Device for de-salting sea water has begun a year of advanced pilot testing at UCSD

September 11, 1962

Berkeley--A promising device for removing the salt from sea water has begun a year of advanced pilot testing at the University of California's new Sea Water Testing Facility at La Jolla.

The device is the "multiple effect rotating evaporator," a spinning-disk apparatus that has been-developed during the past two years at the University's Sea Water Conversion Laboratory at Richmond.

The new La Jolla facility will provide full-strength sea water, for which researchers have found no adequate substitute in the testing and development of de-salting devices.

The rotating evaporator project is headed by Dr. LeRoy A. Bromley, professor of chemical engineering at UC in Berkeley, along with Associate Engineer Stanley Read and Junior Engineer Anthony E. Diamond.

Dr. Bromley and Read have transferred temporarily from Berkeley to the University's San Diego campus during the period of advanced testing at the new La Jolla facility.

In essence, the rotating evaporator is a very sophisticated distillation unit with a number of unique features that enable it to "squeeze" the maximum use out of the energy supplied to it.

Important features are the "multiple effects"--meaning that the energy is used several times instead of only once--and highly efficient methods of heat transfer that help avoid an energy waste.

The evaporator tested on bay water at Richmond, and now being installed for sea water testing at La Jolla, measures about four and one-half feet in diameter and two feet in height.

A stack of 12 to 30 thin circular plates made of copper is placed in the evaporator's shell. This stack is rotated at speeds up to 1,000 revolutions per minute.

When the evaporator is put into operation, salt water is fed onto the upper surfaces of the spinning plates and steam is introduced to the bottom of the lowest plate.

As the steam heats the lowest plate, a portion of the salt water spreading in a thin layer on the upper surface is vaporized and rises about one-half inch to condense on the cooler lower surface of the next plate.

The rising vapor heats the second plate, causes the salt water on its upper surface to evaporate, and thus the process is repeated step by step up to the top of the evaporator, where the vapor from the top plate is condensed on coils containing the incoming sea water.

The thin layers of concentrated brine and distilled water move outward by centrifugal force on the upper and lower surfaces of two spinning plates and are collected in separate channels leading into pipes and out of the evaporator.

In tests conducted on San Francisco Bay water (which is about one-half as salty as sea water), the evaporator has produced up to 7,000 gallons of distilled water per day.

As an indication of its efficiency, the device has produced over 20 pounds of distilled water for each pound of steam supplied to it.

As in all sea water conversion projects, the eventual goal is to reduce the cost and develop a method that can be economically feasible in areas where supplies of fresh water fall short of demands.

Present estimates based on initial tests at Richmond indicate that a large scale installation of rotating evaporators might produce distilled water at about 60 cents per thousand gallons.

Development work at Richmond has been aimed in part at solving several problems in the evaporator's operation.

One problem was caused by dissolved gases in the sea water (especially carbon dioxide) which reduced heat transfer and cut efficiency. To solve this, the engineers devised a "falling-film deaerator" that removes the gases before the sea water enters the evaporator.

Other innovations include a special filtering system, the addition of small amounts of acid to the sea water (to prevent deposition of scale), and a heat exchanger that enables the outgoing distilled water to pre-heat the incoming sea water.

At La Jolla, the UC engineers will continue development of their original evaporator and will also test a double evaporator unit operating from a single source of power and steam.

Components for the evaporators are constructed in part at the University's Lawrence Radiation Laboratory at Berkeley, where the design work is supervised by LRL Engineer Adair Roberts.

The Sea Water Testing Facility at La Jolla is located in a portion of a now ocean-front building an the grounds of the University's Scripps Institution of Oceanography, and will be available for use by both Berkeley and UCLA researchers.

The La Jolla site is regarded as particularly economical, since the costs of enlarging the sea water supply system (shared with other activities) was far less than the cost of constructing a separate facility.

The rotating evaporator project is one of a number of approaches to sea water de-salting under active study by the University and is coordinated by Everett D. Howe, Director of the Sea Water Conversion Laboratory and professor of mechanical engineering at Berkeley.

Funds for this work are provided by special appropriations from the California Legislature and are allocated through the University's Water Resources Center, headed by Director Warren A. Hall, associate professor of engineering at UCLA.