engineering sciences

RADIOLOGY

Nuclear explosion limit

Peaceful nuclear explosions may make possible economical excavation of large public works projects, but contamination of the environment will limit their use, said Dr. G. Hoyt Whipple of the University of Michigan to the Symposium on Public Health Aspects of Peaceful Uses of Nuclear Explosives at Las Vegas.

Dr. Whipple figures that the United States could explode up to the equivalent of 60 million tons of TNT every year. In addition, nuclear power plants could be allowed to produce up to 150 billion kilowatts of electricity. (Both limits are well above present predictions of nuclear use.)

He reaches these limits by a consideration of the long lived radioactive products of such activities, tritium, krypton 85 and carbon 14. These elements would disperse throughout the world. To keep the radiation dosage for people and animals below an acceptable limit of 0.5 rem per year, these three natural radioactive isotopes have to be diluted by the nonradioactive hydrogen, krypton and carbon in the air.

The amount of dilutants available sets a maximum on annual production of the radioisotopes, and when this is calculated, Dr. Whipple assigns six percent of it to the United States since the U.S. has about six percent of the world's population and land area.

RADAR

Locusts being plagued

The eighth plague of Egypt is succumbing to the hand of technology, reports the United Nations Development Program. Desert locusts, which can fly 1,200 miles nonstop and devour crops, have been in a decline in recent years, despite an outbreak last year in Saudi Arabia.

One of the chief factors is the improvement in tracking devices that enable workers to trace the locusts and intercept them in flight or exterminate them in their breeding areas. Most recently a marine radar instrument has been adapted that can identify and track a locust migrating at night.

The Anti-locust Research Center in London is now considering a chain of radar sites to monitor locusts.

SOLID STATE

Gunn oscillator goes acoustic

A Gunn effect oscillator is a small chip of material, usually gallium arsenide, in which an oscillating electric current is caused by clumps of electrons that travel repeatedly across the chip.

Because these electron clumps represent traveling domains in which the electric field is high (SN: 8/3, p. 116), physicists reasoned that they should impose mechanical, that is, piezoelectric, stresses on the material.

Such stresses should produce sound waves, and Drs. Takehiko Ishiguro, Nobuo Mikoshiba and Makoto Kikuchi of the Electrotechnical Laboratory in Tokyo set out to make a Gunn oscillator generate them. The Japanese scientists bonded the Gunn oscillator to an acoustical delay rod made of quartz. An acoustical signal detector was attached to the other end of the quartz rod.

When the voltage applied to the Gunn oscillator reached the point that the electric field across it was 4 kilovolts per centimeter, they report in the Jan. 1 APPLIED PHYSICS LETTERS, the Gunn diode broke into coherent electrical oscillation at a frequency of 140 megahertz. Four microseconds later an ultrasonic signal at 140 megahertz was detected at the far end of the quartz rod.

DESALINATION

Second setback

Construction of the world's first combined nuclear power and desalting plant has suffered another setback. Last September a pullout, prompted by rising costs, by three California utility companies forced the Metropolitan Water District of Southern California to scale down the size of its planned operations for the Bolsa Island plant (SN: 12/28, p. 639).

On March 31, the MWD contract with the Federal Government expired. All that remains in effect now is an informal pledge of mutual cooperation and information exchange. The MWD has set new target dates of 1975 for construction and 1980 for operation. The California agency is going ahead to acquire the necessary right-of-way for onshore facilities and transmission lines.

ROLAMITE

Application of principle

Rolamite—a revolutionary engineering design concept that employs an S-shaped band around two rollers to provide low-friction movement (SN: 10/28/67, p. 415)—has found its first commercial application in electromechanical switches.

The switches will be unveiled to the public at a special rolamite seminar May 19 and 20 in Chicago by the Roltec Inc. of River Falls, Wis. The switches can detect movement caused by acceleration, deceleration, shock, vibration and position change.

TRANSPORTATION

AC motors for trains

Alternating current motors on trains would be smaller, lighter, more reliable, require less maintenance than direct current motors and have comparable efficiency. However, it is the DC motor that is used in rail transportation mainly because of one difference: The AC motor normally operates at a fixed speed whereas the DC motor can vary its speed.

Donald R. Scholtes, senior project engineer of the Louis Allis Co., Greendale, Wis., says that static inverters, devices that can vary frequency and voltage, will now permit AC motors to drive trains. Key to the static inverter is the thyristor, which is basically a switch that controls the movement of large blocks of power via a small electric signal.

Reasons for the thyristor being considered at this time are that only recently have they become available in the right size, quality and price range.