TECHNOLOGY

Atomic Heat Engines

➤ STEAM ENGINES, which have been standard industrial equipment for more than a century, have rivals in the atomic age.

In these newer heat engines, liquid metals take the place of water for generating steam, transferring heat and cooling the reactor.

Problems arising out of the difference between the properties of liquid metals and the corresponding properties of water were discussed at the International Conference on the Peaceful Uses of Atomic Energy in Geneva.

For taking up heat at one part of the power cycle and releasing it at another, where it can be made to do useful work, water is an excellent material, but it has the newly important quality of slowing neutrons. This is a disadvantage in a reactor run for power.

This disadvantage, plus the fact that metals can be heated to higher temperatures, turned the attention of nuclear power plant designers to liquid metals and to a variety of other materials that might be pumped through the pipes of the heat exchangers.

In reporting on his company's experience in handling liquid metals, Dr. S. G. Bauer of Rolls-Royce, Ltd., Derby, England, listed 20 different materials that could, because of the range of their melting and boiling points, be substituted for water in atomic power reactors.

Among materials suggested by Dr. Bauer are organic compounds of both carbon and silicon, inorganic salts. caustic soda, sulfuric acid, and a number of chemical elements and metallic alloys.

"Not all the substances mentioned are either readily available or suitable as heat transfer fluids," Dr. Bauer said. "The situation might fairly be summarized by saying that in the case of the fast reactor we are forced to liquid metal coolants, while in the case of thermal power reactors there are great potential advantages to be set off against the difficulties of introducing a new technology."

Fire when light metals are used and poisoning from heavy metals are two disadvantages of the new technology. Much more serious corrosion results also from the oxides, the nitrides, the hydrides and the hydroxides of metallic coolants than in water-cooled plants.

Leak tightness is essential in the machinery, and any open surface of the liquid metal must be covered with an artificial atmosphere of some inert gas.

Oxides and other corrosion products can be drawn off while the liquid metals are circulating, Dr. Bauer reported, by putting a "cold trap" into the stream. Here part of the circulating metal, chilled to its freezing point, gradually collects floating bits of corrosion products to prevent their clogging the pipes.

New types of electromagnetic pumps, in which the conventional armature current is replaced by current induced in the circulating liquid, have opened design fields not foreseeable in steam plants.

Corrosion problems were also discussed by Dr. Leo F. Epstein of the Knolls Atomic Power Laboratory of the General Electric Co., Schenectady, N. Y. He said that since the end of the Stone Age, man has had long, although limited, experience with handling metals.

He reviewed the experience the General Electric Co. has accumulated since 1922 in operating its mercury vapor turbine for generating electric power.

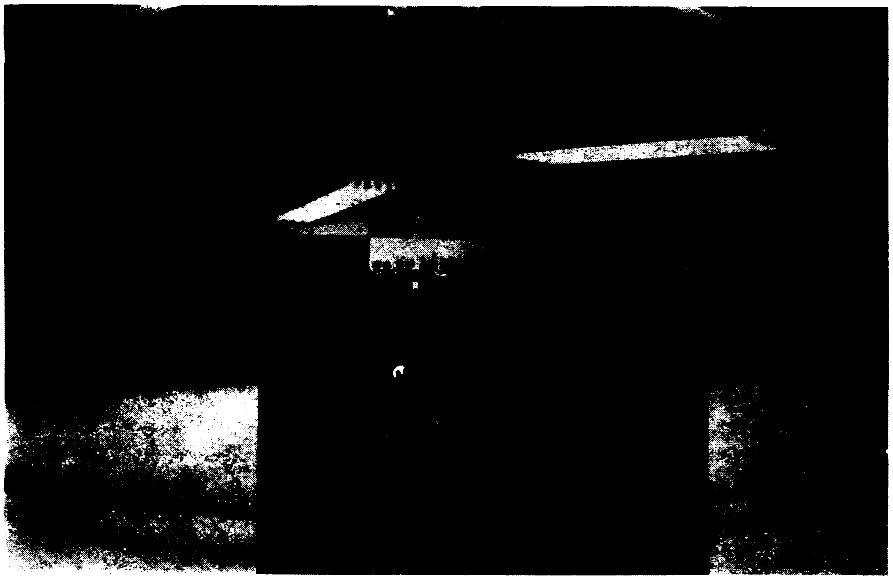
Greater efficiency resulting from the high temperatures when mercury is used can pay for higher initial cost of building such a plant even when coal is the fuel, Dr. Epstein said. Use of liquid sodium to cool valve seats on airplanes, trucks and some automobiles, he pointed out, is already common in the United States.

Revelation that the goal of future research in both England and America is a reactor circulating as liquid fuel a solution of uranium in liquid metallic bismuth was made by Drs. R. Hurst and J. Wright of the Atomic Energy Research Establishment at Harwell, England.

Fission products that "poison" the reactor, making frequent shutdown of reactors using solid fuel in a graphite lattice necessary, would be continuously withdrawn from a liquid fuel reactor.

Such an arrangement would combine the advantages of today's most promising reactors, in which the fuel is a water solution of uranium salts, with the high temperatures obtainable in an all-metal operation. Fused salts would remove interfering fission products in the process described by the British scientists.

Science News Letter, September 3, 1955



ROTATING HOTHOUSE LIGHTS — To grow hothouse plants more cheaply and efficiently during short winter days, a German scientist, Wilm Kind, devised a method of rotating light bulbs that gives good illumination using only a few bulbs.

HORTICULTURE

Rotate Light Bulbs For Winter Plant Growth

➤ TO STEP UP growth of hothouse plants over short German winter days, plant growers have been using electric lights in the greenhouse to help out the sun.

By doing so, they have buried themselves under a maze of electric lamps and installations, incidentally running up large electric bills.

Facing the problem, a German scientist, Wilm Kind, reasoned it would be a lot simpler to use a few lamps that move around the greenhouse than to have separate lamps in every available space. Mr. Kind tried out his idea, mounting a pair of fluorescent lamps on a movable track suspended from the ceiling.

He found that the two lamps, driven by a small motor back and forth across the greenhouse, furnish ample and cheap artificial illumination for quicker plant growth.

For smaller installations, he places his two lamps on the ends of slowly rotating arms run by a small fan, with equally good results.

With this invention, Mr. Kind believes plants can be grown successfully and cheaply even in sunless cellars using artificial light.

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