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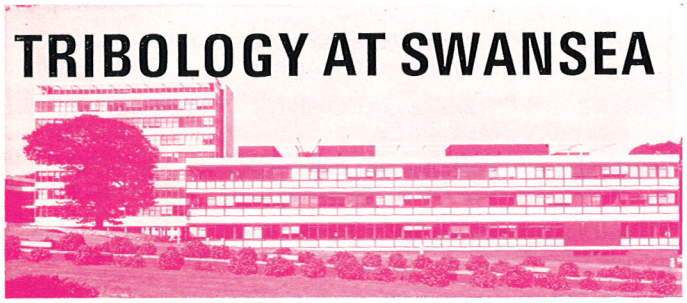
NUMBER 32 : SEPTEMBER 1969

NEWS OF PRODUCTION, RESEARCH AND DEVELOPMENT FROM THE MINISTRY OF TECHNOLOGY

TRIBOLOGY AT SWANSEA



by A. R. Lansdown

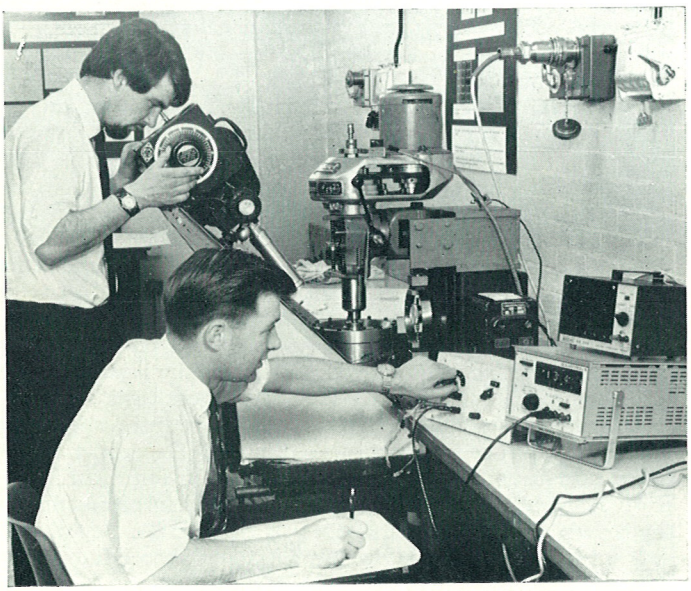
Manager, Industrial Unit for Tribology, University College of Swansea

The Industrial Unit for Tribology was established at the University College of Swansea late in 1968. Its purpose is to assist industry by investigations into all types of problem involving moving surfaces – wear, friction, bearing failures, lubrication, metalworking, and so on. Because of its geographical position it has a special interest in the problems of the process industries – metallurgical, chemical, mining, and refining – but it has also worked on vehicles, engines and machine tools.

Set up with the support of the Ministry of Technology, which advanced £40,000 to assist during its first two years, the Centre must make itself self-supporting within the first four years of its life.

The work of the Centre tends to fall into four main categories: plant design and maintenance, specific metalworking and processing problems, testing and evaluation of materials and lubricants, and the behaviour of rolling bearings and gears.

Analysing the performance of a new angular contact ball bearing design



A vital trend in modern manufacturing is to increased utilisation of plant. In the chemical industry, for example, plant is expected to operate continuously, with no standby components and only annual shutdowns for maintenance.

In these circumstances the cost of unscheduled maintenance and breakdowns becomes enormous. In the 1966 DES report '*Lubrication (Tribology)*' more than half of the potential annual savings were related to maintenance and breakdown. The figures were £230 million per annum for maintenance and replacement, and £115 million for consequential losses. Relate this £345 million per annum to the size of your company and the result may shock you.

Industry is becoming increasingly aware of the savings which can be achieved through a combined approach to the problems of wear, friction and lubrication and their relations to design—savings which have been put as high as £500 million a year.

The Ministry of Technology is producing an exhibition of tribological examples showing their practical advantages in commercial and engineering terms, together with a film dealing with tribology problems in an industrial setting.

Both will receive their first showing at an industrial event to be held in the Angel Hotel, Cardiff, on October 28. This is being arranged by the Ministry in conjunction with the South Wales branch of the Institution of Mechanical Engineers, the CBI (Wales) and the Industrial Unit for Tribology at the University College of Swansea.

To accompany the display and film, a one-day conference on various aspects of tribology in industry has been organised by the Institution of Mechanical Engineers.

Admission to the display and conference is free. Further details and invitations are available from: Ministry of Technology, Office for Wales, 69 Park Place, Cardiff. Tel: Cardiff 37671.

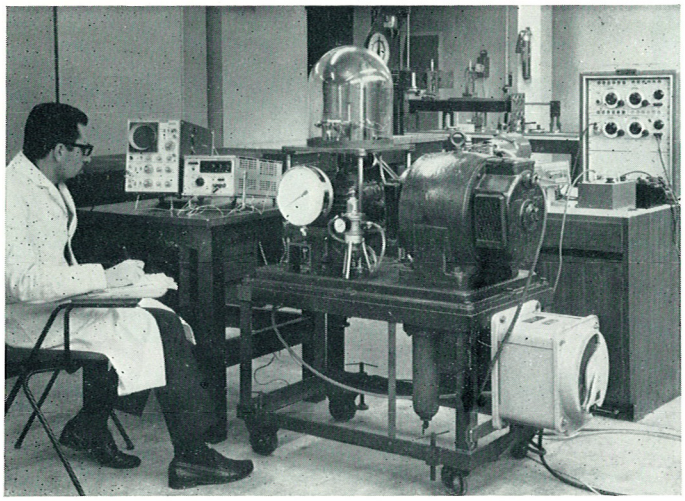
Of course it isn't that simple, but a representative of one large chemical company has stated that the cost of tribological problems to his company is enough to make the difference between net operating profit and operating loss.

The Centre offers a consultancy service on the lines of management consultancy, in which Centre staff will survey a plant and indicate to management the areas in which improvements can be made. Such surveys can be even more useful when carried out at the design stage.

Any sort of tribological problem can occur in the process industries, but some factors are particularly important. They include integrated plant and high throughput (the need for reliability), difficult environments (abrasion and corrosive wear), contamination (filters and seals) and on-line quality control (measurement techniques).

Rigs are available in the Centre for testing filters and seals. In quality control one achievement by the unit has been the invention of a device which measures directly the 'shape' of metal strip as it leaves a rolling mill.

The Centre has a number of test rigs for measuring the friction and wear properties of materials under different loads,



A test in progress on the Centre's controlled environment wear rig

speeds and environments. This work can be done for the manufacturer of materials, lubricants or additives. For example, one such manufacturer commissioned the Centre to study the wear behaviour of a new reinforced resin intended for high-temperature bearing use. But such tests can be of even more value to the user, and the Centre can take a material intended for use in a plant and test it under fully representative conditions for a fraction of the cost of a full-scale plant test and without any of the associated risks. There is also a well-equipped metrology laboratory; and one technique of special interest is computerised 'micro-cartography' of surfaces, soon to be supplemented by a scanning electron microscope.

The Centre is unusually well equipped to study the behaviour of rolling contacts. One major current contract is for a study of the performance of ball bearings used in jet engines, and this work has already led to improved understanding of factors causing premature failure of such bearings. Similar principles are applied in a study of the problems in metal rolling being made for the steel industry. Other techniques are used to measure the stresses in bearings, gears, slides or any other type of moving contact.

The above areas are those in which the Centre has special interest, expertise or facilities, but work is carried out on all sorts of other problems, such as theoretical study of a new seal design, a check on the performance of a new oil filter in service, an analysis of used lubricants, application of dry lubricants to machine tools, and reduction of contamination in lubricant systems. Advice can often be given on such problems immediately in answer to a telephone call, and in such cases the Centre makes no charge for its help.

The senior staff of the Centre consists of the manager and two senior engineers, who cover between them the fields of lubricants and materials, rolling contacts, and sliding contacts. They are supported by junior engineers, technicians and secretaries, and other facilities such as workshop, draughting, library and reproduction are provided by the College.

Bridging operation

Apart from its own internal activities, the Centre can act as a bridge between industry and other College departments, or can obtain the help of these departments in attacking industrial problems. Of particular interest for the Centre's activities are the metallographic and fabrication facilities in metallurgy, control systems work in electrical engineering, heat transfer in mechanical engineering, finite element techniques in civil engineering, extrusion in chemical engineering, surface and discharge phenomena in physics, and spectroscopy in chemistry. Contact between the Centre and College departments is facilitated by the fact that Professor F. T. Barwell combines the appointments of Director of the Centre and Chairman of the School of Engineering.

The Centre also has informal agreements whereby the more specialised expertise of University College, Cardiff, on the microbiology of lubricants, and of Southampton University on gas bearings can be applied to problems where necessary.

Charges for the Centre's work are agreed with the client in advance, and no charges are made without prior agreement. If you have a problem with which the Centre may be able to help, or even if you don't think you have any problems but would like a second opinion, you are cordially invited to contact: The Manager, Industrial Unit for Tribology, University College of Swansea, Singleton Park, Swansea SA2 8PP. Tel: Swansea 24561 (day or night). □

TRIBOLOGY DIARY

Sep. 22–26	**Tribology in Iron and Steelworks.**	London
Oct. 23–24	**Effects of temperature on Lubrication systems.**	Paisley College of Technology
Nov. 24–26	**Tribology in Powder Metallurgy.**	Eastbourne
Nov. 26–28	**3rd Industrial Lubrication and Tribology Exhibition.**	London

More information: Mr D. Brown, Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1. Tel: 01-930 7476.

A two-day symposium and demonstration to explain the principles of tribology and to show how they can be applied in industry will be held at the National Centre of Tribology, Risley, Warrington, Lancs., on September 30 and October 1, 1969. Registration fee: £22 10s.

ADVISORY COMMITTEE ON LEGAL UNITS OF MEASUREMENT

The Minister of Technology, Mr Anthony Wedgwood Benn, in a written Parliamentary Answer has announced the appointment of an Advisory Committee on Legal Units of Measurement, to advise him on that part of the metric legislation which will provide for the legal definition of units of measurement and related matters concerning physical standards.

An extract from the written reply follows:

'The legislation which the Government have undertaken to introduce to facilitate the adoption of the metric system in this country, will include provision for defining the metric units of measurement which are to be authorised for all future legal purposes and for relating them to all other units at present in use.

'In principle, the Government accept, as a basis for the change-over to the metric system, the International System of Units as recommended by the Conference Generale des Poids et Mesures, which was set up by international agreement in 1875 by the Convention of the Metre. The UK joined this Convention in 1885.

'While, however, there is international agreement on the units of measurement to be used for the great majority of purposes, there are nevertheless some areas of genuine difficulty, which will require expert consideration and the widest consultation with all the relevant interests, both within Government and throughout the economy, as well as internationally, before a complete system of measurement can be defined for purposes of the proposed legislation.

'The Government have therefore decided that I should appoint an Advisory Committee to advise me on that part of the metric legislation which will provide for the legal definition of units of measurement and related matters concerning physical standards. My intention is that this Committee should be composed of experts from the principal Departments and Research Councils concerned, the Metrication Board, the British Standards Institution and other widely representative bodies whom I propose to invite to participate in the Committee's work. I have appointed Mr A. H. A. Wynn, Head of my Standards Division, to be Chairman of the Committee.' □

Testing materials by exposure — 'down under' and at home

by B. L. Hollingsworth

Superintendent, Non-Metallic Materials Branch, Explosives Research and Development Establishment

It is common experience that materials, and particularly non-metallic materials, undergo changes on exposure to the weather, and that these changes are much more extreme in tropical climates.

Materials and equipment used by the defence services are no exception to this, and in order to obtain data on their behaviour under tropical exposure, the Joint Tropical Research Unit was set up in Australia in 1962. It is administered jointly by Ministry of Technology's Explosives Research and Development Establishment and the Australian Department of Supply. Its original purpose was to serve the research and development needs of the two countries' Defence Ministries. More recently, however, the scope of the JTRU has been extended, and some commercially sponsored trials are now undertaken.

Current programmes of commercial interest at JTRU include an investigation of the behaviour of pigmented surface coatings based on PVC resin dispersions and applied to primed galvanised steel – produced by Richard Thomas and Baldwins (now British Steel Corporation, South Wales Group); and of various grades of polyethylenes produced and marketed by ICI Australia. Both of these have been directly sponsored by the organisations concerned. Two others conducted under ERDE sponsorship involve exposure of standard panels of steel and zinc, as part of a worldwide assessment of the corrosivity of different sites and areas (British Steel Corporation, British Iron and Steel Research Association); and an extensive trial to assess the behaviour of aluminium alloys on tropical sites (Aluminium Laboratories, Banbury).

Materials undergoing exposure 'down under' in Queensland—in the cleared area at Innisfail (top), in the jungle at Innisfail (centre) and in the hot/dry desert at Cloncurry (bottom)

The unit operates a number of exposure sites – hot/wet jungle, hot/wet jungle clearing, hot/dry desert, tropical sea water and beach. The first two are at Innisfail, Queensland, at 17 degrees South, 146 degrees East, where the unit's offices and laboratories are also situated. Here the prevailing climate is one of high temperature and high humidity. The hot/wet jungle site is in the forest, where the thick foliage overhead screens off direct rain and most of the direct sunlight; the hot/wet jungle clearing site allows full exposure to sunlight and rain, with diurnal variations of temperature and humidity somewhat greater than in the jungle.

Desert and sea

Some 700 miles south-west of Innisfail at Cloncurry – latitude 21 degrees South – is the hot/dry desert site, with a very hot prevailing climate, intense solar radiation and low humidity. Forty miles south of Innisfail, a coastal area of tropical sea water inside the Great Barrier Reef at Clump Point provides facilities for water immersion and beach exposure trials. Full daily meteorological records are kept at Innisfail and Cloncurry for inclusion in any trial report.

A small scientific staff, drawn from Britain and Australia and backed up by appropriate support staff, carries out the unit's work. This is mainly concerned with exposing materials and equipments, maintaining visual inspection records, and withdrawing specimens after agreed exposure periods. Most materials for exposure are mounted as small specimens in an unstressed condition, but there is now an increasing interest in exposing specimens under stress, thus simulating operating conditions.

The exposure frames at the sites are mostly arranged at an angle of 45 degrees, with the exposed surfaces facing north so as to receive maximum sunlight (trials are in hand to check whether this is the correct angle for maximum effect). For some trials, notably on paint, the samples are hung vertically, to prevent the accumulation of rain water and debris on the face of the specimens. Materials to be exposed under stress are mounted on special structures. Specimens may also be buried to determine the effects of termite attack or suspended in sea water from a raft to evaluate attack by marine organisms.

In addition to those described in this article, there are a number of other environmental test facilities of widely different types available to industry in Mintech and other Government establishments. A number of these will be described in a future issue of *New Technology*.

Organisations sponsoring trials may send staff to the unit to help in setting up specimens for a trial where the exposure conditions are unusual, and they may stay on to assist with any special on-site testing. The laboratories at Innisfail carry out some standard physical and chemical testing, including measurements of weight and dimension changes, determination of tensile and flexural strengths, elongation at yield and break, etc. Where special testing requires more complex equipment, the exposed specimens are normally returned by

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Staying on top—with the help of collaborative R & D

by G. F. Arkless

Engineering Director, Engineering Division, The Weir Group Limited

Many of the companies within the Weir Group are situated in Scotland, most of them being only a short distance from East Kilbride, the home of the National Engineering Laboratory. Indeed, Weir Westgarth Limited, internationally known as suppliers of large, land based distillation plant, have their headquarters in East Kilbride itself.

The major member companies of the Engineering Division of the Group are all within easy reach of NEL, most of them having their factories within the precincts of Glasgow. Even Harland Engineering Limited, located at Alloa, is but an easy drive of an hour and a half away.

Ready communication with East Kilbride is not however the only reason why these companies are employing to an ever-increasing extent the services offered by NEL. It is possible to summarise their activities by saying that in one way or another they are concerned with the transport, control and processing of fluids. They either control their state by the addition or removal of heat (feed heaters, condensers, evaporating plant, deaerators); move them (pumps and compressors); or are moved by them (steam and hydraulic turbines); measure their level (Teledep equipment); or control them (valves). Some of the plant may combine these functions.

How well the organisation of NEL matches their needs is immediately apparent when one examines the structure of the Fluids Group, made up as it is of the Flow Measurement Division; the Fluid Mechanics Division; the Properties of Fluids Division (which studies the physical properties of fluids – both liquid and gaseous); and the Applied Heat Transfer Division. But when it is realised that many of the Weir companies either have their own Research and Development Departments or have access to the large and well equipped R & D and Metallurgical laboratories at G. and J. Weir Limited, the largest single company in the Group, it is perhaps natural to ask why they also seek outside services.

There are many reasons for this. Firstly, NEL can make available the advice of nearly 300 qualified specialists, in a wide variety of disciplines including mechanical, electrical, electronic and production engineering, physics, chemistry, mathematics, crystallography and metallurgy. Only the very largest industrial organisation could afford an investment in specialist technical brain-power of this size.

Secondly, at NEL one finds experimental and measuring equipment, much of it of a highly specialist nature, which could not be economically employed other than by an institution like NEL. Indeed some of this equipment is quite unique, having been developed by the staff of NEL themselves: for example the flow measurement and pump and turbine test facilities are unrivalled throughout the world both in scale and accuracy.

Thirdly, it is the policy of the Weir companies to place a proportion of their research and development projects in the hands of competent outside organisations – not only NEL but also, for example, the local universities. In this way they can economically extend the scope of their own research organisation and provide a continuous stimulus to their staff by exposing them to the ideas of other workers in similar fields. From this point of view the increasing participation of NEL in the real problems of industry enhances the value of this liaison, for the wider their experience with industry the more likely are they to be aware of the best approach to a given problem. While a lot of this co-operation can and does take place on a relatively informal basis, confidential development contracts are placed which ensure that the full commercial value of the work is secured.

Numerous examples

There are numerous examples of how NEL's specialist expertise and equipment have been utilised. G. and J. Weir Limited, Drysdale and Harland Engineering all have large pump test loops and the flow measuring equipment in these has all been calibrated by the flow measurement people at NEL. The valve used to throttle the flow from the large feed pumps on the 7,457 kW (10,000 hp) test loop at G. and J. Weir presented difficult problems of energy dissipation, for it had to stand a pressure drop of up to 20·684 MN/m² (3,000 lbf/in²) at flows of the order of 18 m³ (4,000 gals) per minute and still present an orderly flow to the flowmeters downstream of it. A successful design was developed on the basis of an energy dissipating valve originally designed and tested by NEL.

Drysdale's interest in large circulating water pumps, and the growing demand for high specific speed mixed-flow pumps for this duty in Continental and North American markets, led them to consult NEL during the development of this type of pump. A two-way flow of information ensued, Drysdale sending one of their staff to NEL to assist in the work on some of the problems involved. Prototype models built at the Drysdale factory were tested and evaluated at both organisations. On another occasion NEL's interest in the correlation of pump model and full-size pump test results led Drysdale into an interesting collaboration with them and the Central Electricity Generating Board. As electrical power generating equipment has grown in size, so too has the size of the power station pumps extended until today their full scale testing at the maker's works has become a major expense – it may cost up to £40,000 to test a large circulating water pump. If a scale model pump could be built and tested and the results reliably extrapolated to enable the performance of the full-size version to be accurately predicted significant cost savings could be achieved. A full-size pump with a 2·44 m (8 ft) diameter impeller has been carefully tested by several flow measurement teams under NEL guidance, and Drysdale then proceeded to manufacture a series of scale models with 101·6 cm, 50·8 cm, 30·1 cm and 20·3 cm (40 in, 20 in, 12 in and 8 in) diameter impellers. All these models have, over a period of three years, been undergoing extremely accurate tests at NEL. Comparison of the results with the full-size pump performance will enable the effects of dimensional scale on pump performance to be judged with sufficient accuracy to enable full-scale tests to be dispensed with in future.

Raising pump running speeds

One of the major advances currently being made in pump technology lies in raising their running speeds. Particularly in large, high pressure pumps, considerable savings in size and hence cost result from the adoption of higher speeds, as well as improvement in reliability. The snag is that the higher the running speed the higher must be the velocity of the liquid at entry into the pump impeller. This high velocity can only come from the liquid itself at the expense of its suction pressure and unless the expensive solution of a slow-speed booster pump to precede the high-speed pump, or the even more expensive solution of raising the supply tank another 30·5 m (100 ft) or so, is adopted, the pressure at entry to the high speed impeller can drop to a value low enough to allow the liquid to boil. The resulting vapour is carried by the flow into the high-speed impeller where not only does it radically affect its performance by 'choking' it, but the violent collapse of the vapour bubbles when they reach the higher pressure regions causes the material of the pump to be severely and rapidly damaged. This phenomenon of vapour generation and the subsequent collapse of the bubbles is known as 'cavitation' and the damage it causes as 'cavitation erosion'.

One way of tackling this problem is to design a high-speed first-stage impeller of special shape such that it can deal efficiently with a liquid vapour mixture and collapse the vapour bubbles within itself before they reach the main impeller, while also discharging the liquid at the correct velocity into it. Such a first-stage is known as an inducer. While the inducer can be designed so that the collapse of the vapour bubbles within it is much more gentle than would be possible in the main impeller, it must nevertheless withstand a certain degree of cavitation erosion and careful choice of its material of construction must be made if it is to have an acceptable life. Life testing of an inducer may involve many thousands of running hours and is expensive. Accordingly Weir's Research Department utilise NEL cavitation erosion test results carried out especially for them on samples of different materials. These are evaluated in an accelerated corrosion-erosion test rig to establish their relative resistance to this form of damage. An inducer made of a material exhibiting poor cavitation-erosion resistance is then run on the Weir test rig to determine its useful life, from which it is then possible to predict the life of a similar inducer made of the better materials.

Yet another line of attack is to design a first stage in which the collapse of the bubbles occurs immediately after leaving it and within the main stream of flow and not adjacent to the materials of construction so that no damage can ensue. This device, known as the super-cavitating pump, is an NEL development.

But it must not be thought that NEL are only consulted on problems related to fluids and fluid machinery. Occasionally, for example, a failure of a component may occur whose cause is difficult to determine. On such occasions the advice of their Materials Group has been sought to determine the exact nature of the fracture.

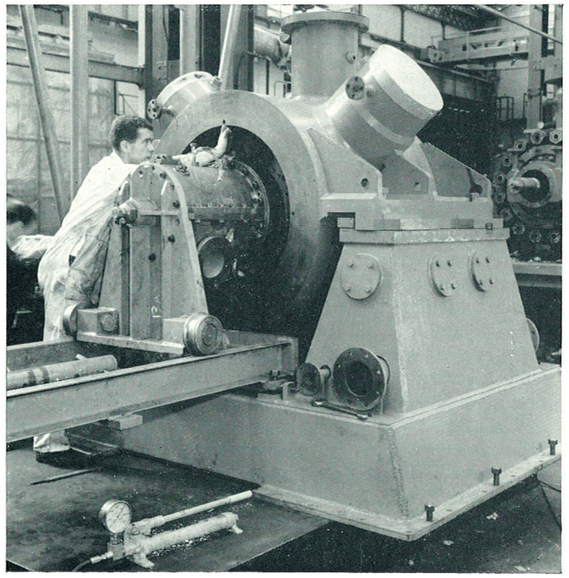
Another important example of collaboration has been in the Regional Experiment in Computer-Aided Design – RECAD – where Weir is perhaps the major industrial participant. As a result of the stimulation resulting from this experiment Weir have been able to rapidly develop a section of their Research and Development Department to undertake system analysis and computer program writing covering a wide range of Engineering Division activities – programming NC machine tools, and carrying out either highly repetitive or complex design calculations. Even Discounted Cash Flow calculations – which the Finance Department employ to assess the viability of the purchase of a new piece of equipment – are today carried out on an on-line computer.

Technical advances today, even in such highly developed technologies as those in which many of the engineering companies of the Weir Group are engaged, are so rapid that product life is becoming increasingly shorter. To stay on top continuous research and product development must be undertaken. Weir believe that extensive collaboration with NEL can offer major benefits both in terms of finding solutions to new problems and in stimulating new approaches to old ones.

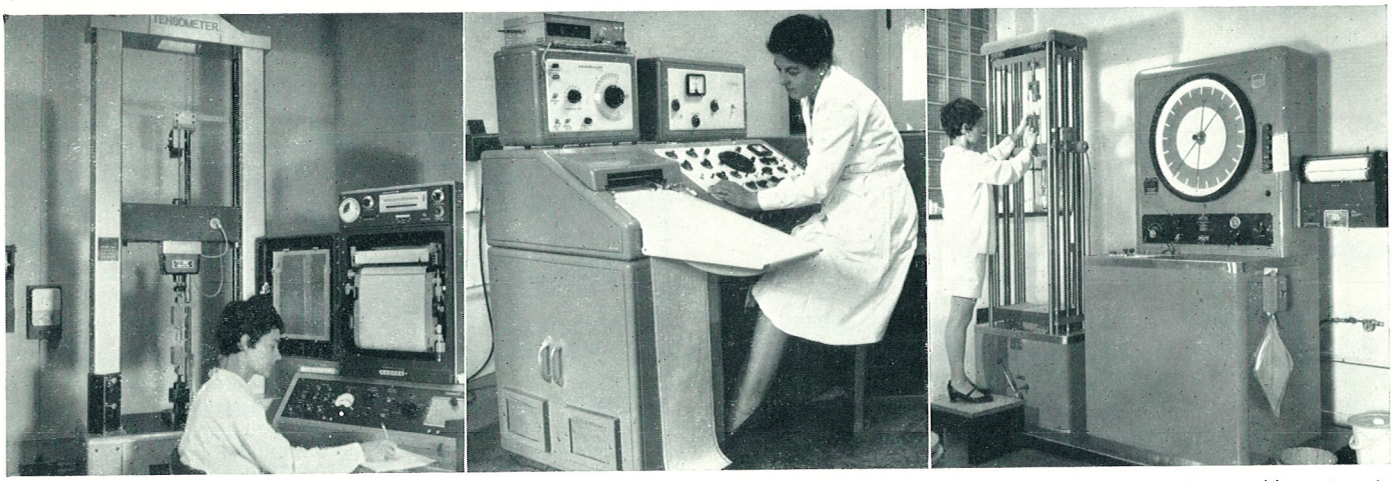
More information: Mr. G. Arkless, The Weir Group Ltd., Cathcart, Glasgow S4. Tel: 041-637 7141. The Director, National Engineering Laboratory, East Kilbride, Glasgow. Tel: East Kilbride 20222. □

A partnership of the brothers George and James Weir in 1871 gave the Weir Group its origin. James Weir was one of the leading engineers of his day and some of the principles he established are still fundamental to modern steam power plant practice. Early growth stemmed from supply of pumps and associated equipment for steam ships, but the company rapidly advanced into other markets, including power generation and the process industries. A holding company, G. & J. Weir Holdings Limited, was formed in 1959 to co-ordinate the activities of the original company and a number of subsidiaries. In 1968, the name of the company was changed to the Weir Group Limited. Today, the five Divisions of this group—Engineering, Building, Foundries and Engineering Supplies, Aircraft Equipment, and Water—supply many markets at home and abroad. The Weir Group now employs 13,500 people, nearly half of them in Scotland, the remainder in England and in seven other countries.

The first of a new generation of high pressure, high speed boiler feed pumps being assembled in the Cathcart, Glasgow, factory of G. and J. Weir before delivery to the CEGB's Ferrybridge, Yorkshire, power station. The internal assembly is being introduced with the aid of a special hydraulically operated cradle



Pump investigations at NEL: measurement of a 275 cm (108 in) diameter impeller



Work in progress at ERDE. Left, a tensometer testing machine set up to determine the strength of a sample of thermoplastic; centre, a spectrometer being used to determine the structure of a polymer sample; right, a tensile testing machine being set up

Testing materials by exposure—

continued from page 3

air for testing in the UK. If required, all exposed specimens can be returned by air to a trial sponsor for evaluation.

A wide range of materials has been exposed, or is being exposed, at the Joint Tropical Research Unit on its various sites. They include a wide variety of paints, plastics, rubbers, light alloys, polyurethane rubbers, a variety of fabrics (dyed and undyed, and with and without rot-proofing treatments), metal-to-metal structural adhesives, and glass-fibre laminates.

In a parallel activity, similar specimens are normally exposed in the UK, at ERDE, to determine the effects of temperate weathering.

However, the rate of deterioration out of doors, even in the tropics, can be slow. To obtain information more easily and quickly, artificial environments have been employed at ERDE in attempts to reproduce the effects of natural weathering. While some of these effects can be reproduced under laboratory conditions, a universal simulated weather condition coupled with accelerated effects has not been achieved. Nevertheless, temperature, humidity and intensity of solar radiation have been shown to be among the most important single factors causing degradation during natural weathering.

In addition to carrying out temperature exposure trials and physical tests on some samples returned from Australia, the Non-Metallic Materials Branch at ERDE is studying the ageing of a wide range of polymers under laboratory conditions. The studies include stress-relaxation, thermal ageing in air and vacuum, the effect of humidity and temperature, and the effects of ultra violet radiation and ionising radiation.

The branch is very well equipped with modern physical testing equipment and analytical instruments, including nuclear magnetic resonance spectrometry, for determining the changes in physical properties and chemical structure which occur during natural and accelerated ageing. In addition, the branch possesses a wide range of modern commercial machinery for compounding, processing and moulding polymers, particularly rubbers and thermoplastics. Many enquiries from industry concerning the use and ageing of polymers have already been handled by the branch, which has often been able to draw on results obtained from trials mounted both at ERDE and in Australia.

Organisations seeking further information, or wishing to explore the possibility of mounting an exposure trial in Australia or at ERDE, are invited to write to: The Director (for the attention of the JTRU Liaison Officer, Ref NT), ERDE, Ministry of Technology, Waltham Abbey, Essex. □

Metrication Board Steering Committees

Individual members of the Metrication Board have accepted responsibility for particular sectors of the economy, and for most of the sectors, Steering Committees are being appointed to work under the chairmanship of the appropriate member of the Board.

The committees will be principally concerned to determine: what is happening in the particular sector to foster the changeover, and what are the further steps necessary; what organisation, trade association or federation is best equipped to explore the situation in depth and develop a comprehensive action programme; what the sector requires public authorities to do, whether by legislation and regulations or changes in purchasing policies; what help the Metrication Board could give by publicity or otherwise in speeding the implementation of the changeover programme. The construction of two such committees, and the names of individual members of the Board responsible for other sectors have been announced.

The Steering Committee on Industrial Materials and Construction, under the chairmanship of Mr. H. J. Cruickshank, will be responsible for co-ordinating work on metrication in the chemicals, metal manufacturing, brick, pottery, glass, cement, timber, furniture, paper and board industries, and also the construction industry.

The Steering Committee on Education and Industrial Training, under its chairman Dr. F. Lincoln Ralphs, will be concerned with primary and secondary schools, establishments for further education, universities, educational administration, industrial training, and the printing and publishing industry.

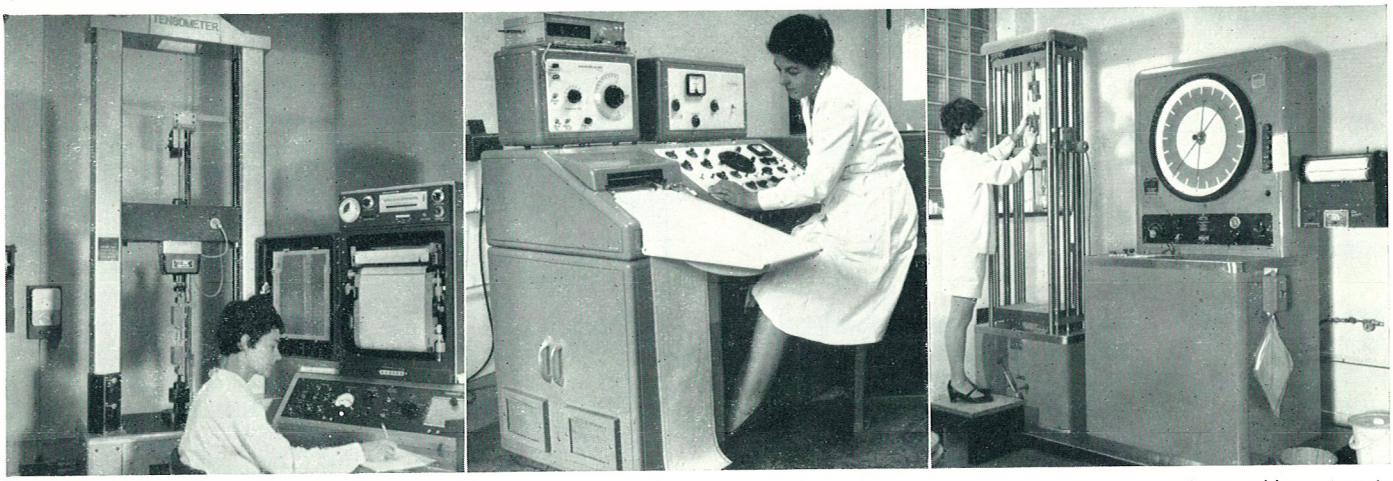
Members of the Board with responsibility for other sectors are: The Earl of Bessborough (Agriculture, Horticulture, Forestry, Fisheries and Land); Mr. E. F. Knight (Engineering Industry); Professor M. L. McGlashan (Fuel and Power); Sir Thomas Padmore (Transport and Communication Industries); Mr. G. Bowen, Director of the Board, will for the time being take the lead in the Distribution, Food and Consumer Goods sector.

The steering committees and Board members are ready to consider observations or memoranda from organisations or individuals concerned with the work of the sectors for which they are responsible. Contact: The Secretary, Metrication Board, 22 Kingsway, London, WC2.

* * *

'Going Metric' on tour

Birmingham, Sheffield and Glasgow will soon have a chance to see the 'Going Metric' touring exhibition, which aims primarily to inform management in the engineering industry about the changeover. Seminars, discussion groups and films will form part of the programme in each city. The itinerary: Birmingham Engineering and Building Centre, September 24 – October 11; Sheffield Polytechnic, October 20 – November 1; Scottish Design Centre, Glasgow, November 10-29.



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However, the rate of deterioration out of doors, even in the tropics, can be slow. To obtain information more easily and quickly, artificial environments have been employed at ERDE in attempts to reproduce the effects of natural weathering. While some of these effects can be reproduced under laboratory conditions, a universal simulated weather condition coupled with accelerated effects has not been achieved. Nevertheless, temperature, humidity and intensity of solar radiation have been shown to be among the most important single factors causing degradation during natural weathering.

In addition to carrying out temperature exposure trials and physical tests on some samples returned from Australia, the Non-Metallic Materials Branch at ERDE is studying the ageing of a wide range of polymers under laboratory conditions. The studies include stress-relaxation, thermal ageing in air and vacuum, the effect of humidity and temperature, and the effects of ultra violet radiation and ionising radiation.

The branch is very well equipped with modern physical testing equipment and analytical instruments, including nuclear magnetic resonance spectrometry, for determining the changes in physical properties and chemical structure which occur during natural and accelerated ageing. In addition, the branch possesses a wide range of modern commercial machinery for compounding, processing and moulding polymers, particularly rubbers and thermoplastics. Many enquiries from industry concerning the use and ageing of polymers have already been handled by the branch, which has often been able to draw on results obtained from trials mounted both at ERDE and in Australia.

Organisations seeking further information, or wishing to explore the possibility of mounting an exposure trial in Australia or at ERDE, are invited to write to: The Director (for the attention of the JTRU Liaison Officer, Ref NT), ERDE, Ministry of Technology, Waltham Abbey, Essex. □

Metrication Board Steering Committees

Individual members of the Metrication Board have accepted responsibility for particular sectors of the economy, and for most of the sectors, Steering Committees are being appointed to work under the chairmanship of the appropriate member of the Board.

The committees will be principally concerned to determine: what is happening in the particular sector to foster the changeover, and what are the further steps necessary; what organisation, trade association or federation is best equipped to explore the situation in depth and develop a comprehensive action programme; what the sector requires public authorities to do, whether by legislation and regulations or changes in purchasing policies; what help the Metrication Board could give by publicity or otherwise in speeding the implementation of the changeover programme. The construction of two such committees, and the names of individual members of the Board responsible for other sectors have been announced.

The Steering Committee on Industrial Materials and Construction, under the chairmanship of Mr. H. J. Cruickshank, will be responsible for co-ordinating work on metrication in the chemicals, metal manufacturing, brick, pottery, glass, cement, timber, furniture, paper and board industries, and also the construction industry.

The Steering Committee on Education and Industrial Training, under its chairman Dr. F. Lincoln Ralphs, will be concerned with primary and secondary schools, establishments for further education, universities, educational administration, industrial training, and the printing and publishing industry.

Members of the Board with responsibility for other sectors are: The Earl of Bessborough (Agriculture, Horticulture, Forestry, Fisheries and Land); Mr. E. F. Knight (Engineering Industry); Professor M. L. McGlashan (Fuel and Power); Sir Thomas Padmore (Transport and Communication Industries); Mr. G. Bowen, Director of the Board, will for the time being take the lead in the Distribution, Food and Consumer Goods sector.

The steering committees and Board members are ready to consider observations or memoranda from organisations or individuals concerned with the work of the sectors for which they are responsible. Contact: The Secretary, Metrication Board, 22 Kingsway, London, WC2.

* * *

'Going Metric' on tour

Birmingham, Sheffield and Glasgow will soon have a chance to see the 'Going Metric' touring exhibition, which aims primarily to inform management in the engineering industry about the changeover. Seminars, discussion groups and films will form part of the programme in each city. The itinerary: Birmingham Engineering and Building Centre, September 24 – October 11; Sheffield Polytechnic, October 20 – November 1; Scottish Design Centre, Glasgow, November 10-29.

news

Mintech 1964–1969

The wide range of the Ministry of Technology's activities in relation to its extended responsibilities in recent years are described in a new booklet. A more comprehensive version of that published in 1967, the booklet traces the development of Mintech from its creation in October 1964 to the present day, highlighting the additional responsibilities which it has assumed over the five-year period. Within the responsibilities of the present Ministry, says the booklet, there are three salient characteristics.

'First, the Ministry has a large and important defence procurement function, but its centre of gravity is definitely in the industrial side and will remain so. Aircraft and atomic energy, which have been the biggest recipients of Government monies, are now regarded as being within the main stream of industrial and economic policy, and not in special enclaves of their own.

'Secondly, the Ministry has abandoned the idea that "science" should be kept at arm's length from the main Government machine in order to preserve the integrity of research; the task is now seen as one of bringing industry and the Government research establishment together in order to get the best possible cross-fertilisation and market orientation. Science and technology are regarded as an integral part of industrial policy.

'Thirdly, the strengthening of industrial structure is now thought to be highly important for the competitive power of British industry; and here Government procurement policy is seen as having a role to play.

'Thus', says the report, 'an articulated chain of Government activity has been forged, linking scientific and technological research and innovation, the problems of industrial structure, and the role of public procurement.'

It adds, 'The essence of the Ministry's industrial work is to establish and maintain effective communication and mutual confidence between the Ministry and industry'.

The report includes details of the organisation of the Ministry and of the advisory services for industry that have been created or are supported by Mintech.

Copies of the report are obtainable free from Mintech headquarters, Millbank Tower, London SW1, and from Regional Offices.

New Director for NCC

The Minister of Technology, Mr Anthony Wedgwood Benn, has appointed Dr A. A. Robinson to succeed Prof. G. Black as Director of the National Computing Centre. Dr Robinson is currently Director of the University of London Computer Centre, where, since 1952 he has planned and managed the execution of operations which included the main central computing facility for the university and successful services to industry and commerce. He became the first Director of the Centre in 1968 and was responsible for planning the installation and subsequent operation of the Control Data 6600 computer.

Know-How on TV

The autumn series of Know How films for engineers, to be screened on BBC1 at 12 noon on Sundays, contains the following titles:

Help. Sources of help with particular reference to the Mintech Industrial Liaison Scheme in action: October 5.

Don't Cut – Grind. Where can abrasive grinding replace machining? Includes a description of a new type of diamond wheel for grinding cast iron and steel: October 12.

Talking to Machine Tools. NC languages at the National Engineering Laboratory and PERA and the use of remote computer terminals: October 19.

No Half Measures. A filmed report from ASEA Sweden – the most enthusiastic user of NC machines in Europe: October 26.

Ultrasonics on the Shop Floor. Industrial applications of ultrasonics including machining, NDT, cleaning, and welding: November 2.

Designing in Plastics. Includes a description of a throw-away plastics catering set: November 9.

Who's in Charge. How ICL Belfast reorganised their factory into small manufacturing units linked by a control computer: November 16.

Work in Progress. How two companies, Herbert-Ingersoll and Ferranti, increased productivity by eliminating unnecessary chores: November 23.

Is Sintering the Answer? New developments in sintering challenge machining, casting and forging as a production technique: November 30.

Right First Time. A fresh approach to quality control – zero defects. Two case studies, one involving a very large firm, the other a small one: December 7.

A number of programmes produced by BBC TV for industrial audiences have already been sponsored into the Central Film Library, so that wider use of them can be made by industry. Mintech would welcome opinions and recommendations for sponsorship from *New Technology* readers on the films shown during the coming autumn. Please contact: Miss R. Christopherson, Broadcasting and Films Section, Ministry of Technology, 42 Parliament Street, London SW1.

Group Technology appreciation

The newly-established Mintech-sponsored Group Technology Centre at Blacknest (see *New Technology*, July, 1969) is now offering one-day appreciation seminars for senior management, covering basic concepts and processes of the technique, and their application in design, planning, production and related areas. Readers of this issue may be too late to apply for the first course, on September 23; the other two are being held on October 21 and November 25, 1969. Fee is £12. Overnight accommodation can be arranged.

More information: The Secretary, Group Technology Centre, UKAEA, Blacknest, Brimpton, Reading RG7 4RS. Tel: Tadley 4111 ext. 5951/5873.

Information retrieval in the USA

Under the aegis of the Computer-aided Design Committee of the Ministry of Technology, two members of the Information Collection and Retrieval Sub-Committee, Mr. M. Scatcherd (National Engineering Laboratory) and Sq/Ldr. A. B. Blackney, (Central Servicing Development Establishment), visited 44 selected centres of information retrieval work in the USA during April and May of this year. A meeting will be held in Faraday Hall, Institution of Electrical Engineers, Savoy Place, London WC1, at 2.30 pm on October 16, 1969, to report on their findings. Time will be made available for questions from the floor. Applications for invitations to attend the meeting to: Ministry of Technology, Systems and Automation Division, Room 219, Dean Bradley House, Horseferry Road, London SW1. Tel: 01-799 5688 ext. 328.

What's happening in corrosion?

The early stages of a Mintech enquiry into corrosion and corrosion protection in the UK have revealed a more acute incidence of corrosion problems than had been expected. But the enquiry has also revealed an awareness of the importance of corrosion problems, coupled with a widespread lack of appreciation of where advice may be obtained. The Committee is investigating whether various industries support enough corrosion and protection specialists and whether improved industrial education is needed at all levels. A survey is also being made of R & D activity in universities, Defence departments, research associations and industry. The ways in which new and existing knowledge are made known are also being looked at. The Committee, which hopes to publish its findings and recommendations in the late spring of 1970, welcomes all offers of help from anyone who feels he has a contribution to make. Contact: The Secretary, Committee on Corrosion and Protection, Ministry of Technology, Room 005, St. Giles Court, London WC2.

Control for NC m/c tools

A residential course aimed at providing machine tool designers and mechanical engineers with basic training in control theory and digital techniques as applied to NC machine tools will be held at Dalandhui House, Garelochhead, Scotland, from October 21 to 29, 1969. The course, arranged by the Birniehill Institute (Mintech and University of Strathclyde), calls for no previous electronics or control experience. Lectures will be supported by tutorials, laboratory work and seminars, and lecturers will be from the Institute, the University of Strathclyde, National Engineering Laboratory and equipment manufacturers.

More information: The Director, Birniehill Institute, East Kilbride, Glasgow. Tel: East Kilbride 20222.

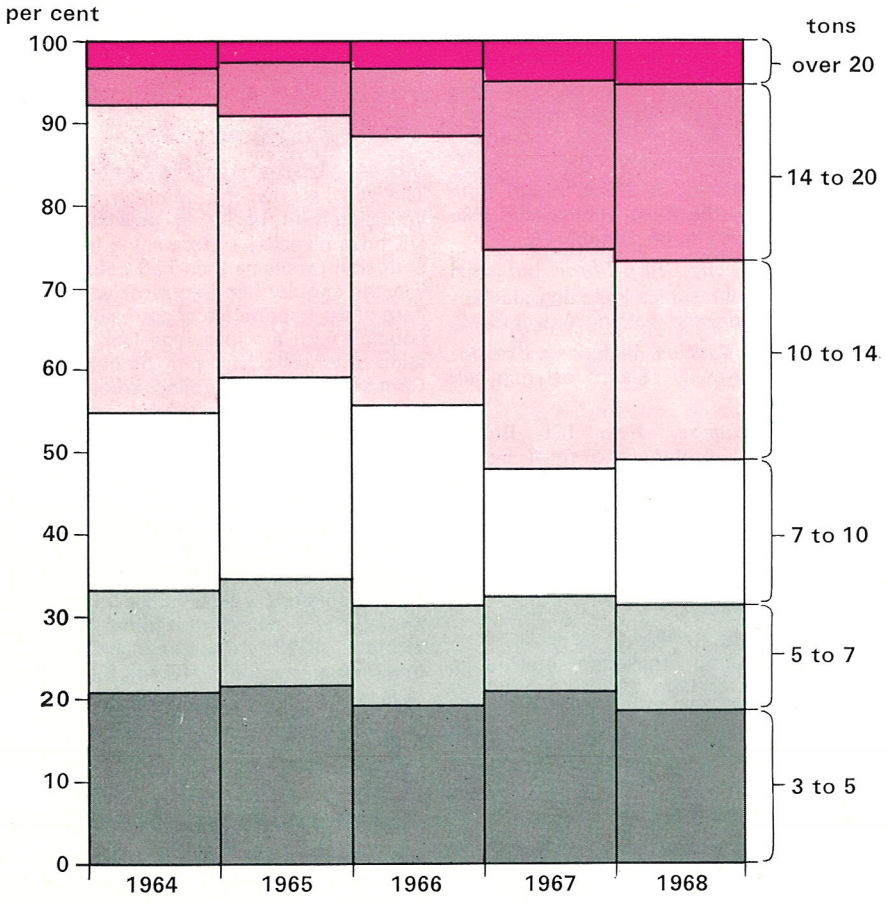
Flame arresters

A one-day symposium to explain the technical principles of explosion protection of electrical equipment is to be held at the Connaught Rooms, London WC2, on Wednesday, October 29, 1969. It has been arranged by the Fire Research Station – of Mintech and the Fire Offices' Committee – whose new technique allows the pressure of an explosion within equipment to be released through vents in the casing while preventing flame emission (see *New Technology*, July 1969). The symposium, principally for manufacturers of electrical equipment and users with hazardous areas, is open to ticket holders only. Contact: Mrs. E. Breathwaite, Fire Research Station, Melrose Avenue, Boreham Wood, Herts. Tel: 01-935 6177, ext. 104.

STATISTICAL INDICATORS

COMMERCIAL VEHICLES– GROWING TREND TO LARGER SIZES

Breakdown of production for home market of vehicles over 3 tons gross vehicle weight



Commercial vehicles

Production of goods vehicles for the home market by number declined by 12 per cent between 1964/5 and 1967 and recovered only to a limited extent in 1968. Within the total there have been substantial changes in the size breakdown which probably means that the total carrying capacity of output has risen. Vehicles over 3 tons gross vehicle weight (excluding motive units) account for only about 30 per cent by number of total output of goods vehicles, although this share is growing slightly, but probably for two-thirds of the total value.

Within this group vehicles over 14 tons g v w have increased from 8 per cent in 1964 to 27 per cent in 1968, largely at the expense of vehicles between 7 and 14 tons g v w. In particular, vehicles between 10 and 14 tons g v w have fallen, from 37 per cent of the total in 1964 to under 25 per cent in 1968. These movements were particularly marked in 1967/8, but figures up to May 1969 indicate that vehicles over 14 tons have since fallen back.

Publications

Heat Bibliography 1968, the latest in an annual series prepared by Mintech's National Engineering Laboratory, is a valuable source of information on heat transfer and related subjects, with over 7,500 references classified alphabetically by subject into 58 sections.

As well as referring to recent developments in desalination and direct contact heat transfer, the volume covers other practical aspects of heat transfer in sections on boilers, furnaces and heat exchangers. The primary modes of heat transfer, forced convection, free convection, conduction and radiation are also comprehensively covered.

A large section contains experimental and operational techniques both for industrial practice and research, while another important section which includes data and methods of measurement, concerns the physical properties of materials. It also embraces the more vital properties such as conductivity, viscosity, specific heat and density of all but the less-common materials, HMSO, £3 5s.

Explosive Welding—Proceedings of the Select Conference. Explosive welding, now a commercially developed process, offers the fabricator specific technical and economic advantages. The proceedings of what is believed to be the first conference (Hove, September 1968) devoted entirely to the subject, are now available from the Welding Institute, Abington Hall, Cambridge, at 60s (90s to non-members).

Seal Research and Development Facilities is British Hydromechanics Research Association's booklet describing and listing the permanent fluid sealing research and development test rigs and facilities which are available at the Association's laboratories at Cranfield, Beds. The booklet describes rigs for mechanical seals, reciprocating seals, soft packing glands, rotary lip seals and valve plates. Free from BHRA, Cranfield, Beds. Tel: Cranfield 422.

Guide for preparing Technical Literature BS4462 makes recommendations for format of literature, illustrations, and scope of information included in technical specifications, relating to measuring instruments and process control equipment, issued in response to enquiries from potential customers. BSI Sales Branch, 101/113 Pentonville Road, London N1. 7s incl. postage (6s to members).

International Practical Temperature Scale of 1968. Makes available for the first time the English version of the official French text defining the scale. The new scale (IPTS-68) was introduced by the Comite International des Poids et Mesures in October, 1968, in place of the earlier scale of 1948, and was adopted on January 1, 1969, by the National Physical Laboratory, the authority responsible for establishing the scale for Great Britain. The new booklet replaces the earlier publication 'Units and Standards of Measurement; IV Temperature'.

Kamerlingh Onnes

New Technology regrets the error in the article 'The Superconductivity Project', published in the July, 1969, issue in which German nationality was ascribed to Kamerlingh Onnes. He was, of course, Dutch. Born at Groningen in 1853, he was educated there and at Heidelberg. He became Professor of Experimental Physics at Leyden in 1882, where in 1894 he founded the famous Cryogenic Laboratory and worked on critical phenomena and low temperatures. He was the first to liquefy helium, and the discoverer of the phenomenon of superconductivity. For his work in low-temperature physics he was awarded the Nobel prize for physics in 1913.

More information: Where possible items in *New Technology* indicate the best sources of further information. Readers are also advised to seek information on matters relating to both *New Technology* and Mintech generally from the Ministry's regional offices: Edinburgh, 031-255 8351; Cardiff 3761; Newcastle upon Tyne 27575; Manchester, 061-832 9111; Leeds 38232; Nottingham 46121; Birmingham, 021-643 8191; Bristol 21071; South East & East Anglia, 01-834 4422. In Northern Ireland, information is given by the Dept. of Industrial and Forensic Science, Belfast 31722.

Editorial office: Ministry of Technology, 42 Parliament Street, London, SW1. Tel: 01-930 4300, ext. 540.

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