TECHNOLOGY

Handling "Hot" Material

The British have built a new high radioactivity handling building at Harwell where workers can test an amount of radioactivity equal to that of 112 pounds of radium in safety.

By A. W. HASLETT

➤ A TRAVELING electric crane and a self-propelling rail truck are part of the remotely controlled equipment used to handle bulky and highly radioactive materials in a new building lately completed at the United Kingdom Atomic Energy Authority's Research Establishment, Harwell, headquarters of Britain's research effort in atomic energy.

Such is the protection provided that components containing an amount of radioactivity equivalent to 112 pounds of radium can be put through engineering and other tests in complete safety to operators. With special arrangements, materials even more highly active can be dealt with at this High Activity Handling Building.

The building has become necessary for the design of safe and reliable British nuclear reactors of more advanced types than those already in service.

To insure reliable operation, it is essential to test all components in conditions which mimic as closely as possible those of the final reactor. That means in an experimental reactor built for the job. There is no other way of reproducing the effects produced in materials by heavy exposure to neutrons at high temperatures.

Materials Testing

One effect, the one that interests design engineers, is to knock the structure of the material about. Another is to make it highly radioactive. The more advanced in type the final reactor, the greater is the neutron irradiation that will be encountered. The more important, therefore, are tests of components. The difficulty of making them is also greater.

Any reasonable combination of conditions can be reproduced at will in Harwell's two materials-testing reactors, "Dido" and "Pluto."

The new building provides the other half of the facilities needed: means for safe examination and testing after exposure. It has been built with an eye to the future. There are facilities for every method of examination, physical and mechanical, that have so far been found useful, and there is provision, so far as possible, for the adoption of new methods.

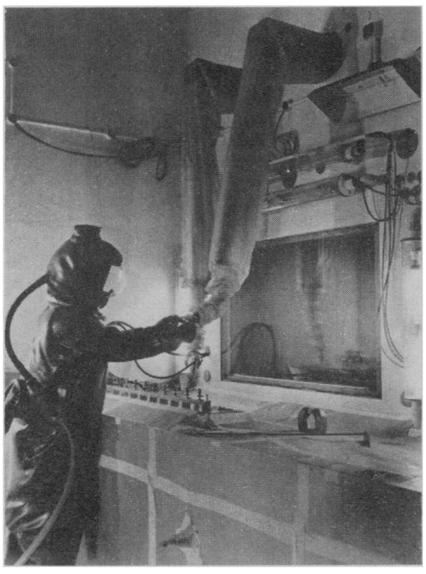
Components which have been exposed in the materials-testing reactors are conveyed in lead-shielded containers to the high activity building. Still in their containers, they are lifted by a 25-ton hoist at the entrance to the building. Specimens can be up to 12 feet long by 12 inches wide without need for special arrangements. If necessary, more bulky components can be handled.

Examinations are carried out by remote control in cells protected by concrete walls five feet six inches thick. There are five of these cells, each eight feet wide, ten feet six inches deep, and 16 feet six inches high. Between adjoining cells, there are removable shielding doors of about 30 tons weight.

Master Controls

Removal of these doors gives access to the traveling crane, which has a lift of one and one-half tons and serves all cells, and to a self-propelling trolley which can support more than three times this weight. To maneuver heavy components on arrival, there is a power manipulator. This is a device with a mechanical arm and hand, operated from a box carried on an overhead railway. Like all other equipment serving the cells, this is controlled from outside.

Each cell has an observation window. These are not mere peep-holes; they measure five feet by three feet and are the same thickness as the cell walls, to provide protection for operators.



NUCLEAR WORLD—A maintenance operator clad in protective clothing works nuclear tools at the new British plant for handling highly radioactive materials. The High Activity Handling Building is set up to handle test components with a radioactivity equal to that of 112 pounds of radium safely. It is at the United Kingdom Atomic Energy Authority's Research Establishment, Harwell, England.

After a component for examination has been placed in the required position, further operations are carried out by master-slave manipulators. These, again, are like mechanical hands, controlled from outside the cells. Operations which can be carried out include rough and fine machining, physical inspection before or after machining, and tests of mechanical properties.

In this way, changes in microscopic structure brought about by increasing exposure times can be followed and correlated with changes in strength and other properties.

Such tests are important, among other purposes, in the development of canning materials. They give information not only on the suitability of particular materials, but on the probable running costs of the final reactor. The time that fuel elements, for example, can be kept in service is a key factor in determining costs. In this way, they contribute to the data needed to compare the economics of one type of reactor with another—although neither may yet have been built or decided on.

Such a building must be used to the full if the cost of construction is to be justified.

The whole plant has been designed so that every operation needed can be done quickly. For the same reason, care has been taken to provide for easy maintenance, and for quick decontamination of the examination cells when necessary.

Contamination-Free Work

On the far side of the cells from the operators, there is a connected maintenance area equipped for operation by frogmen-suited maintenance workers. They can replace one unit by another without danger from radioactive dust in the cell. Finally, the ventilation system and air pressures are so arranged as to prevent contamination of the servicing and operating areas by air movement from the cells.

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"Hi-Fi" Food Preserver Built for Army

➤ A "HI-FI" atomic food preserver will be built for the U. S. Army, the Atomic Energy Commission reported. A company will be awarded a contract to design, build and test a High Intensity Food Irradiator to be known as "HI-FI." It will be a cobalt-60 gamma food irradiator utilizing an amount of radioactive cobalt greater than all the cobalt-60 now in use in the country. The "HI-FI" will be used by the Quartermaster Corps for its food preservation program at the Army's Ionizing Radiation Center, Lathrop, Calif.

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