Mintech ERDE

OPEN DAYS 1968

Press Tour - 13th June

Coach Party No. 2

Guides: Mr. M.J. Harper
Mr. R.C. France

Itinerary:

Exhibit No. D 21	Polymer Development and Applications
Exhibit No. C 13	Composite Materials
Exhibit No. A 5	Composite Propellants
Exhibit No. C 18	Advanced Explosives Facility

MINISTRY OF TECHNOLOGY
press notice

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EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT

PRESS VISIT - 13th JUNE 1968

The Ministry of Technology's Explosives Research and Development Establishment, Waltham Abbey, was set up in 1945. The Establishment was first operated by the Ministry of Supply, then the Ministry of Aviation and finally, since February 1967, by the Ministry of Technology. This is the first occasion on which the Press have been invited to inspect its work.

In its early days ERDE was concerned exclusively with work on liquid and solid propellants and explosives but over the years the Establishment's activities have been extended to cover non-explosive materials such as polymers and adhesives and its R & D programme now embraces numerous projects of general industrial interest An increasing proportion of the Establishment's work has been directed towards civil rather than military applications and one of the main objectives of the Open Days is to ensure that industry is informed about the research facilities and body of expert knowledge that is available at ERDE for the solution of technological problems.

PRESENT STRUCTURE OF ERDE

There are currently seven technical branches within ERDE, each headed by a Superintendent. Two of these are concerned with research and development on propellants, one dealing with those based on nitrocellulose while the other is responsible for work on composite propellants using plastic or rubbery binder systems. An explosives branch is primarily concerned with the development of high explosives and initiating compounds and with carrying out tests on explosives and propellants to provide information for users on safety requirements.

The first materials laboratory was established on the North Site in 1956 and there are now two materials branches, one of which undertakes basic and applied research on the chemistry and physics of polymers while the other is engaged on research and development on fibre-reinforced materials and the growth of ceramic whiskers. The remaining two branches - Analysis and Ingredients, and Chemical Engineering - exist essentially to provide services for the other branches. The first deals with chemical and physical analysis and provides an advisory service on the stability and compatibility of explosives and other hazardous materials; the second is concerned with the techniques and equipment required to develop laboratory processes up to the pilot plant stage.

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REPRESENTATIVE EXHIBITS

Of the 38 exhibits arranged for the Open Days programme the five described below are representative of the major fields of interest of the Establishment.

Fibre-Reinforced Materials (Exhibit C 13)

In the continuing search for engineering materials with improved physical properties, metals and plastics reinforced with whiskers (needle crystals) and other fibres are now the focus of attention at a number of research centres. At ERDE work on composite materials is now concentrated on the application of two types of fibre - refined asbestos for good properties at lowest cost and silicon carbide whiskers for the best properties at a reasonable cost on a mass production basis. The exhibit illustrates the development of whiskers and similar fibres, their incorporation into different plastics and light alloys and some examples of applications.

In another part of the Establishment (Exhibit E 24) can be seen the equipment used for the production of silicon carbide and silicon nitride whiskers by vapour phase chemical reactions.

Packaged Power from Solid Propellants (Exhibit A 11)

Solid propellants developed at ERDE are used not only in weapons for all three Services, for space research vehicles and meteorological rockets but also provide a convenient source of packaged power for such devices as the Martin Baker Rocket Ejection Seat, fire-drenching equipments, engine starters and signal and line-throwing rockets. The Establishment makes use of four types of propellant - plastic, rubber-based, extruded cordite and cast double-base - to produce the wide range of characteristics needed for different applications. The exhibit has been arranged to give an insight into the properties of the various propellants and their fields of application. The current programme of applied research on propellants includes work designed to give faster or slower burning rates, greater energy content, wider temperature range of operation and reduction of smoke and flash.

Polymer Development and Applications (Exhibit D 21)

Much work on the development of rubber proofed fabrics for use in flexible storage containers for liquids, hovercraft skirts and aircraft arrester tapes has been carried out by the Polymer Development and Applications Group. The design and strength of the joints between the proofed fabric sections of Dracone flexible barges and large pillow tanks is one of the subjects under investigation. The evaluation of new plastics and rubbers is another important part of the group's work. Special purpose moulds have been designed to produce the test specimens required for the assessment of the engineering properties of these materials and an investigation is in progress into the production of low-cost injection moulds made from metal-filled thermosetting resins.

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The group is also frequently called upon to look into the causes of failure of components and to suggest remedies. As an illustration of the valuable results that can be obtained from these trouble-shooting exercises visitors can see samples of highly conductive rubbers developed to prevent the build-up of static electricity on the solid rubber tyres of tracked vehicles.

Remote Processing Facility for Advanced Explosives (Exhibit C 18)

To improve the performance of high explosive and propellant systems it is necessary to experiment with new and untried components as oxidisers, fuels and binders. In order to be able to assess explosive and ballistic properties before a detailed examination has been made of all the factors influencing sensitiveness and stability this remote processing facility has been built with the object of completely separating operators and explosive at all stages of production and test firing. A variety of operations, including dispensing, mixing, vacuum moulding, heat curing, inspection, radiography, assembly into test rounds and firing can be carried out on quantities of new compounds equivalent to 15 lb of TNT while the operators are protected by a heavily reinforced concrete structure that can withstand repeated explosions. An important part of the system is a remotely controlled, 5 in gauge electric railway that can transfer hazardous materials between magazines, ovens, process bays and test sites. All process operations can be carried out under controlled atmospheres and samples from the process line can be brought to armoured work cupboards for small scale tests.

Large-Scale Processing of Rubbery Propellants (Exhibit A 5)

This plant has been designed for the preparation of batches of up to 300 kg of the rubber propellants used in rocket motors. They are made by mixing powdered solids and liquids to produce a viscous slurry which can readily be cast into rocket motor casings and then cured to a rubbery solid by heating for several days at about 60°C. The key part of the plant is the specially designed stainless steel mixer incorporating an automatic drenching system actuated by an infra-red detector. To prevent contamination of the propellant by atmospheric moisture the building itself is air-conditioned and processing is carried out as far as possible under vacuum or in a dry nitrogen atmosphere. All potentially hazardous operations are remotely controlled from a separate concrete building.

GENERAL INFORMATION AND HISTORY

The Establishment occupies two sites, one to the north and one to the south of Waltham Abbey, with a total area of about 500 acres. The total staff of approximately 1,000 includes nearly 200 in the Scientific Officer and Experimental Officer grades. Some 250 buildings are in use on the two sites, including laboratories, explosives processing buildings, firing chambers, machine shops and offices.

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Waltham Abbey has had a long association with explosives. Within the boundaries of ERDE stood the gunpowder factory owned by the Walton family which was purchased by the Government in 1787 to become the Royal Gunpowder Factory. Little is known about the very early days of the factory but it is probable that gunpowder was being manufactured on the site at the time of the Spanish Armada, 1588.

The Royal Gunpowder Factory continued in existence until the end of World War II. During the early years of the war it was the only source of production in this country of RDX (Research Department Explosive) which has been described as the explosive of World War II, while for the first two years of the 1914-18 war it supplied the country's entire production of cordite.

Although many of the buildings of the Gunpowder Factory have been converted for use as laboratories and offices a number of new buildings specifically designed for experimental and pilot production operations have been erected on the two sites since they were taken over by ERDE. Other external changes during the past 20 years have been the provision of roads within the Establishment, where previously all internal transport had been by means of the network of canals and a narrow gauge railway system, and the clearance of extensive plantations of alder, at one time used for the manufacture of charcoal, an essential ingredient of gunpowder.

NOTE TO EDITORS: Photographs are available.

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