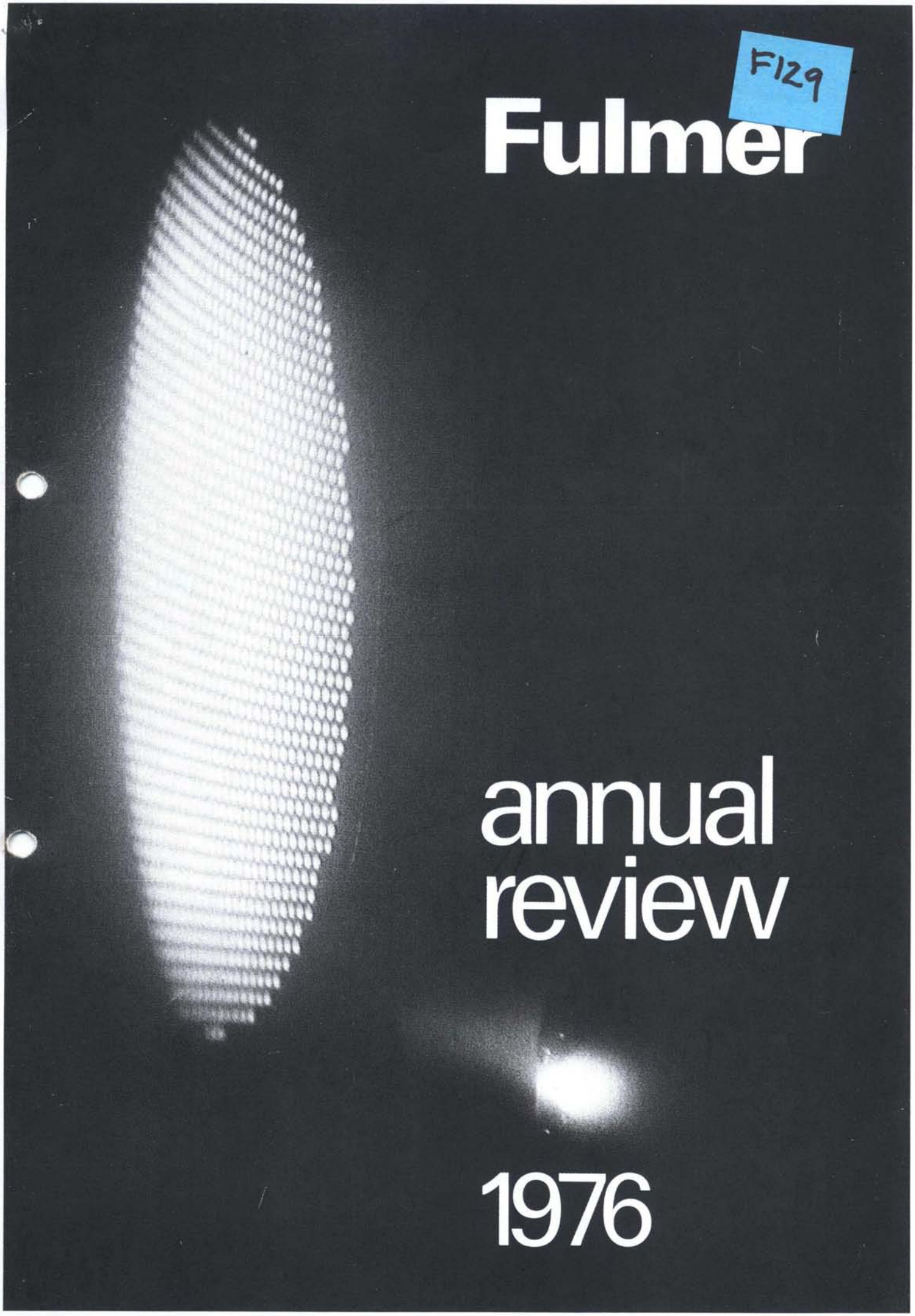
Fulmer



annual review

1976

Fulmer Research Institute Limited 1976

Chairman's Foreword

On the occasion of Fulmer's 30th Anniversary this Annual Review has been prepared to inform our sponsors, other friends and associates of our financial performance and current range of business activities.

It is pleasing to be able to report that, despite the economic storms blowing in the United Kingdom during 1976, Fulmer had a successful year, in which income was increased by nearly 30% and profit by 75%. For this achievement I am grateful to the considerable efforts of all our staff. This Review illustrates some of the major areas in which this effort was expended.

James Taylor.

James Taylor

Front cover: The plasma thrust plume from the U.K. ion engine during life tests.

The Fulmer Research Institute Limited

Fulmer is a contract research and engineering company concerned with the science and technology of materials. We provide research, development, consulting and production engineering services to industry, commerce and government. Our aim is to assist clients to manufacture products and operate more profitably.

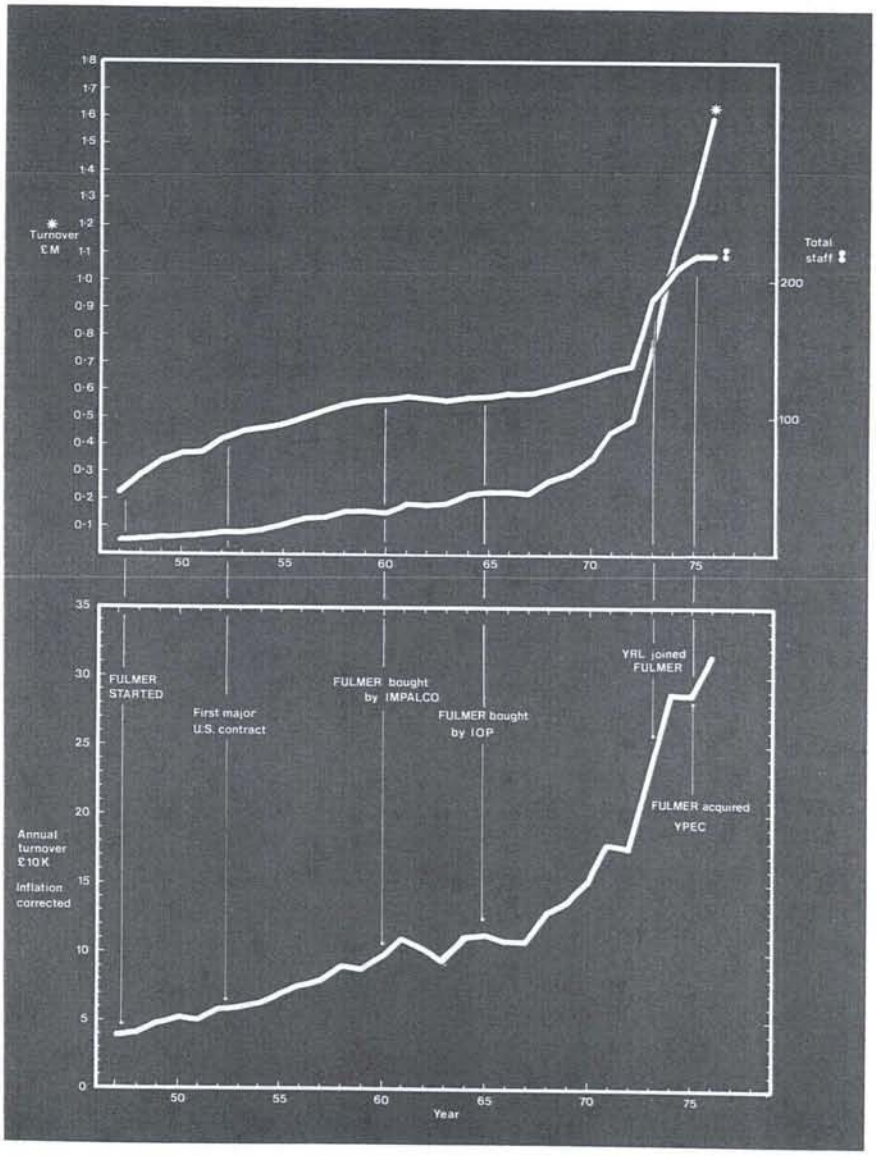
Our research, development and consultancy activities involve all engineering materials, including metals, plastics, polymers, ceramics, fibres, composites, refractories, glasses and adhesives. Typical projects range from the development of new materials and new ways of processing materials, to the evaluation of the properties of materials under real or simulated service conditions using existing or specially developed testing techniques.

Consultancy assignments include routine testing and analytical services, materials selection, failure diagnosis and technical advice relating to patents. Technical and economic studies and market surveys are also undertaken to assist with company diversification programmes or product and process development in engineering materials.

Fulmer is able to assist with a project from its initial conception, through research and development to full scale manufacture. The work is carried out under strict conditions of commercial security.

Fulmer is non profit distributing, is owned by the Institute of Physics and receives no grants or subsidies from any source. It is, therefore, completely independent.

The growth since our foundation in 1946 is shown in the two graphs.



Income Growth and Staff Numbers.

Income, Inflation corrected to 1946 values.

Group Trading Report

Total income for the year increased to £1.67M, compared with £1.29M in 1975. With inflation at an average level of 15% during the year this represents a real increase of about 10%.

A record consolidated profit of £110.921, an increase of more than 75% on the 1975 result, was achieved.

The consolidated balance sheet shows an increase in net worth of the group to £678,215 (1975 £540.842) and net current assets have increased by more than £100,000 to over £280,000.

Financial results for the individual members of the Group are summarised below.

	Turnover			Net Profit	
	1975 £	1976 £	Increase %	1975 £	1976 £
Fulmer Research Institute Ltd	952,215	1,133,971	19.09	24,278	49,425
● Yarsley Research Laboratories Ltd	260,078	306,098	17.69	32,656	36,366
Fulmer Components Ltd	68,169	109,357	60.42	4,715	15,771
Reform Manufacturing Co Ltd	13,776	15,341	11.36	430	3,450
IPEC (Polymers) Ltd	*	106,920		*	5,909

● This company includes the operating division Yarsley Testing Laboratories whose activities produce most of its income.

The operating surplus of £110,000 was used to finance the following:

Addition to capital assets	£67,000
Reduction of overdraft	£24,000
Increased working capital	£19,000

The total staff employed at the end of 1976 was 225 of whom 97 hold University degrees or equivalent.

* As IPEC (Polymers) Ltd were not members of the Group in 1975 comparative figures are irrelevant.

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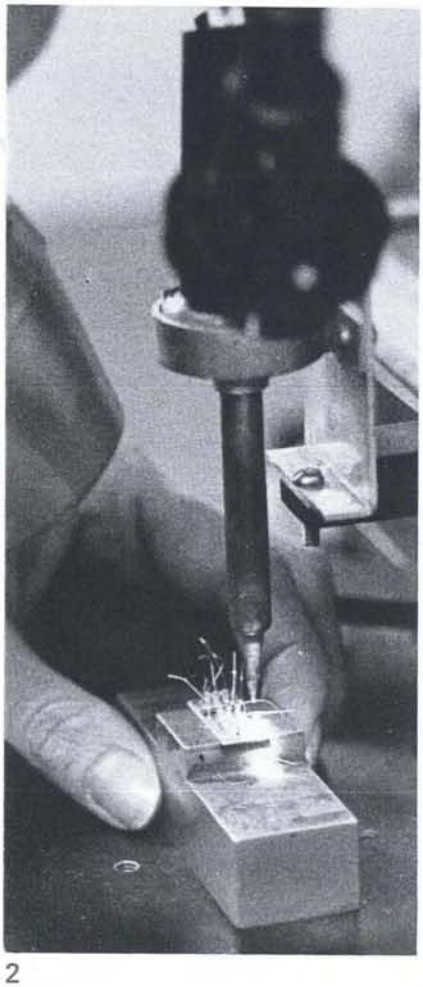

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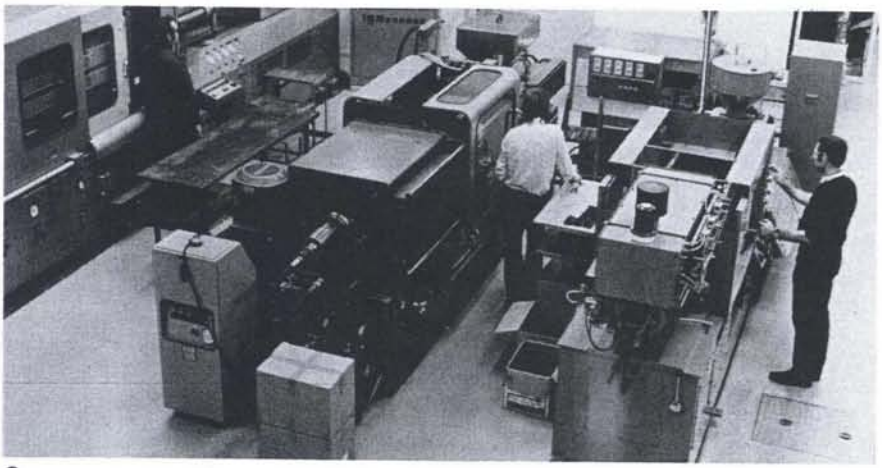

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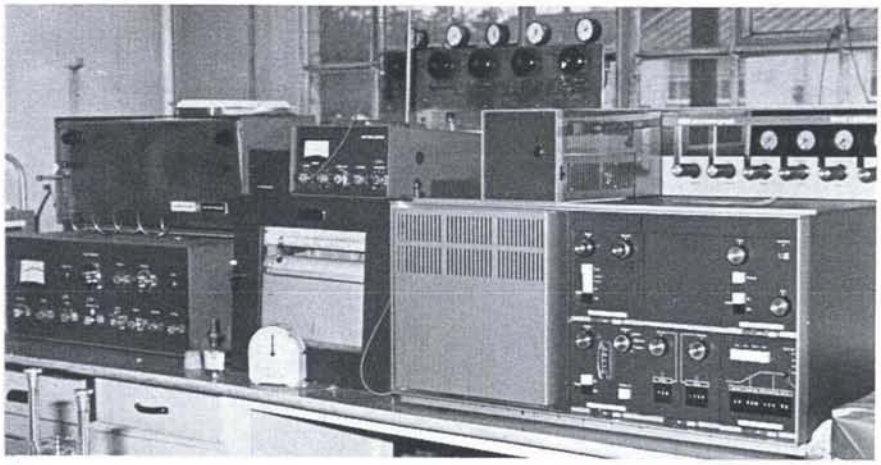

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1 *Fulmer Research Institute – The main administration building, Stoke Poges*

2 *Fulmer Components Limited – Assembly of electronic components, Slough*

3 *Yarsley Polymer Engineering Centre – Injection moulding workshop, Newhaven*

4 *Yarsley Testing Laboratories – Analytical Laboratory, Ashtead*

YPEC

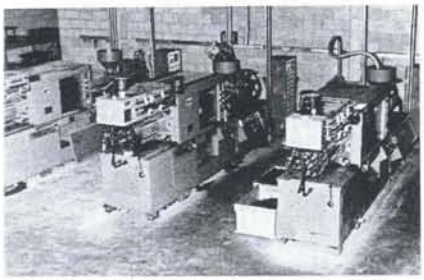
The year commenced with the acquisition by Fulmer of IPEC (Polymers) Ltd and the formation of the new division, YARSLEY POLYMER ENGINEERING CENTRE (YPEC). This development has greatly improved our ability to satisfy the growing world market for the design and manufacture of high quality polymer products.

A major success during the year was the programme carried out for the Black and Decker organisation on the re-design of certain components for their fast selling Workmate, and the setting up of a unit in Eire to manufacture these re-designed parts.

Top: Cost effective polymer component design in the award winning Black and Decker workmate.

Middle: Optimising Hot-runner economics with temperature control system.

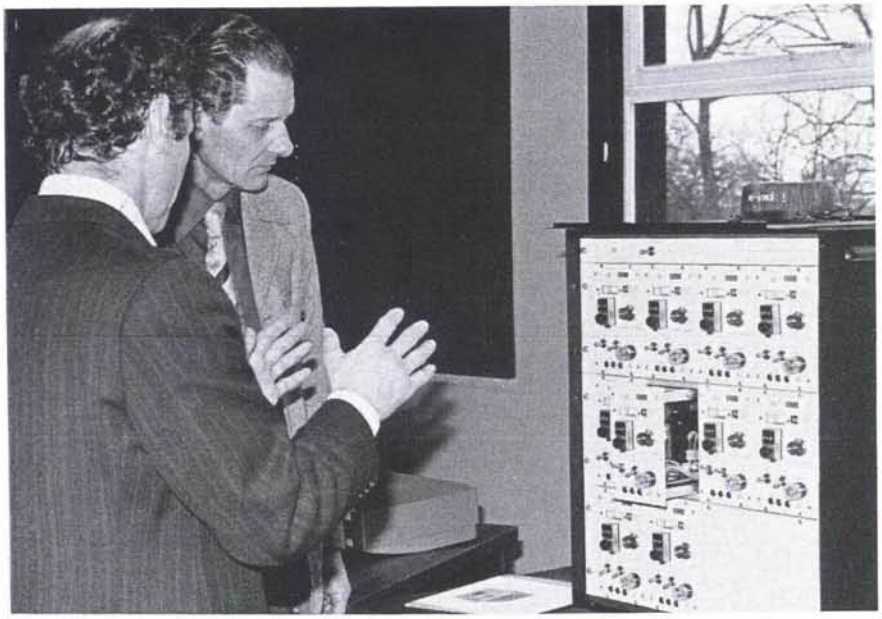
Bottom: Novel heater test unit to improve mold utilisation.

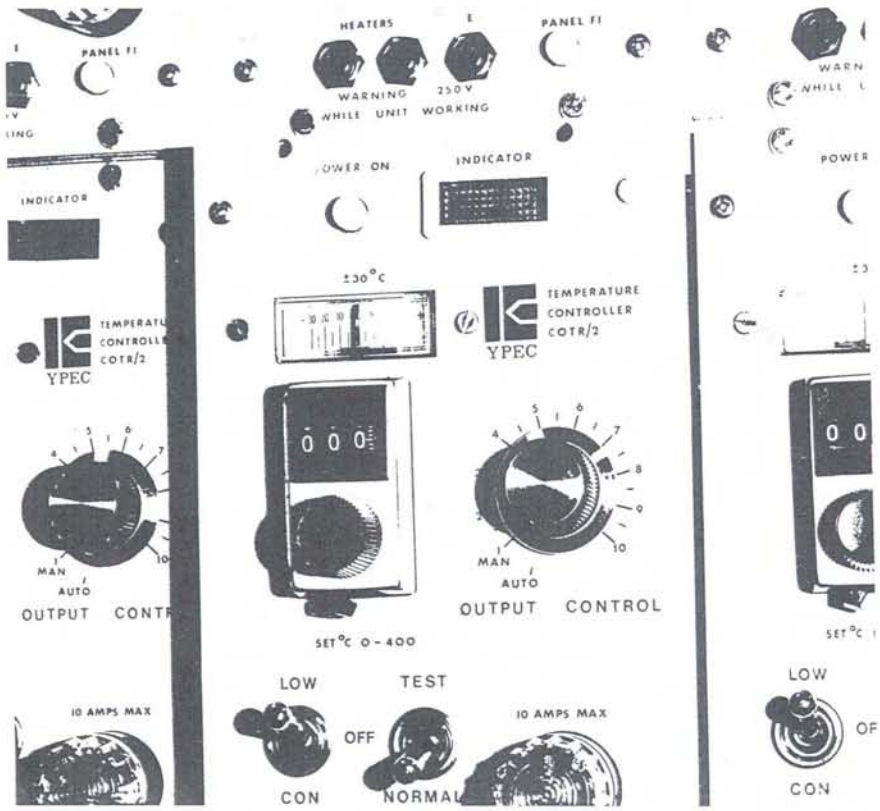


Technology Transfer

Fulmer successfully responded to the UK Government call for the profitable transfer of technology into manufacturing industry by winning major contracts from several Requirements Boards. Most notable were the Mechanical Engineering and Machine Tools Requirements Board contract for the development of a novel system for processing polymers, using a new type of controller to be developed and marketed by the YPEC operation and the Chemical and Minerals Board's support for work on extraction of aluminium from indigenous sources.

Fulmer's planning analytical techniques (RPD and AUQ) have been used successfully to evaluate certain of the Requirements Boards projects.





Overseas Activities

Overseas income again increased. In co-operation with the Paint Research Association a major contract was obtained from the Housing and Urban Development Department of the USA to investigate processes for the abatement of the lead based paint hazard in old buildings.

A hinged boom latch and release system for solar battery panels and other purposes was produced under contract from the European Space Agency, and this demonstrated a new application for shape memory alloys in which a torsional element was used to operate the mechanism.

Other work for the ESA includes studies of radiation effects in spacecraft electronic components. A standard MOS test device for damage detection has been produced.

The development of a caesium field-emission thruster for satellite manoeuvring has proceeded, with thruster levels greater than 1 mN now being obtained. A pre-flight prototype design for the thruster system is currently under consideration.

The International Copper Research Association continues to sponsor work at Fulmer. A copper sprayed hardboard garden hut is undergoing weathering trials in the Stoke Poges grounds. A new contract to study the fundamentals of adhesion of insulating enamel on copper wire was received.

Our network of overseas agents has been increased particularly in the USA, Australia and Japan. Contracts were won for the first time in the Middle East, two in Iran and one in Saudi Arabia. The establishment of the Metals Advisory Service in Pakistan sponsored by UNIDO continued, four of Fulmer senior staff spending a total of fifteen man months in that country in 1976.

Research Programmes

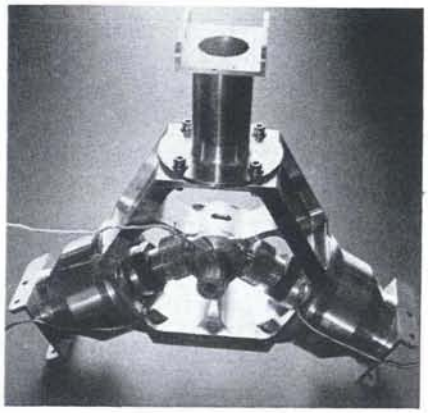
The new solar laboratory was completed during the year. We are engaged in the development of economically viable systems using solar energy for domestic space and water heating. Related research is also being conducted under the same programme to identify the materials, components and processes which should be employed in future commercial systems.

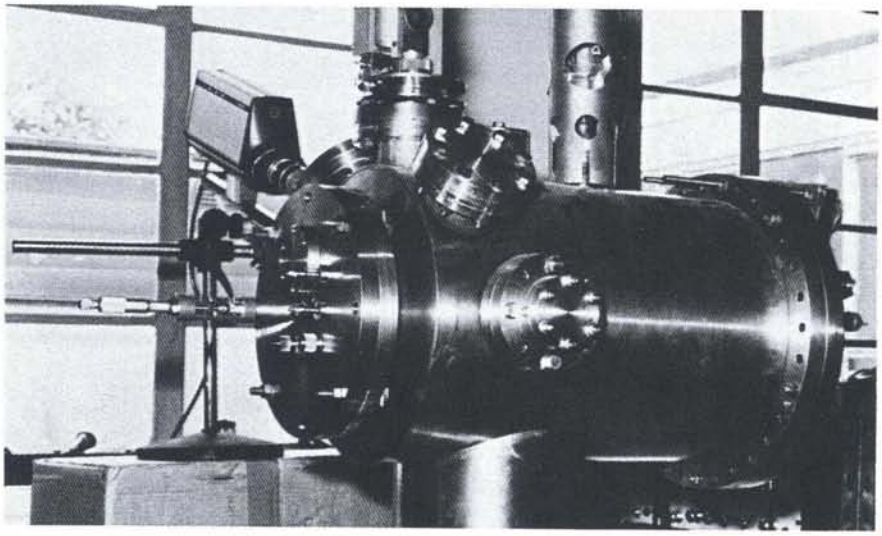
The construction of this solar laboratory enables the thermal behaviour of various types of dwellings to be simulated. It is fully instrumented for monitoring, recording and analysing performance as a function of the local climate, and can be rotated to study the effect of orientation on collection efficiency.

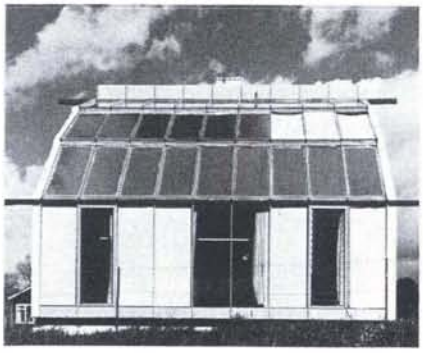
Top: Mechanism for simultaneous release of three booms in deployment of satellites.

Middle: Test rig for caesium thruster.

Bottom: Solar energy laboratory with an effective collection area of 56m^2 and volume of 280m^3.







Above: Acoustic emission detects premature failure of concrete beam.

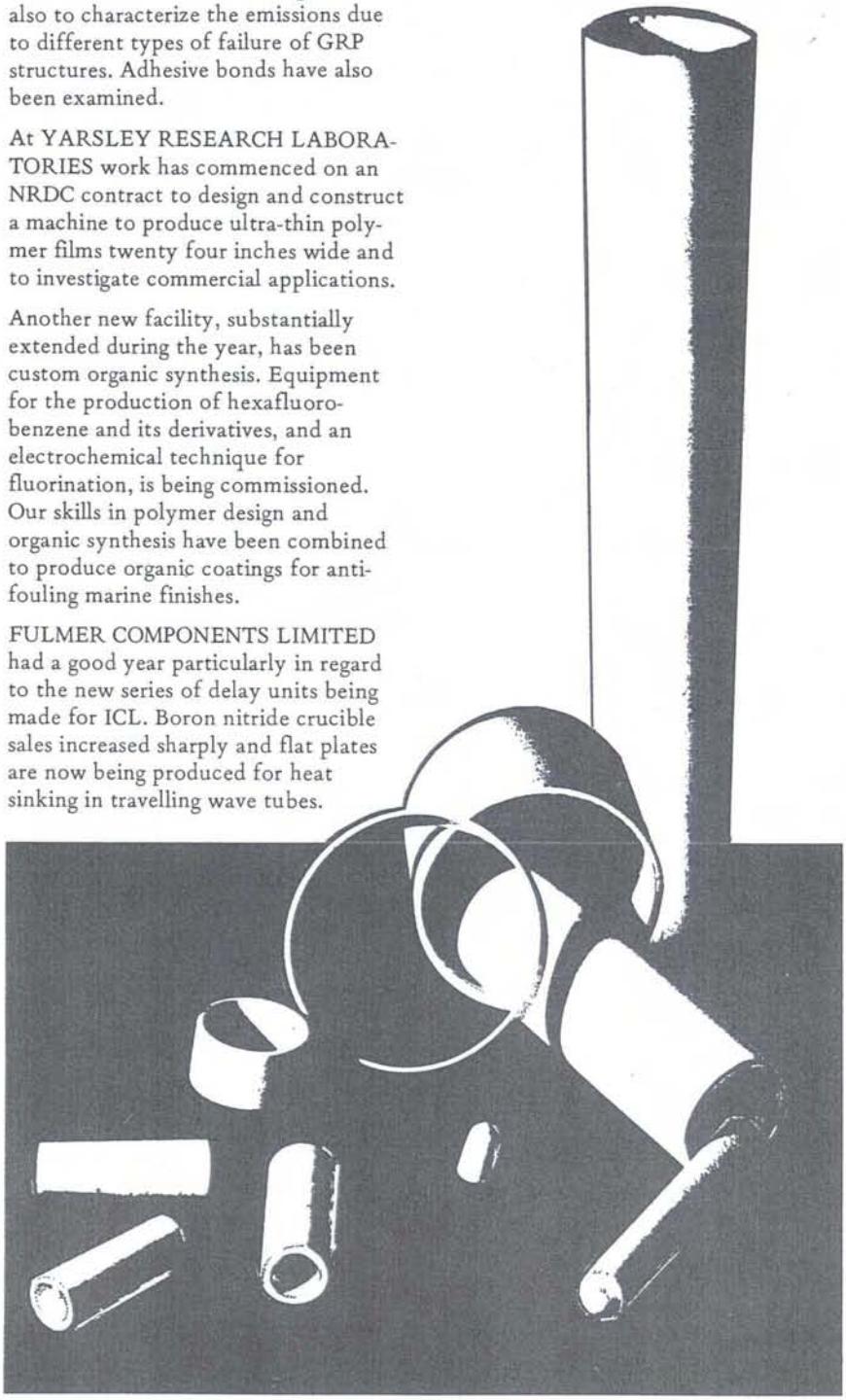
Below: Boron Nitride Components made by chemical vapour deposition.

A new service for industry, developed during the year, has been acoustic emission. The equipment has been used to examine the behaviour of concrete beams under loading, and also to characterize the emissions due to different types of failure of GRP structures. Adhesive bonds have also been examined.

At YARSLEY RESEARCH LABORATORIES work has commenced on an NRDC contract to design and construct a machine to produce ultra-thin polymer films twenty four inches wide and to investigate commercial applications.

Another new facility, substantially extended during the year, has been custom organic synthesis. Equipment for the production of hexafluorobenzene and its derivatives, and an electrochemical technique for fluorination, is being commissioned. Our skills in polymer design and organic synthesis have been combined to produce organic coatings for anti-fouling marine finishes.

FULMER COMPONENTS LIMITED had a good year particularly in regard to the new series of delay units being made for ICL. Boron nitride crucible sales increased sharply and flat plates are now being produced for heat sinking in travelling wave tubes.



At YARSLEY TESTING LABORATORIES major contracts were received from the Department of Environment for testing of large building components, from the Ministry of Defence for fire testing and from an industrial firm for large scale pipe testing. The pollution monitoring services introduced in 1975 are now greatly in demand.

Internal Developments

Additions to capital assets were mainly in the improvement and updating of our general laboratory facilities, particularly specialised analytical service equipment for surfaces and gases. Unique apparatus for recording transient events, extension of machining services for difficult materials and thermal analytical equipment were also installed.

Safety procedures were strengthened and new mechanical handling equipment was installed to reduce hazards. In this respect the provisions and inspection procedures of the new Health and Safety Act were implemented.

An elected Representative Council was established from the 1st January 1976. All grades of staff at the four Fulmer sites are represented on this Council, which is now making a significant contribution to the development of Fulmer's policy making procedures.

A pipe in preparation for long term pressure testing.

INFORMATION SERVICES AND PUBLICATIONS

Fulmer's information services include technical market surveys on a confidential or multi-client basis, and specialist publications. Recent typical surveys have covered new applications for established engineering materials and processes, identification of markets for new materials, technical and economic feasibility studies for new products, and searches for licensing opportunities. A current awareness service in particular technologies is also available.

The health problems associated with asbestos caused popular concern during the year. The Institute published an authoritative report on the hazard characteristics and alternatives to asbestos. Other major publications in 1976 included Statistics on Plastics and Manganese in Ferrous Metallurgy, produced for the Manganese Centre.

For further details of Fulmer's information services and publications, please contact: Dr. N.A. Waterman, Marketing and Information Department.

Telephone: Fulmer 2181.

Fulmer in Perspective

This review has only touched on some of our new major programme changes in 1976. Continuing work in our six operating divisions is outlined below.

Fulmer Research Institute

Surface coatings including chemical vapour deposition, electrodeposition, metal spraying; energy research; novel propulsion systems; alloy development including bearing materials, damping alloys, high energy impact absorbing materials, memory metals; metals processing including die casting, powder metallurgy, metal forming. Fibre reinforced composites.

Yarsley Research Laboratories

Chemistry of polymers, including new formulations, hot melt adhesives, process development, custom synthesis, market research and surveys.

Yarsley Polymer Engineering Centre

Research and development of plastics processing; design and manufacture of specialised systems for polymer processing; product design and evaluation; mould design, procurement and proving; 'turnkey' factory establishment for cost effective production of polymer products; technical surveys.

Fulmer Technical Services

Complete range of analytical and mechanical testing facilities together with sophisticated equipment including XPS, SEM, EDAX, TEM and Quantimet for failure diagnosis and examination of surfaces. Fulmer Technical Services specializes in trouble shooting, simulation testing and consultancy.

Yarsley Testing Laboratories

Examination and evaluation of plastics, rubbers, paints, adhesives, timber products, thermal insulating materials, floor coverings, building materials, consumer goods. Special test facilities include fire testing, pollution test equipment, mechanical and chemical testing, thermal conductivity testing.

Fulmer Components Limited (including Reform Manufacturing)

Special product manufacture including pyrolytic boron nitride in the form of crucibles, plates and coatings for the electronics industry; delay units for computers; specimen stages and filaments for electron microscopes.

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