engineering sciences

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SUBMARINES

Bigger portholes for research

An end to the days of peephole viewing in research submarines is foreseen with the results of stress tests of spherical acrylic windows. A complaint of undersea oceanographers has been the limited view afforded by the small windows of their research submarines. To make bigger portholes, Dr. J. D. Stachiw, senior project engineer of the ocean engineering division of the U.S. Naval Civil Laboratory, Port Hueneme, Calif., has tested different spherical shaped plastic windows to see if they could withstand deep ocean pressure. Their shapes varied from hemispheres to sections of spheres, angles from 180 to 90 degrees proving the strongest.

At 650 pounds per square inch/minute, which exceeds the pressure and speed at which a submarine dives, the test spheres flattened, then buckled and finally cracked.

Since the curved surface enables the spheres to withstand greater pressure, they can be made larger than the conventional flat or conical submarine windows.

The biggest windows fashioned by Dr. Stachiw were four inches thick and 38 inches in diameter. Because they bulge outward beyond the sides of the submarine, they bring an observer closer to the object he is studying. There is a slight distortion problem the farther back from the center of the sphere the observer stands.

RAILROADS

Radar in the freight yard

The slamming of boxcars in freight yards, which costs U.S. railroads $175 million in claims yearly, could be muffled by an automatic system that controls the coupling of free-rolling freight cars. After two years of research, AMBAC Industries, Inc., of Garden City, N.Y., will go into limited production in June of this system whose heart is actually a small radar-type device.

The system acts to eliminate the main cause of freight damage—overspeeding during switching operations. When a car equipped with Sonicar, as it is called, goes over four miles per hour a thin, sonic frequency beam is shot out ahead of it. The beam is reflected back from the boxcar ahead of it. If the boxcar is 50 feet away, the brakes are automatically activated and released moments later to permit a gentle coupling.

The sonic frequency beam is kept purposely thin so that it doesn't also pick up extraneous objects such as poles, railroad ties and signal stanchions. The system can also check the speed of a freight car relative to the speed of another car coming toward it so there is no danger of a forceful jolt.

ROCKETRY

Noise problem considered

Rockets have blown themselves up and altered their courses because of engine noise effects. The sonic vibrations the engines produce interact with the spent gases in the combustion chamber to produce hot and cool spots (combustion instability) on the metal of the combustion chamber. The result is intense heat localization, which can destroy a rocket or knock it off course.

The only way to design a rocket free of combustion instability has been by trial and error, an extremely costly method. But two engineers, Drs. Allan E. Hribar and Kenneth R. Purdy of Tennessee Technological University have worked out a mathematical explanation for the effects of noise on gas flow in the combustion chamber. The method, which utilizes the major factors affecting the spent gas flow while ignoring the minor ones, is a significant step toward the elimination of trial and error in rocket design. The combustion process, or driving mechanism, still remains to be investigated.

NUCLEAR WASTE

Use for discarded isotopes

A University of North Dakota engineer has proposed using discarded nuclear reactor wastes as a heat source in such places as Antarctica, the moon, or under the sea.

Dr. Donald P. Naismith estimates that his fission-product heater, which is still in the design stage, should supply 25,000 British Thermal Units/hour—enough to heat a small family home—for 30 years. Most nuclear wastes, which come as unseparated isotopes, are discarded because the amount of energy to be obtained from them doesn't make salvage and separation worthwhile. However, in environments far removed from conventional heat and power sources, such a heater would be economically practical.

Dr. Naismith's plan calls for taking the nuclear wastes as they come from the reactor and subjecting them to high heat to form them into a suitable fuel.

Total cost for a furnace, from manufacture to setup, is estimated at $156,400.

Dr. Naismith did his work at Iowa State University's department of nuclear engineering.

ENERGETICS

Pollution-free town outlined

A concept of a totally unpolluted agricultural-industrial community in an arid region is described by Dr. Leon Green Jr. of Lockheed Aircraft Corp., Washington, D.C.

The town would integrate three types of energy—nuclear, solar and chemical—to supply the needs of the community, each using each other's waste products instead of dumping them in the air or water.

For example, a nuclear reactor is used to produce heat to convert hydrocarbons, air and water into ammonia and carbon dioxide. By burning the ammonia, more than twice the original water invested could be recovered. The carbon dioxide could be used for speeding plant growth in greenhouses.