

IIT-M's solar-powered desal unit aims at 10K litres of potable water a day

TIMES NEWS NETWORK

Chennai: Researchers at IIT Madras have developed a desalination system that uses sunlight and seawater to produce 10,000 litres of potable water a day. A compact version, which will soon be patented, was developed on the IIT-M campus after a pilot plant was set up at Kanyakumari, in collaboration with National Institute of Ocean Technology (NIOT) and with support from ministry of earth sciences.

The plant uses multi-effect desalination (MED) technology where seawater is heated in stages using flat-plate solar collectors, reaching about 75°C, and transforms into steam under vacuum. The steam passes through four evaporation chambers, condensing into fresh water at each stage. An ejector maintains a vacuum of 100 millibar by removing air, allowing boiling at lower temperatures.

"This technology can be economical, including

HOW THE PLANT WORKS



ADVANTAGES | No electricity used from the grid

- Can run 24 hours with thermal storage
- Suitable for remote and coastal areas

- Seawater is pumped into a settling tank to remove sand and debris
- Water flows through flat-plate solar collectors and sunlight heats the water up to 75°C
- Heated water enters a low-pressure flash chamber
- Under vacuum, water flashes into steam at lower temperatures

- The steam passes through 4 stages condensing into fresh water in each stage
- Remaining seawater (brine) is discarded
- The steam condenses into low-salt drinking water
- Fresh water is collected in a storage tank
- An ejector keeps the system under vacuum

operational and maintenance costs, when scaled up," said Prof Advait Sankar, department of mechanical engineering, IIT-M. "It can work well for residential colonies or academic campuses. We can also combine industrial waste heat with solar energy."

The plant produces about 300 litres of fresh

water an hour between 10am and 3pm, with a salt content of just 1 part per million. Researchers said the system can also run at night by integrating thermal storage to retain heat generated during the day.

The team used simulation tools to model and test the entire system before installation. Compo-

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nents such as the flash chamber, multi-effect evaporator, condenser, ejector, and solar collectors were individually modelled and validated.

Thilagan K, lead researcher at IITM's refrigeration and air-conditioning lab, optimized the system and built a compact 2mx2m prototype on campus, capable of producing 100 litres of fresh water an hour. "We replaced the bulky shell-and-tube heat exchanger with a thin-sheet design to save space and energy," he said.

The team is in talks with the Indian Navy to replicate the system in island regions. They are also developing a grey water treatment unit to recycle kitchen wastewater for gardening and toilet use.