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H & V News

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*Complying with new IIRS specification
(IS 239: 1980)

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Over 300 couplings for connecting either copper or polythene tubing. Made in Ireland since 1934. Solid. Reliable. Leaders of the brand. The entire Irish Instantor range complies with the new Irish Standard specification for compression tube fittings issued by the Institute for Industrial Research and Standards.
(IS 239: 1980)
Which just goes to prove that we’re the top brass. Irish Instantor – the Irish Standard Bearers.

Sanbra Fyffe

Everything On Tap For Plumbers.
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NEW PRODUCTS............ PAGE 50
HRP Walker, the Dublin and Belfast refrigeration component wholesale subsidiary of Walker Air Conditioning, is now able to offer the Searle range of air cooled condensers, coils, unit coolers and allied products throughout the 32 Counties.

Walker has been analyzing all the products available from its HRP Division with a view to strengthening its product offering to the frig trade and is now taking on the Searle range in place of Myson. HPR Walker claim Searle product offering is greater, the quality is well established, and the price competitive.

The company is also seeking new larger premises in Dublin from which to operate in order to further improve its service to the trade. A number of possible new locations are being actively considered at present.

HRP Walker will now add Searle to its other major lines which are copper tube; Isecos refrigerant; Aspera DWM Copeland, Danfoss and Lec compressors and condensing units; Teddington thermostats, pressure controls and expansion valves; KMP driers; Imperial Gould servicing tools; Watsco line valves; Ranco controls; Armoflex insulation and Sabroe components.

The major Searle products available from HRP Walker are the T range of compact coolers for cabinets and small cold rooms; the UCL and K ranges of standard unit coolers for medium or low temperature applications and the new low velocity coolers ideal for food preparation areas, and a wide range of condensers.
the most purchased gauge in Europe

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A new information and advice service on solid fuel heating and cooking was opened last month at 12, Berkeley Street, Dublin.

Hosting the launch was Biddy White-Lennon, best known to Irish TV viewers as Maggie Riordan.

Thermo House has an upstairs demonstration room, where, throughout the year, visiting groups will be shown the capabilities of solid fuel heating and cooking. The demonstration room has a solid fuel cooker in operation, linked to a boiler system with piping clearly visible, so that people visiting the Berkeley Street premises can see how a correct linkage should be made.

It is hoped that two demonstrations a week will be scheduled in the evenings for groups whose members may be interested in the trend towards solid fuel cooking and central heating. In addition to the fully equipped kitchen at Thermo House, tape/slide presentations and video programmes on all aspects of cooking and heating with solid fuel will be on show.

"We hope that Thermo House will become the place to visit once a family begins to think about investing in solid fuel appliances, whether those appliances are cookers, boilers, back boilers or closed stoves."

Moreover, Michael Curtin, General Manager Wamsler (Ireland), said at the opening, "Although we're committed to the value and efficiency of modern solid fuel appliances, the fact is that a change to solid fuel DOES involve a change in life-style. And people should know about it before they invest a lot of money in an appliance. We don't believe that everybody should be encouraged to buy a solid fuel cooker, for example. Someone whose life-style doesn't suit such a cooker will be back to you later with a list of complaints, and rightly so...

"..."Literature on solid fuel cooking and heating is also available at Thermo House. The Solid Fuel Times, a quarterly publication now in its second edition, will be available free to the public both at Thermo House and at dealers who sell solid fuel cookers throughout the country.

"We don't believe that every family should be encouraged to buy a solid fuel cooker, for example. Someone whose life-style doesn't suit such a cooker will be back to you later with a list of complaints, and rightly so..."

One of the most common problems associated with chimneys and flues in Ireland is down-draught and poor combustion due to exposed and turbulent situations. By the recent introduction of the Monodraught Chimney, it is claimed any conventional flued boiler, whether gas, oil or solid fuel, can be converted to a balanced-flue condition, thereby completely eliminating the effect of down-draught. The Monodraught chimney is only 2ft (600mm) high and can be used for single storey boiler houses eliminating the need for tall brick or prefabricated chimneys to the top of the adjoining roof showing a saving of many hundreds of pounds. The Monodraught flue consists of a number of pre-cast concrete blocks with a central flue core surrounded by four air ducts with the intakes sited directly under the chimney capping. Provided the boiler is in a sealed boiler house a balanced-flue condition is provided since the air inlet and the flue outlet are in the same pressure zone and the system is therefore "balanced" at all times regardless of outside weather conditions, the only requirement is that the chimney is sited one metre away from any higher wall or building. In a cross wind situation the wind is simply channelled down the air ducts on the windward side of the chimney and any excess air is vented on the leeward side.

Fize sizes of chimney are available for boilers of 100,000 Btu/hr up to 2,000,000 Btu/hr capacity. The builders merchants Mansell Mitchell, a part of the Graham Group are now the main stockists in Ireland but the Monodraught chimney will soon be available from local stockists throughout the South of Ireland. Prices range from under £100.00 for the domestic chimney and even the..."
The subjects covered on the book are listed as follows:

Introduction to development of the S.I. units of measurement with special reference to heating requirements giving basic units and the build up of desired units.


Effects of heat on a substance.

Pressure, comparison with imperial units of measurement.

Specific Heat Capacity. Comparison with Imperial and evaluation of our change constants.

Methods of heat transfer, conduction convection radiation and energy conservation.

Heat requirements—comfort and its measurement, explanation of 'heat losses'

Air heat loss requirements — calculation of room air heat loss.

Fabric losses. Factors controlling same. Determination of U Values Heat loss calculation for specific buildings

Heat loss checks & slide rules

Insulation of buildings

Heat emitters

Insulation of piping & plant

Pressurisation (sealed systems)

Heat transfer through materials

Energy sources & utilisation

Imperial Units of measurement have been used in all calculations for comparison with S.I.

Contents have been approved by the IDHE as a Text Book for its Associate Membership Examination.

At long last the reprint of Hugh Maguire's excellent text book Heat Transfer for Domestic Heating Engineers is available and as a special offer to readers the book is offered at a special price, details below.

USUAL PRICE: £7.50 plus £0.50 (p & p)

READERS OFFER: £5.50 plus £0.50 (p & p)

PLEASE SEND .......... COPIES OF HEAT TRANSFER FOR DOMESTIC HEATING ENGINEERS.

I ENCLOSE £6.00 (£5.50 + £0.50 p & p) FOR EACH COPY, TOTAL £..............................

Cheques to be made payable to Hugh C. Maguire

NAME:...........................

ADDRESS:...........................

THE ABOVE COUPON SHOULD BE COMPLETED AND SENT WITH REMITTANCE TO: HUGH C. MAGUIRE, 44 SYDNEY AVENUE, BLACKROCK, CO DUBLIN (Tel: (01) 888384)
industrial flue is approximately £300.00 showing a massive saving in the original structural costs as opposed to conventional chimney systems.

Since stable combustion conditions are created, the boiler will also run far more efficiently resulting in reduced maintenance and running costs as well as reducing pollution caused by poor flueing conditions.

Monodraught has been widely used in England for more than 20 years and is extensively used on schools, hospitals, banks and other public buildings as well as being widely used on private housing schemes. The agent for Monodraught in Ireland is Pat O’Donovan of Lisheen, Elton Park, Sandy Cove, Co Dublin and further information is readily available. Mike Taylor of General Heating Co will be pleased to deal with enquiries in the Galway area.

CIS TRAINING COURSE

Coal Information Services Ltd have announced that a further training course in solid fuel heating and good practices has been arranged and will be held in Institute of Engineers Headquarters, Clyde Rd, Dublin, commencing 7 September '81. The course will be of four days duration, culminating in written test and successful participants will qualify for SFAS-CIS Diploma/certificate.

Similar courses held in 1980 were an outstanding success, and as places are limited again this year, early application is advisable. Subscription of £40 to cover lunch, tea/coffee, notes etc is necessary to reserve place. For details contact Coal Information Services Ltd at 18 D’Olier St, Dublin 2, tel 776246/779137 or Eagle House, Lr Glannmire Rd, Cork tel 505111.

HTIL CONTRACTS

Hall-Thermotank Ireland Limited have been appointed refrigeration contractors for the plant installation at the new Batchelors Food Processing Plant at Grand Canal Harbour, James’ Street. The value of the order for the refrigeration contract is £100,000, and work has commenced on the installation of the complex low temperature refrigeration plant.

They have also just commissioned a £150,000 refrigeration plant installation in the new ultra modern shopping centre at Dunnes Stores, Ballyleheane, in the rapidly growing suburban area of Cork.

The refrigeration installation was completed in record time, and the refrigeration equipment was factory assembled to provide two fully assembled compressor packages, factory tested, which minimised the on-site installation time.

The installation complied with E.E.C. Standards of Hygiene and temperature control for the variety of food products stored and on display in the refrigeration cabinets.

FINHEAT ON THE MOVE

By the time you read this Finheat Ltd will have moved to new premises at 17 Ushers Island, Dublin 8 a premises formally owned by Dublin Glass & Paint Co. Although the address will have changed the telephone and telex numbers will remain the same.

Tel: 778109/778120. Telex: 30751.

At the official opening performed by Mr Ray Burke, TD, Minister for the Environment of the new headquarters and engineering works of Apex Fire Prevention Ltd, at Greenwich Industrial Estate, Harolds Cross, were (L-R) Mr Chris Flood (Managing Director); Mr Ray Burke, Minister for the Environment.

Michael D Buckley, Director of Walker Air Conditioning, has had his board responsibilities increased to encompass applications and service as well as sales throughout the 26 counties. He now has responsibility for all aspects of the day running of the company’s Dublin office, except finance.
WINDS OF CHANGES IN U-VALUES

The U-value of a roof is normally calculated according to the method set out in the CIJS Guide Part A31. This involves using the thermal conductivities of the materials concerned (obtained by the hot plate test of British Standard BS 874) and the standard values of surface resistance and loft places space resistance given in the Guide.

This method gives a U-value of 0.40 W/m²°C for a typical pitched roof containing a nominal 80 mm glass fibre quilt if the ceiling joists are ignored; if they are included in the calculation the U-value rises to 0.46 W/m²°C. However, some measurements on loft insulation in the Agrément Board’s ‘hot box’ suggested that the U-value of such a roof (including joists) was 0.78 W/m²°C. Tests on other insulants also gave U-values which were higher than expected. Although some differences between measurements and calculations are to be expected, in this case the variation was so large as to suggest a serious inaccuracy in either the calculation procedure or the test procedure or both.

To investigate the discrepancy, the Building Research Establishment commissioned the Agrément Board to carry out five additional tests in the ‘hot box’ apparatus. These were designed to investigate whether permeable insulating materials, such as glass fibre, behaved differently from impermeable ones, such as expanded polystyrene, and whether the measured result was affected by the air speed above the insulation during the course of the test.

The conclusion of the tests suggests that for permeable insulation materials with the upper surface exposed, the measured thermal conductance is highly dependent on the air speed above the insulation. The Agrément Board’s tests were performed at air speeds which were sufficiently high to raise the conductance significantly above those predicted from thermal conductivity tests. The use of such air speeds may have been connected with unexpectedly high values of measured surface resistance above the insulation, which have yet to be explained. In any event, the imposed air movement conditions during the conductance tests appear to be the major cause of the difference between U-values obtained by the accepted calculation procedures and those derived from measurements in the Agrément Board’s rig.

These tests have shown the importance of identifying which parameters have an effect on the measured result. In this case air movement is very important and future test procedures should include the specification of an air speed, representative of those normally occurring in loft spaces during a heating season. Since existing data are limited, BRE are undertaking measurements of air speeds in lofts to provide more information on conditions in practice. In the meantime, there are doubts as to whether the air movement conditions which have hitherto been applied during the Agrément Board’s tests are representative of those occurring in practice, especially as such evidence as is available suggests that air speeds in lofts are much lower on average. In consequence there is no reason at present to change existing procedures for calculating the U-values of roofs, but it will be appropriate to review the situation when further information becomes available.
ENERGY — THE PROBLEMS

By DL

1973 was the end of an era of low priced apparently unlimited supply of hydrocarbon. The people of the world were made to realise for the first time that the world supplies of hydrocarbons were limited. Even more serious in immediate impact was the fact that the producer countries united in OPEC and were now fully aware of their strength and by taking over controls of the means of production in their separate countries, they could jointly force oil prices on the world markets. They could regulate the quantity of oil produced to suit their own countries best interests. Previously the Government in the producer countries received royalties on the quantity of oil produced. From time to time these rates were negotiated but the accurate production had been controlled by the mainly international oil companies to suit world markets.

Since 1973 the Governments of the producing countries have effectively taken control of production, demanded and achieved, greatly increased prices for oil. The price for oil rocketed upwards. Like many other countries in an era of plentiful and cheap oil supplies, Ireland has become more and more dependent on it and is caught in a difficult situation.

That was in 1973. In 1981 we are still dangerously dependent on oil as our main source of supply. Even given that we discover oil in the morning it is unlikely it will come in stream until the end of the eighties.

Energy Developments

It is firstly desirable to look at the development of energy source usage before projecting forward. If one looks at the development of the use of various sources of primary energy and how their importance has changed you notice that in the years 1800 the world relied mainly on wood, agricultural waste and muscle power to meet the needs of energy. Less than 15% of those needs being supplied from coal. By 1900, coal was supplying approximately half of the worlds energy needs and oil was beginning to appear as a significant source. By 1950, oil and natural gas together were supplying almost as much as coal and by 1970 these hydrocarbons, oil and gas together were the major suppliers of energy accounting for approximately 70% of world consumption. Coal still supplied quite a percentage and nuclear was only beginning to make a contribution on the world scene.

In terms of actual quantities of energy used it is important to note that between 1950 and 1966 the worlds total energy usage doubled and in the next eleven years that is the period 1966 to 1977 it increased by as much again, i.e. the world usage had then reached a level of three times the amount used in 1950. Even more significant was the fact that in the period 1950 to 1977 the demand for hydrocarbons, crude oil and gas had increased fivefold. By 1979, the worlds total demand for energy was in excess of 6½ GTOE (GIGA tonnes of equivalent).

This increasing demand for energy was due not only to the increasing sophisticated standard of living in the developed countries and the economic development occurring in the less advanced countries but also to the rapid increase in a world population. In 1950 it was estimated that the world population was approximately
2,300 million but by 1975 estimates placed it as being close to 4,000 million.

World Energy Demands
In these circumstances various estimates have been made as to what the world energy needs will be, by the year 2000. The estimates vary widely depending on the rates of economic growth assumed and the type of relationship taken between economic growth and energy demand. Some forecasters have made projections assuming economic growth to be at five or six per cent per annum. Today this would seem high. One should only assume world annual economic growth, of \( \frac{2}{5} \% \) per annum to 1985 and 2% growth to the year 2000. The world energy demand projected for the year 2000 would be 11,300 TOE's. Contrast this with 6.5 TOE's in 1979 and you can see the problem. To meet this demand in only 20 years time we would require:

- 650 new coal mines, plus,
- 6 to 8 major gas finds, plus,
- new oil production equivalent to 7 times the present Nigerian production, plus,
- 600 nuclear power stations (1,000 MW each).

We would require all of these. This indeed is a major problem. One might ask could you not be supplied by more oil rather than introducing other complications. However, an examination of the past history and the present situation regarding oil supplies clearly shows that this would be a good overall solution. The countries producing shown on table 1 below are mainly middle east countries and they have become more and more aware that there is no advantage to be gained by taking the oil out of the ground faster than they can utilise the resultant incomes to the benefit of their countries.

They do not particularly wish to build up large balances of dollars, marc, yens, or pounds all of which depreciate in value with inflation. They do not wish to invest on a large scale of properties in other countries other than in their own and this has been particularly borne out by President Carter's appropriation of Iranian assets in 1978. Furthermore by leaving the oil in the ground they know that they will get more cash for it at a later date.

Within their own country there is also the difficulty of investing because of the lack of skills, technologists, and personnel of all types. Due to their social situation they do not openly welcome foreigners as has been amply shown by Iran. This together with the fact that most European people have different religious beliefs to people from middle east countries add's to the problem. In a nutshell, political, social and economic factors are unfavourable to the building of large balances. There is no major desire to build up balances of currencies. As a result there is no major desire to take the oil out of the ground faster than required.

World oil supplies will not come to an end suddenly, like the last drop out of a barrel, but the likelihood of interruptions of supply could become greater. An interruption in output from even a relatively small supplier can have a significant effect on world supplies. On examination of OPEC producers as shown on table 1, one is not reassured regarding the crucial consideration of their having a stable government. This was particularly borne out by the heave ho in Iran these last few years. So, overall, we have a problem.

---

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8 Lower Mount Street, Dublin 2. Phone: 765627.

Published by ARROW@DIT, 1981
Very few people outside the Construction Industry understand the complexities of producing an estimate for mechanical work. People in the industry find it difficult to understand why the techniques of producing the estimate cannot be up-dated and the end result be produced without so many tedious man hours being involved.

There is little doubt that the position has improved recently with the introduction of mechanical pricing of quantities and computerised data storage systems. However, the tedious preparation of the quantities from architectural drawings has been with the industry up until now.

However, a major breakthrough has now been claimed by utilising equipment produced in the USA and customised for operation in European countries, initially for estimating mechanical and electrical schemes within buildings but ultimately intended to cover most trades within the construction industry. By using an electronic probe attached to a computer and electronic printer it allows the estimator or to quantify the materials literally “at the stroke of a probe”. The people involved with developing the equipment are a mixture of electrical services engineers and computer experts and the end result is a system which is tailor made for the electrical contracting industry and requires little or no computer training by the estimator.

It is claimed to reduce the time it takes to produce an estimate from design drawings by up to 75% over the present conventional methods and because it eliminates the stages between quantifying and tender summary, then errors and omissions are reduced considerably.

The computer has two remote probe attachments, one for measuring lengths and the second for counting them. After insertion of the appropriate program the operator merely traces the drawing services with the probes and this measures and counts, totals labour and materials and produces instantaneously a tender summary which is printed out on a high speed electronic printer.

The system is said to be unique in that whilst there are computers and programs available for estimating, none of them include the electronic facility which produces the drawing measurement.

Estimation Limited, who have developed the mechanical programs for the European market are based at Highlands Road, Shirley, Solihull, West Midlands, England.

At a recent presentation, given by Managing Director of Estimation – David Summerfield, at the Burlington Hotel in Dublin to members of ASEE there was considerable interest in the equipment from contractors who could recognise the major breakthrough which has been achieved.

For the moment Estimation will market the equipment direct from Solihull with arrangements in Dublin to service and maintain the system. However, judging from comments made by a user of the system in the US that “the system has needed about as much service as the average family refrigerator” there should be little concern on that aspect.

Hugh Clyne, of the Energy Services, IIRS, has recently published a very useful set of figures on the costings of various fuels used for industrial and domestic heating. The fuels covered by the charts includepeat, coal (including not only house coal but all grades of anthracite etc), oil, gas, and electricity. The only fuel not covered is timber. Using the long accepted method of cost per useful kWh all the fuels are compared under typical efficiencies, although some efficiency figures have been disputed by some engineers in the trade, the method in general gives a long awaited unbiased look at the different fuels. Some interesting figures can be extracted from the tables including comparisons of oil and solid fuel in the April costings:

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Cost per useful kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>2.98p</td>
</tr>
<tr>
<td>Gas</td>
<td>3.79p</td>
</tr>
<tr>
<td>Oil</td>
<td>3.80p</td>
</tr>
</tbody>
</table>

Hugh Clyne on completing this very difficult task and hope the figures will continue to be published as frequently as necessary.

CPI & MARLEY ON SHOW

Architects, engineers, building contractors and builders merchants from Cork City and county were guests of Concrete Products of Ireland Ltd and Marley Flooring and Plumbing Ltd, at two trade receptions held in the Country Club Hotel, Cork, recently.

Samples of the newest products to come from the Lucan, Co Dublin factories were on display and technical representative Ciaran Murphy was on hand to answer questions about the “Modern” through-colour interlocking flat roof tiles and the UF foam filled insulated hollow concrete blocks which are available in two sizes.

Matt Cass, technical representative from the Plumbing Division of Marley Flooring and Plumbing Ltd was also present to deal with questions on the unique Irish designed one-piece “Universal” gully trap which has proved a money saver for builders since it was first introduced a few months ago.

**NEWS**

**"BREAKTHROUGH IN ESTIMATING"**

- Mr Vivian Murray, chief executive, Irish Goods Council (centre) paid a visit to the Unidare plant at Finglas recently. Unidare are the only Irish aluminium extruders for the manufacture of commercial and domestic doors and windows. Showing him round the plant are Mr Brian Gillespie, managing director, Unidare (right) and Mr Fintan Devine, general manager, Unidare (aluminium).

**COMPARISON OF ENERGY COSTS**

April costings:

<table>
<thead>
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</tbody>
</table>

As you can see it all depends on the efficiency for comparison purposes as the same coal being burned in an appliance with 40% eff would have a cost per useful kWh of 2.53p, this will no doubt rise the hackles in the various fuel interests but to be fair to everyone involved this method of comparison is the only one which seems to have gained international recognition in energy circles. Our congratulations to Hugh Clyne on completing this very difficult task and hope the figures will continue to be published as frequently as necessary.

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Wavin Appointment

Wavin Pipes Ltd announce the appointment of Mr Desmond Byrne as Managing Director. Before joining Wavin, he was Personnel Director of Arthur Guinness Son & Co (Dublin) Ltd and prior to that was managing director of Cantrell & Cochrane (Dublin) Ltd.

CIS Cork Diplomas

About 40 students from the two Institute of Domestic Heating Engineers Associate Membership Diploma courses at Bolton Street College of Technology, Dublin were given a night out of class recently when they were invited to the training centre of the Dublin Gas Co. The evening consisted of a conducted tour of working gas appliances on display at the centre and a talk on operation and servicing of gas appliances by Billy Wilson of the Gas Co. Michael Melligan of C&F Ltd also spoke to the students on the subject of controls and chimneys. Questions on natural gas were answered by Tony O'Leary also of the Gas Co and the evening was ended with refreshments provided by the Gas Co.

At a recent ceremony in Cork 17 heating engineers were presented with diplomas certifying their competence in the installation and maintenance of solid fuel heating systems by Coal Information Services Ltd. Coal Information Service along with the British National Coal Board (NCB) run training courses for solid fuel installation contractors.

Prior to the presentation, a film on the many different aspects of solid fuel heating was shown. The film, made by the Solid Fuel Advisory Service in England, highlighted the many developments in the field of solid fuel heating and central heating.

Mr Jim Maher of the Coal Information Service, who spoke before the presentation of the diplomas, said those who had completed the course would, in the future, be providing a valuable service in the community.

He said the training they received was very comprehensive and that the community could only benefit from the expertise of those who were receiving the diplomas.

The diplomas were presented by Mr Peter Barry, T.D.

PIPE AND BOLT THREADING MACHINES

COMPARE THESE PRICES

<table>
<thead>
<tr>
<th>MCC</th>
<th>BSPT</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>40</td>
<td>BSPT</td>
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<tr>
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</tr>
<tr>
<td>100</td>
<td>BSPT</td>
<td>£1760.00</td>
</tr>
</tbody>
</table>

All above prices are sterling.

For further details phone sole importer on (092) 28285

P & F PIPETOOLS (Ireland) Ltd
High Street
Tuam
Co Galway
Although the roots of the company go back much further, Walker Air Conditioning Ltd recently celebrated its 10th year of business with a dinner for the staff at the Weigh Inn Restaurant, which is in the Phoenix Park Racecourse, a good bet for a meal in Dublin I suppose. HVN extends its congratulations to the directors and staff of Walkers and wish them even more success in the next ten years. The names for the faces in the above pictures are as follows: (1) Paddy Reddy, Jim Anderson, Ann Keane, Michael Nolan, Gerry Ross. (2) Tom McDonnell, Brendan Kilgallon and Geraldine Chawke. (3) Peter Andreucetti, Michael Buckley, Bernadette Devereux. (4) Chris Guant, John Monaghan, Tom McDonnell, Bernie Costelloe.

After one of their best years ever the Republic of Ireland branch of the Chartered Institution of Building Services had their AGM recently in the Engineers Club, Clyde Rd, Dublin. After discussion on the previous year a committee was elected for the 1981/82 season, the following are the officers and committee elected:

CIBS Republic of Ireland Branch
Committee 81/82
Chairman: Eamon O'Brien
Vice-Chairman: Michael Moloney
Hon. Sec.: Larry Kane
Hon. Treas.: John Murray
Committee: M. McDonagh, M. Buckley, Tony Knott, D. Byrne, H. E. Taylor, Don Cooney, James Hargin, J. J. Doherty.

A very pleasant duty after the AGM was the presentation of the Annual Students Award which was sponsored by Temperature Control Services Ltd, and the papers were judged by Hugh Monroe. First place went to Pat Murphy, second place, Donna Turner and third place to Rory Walsh.

Pictured at the CIBS Annual Students Awards were: (L-R) standing, Don Byrne, Pat Murphy, 1st place, Rory Walsh, 3rd place, the adjudicator, Hugh Monroe, seated, Donna Turner, 2nd place, and the sponsor of the prizes, Gerry Curran of Temperature Control Services Ltd.

Some of the new CIBS committee elected at the recent AGM (L-R) back row, Michael Buckley, Don Byrne, Don Cooney, Jim Hargin, Michael McDonagh, Larry Kane, Eamon O'Brien, (new Chairman), and John Murray.
The Department of Commerce have issued a petroleum licence to a consortium of Ulster National Resources Ltd, North Sea Petroleum Ltd and Expicon Exploration Ltd to proceed with a search for oil and gas on the north coast of Antrim and Londonderry. This consortium is a combination of bank, commercial and scientific interests.

Mr Walter Pascoe has been elected Chairman of the Master Plumbers Association at their Annual General Meeting held in the Drumkeen Hotel, Belfast.

Mr Pascoe was presented with his chain of office by the outgoing Chairman Mr T Stewart, also present at the meeting was Mr Todd, Southern Director and Secretary of the Scottish and Northern Ireland Plumbers Employers Association.

Those interested in cavity insulation should contact Springvale Polyproducts Ltd, Doagh, Co Antrim who are dealing with the industrial application of Thermocomfort insulation.

Domestic enquiries should be sent to Shell Thermocomfort, Springvale Road, Ballyclare, Co Antrim where they will learn of the new cavity wall insulation consisting of expanded polystyrene beads. Using a special adhesive these are bonded together on entering the cavity, thus filling it up and providing a sandwich of insulation.

The product does not absorb water or allow damp to be transmitted by capillary action. Taking half a day to insulate an average house; with fuel savings resulting of up to 25% the system provides an attractive addition to the cavity wall market.

Having published and sold practically 5,000 copies of their book on industrial and capital grants in Northern Ireland, SKC Publication Ltd felt fully justified in producing a new and updated version "Cash Grants - The Northern Ireland Opportunity".

The publication was launched at a reception, when Mr B Wilson, Managing Director of the publishing company spoke of the desired need for a new book. Anyone interested in running, expanding or establishing an industry or any form of commercial enterprise in Northern Ireland cannot afford to do so without this book which is available from any reputable book shop.

Practically 150 engineers from industry, consultants, government and local authority officials were welcomed to the Culloden Hotel by Bill Devlin, Managing Director of John Kelly Ltd, fuel importers and heating equipment distributors.

The occasion was the launching of the first pneumatic bulk coal delivery in Ireland. F R McBride, Director of John Kelly Ltd, conducted a demonstration of the vehicle which delivers industrial fuel to a boiler plant, through a 4" diameter pipe and which can blow the fuel to a point up to 70 feet from the vehicle, on to an overhead hopper and even round corners.

One of the problems in delivering solid fuel is very often difficulty of access to the boiler, and of course if a considerable number of men have to be employed to carry the coal then the costs rise accordingly.

The demand for the use of fuel oil over the last few years has created a mental approach by designers and by users that the fuel should come by pipe - this is now possible even with solid fuel.

The John Kelly Limited vehicle is a Leyland short wheel based reiver chassis, supplied by Charles Hurst (Commercials) Limited, Ravenhill Road, Belfast, to which has been fitted an aluminium alloy bulk delivery tipping body, complete with a
Rootes Blower. This specialised equipment was supplied by Neville Charrold Limited, Huntingdon.

The vehicle, capable of carrying up to fifteen tonnes of boiler fuel, in addition to the special blower, is complete with a number of flexible hose lengths.

On arrival on site the required length of pipe is coupled up to the blower unit, the body gradually tipped, and the fuel blown into the bunker.

Fuel may be blown horizontally or vertically or round corners up to a distance of seventy feet.

The short wheel base has been chosen to facilitate deliveries to schools, commercial premises and office blocks etc whose boiler house may not be in the most convenient place.

The John Kelly Group also took the opportunity to introduce some of their other energy related interests.

Well known as distributors of heating equipment, the Agency Department introduced their new agency Brenceede Coal Handling Equipment, a multi fuel boiler and the highly successful German made Wilo Heating Pumps.

A subsidiary company, I.E.S. Industrial (Ireland) Limited has in attendance representatives from George Clarke N.E.M. Limited, manufacturers of the well known Maxecon Range of Steam Industrial Boilers from whom I.E.S. are agents and also Dynamic Air Limited who specialise in the conveying of materials by air.

Other products for which this company are agents, include boiler and control instruments, automatic controls, sterilisers etc.

Kelly/Flogas advertised the John Kelly Group interest in LPG for which they have recently become distribution agents for the east of Ulster on behalf of Flogas Limited.

The recently acquired company Aerocowl Marketing Limited had their first promotion since joining the John Kelly Group, of their Aerocowl Flue Terminal. Through its various activities the John Kelly Group have a major interest in the energy requirements of industry, commerce and the domestic customer and with branches in Londonderry, Coleraine, Carrickfergus together with their Belfast base, and Larne subsidiary Howdens Limited are equipped to cover the whole of the Province.

The Northern Ireland section of the Institute of Energy inform us that their biannual Heat and Power Equipment Exhibition will be held in the Alexandra Hall, Balmoral Show Grounds, Belfast between Monday 28th September and 1st October.

The exhibition will this year celebrate its tenth birthday and will follow its well established format which over the years many have attempted to copy.

With over fifty fully equipped stands available, though many are held by tradition by regular exhibitors, the exhibition gives an opportunity to all those engaged in the heat, power and energy industry an opportunity to display their wares to an invited attendance representing all those who may be purchasers, specifiers or in a position to generate business.

The Institute have once again invited WHC Industrial Promotions Ltd of Bluestone House, Drumkirk, Newtownards, Co Down, phone Newtownards 8212577 to stage the exhibition on their behalf and full details of rates etc are available from Mr Caughey at the above address.

Those who were lucky enough to visit Frankfurt Fair must if nothing else have been impressed by the size of the whole thing.

The exhibition, sited in eight halls each of which was larger than any hall used for a similar exhibition in Ireland and some of which had two and three floors. It would not be unfair to say that some of the single stands were as large as some of our complete exhibitions. In fact one...
WHO REPRESENTS WHOM? 1981/82

The publishers of IRISH HEATING and VENTILATING NEWS are compiling a directory of manufacturers, agents and distributors in the H & V trade. Its lists of suppliers of goods to the market in Ireland will make this yearbook a valuable reference for merchants, contractors, consultants, architects and engineers alike.

Questionnaires have already been distributed to principals, agents and distributors and these should be returned immediately. Additional copies of the questionnaire may be had on application to:

WHO REPRESENTS WHOM?

Irish Trade and Technical Publications Limited
5/7 Main Street, Blackrock, Co. Dublin. Phone: 885001.

CLOSING DATE JULY 24th, 1981

THERE IS NO CHARGE FOR LISTINGS IN WHO REPRESENTS WHOM?
Suddenly the search for energy resources in Northern Ireland has burst into a scene of activity.

A consortium composed of Aran Onshore Holdings (NI) Ltd, Marinex Petroleum of Ireland together with Mr W W Wakefield, an American geologist have been granted a licence by the Department of Commerce to explore for gas in South West Ulster. A few years ago drill holes indicated that there was gas in the area but the commercial development was doubtful. However, improved methods of searching, drilling, plus the increasing value of alternative sources of energy has materially altered the situation to the point where the present deposits are worthy of further and more serious investigation.

Another licence has been granted to another locally based consortium, with major bank interests to commence a search on the north Antrim-Derry cost. This consortium like the other will commence drilling within the next couple of months. Drilling has started on the geothermal well at Larne, where high hopes are held of finding a geothermal spring of commercial proportions. Private experiments are also taking place on the north coast with windmills for the production of electric power.

One cannot help but reflect on the possibility of an announcement that a commercial coal field has been found and then indeed it could be said that we had a "full house".

What of the exhibits, unfortunately there was little new. Baths, basins, bidets etc could be obtained in every colour, shape, and material, taps and shower fittings abounded, again, of every shape and material.

Solar panels took up a major part of the show with plastic pipe being used together with a series of ingenious fixings enabling you to follow any pattern acceptable with little or no effort. Heat pumps — it was a matter of what size, type, finish did you require — they were all on show — some with rather outstanding claims on their efficiency.

The next popular item on display was the multi fuel boiler, particularly in the 45,000 or 1,000,000 Btu range.

Most of these boilers are based on a choice of oil/gas/coal burning, with the emphasis on oil with wood as the second choice. If all the boilers on display are sold plus the factory capacity behind them and the users decide on wood as the cheapest alternative fuel, Europe will be dewooded within a very foreseeable period.

Radiators were very much of the panel type with fin attachment and being presented as double panels with an expanded metal top filler attachment. If the commercial products were of as good a finish as those on exhibition, then they were considerably above the standard available on the local market.

As an exhibition it was of considerable interest but one can only think of the cost not only involved in mounting the show, but also in attending it. There is still much to be said for the local smaller and more personal shows if only the manufacturers would realise that big is not always beautiful but that instead they could possibly obtain a more direct approach to the market at possibly cost.
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GUIDELINES TO RAINWATER SYSTEMS

Entry to Drain
Where rainwater is discharged into a foul drain it must discharge through either a trapped gully connected directly to the drain or into a branch rainwater drain without an intervening trap provided there is a trap between the branch drain and the foul drain. Traps must have a water seal with a minimum depth of 50 mm.

Rainwater downpipes may connect directly to a surface water drain if adequate access is provided. Access is particularly important on bends and at the foot of each down pipe.

Rainwater downpipes connecting into a gulley should do so at a level below the grating preferably through a back inlet gulley. No rainwater pipe should be used for discharging the soil or drainage from any sanitary appliance.

Rainwater cannot be discharged into a soil or waste pipe or drain unless provision has been made in the design of the sewerage system for the disposal of surface water. Rainwater inlets to discharge stacks should be made above the level of the highest soil or waste inlet (which would prevent any balcony outlets being con-
Rainwater Systems

connected. No pipe for conveying surface water should ventilate any foul water drain. Rainwater should not be discharged into a foul water sewer if a separate sewer for rainwater is provided, although some authorities allow the use of soil pipes to carry rainwater where there is no separate provision for surface water drainage.

Rainwater pipes and gutters must be arranged so as not to cause dampness or damage to any part of a building.

Roof felt should be extended below the top of a gutter to prevent water being blown into the eaves.

Location
Rainwater pipes can be fitted internally or externally. Rainwater pipes inside a building should be constructed in the same way as discharge pipes. Gutters should be placed centrally under and close to roof eaves. Valley and parapet gutters should be at least 300mm wide to allow access for maintenance. Gratings should only be used on outlets of 150mm diameter or more to prevent blockage.

Sizing Gutters and Downpipes
A balance should be achieved between cost and the frequency and consequences of flooding. Calculation of water run off from a roof — For design purposes, three rates of rainfall intensity can be used each representing a varying degree of risk.

They are:
- 50mm/hour for the design of flat roofs;
- 75mm/hour for sloping roofs;
- 150mm/hour for buildings where an overflow could not be tolerated.

The usually assumed value of 75mm/hour may be expected to last for five minutes every four years.

The rate of run-off from a roof into each gutter is a product of the assumed rainfall intensity and the effective roof area that the gutter serves, i.e. 1mm of rainfall in an area of 1m² is equal to 1 litre of water.

Thus: Rate of run off = Rainfall intensity \times Effective roof area (see Fig 1).

Calculation of Gutter Size
This method is for calculating the size of level eaves gutters. Parapet and valley gutters are more complicated and either CP308 or BRE Digest 189 should be consulted for methods of calculation.

In any run of gutter, the size must be determined for the part between outlets or between an outlet and the end, whichever serves the largest area of roof.

Economies may be achieved by placing outlets in the middle of runs rather than at the end.

Having determined the rate of run off, adjustment should be made for any square angles in the gutter close to the outlet by the appropriate factor which may be read from the table below and should be multiplied by the rate of run off.

<table>
<thead>
<tr>
<th>Type of Angle up to</th>
<th>Angle or less than 2m to 4m from outlet</th>
<th>Gutter size may now be determined for the part between outlets or between an outlet and the end, whichever serves the largest area of roof.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharp corner</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Round corner</td>
<td>1.1</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Size of Rainwater Pipes
A rainwater pipe should be the same nominal bore as the outlet.

The size of an outlet depends on the size of the gutter and may also be determined from the table.

The design of rainwater outlets, pipes and gutters is covered fully in the Plumbing Services design guide Sec C and BRE 188 and 189.

Flat Roofs
The extent to which a flat roof must fall will depend on the type of roof finish specified. The NHBC recommends a minimum fall of 1:60.

The following are recommended falls for different materials:
- Aluminium: 1 in 60;
- Bitumen sheet: 1 in 64 (roll cap);
- 1 in 80 (rib system);
- Lead: 1 in 120;
- Bituminous felt: 1 in 60;
- Mastic asphalt: 1 in 80.

Access
One or more cleaning eyes for access and rodding should be provided at appropriate points to horizontal runs of pipe and on long vertical pipes. This is particularly important at the foot of each stack and at changes of direction.

Paved Area Drainage
The method of design is complicated and beyond the scope of this article and reference should be made to BS CP 308. However, the following general points should be considered:

(a) Drainage should be designed for a rainfall intensity of 50mm/hour which is likely to occur for five minutes once every year.

(b) Gullies should be generously sized and placed at low points with intermediate gullies used to prevent excessive build up of flow towards end gullies.

(c) The number of outlets will probably be determined by the shape rather than the area of the paving.

(d) Water should not be drained to concentrate along the side of a building, this can be prevented by using narrow strips of reverse fall.

(e) For rooms of buildings below the paved area level, water should be prevented from entering the building by such devices as channels provided with gratings or slots.

Materials and Construction for Gutters and Pipes
Gutters and rainwater pipes must be of adequate strength and durability.

The following materials are deemed to satisfy:
- Aluminium; Asbestos cement; Cast iron; Copper; Lead; Mild steel; Pitch fibre; Polypropylene; Precast concrete; uPVC.

Certain other materials are covered by Agrément certificates and British Standards.

Joints
Gutter joints must be watertight. CP 308 gives methods of jointing pipes.

Support
Gutters and pipes must be adequately supported, without restricting thermal movement. Care should be taken to ensure that the gutters are not fixed on a tilt as this reduces their capacity.

Gutters should be supported to prevent sagging and ponding using brackets at a maximum spacing of 1000mm, fixed with minimum 25mm screws.

There should be additional brackets at angles. Rainwater pipes are normally supported at joints. Pipe lengths exceeding 2m should have intermediate supports.

* The above article is based on various standards generally acceptable in this country but local authorities should be consulted for local regulations.
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[Marley] Plumbing

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Published by ARROW@DIT, 1981
Why does the simple task of connecting an open safety vent and a feed and expansion pipe to a heating appliance cause so much speculation and confusion?

A simple look at the problem may show that the confusion is really that of not being able to see the wood for the trees.

Firstly, what are we trying to achieve and why!

History (The Appliance)
An open fire was a good source of warmth and comfort to our forefathers, and a pot filled with water on the fire soon boiled. A lid on the pot prevented evaporation of the contents, and a spout allowed steam to escape. The kettle was designed.

A longer spout became the vent and a feed pipe connection allowed automatic filling. The simple back boiler was born.

The Storage Cylinder
The inclusion of a storage cylinder which could utilize the gravity circulation effect of heated water gave the start of our systems.

Fig A shows how this simply bridges the vent and feed pipes of the appliance, by means of a flow pipe to the cylinder and a return pipe from the cylinder.

Radiators
Bigger fires for bigger back boilers gave greater volumes of hot water movement. Large pipes carrying gravity circulating hot water were introduced to the storage system, to give additional space heating. Radiators were born.

Summary 1
Since the system of cylinder and radiators formed a bridge between the vent and feed pipes of the appliance, then it is obvious that the inclusion of our system did not alter in any way, the original purpose or connection points of the vent and feed pipes.

Fig B shows a suggested manner in which we could consider the terminology of our total arrangement, in order that confusion may be lessened.

Flow and Return Connection Points
With this arrangement of appliance, pipework and system, the pressure in the circuits is that due to the atmosphere on the F & E tank and vent and is an equal amount on both water columns. This is commonly called the...
static head and in the gravity circulation case, so far discussed, only affects the boiling temperature. Water movement in the system causes a friction loss commonly called the dynamic or frictional head. In the gravity system it is so small that it can be considered to have little, or no effect, on the static head.

In Fig B therefore, the points at which the flow and return pipes of the system join the vent and feed pipes of the appliance, are relatively unimportant with regard to their distance from the vent connection and feed connection of the appliance (i.e. distances LV and LF). This is not so however, when the water flow is pumped.

**Circulation Accelerator (Pump)**

The circulation accelerator (commonly called the pump) was developed and enabled the water flow rates of the gravity systems to be speeded up. Smaller bore pipes were then used to supply the volumes of water needed to the radiators via the flow and return pipes of the system.

The inclusion of the pump however, brought with it the problems of where to fit it, and what its effect would be on the scheme. Confusions began.

Into combinations of gravity pipework arrangements the pump was fitted initially in an attempt to accelerate only the radiator water and it was generally considered the pump needed to be installed in the cooler water flow path to the boiler, i.e. that returning to the boiler rather than that flowing from the boiler.

The problems arising from this and other pipework arrangements with pumps associated mainly with the radiators (i.e. poor cylinder temperatures, bad feeds from F & E tank to boiler, high vents etc.) gave rise to other connection techniques for the radiator and pump circuits.

Boilers with four pipe entry connections were made and the pipework drawing layouts started to appear as shown in Fig C.

Thus began the practice (unfortunately) of referring to the boiler tappings as the flow and return tappings, and whilst this was reasonable in the radiator pipework case, those associated with the gravity cylinder were, in reality, still the vent and feed connections.

The portions of vent and feed pipes marked HV and HF in Fig C became considered only as the vent and feed respectively, and those lengths LV and LF were (unfortunately) referred to as the cylinder flow and return, whilst they had not changed at all from the original concept and use. The confusion was worsened.

**Fully Pumped Systems**

It is hardly surprising that when the pump was then used to push water around the system in total, the pipework problems became worse rather than simpler. The basic philosophy was forgotten. All manner of pipework theory was expounded, the real need for vent and feed started to get lost. The confusion still remained.

Where to connect the feed; Where to connect the vent and how high; Where to locate the pump; How to...
pipe the radiator circuits and more.

All the common questions that even today get a multitude of replies, some expensive in pipework costs involved, and some giving further problems of their own. Some, however, are so ridiculous to the author, that if they were not so potentially hazardous, they might be considered funny.

But wait a moment! In Fig A everything happened between the vent and feed, as it does in Fig B. Few real problems were caused with these systems, so why don't we consider today's systems with a similar philosophy.

The System

Surely all that is need is the fitting of a pump into the system box of Fig B in such a manner that it will, create no problems in the vent and feed, allow water to flow correctly in the system. If we can also arrange the pipework in the system box such that it will work correctly, then Fig D shows such an arrangement, and the use of balancing valves in each branch of the system ladder will enable the system parts to be balanced with regard to each other and the available system dynamic pressures. The rate of water flow will be correct in each leg and even heat up will result.

Insert this arrangement between the vent and feed (see Fig E) and we have an ideal, safe, trouble free fully pumped central heating pipework that can be installed every time in practically any premises, provided we pay due regard to pressure drops along LV and LF and that through the boiler. (This subject will be covered fully in the next article. Pumps — their positions in systems, and the effects).

The Three Tee Rule

Firstly, consider Fig F which shows the pipework layout of Fig F in a more commonly presented manner. Both arrangements are identical but the Tee No 1 arrangement of Fig F is better than that of Fig E since it enables better air separation to take place, and the use of an oversized Tee in this position improved air separation even further.

The author's Three Tee Rule for good fully pumped system pipework should now be easily observed, i.e.

Follow the pipe taking water out of the boiler until the first Tee is reached. One branch of this Tee must be connected to a pipe which — unvalved and unhindered — rises continuously to serve as the vent from the appliance to the feed and expansion tank. The other branch of this Tee connects pipework via the pump to the next Tee in the pipework. Tee No 2.

One branch of this 2nd Tee must connect to a pipe which serves only to deliver water to the cylinder flow union (i.e. No other circuit may be teed into this pipe). The remaining outlet of this 2nd Tee connects pipework directly to Tee No 3. The outlets of Tee No 3 connect to the flow side of all the radiators. (i.e. Common flow connection point of all the radiators).

The rule is identical for that pipe returning water to the boiler, except that the 1st Tee connects one outlet to the feed pipe to Feed and Expansion tank, whilst the other outlet goes directly to Tee No 2 (pump is in the flow). The 2nd Tee connects to the cylinder return pipe only from one outlet and to the radiator common return Tee No 3 from the remaining outlet.

If the vent and feed must be taken to the boiler directly (dotted alternative in Fig F) then the boiler unions are counted as Tees No 1 on vent and feed and the 1st Tee encountered on the system pipes are No 2 Tees as before.

Observation of this rule will ensure the system installed will be safe and trouble free from water circulation problems. The installer can confidently assure his customer of its performance, and it will allow the addition of sensible ancillary requirements to be included without problems.

Failure to observe the rule and alteration to the pipework as shown, will invariably give rise to unsafe installations, or water circulation problems, that may be expensive rectify on site later. The addition of ancillary requirements (i.e. bypasses, controls etc.) may also be difficult or impracticable. (These situations will be covered fully in a future article — "Pipework Errors" — their effects, and how to check them).

Summary

It would appear reasonable to call the tappings on boilers what they always were: The vent and feed connections. This might minimise some of the confusion in the industry, and simplify the installer's understanding of the best way to install his pipework with confidence in his installations safety and operational ability.

If the Three Tee Rule is always observed, the installations will always be trouble free of circulation problem and safe.

If the correct calculations of lengths LV and LF, Fig E, together with the boiler resistance are made, then the vent should not pull down air past Tee No 1 on the vent.

In most installations, and particularly double storey houses, only two pipes need to be run on the kitchen walls (less unsightly than four). Invariably the majority of the Tee units pump, etc., can be located conveniently in the airing cupboard, giving ease of maintenance etc. Fig G shows such a practical pipework arrangement. The next article will deal with the pressure relationships that the inclusion of the pump in this or any other position creates in a system, but it is important to remember that with the pump in the flow position shown, there will be a drop in water level in the vent when
the pump starts (surge) and when the pump is running (steady).

The vertical height therefore between Tee No 1 on the feed pipe and the water level in the F and E tanks is most important.

Where the unfortunate (but common) practice of fitting unequal size pipes (i.e. 15mm feed and 22mm vent) it should be realised that water pulled down the vent must rise up the feed to the F and E tank.

Conversely, when the pump is switched off, the volume displaced upwards into the F and E tank will be returned down the feed pipe. The volume of water displaced in the 22mm vent per foot, and its equivalent volume return in the 15mm feed is shown in Fig H.

Consequently, the minimum height from the static water level in the F and E tank to the Tee No 1 on the feed, must be twice as great as that on the vent pipe to ensure that — not only do we not suck air into the flow pipe, due to a too short flow-vent Tee No 1 position, when the pump is switched on, but also that oxygenated water from the F and E tank is not introduced into the return when the pump switches off, giving rise to continuous corrosion, and possible air problems.

A good argument for equal sizing of vent and feed.

**Conclusion**

Improvisations which override the principles outlined in this article invariably create problems on installations, as 14 years of practical installation problem solving have proved to the author and his customers alike. These problems are normally unacceptable to most users, and can be costly to correct on site after completion, and occupation of dwellings has occurred.

A well designed and correctly installed system can be a source of pride to the installer, and the customer satisfaction value can lead to more work through recommendation, so why try short-cuts that will give costly problems.

Terry McQueen M.B.I.M. is Branch Sales Manager of Scotland, Ireland and N.W. England for Honeywell Control Systems Ltd.

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Air Cooled Refrigeration Plant Performance

Basic Considerations
The performance of any refrigeration plant is dependent on a number of factors which can be broadly divided into two basic sections, providing always that the equipment is suitable for the particular application. The two basic sections of which we speak are (1) selection and quality of performance of the major components and (2) interconnecting pipework and controls. Controls are often pushed into the background or indeed forgotten completely by the design engineer until it is too late. The refrigeration design engineer should consult with his controls adviser as to the correct type of control on the correct selection of the particular equipment for the particular application. There are two basic sections which we speak of: (a) selection and quality of performance of the various components and (b) interconnecting pipework and controls. Controls are often pushed into the background or indeed forgotten completely by the design engineer until it is too late. The refrigeration design engineer should consult with his controls adviser as to the correct type of control on the correct selection of the particular equipment for the particular application.

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Refrigeration

preventing oil return to the crankcase. In this case the oil failure switch should trip out at the compressor and in the event of this not happening the compressor will simply seize up. Unlike a water cooled condenser, where the rate of water flow may be adjusted to reduce the condensing temperature, the air cooled condenser has a maximum air quantity which, whilst it can be reduced by switching off fans can seldom be increased. Slight increases in duties may be obtained by increasing the speed of the fans i.e. 960 - 1400 rpm but this change should be approached with caution. It is therefore, obvious that it is of greater importance to allow for pipeline losses in designing an air cooled plant.

One of the most common omissions from the design of any air cooled plant is the vertical liquid lift. In order to obtain a solid column of liquid at the inlet to the expansion valve the pressure drop in the liquid line must be overcome. This can be achieved only by sub cooling the liquid sufficiently to prevent “flashing” in the liquid line and if no other means has been provided the only place this sub cooling can be obtained is in the condenser.

Therefore a greater proportion of the condensing surface will be used for sub cooling and less surface will be available for condensing. Since the total heat of rejection from an air cooled condenser equals k, A, t.

Where k = overall transfer coefficient
A = total external surface area

\[ A \cdot t = \text{difference between air entering the condenser and the condensing temperature.} \]

Sub cooling in the condenser reduces the area available for condensing and to obtain the same condensing and to obtain the same condensing capacity \( t \) must increase, resulting in an increase in the condensing temperature. If we now consider the same plant, but as well as a high liquid pressure drop we have a faulty expansion

condenser surface area. If the condenser has been selected for a 15°C temperature difference, this loss in surface area of 7% would result in a temperature difference of approximately 16.5°C. It can be seen that if the condensing temperature was originally 40°C in an ambient of 25°C the condenser temperature would now be increased to 41.5°C. Furthermore, as the condensing temperature and pressure have risen the work done by the compressor will also increase. This gives the condenser even more heat to dissipate so that finally the condensing temperature could balance out at 42 or 43°C. If the plant had been installed in such a manner that it was impossible to purge non condensable gases from the highest point of the high pressure side it is quite possible that air or other non condensable would be left in the system. The result of which will be a high condensing pressure.

The higher condensing temperature may or may not be acceptable, but one must remember that if the design engineer neglects to allow for pipe line losses and vertical liquid lifts the installing engineer will almost certainly charge the plant with refrigerant until the desired suction pressure is reached and a clear liquid sight glass is achieved with no “flashing” at the expansion valve inlet. In many cases, this condition will only be achieved after the design condensing pressure has been exceeded, giving similar symptoms to those observed with an overcharge of refrigerant, or an under sized condenser. The above comments also apply to plants also using capacity control systems or plants which are intended to serve the dual purpose of maintaining a higher temperature for part of the year and a lower temperature for the remainder of the year. The quantity of refrigerant required at partial loading is less than at full load and therefore the plant must be charged with sufficient refrigerant for full load operation. When the plant operates on partial load, the excess of refrigerant must be stored in the system. For this reason liquid receivers of sufficient capacity are recommended on plants with capacity control. The dual purpose plant may require more refrigerant in the system when operating at low temperature than is needed at higher temperatures, depending on the load and design point at the two conditions. Allowance must be made to store excess refrigerant.

Selection of Air Cooled Condensers

The condenser must in the first instance, be selected to handle the total heat of rejection, which is equivalent to the sum of refrigerating effect plus the equivalent work done on the refrigerant by the compressor motor. It is recommended that the performance data of the compressor manufacturer be consulted, most of whom publish the refrigeration duty and the power absorbed by the compressor motor over the range of operation. Some manufacturers publish horse power per ton by refrigeration. By adding the evaporator capacity to the power absorbed by the compressor we obtain the total heat of rejection. Another method is to use a condenser heat correction curve available in various technical publications. This curve represents the total heat of rejection provided by the refrigeration effect and is plotted against the evaporating temperature at various condensing temperatures.
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Refrigeration

This method, whilst being satisfactory for many applications is basically an approximation if not related to a specific make and type of compressor. If these curves are employed make sure that they refer to the type of compressor whether open or semi hermetic. If no mention is made then the curves are probably drawn for an open type R12 machine.

The correct condenser selection is the major task to perform and having done so the inter connecting pipework must be considered carefully to determine whether or not additional sub cooling will be necessary.

Condensing Liquid Outlet Line

About the most important pipeline in any refrigeration system is that between the condenser outlet and the liquid receiver. The diameter of the pipe should be such that the liquid velocity is about 0.5 metres per second. Tables are available showing the net refrigeration effect verses the pipe sizing recommended for any refrigerant gas. Incorrect pipe sizing here means that the liquid can “back-up” in the condenser, thus causing unnecessary high condensing pressures. The liquid outlet pipe to the receiver is better over sized than under sized. It must be remembered that a change of one pipe size downwards can make as much as 40% reduction in the cross sectional area of flow and would have a very considerable detrimental effect on the condenser performance causing liquid back-up as mentioned above. The position of the condenser relative to the receiver is also of importance. The liquid must be able to free drain from the condenser into the receiver. It is recommended that the receiver inlet should not be less than 300mm vertically below the condenser outlet.

Discharge Lines

It is particularly important that refrigerant cannot condense in the discharge line or migrate back to the compressor head during the off cycle period. This is even more important when the condenser is outside on a roof with the compressor inside and below the level of the condenser. Discharge lines from the compressor to the condenser should therefore be arranged so that the rise just above the highest tube of the air cooled condenser. The top of the hot gas riser, should incorporate a purge connection, for purging non condensible gases from the system. This is illustrated in Fig. 3.

Discharge lines should be sized to give a gas velocity so as to entrain the oil. Again tables are published giving pipe sizing against basic net refrigerating capacities to ensure oil return to the compressor. The discharge line on leaving the compressor should be provided with the slope downwards away from the compressor in the order of 10-30 mm per metre run with an oil trap before the discharge line rises. This is also shown in Fig. 3. Vertical discharge risers exceeding 7.5 metres should have a second trap and from there on, additional traps at about every 6-8 metres. Discharge lines must be sized to the maximum output of the plant at full load design conditions, but frequently compressors with capacity control are used. In this case we would recommend the use of double hot gas risers. This is illustrated in Fig. 4. A purge connection should be provided at the top point of each of the risers. The two vertical discharge lines are not the same size. Hot gas line “A” must be sized to ensure oil entrainment at minimum capacity and line “B” sized to handle the difference between the maximum and the minimum capacity. At minimum load, the trap in line “B” fills with oil and the hot gas flows up line “A” with sufficient velocity to ensure oil entrainment. (See Fig. 4 for details.)

The cross sectional areas of lines “A” + “B” should equal the cross sectional area of a normal single hot gas riser with no capacity control. The same approach should be made when multiple compressors are used for capacity control. Hot gas velocity discharge lines are usually in the order of 17.5 metres per second for a reasonable pressure drop. Vertical hot gas risers should have minimum gas velocities to ensure oil entrainment. Fig. 5 shows a typical gas velocity versus temperature for R12 in vertical hot gas risers. However, it is always good design practice to allow at least 25% greater velocity at the lowest partial loading.

Suction Lines

Suction lines must be sized to give minimum pressure drop and at the same time to ensure a return of oil to the compressor crank case. When the compressor is at a higher level than the evaporator the suction lines risers must be sized to give minimum gas velocity for total oil entrainment.

Fig. 6 gives typical minimum gas velocities using R12 but again design with at least 25% greater velocity at the lowest partial loading. Both single and double suction line risers should be considered and the reasoning is the same as that of the hot gas risers.

Oil traps should be installed at the outlet of the evaporators as shown in Fig. 7 for compressors above the evaporator, (or suction mains above the evaporator) and as shown in Fig. 8 for compressors below the evaporator. Additional oil traps in vertical suction lines with the compressor at the highest level of the installation, should be placed at about 4.5 to 5 metres lift.

Fig. 9 shows the recommended arrangement for manifolding two evaporators to a common suction line.

It should be noted that the position of the two expansion valve phial are placed so that each valve can operate independently of the other and the sensing point of the phial is not influenced by the temperature of the other suction inlet.

Fig. 10 shows the recommended method of connecting two or more separate evaporators to a common suction main.

Liquid Lines

The liquid line from the receiver to the expansion valve is often one which suffers excessive pressure drop and perhaps unequal distribution of refrigerant through multiple expansion valves. These facts are frequently overlooked at the design stage. In order to prevent the "flashing" of liquid refrigerant before the expansion valve the pressure drop must be overcome.

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Every component installed in a liquid line will cause a pressure drop. Every bend or elbow, the vertical lifts of liquid, filters, driers, sight glasses, solenoid valves and shut-off valves all contribute towards this pressure drop. Careful consideration should always be given as to what components are absolutely necessary. Do not include for any components that are not essential. A sight glass in the liquid line is of no value if installed too close to the receiver and some distance away from the expansion valve. "Flashing" will almost certainly not occur near the liquid receiver unless the plant is grossly undercharged with refrigerant. "Flashing" might well be taking place by the time the liquid reaches the expansion valve although the sight glass may well be showing a full column of liquid. Sight glasses should always be located immediately before the expansion valve. A very common mistake made by designers is to select solenoid valves of a convenient size simply because they match the pipe sizing. Solenoid valves should be selected to give the right capacity based on the size of valve orifice. In this way the pressure drop through the valve will be both low and of a known amount. Liquid line filter driers are essential components but it is also recommended that the filter drier, or its core be replaced soon after the initial commissioning of the plant. A dirty filter will only add to the pressure losses in the system.

Hand shut-off valves also cause a pressure drop and the designer should always consider where and when they are necessary components. Needless to say these valves should be of adequate size for the line to once again keep pressure drops to a minimum. Avoid as many bends, elbows and changes of direction as possible and at the same time care should be taken to ensure the piping is done in the most direct and shortest route especially between the

and the only way to overcome this "flashing" is to subcool the liquid to the equivalent degree to that of the total pressure drop. Failure to allow for or failure to reduce liquid line pressure drops to a mini-
Refrigeration

receiver and the expansion valve or valves.

The pressure drop in vertical rising lines must always be taken into account and once again it is a point that is frequently overlooked. The total pressure loss in the system must be known in order to establish the degree of subcooling required to overcome this loss. The static pressure loss due to a vertical lift must be added to the pressure drop due to friction in the line, bends and components.

Some Other Methods of Achieving Sub-Cooled Liquid

Sometimes it becomes necessary to provide additional subcooling of the liquid refrigerant and there are various methods which may be employed.

Heat exchange between the liquid line and the suction line may be sufficient for some cases and can be obtained by having a good thermal contact between the two lines. Whilst this may be the cheapest method it is not the best as it is impossible to calculate the amount of liquid subcooling taking place. The best solution is to use a liquid to suction line heat exchanger of known capacity. However, some compressor manufacturers do not recommend heat exchangers especially when using R22. It is not desirable to create too high a superheat at the compressor suction inlet connection especially on suction gas cooled semi-hermetic compressors. The better alternative is to use a liquid sub-cooler as an extension to the condenser. A separate sub-cooling coil is installed after the condenser and sometimes after the liquid receiver. The sub-cooling coils must have a minimal pressure drop and be located at a lower level than the condenser. Otherwise the condenser will be called upon to sub cool the liquid to overcome the resistance of this sub-cooler itself. Another point to be borne in mind when designing a system is that too much subcooling of the liquid refrigerant can have undesirable effects. If in an extreme case the liquid becomes excessively sub-cooled the mass flow of refrigerant through the expansion valve and the evaporator is less than would otherwise be needed for the same duty resulting in the compressor suction pressure dropping lower than design. This means that the first diagnosis of a complaint about low suction pressure may suggest that the evaporator is too small or the compressor too large, when in fact both components are correctly sized for the capacity of the plant.

Earlier in this article we mentioned that the problems which may be experienced due to incorrect sizing of a component in a refrigeration circuit may not necessarily manifest themselves on the incorrectly sized component.

Flooded Evaporators

In a flooded cooler the refrigerant surrounds the tubes in the shell and the water or liquid to be cooled flows through the tubes in one or more passes depending on the baffle arrangement.

Flooded coolers require a continuous liquid bleed line from some point below the liquid level in the cooler shell to the suction line. This continuous bleed of refrigerant liquid and oil ensures the required return of oil to the compressor. It is usually drained into the suction lines so that the oil can be returned with the suction gas. This drain line should be fitted with a hand shut-off valve, a solenoid valve and a sight glass. The solenoid valve should be wired into the control circuit in such a manner that it closes when the compressor stops.

In such an installation the liquid to suction heat exchanger should be installed close to the cooler. This
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is required to evaporate any liquid refrigerant from the refrigerant oil mixture which is continually bled into the suction line. This prevents liquid returning to the compressor.

Since flooded coolers frequently operate at light loads, double suction risers are often necessary. In order to avoid any possible freeze up of water supply to a flooded cooler the water quantity should never be throttled and should never by-pass the cooler.

Vibration of Pipework

Vibration transmitted through or generated in refrigerant piping and the objectionable noise which results can be eliminated or greatly reduced by proper design and the support of the piping system.

The best way to prevent compressor vibration from being transmitted to the piping is to run the suction and discharge lines at least six pipe diameters in each of three directions before reaching the first point of support. In this manner the piping can absorb much of the vibration without being overstressed.

Loop from the compressor can be attached to the compressor base by means of a bracket if the base is isolated. If there is enough space in the horizontal run of the loop two brackets are recommended to eliminate excessive rocking movement of the piping. Brackets should be attached to the point of minimum movement of the compressor or assembly. The riser following the loop is supported as close as possible to the compressor.

If the compressor is mounted on a resilient base the pipe supports should have a resilient isolator. This resilient isolator should be selected for at least four times the deflection in the spring support of the compressor base.

Summary

It is clear from the foregoing that many factors can contribute singularly or collectively to the way in which a particular plant performs. This article does not pretend to be nor should it be taken as a complete summary of design criteria but it is hoped that when trouble shooting a plant which has an apparent lack of capacity a more thorough investigation may be carried out before condemning a particular component. It is also hoped that it will serve as a reminder once again that the component in a system which appears to be undersized or mis-matched may not necessarily be the offending item at all.

It cannot be over stressed at this point that consideration should be given at the design stage to reduce complaints at a later date.*

* Article supplied by Joe Brennan of the Brennan Group.

Automatic Controls for Commercial Refrigeration Plant and Heat Recovery Systems

The following notes are based on material submitted by the companies concerned.

DAWE

The type 89022C ultrasonic leak detector has been introduced into the Dawe instrument range, to provide the facilities of a steam trap tester and an air or gas leak detector in one instrument.

Designed as a low cost, portable, battery operated instrument the type 8902C works by detecting the ultrasonic energy generated by gas or steam escaping through an orifice.

The instrument being extremely simple to use, requires the minimum of operator familiarisation time, and affords great cost saving by eliminating the need to install steam trap fault detectors in the steam lines and reducing the time needed for maintenance.

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The controls consist of a supply on-off switch with a battery check position, a sensitivity control and a two position switch for selection of general purpose or steam trap applications.

When used as a leak detector the internal ceramic microphone picks up the ultrasonic energy and amplifies it for display on an analogue meter or to drive headphones.

When used for steam trap testing a contact probe plugged into the instrument automatically cuts out the microphone.

Dawe instruments are available from Industrial Instruments Ltd., Cyborg Electronic Ltd and Oliver Traynor.

**RSL**

Robinair's development programme for a new range of test instruments, which commenced with new analogue and digital temperature testers last year, is continued with the introduction of a solid state Thermistor vacuum gauge. Robinair's new vacuum gauge not only covers the refrigeration and air conditioning service engineer's requirement to be shown accurate vacuum readings, but is also an instrument that is rugged enough to stand up to field service work. Robinair's new gauge features solid state circuitry to provide this robust requirement and 10 individual light emitting diodes to indicate clearly and accurately the vacuum levels. Part No. 14830 is battery operated and is provided with a durable plastic carrying case that can be hung from a hook for convenience. Competitively priced against compensated dial type vacuum gauges, this new Robinair instrument is the ultimate in convenience and accuracy for vacuum measurement.

The latest addition to the Robinair range of test instruments, following the introduction of temperature testers and vacuum gauges for the refrigeration service man, is a brand new Volt/amp/wattmeter, Part No. 14865.

Robinair's new instrument has normal and peak switch settings which enable the serviceman to read both normal and peak conditions. The 14865 comes in a rugged carrying case, provides an easy to see, digital reading and is capable of holding peak current readings.

Further details obtainable from RSL Ireland Ltd.

**WALKER AIR**

Two new reciprocating liquid chillers are now available from Walker Air Conditioning Ltd.

The 30HK and 30HL series are each available in four sizes with nominal cooling in the range of 118 to 210kW and are ideal for use in chilled water air conditioning systems and various types of process cooling applications.

The 30HK models are packaged units complete with cooler, condenser(s), controls, factory refrigerant charging and internal piping and wiring.

The 30HL series is a condenserless version of the basic 30HK, shipped with a holding charge of refrigerant and specially designed for applications with remote water, air-cooled or evaporative-type condensers.

Both ranges are designed for easy installation. On-site the only connections to be made are external water and power to the 30HK and refrigerant line connectors to the remote condenser for the 30HL.

The series are also extremely compact, easily able to pass through standard doorways and requiring minimal floor space.

In all applications, quiet operation is important and Carlyle have ensured this with both series.

Enclosure panels around the compressor are insulated and mufflers are fitted to deaden hot gas pulsations. The compressors are also mounted on heavy springs both to minimise operation noise and the transmission of potentially damaging vibrations to the building structure itself.

Both 30HK and 30HL models have low running costs, enhanced by sequential starting and stepping of multiple compressors, two separate refrigerant circuits for the most efficient operation on part-load and refrigerant subcooling which increases system capacity without raising power consumption.

Both series also have low maintenance costs, which are minimised by ease of service — achieved, for instance, by incorporating bolted semi-hermetic compressors — and several self-protecting features.

These include a filter-drier, fitted as standard to keep refrigerant circuits free of harmful moisture and contaminants, quick-sensing elements fitted to compressor motors to protect them against overheating and a moisture-indicating sight glass which allows continuous and direct monitoring of the refrigerant circuit, showing its moisture content on an easily read colour indicator.

For both series, nominal cooling capacities are the same — 118kW for the 30HK model; 144kW for the 040, 167 for the 050 and 210kW for the 060. Operating weights range from 798 to 993 for the 30HL series, and from 1284 to 154kg for the 30HK units.

Optional accessories available include oil pressure safety switch (fitted as standard on the 30HL), a remote control panel and a control circuit transformer.

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And then there's our latest product, Heat Machine, which is going to make a few boilers redundant in the eighties. It removes heat from waste warm water and by dint of its 2.3 to 6.0 C.O.P. (depending upon the water temperatures involved), produces cheap useable heat for comfort or industrial process use.

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With building running costs going through the roof, it's nice to know Carlyle from Walker can help to bring them back to earth.

Carlyle from Walker. Helping to ease the squeeze.

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Refrigeration

It was during September of 1980 that the IDA grant aided factory started to turn out towers and, despite the recession, the growth of the operation has been considerable.

Readers will remember the announcement in HVN of the licence negotiated between Halligan Engineering and Carter Industrial Products of Birmingham, England. Managing Director, Vincent Halligan, after successful negotiations were concluded with Carters, appointed Vincent Flynn as General Manager and the successful partnership that emerged is evidenced by the many tower installations already carried out and the healthy condition of the firm's order book.

Carter-Halligan are perhaps better known by the larger tower users, particularly in the pharmaceutical and food industries, but Vincent Flynn is quick to point out that they do make the smaller packaged towers for the industrial and air conditioning markets.

In addition to producing towers, Carter-Halligan carry out refurbishing of existing towers and, here again, the larger users have used this useful local service more than others.

Being located in Munster, particularly as Vincent Halligan was and is well known in the steel fabrication business in that province, has meant that more sales emanate from there, but Vincent Flynn expects to make an appointment soon in the Dublin area.

Dust Control

Some readers will be interested to know that the rather unusual additional expertise which this expanding organisation has relates to dust and fume control.

There are, of course, companies in Ireland producing cyclonic type dust collectors for applications such as joiner's shops, the milling industry and the like, but, in the main, collectors such as pulse jet fabric filters have been imported either from the UK, Europe or the USA. Carter-Halligan have a comprehensive range of dust and fume control equipment which, like their cooling towers, is produced, under licence, from Carter Industrial Products.

With the ever increasing demand for a clean environment and high energy costs, Carter-Halligan design their systems with both of these aspects in mind and, to complement this important part of the company's activities, they are distributors for Ireland of Gore-Tex PTFE Membrane Filter Bags. This unique material allows the filtered air to be re-circulated, thus reducing heating costs, particularly when larger volumes are being handled.

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determined by the positioning of the set point potentiometer slidewire. The slidewire operates at a high voltage level in order to minimise the effect of dust etc.

The difference between the reference signal and the sensor input is fed to the control amplifiers. The amplifiers modify the signal (see control form) and develop an output which is used to operate the final contactor, solid state switch or solenoid valve. The change in process temperature resulting from this action causes the input signal to change so that the difference between the input and reference signals is reduced essentially to zero.

Further information from Manotherm Ltd.

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Cool Products Limited of Belfast are sole distributors of 'PoLadaire' open-type compressors and condensing units in Northern Ireland. The company will also serve the Republic. A full range of 'PoLadaire' units and spares will be carried. 'PoLadaire' spares are fully interchangeable with the equivalent Frigidaire parts and, following the purchase of the rights to manufacture Frigidaire 'opens' from General Motors 'PoLadaire' is now the sole supplier. Cool Products, although established just over two years ago, is now one of the leading wholesale refrigeration companies in Northern Ireland. The company is a member of the J Norman Fulton Group who were previously official distributors in Northern Ireland for Frigidaire opens.

The management team has many years experience in the refrigeration industry.

Further information, including literature on 'PoLadaire' open refrigeration equipment, is available from Cool Products Limit-

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**RANCO**

A versatile design of electronic digital commercial refrigeration thermostat offering either one or two stage switching with indication, has been introduced by Ranco. Known as the E49 series, this is stated to be the first commercially marketed electronic read-out thermostat for commercial refrigeration use offered by a major controls company. Typical applications include cold rooms, blood banks, milk coolers, display cases, freezers and water chillers. The E49 is a self-contained unit, with clear LED read-out of sensor temperature, combining the function of two normally separate mechanical units, a thermostat and a thermometer. Already a desirable concept for the UK, this is becoming a mandatory requirement in some countries. Read-out itself is more visible than a normal mercury thermometer. The read-out and thermostat are housed in a DIN-standard enclosure designed for simple panel mounting. Remote sensing of up to 100m is possible since the E49 works in conjunction with an NT C sensor located in the controlled medium.

The digital LED read-out displays at all times the temperature at the sensor. As the temperature of the controlled medium rises and falls around the set point, an s.p.d.t. relay is energised and de-energised. (In the case of the two stage versions, the two stages switch sequentially). Signal lights are lit when the relay(s) is energised (when the sensor temperature is above or below set point). The relays are s.p.d.t. voltage free to permit independent switching and, if necessary, remote indicators or alarms. Input voltage range is 200-240V, 50-60Hz. Output relay rating is 10(S) amp, 250V (per relay). Control ranges presently available are -35° to +10°C, and -10° to +35°C; but other ranges and voltages can be made.

Ranco products are available from RSL Ltd.

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**DANFOSS**

Danfoss automatic controls for industrial refrigeration plants are the obvious choice for most refrigeration systems, eg in cold stores, slaughterhouses, breweries, dairies and refrigeration ships. We at Danfoss attach great importance to having an extensive programme so that our automatic controls for refrigeration plants can cover practically all the functions you could wish for from our range of automatic controls for industrial refrigeration plants includes for example:
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- Media temperature regulators;
- Crankcase pressure regulators;
- Capacity regulators;
- Condensing pressure regulators;
- Thermostats;
- Pressure controls;
- Solenoid valves;

- Check valves;
- Automatic and thermostatic water valves;
- Filter driers.

Further information from J G Sampson Ltd.

**BRENNAN**

The recently acquired U.M. Motor-compressor Series manufactured by McQuay Europa are available in 5 sizes, covering a capacity range of 160,000-320,000 Kcal/h (186 to 372 KW) and have been specially designed to meet medium temperature process cooling, encountered in the chemical, petroleum, dairy and allied industries including cascade system applications. The Motor compressor Unit consists of an open type McQuay Europa compressor, coupled to an electric motor by means of a universal joint. All Motor compressor Units are equipped with a control panel, including high and low pressure cut-out, differential oil pressure safety switch, high and low pressure gauges, oil pressure gauge and an oil heater signal lamp. As an optional extra, an electric control panel can be supplied, complete with mains, isolators, fuses and contactor. The MOC compressor is equipped with an hydraulic capacity control actuated by a solenoid valve providing cylinder loading and unloading in response to the cooling demand, ensuring economical operation even at partial load.

Further information can be obtained from: Brennan Airconditioning Limited.

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**HENRY R. AYTON**

Aerofoil bladed fans, combined with a patented pack ensures that a new range of cooling towers provide maximum heat rejection with a minimum electricity use. Developed by Watermiser, the pack, cooling towers are the obvious choice for a patented pack ensures that a new range of cooling towers provide maximum heat rejection with a minimum electricity use. Developed by Watermiser, the pack, (the heart of the cooling tower) is vacuum formed, and offers a massive surface area to guarantee optimum heat transfer for high duty cooling applications.

For maximum operating efficiency and minimum power consumption, the improved range of Watermiser towers use aerofoil bladed fans, these capable of pitch angle variation allow fan duty to more precisely match each installation's requirements, thereby ensuring no energy wastage.

Watermiser towers are formed from heavy gauge mild steel panels, which are hot dip galvanised after manufacture. When erected, these form a monocoque shell of extreme strength and rigidity. This type of construction allows an I.D. cooling tower to be provided in many configurations, either with an integral basin, or on to a customer's concrete pond.

The design and construction of the range ensures minimum maintenance requirements. Watermiser do, however, offer a contract service to ensure that their towers at all times operate with maximum efficiency, and provide a long trouble-free working life.

Further information from: Henry R Aytton Ltd.
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CIBS NEWS

Of all the primary energy used in Ireland over 50% is consumed by buildings, simply to establish an acceptably comfortable environment within them. The greater part of this, some 34% of the national consumption, is accounted for by individual buildings.

Within 20 years, oil and gas sources will diminish, which cannot or will not, be completely replaced by conventional energy sources — coal, wood, peat or nuclear power. It is vital that we are ready with a variety of viable alternatives before they run out. Therefore, in these times of stress on energy conservation, it places the responsibility for reducing the countries energy requirements on the shoulders of the individual user. As the world becomes increasingly dependent on ambient energy from the sun and wind. As a result, new and more efficient ways of harnessing them will be found, in the form of solar panels and wind generators. In a broad sense, we have always enjoyed sun power in the form of wood, oil, coal and gas since the beginning of time, but as conventional methods of utilizing the suns energy become exhausted, new ones must be found.

Ireland is uniquely placed — a great deal of wind from the Atlantic Ocean coupled with a temperature climate, thanks to protection from the Gulf Stream, and an atmosphere relatively free from pollution. According to the meteorological office, we get about 1600 hours of sun per year. The sun generates energy by nuclear fusion reactions in its interior, causing it to lose 4 million tons of matter per second. If only 1% of the solar energy reaching the earths surface could be used with an efficiency of 5%, the whole of the earths population could achieve the same energy consumption as the sun does now of 150 billion tons/day. At the present day. By the end of this century 2% of our energy needs could be answered by solar power. It is we prepared to accept major changes in the way we live and build, then about 20% of our needs could be supplied by solar power. Scientists also believe that if research into other forms of energy such as wave and wind power prove successful, a combination of the above resources could meet about 40% of our needs by the year 2000 — an attractive proposition to those who are worried that nuclear power will be the only alternative when fossil fuels run out.

Solar power requires no energy or fuel for transportation and can be used in small units whenever it is required. It is clean, free and will not be a cause for the all too often heard cries of alarm from anti-pollutionists.

Applications of solar energy are extensive and cover wide ranges, from the solar panel, to solar cells, which can be used to store solar energy, i.e. particles of solar light are converted into electricity which is then stored in solar batteries. Research on exotic types of solar cell include work on amorphous silicon, potentially 1/100th of the cost of present crystalline silicon cells; work on oxides of a rare earth (rhodate) as an electrode in a battery which appears to generate hydrogen and electricity from solar energy; and work on organic cells, which could be the cheapest of all. Presently they are used to operate sattelites on a commercial scale, and to charge the batteries of boats and caravans when mains power is not available. Unfortunately they are far too expensive for providing domestic electricity, so a large manufacturing breakthrough will be needed before the price will drop — current estimates predict that an array of solar cells big enough to produce 1 kWh would cost about £1000.

We are here concerned with low temperature heat for residential premises, particularly rigidly mounted flat plate collectors for heating water. The reasonable expectations from a properly designed solar system in this country is the supply of the greater part of domestic hot water in summer, and worthwhile pre-heating during spring and autumn, needing boosting by auxiliary.

Improving the basic design of our buildings must obviously come first. There is no point in designing a house aimed at conserving energy, when heat is escaping unnecessarily through badly insulated walls, draughts causing heat loss, or, causing it to loose 4 quadrillion tonnes of energy again. It is the original sun greenhouse principle — as the name implies — conserves heat. It has a mainly glass structure and works on the greenhouse principle — allowing long wave sun rays in but now allowing the now shorter waves out again. It is the original sun trap — allowing the sun in but keeping the winds out, thus in turn allowing warmth to be transmitted to the other rooms. A form of passive solar heating, the conservatory utilizes the sun to its maximum advantage without mechanical

CIBS ANNUAL STUDENTS AWARD

After the recent Chartered Institution of Building Services AGM three papers from students were read by the students themselves on subjects related to building services. Donna Turner a second year student of construction studies at Letterkenny Regional Technical College won second prize for her paper ‘An Energy Conservation House for the 80’s’ and following etiquette we publish ladies first.

70% of the house need not necessarily be used when the house is lived in at first. A young couple just may not have the money to furnish and decorate it straight away, or they simply may not need it until they start a family. His dormer style upper floor also means less heat loss to the exterior, owing to the roof having a smaller thermal transmittance or U value of 0.37 w/m20C compared to the external walls value of 0.51 W/m20C.

An advantage is the chimney breast. This internal flue acts as a passive radiator, which if built into an external wall, would only lose valuable heat to the outside. The draught lobby or vestible would be sensible. no house should be without one. It means the front door does not open straight into the hall, causing draughts. Thus it makes valuable heat savings and is also a form of passive solar heating like the conservatory — one of the main features of this house. The conservatory does just what its name implies — conserves heat. It has a mainly glass structure and works on the greenhouse principle — allowing long wave sun rays in, but now allowing the now shorter waves out again. It is the original sun trap — allowing the sun in but keeping the winds out, thus in turn allowing warmth to be transmitted to the other rooms. A form of passive solar heating, the conservatory utilizes the sun to its maximum advantage without mechanical

(Continued overleaf)
means, even in winter to a certain extent.

Insulation standards are high. The walls have 45mm of expanded polystyrene slab in the cavity and 25 mm of the same under the ground floor. The walls are lined with a sandwich of 25mm high density expanded polystyrene slab and aluminium foil backed plasterboard combined. 200mm of glass wool blanket is placed between the rafters. The windows, always a sore point where draughts are concerned, and which can account for up to 15% of heat losses, are double glazed, and fitted with special neoprene rubber sealing strips which form a seal when the windows are closed. The doors have the same sealing.

Much of the design of this house is based upon the traditional Irish farmhouse — south facing, a large central chimney breast acting as a heat store, thick walls and a thatched roof, — basically sound ideas that have been adapted for use today although cavity walls with polystyrene insulation take the place of the thick walls, and glass wool blanket replaces the thatch.

The solar panel on the house is designed to be sufficiently efficient for the needs of the house. Basically a solar collector is a flat box with a glass front — it is a sandwich made up of a collector plate or backing plate between the glass and an insulated backing. The simplest type of collector is an old domestic central heating radiator painted matt black — not as efficient as the glass-metal sandwich but avoids the problem of overtaking water joints. This is a prime example of a direct system or thermosyphonage, i.e. water when heated will expand and rise, allowing cooler water to move and take its places. This continues and the water warms it expands, rising up through the copper pipes, flowing out of the top of the solar panel into the coil in the solar cylinder, thus in turn allowing cold water to take its place through the bottom of the panel, continuing the circulation.

The system used here is indirect, or closed circuit, i.e. the warm water flows through the coils inside the solar cylinder thus transferring heat to the water in the solar cylinder. Cold water from the cistern in the cistern in the roof, normally fed to the existing hot water system, is diverted to the solar heating cylinder. There is a chance to be preheated by the water circulating through the solar panel before reaching the household cylinder, where the temperature can be topped up by an immersion heater, or by either of the two boilers, as can be seen later.

The water circuit being closed means that the same water is circulated constantly as in a central heating radiator system. To prevent freezing in winter, an antifreeze, such as ethylene glycol solution can be added along with a corrosion inhibitor which obviously would not be possible with a direct system.

The solar system must be designed so that if the sun is obscured by clouds, the collector will not lose more heat than it has gained, i.e. if the water in the solar cylinder was hotter than that in the panel, due to clouding over or a drop in temperature, then reverse circulation would take place, with the warm water rising up out of the solar cylinder and back into the solar panel, acting like a radiator. A non-return valve prevents the water circulating backwards, but temperature sensor or temperature differential controllers will be needed also. There is one at the bottom of the solar cylinder, and one at the outlet at the solar panel. This temperature differential controller is a sensor or thermostat that controls the action of the pump circulation taking place when water at the panel outlet is 2°C hotter than that at the bottom of the storage vessel. This means that pump circulation will only take place if the water at the panel is 2°C hotter than that at the bottom of the cylinder, because there wouldn't really be much point otherwise.

The pump aids circulation of the water. It is placed on the cool side of the circulation, i.e. where the cold water enters the solar panel. This is mainly because cool water will not cause as much wear and tear on a pump as warm water will. The bypass valve, or three-way motorised diverting valve is necessary so that water heated to a high temperature (over 55°C) by the sun alone can be fed direct to the taps without it passing through the household hot water cylinder in the hot press downstairs. If it is less than 55°C then it is sent as pre-heated to the bottom of the domestic hot water cylinder.

Since sunlight is an unreliable commodity in this country (although the panels will provide some heat even on overcast days), the more heat that can be stored from a sunny day the more economical the system. Cambridge University's Department of Architecture believe the simplest solution to have a basement where the heat of the sun could be stored in huge water tanks. The theory is that sun heated water would be stored at 70°C, and as it cooled in the winter a windmill on the roof would provide electrical energy to boost the temperature, using immersion heaters. A major drawback here is the size of the tank — a 100 tonne storage tank would be needed for the average family house, as winter sunshine is only 1/16 of the annual total. Therefore the cylinder should be insulated with at least 75mm of lagging and all pipework should have 25mm of mineral wool insulation which should be suitably weather-proofed where exposed.

The panels should be placed in a slope, in this case the roof, facing within 30° east or west of south. They should be inclined at an angle of 30°-40° where it would not be overshadowed by trees or nearby buildings. However it should be noted that even further away from the equator the panels is, the greater degree it should be pitched at to catch the increasingly longer wave sun rays. If it were on the equator it would not be pitched at all, just flat. Nevertheless, the pitch in this part of the world should not be less than 30° or greater than 55°. The glass should be kept clean as efficiency of the panels is cut considerably when
panels get dirty.

One square metre of panel per person acts as a good guideline to the size of the panel. Here we calculate for a family of about five people — a panel size 1.5m by 3.3m which is roughly equal to 5 m². 1 m² of panel should be capable of giving about 120 l of hot water at 60°C on a full day of July sunshine, which would work out to be 600 l for a 5 m² panel. Since the average household hot water cylinder holds 136 l, this leaves a lot of spare potential hot water. Few homes have the space or can justify the cost of a very big tank however. Seeing as this is only calculating for maximum sunshine, a good guideline to the size of the solar cylinder is 45 l per m² of panel. Here there are 5 m² of panel so this means a 225 l tank.

On warm days the water needs no heating by either immersion heater or solid fuel boiler. On days of intermittent sunshine the conventional water heater should only be needed for short periods.

However, the fact remains that despite the available knowledge and equipment, the completely autonomous house is difficult to achieve. For some time to come, most ambient energy systems will have to rely on a boost from one of the traditional fuels, with considerable renewed interest being shown in solid fuel, or rather the improved efficient use of solid fuel, which has been chosen as the form of supplementary heating in this building. An interlinked system was opted for. A feed pipe takes cold water from the storage cistern in the roof to the 136 litre hot water cylinder in the hot press. Inside the cylinder are indirect flow and return coils from the boilers, i.e. a back boiler in the open hearth in the lounge and a range boiler in the kitchen, of which either or both can be used at the same time. Pressure relief valves are necessary at each boiler and also adequate isolating valves. These isolating valves are needed because when only one boiler is heating the water in the cylinder, the hot water then will in turn heat the water in the other coil causing it to absorb heat and start circulating, acting like a radiator. The isolating valves prevent this happening by preventing water in the unused coil from circulating.

Solid fuel is the one fossil fuel whose availability is seen in terms of hundreds rather than tens of years as with oil and gas. Indeed many authorities advocate that it should be obligatory to build a chimney into every new house, leaving the occupants fuel options open. Solid fuel has the advantage also that when banked up at night, it will maintain a gentle heat throughout the house, which is better for its fabric than turning off the heat completely. Given that the house is well insulated the structure will remain continuously charged with warmth, so that the walls and floors do not draw heat from the human body. A solid fuel fire or range will offer high-temperature radiant heat with controlled ventilation, even when the doors and windows are sealed against draughts as they are here. After all, solid fuel, in particular wood and peat, will be easier to obtain for the Irish householder in the coming years than oil will.

Solar energy can be measured in kWh just like electricity. The amount of solar energy falling on an area of 1 m² can be up to 1200 kWh in a year, but most systems installed to heat hot water for household use are only able to use about ½ of this, so the likely benefit will be 600 kWh/m² per year.

The whole object of the solar heating system is to save money on heating bills. During the summer it can supply up to 80% of hot water, and up to 10% in winter. E.S.B. tests show that the system here, for a...
family of five, could save 26% of heating costs in winter and 35% in summer, an average of 30% of the hot water heating bill all year round. If the annual bill came to say £250-£300 per year, then working on their basis of solar would mean a saving of approximately £70-£80 per year, taking into account a small deduction for electricity to run the pump. According to E.S.B. estimates, at present prices a properly installed solar heating system for domestic use could cost £985 (1981 prices) considering a solar cylinder, glass, pipes, a pump, controls, etc. So given a fuel inflation rate of 25% and a discount factor of 14%, it would take about 12 years to pay for itself.

Minimum life expectancy of a system is about 25 years, and there are little or no maintenance costs, apart perhaps from the services of a window cleaner with a long ladder to keep the glass clean. The bigger the annual fuel bill, the bigger the saving, and so the quicker the system will pay for itself. Also, as fuel prices in the next 12 years are unlikely to go anywhere else but up, the time scale for recovery of capital cost will probably be even shorter. It would also be shorter if the householder uses more than the national average of hot water (around 1300 litres a week according to the E.S.B.) in which case payback would be complete in around 10 years.

Various countries are offering incentives for solar energy installations and research. The British Dept. of Energy plans to spend about £3.5 million on a four year plan of solar energy research which seems a lot until it is known that Japan plan to spend £100 million by the end of the century, and their total hours of sunshine per year only slightly outnumber those in Western Europe.

The USA have launched a solar bank (funded by new taxes on oil) to provide capital, and is also offering large tax reductions for factories and houses incorporating solar heating.

Sweden has the world's most ambitious programme, aiming to take from the sun all the energy it needs by the year 2015. It has passed stringent new building regulations for insulation which should reduce the energy requirements of houses by about 40%, and is spending four times as much on solar research as on nuclear research. It is seriously thought that all the Swedish houses will be built with solar ponds in the near future. Solar collectors would heat up the pond in the summer, and the well insulated pond will stay warm until winter when it will be circulated through the house. The Swedish town has a pond with the solar collectors floating on top, slowly rotating to keep them facing the sun. It is claimed that the water never falls below 30° even at the end of the Swedish winter.

Even countries such as Israel, Brazil and India, with limited financial resources are hoping investments will pay off in a few years.

The Frenchman can charge the cost of any energy saving method for his home or his business against income tax. Such a scheme in Ireland could entirely alter the view of every south-facing rooftop in the country!

Irish firms of architects have won major awards in recent EEC sponsored competitions on solar design.

Another supplementary source of power which could be used in conjunction with solar panels is wind power, particularly worth looking into in the north and west of Ireland.

The wind generator comes in the form of a rotor blade 8m in diameter, on a mast 11m above ground level. The rotor blades operate by centrifugal force. The usual mounting is on a four leg angle iron tower. The wind generator used for this house starts charging at a wind speed of 8 mph reaching its potential of 10 kW at 24 mph and shuts down at 60 mph by feathering. A hand-brake can also be used to close down the rotor completely if the occupants perhaps will be absent and not needing electricity for some time. They are easy to erect, maintain and operate.

Our example provides both potable water for radiators and electricity for light, etc. By the loadmatching device water can be stored in insulated hot water tanks and can heat up to five radiators. The electricity generated from it can be fed into a battery charger, which should be at least 12 volts, then a battery bank can provide electrical d.c. lighting. By means of the inverter an a.c. supply for a television, fridge, etc. is provided. At a mean annual windspeed of 16 mph it can produce 25,000 kWh of energy.

Wind machines can range from powering the smallest immersion heater at a maximum of 200 W output, up to large central heating systems at 150 kW for large buildings, factories, etc.

Prerequisite to modern self-sufficiency, it is not a free source of electricity. It is capital intensive with the smallest and cheapest to power lights, televisions, stereos, shavers, etc. starting from £350 ranging to the £35,000 price range. Generators costing £1,000 on the continent are produced for £600 in Ireland.

Generators can be used by most ordinary householders, but there could be problems if the neighbours object to an 11m high mast in the back garden. Also they can be dangerous in very strong winds, as the 8m rotor span will imply, so they are only really suitable for rural areas, in particular farmhouses. They, unlike solar panels, need planning permission.

The key to its economy is the ESB who have followed the example of state power companies in other countries, and let your electricity be fed into their grid, providing they agree to the grid system. They have bought one and are testing it. The erection of 5000-6000 such generators linked to the national grid could mean a big input to its grid. Costs could be reduced by 60%-70%.

The National Board of Science and Technology, Bolton St. and Kevin St. Colleges of Technology, the IDA and Coras Trachtala are all showing interest also.

Wind power has been considered to try to solve the oil problems on the Aran Islands, particularly Inisheer. It was researched into by a firm called Alternative Energy Ltd. from Woodford Co. Galway, who produce a wind machine called the Phoenix. It was considered possible and economical for the island, but unfortunately was turned down by the Government. The inhabitants were hopeful they would change their minds again. An amendment in early April confirmed that they will get their wind generators.

For improved control of heat loss, mechanical ventilation has been employed here, also for the reason that the house is so well sealed and insulated it has to have a controlled ventilation system. This takes filtered air from outside and makes a slight positive air pressure within the house, thus minimising infiltration by draughts. A heat exchanger or extractor recovers heat from the outgoing extractor stale air and uses it to warm the incoming fresh air thus keeping heat loss to an absolute minimum.

The trend remains however that new means of energy conservation and utilisation, in particular solar energy, is still in its earliest stages and has yet to be developed over a wide front. Nevertheless, the possibilities and discoveries that have been coming in to light are astonishingly wide ranging and extremely promising for the future. Hopefully, as more people become aware of and disturbed by the long term hazards and dangers inherent in fast breeders, nuclear reactors and the like, there will be more pressure on the Government to invest similar sums of money on the development of these forms of ambient energy.
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Landis & Gyr, who manufactured the first micro-processed based microiser have now developed a model that incorporates a microcomputer. This development, along with other significant improvements to the OSCB, has not only made it the most sophisticated piece of equipment of its type available, but it has also made it simpler than ever to operate.

The new OSC8 has been designed to make the most efficient use of energy, while at the same time ensuring that the building is heated to the correct design temperature just prior to the start of the working day. The microcomputer inside the Micromiser renders calibration unnecessary; and the simple programme reacts to the various temperatures both inside the outside the building. To a certain extent, the programme can also relate heating requirements to the fabric of the building.

Amongst the special features of the new OSC8 is the fully adaptive search period for optimum 'start' and optimum 'off'. This means that the equipment saves you more money than ever before, since it allows the heating system to run for the least possible time during start up. The required temperature and the hours at which it should be reached are programmed into the OSC8. The heating system is then activated at the shortest necessary time before the working day begins. Similarly, the system is automatically turned off at a time which ensures that heat is not wasted when the building is unoccupied. If the weather conditions change, the OSC8 remembers and adapts its 'start' and 'off' accordingly.

It also has an independent hot water system control. As well as the hot water used for heating the building, the OSC8 has a separate time switch control for the hot water service system, which, in the summer, can be used for domestic hot water control.

In case of power failure, or the need to turn off the power to service equipment, there is a 30 hour back-up battery. Consequently, in such an eventuality, there is no need to re-programme. When the battery does run out and reprogramming becomes necessary, the word "HELP" appears on the screen to inform the user. The OSC8 also gives visual warning if anything goes wrong with the all-important detectors, enabling the user to pinpoint where the error has occurred and to consequently save considerable service time.

As well as effecting these improvements, Landis & Gyr can now save the user money by simplifying maintenance both in terms of time and replacement parts. As a result most of the parts now come as plug-in modules, which can be replaced simply and inexpensively.

There is also a recorder that can be plugged in to indicate not only the inside and outside temperatures, but also the time and duration that the boiler plant fired. The inside and outside temperatures can also be read directly from the LED display, a feature which enormously simplifies servicing and commissioning of the equipment.

Further information available from Brown Boveri (Ireland) Limited, Whitestown Industrial Est, Tallaght, Co Dublin (Tel: 522622).
**NEW PRODUCTS**

**Finheat Extends FBM Range**

S & P Coil Products, represented by Finheat Ltd, has added a new model to the FBM range of fan convectors heaters used in hot water heating systems. The new convector, Model FBM 30, has been developed to meet the need for a rugged heating unit with high strength construction and relatively low capacity.

FBM convectors are commonly used for heating industrial and commercial buildings and especially local authority premises with public access, such as schools and hospitals. Rated at 2.5 kW on its slow speed setting and 4.3 kW on boost, this new heater extends the application of the FBM range. Now complete premises, down to the smallest room sizes, can be fitted with fan convectors of the appearance and higher capacity units in the range, the FBM 30 features an extremely robust casing designed to allow reversal of pipe connections and air flow arrangements on site. As standard, freestanding models are supplied in a hammer grey stove enamel finish. Sapele wood surrounds and white painted front panels are an option. All models are fitted with resiliently mounted motors, with "sealed for life" sleeve bearings for quiet running. Components are mounted on a slide-out chamber which can be completely removed from the casing for easy servicing. Optional extras on top of the basic specification include thermostats, speed controllers, plinths and filters.

Further information from Finheat at their new address, 17 Ushers Island, Dublin 8, (Tel: 778120/778109 Telex: 30751).

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**Low Cost Sound Level Meter**

Dawe Instruments Limited, have introduced into their range the 1408F, an inexpensive Type 2 Sound Level Meter, with facilities which will prove invaluable for a wide range of applications including measurements of environmental noise and assessment of occupational noise deafness risk in industry.

The instruments complies with the requirements of IEC 651 the consolidated revision of earlier international standards and soon to be published as a British Standard. It therefore exceeds the requirements of BS 3489 and ANSI SL 1.4 Type 2.

The wide range of 30 to 120dB is covered in three overlapping ranges, with both A and Flat (Linear) frequency characteristics selectable.

Fast, slow, impulse and maximum hold time-weightings are provided to enable the instruments to measure steady, varying or short duration sounds. The maximum hold facility with a decay rate of less than 1dB over five minutes, is particularly suitable for measuring the rms level of intermittent or short duration sounds.

An ac output is provided to feed tape recorders and frequency analysers.

The instruments can be supplied in a carrying pouch or in kit form which includes an acoustic calibrator and windshield contained in a compact carrying case.

Dawe products are available from Industrial Instruments Ltd, Cyborg Electronic Ltd and Oliver Traynor.
A new industrial pH meter/controller has been introduced by EIL Analytical Instruments, the water analysis specialists of Kent through Industrial Instruments Ltd of Dublin and Cork. The Model 9170 is a tough general purpose pH meter for use in virtually any location and can be easily mounted near the sampling point on a wall, panel or post. A new style cast alloy case with poly-carbonate window fully protects the meter against dust or hazardous chemicals but is easily removed to reveal all the connection points and pre-set controls.

Standard measuring ranges are ±14pH and ± 800mV for redox checks. Ranges of 0-10pH or 2-12pH can be supplied to order. Temperature compensation can be manual or fully automatic from 0-100°C by the use of a compensator in the electrode assembly. A current output for remote meters, recorders and data loggers at 0-10mA or 4-20mA is available.

Separate high and low alarm circuits are provided, making the Model 9170 very suitable for closed loop control systems. Alarm indications are given by lamps on the meter panel and remotely using independent circuits each rated for 2A (non-inductive) loads.

A new air to water heat pump has been launched by Carlyle and is now available from Walker Air Conditioning Ltd.

Designated the 30GQ range, these heat pumps provide the economic, dependable cooling and heating needed in many commercial markets. They are extremely compact and cause no air pollution. Available in six sizes with nominal cooling capacities ranging from 53 to 157kW, and heating from 56.6 to 168.6kW, these packaged units are ideal for comfort air conditioning in office buildings, shops, hotels, schools and hospitals. They are particularly suited to new construction applications in which the cost of a new boiler can be saved.

Plate fin coils and high efficiency tubing enable the units to operate efficiently from 45°C to ambient. Shell and tube type exchangers on the water side operate from 5°C to 15°C in the cooling cycle and from 35°C to 55°C in the heating mode. Directly driven fan motors, mounted in a vibration absorbing suspension system keep the sound level low. The upward air discharge throws any air noise up and away from surrounding buildings. Together the fan cycling thermostat and pressure switch ensure that there is no excessive noise during night-time operation. The comparatively large surface of the heating exchangers gives a c.o.p. of 3.4 and the newly designed multipurpose thermostat accurately control leaving water temperature in accord with load. These new units also incorporate the Carlyle 06D semi-hermetic compressor. These compressors have been used in over 10,000 Carrier cooling units.

A supplementary heating package, pipe heater cable and copper finned coils are available as optional extras. Also available from Walker Air Conditioning Limited, is the 50YQ range of single package heat pumps.

Designed to provide heating or cooling for smaller offices, shops or homes, the 50YQ is available in four sizes with nominal capacities ranging from 7.2 to 17.4 kW. Suitable for roof or ground installation, the unit comes factory-wired, piped and charged for ease of installation.

With operating weights ranging between 145 and 204 kg, the units have been built to VDE code requirements and incorporate as standard a low pressure switch for protection against excessive operation conditions, Time Guard II to prevent compressor short cycling and a low pressure switch to prevent evaporator or coil freeze-up and loss of charge.

Accessories available include electric heaters, roof curb, discharge roof plenum flexible duct kit and remote diffuser package.

A cooling only version of this range is also available. Designated the 50YH it is also available in four sizes with capacities ranging from 7.2 to 18.3kW.
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