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March 1979

International Federation Issue

The Journal of the Institute of Hospital Engineering

I.F.H.E.

Centralised Control of Engineering Services

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HOSPITAL ENGINEERING

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Institute News

35th Annual Conference

Spiders Web Motel, Watford By-Pass (A41), Bushey, Herts, May 9-11, 1979

The Conference
is the 35th Annual Conference of the Institute and will be held at the Spiders Web Motel, Watford By-Pass (A41), Bushey, Herts.

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

Conference Registration
Application forms have been sent to members, and are available from the Secretary of the Institute.

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

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

Conference Dinner Dance
will be held at the Spiders Web, on the evening of Thursday, May 10, 1979, when the principal guest and speaker will be Mr Eduardo Caetano, President, The International Federation of Hospital Engineering. Other distinguished guests will include: Mr John Bolton, Director of Works, DHSS; Mr T. A. Nicholls, Chief Engineer, DHSS; Mr M. C. Hardie, Director General, International Hospital Federation; Mr W. G. Cannon, Director, King's Fund Centre.

Ladies' Programme
As usual, a special Ladies' Programme has been arranged, as shown. An introductory meeting will be held in the Spiders Web on the first morning of the Conference.

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

Conference Programme

Wednesday, May 9

10.15 a.m. OFFICIAL OPENING by
W. F. HODSON, Esq,
Member, North West Thames Regional Health Authority
Introduced by
J. R. HARRISON, Esq, CBE, CEng(Fellow),
President, The Institute of Hospital Engineering

10.30 a.m. 'SITE INSPECTIONS AND PROCEDURES'
Speaker: F. D. P. BERRY, MSATT,
Associate, Yorke, Rosenberg Mardall
Chairman: P. E. BATHURST, FRICS,
Regional Works Officer, North West Thames Regional Health Authority

2.30 p.m. 'SITE PROGRESS AND VALUATION'
Speaker: R. D. DANN, TEng, MIPlantE, FIHospE, ACIBS,
Resident Services Engineer, Oxford Regional Health Authority
Chairman: W. S. WILLIAMSON, CEng, FIMechE, FCIBS, FInstF, FIHospE, MBIM, MConsE
Partner, Oscar Faber and Partners

7 p.m. to 7.45 p.m. *PRESIDENT'S RECEPTION*

Thursday, May 10

9.30 a.m. 'THE PUBLIC UTILITIES — INTO THE 21st CENTURY'
'TOMORROW'S WATER'
Speaker: J. D. PERRET, BSc, CEng, FICE, FIMunE, FRSH, FGS, MBIM
Assistant Director, Corporate Planning, Thames Water Authority
Chairman: M. L. F. FRANCK, TD, BSc(Eng), CEng, MIMechE, FIHospE, AMBIM
Regional Works Officer, South East Thames Regional Health Authority

11.30 a.m. 'GAS — TODAY AND THE FUTURE'
Speakers: W. E. FRANCIS,
Assistant Director, Midlands Research Station, British Gas Corporation
D. BUTLER,
Information Manager (PR), British Gas Corporation
Chairman: A. J. BARRETT, CEng, MIMechE, MCIBS,
Area Works Manager, Hertfordshire Area Health Authority

Thursday, May 10

2.30 p.m. 'THE ASSURED FUTURE OF ELECTRICITY'
Speaker: J. R. PLATTS, BSc(Eng), CEng, FIMechE, FIEE,
Energy Sales Manager, The Electricity Council
Chairman: R. MANSER, BSc(Eng)(Hons), CEng, MIMechE, FIEE, PPIHospE,
Assistant Chief Engineer, Department of Health and Social Security

Fifth International Congress of Hospital Engineering

This paper was presented at the 1978 Lisbon Congress under the subject title 'Technical Installations in the Hospital'. The author is a Hospital Engineer from the USA.

Energy Conservation - Hospital Engineering Services

Conservation d'Energie

VERN ATWATER

Synopsis/Résumé

Je parlerai de la conservation d'énergie dans les hôpitaux et, spécifiquement, de ce que nous avons realisé dans notre hôpital.

Quelques sources d'énergie:

1. 25% de toute l'énergie consumée aux EUA est du gaz naturel;
2. 46% de toute l'énergie consumée aux EUA est du pétrole;
3. Les EUA ont des réserves de charbon pour 200-400 ans;
4. Les EUA ont des difficultés avec l'énergie nucléaire dans les stations de production d'énergie électrique;
5. Il semble que l'énergie solaire aura un future brillant en ce qui concerne les hôpitaux;
6. L'énergie éolienne en ce qui concerne les hôpitaux a un développement lent;
7. Il semble qu'il n'y a pas des changements en ce qui concerne les sources d'énergie géothermique et hydroélectrique;
8. Sources d'énergie insolites.

Nous avons pris un 'audit' d'énergie qui consist du numéro de lits, espace (mètre carré), mètre carrés par lit, usage d'énergie, et coûts d'énergie par mètre carré et par an, et par lit et par an. Vous pourrez comparer vos resultats avec ceux d'autres hôpitaux.

Nous avons conservé l'énergie en baissant les pressions de nos chaudières, diminuant les niveaux d'illumination, changeant les appareils d'illumination et modifiant les méthodes d'opération quand l'usage plus efficace de l'énergie était apparent. Un bon programme de maintenance preventive est le meilleur moyen de conserver l'énergie et ça ne coûte rien.

Nous avons tous déjà vu des équipements si sales qu'ils ne peuvent pas fonctionner efficacement. C'est le cas, par exemple, d'un filtre d'une unité de ventilation ou un condensateur d'une unité d'air conditionné.

Un serpentin de vapeur dans un réservoir d'eau chaude qui est couvert de tartre pourra éventuellement n'être pas capable de transférer la chaleur et par conséquent ne produira pas de l'eau chaude. Une chaudière qui a beaucoup de tartre est un hasard et beaucoup inéfficace. J'ai dit que la maintenance préventive ne coûte rien parce que nous sommes en face des conditions mentionées au-dessus si nous les avons et un programme de routine sera payé par lui même en conditions de travail efficace.

Nous avons installé un programme par ordinateur appelé 'Energy Management'. Nous avons conçu le système nous même et l'avons relié à l'ordinateur. Nous contrôlons la consommation et la demande.

Je vous presente une voie de mesurer les résultats de conservation d'énergie:

$$ECM^{(1)} = \frac{\text{Total de BTU consommés par mois}}{(\text{Mètres Carrés de l'Hôpital}) \times (\text{Jours Mois}) \times (\text{Total de Degrés Jours Mois})}$$

Vous pouvez évaluer le ECM pour l'année avant qu'un programme total majeur de conservation d'énergie fonctionne. Nous pourrons alors calculer le ECM dans une base mensuel ou annuel et faire des comparaisons.

(1)ECM = Mesure de Conservation d'Energie.

The Full Paper

This paper is concerned with energy conservation in hospitals, and also, specifically what we have accomplished in our hospital.

Let us take a look at some of the energy sources — Of all the energy consumed in the United States, 25% is natural gas. Apparently the US has about a ten-year supply, although I expect someone will find some more and extend this figure. What the natural gas situation is right now, is the best situation our hospital is going to have for the rest of its life.

46% of all energy consumed in the United States is oil. I am told our known oil supplies will last twenty to thirty years. Again, I expect someone to find more oil. But even with these new finds, the oil picture can be frightening. For example, they estimate there are ten billion barrels of oil to be produced in Alaska. But at today's consumption this would last the United States about 1¾ years which does not take us very far down the line.

The United States has a 200-400 years' supply of coal, so this appears to be the major source of energy of the future. At our hospital we are planning a new boiler plant which will be able to burn coal. Of course, nuclear fuel in hospitals is a possibility for the future, but it is unlikely to happen in my lifetime. The United States is having enough difficulty in putting it into electrical power plants now. Just imagine the public reaction if someone suggested a hospital. Solar energy, however, appears to have a bright future in hospitals. There are hospitals that already use solar energy as a part of their energy requirements. Existing hospitals can have this source added and new hospitals can have it designed in.

Wind energy and its relation to hospitals is slow in being developed. There does not seem to be any advance in the exploitation of geothermal and hydroelectric energy sources.

Unusual energy sources are always intriguing. I once read about a fellow who had converted his motor car to hydrogen fuel. According to him, it was really quite easy. He put on a carburettor with a larger fuel/air mixing chamber. The hard part was obtaining hydrogen in a safe condition. He combined the hydrogen with a dry magnesium hydride and made rather harmless hydrogen pellets that he could carry in his hand or put in a tank he could attach to his car. These pellets could readily be converted to hydrogen gas, by controlled decomposition. He made his own hydrogen just as we all did in our chemistry classes. By placing an electrode in each side of a container of conductive water he captured the hydrogen that came off one end and claimed he made hydrogen at lower cost than the purchase of gasoline. The cost was equivalent to 6 cents per gallon. I pay 60 cents for a gallon of gasoline. His only problem seemed to be that when the hydrogen burned and combined with the oxygen in the air in the engine, it became water. He had no good way to get rid of so much water. Supposing we converted all this to hospital boilers. The boilers would probably easily burn the hydrogen and we could use the water for boiler make-up.

In entering into an energy conservation programme, it is as well to take an audit. There are many ways to do this but I used the one from the American Society for Hospital Engineering Newsletter because it looked complete and used figures that were available to me.

In 1974 when the Middle East countries closed their oil pipe-line valves, we took a good look at our department in our hospital. We could control changes there, although we may not be able to do so in other departments. Also, we wanted to be controlling our own energy conservation.

We found some strange things. One was a water booster pump running constantly in what we call our South Equipment Room. When we put it on the line, a problem revealed itself at our water softeners in our Main Equipment Room. Instead of taking the pump off the line, we put another pump on the line in the Main Equipment Room. We were quite embarrassed when we found that we could take them both off the line, put the first pump on automatic to take care of some unusual situations, and everyone was happy. This illustrates that you should look at every piece of equipment and ask yourself — why is this running?

We lowered our boiler pressures just 35 kgr/sq cm and were convinced we saved between 5 and 10% of natural gas consumption. We then looked a step further and lowered our steam pressure another 1.05 kgr/sq cm at night. We never did get a feel of what that did to our natural gas consumption but are sure we achieved savings.

We had a standing written order to lock our equipment rooms and turn off the lights. In our conservation scrutiny, we found that this was not being followed, so we had a campaign to observe the order.

We have replaced some incandescent lighting fixtures with fluorescent at low cost. Old fluorescent fixtures that were taken down in other areas, were remodelled so that new, modern fixtures were installed. In a couple of our areas, the lighting levels were high and all we did was remove or disconnect some fixtures. We kept the level of lighting safe and within current standards.

We designed and installed a Power Management Programme. After connecting our air handling units and our electric demand meter to a computer we programmed the computer as to the shut-off and turn-on times of our air handling units. These are quite frequent. For example, we do turn units off for 5 minutes every 15 minutes. Each air-handling unit has its own programme. We monitor the electric demand meter and by setting an established, not to exceed, kilowatt hour amount, the computer is able to take pre-programmed action to stay within the amount set.

Our Power Management Programme, which is only electric, has reduced our electric consumption by 10-15%. There are also indirect savings, such as less chilled water needed, less running of electric motors, etc. The programme itself must be monitored and adjusted as changes take place rather than be rigidly fixed.

We have had a window changing programme at our hospital for a number of years. The wooden sashes have become so dried up, cracked and worn that they no longer fit the casings. They were draughty and we were losing a lot of heat or cooling. There were also maintenance problems, so we started on a yearly programme.

Every year we would put an amount in our budget to change some windows. They used to cost about $100 each, picking a good, substantial aluminium window. Today we pay about $150 each. The cost of windows keeps going up, but so does the cost of the energy lost through the old windows. Our justification for the expenditure remains the same.

I have saved the best until last — a preventive maintenance programme. There is no better way to conserve energy than by having a fine preventive maintenance programme. If it does nothing more than keep the equipment clean a noticeable amount of energy will be saved. How many of us have seen refrigeration equipment become so inefficient that it cannot do its designed job, just because the condenser coil was filthy? A cooling coil can become so dirty that the air cannot pass through it and reach the area it was designed to cool. Steam coils can become so covered with scale that they operate at less than

50% efficiency. A dirty filter will reduce the efficiency of the equipment.

A belt slipping or out of alignment also wastes energy. An air handling unit out of design control condition and, boilers without the proper air/fuel ratio will waste large units of valuable energy. With a good preventive maintenance programme not only is energy conserved, but the equipment will be running properly and patients will have the best possible environment for their treatment and recovery.

Energy conservation should be a continuing, on-going programme. Never be satisfied with your achievements, always be on the lookout for additional conservation methods and you will find them. A 40 watt fluorescent bulb has been standard in the United States. We noticed 35 watt coming on the market. We now buy these, are still able to maintain standard levels of lumens and save electrical consumption.

There are many and various ways of conserving energy — each of you are probably thinking of something I could have mentioned, which is just the right attitude.

Here is a metnod of judging the results of energy conservation achievements:

$$*(\text{ECM}) = \frac{\text{Total DTU's consumed monthly}}{(\text{Hospital square metres}) \times (\text{Days in the month}) \times (\text{Total degree days in a month})}$$

and I have calculated some for our hospital. I arrived at the total BTU's consumed monthly by filling out this form.

*ECM = Energy Consumption Measure.

Spot Survey of Hospital Energy Usage

Energy use data for six hospitals in different parts of the United States were gathered by ASHE's Committee on Energy Conservation for the period September 1974 through August 1975.

Hospital							
Location	**Minnesota**	**California**	**Alabama**	**New Jersey**	**Arkansas**	**Colorado**	**Missouri**
Number of beds	124	530	915	370	522	300	660
Space, sq m	13,404	27,351	94,851	29,542	48,958	25,548	43,502
Sq m per bed	108	52	104	80	94	85	66
Budget, $	3,500,000	21,500,000	35,931,377	13,500,000	20,247,544	14,337,021	
Natural Gas							
Annual Usage							
Thousand cu m	681	32,854	4,966	463	7,691	1,937	5,071
Annual cost, $	18,039	115,565	100,525	3,487	165,005	39,910	128,062
Contract	Interrupt.	Interrupt.	Interrupt.	Firm in kitchen and lab, interruptible elsewhere	Firm	Interrupt.	Interrupt.
Fuel Oil							
Annual Usage							
Litre	222,074	19,039	239,023	2,001,379	2,316	143,830	———
Type, #	6 heavy	2	2	6	2	2	5
Storage capacity, days	10	3	10	8	7	70	10
Annual cost, $	21,642	1,858	18,124	178,165	189	11,400	———
Electricity							
Kwh per year	1,324,752	6,415,726	26,040,000	8,775,569	12,729,600	7,308,000	13,880,700
Annual cost, $	36,834	118,189	441,427	181,724	218,462	97,848	331,862
Energy Cost							
Per sq m, $	4.95	8.61	5.92	12.27	7.86	5.82	10.55
Per bed per year, $	536	445	611	982	735	497	697
Per thousand cu m, $	26.43	35.00	20.36	7.50	21.43	20.71	27.86

Oct '74-Feb '75	Gas	1,844 Mcm	$40,439	3.44 per sq m, $
	Elec	4,922,600 kWh	$108,257	225 per bed, $
				3.77 per thousand cu m, $
Oct '75-Feb '76	Gas	2,168 Mcm	$53,063	3.77 per sq m, $
	Elec	4,529,970 kWh	$109,965	247 per bed, $
				10.00 per thousand cu m, $

Monthly and Annual Fuel Consumption Form

YEAR 1974	ELECTRIC POWER kWh ($\times 1,000$)	ELECTRIC POWER BTU/ kWh	ELECTRIC POWER BTU ($\times 1,000^2$)	NATURAL GAS k M3	NATURAL GAS BTU/ k M3	NATURAL GAS BTU ($\times 1,000^2$)	FUEL OIL Litres	FUEL OIL BTU/ Litres	FUEL OIL BTU ($1,000^2$)	TOTAL BTUs ($\times 1,000^2$)	ECM
January	808.8	3,409	2,757.2	414.3	34,107	14,132.1	35,390	39,101.7	1,383.8	18,273.1	10.65
February	712.8	3,409	2,429.9	409.1	34,107	13,954.5				16,384.4	15.75
March	938.4	3,409	3,199.0	424.3	34,107	14,971.1				17,670.1	23.44
April	1,101.3	3,409	3,754.3	321.3	34,107	10,959.6				14,713.9	39.84
May	1,203.9	3,409	4,104.1	455.6	34,107	15,537.9				19,642.0	137.41
June	1,019.7	3,409	3,476.2	522.8	34,107	17,832.7				21,308.9	92.77
July	1,357.2	3,409	4,626.7	506.5	34,107	17,276.9				21,903.6	30.19
August	1,653.6	3,409	5,637.1	566.6	34,107	19,324.4				24,961.5	70.11
September	1,209.9	3,409	4,124.5	539.6	34,107	18,402.8				22,527.3	367.27
October	1,237.2	3,409	4,217.6	302.1	34,107	10,304.5				14,522.1	53.84
November	1,054.8	3,409	3,595.8	326.1	34,107	11,122.9				14,718.7	20.47
December	995.7	3,409	3,394.3	391.3	34,107	13,347.1				16,741.4	13.36
Annual BTU Totals	13,293.3		45,316.7	5,179.6		176,666.5	35,390	39,101.7	1,383.8	223,367.0	875.10

$$\text{Energy Consumption Measure (ECM)} = \frac{\text{Total BTU's Consumed Monthly}}{\text{(Hospital Square Metres) (Days in Month) (Total Degree Days in Month)}}$$

$$\text{January 1974} \quad \text{ECM} = \frac{18{,}273{,}100{,}000}{43{,}502 \times 31 \times 1{,}272} = 10.65$$

$$\text{June 1975} \quad \text{ECM} = \frac{19{,}094{,}700{,}000}{43{,}502 \times 30 \times 289} = 50.63$$

$$\text{February 1976} \quad \text{ECM} = \frac{18{,}790{,}100{,}000}{43{,}502 \times 29 \times 640} = 22.07$$

This paper was presented at the Lisbon Congress last year under the theme 'Hospital Planning and Programming'.

Planning a Centralised Hospital Supply Service for a Developing Country

Planification d'un Service Centralisé d'Approvisionnement Hospitalier dans un Pays en voie de Développement

W. D. S. CLINKSCALES

Synopsis/Résumé

Cet exposé rapporte les recherches conduites par une équipe professionnelle avec de l'expérience en matière de projects d'hôpitaux, dans le but d'étudier la praticabilité et les conditions économiques d'une centralisation de l'achat, de la fabrication et de la distribution, de certains approvisionnements hospitaliers dans un État Africain récemment devenu indépendant.

La couverture hospitalière actuelle comprend trente et un hôpitaux, avec un total de 7,500 lits environ. Ces hôpitaux se trouvent disséminés à travers le territoire, et les distances séparant un hôpital de l'autre peuvent atteindre 350 kilomètres.

Selon le système traditionnel, chaque hôpital obtenait ses approvisionnements de la source qui lui convenait le mieux et s'occupait indépendamment de sa buanderie-lingerie. des matériels stériles, de la nourriture et des autres approvisionnements. Ce système a conduit à des inefficacités dans l'utilisation du personnel et des

installations, et l'absence d'une quelconque autorité centrale d'achats a eu comme résultat la réduction du pouvoir de discussion des prix dont on pourrait disposer pour les achats en gros. La standardisation des matériels achetés était pratiquement inexistante.

L'équipe professionnelle a visité tous les hôpitaux, en vue d'apprécier les nécessités de chacun, ainsi que l'équipement existant et son état, et d'évaluer l'étendue des besoins communs. Il est vite devenu évident qu'il serait possible de réaliser de très importantes économies par la réorganisation de la méthode de manutention et d'approvisionnement en articles atteignant de gros volumes et qui se prêteraient à l'établissement d'un système centralisé de production suivie de distribution.

Les Services qui ont semblé les plus appropriés ont été la Lingerie, la Cuisine (un service partiel seulement), les Matériels Stériles, la Pharmacie et la Maintenance de l'Équipement Médical. Une partie essentielle de ce service serait la création d'un Département Central d'Achats, combiné avec l'installation d'Entrepôts Centraux où il soit possible de garder en sécurité et dans des conditions adéquates les stocks d'articles, en attendant leur distribution aux différents hôpitaux.

La communication décrira les recherches entreprises et les conclusions auxquelles elles ont mené, en vue de la planification des services centralisés ci-dessus mentionnés et présentera des exemples des économies que l'on peut réaliser par l'adoption de la centralisation.

Seront énumérées et décrites les plus grosses difficultés qui se sont levées lors de la planification initiale et de la réalisation subséquente d'un système centralisé, ainsi que les solutions pour ces difficultés auxquelles nous avons été amenés dans le cas présent.

Un manque aigu de personnel entraîné et qualifié pour les tâches de manutention, ainsi que l'absence d'un système adéquat de transport pour la distribution des matériels hospitaliers, ne sont que deux exemples des problèmes qu'il fallait surmonter.

Du côté positif, le fait qu'un nouvel Hôpital Central National se trouvait en phase initiale de planification à l'époque de la réalisation de nos études concernant la centralisation, a fourni l'indication d'une localisation évidente pour les fonctions centralisés.

L'emplacement choisi pour le nouvel hôpital était adéquat, tant en ce qui concerne sa situation géographique par rapport aux autres hôpitaux que quant aux dimensions exigées par les services à centraliser. Par ailleurs, la plupart du peu d'installations existantes se trouvaient déjà concentrées à cet endroit.

L'établissement de fonctions centralisées dans le terrain même de cet hôpital permettrait de leur faire partager avec le nouvel hôpital des besoins communs de services tels que la vapeur et l'électricité, en réduisant d'autant le montant de l'investissement nécessaire.

On estime que, d'une façon générale, cette communication présentera une information actualisée concernant les avantages, les inconvénients et les implications sur les coûts, de l'établissement d'un service centralisé pour des hôpitaux largement disséminés à travers un pays en voie de développement et, par conséquent, pourrait être d'un grand intérêt pour les administrateurs, ingénieurs et architectes dont dépend la définition de la politique hospitalière sous des conditions semblables ailleurs dans le monde.

La communication pourrait être illustrée au moyen de diapositives en couleur montrant les conditions actuelles et présentant des indications sur les développements futurs prévus par la planification.

The Full Paper

Prior to the granting of independence to the Transkei by South Africa the hospital services there were under the control of a number of separate bodies. The larger hospitals were administered by the Cape Provincial Administration, while the remainder were operated, as Mission hospitals, by churches of various denominations, under the control of the South African Department of Bantu Administration and Development. Following independence on October 26, 1976, the total health service was transferred to the Department of Health and Welfare, Government of Transkei.

The service consists of 31 hospitals, containing a total of 7,457 beds, together with a number of clinics, distributed. throughout Transkei, which has a total area of 41,620 square kilometres. Umtata, the capital town is near the centre of the country and two of the largest hospitals are located there. The total population of Transkei is nearly two million.

Centralisation of Services

Traditional Systems

Materials Procurement

In the past, each separate hospital was responsible for the procurement and delivery of all materials required for its operation. Certain items were available for purchase at a central store in Pretoria, 600 kilometres from Umtata, but all other items, including food, medicines and drugs, bed linen, instruments, sterile supplies, etc, were obtained from the most convenient source. No attempt was made to standardise the equipment or materials purchased; each hospital made use of items considered to be the most suitable. In the majority of cases, materials were collected by the hospital's own transport, and this was often unsuited to the purpose for which it was used. Duplication of routes travelled led to inefficient use of transport, and the poor state of some of the roads resulted in high vehicle maintenance costs.

The individual buying method eliminated any cost advantage which could be obtained by bulk purchasing. The overall efficiency of the system was entirely dependent upon the capability and economic expertise of the people concerned with purchasing. A survey revealed that the overall operational cost of hospitals varied between R1.32 (US$1.52) and R14.23 (US$16.36) per bed per day.

Equipment

Each individual hospital was responsible for its own laundry, sterilization, cooking and the general maintenance of the various items of equipment installed for these operations. In most instances, the equipment provided was inadequate, in a poor state of repair and antiquated. Maintenance by local hospital personnel was limited to simple procedures, because of a shortage of trained artisans and adequate facilities. Any major repairs involved the use of private contractors, often obtained from towns remote from the hospital and at high cost. A central maintenance organisation existed in Umtata, but, with 31 hospitals to serve, months often passed before its service was available. Due to the age of some machines, replacement parts were causing further delays. In some instances the inadequacy of equipment or an acute shortage of water at the hospital following a breakdown of pumping equipment, required dirty linen to be washed by hand in adjacent rivers.

Survey Team

In late 1976, the Transkei Government appointed a professional team, experienced in hospital design, to carry out an investigation into the feasibility and economics of centralising the purchasing, manufacturing and distribution of hospital supplies to meet the needs of all hospitals throughout the country. The team consisted of an engineer, an architect, and a hospital equipment consultant, all in private practice. Each of them had previous experience in centralisation of services in other areas in Southern Africa. The terms of reference given to the team were very broad and it was left to them to make recommendations, based on their investigations, regarding the extent and method of implementation of the systems to be employed.

The professional team visited all the hospitals and investigated, in detail, the systems in use for procuring materials, hospital transportation, laundry, kitchen, sterilizing and medical equipment and various other services, all of which affected the efficiency of operation of the institutions. Some weeks before the actual investigation on site, a questionnaire was sent to the Medical Superintendent of each hospital, in order that quantitative information could be collected for presentation to the team during their visit. The overall objective was to evaluate the extent of common needs, with a view to providing them from a central source.

It became evident very early in the investigation that considerable economies could be effected by the reorganisation of the method of handling and providing those items which, because of their common use in all hospitals, were of high volume, and which would lend themselves to a system of centralised production and subsequent distribution.

The services which were found to be suitable for centralisation were Laundry, Kitchen (a partial service only), Sterile Materials, Pharmaceuticals and Medical Equipment Maintenance. The provision of a Central Purchasing Department combined with Central Stores, where stocks of items awaiting distribution to the individual hospitals could be securely and suitably held, was also considered to be an essential part of the service.

Location

The map of Transkei, see opposite, shows the location of all Hospitals, together with the beddage of each. It can also be seen that the capital town, Umtata, is centrally situated and that the main road between East London and Durban, two large towns in the Republic of South Africa, passes through it.

Construction of a National Referral Hospital, of 1,200 beds, has commenced in Umtata and facilities already exist in the town for hospital maintenance to be carried out from a central workshop. In addition, the Department of Health and Welfare administers all Transkeian hospitals from Umtata and has, thus, a strong departmental section already active there.

Because of the above factors and as sufficient space was available on the new hospital site to accommodate the necessary additional buildings, it was decided that all centralised services should be located in Umtata. Placing these departments close to the new hospital eliminated the necessity for separate mechanical and electrical services, such as boiler house, water storage and treatment, etc, as it only became necessary to increase the provisions made for the hospital itself. The distribution of the products of centralisation to the hospital also did not necessitate any special transportation arrangements, and departments, such as laundry, CSSD and main Pharmacy, were eliminated entirely from the Umtata Hospital Planning. As these are all non-medical functions, the overall planning of the new hospital was greatly simplified and became more flexible.

Consideration of Individual Services

Laundry

It was determined that the total wash for all hospitals amounted to 336,000 articles per week, or an approximate dry weight of 123,300 kilograms per week. No records were available regarding the present total cost per article of processing this linen in Transkei. However, investigations done elsewhere indicate that, by centralising production and increasing the scale of output from 45,000 to 400,000 articles weekly, total production costs can be reduced by a figure in the region of 25%.

This saving would, of course, be reduced when the additional cost of transporting the linen to and from the hospitals is included. Considering, however, the inefficient methods and the outdated equipment in use in the majority of Transkei hospitals, it is certain that in a central well-equipped and well-managed laundry, the reduction in cost mentioned above will be surpassed.

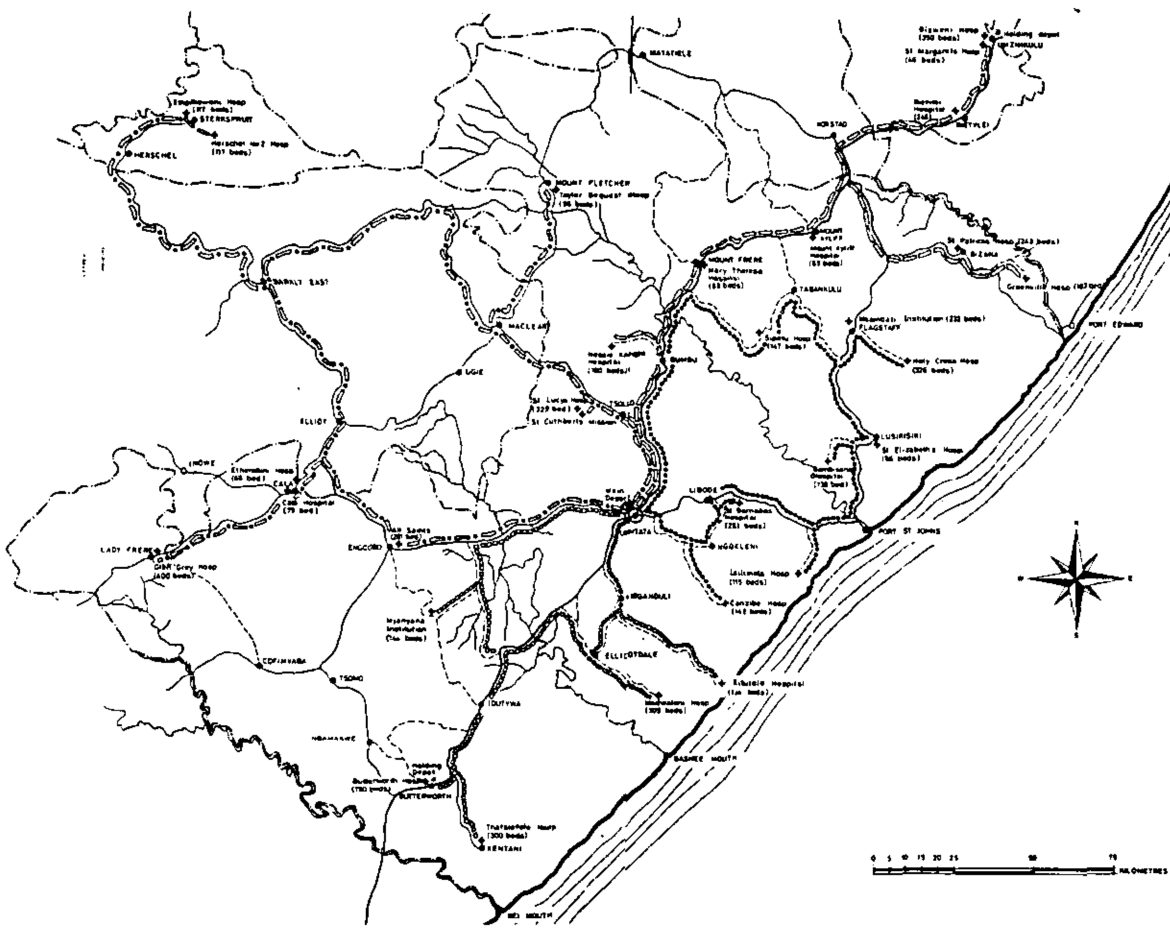
The quality and sterility of the linen produced under modern controlled conditions will certainly be superior to that obtained at the individual hospitals. Security will also be improved. Losses by theft were at a very high level with the conventional system.

A system of collection of soiled linen at the hospitals, involving a limited amount of pre-sorting on the ward floors into linen/plastic bags with different colours for identification, largely eliminates the necessity for re-sorting in the laundry and does not impose any additional burden on the nursing staff. It is only necessary to separate the dirty linen into two categories, 'soiled' and 'foul and infected' and these two types are handled separately, as described below.

The bacteriologically unsafe practice which is commonly used in hospitals of sluicing the foul and infected linen at ward floor level before despatch to the laundry, is considered to be totally incorrect. The recommended method of dealing with this linen is for it to be taken in plastic bags to an area (in many cases this would be to the existing hospital laundry) where sluicing in a conventional washing machine will take place, followed by processing through a hydro-extractor and then a tumbler dryer. Once this operation has been completed, the foul and infected linen can be treated as normal soiled linen and no further separation is necessary. This process removes the bulk of the foul matter as well as the majority of the blood stains.

Passing the sluiced linen through a hydro-extractor and a dryer is essential if the formation of 'mildew' is to be prevented, especially if collection of the dirty linen is carried out on a weekly basis. Foul and infected linen forms only approximately 5% of the total wash, and sluicing at the hospital does not, therefore, constitute a major operation. In any event, much of this type of linen, particularly babies' napkins, would have to be sluiced in the conventional hospital laundry before being despatched to the laundry for washing.

Map of Transkei.



Given the volume of linen which would be involved in a central laundry for Transkei, it is felt that the use of tunnel type washing machines is essential. As the tunnel washers handle the bulk of the work, washer extractors will be provided to deal with special batches, including the separate washing of TB linen. Conventional roll-ironers and other finishing equipment will complete the process.

Kitchen

The investigation into the types of food which were being used, the volumes of this food and the sources of supply (in particular, any local procurement, such as vegetables grown in hospital gardens) led the investigating team to the conclusion that there could be no justification whatsoever for the consideration of a total food supply service to the hospitals from a central point. Numerous items of food were in use, particularly those which are traditional to the Transkeian peoples, such as mealie rice, samp and dried beans. These products are readily procured locally and are very simply prepared in each individual hospital kitchen. The main advantage to be derived from a centralised kitchen service would be in respect of those food items which are difficult to procure locally (particularly seasonal items, such as vegetables), and those which could be more advantageously purchased in bulk. This latter would relate, in particular to the purchasing of meat.

The Transkei people continue, by tradition, to count their wealth in cattle. When taking a wife, males are required to make to the father of the bride-to-be a payment, consisting of a number of cattle. The quantity is negotiable and dependent upon the beauty, talents and other attributes of the daughter. The result of this tribal system is that the production of cattle for slaughtering purposes is the exception rather than the rule. Hence the shortage of meat and the high prices which must be paid for it. Much of the available meat is supplied from external sources. A programme of education has recently been instituted in an attempt to develop a local meat industry, but it will be many years before the tradition of generations can be overcome.

The advantages to be obtained from the cook-freeze method of food preparation, distribution and reconstitution are too well known to be described in detail here. It is sufficient to point out that the erection of a factory kitchen to prepare, cook and freeze vegetables and meat dishes for subsequent distribution to all Transkei hospitals will not only obviate the necessity for maintaining a fully equipped kitchen at each of the peripheral hospitals. It will also eliminate many of the raw material supply problems which have existed in the past. A centralised cattle industry, located in the territory surrounding Umtata, will help to strengthen the economy of the country as a whole, as well as providing employment. Similarly, a constant and heavy demand for vegetables will foster the development of a local agricultural industry in the area. The existing cattle slaughtering facilities throughout Transkei are of a low standard and are unhygienic. A new, modern abattoir is at present being planned for the Umtata area and this facility will provide a reliable source of meat in bulk form for the central hospital kitchen.

A few of the main advantages of producing food by means of the cook-freeze system, for all Transkei hospitals, are as follows:

Fewer highly skilled staff are required. Chefs and dieticians are virtually non-existent and have to be brought in from neighbouring countries;

Better quality control of the food;

Colour, taste, appearance and nutritional value of food does not deteriorate because of the rapid freezing after cooking;

Wastage and theft from the kitchen is greatly reduced. With the present system of 31 separate kitchens, this loss is very high;

More realistic budgeting and strict cost control is possible.

An inspection of the kitchen equipment at the hospitals at the time of the survey revealed that, while some kitchens were adequate, others had an absolute minimum of equipment. Equipment, generally, was found to be in very poor condition. Any relief, therefore, which is provided to the kitchen staff in the form of the removal of the main cooked items from the hospital kitchen, will relieve an already unsatisfactory condition.

As previously mentioned, the starch portion of the meals will still be prepared and cooked in the hospital kitchen. The meat and vegetables will, however, be removed from the deep freeze storage cabinet at the hospital some time before the meal is due to be served. Reconstitution will then take place. All constituents of the meal will then be placed into heated containers and transported to the wards for dishing-up in the usual manner.

Over 50% of the cost of feeding lies in the cost of the raw food materials. The food wastage in production, portion control and trolley and plate wastage with the conventional system is extremely high. Experience has shown that this wastage can be reduced by 50% using the cook-freeze system. This saving more than offsets the additional cost of packing materials and of freezing. It is estimated that, making allowance for these additional costs, a 10% saving will be effected and the quality of the food served to patients will be greatly improved.

The central kitchen will produce the equivalent of 6,000 to 7,000 meals per day for hospital use only. The higher the production rate, the more economical and feasible does a central kitchen become. Consideration is, therefore, being given to providing the meat and vegetable requirements for other institutions, such as school hostels and the new University, from this kitchen.

Central Purchasing

An attempt was made during the survey to establish a purchasing pattern amongst the individual hospitals, but this was not possible. Records of purchases and prices paid have not been maintained in any meaningful manner. This lack of information must be viewed in the light of an annual operating budget of R7.5 million (US $8.63 million). Any potential savings on this amount will, therefore, be significant.

The influence of trade representatives was evident, in that foreign firms which maintained a sales force in Transkei were those whose products were used. Not all items were purchased direct from manufacturers, with the result that prices were higher by an average of 25-30%. This additional cost will immediately be eliminated by the establishment of a central purchasing body fully conversant with prime sources of manufacture and supply.

A multiplicity of items and sizes, used for the same function at different hospitals, was noted. This could be controlled by a central purchasing department, after research into the best available material for a specific function, followed by acceptance by the professional users. These items would then be standardised, and competitive buying introduced by annual award of contracts of high volume. The savings to be obtained in this manner vary between 10-50% on specific items priced by the survey team.

Combined with central storage and an adequate distribution system, this service is viable if operated in conjunction with other centralised services. The medical equipment and pharmaceutical supply budget proposed for Transkei for the year 1977/78, is over R4 million (US $4.6 million). It is thus obvious that a centralised purchasing department is fully justified, in order to adequately control the expenditure of this amount and to effect the savings which have been enumerated above.

Medical Equipment

Sophisticated and specialised medical equipment, for the use of doctors and specialists, is being produced in ever increasing proliferation throughout the world. The use of this equipment by medical practitioners in Transkei follows the world trend. Many of the doctors have been trained to diagnose the patient's needs with the aid of such equipment.

The technical knowledge necessary to maintain and repair such equipment does not exist in Transkei, and hospitals are dependent upon equipment supply companies based in the Republic of South Africa for this service. As travelling from base to the various hospitals involves high cost in terms of transport and unproductive time, the team investigated possible solutions to this problem.

Standardisation of equipment purchases and selection of types of equipment which may be transported to a central workshop in Umtata were found to eliminate many of the existing difficulties. Specialised technicians are available, on annual contract, to be employed at this workshop and the items of equipment will be brought to them, on an exchange/replacement basis, by means of the centralised transport system. Central control of repairs will ensure that they have been properly carried out.

Implementation of the central system will not take place overnight, as existing expensive and usable equipment cannot be discarded, due to the high cost of replacement. However, if adequate equipment specifications are prepared and service contracts entered into for servicing movable items in Umtata and immovable equipment on site, in time the system will rationalise itself and a gradual improvement will result.

A further recommendation which is taking effect is that the responsibility for servicing of specialised medical equipment will lie with the Department of Health. This is distinct from other engineering equipment, such as that used in laundries, kitchen, etc, which remains the responsibility of the Department of Works and Energy.

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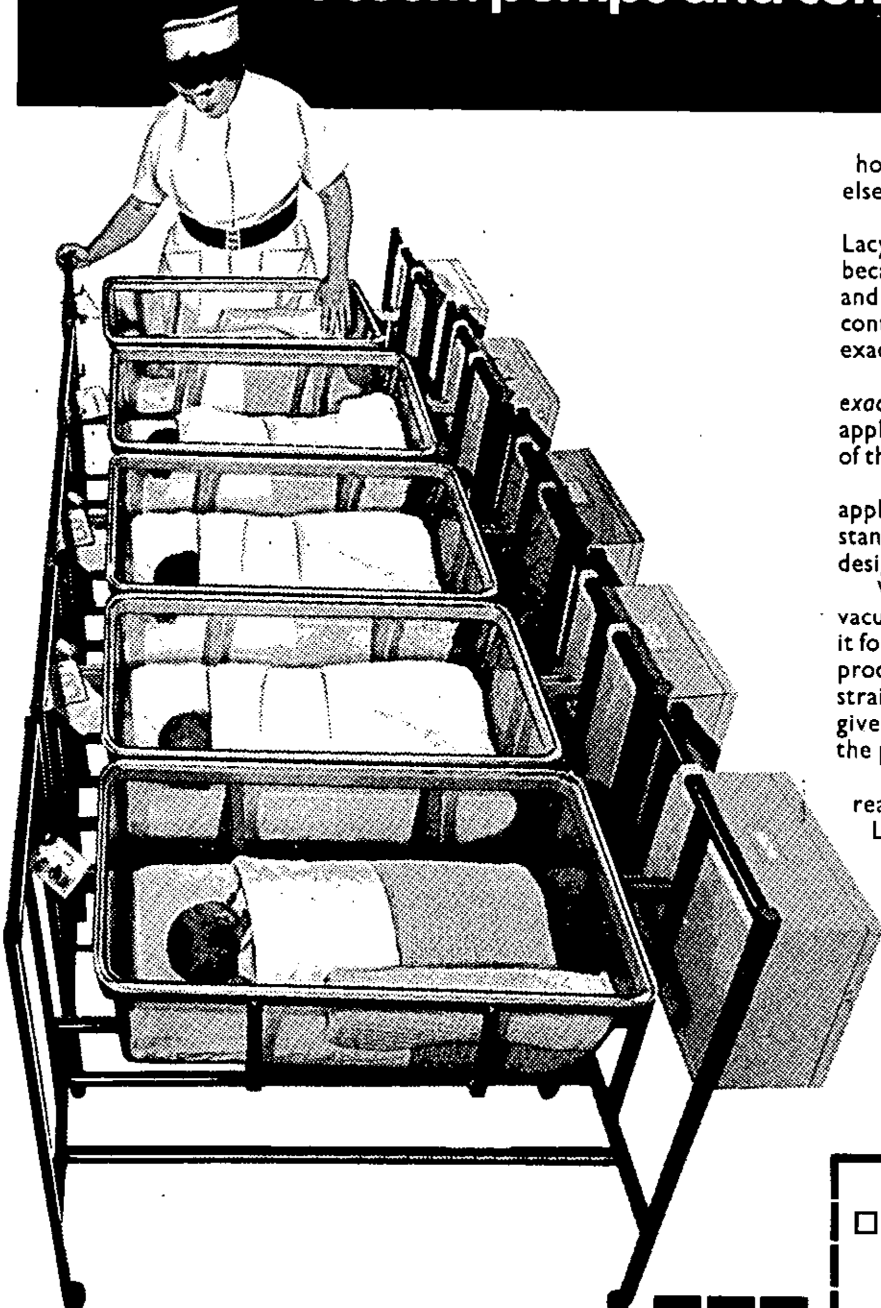

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Pharmaceuticals

At each hospital visited, investigations were made as to the existing purchasing and delivery patterns of pharmaceutical preparations. Very few hospitals in Transkei were found to have a resident pharmacist and, consequently, this duty usually became one of the many functions allocated to the Medical Superintendent.

The majority of hospitals continued to requisition their needs from the Central Medical Stores in Pretoria and an estimated R2 to R2.5 million (US $2.3-$2.875 million) per annum is expended in this manner. A handling charge of 5%, representing between R120,000 and R125,000 (US $138,000 and $144,000) is charged. Delays of up to nine months in delivery were reported, the average delivery period being three months. A few hospitals purchased directly from pharmaceutical suppliers located nearest to them and these reported shorter delivery periods and lower prices.

A large variety of preparations for treating similar medical conditions were seen to be used at the various hospitals, and a Drug Usage Committee has now been appointed to study this problem and to standardise as far as possible.

The establishment of a central pharmaceutical purchasing department with warehousing facilities, in Umtata, under the control of an experienced Pharmacist, will effect an estimated saving of a minimum of 12% of the present annual amount expended. No additional capital is, therefore, necessary to finance such a department.

Central Sterilizing Department

An examination of the methods and equipment used in the hospitals revealed the following deficiencies:

Of 19 autoclaves tested, only three were sterilizing adequately. This was due to inadequate servicing and obsolete equipment;

Ineffective control of the sterilization process, caused by lack of specialist knowledge and the difficulty of adequately monitoring a decentralised system, was in evidence;

Lack of standardisation of materials used led to purchase of small quantities with resultant increased cost;

Production runs were not possible due to low individual volumes and the ratio of items prepared to numbers of staff employed was low;

Storage facilities for sterilized materials were poor, resulting in loss of sterility which often passed undetected;

Very few hospitals had specific areas designated to this important function of sterile material production.

Based on previous experience, a system which combines the advantages of a central sterilizing service with those of an improved service at each hospital for the processing of certain specific items, such as surgical instruments, was devised. Standard ward packs and sterile topical water will be produced in the centralised unit, adjacent to the new hospital in Umtata. This unit will be equipped with large, modern autoclaves, capable of handling porous loads, such as textiles. Initially, sterile linen will be produced locally but, with the commissioning of the central laundry, this function will be transferred to the central sterilizing factory and the linen provided in packs, ready for use.

The contents of all unit ward packs and surgical textiles used in operating theatres will be standardised, as determined by the medical and nursing staff, in order to reduce costs. Monitoring of all sterilization processes will be controlled as personnel, trained in specific processes, will be available at the central point. The fitting of built-in safety mechanisms on the autoclaves, in order to ensure sterility, is only justified at the central processing unit, because of their complexity. The high volumes to be handled allow production runs of one type of material to be undertaken and this increases productivity, lowers the labour content per unit and ensures standardisation of packing method.

High volumes of identical material would enable use to be made of cartons for containing the units. The cartons, together with their contents, are sterilized *in toto* and protect the wrappings of the unit packs from damage, preserving the contents until ready for use.

Previous experience has shown that an overall conservative saving of 20% may be forecast by using the centralised system. As the projected annual cost of providing the present service is R875,000 (US $1,006,000), this represents a saving of R175,000 (US $201,000) per annum.

Transport

Present System

A major item affecting the acceptance by the Department of Health and Welfare of the principle of centralisation, was the question of the distribution of goods from the production area in Umtata to the hospitals throughout the country. A thorough investigation into this aspect of transport was made by the survey team, in an effort to find an acceptable solution.

Basically, all transportation has to be done by road. Bulk deliveries to Umtata and certain other centres may be done by rail, but, even from these points, additional road transportation to the hospitals is necessary. Roads were found, in general, to be reasonably good, but sometimes become impassable for periods of up to two or three days during the rainy season. However, as all deliveries to individual hospitals have always taken place by road, no new principle was involved. Far more important than the state of the roads, were the problems of the use of unsuitable vehicles and the gross overloading of these vehicles.

The survey team arrived at the conclusion that the existing method, where each hospital provided only for its own needs, constituted an uneconomical and unco-ordinated system. In a number of cases, vehicles from different hospitals located in the same area obtained supplies from the same source, and both travelled the same route, thus doubling quite unnecessarily the distance covered.

Proposed System

From the map of Transkei it can be seen that the territory has been divided into four sectors. Each sector is to be served on a regular basis by means of a direct supply from a central depot in Umtata with all those materials which have been centralised. These materials will be requisitioned as required, by a responsible officer in each hospital. Included in this service would be frozen foods, clean laundry on the outward journey and dirty laundry on the return, sterile supplies, general medical and pharmacy supplies, equipment requiring service, and medical gases.

Certain suppliers have indicated their willingness to deliver goods to fixed locations within Transkei at no transport cost, provided that these are bulk purchases. For this reason, two receiving depots, located at Butterworth and Umzimkulu respectively, have been planned. These depots are indicated on the map. The Transkei transport vehicles, after having delivered to the hospitals, will then collect goods from these depots and carry them to the central stores in Umtata.

Heavy duty vehicles, suitable for the type of operation to be performed, will be purchased. It will be necessary to provide either separate or composite vehicles for delivery of refrigerated goods and for the laundry, sterile supplies, etc. A weekly delivery service to each hospital is planned, and the size and number of vehicles will be determined by the volume of materials to be handled.

Staff

It is essential, if the change to a centralised service is to be successful, that the creation of and appointment to positions be made for senior administrators who will have responsibility for the following departments:

Pharmacy;
Central Purchasing and Stores;
Kitchen Services;
Laundry Services;
Sterilizing Services.

The early appointment of such staff will have a direct effect upon the ultimate efficiency of these departments. The persons responsible will form part of the planning team, as this will make them familiar with the decisions which are taken during the development stage.

Costs

In order to present to the Government of Transkei the magnitude of the capital costs which will be involved in the erection of the buildings and the purchase of the plant necessary for a centralised service for Transkei, estimates for the different services were compiled. These estimates were based, originally, on similar installations previously carried out elsewhere and were, therefore, realistic. Against this expenditure it was necessary also to consider the savings which will be effected, both in the elimination of facilities which would be necessary at the individual hospitals should centralisation not be implemented, and the lowering of purchasing, operating and maintenance costs which will be brought about by the centralisation scheme.

For any comparison to be meaningful, the costs involved in producing a centralised service must be compared directly with the expenditure needed to provide a decentralised system of the same quality and efficiency. It was completely unrealistic, for example, to compare the existing laundry service with the service which will become available from a new central laundry. The cost of repairing, replacing and, in many cases, completely equipping the existing hospital laundries, had to be counterbalanced against the cost of providing the new laundry. Similarly, the cost of a new laundry for the Umtata National Hospital had also to be taken into account. This laundry will obviously not be required because the central laundry operates on this hospital site.

Taking into account, therefore, all factors described above and all savings due to bulk purchasing, standardisation of materials, etc, as mentioned previously in this article, it was calculated that over a five-year period, the net saving to be effected by the change to centralisation would be about R3,000,000 (US$3,450,000).

It must be strongly emphasised, however, that any monetary savings, which may come about, represent only one of the many advantages to be gained by centralising. The decision to embark upon this type of programme must be made with the full picture in mind. The financial advantage to be gained should only be considered as one benefit to the other manifold improvements which will accrue to the Hospital Service overall.

M Flury est chef du Secteur technique au Centre Hospitalier Universitaire Vaudois (CHUV), la Suisse.

(Mr Flury is head of the Engineering Department at Vaudois University Hospital Centre, Switzerland).

Centralised Control of Engineering Services

La Surveillance Centralisée des Installations Techniques

J. FLURY (Switzerland)

Synopsis/Résumé

The Vaudois University Hospital Centre is composed of twenty different buildings with a total capacity of 1,350 beds. There has been centralised control of engineering services since 1970. Each building has a board on which are situated different technical alarms connected to the main boards of each service. These boards are connected also to the main telephone switchboard which receives the information from each building concerning fire, technical and lift alarms. Maintenance personnel is informed by the main switchboard when an alarm occurs.

Although this system is satisfactory, it does not allow either certain functional actions or energy savings. For the 900 beds in the new building a more efficient system was found. It is a management system for complex engineering services working according to the principle of continuous control by systematic and permanent scanning of all data.

It allows the remote control of engineering services and it gives a permanent image of the state of these services. The system announces and registers alarms and also indicates the degree of emergency. It is possible to get an outline of each emergency, with an indication of date and time of

failure.

The installation is composed of a control console, auxiliary stations and circuits. The control table includes: the table, scheme projectors, printing machine, screen and computer. Each alarm is visible on the screen and printed. When an alarm is given, it is possible to select on the control console which installation scheme appears on the screen. So one can see immediately the type of failure and can eventually take care of it by remote control. It is possible, at any time, to ask the computer to deliver a list of failures, according to emergency priorities. This indicates the date and time of failure, number of the element where the failure occurred and description of the element.

When maintenance is performed by the personnel on duty a repair sheet works order is printed.

The computer has available programmes such as:

— Connection of electrical installations to emergency generators according to available power.

— Switch-off of peak loads (overheated water) to avoid high taxes.

— Reduction of ventilation and heating.

— Reduction of corridor illumination according to traffic.

— Changing of work programme for the lifts according to personnel.

Full Paper

Le Centre Hospitalier Universitaire Vaudois (CHUV) est composé de 21 bâtiments et a une capacité de 1,350 lits. Il y a 8 ans, nous avons centralisé la surveillance des installations techniques.

Cette centralisation a été réalisée selon le principe suivant (*Cliché 1*). Les différents éléments à surveiller dans une installation sont reliés sur le tableau de l'installation qui signale leur état de fonctionnement: marche, panne. De ce tableau, une alarme est transmise sur un tableau qui se trouve à l'entrée de chaque bâtiment et qui indique le genre d'alarme. Les alarmes "FEU" sont situées géographiquement et avec l'indication des niveaux. Depuis ce tableau, l'alarme est transmise sur un tableau au Central téléphonique sur lequel figurent les indications suivantes:

alarme feu;
alarme technique;
alarme ascenseur.

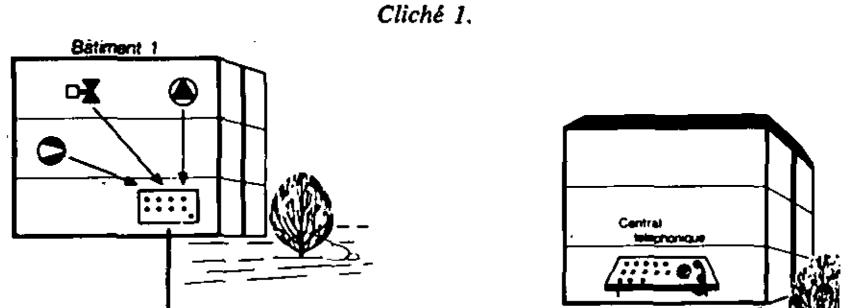
ainsi que la signalisation du bâtiment d'où provient cette alarme.

Cette installation nous donne satisfaction, mais présente cependant quelques inconvénients:

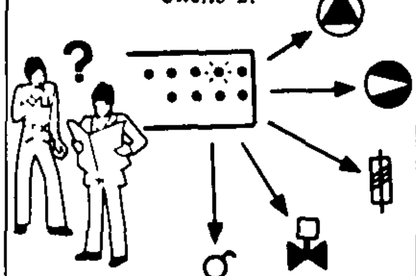
nous ne connaissons pas l'urgence d'intervention;
ne pouvant déterminer quel élément est en panne, il n'est pas possible d'envoyer la personne compétente;
pas de possibilité de contrôle et de commande à distance.

Actuellement, nous construisons un bâtiment de 900 lits. Les installations techniques étant beaucoup plus importantes et complexes que dans les anciens bâtiments, un certain nombre de données sont nécessaires pour contrôler, commander et surveiller ces installations. Nous avons choisi un système de supervision et de commande centralisé des installations techniques (*Cliché 2*). Ce système permet le contrôle et la commande de 10,000 points. Sa construction modulaire s'adapte, au fur et à mesure de transformations et d'agrandissements éventuels. Cette installation permet d'économiser *également* de l'énergie et du personnel.

Cliché 1.



Cliché 2.



Plus ainsi!
contrôle inexacte
perte de temps
trajet de recherche
personnel difficile à trouver
degré d'urgence
recherche du défaut

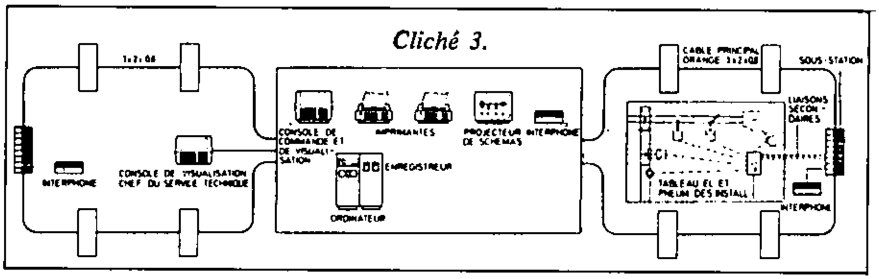
Voici en quelques mots le principe et la composition de ce système:

Principe

Toutes les fonctions, telles que commandes, mesures, surveillance des moteurs, d'ascenseurs, de débit, de compteur d'énergie, sont reliées au centre de contrôle par l'intermédiaire de tableaux secondaires, appelés également sous-stations, qui sont répartis dans les différents étages du bâtiment suivant les besoins. Ces sous-stations sont reliées au Centre de contrôle.

Composition

La Centrale d'information se compose (*Cliché 3*)
de l'ordinateur;
de la console de visualisation;
de trois imprimantes;
d'un projecteur de schémas d'installations;
d'enregistreurs programmables;
d'un interphone.



Cliché 3.

L'ordinateur avec mémoire à semi-conducteur de 1,000 KM à 16 bits
Le centre du système est constitué par l'ordinateur. Les états des installations sont mis en mémoire dans l'unité centrale par une recherche cyclique ininterrompue de toutes les adresses caractéristiques. L'accord entre la console de visualisation, l'imprimante, l'automatisme de programmation, le chercheur automatique d'alarmes, l'enregistreur, le projecteur de schémas d'installations et l'interphone est commandé par l'ordinateur. La commande du système a lieu par l'intermédiaire de la console et de l'automatisme de programmation.

Le programme de commande automatique
Le programme de commande automatique permet la télécommande de tout élément présélectionné dans l'installation, en fonction d'un horaire choisi ou en réaction à un événement ou incident.

Programme en fonction du temps
Ces programmes permettent la télécommande d'éléments déterminés, l'établissement de journaux de bord, etc, en fonction d'un horaire choisi à l'avance par l'operateur, et sans l'intervention de celui-ci Le système n'est pas limitatif et autorise, *par exemple*, un nombre important de marche-arrêt dans une même journée pour un même élément.

La modification de ces programmes peut être faite en tout temps, directement par l'opérateur.

Programmes prioritaires de réaction
(*Cliché 4*) Ces programmes sont commandés automatiquement, consécutivement à un événement ou incident dans l'installation.

Exemple: incendie, groupe de secours, coupure des pointes d'énergie, etc.

Lors d'une alarme incendie, commande automatique pour la fermeture des clapets coupe-feu, de l'enclenchement de l'éclairage, de la signalisation d'évacuation, de la coupure des ventilations, ascenseurs et transports automatiques dans le secteur de l'incendie.

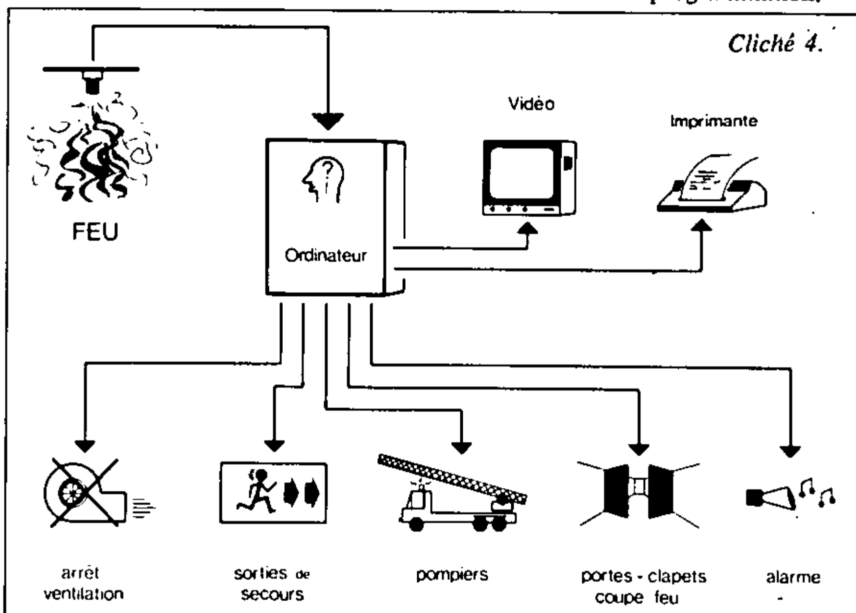
Console de visualisation
Elle se compose d'un clavier de commande et d'un écran à tube cathodique.

Le clavier permet:
la sélection d'adresses;
l'appel d'informations (*Ex.* points de mesure, état de service);
l'émission d'ordres (*Ex.* Mise en marche et arrêt d'installations, etc);
le dialogue avec l'ordinateur (*Ex.* Modification de consigne, de programme, etc);
la sélection des schémas d'installations qui apparaîtront directement sur le projecteur.

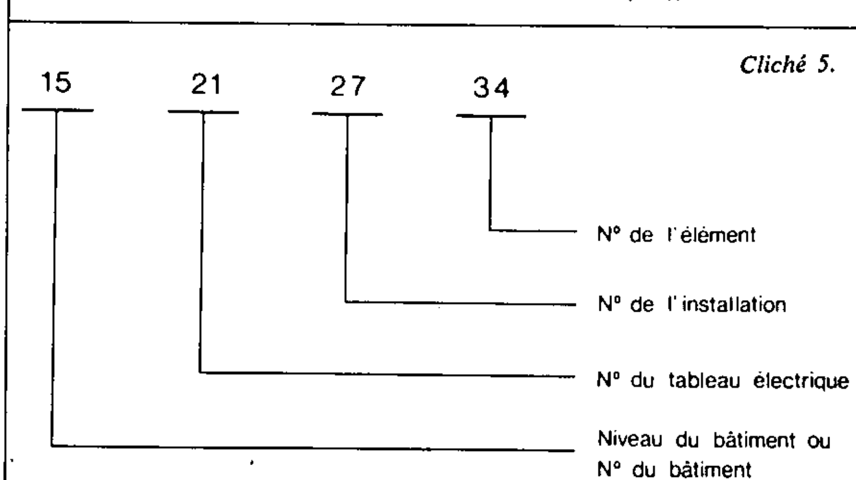
L'écran permet de recevoir:
les informations provenant des différentes installations techniques;
(*Ex.* Les états de fonctionnement, alarmes, etc).

Adresses
(*Cliché 5*) Chaque élément d'installation à contrôler, mesurer ou à commander est associé à une adresse formée de 8 chiffres. Cette adresse est composée de la façon suivante:

Imprimantes
Il est prévue 3 imprimantes sur papier dont chacune a la fonction suivante:
La première enregistre toutes les alarmes, les états de fonctionnement, les dépassements des valeurs limites.
La deuxième enregistre tous les protocoles demandés, soit par l'intermédiaire de la console, soit par l'automatisme de programmation.



Cliché 4.



Cliché 5.

La troisième imprime les bons de réparations.

Ces imprimantes ont une vitesse de frappe de 120 caractères par seconde.

Projecteur de schémas d'installation
Tous les schémas des installations sont mis sur un microfilm de 16 mm avec une capacité de 1,000 schémas (*Cliché 6*). Sur chaque schéma figurent les différents organes composant l'installation avec le No. de chacun. C'est par l'intermédiaire de la console que l'opérateur fait apparaître sur le projecteur le schéma de l'installation.

Ce projecteur est prévu avec un système de photocopie, ce qui permet de reproduire un schéma et d'indiquer plus facilement au personnel d'entretien la source du dérangement.

Enregistreur programmable
Pour la transcription des valeurs mesurées deux enregistreurs à 6 pistes sont à la disposition de l'opérateur. Les enregistreurs étant programmables à partir de la console de visualisation, cela permet de suivre les variations de fonctionnement (débit, température, pression, etc).

Interphone
Une installation d'interphone met en liaison la centrale de commande et un certain nombre de postes répartis selon l'importance des installations. Pratiquement un interphone est prévu pour chaque sous-station. La commande se fait par l'intermédiaire du clavier de la console de visualisation.

Sous-station
Les sous-stations regroupent toutes les liaisons en provenance des divers éléments à raccorder sur le centre de contrôle.

Conception des sous-stations
Toutes les unités réceptrices de fonctions, ponts de mesure, unités détectrices d'alarmes, modules de sélection, compteurs quantitatifs (énergie, chaleur, débit), compteurs d'heures de service dotés d'un contact pour l'alarme d'entretien, sont conçus sur cartes enfichables. Toutes ces cartes sont disposées dans des tiroirs montés dans des châssis-supports escamotables.

Possibilité de fonctions (cartes)
Commande:
O-I avec mémoire
O-II avec mémoire
O-I-II avec mémoire
O-I-II-III ou O-Aut-Ouverte-Fermée
Déplacement du point de consigne avec positionnement
Par impulsion

Mesure:
de température
d'humidité
de pression
de débit
de courant
de tension
Indication de positionnement
Comptage: horaire-quantité

Pourquoi choisir un centre de contrôle

Le choix pour un tel système est dicté par un besoin de sécurité, de connaissance des états des installations, d'économie d'exploitation.

Besoin de sécurité par des programmes adéquats
En cas d'incendie
Arrêt de ventilation, fermeture de clapets coupe-feu, enclenchement de l'éclairage, de signalisation d'évacuation.

En cas de coupure de courant
Mise sous-tension de secours uniquement les consommateurs prioritaires suivant l'urgence et le moment de la journée.

Connaissance immédiate de tous les dérangements techniques
Protocole d'événements.
Grâce à ces programmes la sécurité des malades, du personnel et des bâtiments est considérablement accrue.

Protocole d'événements
Une des imprimantes est prévue pour l'établissement de ce protocole ou journal de bord.

Les informations, telles qu'alarmes, état de fonctionnement, dépassement des valeurs limites (comptage et mesure) constituent ce journal.

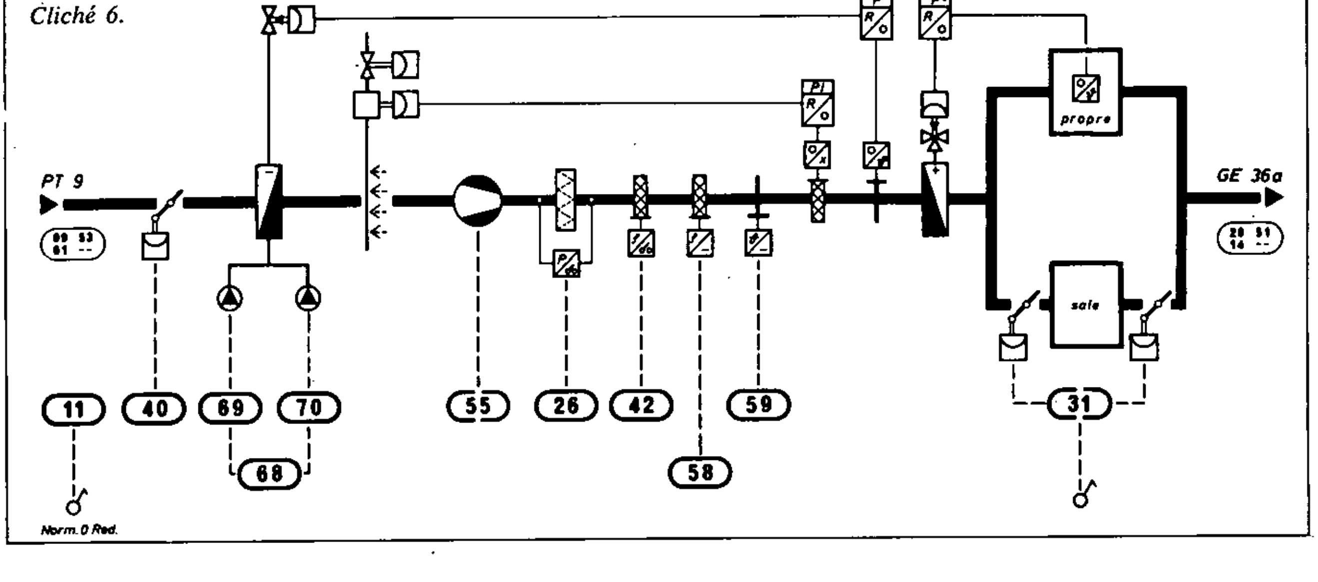
Pour chaque changement d'état, alarme ou dépassement, une information est imprimée.
Exemple: Cliché 7

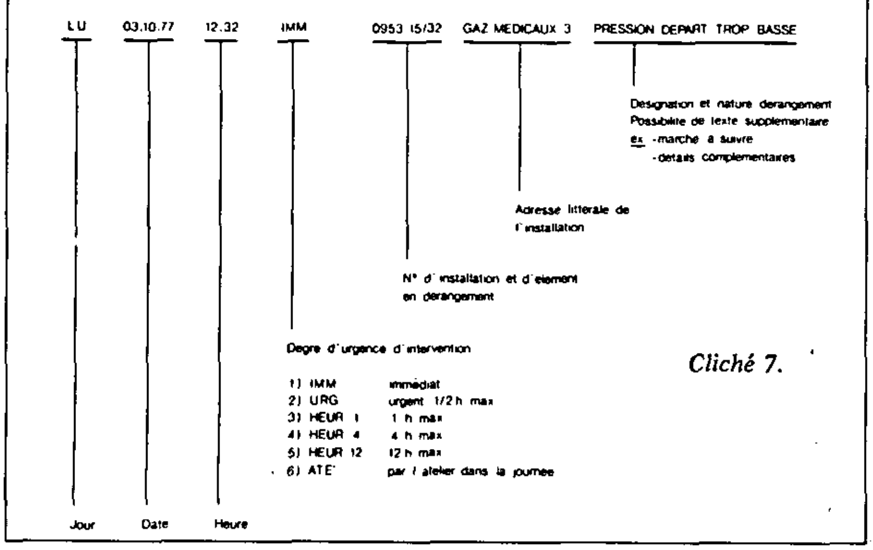
Connaissance des états des installations
A n'importe quel moment de la journée, l'opérateur peut demander au système de supervision, l'élaboration de protocoles, soit visualisé sur la console, soit écrit par l'imprimante, soit les deux simultanément.

On distingue les protocoles suivants:
dérangement suivant la catégorie d'urgence;
entretien;
état de service;
mesure;
comptage;
installation.

Réduction des coûts d'exploitation
Les coûts d'exploitation, avec un système centralisé, sont moindres

Cliché 6.





Cliché 7.

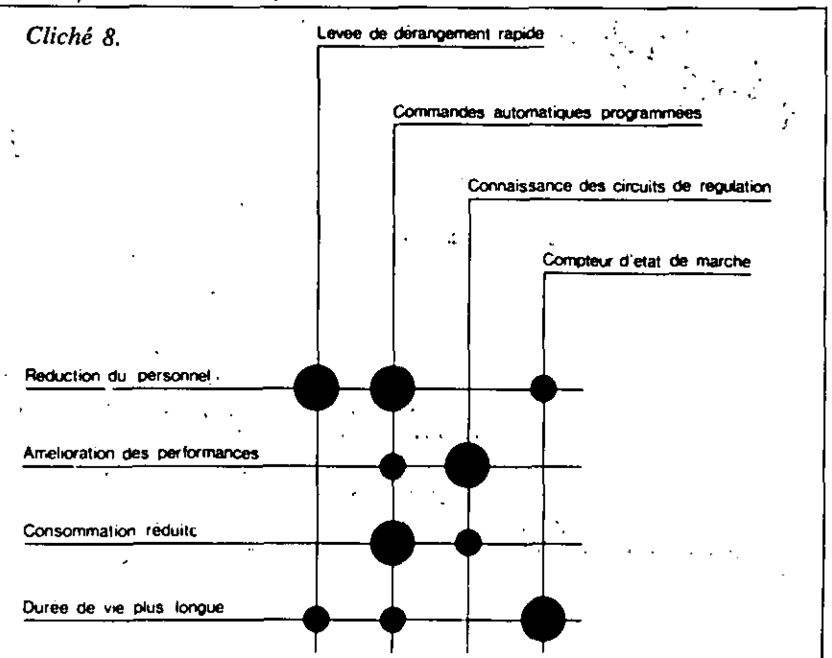
qu'avec un système conventionnel.

Les diverses économies se font par différents programmes automatiques:
Réduction de nuit, de fin de semaine des installations de chauffage, de climatisation et d'éclairage;
Enclenchement et déclenchement progressif de divers consommateurs pour limiter les pointes de puissances électriques et de chauffage;
Inversion des pompes, circulateurs, ventilateurs, etc, selon le nombre d'heures de fonctionnement qui nous facilite un entretien régulier;
Réduction du personnel d'exploitation.

Amélioration des performances
En prenant, par exemple, une régulation en climatisation, la connaissance des températures, de l'humidité et la position des vannes, permet de contrôler en permanence le bon fonctionnement de ce circuit de réglage.
L'enregistrement en fonction du temps peut faire ressortir les oscillations de température provoquées par un défaut ou un mauvais réglage.
Une marche correcte de l'installation entraînera de ce fait également une économie d'énergie.

En résumé, les principaux avantages d'un système centralisé sont:
Aspects techniques:
Localisation rapide des pannes et des informations diverses;
Prévention d'incidents;
Télémesures;

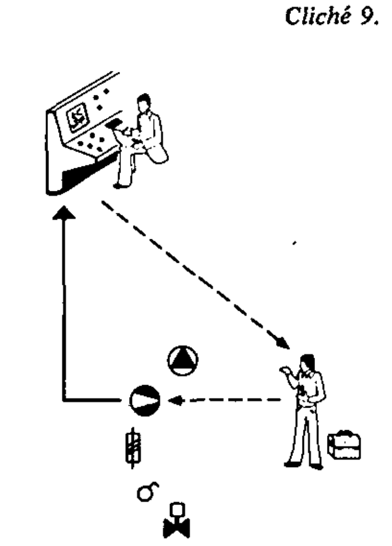
Cliché 8.



Technique de transmission permettant de grandes distances.

Aspects pratiques: (*Cliché 8*)
Organisation plus rationnelle du travail de dépannage grâce à l'indication du degré d'urgence et du schéma de l'installation;
Connaissance immédiate de l'état du fonctionnement de chaque installation;
Planification aisée de la maintenance;
Centralisation des informations (*Cliché 9*);

Cliché 9.



Mais comme cela . . .
système de recherche
compétence professionnelle
information exacte
exploitation rationnelle
évaluation précise

Tenue de journaux de bord;
Commande du système par une seule personne, sans qualification spéciale;
Rapidité d'intervention et sélection des informations;
Contrôle permanent de l'état des câbles;
Surveillance des portes de sortie de secours;
Toutes les liaisons sont réalisées par un câble à 2 paires de fils, entre les sous-stations et le centre de contrôle.

Aspects économiques:
Réduction des coûts:
du personnel;
de l'énergie jusqu'à 15%;
maintenance.

Utilisation rationnelle des installations, d'où amortissement du système entre 5 et 10 ans suivant le projet.

This paper was presented to the 1978 Lisbon Congress under the subject title 'Safety and Comfort'. The author, who is a Portuguese architect, wishes to thank his colleagues M. F. Abecasis, A. N. de Carvalho, M. A. Fernandes and A. D. S. Loweiro for their assistance in the preparation of this paper.

Comfort and Surroundings in Hospitals

Le Comfort et L'Environment dans L'Hôpital

E. HILARIO

Synopsis/Résumé

Le versant historique des hôpitaux portugais dans une perspective d'ambience et confort.

Conditions politiques, sociales et économiques. Les découvertes maritimes du XV siècle et sa contribution vers le developpement d'une *société*. Chronologie; les origines; les hospices; les hôpitaux pour les lépreux; les "Misericórdias"; principales périodes d'accroissement de *secours jusqu'à nos* jours.

Le problème des vieux édifices hospitaliers des grands villes (Lisboa, Porto, Coimbra, *parmi d'autres*).

La dégradation comprend les édifices les malades, le public et le personnel responsable, confondant les secteurs *administratifs et pulvérisant*, avec des solutions précaires, l'argent de l'Etat.

C'est un grand problème à resoudre en ce moment et avec tout l'urgence possible.

Chaque pays a ces propres notions de confort, toutes les populations ne doivent pas être vues sous le même angle, par les architectes et les programmateurs.

Les solutions architectoniques, les hauts ou bas volumes de construction, l'orientation, le chauffage, les circulations, etc, doivent s'ajuster à chaque région et à sa économie propre.

C'est complexe parler d'un confort généralisé et il y a beaucoup de points que nous préoccupent dans les hôpitaux portugais, tels que:

confort de chauffage, ventilation, bruits, infirmeries, zones de familiarité, alimentation, habillement, lecture et TV, hygiène interne et externe, ordures, insectes et rougeurs.

Il appartient aux architects et à d'autres techniciens de rendre suportable le séjour des malades (ayant quitté leur milieu familier) et du personnel à l'Hôpital.

La solution doit conduire à une approximation 'malade — personnel', en plus de l'obligation d'études et d'un equipement chaque fois plus parfait et confortable pour tous.

L'équipement hospitalier exige une évaluation minutieuse d'un nombre élevé de pieces, environ 3.000 articles différents, dès la petite cuillère au charriot à pensements et aux actuels appareils de R.X. les plus perfec-

tionnés.

La flexibilité et l'échelle humaine doivent être dans la préoccupation des techniciens, de même que la bonne qualité des achèvements, épargnant le choc visuel, autant en couleurs mal appliquées comme dans le mauvais dessin de quelques pièces fondamentales.

En ce moment, nous traversons une époque d'increment de nouvelles constructions hospitalières en sus du profit de quelques édifices centenaires, mais bien localisés.

Les nouveaux hôpitaux doivent garantir la possibilité d'expansion de leurs services. Cette exécution doit être rythmée. Très souvent on inaugure des hôpitaux qui ne sont plus actualisés face à l'augmentation de la population, par exemple.

Les 'Centres de Santé' en construction en ce moment peuvent servir d'un bon appui aux hôpitaux Centrals et d'une décisive expérience à notre politique hospitalière. Mais ils doivent être doués d'un personnel expérimenté et proféssionellement intéressé à sa noble mission.

Le malade doit de nouveau sentir vis-à-vis des hôpitaux une protection et un appui ainsi q'une compétence de traitement. La plupart des personnes — et avec raison — sont éffrayées à l'idée d'avoir recours aux hôpitaux, spécialement dans les grandes villes.

Il faut se rapporter comme élément de confort, la différence entre les divers types ou phases que le malade traverse, depuis la phase de malade couché, à la phase de malade en convalescence (debout). Il faut à prévoir dans les nouveaux hôpitaux des espaces adaptés à cette activité. Un autre problème qui réclame une solution urgente c'est le problème des visites aux malades que restent au lit. C'est le project d'architecture qui doit savoir donner une réponse à toutes les questions.

Le personnel hospitalier doit posséder le confort et la sécurité pour accomplir ses fonctions et donner au malade tout l'appui et l'affection dont il a besoin.

La dégradation, le professionalisme mal interpreté et l'indiscipline doivent être interdits dans nos hôpitaux.

Les équipements, les aires des salles et les parcours, les garanties sociales, sont quelques uns des points à revoir pour donner au personnel la totale possibilité de se réaliser, travaillant dans de modernes édifices.

Quant à l'avenir?

Il est normal que les hôpitaux du siècle prochain soient bien différents des actuels, comme le sont déjà, aujourd'hui, quelques uns des nouveaux hôpitaux en comparaison avec les édifices centenaires ruinés et desactualisés, mais toujours en fonctionnement.

Les problèmes de la pollution et des urbanisations surpeuplées et sans plan et les faubourgs des grandes villes, ont contribué pour dégrader l'influence des Hôpitaux. Sommes-nous encore à temps?

Ceux qui cherchent la solution de la souffrance aux Hôpitaux, sont dignes de réflexion.

C'est avec espoir dans un futur meilleur et plus confortable physiquement, pour tous et spécialement pour ceux qui souffrent, que nous terminons ce thème. Il nos reste l'obligation de contribuer pour une vraie révision ainsi que l'humanization de ces problèmes.

Full Paper

The historical background of the problems of the Portuguese hospitals in the care of the population goes back a very long way.

In the course of their history the Portuguese people with their strong reluctance to adapt to an evolutionary world, have suffered from their deeply conservative spirit.

The first centres for treatment known about had several purposes — to provide accommodation for pilgrims or travellers, to lodge sick people, to receive destitute children, to feed the poor. We can divide this social welfare into four periods:

1140-1498

The religious orders performed the most important role in this the earliest stage of assistance. Constant battles, conquest, protection and consolidation of territory, and the ignorance of hygiene led to sickness and hunger, and to the necessity of providing facilities for the lodging and protection of sick people. The majority of people from the interior of the country were peasants who grew cereals, produced wine and olive oil. People of the littoral lived from fishing and sea-salt.

The maritime discoveries, which started in the first half of the 15th century and were crowned with success in 1498 with the arrival of the Portuguese in India, contributed to a particular historical evolution. The desire to explore by sea resulted from Portugal's favourable geographical position, religious crusades against the heathens, economic, strategical and political factors. Social welfare work systems were changed according to necessity.

After the religious orders the oldest institutions for shelter and support of destitute people were the first hospitals, generally situated near convents and supported by religious orders, the crown, aristocracy and landowners.

Beginning of Modern Age — Late 1400-1866

Methods of assistance were improved in this period. The small buildings for the sick gathered into larger units which depended upon royal power. In 1488 the first 'Misericórdia' (Charity Institution) was created in Lisbon, with new schemes for protection against diseases.

In 1514, King Manuel I published the 'Rule for Chapels and Hospitals'.

The concentration on building for those in need spread to other towns — Évora (1505), Coimbra (1508), Oporto (1521), Beja (1532).

All Saint's Hospital in Lisbon, the building of which had begun in 1491/2, incorporated 43 small hospitals from the surrounding area and its limits bordered on Figueira Square and Rossio.

The earthquake which in 1755 destroyed some of Lisbon, certainly changed the appearance of the city. The most important buildings had disappeared, including All Saint's Hospital.

In 1886 the 'Misericórdias' (Charity Institutions) were integrated in the State and their importance to Portuguese people everywhere came to an end.

Advent of Liberalism — 1886-1940

This period saw increased assistance which was carried out by the State. A few years before, in 1860, the building of the only children's hospital of Lisbon — the D. Estefânia Hospital — was begun and completed.

Asylums, day-nurseries, new general hospitals and psychiatric hospitals were built, tuberculous people given assistance, etc. In 1909 Ricardo Jorge Md, published the 'Sanitary Reform', a very important document leading to the protection of the population's health.

The Law of the May 15, 1944 — present day

In 1944 a basic law for the assistance of the population came into effect — the Statute for the Social Welfare Work.

This was the starting point for a new type of social assistance, taking form in the law 2001 of 1946. The country was divided into zones, regions and sub-regions, with central hospitals (at least one per zone), regional and sub-regional hospitals. Other specialised hospitals were suitably organised and the Hospital Medical Schools of Lisbon and Oporto were built. The classification of the hospitals has subsequently been modified.

The Health Centres have been created through the Decree 102/71. In spite of being previously planned, they are only now beginning to be built. Three kinds have been foreseen, C1, C2, C3, according to the number of inhabitants, and in addition small units for regions with a smaller population. Through this new way of facing the problem of care for the population's health, a challenge is being made to the capacity for organising efficiently the operation of these centres by qualified and interested staff.

Until about the first half of the 1940s, the problems of hospitals in Portugal had been considered mainly as a result of the old buildings, some of which were two hundred years old.

The relations to be established between the District Hospitals and the other facilities for screening and treatment must be completely modified. The main hospitals of Lisbon and Oporto, in old and degraded buildings, treat all kinds of pathological cases. A hospital is like a part of a whole, assembled by a principle of functional unity. A patient's dignity demands the end of the distressing appearance of some hospitals, which leads to the discouragement and discomfort of the patients and their family, dismays the doctors and responsible staff, confuses administrative departments and wastes public money.

The repair works for remodelling an old hospital are so fundamental and so expensive that frequently it makes no sense to improve an old building, with the exception of some special cases. In the cities of Lisbon and Oporto the old hospitals are a major problem which has to be solved. Studies are now in progress in the Directorate-General of Hospitals, concerning plans for the complete transformation of hospitals where this is considered advantageous. Some hospitals have reached such a degree of ruin and degradation that this must be faced right away. The dignity of patients and staff requires urgent programmes, planning and repair works.

Nowadays the consideration of comfort and well-being of the patients who have to be sent to hospitals is part of the general concern of man in making use of the benefits for simplification and easing of his work. This paper will be limited to the conditions of material and psychological comfort necessary in the new and in the remodelled hospitals.

The patient, away from his/her usual environment, separated from his/her daily activities, without the companionship of his/her family, worried and depressed by sickness and suffering, must be surrounded by comfort with the necessary dignity.

To some extent each country has its own ideas about comfort and environment and if they suit some populations, they are completely wrong in other cases. But there are some elements in common regarding this problem and we will mainly deal with them.

The different levels of comfort can be attained in several ways, which are connected with matters like circulation inside the hospitals and can be achieved by different types of architectural solution, vertical communications location and orientation of the wards, accesses, etc.

In Portugal for instance, we are making only slow progress in raising the comfort level through convector heaters, whose utilisation rates are very high. Therefore, less use of such devices means we have discomfort.

In the same way air conditioning is installed in some departments only.

We must look at certain concepts and think, in terms of economy, about a system of construction and about equipment that would suit conditions in Portugal. Strongly protected walls, better placed windows and suitable doors, for instance, can contribute from the very beginning to savings in maintenance costs. They can also lead to other benefits.

It is very difficult to speak generally about comfort. We are concerned about the problems in Portuguese hospitals, discussed in the book 'Hospital Facilities and Equipment', by Mr Eduardo Caetano, engineer, published in 1972. The author refers to:

a. Thermic comfort; b. Ventilation; c. Noise; d. Wards or rooms; e. Areas for entertainment; f. Food service, linen, entertainment (reading, radio and TV); g. Outside and inside cleanliness; h. Waste disposal. Insects and mice.

The architects and technicians must find the answers that enable both patients and staff to endure their stay in the hospitals. The solution must allow a 'patient-staff' approach which reflects our technical capacity for planning areas, volumes, comfortable and agreeable interior and exterior spaces and adequate equipment.

Three basic elements are necessary for hospital life: facilities, equipment and staff.

The construction cost of a hospital is usually not greater than the total amount of the medical and general equipment required. The overall cost is usually considerable and demands conscious and qualified staff to make sure the investment is worthwhile and to maintain it in such a way as to avoid waste. The daily use, for instance, of wheeled equipment, frequently causes damage to the decoration, doors, etc. The faulty design of such equipment together with careless use by untrained staff, leads to extra expenses for hospitals.

The equipping of a hospital requires a wide appreciation of the problems involved in arranging a large amount of equipment, with differing functions, in an effective and efficient manner. From a baby incubator to a mortuary refrigerator, from a tea-spoon to a bed-pan, from a screw-driver to a power plant and from a clinical thermometer to the latest RX equipment there are approximately 3,000 different articles required for the proper functioning of a hospital. All of these items must be provided in the correct numbers, in order to achieve maximum operation and cost effectiveness. In addition, there must be a rigorous selection of the large numbers of different manufacturers, sometimes more than a hundred.

The flexibility of hospital buildings is a constant preoccupation of designers and will enable us to face new needs and development of functions within the same building.

In most cases the remodelling of the 'Special Technical Facilities' in the

old hospital having difficulty in coping may be the main reason why the modernisation of a traditional hospital is not sufficient. We must consciously think about the points for and against, given the limited Portuguese economy.

The patient, coming from his/her familiar surroundings, needs psychological protection, because he/she becomes frightened and worried. The environment of hospitals must be calming and comfortable, without luxury but with quality. Areas, shapes and proportions, scale, structure and quality of materials suitably used are some of the elements basic to the concept of hospital comfort. Colour is a means of introducing in the interior zones the calm light and freshness which we can only find in the open air; light, natural or electric is an emphasising factor for aesthetic effects. Both should be used with the intention of avoiding deep changes between light and shadow. The team, architect/interior designer, is responsible for this range.

Durability and quality of materials and furniture are other important points. With an accurately planned distribution of the general equipment and uniformity, we can reach levels of good quality in interior design.

It is important to avoid visual chaos, because the furniture supplied by manufacturers uses materials with no guarantee of quality, without good finishings and badly designed. Good quality represents an economy and should lead to both long use and the patient's and staff's well-being.

Industry standardisation enables the achievement of good levels of interior design. In the case of hospitals this is a vital factor in improving the environment. We are trying to interest Portuguese industry in the designing and manufacturing of equipment which to date has had to be imported.

In regard to prefabrication of hospital buildings and its quality, we are not aware of any such installations in Portugal.

Main Physical and Psychological Factors Determining Various Levels of Environment and Comfort of Patients and Staff

People responsible for collective health equipment are facing two sides of a very controversial national problem. On the one hand, the old hospital, whose system has been adapted to the needs of medical evolution and demographic growth. On the other hand, the building of new hospitals which can meet the needs, culture and habits of the population, with acceptable levels of safety and comfort.

Curiously a new hospital does not always meet the requirements of a good operation. In the same way, we admit that the old hospital, provided it is large and in a good location, may acquire acceptable levels of comfort, security and working, if properly adapted. There are good examples in some countries.

This is caused by the specific factors that determine the operation (rather than the comfort and environment) of hospitals and is a direct consequence of the attention designers and hospital staff give them without paying attention to the building in which they are performed.

It is not worth while having good and modern buildings, specialised departments and sophisticated hospital equipment if, when planning the use of these hospitals, the abilities and numbers of the working staff are not taken into consideration. Sometimes we could even say that 'It is not the car that is missing, but the driver'.

We can see that the adaptation of an old building through a sub-division of the enormous halls of the hospitals and leper hospitals (which in the 14th and 15th centuries were surrounded by beds, hidden behind curtains and where the patients lay), brings good results. At the back there was an altar, essential to a pre-therapeutical period in which sickness was, first of all, a preparation for death. As we have said this sub-division has been effective, if accompanied by suitable architectural and engineering repairs and finally provided with satisfactory equipment and enough qualified staff. But it cannot compete, in terms of comfort and circulation, with the best new plans.

After the period of the 'enormous halls' followed by the pavilion wards in about 1930, the actual 'hospital building', in which the first element considered is its location, is governed by economic needs (site, heating, circulation, staff, etc). This is because ambulant consultation is relatively the most important service within the hospital.

Facility of access to the hospital is, therefore, absolutely fundamental and must have priority.

Next to flexibility in order of importance comes the size of the building site which, in the case of the old hospitals in the large towns, may be a strong obstacle to their development.

The new hospital should also permit future expansion of its departments, and here we are facing a problem which is difficult to overcome. The problem consists both of the provision of suitable hospital planning and of the fact that the period for building the hospital is often too long. Soon after beginning to work, some departments may find that they are not able to meet the requirements of population growth, new techniques, etc.

Flexibility also runs parallel to the evolution of the hospital, which has a tendency to enlarge the area assigned to ambulant consultation and the 'technical staff' or group all the medical and technical specialised departments to the prejudice of the accommodation areas.

To allow the reduction of the lodging area (and here we unavoidably find the economical, political and social background), it would be essential to have the right assistance policy to help the old, who account for a large proportion of the occupation of the hospital lodgings. Together with this, we must develop preventive medicine which leads to more efficient ambulant consultation.

We are sure that the new 'Health Centres' now being built are going to help improve this side of the problem.

The 'Health Centres' may become a fundamental change in the adaptation of our hospital policy. They are going to reduce the workloads of the main hospitals and give people protection in health matters through preventive medicine. These Centres must rely on qualified and professionally interested staff, so that the local population believes in the quality of the services.

The different levels of hospital comfort for patients result in first place from the so-called 'hospitalism', which we can include among the psychological factors that have caused the dramatic aversion most people have of hospitals.

This is a fact which can be identified in several countries and is an obvious explanation.

This being so we notice that in the case of a hospital in one of our towns which had the chance of organising ambulant consultations for the Social Welfare Service, it has not reached its planned capacity, in spite of the attractive appearance of its facilities which have no relation at all with those painful impressions that previously caused such a reaction from the public.

In fact 'hospitalism' results from several elements, such as the progressive degradation of patients in the hospital, contamination inside the hospital, and mainly, as a psychological factor, the loneliness, because first of all the patient is away from his/her closest friends and because in the hospital doctors and nurses are usually judged according to their friendly or bad character and not according to the care they give. As medicine becomes more technical, comfort is what patients mainly care about. Ignoring the evolution of medicine, what comfort is there left for the patient, besides that which staff must provide with missionary spirit?

Inevitable psychological reactions take place inside the hospitals, both from 'hospitalism', which we have already mentioned, and from the size of the hospital itself which, according to studies usually ranges between 300 and 1,000 people. A medium-sized hospital is easier to operate and more human in countries having economic and social features similar to those in Portugal.

It seems also worthwhile remarking, as an element of comfort, the distinction between several kinds of phase which bed patients pass through, from the phase of being confined to beds, to that in which they can walk.

This is important because a patient who walks needs an occupation which is completely different from those of the patients who are in bed.

It would be a good idea to think about some entertainment for this kind of patient and about their visitors, who so trouble the patients lying in bed. In Portugal and specially in the old hospitals, visiting hours become a 'fair'. It is a matter of civility, we must admit, but it is important to find a solution for this problem, from the plan itself.

A patient's comfort is directly related to the staff's comfort, which is perfectly understandable.

Hospital staff, who have no comfort and not enough safety to perform their functions, will not be able to give patients the necessary help and care. Degradation and lack of discipline cannot take place inside a hospital. We are also considering the problem of safety within hospitals, which starts at the architectural stage and the assessment of non-inflammable materials, etc.

All these facts involve: (1) the number of beds per ward, which must not exceed 3/6 beds; (2) auxiliary staff, qualified and in sufficient numbers to provide good hygienic conditions; (3) department location and their relative proximity; (4) hospital equipment in a general way, including technical equipment, etc.

It is desirable that the medical and nursing staff have their tasks made easier, affording a pleasant, safe and steady working environment, so that they can concentrate attention and care exclusively on the patient.

Fixed equipment for instance (work benches, wash basins) must be carefully studied, as well as the ergonomical adaptation.

On the other hand, rooms must have adequate areas and make possible a good and easy arrangement, avoiding permanent confusion and the obstruction of equipment and supplies used each day. Besides being unfavourable to the necessary organisation of the services, small areas give rise to conditions which do not allow good standards of hygiene, disinfection and safety.

Hospital environment, as any other environment of an architectural space, depends on several elements, among which we find colour.

There is the *a priori* idea that the main colour of a hospital should be white. In fact we notice this is not the case, because psychiatric research has brought new guidelines which are not always duly considered.

In a general way the use of colour will affect the patients and will lead to:

— a more or less pleasant environment;

— less apprehension concerning the patient's entry into a hospital (the in-patient is invaded by a feeling of anonymity emphasised by the white colour);

— a psychological help to recovery.

Among staff (surgeons, doctors in general and nursing staff, etc) colour may create a more pleasant environment and, therefore, leads to higher work levels. We know that staff who fill hundreds of forms and file-cards per day will feel less tired working on greenish papers.

Warm and stimulating colours make some convalescences easier, while more temperate and restful ones help chronic diseases.

Another aspect resulting from an indiscriminate use of colours is found in the fact that usually ceilings are white. This ignores the fact that the main users of a hospital, the patients, have to look at the ceiling for long periods.

The choice of colour must be made according to the typical psychological and biological features of the several diseases and therefore colour plans for hospitals must not be completed without there being a meeting between the technical staff and the 'Centres for study of colour', when one exists.

Colour used in the operating theatres for instance must be relaxing, so that doctors may rest their eyes. Blue-green and green used for walls and clothes are suitably restful.

And what about the future?

There must be no doubt that if the doctor becomes a full-time worker the same must not happen to the patient . . .

The hospitals of the next century are, of course, going to be very different, as nowadays the best existing hospitals are, compared with those of the last century. Disease prevention as well as the patient's readaptation will also concern hospitals.

We must fight against routine, trying to improve the professional quality of the hospital at every level. We must know how to demand and think about the many hazards which contribute to an increase in the number of patients. We are thinking about the problems of pollution and uncontrolled urbanisation around the large towns. Will we be in time? We conclude this subject hopeful of a better future and better physical and psychological comfort for everyone and above all for those who suffer, with a fairer division of benefits among mankind. Those who look for a solution to their problems with the hospitals, deserve from us a moment of conscious reflection.

The Division of General Equipment of the Directorate-General of Hospital Construction, Public Works Department, has a team of technicians which began work about a year ago. We are trying to do our bit in tackling the problems of environment humanisation, by interesting the national hospital equipment industry and by making responsible departments aware of some naturally inconvenient realities which we must try to fight and overcome.

Product News

New Colt Conditioning System

Colt International Ltd, the ventilation company, have produced an addition to their Jetstream Conditioning equipment which they consider can have a marked effect on the health and general well-being of people indoors. The Jetstream can now be supplied with an integral ion generator which introduces a stream of negative ions (negatively-charged air molecules) into the airflow. The stated benefits of a negative ion-rich environment are: (a) Increased efficiency of breathing due to easier exchange of gases in the lungs; (b) Heart-beat reduced; (c) Reduced level of Serotonin in the blood, thus easing tensions, reducing the blood pressure, relieving some types of migraine; (d) Relief to many sufferers from hay fever, bronchitis, asthma, etc; (e) There is also evidence that some persons will obtain an increased resistance to infection from respiratory ailments such as influenza. High levels of positive ions affect the respiratory system, making the lungs less efficient, causing shortness of breath and leading to mental fatigue and a reduced resistance to stress.

Further information is available from: Colt International, New Lane, Havant, Hants PO9 2LY. Tel: 0705 451111.

New Anti-Static Flooring System

An anti-static flooring system known as Reinau EW 99 AS has been introduced by Th. Goldschmidt Ltd. The Reinau EW 99 AS system, which is completely seamless, bonds to the substrate, is available in a range of four colours and is claimed to give a high degree of chemical resistance. It can be supplied in two versions to give either a smooth or an anti-slip flooring texture. The new flooring can be used wherever there is a possibility of electrostatic sparks igniting flammable or explosive materials eg in operating theatres, anaesthetic rooms, laboratories, film processing areas and computer rooms. The system meets Hospital Technical Memorandum PT2 with regard to floors in operating theatres.

Further details are available from: Th. Goldschmidt Limited, Initial House, 150 Field End Road, Eastcote, Middx HA5 1SA. Tel: 01-868 1331.

Machines for the Engineer's Workshop

Cowell Engineering Ltd manufacture a range of machinery including a vertical milling machine, 90 HS lathe, 90 CW lathe, printed circuit board drill which are of interest to the engineer who wants his own workshop facility. The machines are made in the UK and are cheaper than those produced in West Germany. Although designed particularly for model engineers, the machines are robust and fully capable of withstanding hard workshop use.

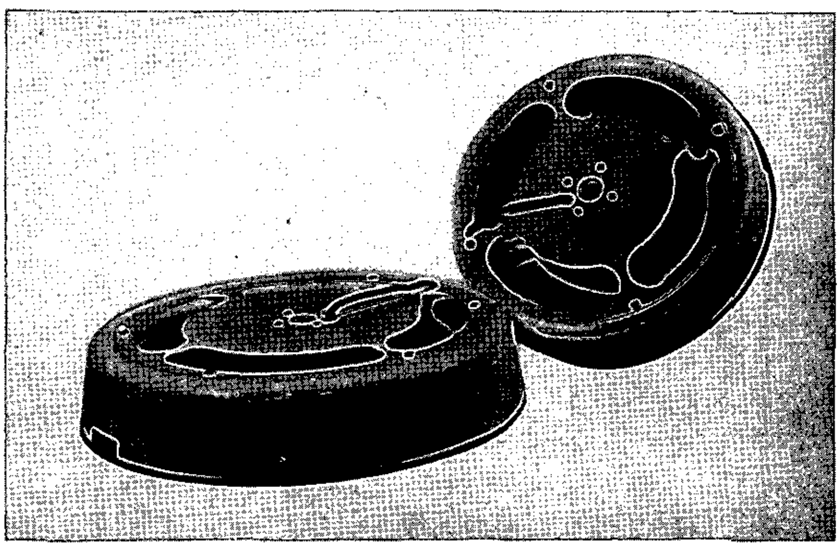
For further details, please contact: Cowell Engineering Ltd, 95-101 Oak Street, Norwich, Norfolk. Tel: Norwich 614521.

New Blower Unit

Willsher & Quick Ltd have introduced a new blower unit, the 'Extravent' Model 378, which is designed to achieve maximum heat transfer by air circulation in enclosed electrical or electronic installations. These low profile units may be fitted either horizontally or vertically, inside or outside an enclosure. Powered by a centrifugal fan they can provide local heat extraction from a specific hot spot. The units can be supplied with a plug and a socket ready for connection to the appropriate electrical supply of 110 or 240 volts. For on-site installation all that is required is a 150 mm round or square aperture.

For further information, please contact: Willsher & Quick Ltd, Walrow, Highbridge, Somerset TA9 4AQ. Tel: 0278 783371.

The Extravent blower unit.



Stick-on Heat Conservation

A new window insulation film from 3M's Energy Control Products is claimed to approach the thermal efficiency of double glazing at a fraction of the cost. Scotchtint P19 window insulation film is applied to the interior of window surfaces, where it performs two functions — reduction of heat losses from inside during winter and control of excessive solar heat from outside during summer.

Long wave infra red radiation (IR), which is emitted by all objects in a warm room, can account for 60% of the total heat loss, as glass is a good absorber of long wave IR. Window panes normally become warm themselves, and lose their heat to the cool, outside air. When 3M's new low emissivity laminate film is applied, the long wave IR radiation is reflected back into the room via the aluminium vapour coating, thus conserving interior warmth and saving on heating costs.

3M calculate that a reduction in heat loss of 33% may be obtained with P19-treated single glazing and 23% with double glazing. The film also reduces solar heat by 75% and filters out ultra-violet rays to combat fading of furnishings. 3M's solar control films are applied by a nationwide network of specialist applicators.

Further information may be obtained from: Mike Gadd, Energy Control Products, 3M United Kingdom Limited, PO Box 1, Bracknell, Berks, RG12 1JU. Tel: 0344 58280.

Patent Boiler Services Move

Patent Boiler Services Ltd, specialists in all aspects of the cleaning and maintenance of hot water and steam generation equipment, have moved to a new headquarters in Clapham, London.

The move to larger premises follows the progressive expansion of the company's industrial and commercial contract maintenance and cleaning operation during the past 12 months. In addition to offering both waterside and fireside cleaning services for boiler equipment using established chemical and mechanical cleaning techniques, Patent Boilers now offer a comprehensive mechanical and electrical maintenance service for boilers and associated control equipment. Patent Boilers also offer a specialised asbestos removal service which fully meets the requirements of current Health and Safety legislation.

Further details are available from: Patent Boiler Services Ltd, 44 Southside, Clapham Common, Clapham, London. Tel: 01-720 0196.

Multi-functional Cooling Water Chemical

A multi-functional liquid chemical for combating corrosion, scale and microbiological activity in cooling systems has been developed by Nalfloc Limited. The new product, Nalfloc A108, has been tested on mild steel components and corrosion rates of less than 1 mpy have been recorded. It is suitable for use in most cooling systems, particularly those associated with air conditioning and computer cooling installations.

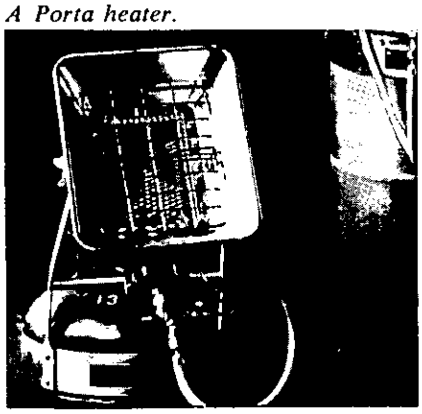
Further details are available from: Nalfloc Limited, PO Box 11, Northwich, Cheshire CW8 4DX. Tel: Northwich 74488.

New Range of Industrial Heaters

Infradex Limited have introduced a new Porta-Radiant range of industrial heating appliances in three forms, either as standard, or alternatively with flame failure valve or with flame failure valve/oxygen analyser. With an adjustable clamp which enables them to be fixed securely to the gas bottle itself, these infra-red radiant heaters provide immediate warmth anywhere that independent heating is required. Model PRH/1 is for propane cylinders of 11 kg gas weight and over, while models PRH/2 and PRH/3 fit 4½ kg cylinders. All models are supplied complete with 3 ft hose and 50 m bar regulator. The heat inputs range between 12,500 and 6,000 Btu/h and respective consumptions between 9.0 and 4.0 oz/h. The new range is available at a price from £29.50 plus VAT.

For further information, please contact: Infradex Limited, Brewery Road, Hoddesdon, Herts.

A Porta heater.



Burner Efficiency Monitor

Hoccom Developments Ltd is to market the 'Burner Bug', a burner efficiency monitor designed to achieve optimum economy in energy consumption for both industrial and domestic heating systems. The 'Burner Bug' is claimed to provide an effective yet inexpensive method of ensuring that warm air heaters, boilers or process plants are working efficiently and using the minimum amount of fuel required. The 'Burner Bug' can also act as a guide to impending heater or boiler breakdown, as a swift service made when a deterioration in efficiency level is indicated can prevent irreparable damage.

Fitted by means of a bracket to the flue stack, the 'Burner Bug' works on the principle that any change in the temperature of the flue gas is caused by a drop in combustion efficiency. Therefore, if the temperature in the stack alters by more than three degrees the 'Burner Bug' will detect this and indicate a reduction in efficiency. It is suitable for all types of boilers and heaters with a flue stack.

For further information, please contact: Mr J. H. G. Lywood, Managing Director, Hoccom Developments Limited, Faraday Drive, Stourbridge Road, Bridgnorth, Salop. Telephone: 074 62 5361.

Controlling Boiler Noise

A solution to the problem caused by the noise of venting exhaust gases is offered by Designed for Sound, a noise control company. Designed for Sound are UK distributors for the extensive range of Rauchrohr silencers, manufactured in Germany by Grunzweig and Hartmann GmbH and in this country under licence. The standard G+H unit has been designed to give a noise reduction of 10 to 15 dB(A), covering the usual frequency spectrum of boiler noise.

The Rauchrohr is compact, since there is little space to spare in a plant room. There are several shapes available as standard and special designs can be made to order. The silencers are supplied with all the fittings necessary for easy installation.

For further details, please contact: Mr J. E. Culshaw, Designed for Sound Limited, Hamilton Road, Wivenhoe, Essex. Telephone: 0206 22 3711.

Paragon Generator Trailer

A fleet of 'Paragon' Trailers specifically designed for the use of small generator plant for emergency power supplies in vital areas have been produced to suit local council's needs. In the event of any power failure or lack of power because of industrial action the units are linked to provide a source of power. The trailers are high speed road vehicles with full regulation lighting equipment, independent rubber suspension running gear, conventional 50 mm ball towing coupling with adjustable leg props, and overrun brakes with hand lever parking brake facility.

For further details, please contact: G. W. Elen & Sons Ltd, 'Paragon Works', St. George's Way, Peckham SE15 6PY. Tel: 01-703 6771.

Classified Advertisements

APPOINTMENTS AND SITUATIONS VACANT

To place an advertisement in the next issue of **HOSPITAL ENGINEERING**, appearing in **April, 1979**, please contact:

EARLSPORT PUBLICATIONS, 17 St. Swithin's Lane, London EC4, 01-623 2235/8, by March 23, latest.

Closing Dates

Recruitment advertisers are requested to set closing dates no earlier than three weeks after publication date of the Journal.

Monthly publications do not receive preferential treatment by the Post Office and circulation lists in hospitals also delay receipt of the Journal by many potential applicants.

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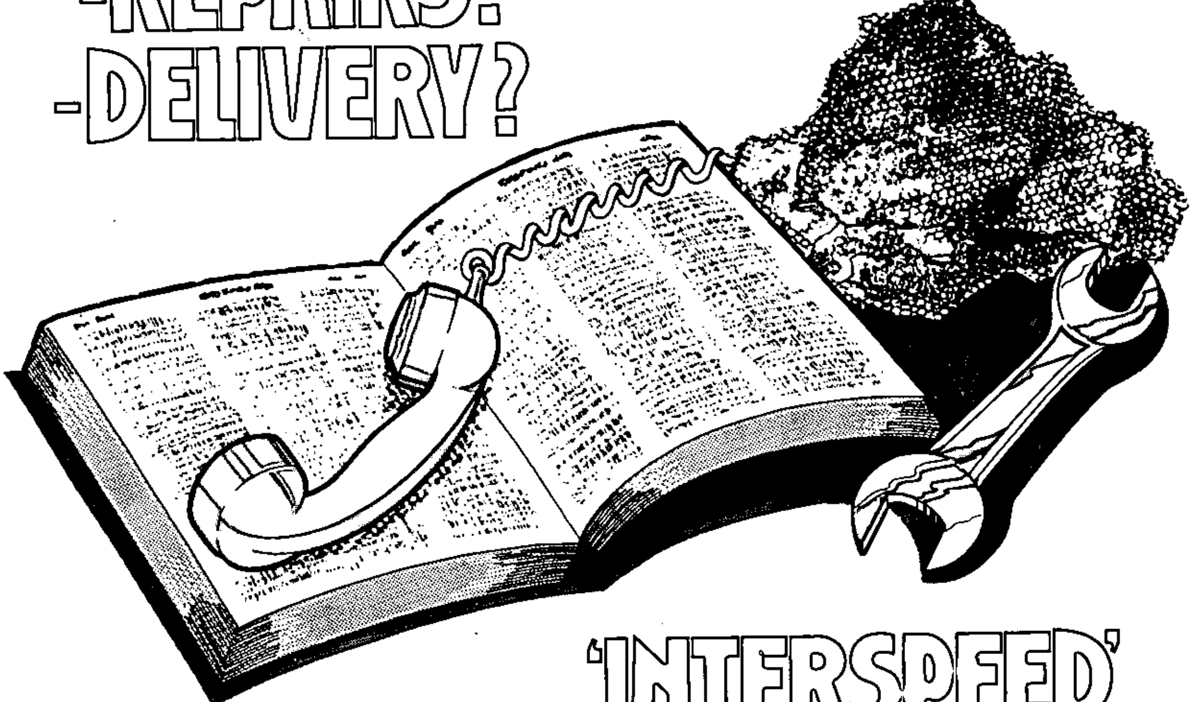

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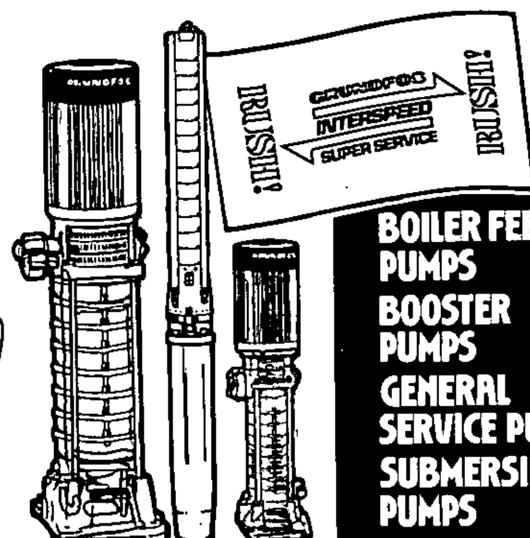

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