NOTES

LOW TEMPERATURE THERMAL DESALINATION PLANT AT KAVARATTI, LAKSHADWEEP

Introduction

With the passage of time, and increase in global population, availability of fresh water is becoming scarce. An effective way of obtaining fresh water from the seawater is through thermal desalination. In high temperature thermal desalination, the seawater is heated and flash evaporated, and surface seawater is used for condensation. However, in this process, a lot of energy is required in heating the water and therefore it is not very attractive. In low temperature thermal desalination, surface sea water is flash evaporated, and cold water from suitable depth is brought up to condense the vapor. This process is extremely suitable in tropics where sea surface water temperature is around 25 to 28 degrees Celsius round the year and very often at depths of 300 m or so temperature drops to some 12 degrees Celsius.

The National Institute of Ocean Technology (NIOT, Chennai), has succeeded in setting up a low temperature thermal desalination (LTTD) plant of 100000 liters/day capacity at Kavaratti in the Lakshadweep group of islands.

Concept of Low Temperature Thermal Desalination

Figure 1 describes the concept of low temperature thermal desalination (LTTD). The surface warm water from the sea is brought into the flash chamber, where under suitable low pressure, the warm water is flash evaporated. The water vapor then goes to the condenser. In the condenser, cold water brought from suitable depth is circulated and the water vapor is condensed into freshwater.

Pilot Plant

To test the concept of LTTD, a pilot plant was commissioned by NIOT at its campus in Chennai, with a capacity of generating 5000 litres of fresh water per day as shown in Fig 2. This plant worked very efficiently and gave impetus to commission a bigger LTTD plant at a suitable location.

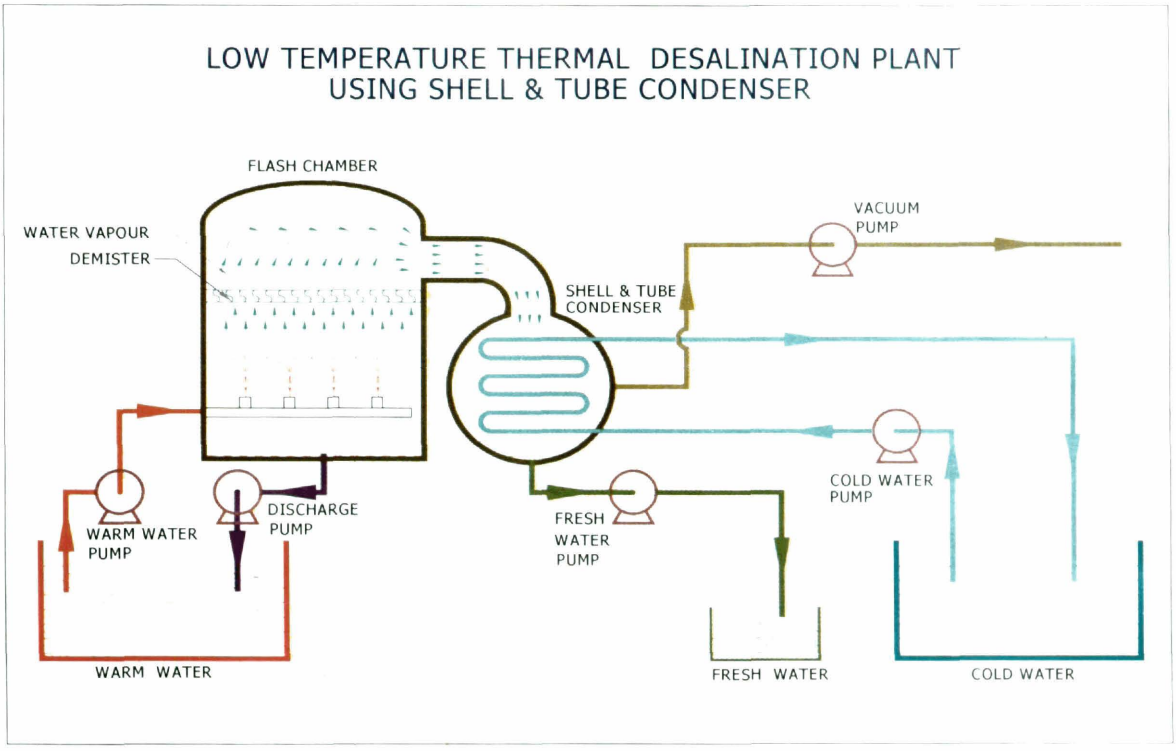

Fig.1. Schematic Diagram of LTTD working principle

Fig.2. A 5000 litres per day capacity plant commissioned in NIOT

Low Temperature Desalination Plant at Kavaratti

Kavaratti is an inhabited island of about 10,000 population belonging to Lakshadweep group of islands located some 200 km west of Indian mainland, with direct connectivity with the city of Kochi on the west coast.

The advantage of Kavaratti is that within a distance of 400 m from the island, a depth of 350 m of water is available where the temperature is around 12°C. The cold water from this depth could be brought to the plant site using a 600m long pipeline. Figure 3 shows the Kavaratti Island and the location of the plant. Figure 4 gives an overview of the plant in operation at Kavaratti.

Specifications of the Plant at Kavaratti

Fresh water generation rate	-	100000 LPD
Warm water temperature	-	28°C
Cold water temperature	-	13° C
Cold water flow rate	-	180 kg/s
Warm water flow rate	-	145 kg/s
Cold water intake	-	from 350 m water depth
Vacuum maintained	-	Low vacuum level

Some Salient Features of the Plant

The plant does not require any pre-treatment of feed water, and it is easy to maintain because of its operational simplicity besides being environmental friendly and non-polluting. The quality of fresh water generated is of BIS / WHO standards (see Table 1). The deep sea water utilized is rich in nutrients and can be used to cultivate marine life.

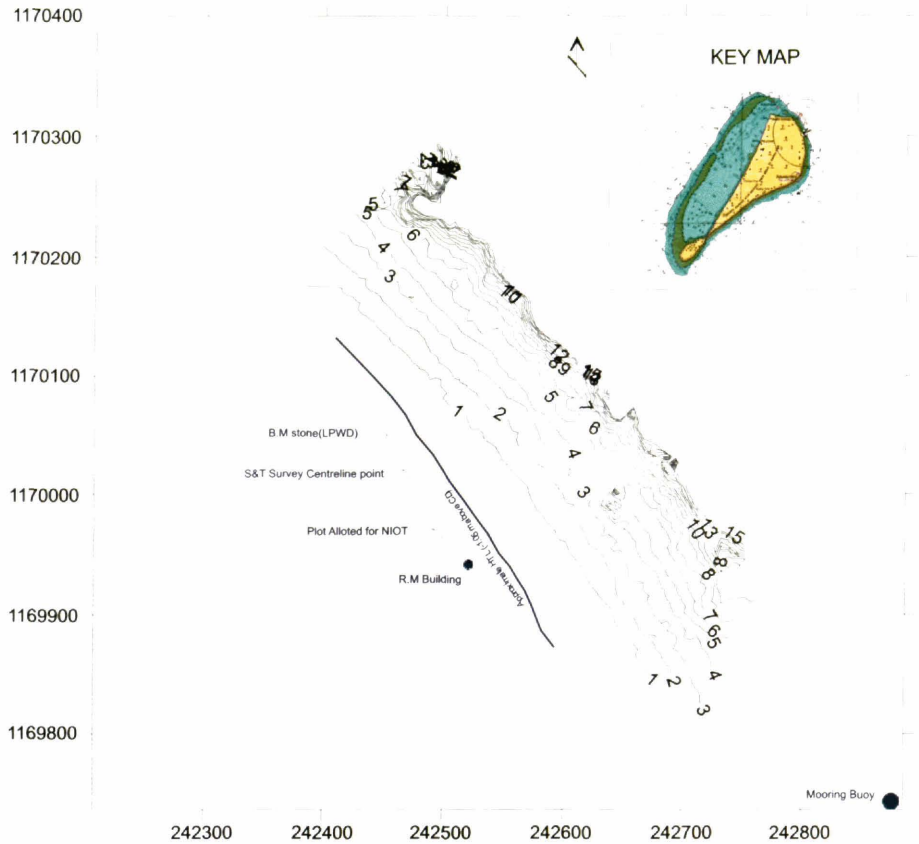

Fig.3. Kavaratti Island, bathymetric details and the location of the LTTD Plant.

Fig.4. A view of the LTTD Plant operating at Kavaratti.

Future Plans

The 100000 liters/day plant set up at Kavaratti has been functioning very efficiently over the past 10 months. As a matter of fact, the production from this plant is in excess of 100000 liters/day. The cost of water for this plant comes to about 15 paise/liter. This includes the cost of setting up of the plant, which is expected to work for 10 years, and all other direct and indirect costs. The water has been a boon for the 10000 odd population of this island. This is the first time that the people have used fresh water. The Lakshwadeep Administration has asked for 6 more similar plants to be set up in other islands.

NIOT is also currently busy in setting up another plant of 1 million liter/day capacity. We strongly believe that considering the low cost (5 paise/liter for a one million liter plant), being environment friendly, and suitable for all countries located in tropical seas, where a temperature difference of 10 degrees celsius or so exists between the surface water and water at depths of 300 or 400 meters, low temperature thermal desalination is the answer to ever increasing need for fresh water.

Table 1. Comparison of quality of desalinated water with recommended standards

Parameter	Desirable limit	Permissible limit	Desalinated Water
Color	Un objectionable	Un objectionable	Ok
Odour	Un objectionable	Un objectionable	Ok
Taste	Un objectionable	Un objectionable	Ok
pH	6.5	8.5	7<>8
TDS (PPM)	500	2000	280
Chloride (PPM)	250	1000	90
Total Hardness	300	600	100
Total Coli forms (MPN)	1	10	ND

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