Osmosis Purifies Water

A new plant under construction will use reverse osmosis to purify water at lower cost than other forms of desalinization

➤ THE LARGEST water purification plant using the principle of reverse osmosis will be producing 50,000 gallons of fresh water a day when completed in late 1966.

The plant, to be built for the Federal Government by the Aerojet-General Corporation, will be a step toward construction of plants producing more than one million gallons of pure water a day, at lower cost than plants using other methods of desalinization.

Key to the success of the plant will be the use of the reverse osmosis process which provides clean water by separating out pollutants such as bacteria, viruses, chemicals, radioactivity, alkalinity, detergents and scale.

The technique is so simple that it is inexpensive to operate and shows promise of being the cheapest desalinization process yet devised, said Dr. Bert Keilin, manager of Aerojet's water resources department in Azusa, Calif., where the plant will be built, then transferred to Laguna Beach, Calif.

Eventually plants using this process will produce water at a cost of 30 to 60 cents per thousand gallons, he said, compared to the one dollar per thousand gallons it costs today with existing equipment. A most important factor is that the process can be run at room temperature, eliminating the need for costly equipment to generate heat.

Essentially, this is how the process works: polluted or saline water in a tank is put under pressure which forces the pure water molecules to pass through a special membrane to the other side where they are collected as pure water. The pollutants are left behind.

This process is called reverse osmosis—the reverse of a natural phenomenon that occurs in cells of living plants and animals.

The flow of materials is usually from the more concentrated into the less concentrated. For instance, in a tank where a membrane separates fresh water from saline, the flow of water normally is from the fresh into the saline. To make the system work the other way and obtain fresh water from the saline, pressure must be applied to the saline water.

Exactly how the membrane operates is not yet perfectly understood, said Dr. Keilin. It is constructed in such a way that it is a dense, tough, but thin skin on the side toward the saline water. On the side toward fresh water, the membrane material is looser and more porous. The skin of the membrane has no openings. The water molecules interact with the outer skin of this membrane, then are forced deeper into the membrane by the high pressure. Other molecules crowd in behind to replace them.

The membrane is particularly effective on the brackish water found in some contaminated rivers, streams and wells—making it ideal for inland cities, towns and communities.

Scientists working with the reverse osmosis process believe it is going to be one of the big breakthroughs in man's search for a low-cost water purification process.

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GENERAL SCIENCE

Alaska Gets Hospital

➤ THE NORTHERNMOST HOSPITAL in North America, the U.S. Public Health Service Alaska Native hospital at Barrow, 200 miles above the Arctic Circle, was officially dedicated on April 12.

The new 12-bed, two million dollar hospital replaces an obsolete structure built in 1930. It will permit provision of the most modern medical services for some 1,600 Eskimos and 100 non-native people living in Barrow, Wainwright, Barter Island, Point Lay and other Arctic villages.

The Public Health Service staff at the hospital numbers 36, including one physician, one dentist and eight nurses.

During the past decade, the Eskimos have been making increasing use of the health services offered to them, reported Dr. E. Stuart Rabeau, Assistant Surgeon General and chief of the division of Indian health. In 1965, hospital admissions totaled 529 and there were 96 births in the hospital. Almost 10,000 outpatient visits for medical treatment were recorded and 4,000 dental services provided.

Certain significant health improvements have been noted among Alaska natives, said Dr. Rabeau, the most dramatic being the reduction of about 70% in the infant death rate from 1954 to 1964. Mortality rates still are much higher than in the general population, however, as are rates of infectious diseases and other common illnesses.

Construction began on the hospital in August 1964 and was completed last December. Various unusual practices and techniques had to be employed due to the harsh climatic conditions.

All materials and equipment had to be brought in by ship during the two-to-three-week summer period when the ice moves away from the shore. Wooden pile foundations were sunk at least 15 feet into the permanently frozen ground and the buildings kept to a minimum of three feet above grade so that housing for the utilities could be hung under the floor area.

Further complications were the extended periods of sub-zero temperatures and total darkness.

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TECHNOLOGY

Advantages of Plastic Milk Bottles Cited

➤ ONE OF THE MOST promising markets for plastics is in milk bottles. Consumer testing by several resin companies, container manufacturers, and over 100 dairies is underway in various parts of the country, it was reported in Industrial Bulletin of Arthur D. Little, Inc., January 1966. Housewives appear willing to pay a premium for a leakproof and unbreakable milk bottle under certain market test conditions. Some experts believe that by 1970, plastic bottles may take $25 million to $35 million worth of resin, representing $60 million to $70 million worth of bottles, some 8% to 12% of the total market.

At present, most milk is sold in polyethylene-coated paperboard cartons, from the individual half-pint to the half-gallon size. Glass is still used for 95% of the gallon-size containers, which constitute about 10% of the present market. Supermarkets, housewives, and dairies will welcome a substitute for the larger returnable glass bottles.

While several types of plastics are suitable for these bottles, and some are superior to others in certain characteristics, most of the testing has been done with high-density polyethylene, which is most economical, especially for the gallon size. The market for the larger size bottles is expected to grow rapidly. It has been predicted that 15% of all milk sales will be in gallons by 1970.

The plastic bottles can be made in a variety of shapes and designs or embossed with a trademark to afford greater advertising appeal to the dairy.

It is also possible that, if the plastic bottles were formed on machines in the bottling plant, they would be sterilized during fabrication, and no other sterilization would be necessary. The plastic bottle, being translucent, would permit the housewife to see the amount of milk remaining in the bottle.

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