pressure within its range.

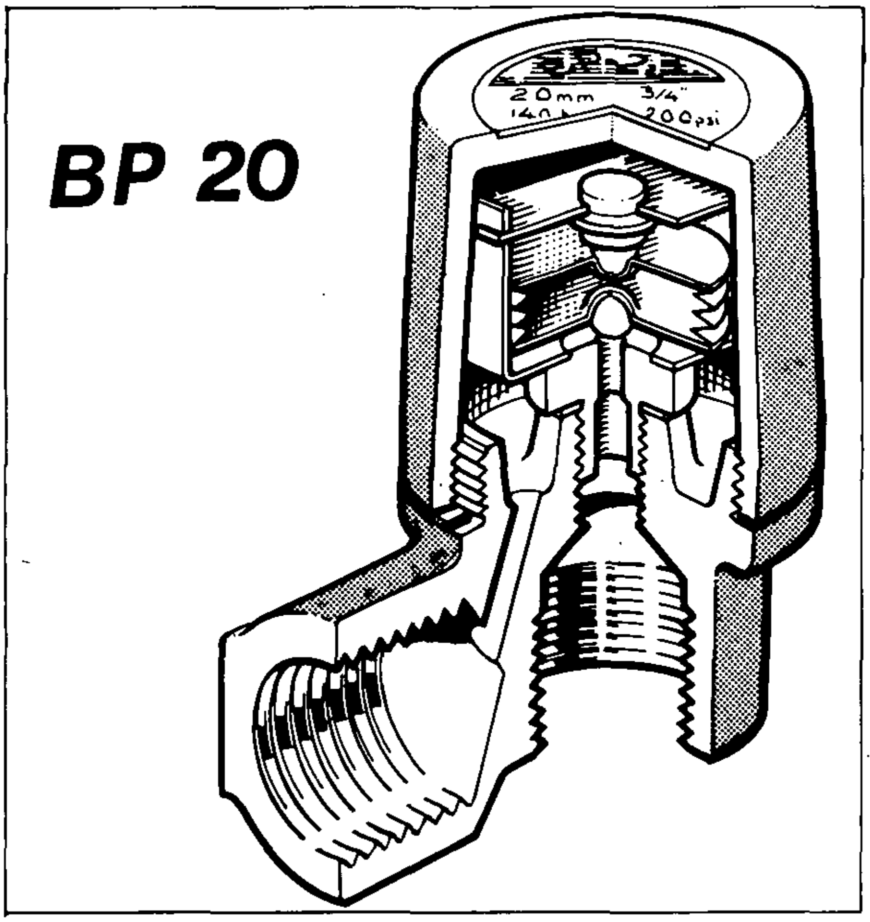


Figure 10. Balanced Pressure Thermostatic Trap.

Thermodynamic

This trap, shown in *Figure 11*, opens because of thermal losses from the top cap and closes due to the dynamic action of steam or flashing condensate. It is the most simple in construction but for most of us the most difficult to understand. It closes when condensate at the inlet orifice starts to flash to steam, to produce low pressures under the disc which is drawn down on to its seat. It therefore closes with condensate on the upstream side and, as with all flooded valves and seats, it does not normally pass live steam. It opens when heat losses from the control chamber above the disc cause a drop in pressure within the chamber which allows the disc to lift.

There are many modifications of the trap principles we have looked at and each of the traps has its own advantages and disadvantages. Good steam trapping consists of knowing the characteristics of the various types of trap and matching them as closely as possible with the characteristics of the jobs to which they will be applied.

A booklet 'Practical Steam Trapping'[1] lists typical applications, each with a practical diagram and shows first and second choice of steam trap for that job with the advantages and disadvantages of each type of trap.

Let us now move on to steam trap selection and installation. Having decided on the type of trap, we must now size it. To do this we must know both the capacity and the differential pressure across the trap. For a piece of plant with a load of 500 lb/h, we do not merely select a trap to pass this amount. This is the running load and it is doubled to cater for start-up conditions when air may be present as well as cold condensate and heat transfer rates are at their greatest. Next is the question of differential pressure. It must be remembered that we may be imposing a back pressure which will effectively reduce the differential pressure.

As far as actual trap installation is concerned, the golden rule of steam trapping is to make it easy for the condensate to get to the trap, for no trap can make the water come to it. If at all possible, it is best to fit the trap below the drain connection as a drop of even a few inches is always an advantage. Most traps should be fitted close up to the drain connection, otherwise steam locking may occur. Exceptions to this rule are the various thermostatic traps where a cooling leg of unlagged pipe is needed between the drain point and the trap to allow the condensate to lose some of its sensible heat.

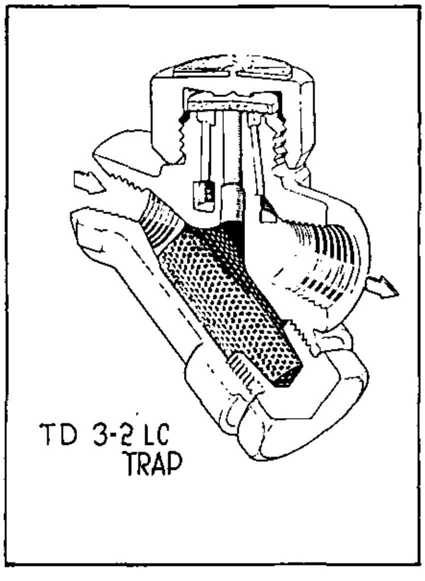
Condensate Recovery

Having fitted a steam trap the steam gives up all its latent heat and changes its state back to water — it has condensed. It is here that problems sometimes begin. It has been said that "if only steam would vanish to nothing when it condensed, it would save a lot of trouble running pipes to drain". This is hardly the correct attitude since this condensate is hot water and it contains sensible heat units that have been added by burning valuable fuel in every pound. It has also been chemically treated to reduce scale formation, so it is good quality hot water. The cost of water itself is also rising dramatically. So there are three reasons for returning condensate:

Fuel economy to save the sensible heat units.
Cost of water treatment.
The cost of water itself.

A frequent difficulty in returning condensate is that it can be too hot to handle. The problem may be that, due to the high temperature, cavita-

Figure 11. Thermodynamic Trap.



[1]Published by Spirax-Sarco.

tion takes place at the feed pumps. It may be possible to raise the height above the feed pump or to lift the water to a head tank. It is possible, in fact, to take some more heat out of the condensate via a flash recovery system. With a heating calorifier, see *Figure 12,* this takes the form of a flash condenser and condensate sub cooler. With other plant it may be necessary to instal a flash vessel. High temperature (pressure) condensate is fed into the vessel and low pressure steam is flashed off which can then be used elsewhere as shown in *Figure 13.* Flash steam is good quality steam and it is virtually free. there are times, of course, when it isn't possible or economical to return all the condensate. The condensate may be contaminated but even then some heat can be recovered by passing it through a heat exchanger. With fuel costs rising, even on the most extensive site, the economics of not recovering condensate must be very carefully calculated.

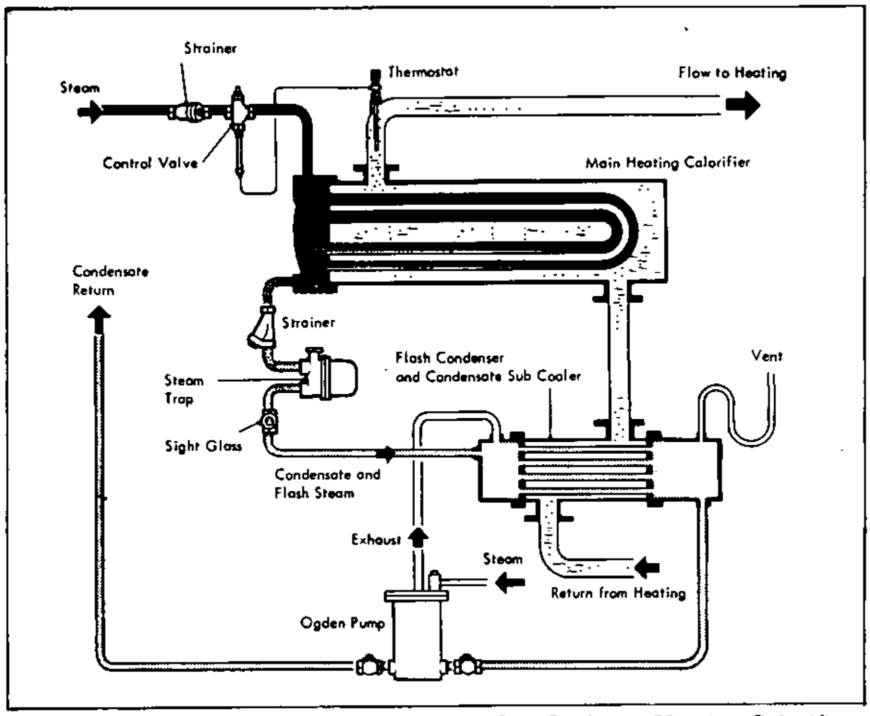


Figure 12. Flash Condenser and Condensate Sub-Cooler on Heating Calorifier.

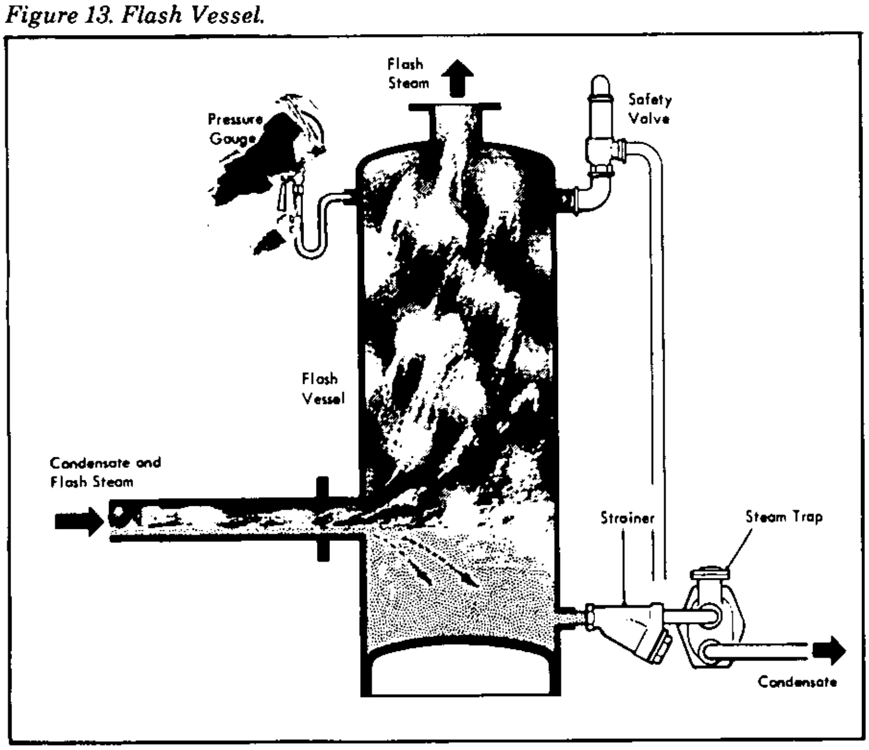
All the trap discharges must be collected together into a common pipe-line but what size should it be? The line has to handle:

On start-up, air discharged by traps.

This is followed by a large amount of cool condensate, perhaps two or three times the normal running load.

As the plant warms up, so the amount of condensate reduces to the running load but as condensate nears the steam temperature, there may be some flash steam.

Figure 13. Flash Vessel.



Experience has shown that if the pipe is sized as if it were carrying water under the starting conditions all eventualities are catered for. It is generally safe to assume that for most average systems, the starting load will be twice the running load. Again, tables and charts are available to make life easier.

Another question frequently asked is "will your trap lift the condensate?" The answer is that no trap lifts condensate — it is the steam pressure at the trap which does the lifting. A lift of 2 ft is possible for every 1 psi of pressure available but this presents a back pressure and reduces th differential pressure across the trap. This must be taken into account when selecting a trap.

With temperature controlled plant, lifting condensate is not to be contemplated and in all cases of temperature controlled equipment, condensate must return by gravity to a vented receiver to prevent problems such as waterhammer, tube corrosion and noise.

Having discussed good quality steam, keeping pipe sizes to a minimum *etc* in order to make the most of energy, two other vital factors must be mentioned. The first of these is insulation. There is little point in taking all the steps along the way if steam and condensate pipework is not effectively insulated. Flanges and valves must not be forgotten — the waste of energy can be very surprising. Finally, do pay attention to regular maintenance of plant and attend to leaks promptly. A $\frac{1}{8}$ in. hole gushing steam at 90 psig can waste 1000 gallons of oil per year over an 8 hour/5 day/50 week working year.

Aerial Heat Loss Survey of Hospitals

J. H. ARMSTRONG CEng MIMechE
West Midlands RHA

Introduction

Energy conservation has risen in importance over the last few years to the point where everyone is aware of it. With the constantly escalating prices of all fuels the necessity to conserve energy is being felt everywhere.

With an approximate annual fuel bill of £130 million the NHS is very much aware of the importance of saving energy. One obvious way is by identifying areas of heat loss on existing sites.

In the West Midlands Region, with an annual fuel bill of about £15 million, much use was made of the Department of Energy subsidy to pay for an energy survey of premises by an accredited fuel consultant. This was found to produce a report of interest but did not provide an overall view of a site which gave areas of heat loss on a comparative basis, showing the areas of high priority for remedial work.

Initial interest in Aerial Surveys

In the latter part of 1978 Area Works Officers at a meeting at Falfield were given a talk on the use of Infra-Red Photography for aerial heat loss surveys and the applicability of this technique to hospitals.

As a result of the talk several AWOs in the West Midlands approached the Region to obtain more information on the process. It was found that the commercial application of the infra-red survey technique was principally undertaken by Fairey Surveys Ltd, of Reform Road, Maidenhead, Berks, although other organisations also carry out similar work.

It was decided to obtain a quotation from Fairey for the larger sites in the Region. A Regional approach was agreed because of the benefit of one order for several sites. The sites were chosen mainly on the basis of those having over 100 beds, though AWOs were consulted on the proposed lists and some amendments made. This resulted in approximately 100 sites to be surveyed.

Fairey Surveys required map references for each site to enable them to plan their flights and also site plans (mainly provided at 1:1250 scale) to be used in the final reports.

Technique of Infra-Red Survey

Essentially an infra-red survey provides a picture of the ground which indicates the relative temperature variation of the surface features. Thus, for areas of roofing, variations in the surface temperature within one building can be recognised and hence the relative heat loss evaluated. With respect to pipes, the infra-red image is capable of detecting leaks or inadequate insulation both when the pipe is underground as well as at or above surface level.

The temperature of a body is proportional to the energy being emitted from it. The energy is emitted in part in the infra-red range of the electromagnetic spectrum and the intensity of infra-red energy emitted is chiefly a function of absolute temperature and emissivity. Emissivity refers to the capacity of a substance to absorb and subsequently emit electro-magnetic radiation, and is expressed as the ratio between the amount of energy emitted by a substance and the amount of energy which would be emitted by a perfectly efficient electro-magnetic radiator (ie 'black body') at the same temperature.

Thus, if the amount of infra-red radiation emanating from two objects with the same emissivity can be compared, their relative temperatures can be measured. Similarly, variations in infra-red radiation from a source which is at uniform temperature indicates that objects in the source have different emissivities which for a particular building may indicate insufficient insulation or damaged structure.

Survey equipment

The survey equipment consists principally of a thermal line scanner (see *Figure 1*). This essentially is a telescope which focuses the received radiation on to thermal detectors. The field of view of the scanner is continuously being re-directed by a spinning mirror which causes the system to scan in a plane perpendicular to the line of flight. The image is generated line by line through the

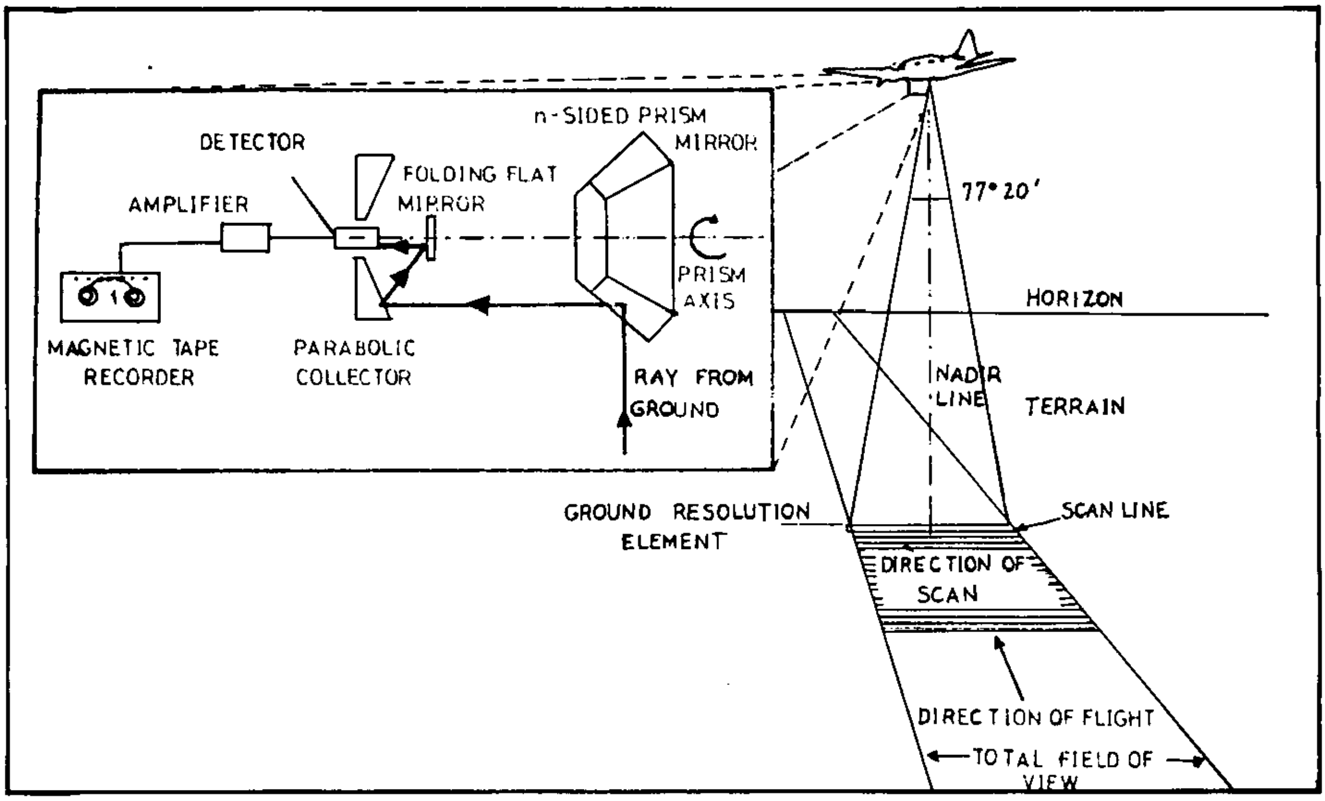
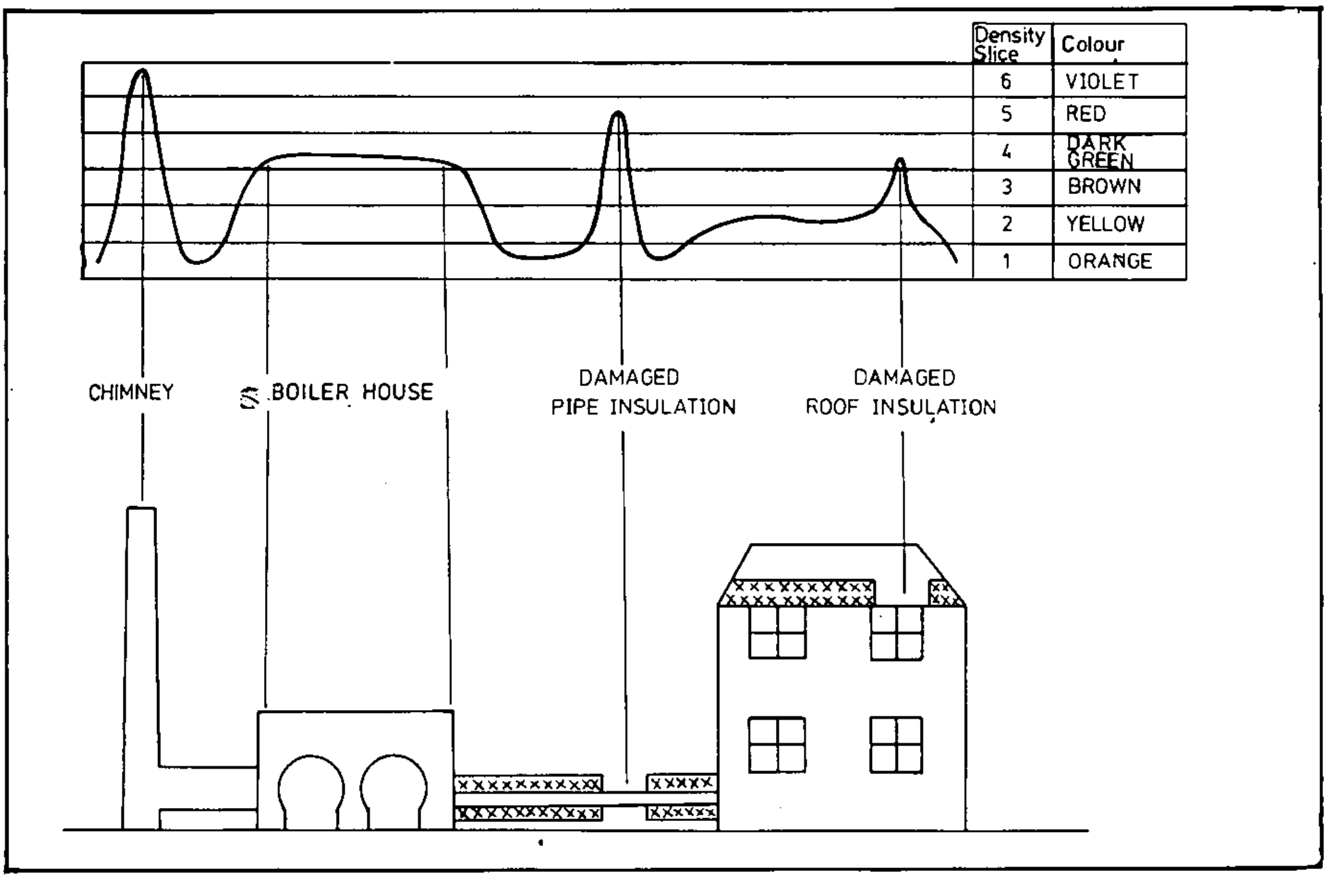


Figure 1. Simplified diagram of an airborne thermal scanning system. Incoming radiation is detected, amplified and stored on a magnetic tape.

Figure 2. The concept of density slicing.



In the normal Black and White image there is a smooth change of tones from Black to White. In the density slice, each slice represents a discrete increment with Black and White marking the extremes and four distinct shades of Grey the slices in between. In the coloured image each slice is shown by a separate colour.

forward movement of the aircraft, the speed being regulated to ensure complete ground coverage.

To enable calibration and quantification of the data, two black body reference temperatures are recorded.

The radiation received is transformed into an electrical signal and then recorded in analogue form on magnetic tape.

Data Presentation

After storing the data on magnetic tape it is played back via a cathode ray tube and exposed on to panchromatic film to produce an image for interpretation. The final image is adjusted with respect to the 'black body' reference and two geometric corrections are made, one for lateral distortion due to the mode of scanning and one for compression of the data along the line of flight. This produces a geometrically corrected continuous tone image.

In addition two further images are produced. One is a black and white density slice which produces an image divided up into six distinct series of steps representing particular temperature bands (see *Figure 2*). The second is a progression from the black and white density slice in which each of the six temperature bands is colour coded and an image of the site is produced with the maximum visual contrast between each density slice.

Interpretation and Report Presentation

The heat loss survey includes an analysis of the thermal images by the survey firm together with a written report and site plan showing the main areas of heat loss. Before presenting the written report, the large sites were visited by representatives of the survey firm to gain a detailed knowledge of them and identify such factors as roofing materials, major heat producing areas such as boilerhouses and chimneys, and other similar aspects peculiar to particular sites.

The survey results were presented as a written report briefly describing the type of hospital and the principal heat loss anomalies, together with a complete numbered list of all heat loss anomalies found on the thermal images cross-referenced with their locations on the hospital site plan. In addition a black and white thermal infra-red image, a black and white density sliced image and a colour coded density sliced image for each site were presented with the report together with a black and white aerial photograph, where this was available.

Benefit of Aerial Heat Loss Surveys

From the time the order for the surveys was placed in March 1979 till the reports were received in July 1979 took five months so the turn round time in receiving the information is obviously fairly lengthy to allow for processing and interpreting the results of the aerial survey. However, once received the results have been found to be very useful by Area Works Officers since they readily identify the heat loss areas on a site both by their location and their degree of loss compared with the rest of the site. This quickly gives an indication of where remedial work can most effectively be carried out and could be used for preparing an insulation and energy saving programme. The reports also serve as a useful management tool by proving the effectiveness of energy conservation work already carried out and by identifying areas not already insulated.

Examples of the items highlighted by the reports; besides much detailed information on the state of roof and pipework insulation, were:

the lack of insulation on heated oil storage tanks;

the number of roof vents and skylights which are sources of energy loss;

the extent of greenhouses, garages and storerooms that are heated and therefore adding to the energy bill.

In addition, as a very specific example, it was found that the east side of a large office block was noticeably warmer than the west side. This was discovered to be caused by the control valve serving the east side being stuck in the open position, so effectively starving the west side of heat.

The results have also provided information applicable to future design considerations by demonstrating the effectiveness or otherwise of insulation standards in existing buildings. Additionally a particular problem relating to a leaking flat roof has been helped by the survey since the extent of the damaged roof insulation shown on the thermal image gave an indication of the amount of roof material affected by the leak.

Other spin-offs from the survey have included a greater interest in the engineer's problems associated with energy conservation and publicity material based on the results of the survey which has been used by local energy conservation groups.

Disadvantages of the Infra-Red Survey Technique

Although this technique has several benefits it is only right to mention some disadvantages that were found.

Because the technique relies not only on surface temperature but also on emissivity, problems arise if the emissivity value for various roof structures is not fairly constant. For any roofing material containing a metal base the emissivity is substantially different and very inaccurate results can be drawn since the photographic results of such a roof indicate it to be very well insulated. It is therefore very important to know of any roof constructed from material containing a metal base since the survey equipment needs to be specially calibrated.

The angle at which the survey is done is not perpendicular to all buildings since a scan is being carried out. This means that walls and windows are identified, particularly at the edges of the photographs and the energy emanating from them may camouflage heating pipes running close to the buildings.

A similar problem exists where major heat producing areas exist (eg boilerhouse, incinerator) since the energy from them can obliterate any equipment in their immediate vicinity.

Costs of the Survey

The cost of the survey was approximately £600 per site. Other methods are of course possible but aerial survey results are of more value due to their method of presentation and lend themselves relatively easily to providing information on where energy conservation work can most effectively be carried out. Any heat-loss survey is not an end in itself, it can only serve as a means of determining where energy can be saved. Perhaps the cost of this survey can best be put in perspective by stating that if it results annually in energy saving in the Region of half of one per cent of the current annual energy bill, then the survey cost will have been recovered within 12 months.

Mr Fletcher was Area Engineer with Cleveland AHA until his untimely death last summer. This last article of his occasional series for new entrants is published both as a tribute to him, and to mark the presentation of the Northcroft Silver Medal for 1979 to his widow at the Institute Annual Conference in Seaton Burn.

The medal was awarded for his article "Good Guidance to Boilerhouse Practice and Management" in the May 1979 issue of Hospital Engineering.

For New Entrants

Management — What's it all About?

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Area Engineer, Cleveland Area Health Authority

For my fourth lecture/article, I think it is appropriate that I digress from technical subjects to a subject which causes more than minor problems to entrants into the NHS, namely, Management; arguably the subject on which there has been more theorising, and books written with less consistent impact, than any other single subject.

Possibly the greatest change engineers have to make when entering the NHS direct from industry, is to adjust from a technically orientated background operating under functional management, to what often appears to be a complex and lethargic method of decision making and operation, operating under consensus management, sometimes referred to as 'management by committee'. This frequently leads to a sense of frustration within newcomers to the Service (a feeling that the old-hands have learned to live with). Newcomers frequently ask, what can be done to speed up decision making, with the hope that it will in turn improve management efficiency. Unfortunately, the two do not always go together, quick decision making is not necessarily the same as good decision making.

Perhaps if it were possible for someone to state clearly what everyone's precise role is within the NHS, it would then be possible to eliminate the duplication of responsibilities that occur, and by that I mean what one's role *is*, not what one thinks it is, or should be.

If the parameters of responsibility can be defined clearly, the manager can then plan his resources to produce the best results. If he does not produce the necessary results, then he must have enough knowledge to highlight the reasons for that failure and to take, or recommend, the necessary corrective action.

Before any manager can hope to function efficiently, it is essential that he is clear as to what is expected from his department, and what resources are available for his department to achieve those expectations.

The Works Department can be likened to the second line or back-up troops who provide essential services for 24 hours every day of the year to the first line troops in patient care, namely, medical, nursing, and paramedical staff. I therefore suggest that for any Works Manager to function efficiently, he should develop a close and friendly working relationship with all other departmental heads, particularly medical, nursing, para-medical and administration.

Without this close and friendly relationship, it will be difficult to establish what level of service is expected or required from 'Works', or indeed, the true level of service actually being provided. Only by obtaining advice or information from the 'user' can a Works Manager be clear as to what is expected from his department. A manager must be encouraged to make the best use of available resources at his disposal, to manage his staff effectively, to improve his organisation or department, and to take the necessary decisions to deal with the unexpected and emergencies. The manager must be able to understand the technical requirements of the task at hand and to be able to challenge rules which are ill-adapted to the prevailing circumstances. Managers must bear in mind that the ultimate purpose of all he does is to serve the public interest and assist in better patient care. It is in the interest of the Service that there is a better understanding of each others' jobs and responsibilities. For this reason, there should be a greater interchange between disciplines, joint participation in courses, seminars, etc. Cross fertilisation of ideas should be encouraged. Having arrived at the department's expectations, the next step is to establish the resources available. A manager's resources are material and human. The material resources consist of the fixed assets of the estate and the financial allocation to utilise those fixed assets. Experience shows that the financial resource is invariably what was allocated in previous years with a suitable improvement based on inflation, and frequently bears no resemblance to what is required to provide a factual and professional service. The fixed material resources can only be achieved by compiling a comprehensive inventory of the estate. This can be a tedious and time consuming exercise, hence the reason why so many managers appear to avoid the problem. Nevertheless, whilst compiling a comprehensive inventory of the estate is time consuming, I suggest that it must remain one of the top priorities of a Works Manager. The human resources inventory, although usually quite easy to compile, can raise problems in how best those resources can be utilised, and the one that usually produces the most problems.

Health Service managers are operating in a sensitive environment, and some of the recent criticism of overmanagement (administration) fails to recognise recent Government legislation and the constraints imposed by the environment in which the individual manager works, who, in the majority of cases, is trying to do his job well.

Management by dictat has gone, nowadays a sophisticated level of perception and effort is needed to enlist the co-operation of, and to work in partnership with, the workforce and their representatives.

Industrial or occupation democracy is inevitably, extending within the NHS, and this will place greater demands upon management, particularly middle management. Middle management may be placed in the unenviable position of applying top management policy on a workforce who may have the power to change that policy whenever they wish through strike action or similar.

Frustration of middle management can be reduced by senior management, involving them in formulating policy and making better use of the experience and knowledge possessed by middle management.

There is no simple solution, but the situation can be assisted by:

Making the line of authority clearer.
Giving more autonomy, discretion and variety to managerial jobs and encouraging the use of initiative.
Permitting middle managers to participate in decisions.
Senior management should not become involved in trivial and routine procedures, they should delegate as much responsibility as possible.
Promoting job satisfaction within subordinate staff.

The activities, priorities and behaviour of middle managers is influenced or established by senior managers. The latter usually prescribe their subordinates' authority and responsibilities. Lack of delegation from above usually means that the more dynamic managers become frustrated and may leave the Service. The ones that remain then tend to direct their energies into playing politics and practicing self preservation, often by 'rule by committee', passing the buck, negative thinking, only making a decision as a last resort, etc.

The question 'What's It All About?' still remains unanswered, so I shall endeavour to comment on some of the aims.

Management is About:

Communication

Every manager must have the ability to communicate clearly, articulately, and precisely his aims and intentions.

Be honest
Be clear and specific
Be simple
Be practical
Be positive
Be interesting
Be courteous
Be brief

Delegation

Achieving maximum delegation downwards with matching accountability upwards. Never undertake work that can effectively be performed by subordinate staff. All too often one sees senior management performing trivial tasks. My advice is 'if you enjoy doing your subordinate's work, change places'.

Decision Making

Every manager should be able to recognise the important from the non-important. He should know who will need to be involved in the decision making and to be able to intelligently foresee any future reactions from that decision. The following basic rules in decision making should be noted.

It must be accepted that decisions have to be made with less than specific data.

Managerial time is a scarce resource and valuable time cannot be wasted by using the lack of information to avoid tough decisions. Therefore, decisions have to be made on the data available at that time and place.

Uncertainty must be recognised when present, and then presented in the form of a number of possible alternatives. Recognised uncertainties must be detailed.

There is no such thing as perfect decision making, as the future invariably differs from the expected.

Problem Analysis

Every manager must be able to establish the following.

Is there a problem?
What is the problem?
How best can that problem be solved?
Investigate all alternatives
Choose optimum solution
Specify optimum solution to all interested parties and obtain approval.
Introduce solution and monitor
Obtain feedback on final outcome
Analyse feedback and recommend any corrective action required

Industrial Relations

Every manager should be familiar

with the grievance and disciplinary procedure within his employing authority. Management is about human activity and is determined by the interplay of human forces. Although previous behaviour patterns do not necessarily shape the future, they often provide guidance material for the manager. Therefore, every manager should take full advantage of any industrial relations expertise and experience available. A viable industrial relations system must be one which interacts with its environment no matter how variable and unpredictable that environment may be.

Legislation

Every manager should try to keep abreast of all legislation which will affect the performance of his department and workforce. This, I agree is much easier said than done, particularly over the last decade, but, a manager should take advantage of any specialist expertise and experience available. Managers must be capable of coping with any sudden changes in operational policy brought about by legislation.

Planning

There is often a reluctance to look ahead on the part of management unless forced to do so. Change is often resisted, how often does one meet the cry "it's never been done that way before". Change often shakes the lazy and negative into dynamic action. Every manager should prepare a five year plan as to how he sees his department developing. This plan should be openly discussed with all concerned so that all members of a team can contribute and be aware of what is expected from each and everyone.

Team Spirit

Every manager should promote a feeling of team spirit within his department. A happy team invariably produces better results than a dispirited one. Managers should not shrink from taking workers into their confidence and explain the hopes, objects and goals of the team. A manager will obtain better results leading a team than driving a workforce.

Health and Safety

Although this comes under the legislation heading, I feel it warrants a particular mention. The Health & Safety At Work Act 1974 has enlightened management's awareness of the need to run a safe and healthy place of employment. One of management's most exacting roles is in the safety field and working constructively with union appointed safety representatives. Many managers tend to leave safety matters to safety representatives. This does not relieve managers of their responsibilities and they must know enough about safety matters and procedures to manage and organise their department and staff in a safe manner. If a manager is in any doubt as to his responsibilities and duties under the Health & Safety Act, he should seek immediate expert opinion.

Staff Training

A manager should ensure that a training programme is established to ensure that his staff can effectively, and efficiently, carry out their duties and fulfil their responsibilities. Although lack of finance can prohibit the sending of staff away on expensive training courses, every effort must be made to take full advantage of the excellent DHSS training courses at Falfield. Lack of finance should not prevent a manager from instigating 'in house' training. The lack of training can affect the promotion and career prospects of subordinate staff. Training can introduce variety into one's work role and encourage better individual performances.

Policy Making

The senior manager must be clear as to the aim and object of his department and for the preparation of a factual policy to achieve those aims, etc. Establish a monitoring procedure to ensure that the agreed policy is being adhered to and standing orders are obeyed.

Strategy Development

A manager should analyse the strengths and weaknesses of his department, manpower, standard of maintenance, industrial relations, cost control, etc. Develop a strategy to improve the strengths and eliminate the weaknesses over a set time period (3-5 years). Obtain the approval of senior managers to the analysis and subsequent plans.

Co-ordination

This element in management does not always use special techniques, but is largely achieved by the active skill of the manager, giving practical form to his personal attitude of constructive co-operation and sense of mutual responsibility. This is particularly important in a labour intensive industry such as the NHS with its multiplicity of disciplines.

Leadership

This is where the human skill of the manager is called into play. His task is to fuse the varied individual human capacities and powers of the many people employed into a smoothly working team with high morale and productivity. This can be achieved by securing interest, maintaining loyalty, personal interest, group harmony, preventing frustration, preserving impartiality and encouraging responsibility in the affairs of the department or organisation. Although some people appear to be born leaders, most people acquire it by practice and experience, the best practitioner is invariably the best manager. Leadership appears to be a commodity in short supply within the NHS, although I have met and worked for some very good 'one man bands', I have met very few conductors of an orchestra. I prefer managers who can conduct or lead, rather than being good all round buskers.

It can be seen by the foregoing that management is a complex business, to which there is no easy solution. There is no such thing as an ideal system of management, as society changes so must the approach to management.

The changing role of management is reflected by the replacement of one management technique by another, eg

Scientific Management
Management by Objectives
Functional Management
Consensus Management
Participative Management

Whilst NHS managers may not be expected to be experts on all of the above techniques, they should have some knowledge of the basics involved. This is particularly so for Participative Management, otherwise known as Industrial Democracy. Although Participative Management is receiving great attention at the present time, it is by no means something new, it is literally as old as the trade union movement.

Worker Participation or Industrial Democracy

'Participation' or 'democracy' means different things to different people. Participation can be seen as offering a number of benefits to employers, managers and workers. Employers and managers may see it as a device to contain the growing power of workplace representatives or as a means of reducing conflict and increasing productivity. Some trade unionists see participation as a means of extending their influence over a wide range of issues, including those not traditionally covered by collective bargaining. Others may have wider political aspirations. Participation is a good idea, providing there is a will to participate by all parties involved. There are those who subscribe to the view that the interests of managers and workers are largely at conflict, and expect that industrial democracy will serve to contain the conflict within an institutional framework. There are those who tend to believe that there are common interests between managers and workers, and expect industrial democracy to facilitate decision making based on a joint approach to problems. One view implies that industrial democracy will lead to more bargaining, the other, that it will produce harmonious problem solving.

Participation Management will continue to play an ever increasing role within the NHS. It is therefore essential that managers should understand some of the aims and objectives.

Participation Management is inevitable, and has been given impetus to the evolution of participative practices. Managerial power rests on implicit consent, but managers should contrive to arrange matters so that consent reinforces, and does not conflict, with the power to manage.

The participative aspects of industrial democracy provide a means of gaining acceptance for decisions whose legitamacy might otherwise be challenged.

Participation can provide the means of reorganising work so as to improve job satisfaction, eliminate demarcation disputes, and improve job flexibility, etc. Increased job satisfaction can lower labour turnover and increase productivity.

In a labour intensive industry such as the NHS, one of the crucial factors affecting the standard and efficiency of service provided to the patient is the relationship between the various disciplines, particularly between management and staff. With increased union participation within the Service, it is essential that a good relationship exists between management and worker representatives.

All too often, in the past, this relationship has deteriorated to a state of loggerheads, with its subsequent adverse affect on the patient. The 'us and them' attitude must be discouraged, and can only be detrimental to the Service.

Participation should take into account the relationship between the formal and informal approach to problems. Formal employee participation through committees is impractical without the backing of appropriate administrative assistance to enable the worker representatives to gain access to relevant information. An informal approach through day to day contact over a cup of coffee can often resolve problems before they have time to develop into a conflict situation. A manager should never impose a rule or decision on people that they cannot or will not fulfil, even if it is considered to be for their own good.

Participation should take account of the view, experience and aspirations of employees. Managers and workers should work in an atmosphere of constructive relationships, which recognise and encourage their ability to contribute to decisions which directly affect them. Managers and supervisors who have the responsibility of the final decision must take into account the views of those affected.

Participation invariably means additional work for management through attendance at meetings, and the preparation of subsequent follow-up information for presentation to participative committees.

Workers are interested in greater economic rewards and more leisure time, nevertheless, they have the right to expect more meaningful work and greater participation in management activities. Workers invariably express greater belief than managers in group activities as opposed to individual activities, and participation may increase identification with and commitment to decisions made.

Autonomous work groups, as practiced in the Swedish Car Industry, is a form of participation management which enables certain goals to be established by managers and workers whilst encouraging job satisfaction.

Employee participation is demanding, and difficulties and differences will occur which will require all those involved having to co-operate and persevere with the principles that have been agreed. The measure of participation will be the success of the department, the effective use of resources and the satisfaction managers and employees will receive from their participation.

If the answers to the following questions are positive, then participation management should be encouraged.

Do workers have valuable information to contribute?

Do workers have the same aims and end result in mind?

Do workers have the same fundamental set of values?

Before the introduction of participative management,

Training must be provided.

Effective work groups must be established.

Ensure that the members of committees are capable of discussing and understanding the topics under discussion.

Provide appreciation/briefing modules for those employees not formally involved in the participation structure.

Establish Joint Consultative Committees to establish objectives, targets and monitoring of results.

The current growth of union involvement in management problems has led to Joint Consultative Committees, which have taken over some functions which were previously the prerogative of middle management. This has left middle management with the administration of many of the procedures arising from participative meetings, but with little of the substance of power.

This in turn can lead to loss of initiative and frustration within middle management, who may feel that they are trapped between the big power groups, ie Government/Senior Management/Trade Unions. Low morale and lack of commitment can develop among middle management, who may feel that their function is solely to implement and administer decisions and rules to which they did not contribute. This can be reduced by involving middle management in all participative committees.

A good manager should have integrity, consistency, motivation, intelligence, sound judgment, experience relating to his duties, independence of thought and the ability to communicate clearly with both management and the work force.

Good management lies in rational conclusions from observed facts, expressed in terms of humane and effective action, monitored honestly to check that the predicted and unforeseen results conform with logically selected objectives, and at all times subjected to the test of reality.

Managers should only attend meetings to which they can make a positive contribution, there are too many within the NHS who attend meetings purely for the status symbol they misguidedly think they provide. A manager's efficiency is often hindered by the amount of information that has to be processed before attending non-productive meetings.

The basic resources of a works department are its measurable assets, ie land, buildings, plant, machinery and personnel. Of these, the most important is the personnel at all levels, they influence the optimum utilisation of the material side of the estate. Therefore, management should ensure that the correct environment exists in which people can operate at their most effective level of performance. Managers should treat the work force as members of his team and not as an encumbrance, a pluralistic approach to decision making should be encouraged. A pluralistic frame of reference accepts that there are sources of leadership, authority and loyalty other than management, and these can be encouraged by adaptations in work organisation, work rules and work practices, and that direct negotiations with work groups is an essential part of modern management. Often staff do not object to the amount or type of work they are doing, but to the way in which they are told to do it and the rewards they subsequently receive. To quote Carl Duer everyone has to: *Go home tired, Earn good money, Be proud of their days work, Enjoy doing their work.*

Every manager should ask the following basic questions.

Am I delegating correctly?
Am I supervising correctly?
Am I paying sufficient attention to the most important problems?
Am I wasting too much of my subordinates time with pointless duties and investigations?
Is my boss wasting too much of my time?

Finally, I repeat there is no quick or easy way to becoming a good manager, one has all too frequently to attempt to do one's best with inadequate resources to satisfy impossible customers, at the same time keeping abreast of changing conditions, and at the constant risk of being buried under paperwork.

If you have any doubts as to whether or not you are a manager, ask yourself a simple question — "Am I managing or am I working" — you certainly cannot be doing both.

Accountability

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Accountability, though of ancient standing, is part of modern management jargon, and a pleasant word, and usually believed only to apply to others. This slightly cynical thought has given rise to the following paragraphs designed to identify the philosophy appropriate to responses to shortcomings.

Introduction

A manager who is accountable for a service is responsible, inside whatever constraints are applied, for the success or failure of the enterprise. The constraints in question can hamper his success or encourage (or cloak) his failure and so it is important to limit those constraints so far as is practical. It might be thought that the most readily seen accountable condition is when a person is in sole charge of a tactical situation using the tools, weapons and facilities that he has freely chosen to achieve ends which he has accepted.

Aims

The primary objective of accountability is not to locate failure or allocate blame. It is adopted to permit a free-ranging of managerial and/or technological skills and abilities, to promote a sense of responsibility for men and product, to encourage pride in a job well done and to motivate those so appointed to achieve continuously improving standards. It should be designed to encourage the kind of challenge to which intelligent human beings respond. Wherever accountability promotes fear — and it most assuredly can — the man (or woman) so concerned has been wrongly chosen and the fault is not with him but with those who chose him.

Failure Signals

There are two criteria to apply to the outturn in any accountable situation, namely:

have the forecasts generally accepted been reasonably met; and are the standards achieved in quantity and quality an improvement on previous endeavours?

Some would argue that the second question is the more important. It is only if there is a downturn in either of these matters that failure can even be suspected and enquiry started to determine the source of weakness. It might be argued that three financial years might have to pass in normal circumstances before fair judgments on individuals can be made. Let it be said here and now that the foregoing is concerned with ordinary business circumstances. Acts of financial, technical and administrative negligence must be dealt with on their merits — or demerits.

Accountable Staff — and Others

Careful selection of new personnel, selective training, properly prepared appraisal reports, intelligent career development and a continuing review of potential promotees should ensure the production of an adequate number of accountable and responsible people and the question arising perhaps at, say, Deputy Manager and certainly at Manager level should be degree of competence rather that prospect of failure. In the more junior ranks performance may be expected to be more patchy for a variety of reasons — limited experience, lack of training, no initiative, over-promotion, etc. But criticism of junior ranks should always be voiced in full acknowledgment of the fact that they are junior, and can be expected to act accordingly. On the whole, critism should rise in pertinence and severity in direct proportion to the rank of the individual in focus. Senior staff may vary in performance. They should not 'fail' — though they may be expected to make individual mistakes. Skilled promotion boards, based on long and short term merit, should achieve a success rate of 3:1 at the first tier and ought continuously to be more successful in more senior rounds. In senior grades adequate performance ought normally to be the expected minimum providing the staff appraisal and promotion system is skilfully and wisely applied.

The Unsuccessful

All the world can recognise a success, though standards vary. Identifying failure is a much more chancy business and requires a starting point in self-examination to put the enquiry into proper framework. If the individual has been over-promoted for any reason — the organisation responsible for the choice must carry the consequences and solve the problem as best it might. The procedures for identifying and locating failure in these circumstances must be the same as for an individual appointed for the best possible reasons and who has failed to perform in accordance with expectation. The following steps might be taken in dealing with an apparently incompetent man or woman:

Paternal discussion by immediate senior on shortcomings with encouragement well to the fore and help proferred.

Verbal warning of prospects of a formal report on shortcomings (to head of Establishment or Personnel).

Written warning (after agreement with H/E) stating shortcomings and forecasting disciplinary action.

Transfer to another section (and another senior) to provide a new start (arising from and part of (iii)).

Special review of transfer as at (iv) after twelve months and repeat as necessary steps (i), (ii) and (iii) followed by (a) demotion and (b) in the ultimate some form of retirement or redundancy.

Time periods between activities are matters for judgment but three or six monthly gaps are in mind. As of course is Justice. Many managers mismanage indirectly by niggles and grumbles. In taking these steps the offender must be under no illusion about the managerial intention.

Below Standard Performance

There should be no doubt about the performance of new or promoted staff after static employment for two years or so. With a sound staff appraisal system potential for promotion could be identified fairly well after about five years. Absolute failure should be a very rare occurrence, relative failure slightly surprising, and satisfactory performance the general rule. Absolute failure would be a fall-back over two or more years in standards already agreed, set and achieved. Relative failure could be mixed variable results over a similar or maybe longer period. Individual results within 10% of forecast might be argued to be good, inside 25% not awful. Different standards clearly must apply (in the building industry for instance) to New Works, Maintenance and Operations.

Continuous performance then is susceptible to some kind of accurate forecasting and monitoring. Negligence is a much more random occurrence. Negligence arises, from a lack of foresight or declared skill. As a starting point it is wise to adopt the assumption that neglect is not in question — just human fallibility. Repetition of failure should cause deeper reflection. To be more pertinent, the failure of a single diesel engine satisfying a vital function could properly be argued to be a sign of incompetence. The failure transiently of one out of a battery of four even if inconvenient must be regarded as a hazard in modern technology — even given planned preventative maintenance.

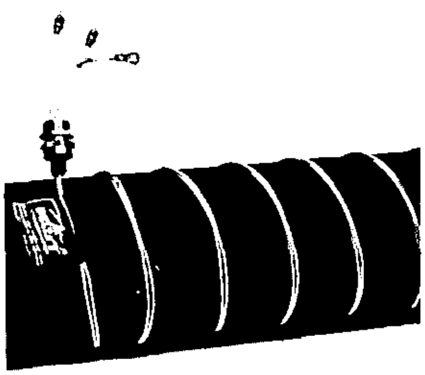
And so it might be argued that in searching for technical staff, in training, selecting and promoting them, the search must be for foresight — as in every other facet of business — allied to skill. On balance, foresight is the required predominating quality based as it must surely be on analytical ability, wisdom and understanding.

Product News

New Trace Heater

A new electric trace heater — the Deltatrace STF — designed specifically for the freeze protection of water pipes, valves and tanks, has been introduced by Delta 'T'.

The Deltatrace STF is available in lengths from 3.5 m to 100 m and is suitable for the freeze protection of all emergency water pipelines such as fire mains, sprinkler systems, safety showers, as well as process and non-essential lines.



Under freezing conditions and using a thermostatically controlled system, the Deltatrace STF automatically replaces the heat loss through the thermal insulation, thus maintaining the pipe at a temperature above zero °C, yet without consuming unnecessary electrical energy.

The Deltratrace consists of twin PTFE insulated conductors within a braided stainless steel armouring, making it mechanically tough to withstand impact, resistant to most forms of chemical attack, weatherproof and capable of tolerating temperatures up to 200°C and high transient voltages under fault conditions.

Full details from: Delta 'T' (Trace Heating) Ltd. 155 High Street, Potters Bar, Herts, (Tel. 0707 44866).

Flotrol Cradle

The Flotrol is a piece of equipment which enables you to conform to the recommendations of the Health and Safety at Work Act on lifting objects and weights, and to prevent spillages.

The Flotrol Cradle accepts nearly any body shape of 25 litre liquid container and this can be loaded into the cradle without lifting. Thereafter only finger tip pressure is needed to pour. No maintenance is needed.

Further details: from Debiquip Ltd. 80 Spencer Road, Belper, Derbys. DE5 1JW.

New Static Inverter

Mawdsley's Limited of Dursley, Gloucestershire, have launched a new Transistorised Static Inverter.

The equipment is designed for applications demanding a high-quality, uninterrupted three-phase power supply. It is intended for applications where the load is sensitive — for example computer installations,or hospital systems — and also when the mains supply is subject to distortion. The unit is capable of accepting the wide voltage and frequency tolerances which are often a feature of low-quality power supplies. A stabilised output, with a clean, sinusoidal voltage wave form is produced which is especially suitable for supply to sine wave distorting loads. The unit may also be used to change the

frequency between the mains supply and the requirements of the load.

It is available in three capacities: 7.5 kVA, 15/25 kVA and 50/75 kVA. Greater capacities can be achieved by using two or more units. In addition, they can be used in conjunction with an auxilliary battery power supply, to provide uninterrupted power in the event of mains failure.

Further information from: Mawdsley's Ltd, Zone Works Dursley Gloucestershire GL11 5AE Tel: 0453 4131

High Volume General Purpose Pump

A new general purpose pump has been added to the Flexian range. Specifically designed for arduous, continuous high volume pumping it combines a 3 in. × 3 in. (7.62 cm × 7.62 cm) impeller pump with suction lift, and the Petter Acl 6.5 BHP air cooled diesel engine.

The pump is designed to deliver from 185 gpm at 20 ft lift 23 ft. head up to 245 gpm at 5 ft. lift 20 ft. head. Max Head 90 ft. Max Lift 20 ft.

Skid mounted the pump is self-priming and can be trailer or barrow mounted if required.

Uses include irrigation, de-watering, tank filling, etc.

Price: Ex-Works price is £765.00. Additional hose requirements can be supplied on request.

Further imformation from: Flexian Hydraulics Ltd, Mitchell Road, Churchfields, Salisbury, Wilts. 8P2 7PZ Tel: 0722 24433

New Giant Lathe

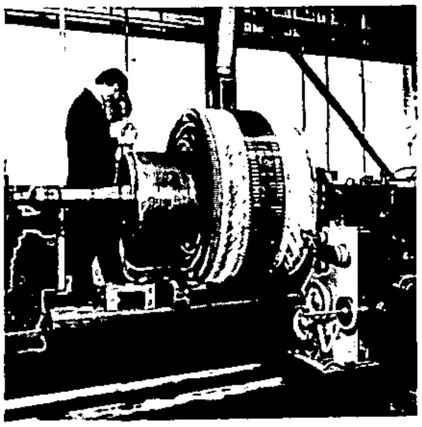
A 32 ft long Louden lathe has just been installed in Dowding & Mills' Sutton-in-Ashfield, Nottingham, repair centre which will allow the Centre to increase its round-the-clock' service to industry over a wide area of the country — from the industrial Midlands to the East Coast.

The lathe has a swing over its bed of 62 in. in diameter and an 8 ft swing over gap. Among its many advanced features are full electronic control and variable motor speed control from 0-800 rpm.

The lathe will allow Dowding & Mills to work more efficiently and quickly on the largest motors, and they see this as a major improvement to their service to customers.

The lathe was re-designed to Dowding & Mills' specifications by Steel Machine Tools Limited of Ratcliffe Road, Atherstone, Warwickshire. SMT also installed and commissioned the new equipment.

Further information from: Dowding & Mills Limited, Camp Hill, Bordesley Birmingham B12 0JJ. Tel: 021-773 8431



Electrical Generating Sets

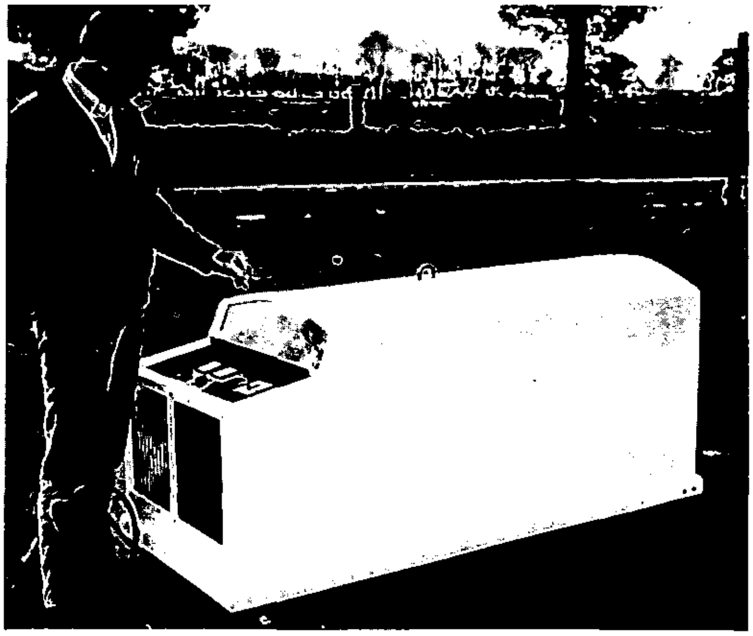
A range of two-pole generating sets fuelled by LP gases has been introduced.

Seven models are included in this range, with power outputs ranging between 12.5 kVA and 32.5 kVA. 50 Hz. All the models are available as static or mobile equipment and can be supplied for either manual or automatic start-up.

The generating sets utilise a 1600 cc spark-ignition engine adapted to operate on propane or butane. The two-pole alternator powered by the engine will produce either 240 V single-phase or 415 V three-phase outputs.

An optional extra facility offered with these LPG-fuelled sets is heat recovery in the form of a hot water supply at 90°C.

Further details from: Sterling Power Company Ltd, New Platt Lane, Goostrey, Cheshire CW4 8LL



Classified Advertisements

APPOINTMENTS AND SITUATIONS VACANT

HERTFORDSHIRE AREA HEALTH AUTHORITY – EAST DISTRICT

DISTRICT ENGINEER

Salary scale £7,818–£9,303 pa plus £141 pa Outer London Allowance.

Applications are invited for this post which is now vacant.

Applicants must have a sound knowledge of the maintenance of engineering services and equipment in hospital buildings.

The district includes Welwyn Garden City, Hertford and Hatfield and has a wide range of health care buildings. The total number of hospital beds is approximately 900.

Only those candidates who possess the requisite qualifications specified in the relevant circulars will be considered.

Application forms and job description are available from Area Personnel Officer, Hertfordshire Area Health Authority, Hamilton House, 111 Marlowes, Hemel Hempstead, Herts. Tel: 61663 ext 278.

Closing date May 23, 1980

HOSPITAL ENGINEERING CENTRE
EASTWOOD PARK FALFIELD, AVON

LECTURERS

Lecturers are required at the above Centre located between Bristol and Gloucester which provides residential training courses for all grades of Works Staff employed in the National Health Service.

Candidates should be qualified to at least HNC standard in either Engineering or Building and have relevant mechanical, electrical or electronic engineering or building experience in either the National Health Service or industry and/or teaching experience.

Salary scale £5,850 to £6,900 per annum. Commencing salary may be above the minimum of the scale for a candidate whose qualifications and experience are appropriate.

TECHNICIAN DEMONSTRATORS

Technician Demonstrators also required at the above Centre.

The successful candidates will be required to construct, install, test and maintain various types of electrical, electronic or mechanical equipment as found in hospitals under the direction of the Lecturing staff and to explain and demonstrate the operation of the equipment to adult students.

An appropriate Ordinary National Certificate or City and Guilds Certificate is desirable together with some practical engineering experience.

Salary scale £3,771 to £5,148 per annum. Commencing salary may be above the minimum of the scale for a candidate whose qualifications and experience are appropriate.

Application forms stating for which post, also further information regarding the centre are obtainable from Mrs D. M. Little, Personnel Section, South Western Regional Health Authority, UTF House, 26 King Square, Bristol BS2 8HY.

Closing date May 16, 1980

Bexley Hospital

Old Bexley Lane, Bexley, Kent

Senior Engineer

Salary £6,413–£7,361 including London Weighting

This large hospital provides a service for four health districts. The person appointed to this senior position will gain valuable experience for promotion within the Health Service.

A man/woman qualified to HNC or equivalent approved standards in engineering is required. New entrants to the NHS commence at the minimum of the salary scale.

For application form and job description please contact: The District Personnel Department, Bexley Health district, 221 Erith Road, Bexleyheath, Kent. Tel 01-301 2333 ext 63.

For an informal discussion about the post contact Mr Woolley, District Works Officer on ext 22.

Closing date May 16, 1980

BEXLEY HEALTH DISTRICT

Lancashire Area Health Authority

Blackburn District

Accrington Victoria Hospital

Engineer

Applicants are invited from Engineers who have completed a recognised apprenticeship in mechanical or electrical engineering, hold a minimum qualification of an Ordinary National Certificate and have relevant experience as an Engineer in plant maintenance.

The successful candidate shall assist the Senior Engineer to manage the operation and maintenance of all engineering plant, equipment and services in the Accrington Victoria Sector.

The Sector covers a large geographical area comprising an acute modernised hospital, a geriatric hospital, numerous large and small community properties including ambulance stations. The properties are to be further developed and the scope of the work shall provide an interesting opportunity to gain promotion in hospital engineering.

Application form and work description are available from the District Personnel Officer, Queen's Park Hospital, Blackburn, BB2 3HH. Tel: Blackburn (0254) 661311 ext. 223

Closing date May 16, 1980

£500 ENERGY SAVING COMPETITION

Hospital Energy Conservation Year 1980

Wanted	Your ideas for Energy Saving Schemes
Reward	You can win a cash prize, and have your idea published in Hospital Engineering Magazine
Who?	Anyone who works in or with hospitals (or uses hospitals) e.g. Administrators, Doctors, Nurses, Ancillary Staff, Engineers, Patients and Visitors
When?	Submit your entry anytime until October 1980
Subject	Enter in any of the classes below

1. Modifications to Plant (Heat Recovery etc) which have been implemented and proved
2. New Ideas for Plant Modifications, etc, which have still to be evaluated
3. Non-Engineering Suggestions for Conservation Measures
4. "In-House" Publicity Schemes, eg Regular Hospital Energy News Sheet for all Staff
5. Poster Design for Encouraging Energy Savings in Health Care

Prize - £100 per class (prizes may be shared or not awarded at all, at the judges' discretion. See full rules for further details.)

The Institute of Hospital Engineering, 20 Landport Terrace, Southsea, Portsmouth, PO1 2RG