# Chemical Age

ALKALI INSPECTOR'S ANNUAL REPORT (page 17)

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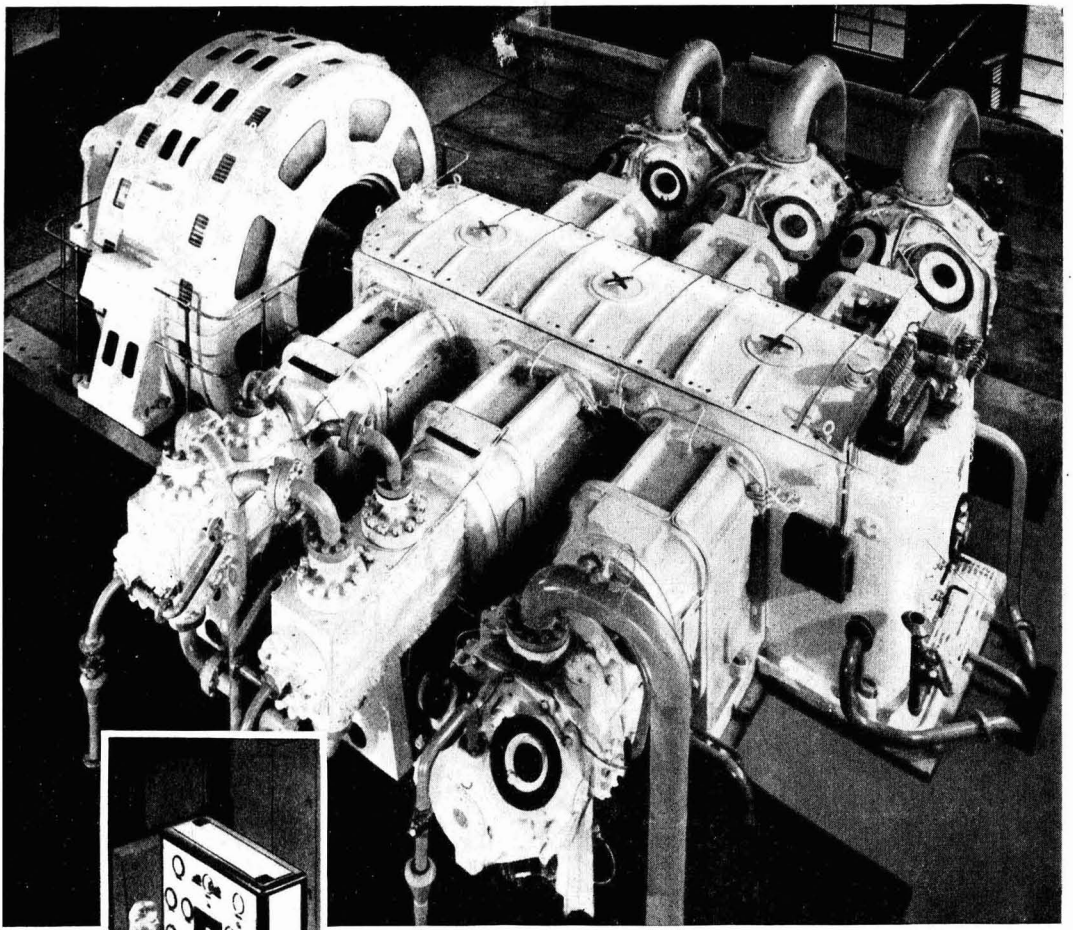
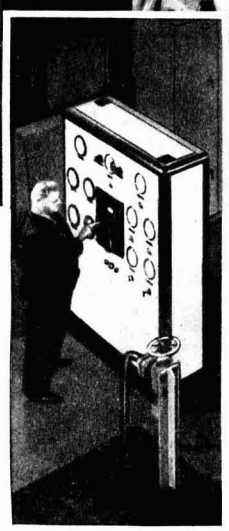
THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY





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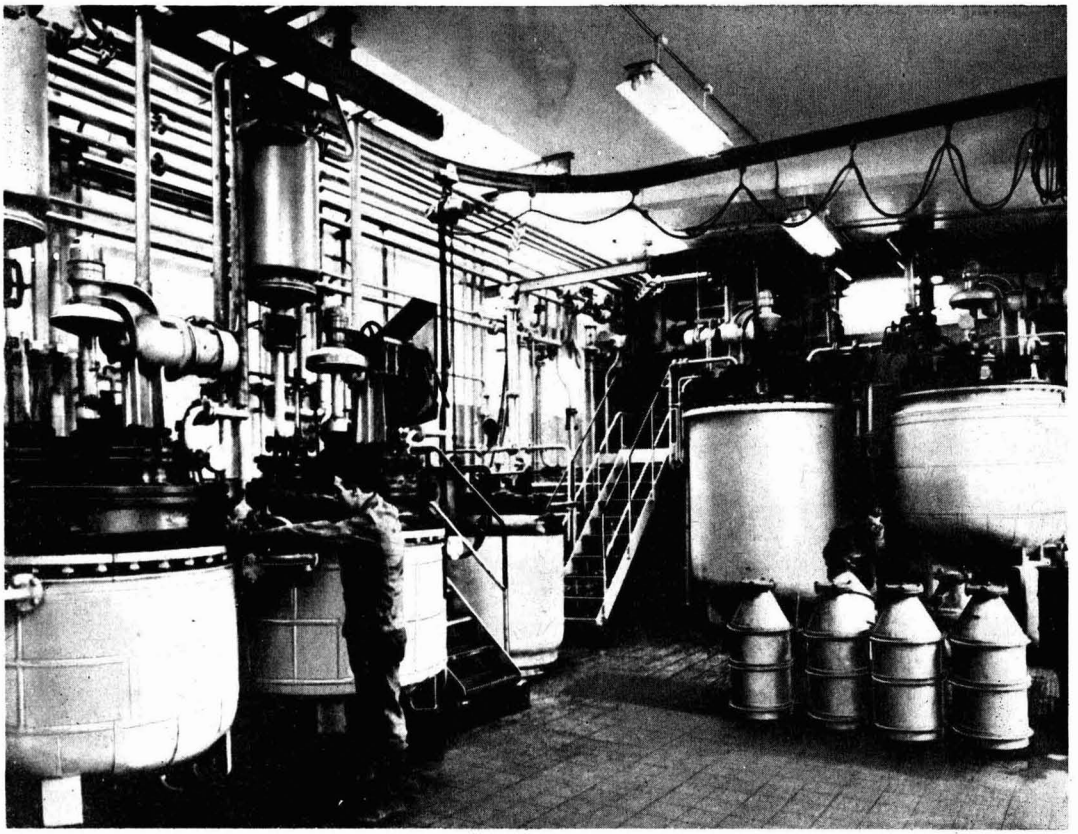

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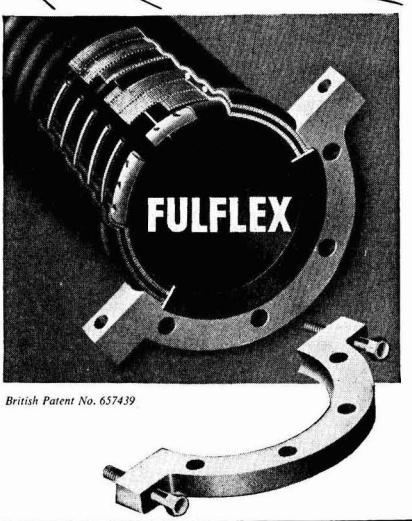


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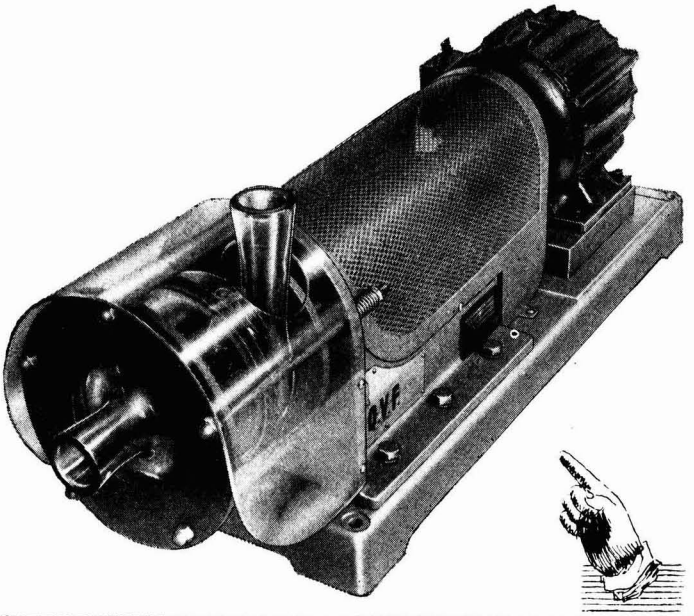

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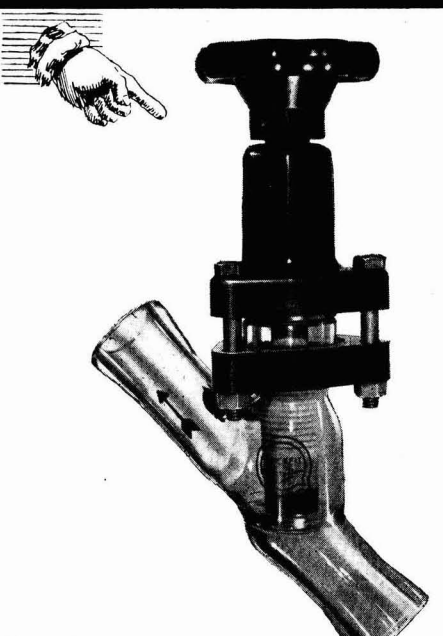

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CHEMICAL AGE

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# WATER USAGE

NOT only have trade wastes in themselves become much more complex with the advent of new industrial processes and the greatly increased use of synthetic detergents, but industrial demands for water have been steadily rising for some years. In addition to the re-use within works of treated water, it has also become more than ever essential to make use of surface waters to which industrial and sewage effluents have already been discharged.

Any system involving the large-scale re-use of water can, of course, only operate successfully if polluting liquors are adequately purified before discharge to streams. Investment in the British chemical industry in effluent treatment plants is already heavy and today the treatment of wastes is an automatic consideration in the planning of new plants; in fact prime consideration in site choice is the provision of adequate water supplies and facilities for effluent disposal.

Investment in plants for the treatment of trade wastes in the chemical industry is obviously considerable, but although no industry-wide statistics are available estimates have been made (see 'Distillates').

In the public sector the River Boards and, in Scotland, the River Purication Boards, are taking active measures to effect an improvement in the quality of effluents discharged in their districts. During the last year or so, annual spending by local authorities on providing sewers and new works and the extension of old ones, has increased considerably. In 1958 schemes to the value of £33 million were authorised; about 30% more than in 1957. A further increase can be expected to be shown for 1959.

The Central Advisory Water Committee has estimated that water demands in England and Wales alone will increase by 25% in the period 1955-65, rising from the 3,600 million gall./day gross demand of 1955 to some 4,500 million gall. by 1965. Of the total usage of water only about 20% is used for domestic purposes; of the remainder industry takes about 45%, with a similar percentage going for agriculture and irrigation.

It is with this background in mind, that the Water Pollution Research Board reviewed the work of the Water Pollution Research Laboratory at Stevenage for the second five-year plan of the Department and Scientific and Industrial Research, which runs from 1959 to 1964. It was agreed that the type of work undertaken was of increasing importance in the national economy and that this trend is likely to continue. After considering the W.P.R.L. programme, it was decided that the staff should be increased appreciably and that an extension to the laboratory would be necessary.

Plans for this extension are now well in hand and it is expected that building will be completed in the spring of next year. Much of the new facilities will comprise pilot-scale laboratories, as stated in the report 'Water Pollution Research, 1959', referred to in p. 19.

It is also heartening to learn that the important microbiological section is to be increased. Thus the valuable work of the National Chemical Laboratory's microbiological section, closed by D.S.I.R. decision taken at the end of 1958, will be continued; in fact many of the N.C.L. staff are

already working at the Stevenage laboratory.

Increased emphasis is to be placed on the services provided by the W.P.R.L. to industry. For many years, individual firms have asked the laboratory to carry out short studies on their effluent treatment problems on a repayment basis. Until recently it has not been possible to accept many of these invitations, but it has become obvious that the demand was widespread. Arrangements have now been made to meet such requests and in the first six months of 1959, 10 short investigations for manufacturers were undertaken. Most of these involved a visit to a factory, the measurement of effluent flows, the study of samples and sometimes experimental work in the laboratory.

# CONTINUOUS PROCESS FOR NIOBIUM

A NEW process for the production of niobium has been developed by the Battelle Memorial Institute, Columbus, Ohio, for Nova Beaucage Mines Ltd. and is said to represent an entirely new concept in the reduction of niobium pentachloride. The process is well adapted to continuous operations; present chemical and electrolytic processes for producing niobium are carried out on a batch basis.

Basis for the hydrogen reduction of niobium pentachloride is the fluidised-bed vapour deposition process that has been applied commercially in the petroleum, mineral and chemical industries. According to Dr. J. H. Oxley of Battelle, the quality of niobium produced by this method is "at least as good as the premium quality niobium now on the market". A product with less than 500 p.p.m. of impurities, well within the requirements for niobium used in nuclear reactor fuel elements, can be produced.

In the process developed at Battelle, the volatile niobium pentachloride is fed into a reactor chamber containing a fluidised bed of seed niobium. Subsequent reduction by the hydrogen fluidising gas at 1,500°F produces metallic niobium which is deposited on the seed particles. Seed for the fluidised bed is replenished by grinding a portion of the end product and recycling it into the reactor. Much of the Battelle report covering this development is concerned directly with the operation of the laboratory-scale processing equipment. The report, however, does contain data on rates of production, conversions to metal, and spectrographic and hardness studies of the niobium produced.

Apart from the interest in niobium as a future reactor fuel element, the material is a potentially excellent metal for structural applications in high-temperature equipment. Niobium has a high melting point, maintains its strength even at elevated temperatures and is relatively easily formed and machined. Unfortunately the metal corrodes severely in air at temperatures as low as 400°C, so that its usefulness in high-temperature applications is at present severely limited.

This corrosion is marked by two stages. Firstly, a low-porosity oxide is formed as a surface layer of uniform thickness. It appears that when this superficial oxide film forms on the surface, dissolved oxygen diffuses into the metal. The initial surface film apparently consists of either a mixture of niobium oxide (NbO) and niobium dioxide, or a new suboxide phase. During the transition to rapid oxidation, very small black specks appear in the surface film and increase in number and size as the transition proceeds. The U.S. National Bureau of Standards has identified these specks as the low-temperature form of niobium pentoxide ($Nb_2O_5$). When the oxidised material is viewed in section, these specks look like spherical globules of gray material lying along the metal surface and penetrating partly below and above it. These pentoxide globules are initiated beneath the initial oxide film and push it up as they grow, forming blisters that grow until they eventually rupture when the film's tensile limit is reached.

As these porous globules grow, more and more niobium is exposed to oxygen. The metal surface is continually exposed because the large volume increase which accompanies the conversion of niobium to its pentoxide hinders the formation of a stable interface between the niobium and pentoxide. Thus the reaction becomes a surface reaction of constant rate and rapid oxidation results.

# INVERT HERBICIDE CUTS DRIFT

SOLUTION of a problem that has plagued the aerial spraying of agricultural chemicals from its beginnings —that of drift—may have been found by research work on the part of the Southwest Agricultural Institute, San Antonio, U.S. Newly developed at the Institute, with the backing of Stull Chemical Co., San Antonio, is a herbicidal spray with what is described as a 'mayonnaise-like' consistency (*Chem. & Engng. News*, 1960, **38**, 58).

A drift of only 40 ft. in a 20 m.p.h. wind was recently demonstrated by a helicopter that flew 30 ft. above the ground. Usual altitude for spraying is 10 ft., at which height drift would have been much less. Also it is not usual to carry out aerial spraying in winds of this velocity. The new herbicide has not yet been applied by aeroplane and it is thought that this might cause even less drift than from a helicopter.

Details of the spray composition and the specially designed nozzle that produces an invert emulsion of water in oil-herbicide are not available, but the emulsion is a mixture of water, a non-aromatic oil, and herbicide. Additives are said to include a surface active agent, an emulsifier, and a sticking agent, such as a monoglyceride. The normal emulsion is oil-in-water. Both the nozzle and herbicidal mixture are the subject of patent applications.

Active ingredient content per lb. is about the same as that of conventional sprays. The components are intimately mixed in the nozzle and the invert emulsion which is formed is ejected in uniform, 80 micron droplets, about twice the size of droplets formed in the usual herbicidal sprays. Because the spray oil is non aromatic it resists evaporation. In addition the spray retains stability for several weeks. The technique can be used for insecticides and other agricultural chemicals.

If further investigations bear out the early promise, it seems likely that the system will have wide applications, not only enabling spraying to be undertaken in higher winds than normal, but in fields where spraying has not previously been possible owing to the juxtaposition of streams, and orchards or other fields bearing different fruit or crops to that being sprayed.

## Boots Pilot Plant Facilities will Speed Flow of New Products

SALE of bulk chemicals by Boots Pure Drug Co. Ltd. of Nottingham for pharmaceutical and industrial purposes at home and overseas produced about £1.75 million in the year to 31 March. About 70% of chemical production from the Island Street and Daleside Road, Nottingham, works, including biologicals such as insulin, as well as corticosteroids and antibiotics, is distributed through the Wholesale and International Divisions and about 25% of production from the Beeston and Airdrie factories. This is stated in 'Building for the Future', a review of Boots activities that accompanies the annual report and accounts.

At the Island Street works, a rebuilding programme now under way will involve a spending of £2½-£3 million in the next five years. Priority among the new buildings has been given to a block housing an adaptable pilot plant to bring out newly developed lines very quickly, in quantities big enough to meet initial demand. This will enable the benefits of a research discovery to be brought to the public speedily and enable the company to measure the potential market for a new product before any heavy investment is undertaken.

The company, which opened a new block for biological research last year, has plans being drawn up for a new chemical research laboratory. Expenditure on research in the fields of pharmacy and medicine, drugs for veterinary use and chemicals for use in agriculture and horticulture, now amounts to more than £600,000 a year.

## Pfizers Acquire New Site at Sandwich

RICHBOROUGH Port, at Sandwich Kent, has been purchased by Pfizer Ltd., Folkestone. Mr. P. V. Colebrook, managing director, has stated that the land will be used for future development of Pfizer's manufacturing needs in varying fields of interest, including chemical, pharmaceutical and agricultural products. Richborough Port represents an area of about 89 acres and adjoins Pfizer's present 80-acre site at Sandwich.

Since 1955, £5 million has been spent at the Sandwich plant. Pfizer's are now completing a £500,000 administrative block to house the office staff at present at Folkestone.

### Wills

**Mr. Merrick Blain,** regional sales manager for I.C.I., who died on March 23, left £7,078 net.

**Mr. Stanley Robson,** one of the first chemical engineers to be trained in Britain, and former research and development director of the Imperial Smelting Co., hon. secretary of the Royal Institution and president of the Society of Chemical Industry and the Institution of Chemical Engineers, who died on 26 March, left £2,171 net.

*Project News*

# ESSO ETHYLENE EXTENSION CONTRACT AWARDED TO FOSTER WHEELER

● CONTRACT for the recently announced £5½ million extension of the chemical feedstock manufacturing plants at the Fawley refinery of Esso Petroleum Co. Ltd. has been awarded to Foster Wheeler Ltd., who will take care of the detailed engineering and erection of the new plant.

The new units, which are Esso designed, will include a steam cracker, ethylene recovery and butadiene extraction plants. Construction will commence shortly and will be completed by the end of 1961.

Associated with the new Fawley extension, as discussed in CHEMICAL AGE, 20 February, p. 317, is the plan to link the refinery to I.C.I.'s new Severnside projects by an £800,000 pipeline. Contractors for the pipeline have not yet been announced.

● WHIFFEN and Sons Ltd. have opened a new block of offices covering 10,000 sq. ft. at Grange Street, Loughborough. This makes available additional factory space at the company's Willow works, Loughborough, which will be devoted to extending productive capacity. Work on the installation of process equipment is to start immediately.

The opening ceremony was performed by Mrs. O. Robinson, wife of Whiffen's managing director.

● PLANS to reconstruct their Sandilands, Aberdeen, fertiliser works at a cost of more than £1 million have been announced by Scottish Agricultural Industries Ltd. This 110-year-old factory was taken over by S.A.I. in 1928 and modernisation will begin this year with completion scheduled for the summer of 1962.

On completion of the project, Sandilands will produce concentrated complete fertilisers instead of superphosphate-based products as at present. S.A.I. now produce C.C.F. at their modern Leith plant, but it is thought that demand for this range will exceed supply in the next few years unless additional capacity is provided.

● BRITISH Oxygen Gases Ltd. have received a contract, worth more than £1 million, to build and operate the largest tonnage oxygen plant serving the West European iron and steel industry. To be installed at the Steel Company of Wales Margam Works, it will have a capacity of 566 tons of oxygen a day and is scheduled to come into operation by January 1962. It will be the first tonnage oxygen plant in West Europe for the air enrichment of blast furnaces.

### Memorial Service for Mr. John Rimington

A memorial service for the late John McNay Rimington will be held at St. James's Church, Piccadilly, London S.W.1 on Monday, 11 July, at 12 noon. Mr. Rimington, managing director of the Chemical Division of the Distillers Company Ltd. until 1 April, died on 19 June after a long illness.

# *210% Rise in Courtaulds Group Capital Expenditure Commitments*

ANNUAL accounts for Courtaulds show that at 31 March group capital expenditure commitments stood at about £8.75 million, compared with £2.8 million a year earlier and about £5.25 million (£1.3 million) for Courtaulds Ltd. Group profit was a record £21.04 million. The improved results were experienced by nearly all group companies, particularly in the cases of the fibres and chemicals divisions of Courtaulds and British Celanese.

Demand for Courlene polyolefin yarns and fibres continued to increase and additions were made to the plant in the year; further expansion is planned for the next few months.

Major extensions to chemicals production are in hand and efforts to develop chemical production are to be intensified. Prices are expected to be lower in the face of low-priced imports from the Continent and North America. In Germany, Glanzstoff-Courtaulds GmbH, started producing sulphuric acid and a new German company should come in production with carbon disulphide in 1961. At present prices, the United Sulphuric Acid Corporation, in whom Courtaulds hold a minority interest, are not highly profitable, but the firm is efficiently run and provides a useful reserve of capacity.

Further steps have been taken to integrate the research departments of Courtaulds and British Celanese, with a view to B.C. concentrating on petrochemicals; a number of petrochemical pilot plants are being built at Spondon and a new research laboratory is planned there.

Four contracts for the supply and erection of complete process plants have been completed with the Soviet Union to a total value of nearly £20 million. Two plants are for acetate yarn, one for viscose tyre cord and one for acrylic fibres. Deliveries under the first contract are virtually completed and the other three are proceeding well.


★ PUBLICATION of the annual report of the Water Pollution Research Laboratory last week (see p. 19) prompted me to do some mental arithmetic. As stated in the leading article (p. 13), no detailed statistics are kept of the total cost to the British chemical industry of treating its trade wastes. There is no doubt that the industry has a first rate record in this respect for it is well aware of its responsibilities to the general community.

U.S. estimates place the cost of effluent treatment as representing some 2% of total capital outlay in the American chemical industry. From my enquiries, a similar percentage is acknowledged by a number of U.K. companies. It will, however, vary from company to company for two reasons. Firstly, few companies agree entirely on what should be included, or left out, when arriving at their own costs for effluent treatment. Secondly, there are differences in the extent to which companies can offset these charges by the recovery of valuable chemicals during treatment processes.

With these reservations in mind, the 2% quoted can be accepted as representing an order of magnitude. Taking annual capital spending in the British chemical industry as totalling £160 million, then the treatment of trade wastes represents a charge on the industry of some £3.2 million a year. (The annual bill for the prevention of air pollution has also been estimated at 2% of total capital spending.)

★ UNIVERSITY appointments boards, youth employment officers and others concerned with the problem of placing youngsters in industry will surely welcome the new A.B.C.M. careers booklet. Although only one of many hundreds produced by professional bodies, trade associations and companies, it sets out attractively the reasons why young people leaving schools and universities should invest their future in the chemical industry.

Entitled 'The Chemical Industry—A Career for You', it has been produced by the careers booklet sub-committee (chairman Mr. E. A. Blench of I.C.I. Billingham Division), set up by the productivity committee of the Association of British Chemical Manufacturers. The booklet stresses the fact that it is one of the most progressive industries with a growth rate greatly in excess of that of manufacturing industry in general. Notes are given in the booklet on the careers available and the lines of progress that can take young people to the top of the executive tree. A separate booklet lists A.B.C.M. members offering opportunities for careers, indicating their product ranges and whether facilities for visits are available.

On Monday, when the booklet was introduced, I was told that the initial print order was for 6,000. These will go to youth employment officers, university appointments boards and later to grammar schools. Copies are available to *bona fide* enquirers from A.B.C.M. The booklet should be of great benefit next year when the so-called 'educational bulge' will produce more school leavers than ever before. Then chemical manufacturers will be asked to take for training more youngsters than usual in a commendable effort to overcome this problem.

★ NOW finding increasing applications in science and industry, closed-circuit TV had what must have been a new role last week at the opening of the Pernis synthetic rubber works (see p. 20). A large warehouse was converted into an auditorium for the opening and above the heads of the guests were three or four row of TV receivers.

Before the prominent guests arrived these receivers showed a series of still views of the plant. As Minister de Pous officially set the plant in operation the TV cameras were brought into operation to show the start of the first movement of rubber bales through the packaging equipment. Guests saw the first few bales pass through an automatic foil wrapper and along a conveyor to the packing hands. They also saw the packing of these pioneer blocks into a crate.

When the first crate was full, a fork-lift truck was shown lifting it and bearing it away across the site. The truck moved to the entrance of the warehouse where the opening ceremony had been held and as the receivers became blank, it was driven across the hall in front of the audience. Thus TV helped a relatively sombre occasion of an official inauguration to become an exciting event.

★ THE newly set-up market development department of Midland Tar Distillers, which consists so far only of Dr. E. R. Wallsgrove, is described in the summer issue of *M.T.D.*, the company's magazine. Dr. Wallsgrove is also a member of a four-man development committee which formulates research policy and provides priorities in terms of economic importance for research and development work.

Currently the company has some seven or eight lines in which it is potentially interested and on which active chemical market survey work is in hand. Investigating these is taking M.T.D. to an even wider range of chemical consumers than they had met in selling coal tar products. M.T.D. find that their market survey work is greatly aided by "a striking change" in the climate of British chemical industry over the past few years.

Gone, it is said, is a great deal of the old secrecy about products, prices, quantities, usage and future plans. The readiness with which companies are now willing to exchange information makes it possible to give more realistic and factual pictures of trends in the industry than might have been possible a few years ago. I also find that many companies are willing to discuss what they would have termed secrets a few years ago with other firms, but that they frequently plead that such matters are still 'secret' when it comes to Press comment.

★ ARE extensions to the Du Pont neoprene plant at Maydown, Northern Ireland, already in view? Mr. Crawford H. Greenewalt, president of E.I. du Pont de Nemours and Co., is reported to have said, when he visited the Northern Ireland stand at the British Exhibition in New York: "We shall be very disappointed if we don't have to expand our Maydown facilities in the near future". However, the London office of the Du Pont Co. (United Kingdom) Ltd., were inclined to be reticent on this subject and were unable to reveal any definite expansion plans. The plant, due to be officially opened on 26 July, came into production last month and was described in CHEMICAL AGE, 21 May, p. 839. It has a capacity to produce 50 million lb./year of neoprene synthetic rubber and is expected to go into full production next month. Certainly there is a lot of room to spare on the 365-acre site and, in the words of one authoratitive Du Pont (U.K.) spokesman: "Du Pont are not going in for agriculture".

Another U.S.-backed plant in Northern Ireland which seems destined for expansion in the not too distant future is £3½ million Acrilan acrylic fibre of Chemstrand Ltd. at Coleraine. This too was built with future expansion in view and the parent company, Chemstrand Corporation of Decatur, Alabama, are "more than pleased with progress to date".

★ A NEW word for the chemical dictionary has been suggested for molecules that are bigger than a monomer, but not as big as a polymer. Most chemists would say this was a small polymer. But the Texas-U.S. Chemical Co. has another answer—an 'oligomer'.

Oligomers, Texas-U.S. say, are low molecular weight products consisting of only a few (2, 3 or 4, simple chemical units. The company considers the time is ripe to popularise the term.

I should point out that the word is of Greek derivation. *Oligos* meaning small, few.

*Alembic*

# ALKALI INSPECTOR'S REPORT

## *Increasing Complaints Show Growing Concern Over Pollution*

**THAT the general public are becoming increasingly aware of the problem of industrial air pollution is apparent from the Chief Alkali Inspector's report for 1959. The report (96th Annual Report on Alkali, etc., Works, England and Wales—H.M.S.O. 4s net) shows the number of specific complaints investigated in 1959 to be one-third up on 1958 and more than double the 1957 total.**

**The number of works registered at the end of 1959 was 2,213, involving the operation of 3,466 separate processes. The total number of visits and inspections during the year was 8,430, including special visits by the chief and deputy chief inspector. Of the total, 220 visits were to or in connection with works not registered under the Act.**

**Dr. J. S. Carter, the chief inspector, said that the complaints investigated were mainly at the request of the local authorities and concerned 354 works compared with 270 in 1958 and 133 in 1957; 224 were registered works and 70 non-registered. Complaints were most numerous against gas and coke works (63), ceramic works (51), electric power stations (31), iron and steel works (30), copper works (19), aluminium works (17), and cement works (13).**

In addition to these there were 15 complaints which can be conveniently classed as 'area complaints,' that is, complaints against emissions from a highly industrialised area or of one intensive production, adverse comment being directed against the overall emissions rather than against individual works and often involving both registered and non-registered works. Examples of this type of complaint are the Thames-side area, the Trafford Park area and three Pennine areas. Complaint is often strongest against small works which are often close to houses, and at times largely hemmed in.

### *Pre-1958 Processes*

As with last year, the recording of infractions presents a difficult problem since the works added as a result of the 1958 Order are still without the 'best practicable means' for dealing with their particular 'noxious and offensive gases' and are therefore in a state of technical infraction until their individual emission problems are solved. As a working arrangement infractions are again confined to the pre-1958 processes.

There were 15 infractions compared with 12 in 1958 and 17 in 1957. They are: alkali (saltcake) works, 2; sulphuric acid (chamber process), 4; sulphuric acid (contact process), 3; chemical manure, 1; muriatic acid, 2; bisulphite, 2; and lead, 1.

Visits have again been paid to the establishments of the U.K. Atomic Energy Authority to ensure that the Authority is continuously using the best practicable means for reducing discharges of radioactive gases, mists and dusts, and that such discharges are regulated in such a way that public health is in no way endangered.

*Unregistered Processes.* Continued attention is being paid to a works where there is a hazard of an emission of selenium if special precautions are not taken. Conditions have again been satisfactory. There has been a greatly increased amount of work in connection with operations involving beryllium.

There have been renewed complaints against the plant producing phthalic anhydride, which is now a major heavy organic chemical of increasing importance to a number of industries. After much delay a new condensation unit of continental origin and a coke-packed tower were commissioned but the design of the condensation unit proved to be faulty and after only a few days' operation it broke down. Meantime reactor trouble has resulted in little or no production and the inspector has been unable to see the plant properly in operation. It is hoped that the next report will be able to record some progress. Investigations have also been made into the treatment of emissions from the production of alkyd resins from phthalic anhydride with vegetable oils.

There has been further complaint against non-registrable processes at a registered works where a considerable number of fine chemicals, pharmaceuticals and intermediates are made. This is one of the type of complaints where there is a background odour due to a concatenation of emissions. In this particular instance it has been agreed that the erection of a 200 ft. chimney to which all process buildings and a number of driers will be vented was the most promising solution.

### *Salt-cake Plants*

*Alkali Works.* Fourteen works are registered for the manufacture of sodium and potassium sulphate but not all have operated. Saltcake plants have operated reasonably well but there have been two complaints. One was due to fume from hot spent charges and suitable remedial means have been installed, the other to fumes from furnace door in one of the few remaining hand operated units when the charge was being raked from pot to hearth. This more difficult problem is being considered. A third complaint not relating to emissions from manufacturing processes but to filling road tankers with acid for delivery to customers has been dealt with by installing a fume plant.

*Sulphuric Acid.* Production of sulphuric acid was 2,213,000 tons calculated as monohydrate, compared to 2,023,000 tons in 1958. The proportion of acid made by the chamber process and tower processes was 14.4% and by the contact process 85.6%. The fact that the post-war increase in national production capacity has been almost entirely by the contact process is reflected in the difference to the 1938 figures which are 60.3 and 39.7%. During the year further contact acid units have been commissioned and further chamber units have gone out of commission. The larger manufacturers are increasing their output. At one time a works making above 100 tons of acid daily from all production units on the site was considered to be a large works. Now individual contact units are making 200 tons and more daily. Where these big point sources of emission are concerned the task of the inspectorate is especially difficult. The concentration of sulphur oxides in the waste gases must be kept at the lowest practicable, with means taken to deal with any acid droplets that may be produced and with final gases sent to the air at a height determined by the mass emission. 1959 saw the successful use of ferrous sulphate, a by-product from certain industries, as a raw material for sulphuric acid.

### *Chamber and Tower*

The tonnage of sulphuric acid produced by the chamber and tower processes was 318,000 tons, and the plants still in use have been operating in a satisfactory manner. The problem of acid mist in the waste gases of 2 tower process plants reported last year have been satisfactorily solved, the one by the provision of an electrical precipitator and the other by the installation of ceramic filters.

The average of all tests made on exit gases during the year showed an acidity of 1.67 gr. per cu. ft., calculated as sulphur trioxide. The four infractions, as in previous years, all related to the burning of spent oxide, but again there were extenuating circumstances. At one works, during commissioning after a major overhaul, difficulties were experienced mainly due to the accumulation of acid sludge in the acid circulation system. A heavy escape of 9.9 gr. at another plant was also during a period when need for urgent repair led to the disorganisation of the circulation system and some loss of nitre. The third complaint resulted from the combination of high gas strength and loss of nitre which led to temporary loss of control. Lastly, at one plant, a sudden increase in the amount of sulphate of ammonia saturator waste gases (hydrogen sulphide and carbon dioxide), was the basic cause of the escape of 24 gr.

Referring to the chamber or tower process, the question has been asked why the total acidity of the undiluted escape to air should not be reduced below the present 4 gr. per cu. ft. of sulphur trioxide, since in practice the acidities

are much lower. The statutory limit was decided upon only after appreciable experience of the operation of chamber acid plants. A chamber set is very sensitive to sulphur feed and even to sudden fluctuations in atmospheric temperature, so that the 4 gr. limit allows room for manoeuvre and prevents the listing of petty infractions and is a deserved and appreciated concession to a good plant operator.

The number of registered works operating the contact process has increased from 38 to 41, and new units have been commissioned at works already registered. A pleasing advance is the construction of tall chimneys, from 120 to 250 ft., depending on the scale of operations. The main problem, that of acid mist, is being dealt with by electrical precipitation most successfully at some works. The ceramic filters have been only partly successful and persistent and costly experimentation with mechanical filtration, techniques reasonably successful elsewhere, has met with little success. The whole matter of mist emission will be given special attention in the 1960 report.

There have been three instances of infraction concerning the contact process, all concerned with brimstone burning.

**Sulphuric Acid Production (England and Wales)**

*Excluding Government Production*

| | 1959 | 1958 | 1957 |
|---|---|---|---|
| Production ... | 2,213,000 | 2,023,000 | 2,137,000 |
| Proportion of plant in use ... ... | % 82.1 | % 80.0 | % 86.4 |
| Proportion made: | | | |
| Chamber and tower ... | 14.4 | 19.0 | 20.6 |
| Contact ... | 85.6 | 81.0 | 79.4 |
| Raw materials used: | | | |
| Pyrites ... | 288,000 | 278,000 | 318,000 |
| Sulphur, inc. recovered, $H_2S$ and filter cake | 330,000 | 277,000 | 293,000 |
| Spent oxide ... | 212,000 | 231,000 | 252,000 |
| Zinc concentrates ... | 192,000 | 152,000 | 159,000 |
| Anhydrite ... | 748,000 | 749,000 | 737,000 |

*(To be continued)*

## *In Parliament*

# Government Foresees Record Increase in U.K. Fertiliser Consumption

A PROVISIONAL estimate of fertiliser consumption during the year ending 30 June points to an increase of at least 13% over the previous year. Farmers may well spend something like £91 million on fertilisers, compared with £62½ million five years ago. Of this £91 million, about £30 million will have been contributed by the Government in the form of subsidies.

These facts were presented to the House of Commons by Mr. J. B. Godber, Joint Parliamentary Secretary to the Ministry of Agriculture, Fisheries and Food, when he opened a debate on the Government's fertiliser scheme for 1960-61. This scheme extends the fertiliser subsidy arrangements for a further year and provides for the payment of contributions to farmers for nitrogenous and phosphatic fertilisers delivered to them during the year ending 30 June 1961.

The scheme for 1960-61 is similar to the existing one, but the total subsidy is lowered by about £1½ million. Broadly speaking, the reductions amounts to 6d/unit of nitrogen and 4d/unit of soluble phosphoric acid. The subsidy on sulphate of ammonia, for instance, will come down from £9 19s 6d/ton to £9 9s, while that on triple superphosphate will fall from £17 12s 6d to £16 16s 10d/ton. The new rates will reduce the subsidy on nitrogen by about £870,000—a little more than 5%—and on phosphates by £630,000 or just under 5%.

The discussions that are being held with the fertiliser industry by the Board of Trade and the Ministry of Agriculture following the Report of the Monopolies Commission are well advanced but are not yet complete except as regards the Commission's recommendations on potash (see CHEMICAL AGE, 28 May, p. 880).

Referring to the recent reductions in the price of fertilisers by both I.C.I. and Fisons, Mr. Godber pointed out that, as a result, many fertilisers would be cheaper in the coming season, despite the lowering of the subsidy.

The Government's fertiliser subsidy policy was challenged by Mr. F. Willey (Labour) who again drew attention to the fact that, despite the heavy subsidy here, Britain lags behind Western Europe in fertiliser consumption (CHEMICAL AGE, 26 March, p. 527). He maintained that there was no factual evidence to show that expenditure on fertiliser subsidies was justified, and demanded a public inquiry into the matter. Another critic was Mr. J. Thorpe (Liberal) who said the fertiliser industry "needed a healthy dose of competition and a lifting of the tariff". The industry was lagging behind in modern techniques, he said, and he quoted figures to show that home prices for triple superphosphates and sulphate of ammonia were higher than they should be.

Defending the subsidy against these criticisms, Mr. Godber pointed out that the increased total consumption of fertilisers since 1952 (when the subsidy was introduced) had been "quite startling". There had been an increase of about 50% in total application. In terms of plant nutrient content, consumption had risen from 828,000 to 1.2 million tons.

The high level of subsidies on other fertilisers has also had an effect on potash consumption. Estimates show that this has risen from 227,000 tons in 1952-53 to an estimated 400,000 tons in 1960-61.

## Food Standards Committee Considers Emulsifying Additives

In the light of reports of the Food Standards Committee, regulations have been made to ban the use of preservatives, antioxidants and colouring matters in food except those specifically permitted and similar regulations about emulsifying and stabilising agents are now being considered. Mr. John Hare, Minister of Agriculture, in the House last week said it was not possible to give a list of all permitted additives.

## Agriculture Ministry to Review Antioxidant in Food Regulations

THE Government is to review the Antioxidant in Food Regulations, 1958, and the Antioxidant in Food (Scotland) Regulations, 1958. Main points in the regulations to be considered are the kinds of antioxidants to be permitted, the foods in which they may be used, the maximum allowance for permitted antioxidants, and labelling requirements.

Before deciding whether, and to what extent, amendments to the present regulations are necessary, the Government will give full consideration to any representations made by interests concerned. These should be addressed to the Assistant Secretary, Food Standards Division, Ministry of Agriculture, Fisheries and Food, Great Westminster House, Horseferry Road, London S.W.1, or to the Secretary, Department of Health for Scotland, St. Andrew's House, Edinburgh 1, to arrive not later than 31 December 1960.

## Call for Free Aluminium Lithium Hydride from Duty

THE Board of Trade are considering an application for the removal of the import duty on aluminium lithium hydride, falling under tariff heading 28.57(A).

Requests for a statement of the applicant's case, together with an undertaking to treat the information it contains as strictly confidential and to allow comments on it to be passed to the applicants for reply, should be addressed in writing to the Board of Trade, Tariff and Import Policy Division, Horse Guards Avenue, London S.W.1, not later than 15 July. Comments on the application should reach the B.o.T. not later than 29 July.

## Alkali Workers Postpone Strike, Keep Overtime Ban

BY an overwhelming majority, 2,000 craft workers of I.C.I. Alkali Division, voted at a meeting on 22 June to postpone strike action at the mid-Cheshire works until the result of the national wage claim talks with the company was made known on 1 July. It was decided not to lift a ban on overtime. Unions represented were the A.E.U., the E.T.U., and the Boilermakers' Society.

Earlier in the day, division chairman, Mr. J. K. Batty, had issued a statement to all workers that unless the A.E.U. and the Boilermakers' Society withdrew their strike action notices due to expire on 24 June, and along with the E.T.U. lifted the ban on overtime, the company would not discuss the unions' wage caims at national level on 1 July.

# WATER POLLUTION RESEARCH EFFORT TO BE INCREASED BY NEARLY 50%

## *Industry's Rapidly Rising Demands for Water*

A NEW wing now under construction at the Water Pollution Research Laboratory, Stevenage, and due for completion early next year, will increase the total research effort of the laboratory by nearly 50%. An additional 40 research staff will be accommodated. This is stated in the laboratory's annual report ('Water Pollution Research 1959', H.M.S.O., 7s., by post 7s. 5d.).

Professor F. H. Garner, O.B.E., chairman of the Water Pollution Research Board, states that this expansion, undertaken six years after the laboratory was opened, is due to the rapidly increasing use of water, particularly for industrial purposes, making it more and more necessary to use waters to which industrial and sewage effluents have already been added.

Most of the new accommodation at Stevenage will comprise pilot-scale laboratories in which new experimental methods of treating waste liquors can be taken to the stage where they can easily be introduced into full-scale practice

### Microbiology Section

As much of the work is microbiological, the expansion of the research programme will entail a considerable enlargement of this section. This is in hand, the section having been strengthened by the addition of part of the microbiological team formerly at the National Chemical Laboratory. Further staff for this section is to be recruited this year.

Further studies have been made on the treatment of a number of industrial waste liquors, including those from electroplating and the purification of coke-oven gases. Many of these investigations have been made at the request of manufacturers and on a repayment basis—a service that has grown considerably during the year.

Work continued during the year to determine the relative efficiency of aeration in the activated-sludge process by different means, including diffused air, rotating brushes and 'Simplex' aeration units.

Further work has been done on the toxicity to fish of a number of substances, including ammonia, gas liquors and salts of lead, copper and zinc. First results of a series of experiments on the effects of inert suspended solids on fish show that over a period of some three months, concentrations of about 100 p.p.m. may kill trout.

*Coke Oven Effluents.* Spent liquor from a South Wales ammonia still has been used by two National Coal Board workers at the W.P.R.L. as the substrate for growth of a mixed culture of organisms in apparatus described in the 1958 Report. Average composition of the liquor was: total carbon, 2,000 p.p.m.; ammonia (as N), 980 p.p.m.; permanganate value 5,000 p.p.m.; monohydric phenols 1,800 p.p.m.; total phenols, 2,000 p.p.m.; thiocyanate, 350 p.p.m.; pH value, 8.6.

The problem of removing the organisms from the reactor effluent is being approached in two ways, namely by high-rate treatment in a percolating filter and by the use of flocculating agents and coagulants. The percolating filter also serves to improve the effluent, mainly by reducing its content of thiocyanate. No thiocyanate is removed in the culture vessel because of the long generation time of *Thiobacillus thiocyanoxidans* in relation to the retention time.

Nutritional requirements of the organisms in this continuous-culture process call for comparatively large amounts of magnesium and phosphate; traces of copper, cobalt, iron and calcium are also needed. These experiments are continuing.

Experiments have also been carried out in the Warburg respirometer to determine the rates of oxidation of various monohydric and dihydric phenols by a strain of *Pseudomonas aeruginosa* isolated from soil. Catechol, 4-methyl catechol, and 3:4 xylenol were found to be oxidised readily, 2:3, 2:6, and 3:5 xylenol slowly, and 2:5 xylenol not at all. The Warburg respirometer was also used to determine the effect of the inorganic salts present in coke-oven liquor on the rate of oxidation of phenol. At the concentrations at which these salts normally occur in the liquor none was found to have any serious effect.

### Oxidation of Thiocyanate

Work of the W.P.R.L. on the biological treatment of coke-oven liquors has been concerned largely with factors affecting the biological oxidation of thiocyanate. Aim of this work is to find the period of retention necessary to remove thiocyanate by the continuous-culture technique from the dephenolated coke-oven liquor. Effluent from the percolating filter already mentioned was used as the starting material. In treatments with (A) mixed cultures of organisms supplied with dephenolated coke-oven liquor and (B) a mixture of equal volumes of this liquor and a solution of ammonium thiocyanate, 90% and 98.5% respectively of thiocyanate was removed. Retention times were 15.5 hours and 11 hours. In both reactors, the volume of culture was 900 ml.

*Cyanide Wastes.* Summarising the work on biological treatment of cyanides in a percolating filter, the report states it appears that the process could be of value for treatment of solutions containing sodium cyanide, for example from cyanide hardening of ferrous metals. If small medium, say 3/16 in. to 3/8 in., is used, solutions containing the equivalent of 90 p.p.m. HCN (or 163 p.p.m. NaCN) can be treated at the high rate of 650 gall./cu. yd./day to give an effluent containing less than 1 p.p.m. HCN. A small amount of organic material is required in the solution; peptone was used in the tests but other less expensive materials could probably be used.

Temperature of the filter and of the liquid applied must be kept above about 11°C and the filter has to be inoculated with cyanide-destroying organisms. This was done by aerating a suspension of garden soil in water with gradually increasing concentrations of sodium cyanide until satisfactory destruction of cyanide was achieved.

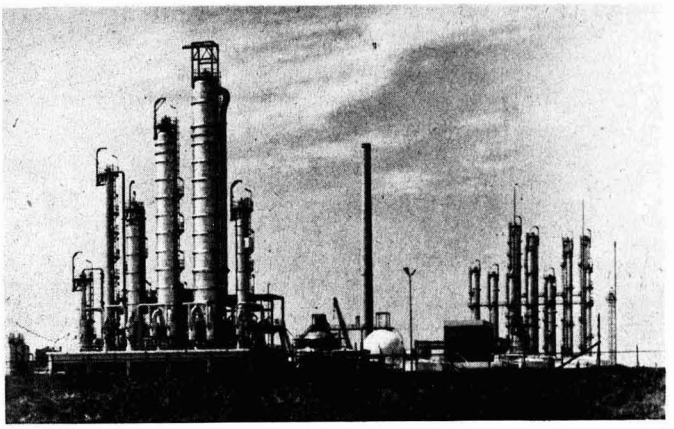
As small concentrations of cyanide might be found in the filter effluent, the process is most likely to be of use for pre-treatment before discharge to a sewer. The method is of more doubtful application to plating wastes containing complex metal cyanides.

### Pre-treatment Process

*Chromate and Cyanide Wastes.* It seems that if waste waters from the alkaline chlorination of cyanide containing any significant amount of free chlorine were mixed with waste waters containing chromic salts, there would be a risk of a small concentration of chromate being formed. Chromium present as chromate is not precipitated on subsequent neutralisation and would, therefore, be discharged in the final effluent.

Whether the small chromate concentrations formed in this way would prove an embarrassment would largely depend on local conditions. In practice the pH value of the mixture might be unfavourable, excess chlorine might be dissipated by excess sulphite or chlorination products, or the final effluent might be diluted by other effluents before discharge.

*Radiochemical Analysis.* A method for radiochemical analyses of river waters has now been completed and is adopted from that of Crouch and Cook (A.E.R.E. C/R 1760) in which samples were decomposed by fusion with an alkaline oxidising mixture; chemical and ion-exchange separations were then used to furnish specimens of ruthenium, caesium, barium, strontium, zirconium, yttrium and 13 other elements, for radioassay. In the present method, the analysis is confined to the six elements mentioned with the addition of niobium, tellerium and, if required, iodine. Separation of strontium and barium was not entirely satisfactory and a novel method is at present being developed.



General view of the styrene plant at Pernis

# SHELL SYNTHETIC RUBBER PLANT OPENED AT PERNIS

WITH the opening of their £10-million styrene-butadiene plant at Pernis, near Rotterdam, on 24 June, Shell have launched their first synthetic rubber venture outside the United States. The plant is initially capable of producing 60,000 tons—enough to supply all the styrene-butadiene rubber requirements of the Benelux countries with some left over for export to other countries. Covering some 25 acres, the plant makes an important extension to the chemical industry of Pernis, already the Netherlands' largest chemical centre.

Operated by the Royal/Dutch Shell concern, Shell Netherland Chemische Fabrieken N.V., the new plant consists of three units, for the manufacture of styrene, butadiene and the copolymer respectively. The plant is stated to be the first to put into commercial use, in the purification of butadiene, the acetonitrile distillation process pioneered by Shell Chemical Corp., in the U.S. An interesting feature of the copolymer plant is its flexibility, permitting the production of hot or cold S.B.R. at will, in batch production if required. Ethyl benzene for styrene manufacture will be drawn from the Carrington, U.K., works of the Shell Chemical Co. Ltd. *n*-Butylene produced by the cracking plants of the nearby Pernis refinery of Shell will be used as base material for butadiene production.

In an almost completely automatic plant, Shell Nederland Chemische Fabrieken are manufacturing a type of rubber which will be marketed in Holland by Shell Nederland Verkoopmaatschappij N.V., and also exported, under the trade name of Cariflex. It is produced by a dehydrogenation process involving the use of an iron oxide-chromium oxide catalyst, Shell 105, in the case of styrene and a more alkaline version of this, Shell 205, in the case of butadiene. It is intended, in the future, to produce other types of rubber of quality up to and surpassing the best grades of natural rubber, and plans for the building of polybutadiene and polyisoprene units are already well advanced.

In the styrene plant, which like the other two main units is controlled from a central panel, the imported ethyl benzene is converted at a temperature of about 600°C and in the presence of large quantities of steam diluent. This steam keeps the partial pressure of the hydrogen low, continuously regenerates the catalyst and minimises by-products formation. The catalyst, the action of which is promoted by a potassium salt compound, has a lifetime of some two years. Distillation breaks up the raw dehydrogenation product, which consists of some 40% styrene, plus quantities of unconverted ethyl benzene, and also of toluol and benzene, the ethyl benzene being recovered in so far as it has not been converted for future further use. This fractionisation of the crude product is performed at a high vacuum to prevent styrene polymerisation and a polymerisation inhibitor is added to the distillation feed as a further precaution; the finished styrene is protected against polymerisation during storage by the addition of an inhibitor.

Control room for the copolymerisation unit, for which Matthew Hall were contractors

The *n*-butylene, present in the gas obtained from both thermal and catalytic crackers at the Pernis refinery, and fed to the rubber plant from storage, is subjected to an adiabatic reaction in two fixed-bed reactors after its preheating and dilution with superheated steam. The reaction is conducted at rather more than atmospheric pressure and, like the styrene process, at temperatures in the region of 600°C.

Extractive distillation with acetonitrile as solvent is used at the Pernis plant both for a saturates removal and for the purification itself. In the butadiene process the product gas passes through a waste heat recovery unit, a quench and condensate rejection stage and a gas compression process, finally to be broken up in the recovery of the butadiene-content $C_4$ fraction, the butadiene itself being won from the extractive distillation followed by final purification in a fractionation column. Unconverted *n*-butylene is led back to initial dehydrogenation stock and finished butadiene to the co-polymerisation unit.

## Hot or Cold S.B.R.

As mentioned above, the copolymer plant permits the output of hot or cold S.B.R. Hot rubber is prepared at a temperature of 50°C by the mixing of the two feed compounds in an aqueous solution to which an emulsifier and catalyst have been added. The more regular-structure cold type is the result of the reaction taking place at 5°C, and it is this product which is at present in most demand. The latex resulting from initial processing is freed from unconverted monomers, these not being directly recycled but, in the interest of a higher quality rubber, routed to a monomer purification unit before being led to the polymerisation plant; this means that instead of the mixture of fresh and rephased monomers used in most plants the monomer flow is uniformly fresh. This latex is then treated for the recovery of unconverted butadiene and styrene, fed into a coagulation vessel after treatment with dilute brine solution and a dilute acid spray, passed on to a soap conversion unit and thence, via a shaker screen and a re-slurry tank, for breaking up and demoisturing to mill and apron-dryer units. The finished rubber is made up into bales of about 75 lb., to be packed automatically in polythene film for manual crating or for talc-dusting and storing. At present two polymerisation lines, each containing ten stirrer-reactors and five displacement tubes, determine the plant's capacity.

The official opening of the plant was performed by Mr. J. W. de Pous, Netherlands Minister of Economic Affairs, who was welcomed by Mr. L. Schepers.

Contractors for the copolymerisation plant were Matthew Hall and Co. Ltd., contractors in charge of works erection being the Werkspoor concern.

# SEWAGE PURIFICATION MEETING

## Institute President Pays Tribute to Pioneers of Sewage Treatment

REFERRING to trade effluents in his presidential address at the annual conference of the Institute of Sewage Purification, held last week in Scarborough, Mr. M. A. Kershaw said that although it was now generally accepted that the proper place for their ultimate treatment is at the sewage works of the local or regional authority, it was equally true that the first attack on these problems should be made in the factory from which they originated. Modern manufacturers of new products such as weedkillers, insecticides, detergents, plastics materials and radioactive elements, produced complex trade effluents which imposed additional burdens on existing sewage treatment processes.

Speaking as the son of a founder member, Mr. Kershaw paid tribute to the pioneers of sewage treatment and reminded members that the Institute was still working on the firm foundation laid down in early years and was now fully recognised as a leading authority on all problems of sewage and trade effluent treatment.

From the very early days, papers and technical discussion have been recorded, and this year's conference was certainly no exception. Papers were presented on the subjects of synthetic detergent problems, power generation from sludge digestion gas and bacteriological ecological and epidemiological problems.

While advances are to be seen in the work produced through committees specially set up to investigate particular problems in the cases, for instance, of detergents and radioactive wastes, important work still remained to be done. The economic conversion of waste products to gainful use is a branch of research which continues to demand attention, although some progress has been made in the utilisation of sewage gas for power and heating purposes.

## Sondes Place Director on Power Generation by Fuel Cells from Sludge Digestion Gas

FUEL cells under development today are in principle well adapted to power generation from sludge digestion gas, declared Dr. H. H. Chambers, director, Sondes Place Research Institute, in his paper on 'Fuel cells and their potentialities for power generation from sludge digestion gas'. All the conventional methods of producing electricity from fuel involved an initial stage of degradation of chemical energy to heat and this imposed, by the second law of thermodynamics, a serious theoretical limit on the overall efficiency of the process. Fuel cells passed directly from chemical energy to electrical energy and thus that limitation no longer existed.

The basic principles of fuel cells are illustrated in the figure. The porous electrodes are separated by an electrolyte, which, for the sake of simplicity, can be regarded as an ionically conducting oxide. Air passes over the face of one electrode and the fuel gas such as methane over the other. The electrolyte, by providing a barrier permeable to oxygen ions but impermeable to air or fuel, prevents direct combustion of the fuel but allows electrochemical oxidation to proceed by way of charged oxygen ions.

The air and fuel diffuse into the porous electrodes to the interface between the electrode and the electrolyte. A small number of oxygen ions form at the air electrode by absorbed oxygen gas taking up electrons at the electrode, thereby leaving it positively charged.

At the same time an equal number of oxygen ions are discharged from the electrolyte at the fuel electrode, giving up electrons to the electrode, and making it negatively charged, and at the same time oxidising the fuel to carbon dioxide and water. This process continues until a potential difference of about one volt has been built up, when the air and fuel pass though the cell unchanged.

This principle can comparatively easily be embodied in a cell, but to have a high efficiency and a long operating life certain conditions must be complied with. All the processes occurring in the cell must be rapid to prevent polarisation; the overall reaction must be the complete oxidation of the fuel to carbon dioxide and water—any other end products will cause a reduction in the current obtained for a given rate of fuel consumption; finally the internal resistance of the cell must be so low that large currents can be taken.

If fuel cells are to make a major contribution to electricity generation they must be made to operate on primary fuels such as gaseous or vaporised hydrocarbons. A great deal of work in this direction is being carried out in the U.S., notably by the National Carbon Co., Chalmers Corporation, and General Electric. Similar work is being done in Germany by Justi, who have also recently been experimenting with high-temperature cells.

High-temperature cells will probably prove to be the most suitable for operation on ordinary commercial fuels, since at high temperatures the electrode reactions are inherently rapid and high catalytic activity in the electrodes is not necessary. It is on these high-temperature cells that the work at Sondes Place has been concentrated.

The Sondes Place cells operate at temperatures between 500° and 700°C They can consume a great variety of fuels and are unaffected by catalyst poisons. The electrolyte is a molten mixture of sodium and lithium carbonates held in the pores of porus sintered magnesium oxide dia-

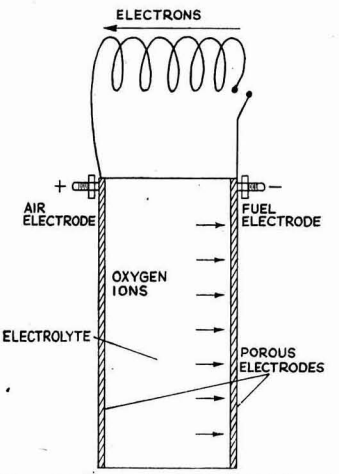



**Diagram showing the basic principles of fuel cells**

phragms. Carbonate electrolytes are used in practice since no completely suitable conducting oxides are known. The porous electrodes are composed of zinc oxide and metallic silver which has moderate catalytic activity and at the same time is chemically inert towards air, fuel and electrolyte. Each cell develops about one volt and the cells are connected in series through metal connector separator plates which also distribute air and fuel to the appropriate electrodes.

The Sondes Place cell operates on the principle described with the complication that oxygen has to be transported across the cell as carbonate ions and this entails feeding a proportion of carbon dioxide into the air stream. The electrode processes are, therefore, shown by the equations:

Air electrode $O_2 + 2CO_2 + 4e = 2CO_3^{--}$

Fuel electrode $2CO_3^{--} + \frac{1}{2}CH_4 = 2\frac{1}{2}CO_2 + H_2O + 4e$

The silver-zinc oxide electrodes are active enough to give equally high efficiencies with fuels as widely different as hydrogen, carbon monoxide and vaporised kerosene. Because methane, the main constituent of sludge digestion gas, is the most stable hydrocarbon, it is the most difficult to oxidise, but current work has shown that it will not be long before fuels cells will work just as efficiently on methane using activated electrodes.

The theoretical advantage of fuel cells, their high efficiency, has been amply

although demonstrated in practice, does not necessarily make them competitive with older methods of power generation. There is, however, reasonable expectation that they will find many smaller applications to begin with which will enable experience to be gained on long term performance.

# Progress Reported Towards Solution of the Synthetic Detergent Problem

FIRST section of the conference took the form of a symposium consisting of five papers on different aspects of an experiment carried out in the Luton-Harpenden area (the Luton Experiment) on the use of a new synthetic detergent. (See also CHEMICAL AGE, 7 April, p. 715).

The synthetic detergent problem is a result of the use of alkyl-aryl sulphonates, which have largely replaced the earlier type of active material and have proved more resistant to breakdown by the usual processes of sewage treatment. The possibility of producing a household synthetic detergent with the same washing efficiency but based on materials which could be readily oxidised or eliminated, led to the development of a new alkyl-aryl sulphonate (JN) which is more oxidisable than the older type (PT) although behaving identically with it.

The new material had shown promising results in the oxidation tests carried out in the laboratories of the manufacturers and of the Metropolitan Water Board. Further testing was, therefore, undertaken to establish its behaviour in sewage disposal processes on both percolating filters and activated sludge bedplants. The procedure was described by G. E. Eden and C. A. Truesdale.

## Detergent-free Sewage

It was necessary to prepare a detergent-free sewage since all sources of sewage in this country are contaminated with synthetic detergents. The conditions to be met with in a typical sewage works were simulated as far as composition of sewage and concentration of detergent, etc., were concerned. Both JN and PT were tested with adequate controls.

The paper dealing with the particular analytical problems of the Luton experiment were presented by H. L. Bolton and P. L. Cooper. Extraction of the alkyl-aryl sulphonate from the sewage free from impurities was accomplished by a two stage process comprising the foaming of the sample by passing a stream of fine bubbles of nitrogen upwards through the liquid followed by solvent extraction of the condensed foam after acidification with concentrated HCl. The extraction was carried out by three successive 100 ml. volumes of AR chloroform. The solution was dried and the chloroform distilled off.

The analysis of PT and JN was carried out by infra-red spectroscopy. The detergents were dissolved in carbon tetrachloride to give solutions of approximately 2% w/v. The infra-red spectra from 7 to 7.5$\mu$ were recorded using a 1.5 mm. cell with solvent compensation in the reference beam and a scanning speed of 1$\mu$ in 16 min. Using a baseline technique, the ratio of the absorbances at 1,406 and 1,396 cm.$^{-1}$ was determined and these values plotted against percentage of either component.

The attempts to demonstrate the advantages of the new material in full scale trials at Luton has yielded results in general agreement with those predicted from the laboratory experiments. In spite of difficulties in completely replacing PT by JN, it has been shown that 79% of the newer detergent was removed compared with 60-65% of the older type. These results indicate that with complete replacement up to 94% may be removed at the sewage works.

## Elliott-Automation to Exploit Shell Quality-control Instruments

A RANGE of automatic analytical control instruments developed by the Shell Research Laboratories at Emeryville, California, for the petroleum, petrochemical and chemical industries, are to be exploited by Elliott-Automation under an agreement with Hallikainen Instruments of Berkeley, California, who manufacture these instruments under licence. Hallikainen will supply the North and South American markets and Japan; Elliott's will supply the rest of the world. A new Elliott-Automation subsidiary company, Hallikainen Instruments Ltd., is being formed in London to handle the new business. It will work in close association with the other divisions of the quality control group of Elliott Brothers (London) Ltd.

The instruments covered by the agreement are mainly for the 'in-line' control of processes by continuous measurement of viscosity, vapour pressure, distillation points, specific gravity and colour analysis.

# New Type Magnesium Carbonate Thermal Insulating Material Introduced

AN improved type of magnesium carbonate insulating material is being produced by the Chemical and Insulating Co. Ltd., a member of the Darlington Chemicals Group. This material, which will be called Supermag, is available in pre-formed sections and slabs for fitting to pipework and boilers, for use in any industry where the prevention of heat-loss is essential.

The material is a mixture of magnesium carbonate trihydrate with asbestos in the proportions, 85% – 15% as are the traditional magnesia compounds, but a unique manufacturing process is said to change its form and to bond it with the asbestos at a critical temperature.

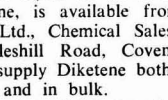
Mr. F. R. Gibson, managing director of Chemical and Insulating, said this week that Supermag was now in quantity production and was coming into general use. "It is firmer, more easily handled, harder and stronger than orthodox magnesia products, and is also resistant to water. Supermag can also be moulded to much higher standards of precision." Chemical and Insulating are the only source of supply in the Eastern hemisphere.

Both Supermag and ordinary magnesia insulation is made in three thicknesses (1 in., 1½ in., and 2 in.) for 22 sizes of pipe, giving 66 variants in all. Many of these, as ready-packed sections, are held in stock.

# Celanese Introduce New Synthesis Reagent

THE first leaflet on the new chemical Diketene, is available from British Celanese Ltd., Chemical Sales Department, Foleshill Road, Coventry. B.C. can now supply Diketene both in small quantities and in bulk.

The structure of Diketene is probably represented by the formula:



The B.C. product, which contains a minimum of 96.0% of the pure chemical, has a variety of uses but at present it will find its principal uses in the following processes: pyrolozone dyestuffs from aryl hydrazines; aceto acetylamides from amines; ketene by decomposition at high temperature; dehydroacetic acid by polymerisation; and aceto acetic esters from alcohol.

Diketene is stable at 0°C but polymerises slowly at room temperature and rapidly at high temperatures; the polymer is a dark, almost black solid. It should be handled with care as its vapour is very lachrymatory and it is stated to have a toxicity 1/10 that of chlorine vapour. Diketene should not be allowed to come into contact with mineral acids or alkalis as they may initiate a reaction of explosive violence.

## New Cambridge Chair in Chemical Microbiology

The Council of the Senate at Cambridge University has recommended the setting up of a professorship of chemical microbiology.

# C.T.R.A. REVIEWS RECENT DEVELOPMENTS IN TECHNOLOGY OF COAL TAR

RECENT developments in the technology of coal tar and coal tar products, as well as the general chemistry and chemical techniques relating to this field, are reviewed in the latest 'Review of Coal Tar Technology' (July-December 1959) published by the Coal Tar Research Association, Oxford Road, Gomersal, Leeds (price 10s). The report deals with a wide range of subjects, from investigations into coal structure and carbonisation developments to the utilisation of coal tar and its products in paints, fuels, plastics, agricultural chemicals, etc. Some of the more important developments are briefly summarised below.

*Coal Carbonisation.* Work at the British Coal Utilisation Research Association has shown that briquettes made from low rank coal and activated charcoal emit less tar-like products on burning than would be expected from their coal content. This seems to offer a method for reducing the yield of tar in the carbonisation process, although for complete elimination a large area of carbon surface would be needed. (*Nature*, 1959, **184**, 425-6, 8 August, R. L. Bond *et al.*)

*Tar Analysis.* Tars produced by pressure gasification of South African bituminous coal using oxygen and steam have been assayed by Terres and Hahn (*Erdöl u Kohle*, 1959, **12**, 734-9, 823-9, 903-6) and found to contain 57-66.4% of neutral oils, 22-26.6% of tar acids and 5-4.9% of bases. Twenty-four phenols were positively identified.

## Reduced Corrosion

*Tar Distillation.* In a U.S. Bureau of Mines report (R.I. 5534, 1959), J. B. Goodman and R. S. Detrick report that distillation of a low temperature lignite tar has been shown possible, both with and without tar recycle, in a conventional tube heater and flash fractionator without coking. The yield of hard pitch could be varied from 38% to 60%. Evaluated as an electrode binder, the product was found to be inferior to bituminous coal tar pitch. Reduction of corrosion in distillation equipment by the addition of 0.5 to 1% of phosphoric acid to low temperature tar is claimed in a patent to the Koppers Co. Inc. (U.S.P. 2,901,424).

*Light Oils, Benzole, Cyclopentadiene.* The one-step Litol process for the simultaneous purification and dealkylation of aromatic light oils, developed by the Houdry Process Corp., is claimed to give purified benzene of f.p. 5.4°C or higher, containing less than 1 p.p.m. of thiopen (CHEMICAL AGE 7 November 1959, p. 651). The method is particularly applicable to coke oven light oils but may be used for the dealkylation of toluene and xylenes from other sources.

E. Homborg (*Gas-u Wasserfach*, 1959, **100**, 1229-32, 20 November) has described a German process by which benzoles are recovered from coal gas by cooling the gas to below 0°C by means of cooled calcium chloride brine, under a pressure of 6 atm., in the presence of an aromatic solvent of low freezing point, e.g. solvent naphtha. The costs given indicate a substantial saving as compared with the conventional method using wash oil scrubbing. The process is covered by a Koppers patent (B.P. 825,388).

According to Russian workers (N. B. Kondukov *et al.*, *Koks i Khim*, 1959, No. 10, 49-50) carbon disulphide is satisfactorily removed from benzoles by the use of coke oven gas and a fluidised bed of activated iron ore at 400-500°C. To remove thiophen, an increase in contact time, necessitating several passes of the feedstock, is required.

## Phenolic Pitches

*Pitch and Bitumen.* A process for reducing the water solubility of phenolic pitches, so making them suitable for use as paints, etc., has been described in B.P. 823,381. The principle is to mix in proportions of such hydrophobic materials as lignite tar pitch or petroleum pitches. A patent by Shell (B.P. 816,254) claims a process for producing a foamed bitumen, in which a foaming agent, e.g. sodium bicarbonate, is dispersed in the bitumen (preferably a blown asphaltic bitumen, 85-135°C, R and B, pen 10-40) together with a surface active agent. The mixture is then heated to about 130-150°C which causes the bicarbonate to break down. Heating is controlled so as not to lose much gas. The product is said to be suitable for heat and sound insulation.

*Tar Acids.* A patent to the Shell Development Co. (Canadian P. 585,540) describes the preparation of unsubstituted phenolic compounds by reacting an unsubstituted aromatic compound with hydrogen peroxide in the presence of added oxygen at 400-600°C in the absence of a catalyst. The process is claimed to be particularly applicable to the oxidation of benzene. Another patent (B.P. 814,616), by Farbenfabriken Bayer AG., relates to the scission of diaryl, aromatic-aliphatic or aromatic araliphatic ethers to yield phenols by hydrogenation under pressure at elevated temperatures in the presence of an alkali metal. A hydrogenation catalyst and an alkali metal transfer agent such as fluorine may also be present.

A British patent (815,568) to Metallgesellschaft AG. describes the extraction of pure phenols from crudes or from phenolic oils with an alkali metal phenolate lye, while a French patent (1,116,526) describes the purification of crude phenol by treating with sulphuric acid (60° Bé.) at below 50°C, decanting the phenolic layer and then treating with ammonia solution (18° Bé.).

Phenol fractions of much improved light stability may be prepared, according to a German patent, by treating with acidic condensation agents such as aluminium chloride, boron trifluoride, mineral acids, hydrofluoric acid, etc., at 50-250°C in the presence of an aromatic hydrocarbon. The agent is removed with anhydrous carbonate and the phenol treated with activated alumina or fullers earth and then distilled (German P. 959,826).

At the Coal Tar Research Association laboratories, Dean and co-workers have applied the techniques of butylation, chromatography and fractionation to the separation of the constituents of a high-boiling (230-300°C) vertical retort tar acid fraction. A total of 45 phenols have been positively identified. (*J. Appl. Chem.*, 1959, **9**, 629-41).

*(To be continued)*

## Upswing in Demand for Process Control Computers

SUDDEN and dramatic expansion of the market for computers for process control purposes is reported by Elliott Brothers (London) Ltd. Out of a total of 22 orders for computers that Elliott Brothers have on hand, nine are for the control of industrial process plants in the chemical, gas, electrical power, nuclear and steel industries. Three are for American chemical plants of E.I. du Pont de Nemours, whereabouts of the plants not being specified.

The upswing in demand is much greater than was expected a few months ago. Mr. Leon Bagrit, deputy chairman and managing director of Elliott-Automatic said recently that it appeared that computers for process control were reaching their "break-through point".

## New Firm to Handle European Chemical Agencies

A NEW company, Fraser Chemicals Ltd., has recently opened offices at 9 West Halkin Street, Belgrave Square, London S.W.1, and has already been developing agency representations for a number of European chemical and allied manufacturers. Continental products handled by Fraser at present include pharmaceutical and fine chemicals, a range of starch products, glass fibre cloth and industrial inks. The company also plans to offer both British and Continental manufacturers the opportunity of exchanging and utilising new processes and developments. Particular interest is shown in new fermentation products and techniques.

Chairman and managing director of the company is Mr. A. Fraser, who was commercial manager and director of Hickson and Welch Ltd. before becoming managing director of 'Protim' Ltd. With him, as director, is Mr. M. Apor, who has been connected with an anti-corrsion and anti-oxidation products business in Italy, as well as with the fermentation industry there.

# New Data for Mass Transfer Phenomena in Packed Beds

DATA relating to mass transfer phenomena in packed beds is important in the design of equipment for a variety of industrial processes, e.g., adsorption, drying, ion exchange, catalytic regeneration, etc., but there are considerable variations in data appearing in the literature. Experiments in naphthalene packed beds have now been carried out at the Department of Chemical Technology, Osmania University, Hyderabad-Dn., India, by V. Gopalakrishnan and R. Kaparthi, who reported the results of their work (*Trans. Ind. Inst. Chem. Engrs.*, 1958-59, **11**, 43-47).

They found that the mass transfer of naphthalene to air has a slight trend in the direction of the theoretical predictions of S. Ergun (*Chem. Eng. Prog.*, 1952, **48**, 227) but there is much deviation. The concept of Ergun's theory did not seem to be satisfactory in the case of gases. Observations pointed to the fact that the controlling step for mass transfer is the combination of the rate of solute molecules leaving the solid surface and that by molecular diffusion through the laminar gas film surrounding the particle. The rate of sublimation increases with decreased particle size and with increase in modified Reynolds Number. A correlation is developed connecting the rate of sublimation and other variables as follows:

$N_s/L^{0.5} = 0.31\ (D_p)^{-0.941}\ (N_{Re}/1-\epsilon)^{0.58}$

where $N_s$ = rate of sublimation, in g./hr.; L = height of packed bed; $D_p$ = diam. of granular solids; N/Re = Reynolds Number and $\epsilon$ = fractional void volume in packed bed.

# *Polythene and P.V.C. are Pacemakers in Record First Quarter Sales*

NET sales of plastics materials in the first quarter reached a record level at 146,400 tons; 33,000 tons, or more than 29% higher than in the first quarter of 1959. The steady build-up of manufacturers' stocks during the second half of last year continued and in the first quarter of 1960 total stocks of materials (mainly thermoplastics) rose by 4,300 tons to 66,000 tons.

The highest rate of expansion was still in the thermoplastics group, total sales of which were 92,000 tons; about one-third higher than a year ago. In terms of volume polythene and p.v.c. contributed most to expansion in this group. However sales of thermosetting materials in the first quarter (55,000 tons) showed an exceptionally large increase (nearly 10,000 tons, or 22%) on the level of the previous year. Sales of aminoplastics increased markedly; sales of polyesters and epoxide resins, although still relatively small, continued to show a rapid increase.

Exports of plastics materials in the first quarter were 42,000 tons, the highest for any quarter so far and about 29% higher than in the corresponding period in 1959. Imports during the quarter at well over 22,000 tons were also at a high level, more than double that in the first quarter of 1959.

**NET SALES OF PLASTICS MATERIALS**

*Thousand Tons*

| | January–March 1959 | October–December 1959 | January–March 1960 |
|---|---|---|---|
| **Thermosetting materials** | | | |
| Alkyds ... ... | 11.5 | 12.8 | 12.8 |
| Aminoplastics ... | 12.6 | 15.7 | 16.0 |
| Phenolics and cresylics | 17.3 | 20.9 | 20.2 |
| Polyesters ... ... | 1.5 | 1.9 | 2.3 |
| Other (a) ... ... | 1.8 | 2.5 | 3.3 |
| Total thermosetting | 44.7 | 53.8 | 54.5 |
| **Thermoplastic materials** | | | |
| Cellulose plastics ... | 2.6 | 3.2 | 3.1 |
| Polyvinyl chloride (b) | 20.2 | 22.4 | 26.0 |
| Polystyrene ... | 8.5 | 10.8 | 10.7 |
| Polyvinyl acetate ... | 3.0 | 3.4 | 3.9 |
| Polythyene ... } Other (c) ... } | 34.3 | 45.4 | 29.0 / 19.1 |
| Total thermoplastics | 68.6 | 85.2 | 91.8 |
| TOTAL, ALL PLASTICS MATERIALS ... | 113.3 | 139.0 | 146.4 |
| Stocks at end of period: | | | |
| Thermosetting materials | 16.7 | 17.3 | 18.6 |
| Thermoplastic materials | 40.8 | 44.4 | 47.4 |

(a) Including epoxide resins and casein plastics.
(b) Excluding sales of resins (i.e. polymers sold as such).
(c) Including acrylics, polyamides, p.t.f.e., p.v.c. resins.

# O.C.C.A. Exhibition and Conference 1961

PRELIMINARY arrangements for next year's Oil and Colour Chemists' Association technical exhibition, and also for the biennial conference, have been completed. A new venture for the exhibition will be its opening four days instead of the usual three. It will be held at the Royal Horticultural Society's New Hall, London S.W.1, on 6 March (3-7 p.m.) and on the 7, 8 and 9 March (10 a.m.-7 p.m.) Sir Cyril Hinshelwood, O.M., D.Sc., F.R.S., is to be guest of honour at the exhibition luncheon. Theme of the exhibition will be technical advances in industries supplying the paint, varnish, printing ink, lineoleum and other allied industries.

The O.C.C.A. conference will be at Torquay, Devon, from 30 May to 3 June 1961, with headquarters at the Palace Hotel. Nine papers, under the general title of 'Physics in surface coatings', will be presented at three morning sessions.

Details of both exhibition and conference are available from the general secretary of the association, Wax Chandler's Hall, 1 Gresham Street, London E.C.2.

## Balfour Group Plan Major Works Expansion

HENRY Balfour and Co. Ltd., chemical engineers, Leven, Fife, who opened their new laboratories and research centre last month are to proceed with a major expansion of manufacturing facilities. They will build an extensive new boilershop, costing £250,000 and other ancillary units, costing in all £500,000. This development at Mountfleurie will supplement the older Durie Foundry, where expansion and development plans are also in hand.

A big extension to the works of Enamelled Metal Products is also planned.

Mr. W. Lindsay Burns, Balfour Group chairman, is confident that the Leven enterprise will continue to grow and expects to see further additions to the company's activities within the coming 18 months.

## I.C.I. to Move Chemicals Division H.Q. to Runcorn

THE 260 members of I.C.I.'s General Chemical Division, now at Cunard Buildings, Liverpool, are to move to new headquarters in Runcorn. The move to extensions of a building opened 12 months ago at Runcorn Heath should take about two and a half years to complete. When the transfer is completed the whole of the division's headquarters will be situated at Runcorn.

Mr. E. S. Hyde, division secretary, said that planning permission had still to be sought and that plans for the extensions had still to be drawn up. The new high level road bridge, due to be opened across the Mersey early next year, was an important factor in the company's decision to move from Liverpool to Runcorn.

## Rigidex Tested as a Detergent Package

TESTS made on detergent bottles produced from 'Rigidex polyethylene' and copolymers, have shown that Rigidex type 3 has the best long term resistance to stress cracking, even at 70°C, a very severe test. Technical Note R.203, issued by British Resin Products Ltd., Devonshire House, Piccadilly, London W.1, gives the results of recent work carried out in which five powerful detergents were stored for protracted periods both under normal conditions and at temperatures up to 70°C. It also discusses the effect of providing bottles with vented stoppers.

Rigidex Type 3 is a copolymer of ethylene and higher olefins and has a density of 0.95. It is less stiff and has a slightly lower softening point than either of the other types tested, 2 and 9, which are homopolymers of ethylene with a density of 0.96. Type 3 has much greater resistance to stress cracking and has a comparatively low melt index (0.3).

Overseas News

# TWO NEW U.S. PLANTS TO PRODUCE NAPHTHALENE FROM PETROLEUM

THERE is news of two new petroleum-derived naphthalene plants in the U.S. The first, to produce 50 million lb. a year of naphthalene, is to be built jointly by Tidewater Oil and Collier Carbon Chemical at Tidewater's Delaware refinery near Wilmington. The plant, operated by Tidewater, will produce high purity naphthalene from alkyl naphthalenes by a patented process developed by Union Oil of California. Construction will start this year and the plant is expected to be completed by the end of 1961.

The second plant with a capacity of 100 million lb./year is the Sun Oil $8 million project at Toledo, Ohio. This unit is also expected to be on stream by the end of 1961 and will use a high temperature catalytic process to yield a high purity product for fluid bed phthalic anhydride producers.

## Swedish Firm Plans to Build Tunisian Superphoshate Plant

The Swedish concern Forenade is planning to erect a superphosphates plant in Tunisia with an annual output of some 100,000 tonnes. The company is at present negotiating with the Tunisian Government about the plant, cost of which would be some £2½ million.

## Large-scale Expansion for Turkish Fertiliser Industry

The Turkish synthetic fertiliser industry is reported to be in the process of "large-scale expansion." By 1965, the target year of the country's current five-year plan, Turkey should be independent of imports of fertiliser, producing some 1,090,000 tonnes a year as against a current annual output of only 330,000 tonnes. To this end a new plant is to be opened this year at Yarimca, and new works are planned to be sited at Mersin and Samsun, while the capacity of the Kütahya plant will be doubled.

## New Fibre Plant for E. Germany

A new plant for production of polyester fibre is stated to be under construction at Schwarza, in the East German republic. The plant is intended to come into operation during next year.

## New Terephthalic-isophthalic Process for Royal Dutch/Shell

Successful production of terephthalic acid and isophthalic acid by a new process, using a 200-kg./day experimental unit, is reported to have been achieved by Koninklijke Shell, of Amsterdam. The system is based on air oxidation in liquid phase at temperatures of 120 to 150°C. The first stage consists of the production of *p*- or *m*-diisopropyl benzole from benzole and propylene by a new alkylation process, a conventional type catalyst being used. Distillation separates the *p*-compound from the *m*-compound. The diisopropyl benzole is oxidised to the disbasic acids in acetic acid, with a catalyst mixture of cobalt and manganese acetate.

## Production of Nuclear Fuels In Italy

A new concern, Italatom, which will build and operate a plant for the production of nuclear fuels, has been formed by the two firms, Engelhard Industries of Canada and Sorin, noted for their large reactor of Avogadro type at Saluggia near Vervelli (Piedmont). A L1,500 million plant will be built with an initial output of 40 tons of uranium oxide pellets, but will be designed so that this figure can be doubled if necessary.

Eventually metallic uranium and other types of nuclear fuels may be produced.

## Hooker Phenol Plant will Use Development of Raschig Process

Hooker Chemical have decided to build a 60 million lb. a year synthetic phenol plant at South Shore, Ky., U.S. Hooker already make 65 million lb. of phenol a year by the Raschig process at their Tonawanda, N.Y. plant. The new unit will use a Hooker development of the Raschig process. Construction will begin this year and the plant is expected to be completed by the end of 1961.

## Zagreb Chemical Works Due for Completion in 1963

The plastics works to be built at Zagreb in Yugoslavia with credit of $23 million form the U.S.-based Development Loan Fund, will come into operation in 1963. It will use natural gas discovered in the Klostar and Strzec oilfields and domestic-produced benzole to produce annually some 15,000 tonnes of polystyrene and polythene and 15,000 tonnes of other chemical products, including styrene monomer, phenol and acetone. Value of equipment and licences needed is set at $30 millions, supplier countries to be the U.S. and/or the U.K.

## U.S. Cyclohexane Capacity Will Reach 380,000 tons

By the end of 1960, cyclohexane production capacity in the U.S. will have risen to 380,000 tons a year. This total will be based on the following plant capacities (rounded off): Continental Oil Co., Ponca City, 59,000 tons; Du Pont, Belle, 88,500 tons; Gulf Oil, Port Arthur, 60,000 tons; Philips Chemical Co., Sweeny, 85,000 tons, and at their Borger plant, 60,000 tons; and Shell Chemical Co., Wilmington, 25,000 tons.

## High-purity Phosphorus

Phosphorus of 99.9999% purity is now being produced by the American Agricultural Chemical Co., New York, for use in semi-conductors.

## New E. German Licensing Organisation Set Up

A new State trading organisation has been set up in East Germany for the purchasing or selling of patents, licences, etc., and the organisation of scientific aid schemes in western countries. Bearing the name of Limex, it has its headquarters in East Berlin.

## Dutch Free Sodium Nitrate Imports

The Netherlands Government has removed sodium nitrate from import quota. Imports of this chemical can now be undertaken free of control.

## C.I.L. to Make Stabilised Blowing Agent at Hamilton

Canadian Industries Ltd. are to build at their Hamilton, Ont. works a plant to produce stabilised dinitroso pentamethylene tetramine, a blowing agent used in making certain types of cellular foamed rubber. This marks the initial entry of the company into the manufacture of organic chemical specialities. The plant will be housed in an existing building at the Hamilton Works.

## Pechiney-Niarchos Agreement on Alumina Production

Pechiney have announced an agreement with the Greek Government and the Niarchos group for setting up a plant in Greece for the production of 50,000 tons of aluminium and 100,000 tons of alumina a year. The costs, to be provided by a Franco-Greek company soon to be formed, are estimated at $75 million.

## Buckeye Double Chlorine Dioxide Capacity at Foley

Buckeye Cellulose Corporation have doubled the chlorine dioxide generation capacity of their wood pulp mill—from three tons a day to six tons a day. In effecting the expansion, Buckeye utilised a unique construction method to reduce shut-down time to a minimum. Faced with the problem of extending the chlorine dioxide absorption column from 20 ft. to 30 ft., the decision was made to add an impervious membrane and an acid resistant brick lining to the steel shell of the extension while it was still on the ground in a horizontal position. After the extension was lined, the head of the old column was removed and the new extension was hoisted and bolted

into place. Once it was bolted on top of the old column, production was resumed as soon as the packing was placed in the new section.

Another unusual feature of the expanded facility is that glass fibre reinforced polyester pipe was used for the chlorine dioxide gas line. Through the use of this pipe, Buckeye hope to reduce corrosion problems to a minimum.

To achieve added efficiency, Buckeye changed from a single-stage to a two-stage process by adding a new six-ton generator and rearranging the existing process units. The original generator was utilised as a secondary generator, giving the second stage a capacity equal to 50% of the primary generator. As part of the change, the original tail gas scrubber was used as a sodium chlorate scrubber for the removal of acid mist from the chlorine dioxide gas.

## Symposium on Chemical Reactions in Atmospheres

An international symposium on chemical reactions in the lower and upper atmosphere, sponsored by Stanford Research Institute, is scheduled for April 18-20, 1961, at the Hotel Mark Hopkins in San Francisco.

Dr. Richard D. Cadle, manager of the S.R.I. atmospheric chemistry section, will be chairman of the symposium, which will concern uncontaminated upper and lower atmospheres and smog-laden city atmospheres. Further information is available from the Stanford Research Institute at Menlo Park, California, U.S.

## Colgate-Palmolive Anti-bacteria Spray

The Colgate-Palmolive Co., New York, have introduced a spot disinfectant spray with Permachem which kills, on contact, most bacteria—including *Staphylococcus aureus*—and fungi that can cause infection, odours, and decay. The active ingredients of Permachem are tributyl tin oxide, dialkyl dimethyl ammonium chloride and salicyclic acid. The spray is available in one-pound containers only, packed 12 to the case.

## Slight Fall in Chilean Nitrate Production

Production of nitrate for 1959 in Chile totalled some 1,253,000 tons, compared with some 1,281,000 tons for 1958. Authorisation has been granted for the closure of the 'Nebraska' mine of Cía. Salitera de Tarapacá y Antofagasta, which has been working at a loss for some time. Such permission had been withheld pending re-employment of the workers.

## Rumania's Chemical Production In 1959

Rumania's chemical industry is reported as having supplied approximately 28% more products last year than in 1958. It is stated that Rumania produced in 1959, 282,000 tons of fertilisers (152,000 tons in 1958) and 6,300 tons of plastics and synthetic resins (2,000 tons in 1958). For the first time Rumanian chemical products in 1959 will include synthetic yarns and fibres, out of which some 1.5 million square metres of fabrics will be produced.

## Du Pont to Double Nylon Yarn Output

E.I. Du Pont de Nemours plan to extend industrial nylon yarn production at their Richmond, Va., plant by over 100%. By mid-1961 annual production of the works will exceed 100,000,000 lb.

## G.E. Produce 'World's Largest' Piece of Pyrolitic Graphite

A rectangular piece of highly heat-resistant pyrolitic graphite, measuring 17 in. by 31 in. by $\frac{1}{8}$ in. thick, has been produced in the research laboratory of U.S. General Electric, and is believed to be the largest piece yet made.

Pyrolitic graphite is stronger and more resistant to oxidation than ordinary graphite and has greater heat resistance. It has potential uses for rockets and missiles, while industrial applications include melting crucibles for metals, ceramics and semi-conductors. It may also prove useful in nuclear reactors.

## Agricultural Chemicals Plant Opened in Italy

A chemical plant built by Ravit in close co-operation with the French Pechiney-Progil Group has been opened at Quassolo, a few miles from Ivrea, Italy. Already in partial operation, the plant will produce pesticides and weed-killers.

## CIBA Production Includes Veterinary Products

Ciba of Basle have recently added the manufacture of therapeutic products for veterinary use to their production programme. Two veterinary specialities and two dietic products for enriching cattle feed have already been marketed and further products, at present in the trial stage, are to be put on sale later this year.

## Mine Production of Zinc in the U.S. Increases

Mines in the U.S. produced 42,100 tons of recoverable zinc in March 1960. This quantity is 11% above that of the preceding month and the largest monthly mine output since August 1957. Production from mines east of the Mississippi River increased 9% to 22,800 tons. All producing districts except southern Illinois contributed to the increase.

# New Ziegler, Montecatini, Natta Processes Described in English

A NEW technical bulletin listing translations of papers by Dr. Karl Ziegler, Montecatini, Professor Natta and others on new and improved processes for the production of polyolefins, tetraethyl lead, and graft polymerisation has been issued by Research Information Service, 40 East 23rd Street, New York 10, New York, as Technical Bulletin 184.

*Tetraethyl Lead.* Two particularly interesting reports dealing with improved processes for more economical production of tetraethyl lead are translations of Belgian Patents issued to Ziegler. The first, 'Improved Electrolyte for Process to Produce Tetraalkyl Lead', Belgian Patent 575 641, shows how a composite electrolyte consisting of tetraalkyl aluminium, an alkali metal and a trialkyl alkali-alkoxy aluminium, results in a greater conductivity and consequently lower current consumption in the process for producing tetraalkyl lead, particularly tetraethyl lead, by electrolytic means. (Report No. 97071, price $25.)

The second, entitled 'Electrolytic Process for Producing Tetraalkyl Lead, Particularly Tetraethyl Lead', Belgian Patent 575 595, describes an electrolytic process for obtaining tetraalkyl lead, particularly TEL, using lead anodes and a complex electrolyte of the general formula $Na(Al(R')_3OR)$, in which R' is a primary alkyl with a straight chain and from 2 to 4 carbon atoms and R is a hydrocarbon radical, preferably an alkyl with from 2-12 carbon atoms or possibly a substituted phenol, and facilitating separation of the tetraethyl lead from the anodolyte with the use of either a two bed system or by simple distillation. Preparation of the electrolyte and the arrangement of the electrolytic apparatus are described in great detail. The process greatly reduces the current consumption and eliminates danger of short circuit by permitting removal of the metal forming at the cathode in the liquid phase. (Report No. 97072, price $65.)

*Polyolefins.* Among many reports dealing with polyolefins is 'Improved Stabilisers for Polyolefins' German Pat. Appl. F 18 865—Farbwerke Hoechst AG. Basic organic compounds are added to mixtures of linear or branched aliphatic mercaptans and used for stabilising polyolefins, particularly polythene. Polythene treated with these new stabilisers exhibits greatly reduced tendency to molecular degradation at temperatures as high as 120° and consequently greatly reduced brittleness. (Report No. 97064, price $20.)

'Mesomorphic Modification of Isotactic Polypropylene', by G. Natta, M. Peraldo and P. Corradini, Rendiconti dell'accademia Nazionále dei Lincei, series VIII, vol. XXVI, is a study of a thermally induced metastable modification of isotactic polypropylene, lying between the tridimensionally ordered crystalline state and the amorphous state which permits establishment of criteria for determining crystallinity. (Report 97069, price $11.50.)

# PEOPLE in the news

● **Mr. C. R. Prichard,** I.C.I. main board director in charge of the company's Heavy Chemicals Group, resigned on 30 June, on the grounds of ill health. His resignation has been received with regret. Mr. Prichard joined Brunner, Mond and Co. in 1926 as a chemist and, after serving in various executive capacities in the Alkali and Salt Divisions, was appointed a director of I.C.I. in 1952.

● As already announced, **Dr. R. A. E. Galley, Ph.D., A.R.C.S., D.I.C., F.R.I.C.,** director of the D.S.I.R. Tropical Products Institute, leaves shortly to take up a new appointment with 'Shell' Research Ltd., and his successor will be **Mr. E. S. Hiscocks, M.Sc., F.R.I.C.,** at present in charge of the U.K. Scientific Mission in Washington. The vacancy in the T.P.I. senior staff has been filled with the appointment of **Dr. L. Horton, Ph.D., A.R.C.S., A.R.I.C.,** as assistant director (research). Following **Mr. K. Wilson-Jones's** departure to take up an appointment in Australia, **Dr. H. S. Hopf, Ph.D., A.R.C.S., D.I.C.,** is now scientific secretary to the Colonial Pesticides Research Committee.

**N. K. Smith, technical director of the Murphy Chemical Co. Ltd., awarded the O.B.E. in the Birthday Honours (C.A., 18 June, p. 1009)**

● **Professor Sir Cyril Hinshelwood, O.M.,** Dr. Lee's Professor of Chemistry, Oxford, and president of the Royal Society in its tercentenary year, had the hon. degree of Doctor of Civil Law conferred on him by Mr. Harold Macmillan, Chancellor, at the Sheldonian Theatre, Oxford, on 22 June.

● Gold watches to mark the completion of 25 years' service with CIBA Clayton Ltd. were recently presented by **Sir Arthur Vere Harvey, C.B.E., M.P.,** chairman, to five members of the sales staff. They were **Mr. J. Furniss,** senior Yorkshire sales representative, **Mr. E. Walker,** commercial executive assistant, **Mr. W. J. Errington,** commercial assistant in charge of stock control, **Mr. W. Mabon,** commercial assistant dealing with technical inquiries relating to the company's sales, and **Mr. T. B. Walsh, B.A.(Com.),** commercial executive assistant.

● **Mr. J. G. M. Richards, C.M.G., M.A.,** has been appointed secretary-general of the International Superphosphate Manufacturers' Association in succession to the late **Mr. Hugh McErlean.** Mr. Richards has served for over five years in the U.K. delegation to O.E.E.C. in Paris as commercial counsellor.

● The first Fowler, Ardern and Lockett Prize has been awarded by the Institute of Sewage Purification to **Mr. J. H. Edmondson, O.B.E., M.I.Mech.E., M.I.Chem.E.,** general manager and engineer, Sewage Disposal Department, City of Sheffield, for his paper 'The improved bio-aeration plant'. The prize, awarded every five years for the most outstanding contribution to the literature on the activated sludge process, takes the form of a specially bound copy of the 'Symposium on the evolution and development of the activated sludge process of sewage purification', which was presented at the 1954 annual conference held in Blackpool in 1954 to mark the 40th anniversary of the announcement of the original discovery, and a cheque for £10 10s.

● **Dr. J. S. A. J. M. van Aken** and **Mr. A. A. C. Guépin** have been appointed directors of Koninklijke Zwavelzuurfabrieken v/h Ketjen N.V., Amsterdam.

● **Mr. Edward Reeve Angel** has been appointed a non-executive director of Albright and Wilson Ltd. He is chairman and managing director of Star Paper Mills Ltd., chairman of H. Reeve Angel and Co. Ltd. and a director of W. R. Balston and Co. Ltd.

● In our reference to the directors of Godfrey Woodhead and Son Ltd., following acquisition by Bush Beach and Segner Bayler Ltd. in 'People in the News' of 18 June, the company's name was given inadvertently as 'Godfrey Whitehead and Son Ltd.' The title was given correctly in the same issue in 'Commercial News'.

● **Mr. A. H. Wilson,** a deputy chairman of Courtaulds Ltd., has been appointed chairman of Pinchin Johnson and Associates; **Mr. C. F. Kearton,** a managing director of Courtaulds, has been appointed deputy chairman of Pinchin Johnson, who were acquired by Courtaulds in February. **Sir Horace W. Clarke,** chairman, **Mr. N. H. Docker** and **Sir James R. Young** have retired from the Pinchin Johnson board.

● **Mr. K. P. H. Jeens, A.M.I.Mech.E., F.I.Pet.,** has been appointed manager, Oil Industries Department, of Worthington-Simpson Ltd., at their London office, Queen's House, Kingsway, W.C.2. Until recently he was with Stone and Webster Engineering Ltd. where he was pump and compressor engineer.

● **Mr. K. E. Piggott,** chief chemist, has been promoted technical manager of Styrene Co-Polymers Ltd., and **Mr. P. G. Salmon** has been promoted marketing manager.

● **Mr. John Lindley, O.B.E., J.P.,** hon. treasurer of the British Cotton Industry Research Association since 1952 has been appointed chairman in succession to **Mr. N. G. McCulloch, C.B.E.,** who has resigned after holding the chairmanship since 1949. Mr. McCulloch was closely associated with the setting up of Shirley Developments Ltd. to effect a wider and more rapid utilisation of research results.

● **Dr. N. A. de Bruyne, M.A., Ph.D., F.Inst.P., F.R.Ae.S.,** is to resign as managing director of CIBA (A.R.L.) Ltd., Duxford, Cambridge, at the end of this year. He will, however, remain on the board. From 1 January 1961, **Mr. R. F. G. Lea, O.B.E., M.A.,** will become deputy chairman, and will, with **Mr. D. A. Hubbard,** also become a joint managing director. Dr. de Bruyne is resigning to devote more time to research, particularly the development of scientific instruments. Founder of the company he built in 1934 a laboratory and aeroplane hanger with its own landing ground at Duxford. This undertaking he financed from his own resources and established it under the name Aero Research Ltd. Control was acquired by CIBA, Basle, in 1947, Dr. de Bruyne remaining as managing director. The name was changed to CIBA (A.R.L.) Ltd. in 1598. Mr. Lea joined Aero Research in 1937 and in 1946 was appointed a director. Mr. Hubbard joined Aero Research as works manager in 1939 and became a director in 1958. In charge of production throughout this period, he was mainly responsible for the planning of new urea-formaldehyde and epoxy resin factories as well as for other extensive post-war building developments at Duxford. Earlier this year he joined the board of CIBA laboratories Ltd.

**Dr. N. A. de Bruyne, right, with R. F. G. Lea, below, and D. A. Hubbard, below right**

● **Mr. J. P. Savage,** chairman and managing director of Boots Pure Drug Co. Ltd., who is to retire on 31 March 1961, will be 65 in November. He will be succeeded by **Mr. Willoughby R. Norman** as chairman of the board and head of the company and by **Mr. F. A. Cockfield** as managing director and chairman of the executive management committee. **Mr. K. D. Williamson** will be appointed as deputy managing director. Mr. Savage, who has been chairman and managing director since 1954, joined Boots as an office boy in 1911. He was appointed administrative general manager in 1936, joined the executive management committee a year later, and in March 1942 became a director. He became joint vice-chairman in 1951 and succeeded to the chairmanship on the retirement of the late Lord Trent in 1954. During the period Mr. Savage has been chairman, sales have increased by over 60%, while profits have risen 2½ times. In the same period a total of £15 million has been spent on capital development.

**J. P. Savage, left, with W. R. Norman, below left, and F. A. Cockfield, below**

Mr. Norman, who has been vice-chairman since 1954, is a son-in-law of the late Lord Trent. He was appointed in 1946 to take charge of the newly created Farms and Gardens Division, and he became a member of the executive management committee in 1948, joining the board in 1951, when he became assistant general manager working directly under Mr. Savage.

Mr. Cockfield, who has been finance director of Boots since 1953, in 1945 succeeded Mr. S. P. Chambers, now I.C.I. chairman, as director of statistics and intelligence at the Board of Inland Revenue. In 1951 he became a Commissioner of Inland Revenue and a member of the Board. Mr. Williamson, who has been a director of Boots since 1959, has, since 1955, been head buyer and a member of the executive management committee.

# TRADE NOTES

## Visco Water Coolers

Various types of evaporative coolers in current use are briefly described, and typical plants illustrated, in brochure No. 603 from the Visco Engineering Co. Ltd., Stafford Road, Croydon, Surrey. Tables are given for velocity of water discharged from pipes of various diameters, power consumption in cooling towers for various heads, and loss in head of water due to friction.

## I.C.I. and New Metals

Achievements of I.C.I. in the field of new metals are outlined in a brochure available from Imperial Chemical Industries Ltd., Metals Division, Kynoch Works, Witton, Birmingham. Production properties and applications of titanium, zirconium and beryllium are discussed and there is a section devoted to a description of the activities of the research department at Witton, mentioning work on the evaluation of hafnium, niobium and vanadium. A description of the latest titanium and beryllium production and processing facilities at Witton, and the new metals laboratory, was given in CHEMICAL AGE, 19 December 1959, pp. 895-896.

## Heavy-duty Refractory Coatings

Introduced to combat the destructive action of acids in oil-burning furnaces, boilers, etc., Furnascote heavy-duty refractory coatings are claimed to give a heat resistance of up to 1,910 or 3,500°C. as well as greater resistance to damage of brickwork. Three grades are produced, containing high proportions of zircon compounds. Makers are Corrosion Ltd., Malvern Road, Southampton, who have produced a pamphlet on the subject.

## Wood Preservatives

A woodworm killer with a mild but pleasant odour, suitable for eradication work in occupied buildings, has been added to the Brunophen range of preservatives supplied by Preservation Developments Ltd., 23 Sloane Street, London, S.W.1. These are organic solvent type preservatives and contain a number of highly active insecticides and fungicides including pentachlorphenol and dieldrin. Literature is available.

## Alkyl Phenol Ethoxylates

A range of sulphated alkyl phenol ethoxylates is under development by Marchon Products Ltd., Whitehaven. Further information will be available shortly. As stated in CHEMICAL AGE, 4 June, p. 921, Marchon have started large-scale production of alkyl phenol ethoxylates, non-ionic surfactants.

## B.D.H. Catalogue

The 1960 edition of the B.D.H. laboratory chemicals catalogue is available from B.D.H. Laboratory Chemicals Division, Poole. The catalogue lists between 6,000 and 7,000 products in various sections including: organic and inorganic chemicals for laboratory use, Analar chemicals, enzymes, indicators, ion exchange resins, etc. Items introduced since the last edition of the catalogue was published are listed. Details of new products are given as they are introduced in the monthly leaflet, 'New entries in the B.D.H. catalogue.'

## Changes of Name

W. DAVID AND SON LTD., manufacturing chemists, etc., 47-49 Caledonian Road, N.1. Name changed to W. David and Sons Ltd., on 19 January 1960.

CAMPBELL CHEMICAL ENGINEERING CO. LTD., 40 Kennedy Street, Manchester, 2. Name changed to Process Equipment Ltd., on 20 January 1960.

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## *Market Reports*

### Hydrogen Peroxide in Good Demand

**LONDON** There has been little change on the week either as regards prices or trading activity, and a fair demand is reported for most of the routine industrial chemicals. Chlorate of soda and hydrogen peroxide are moving in good quantities, while there has been a steady call for formaldehyde, borax and boric acid.

A better demand for fertilisers has been reported following the price reductions operating from 1 July. Among the coal tar products, creosote oil and refined tar are in good request and most other items are moving well.

**MANCHESTER** In spite of an increasing number of delivery suspensions arising from holiday stoppages at textile mills and other industrial outlets, there have been a fair number of enquiries circulating during the past week. A reasonably steady movement into consumption is reported for soda and potash compounds and a wide range of general chemicals, including hydrogen peroxide, borax and boric acid, alum and sulphate of alumina. The price position generally has been maintained. Demand in most sections of the tar products market is maintained at a satisfactory level.

**SCOTLAND** Despite pockets of inactivity which have, if anything, increased during the past week, reflecting the popular term credit squeeze, business on the whole has been brisk. The demand for the usual run-of-the-mill chemicals is on a par with any period in the past, with certain unaccountable shortages still prevailing, due mainly to increased demands. Prices where shortages are acute are inclined to be on the high side, but on the whole they are steady. The weather, with its advantages and disadvantages, has resulted in very good demands for agricultural chemicals, and in keeping with the healthy signs during the past week in the home market, the interest in export has been maintained.

# Commercial News

- Boots Report Rise in Bulk Chemicals Sales
- 45% Increase in W. J. Bush Net Profit
- Laporte Offer for Peter Spence Shares
- Sturge Issue is Heavily Oversubscribed

## Amber Chemical Industries

The arrears of the dividend for the year 1956, on 5% Preference shares, are payable on 1 July, state Amber Chemical Industries Ltd.

## Boots Pure Drug

In his annual statement, Mr. J. P. Savage, chairman, who is to retire next year, said that pre-tax profits were £7.56 million, 51% higher than the previous year's figure of £4.99 million. The manufacturing operations made an important contribution to the increase in profits, a reflection partly of increased output and partly of improved efficiency.

Export patterns have changed considerably over the last few years with lower sales of bulk chemicals as a result of intensified world competition. The loss has been more than made good by improved sales of Boots' branded medical, pharmaceutical and veterinary specialities. Sales by overseas companies increased by more than 15% over the previous year and now total well over £2.5 million. A growing proportion of this business now comes from local manufacturing resources.

The Home Wholesale Division's sales were a new record and the total included a welcome increase in manufacturing for other pharmaceutical companies. Bulk chemicals' turnover has also increased, a noteworthy improvement because certain of the less profitable lines were cut from the chemical inventory during the year.

## British Glues

Group profits before tax of British Glues and Chemicals Ltd. for the year ended 31 March were £384.905 (£631,407). After tax of £132,000 (£266,000), the net balance was £252,905 (£365,407). Final dividend of 17½% (same) is declared, making 22½% (same).

## W. J. Bush

Group trading profit of W. J. Bush and Co. Ltd. was £1,045,875 (£796,798) for the year ended 31 March. Net profit rose 45% to £457,978 (£313,643), after depreciation of £185,424 (£166.934) and tax of £376,312 (£289,694). Final dividend of 10% is declared, making 14% on increased capital (against an equivalent 10½%). A further scrip issue of one 'A' Ordinary for every two Ordinary or 'A' Ordinary held is proposed.

## Laporte Industries

Group income for the year ended 31 March before tax of Laporte Industries Ltd., of £3,147,943, a record and 83.6% higher than the previous year, included £258,633 earned by the Sheffield Chemical Co., James Wilkinson and Son and Glebe Mines which were not subsidiaries in the previous year. Their collective pre-tax profit was then £157,693.

Referring to the production of hydrogen peroxide by Laporte Chemicals, Mr. P. D. O'Brien, chairman, in his annual statement, said that although world production had risen substantially, it appeared that consumption was more than keeping pace with it. The manufacture and sale of organic peroxide products was playing an increasingly important part in the economy of this subsidiary. The sodium chlorite plant was now coming into operation. Laporte Chemicals had a number of developments in hand, but no major capital spending was envisaged in the current year.

Laporte Acids had a successful year's trading and were now integrating their various sites to best efficiency and widening the scope of their business. Not a great deal of capital spending was involved. Acquisition of Glebe Mines and James Wilkinson enabled the company to enter the field of fluorine chemistry.

The associated National Peroxide Ltd., Bombay, reported that sales demand for hydrogen peroxide was such that plant capacity was to be raised 50%. (See CHEMICAL AGE, 25 June, p. 1071).

## Griffiths Hughes

Griffiths Hughes Proprietaries Ltd. announce a consolidated profit for the year ended 31 March of £611,825 (£516,615 after adjustment for overseas taxation). After U.K. taxation of £247,170 (£247,696) and overseas taxation of £31,526 (£28,081), the payment of dividends, and the placing to reserve of nil (£101,316), carry forward is £378,405 (£190,809). The directors also state that, having paid interim dividends amounting to 12% (10%) on Ordinary, no final dividend will be recommended.

## Midland Tar Distillers

In the year ended 31 March, Midland Tar Distillers benefited from the general improvement in trading conditions and an increase in all-round efficiency at the works at Four Ashes and Nechells said Mr. R. B. Robinson, chairman. Tar acids continued to prove a successful and demanding market, both at home and abroad; naphthalene was in constant demand for the production of phthalic anhydride and the company was making steady progress in expanding and exploiting its pyridine bases. Group commitments for capital spending at 31 March amounted to about £152,500 (£120,000).

## Peter Spence

Laporte Industries Ltd. have made an offer through Morgan Grenfell and Co. for the 5% cumulative preference shares and the ordinary shares of the old-established family chemical business of Peter Spence and Sons Ltd., Widnes, for a total cash consideration of about £2.5 million. This offer was made in agreement with Mr. Derek Spence and his co-directors who have recommended it to shareholders. Acceptance by a majority of shareholders has been assured.

The Spence business in the production of heavy chemicals including aluminium sulphate, sulphuric acid, catalysts and organic titanium compounds, is in some respects complementary to the existing interests of the Laporte Group.

## Wm. Neill and Son

Net profit after tax of Wm. Neill and Son (St. Helens) Ltd. for the year ended 31 March was £178,893 (£197,624). A dividend of 11d. per share (same) is proposed. Level of production at Bold Works fell due to reduced demand. Competition was keen for the work available and profit margins narrow. Work ahead is said to be now more satisfactory with delivery times short dated.

## John and E. Sturge

The issue of 600,000 5s shares by John and E. Sturge was heavily oversubscribed at 11s per share with 14,738 applications for a total of 14,101,700 shares.

## Et. Kuhlmann

Manufactures de Produits Chimiques du Nord, Etablissements Kuhlmann S.A., Paris, announce a net profit of N.F. 11,940,000 (N.F. 11,640,000) after depreciation of N.F. 30,150,000 (N.F. 24,200,000) for the financial year 1959. A dividend of N.F. 7.80 (N.F. 7.73) per share is declared.

## Rhône-Poulenc

Average monthly production in the first four months of 1960 by the French chemical producers Soc. des Usines Chimiques Rhône-Poulenc was 18.8% higher than the monthly average for 1959. Compared with the total turnover for the first four months of 1959, that for the January-April period of this year was higher by 24%. Capital is to be raised in one or several stages to N.F.600 million.

## Valeurop

Shares of I.C.I., B.P., the I.G. Farben successor companies, Vereinigte Glanzstoff-Fabrieken, Montecatini, Società Edison, Péchiney, Air Liquide and Royal Dutch are among those to be covered by Valeurop, a new investment fund set up in Luxembourg on 20 June. Single holdings in the fund are to be issued at Lux. Fr.950 and in bundles of 1,10 or 25 shares. Organisers of the new fund are the Luxembourg-based Euralliance, Société de Gestion d'Investment Trusts S.A.

# NEW PATENTS

*By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.*

*Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.*

## ACCEPTANCES

### Open to public inspection 4 August

Process for starting an installation for the pressure refining of crude benzene. Koppers GmbH., H. **843 632**

Process for preparing anion exchangers on the basis of thiuronium salts. Cerny, J., and Wichterle, O. **843 006**

Process of producing glutamic acid compounds. International Minerals & Chemical Corporation. **843 552**

Pharmaceutical compositions containing piperidine derivatives. Imperial Chemical Industries Ltd. **843 118**

Process for the production of pregnadienes. *Schering Corporation.* [Divided out of and addition to 843 211.] **843 213; 843 217 & 843 218**

Steroid compounds. Schering Corporation. **843 214; 843 215; 843 216**

Products containing grafted polymers and process for their preparation. Montecatini Soc. Generale Per l'Industria Mineraria E Chimica. **843 190**

Process for making bis-($N_1$-N-disubstituted amino-alkyl) acetylenes. Lakeside Laboratories Inc. **843 194**

Production of bromine oxygen compounds. Soc. d'Etudes Chimiques Pour l'Industrie Et l'Agriculture. **843 558**

Apparatus for producing porous or homogeneous plastics. Farbenfabriken Bayer AG. [Addition to 626 623.] **843 197**

Process for simultaneously removing naphthalene and water vapour from coke oven gas. Stamicarbon N.V. **843 503**

Preparation of *cyclic dimethylsiloxanes.* Union Carbide Corporation. **843 273**

Polymerisation process. Imperial Chemical Industries Ltd. **843 611**

Material comprising bonded fibres and method of producing same. Pluhacek, R., and Trachta, J. **843 612**

Polyethylene compositions and process for their manufacture. Cabot Inc., G. L. **843 617**

Glycyrrhetinic acid derivatives. Biorex Laboratories Ltd. **843 133**

Water-insoluble styryl dyestuffs. Sandoz Ltd. **843 643 & 843 644**

*Catalytic reforming* of non-aromatic hydrocarbons. British Petroleum Co. Ltd., White, P. T., and Burbidge, B. W. **843 203**

6-Methyl steroid compounds. British Drug Houses Ltd. **843 353**

Pharmaceutical compositions. Biorex Laboratories Ltd. **843 134**

Recovery of thorium by means of *oxalic acid.* United Kingdom Atomic Energy Authority. **843 206**

Normally solid copolymers of aryl diolefins and terminally unsaturated olefins and process for preparing them. Du Pont De Nemours & Co., E.I. **843 207**

Manufacture of polyethylene terephthalate. Imperial Chemical Industries Ltd. **843 356**

Process for the production of solid thermoplastic synthetic materials. Henkel & Cie GmbH. **843 361**

Conjunct chlorination procedure for polyolefines. *Dow Chemical Co.* **843,209**

Methods for recovery of polymers. Phillips Petroleum Co. **843 027**

Process for determining cyanide concentrations in solution. Deutsche Gold- and Silber-Scheideanstalt Vorm. Roessler. **843 028**

Pentacyclic triterpene triols derived from glycyrrhetinic acid and pharmaceutical compositions. Biorex Laboratories Ltd. **843 137**

Compositions comprising polyvinylchloride blended with linear chlorinated polyethylene. Dow Chemical Co. **843 210**

Polymerisation of olefins and catalysts therefor. Esso Research & Engineering Co. **843 408**

Steroidal lactones. Searle & Co., G. D. **843 155**

Process for the production of hyposulphurous acid and salts and esters thereof. Farbenfabriken Bayer AG. **843 291**

Production of cumene hydroperoxide. Distillers Co. Ltd. **843 032**

Steroid compounds. Laboratoires Francais De Chimiotherapie. **843 516**

Thiophosphoric acid esters. Farbenfabriken Bayer AG. **843 309**

Benzoquinolizine derivatives and a process for the manufacture thereof. Hoffmann-La Roche & Co., F. A. G. **843 310**

Acid milling of phthalocyanine pigments. General Aniline & Film Corporation. **843 051**

Glycidyl polyethers and products produced therefrom. *Westinghouse Electric Corporation.* **843 233**

Production of hydro-brominated derivatives of olefinically unsaturated compounds. Distillers Co. Ltd. **843 234**

Production of polyesters of carbonic acid. Badische Anilin- & Soda Fabrik AG. **843 314**

Photopolymerisable compositions. Du Pont De Nemours & Co., E.I. **843 238**

Compositions containing polymeric substances. De Bataafsche Petroleum Maatschappij. **843 239**

Production of glycidyl polyethers of polyhydric phenols. Union Carbide Corporation. **843 575**

Preparation of isoglutamine and derivatives thereof. Uclaf. **843 373**

Water-in-oil suspension polymerisation of water-soluble ethylenically unsaturated monomers. Dow Chemical Co. **843 374**

Bonding of polyamides to rubber. Badische Anilin- & Soda Fabrik AG. **843 377**

*Steroid compounds. Laboratoires Francais De* Chimiotherapie. **843 517**

Substituted amino-acid hydrazides and a process for the manufacture of same. Hoffmann-La Roche & Co. AG., F. **843 372**

Method of radiation graft copolymerisation of N-vinyl lactam monomers on acrylonitrile polymer substrates. *Dow Chemical Co.* **843 063**

2,2-Diaryl-ω-(4¹-phenyl-1¹piperidimo) alkanonitriles. Janssen, P. A. J. **843 319**

Gas chromatography analysis system. Foxboro Co. **843 065**

Ester salts of sugars. Farbenfabriken Bayer AG. **843 067**

Derivatives of 2-piperidyl phenyl methanol. Soc. Des Usines Chimiques Rhone-Poulenc. **843 070**

Process for the manufacture of carbamates and novel carbamates. Hoffmann-La Roche & Co., F. **843 331**

2-Methyl-3-orthotolyl-4-quinazolone and acid addition salts thereof. Laboratoires Toraude. **843 073**

Production of beta-ionylidene-ethyl-triaryl phosphonium halides. Badische Anilin- & Soda-Fabrik AG. **843 422**

Polymerisation of aliphatic olefins and the resulting polyolefins. Bataafsche Petroleum *Maatschappij N.V., De.* **843 424**

Production of unsaturated polyesters containing tetrahydrophthalic acid and suitable for air-drying unsaturated polyester resins. Chemische Werke Hüls AG. **842 958**

Organo-polysiloxane resin coating compositions. Midland Silicones Ltd. **843 074**

Process for the production of methane-rich gas mixtures. Bataafsche Petroleum Maatschappij N.V., De. **843 459**

Phosphonate compounds. Dow Chemical Co. **843 428**

Manufacture of *isozeaxanthine* compounds. Hoffmann-La Roche & Co. AG, F. **843 438**

O-aminoalkyl oximes. Ciba Ltd. **842 968**

Heterocyclic hydrazine derivatives and a process for the manufacture of same. Hoffmann-La Roche & Co. AG, F. **843 440**

Steroid compounds. Schering Corporation. [Divided out of 843 211.] **843 219**

*Production of unsaturated alcohols.* Chemische Werke Hüls AG. **843 585**

Preparation of hydrazine sulphate. Soc. Des Usines Chimiques Rhone-Poulenc. **843 587**

Synthetic rubber compositions. Switzer Bros. Inc. **843 160**

Process for the production of monovinyl acetylene of high purity. Knapsack-Griesheim AG. **842 969**

Polymerisation catalysts. Esso Research & Engineering Co. **843 385**

Epoxy-ethyl benzenes. Geigy AG., J. R. **843 083**

Neutralisation of fatty-acylisethionate detergent preparations. Unilever Ltd. **843 593**

Process for the preparation of iodine. Baatafsche Petroleum Maatschappij N.V., De. **843 599**

1,1,2-Trifluoroethylfluorosulphonate and fumigation process. Dow Chemical Co. **843 594**

Removal of acetylenes from butadiene-bearing streams with cuprous ammonium acetate. Esso Research & Engineering Co. **843 255**

Polymerisation process. Solvic S.A. **843 170**

Production of high percentage nitric oxide. Badische Anilin- & Soda-Fabrik AG. **843 597**

Glycyrrhetinic acid salts. Biorex Laboratories Ltd. [Divided out of 843 133.] **843 135**

*Pyridine derivatives. Irwin, Neisler & Co.* [Divided out of 842 995.] **842 996**

### Open to public inspection 10 August

Separation of plutonium. Angerman, A. H. **844 151**

Production of rubber composition sheet material. Semtex Ltd. **843 763**

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