



विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY

DST-IITM-KGDS Test bed on Solar Thermal Desalination Solutions in Narippaiyur, Ramanathapuram District, Tamil Nadu



Dr. Harsh Vardhan
Hon'ble Union Minister for Science & Technology, Earth Sciences, Environment, Forests and Climate Change

"S&T should provide tools technologies and enable Integrated Water Resource Management. In the context of water scarcity issue facing the country, cost effective renewable powered sea water desalination is crucial to our water security. Our R&D institutions and industries should focus on innovations to scale up sea water desalination at affordable cost"



Professor Ashutosh Sharma
Secretary to the Government of India,
Department of Science and Technology

“Global experience in the Desalination technologies need to be studied to evolve India-centric effort for wider adoption. Location specific test beds need to be set up to generate scientific data on basket of technology options available.”

Issue:

- To provide clean and safe drinking water to all our water scarce areas, the ability to use seawater that most coastal states have access to, could be sustainable solution. Desalination essentially means removing salt and other minerals to make water fit for drinking or other purposes. The filtration of saline water can be done through Thermal Desalination Technology or Membrane Technology like Reverse Osmosis (RO). These technologies are relatively expensive and also require costly infrastructure, so the challenge is to develop cost effective variants.
- Dr. Harsh Vardhan, Hon'ble Minister of Science and Technology, Earth Sciences, Environment, Forest and Climate Change during a meeting held to discuss 'The role of desalination for India's water security' under his chairmanship on 27th May 2017 in New Delhi. stressed on about the water scarcity issue becoming a major issue across many States in India. He urged on the urgent need to evolve an integrated water resource management policy. He further observed that sea water desalination will play a key role for ensuring water security of the future and mentioned that our R&D institutions should focus to reduce the cost of sea water desalination and attain scale to serve large segment of the population.
- A National Mission on Desalination has been mounted with DST as the nodal body and Prof. Ashutosh Sharma, Secretary-DST in his opening remarks during the first Task force meeting of the Mission emphasised upon studying the global experience in the desalination technologies and bring out India-centric effort that may be needed to adopt them in Indian context. Considering the importance of location specific interventions, it would be useful if technology choices are presented to the user in a form which enables them to take informed decisions.
- Ramanathapuram District in Tamilnadu is severely affected by scarcity of potable water due to salinity, brackishness and also poor sources. As far as drinking water supply scenario is concerned it is a well-known fact that Ramanathapuram district is suffering from water shortage for many years and the supply of even the minimum 40 lpcd of potable water is a challenge.
- The non-availability of potable water is severely affecting economic and industrial development of the district. The desalination test bed set up in the village is an attempt to evaluating various renewable powered desalination technologies.
- Lack of customized solution tailored to socio-economic context to meet the demands of Safe drinking water in Narippaiyur, Ramanathapuram District, Tamil Nadu.
- More effective use of coastal line measuring about 265 kilometers in in Narippaiyur.

What will Centre do?:

- Provide customized technological water solution by demonstrating futuristic and versatile Forward Osmosis (FO) desalination system to provide potable water in Narippaiyur test bed

DST-IITM-KGDS Test bed on Solar Thermal Desalination Solutions in Narippaiyur,
Ramanathapuram District, Tamil Nadu

facility for the benefit of local villagers by demonstration of novel seawater desalination system.

- Develop and demonstrate technology to produce high quality drinking water from sea water for the benefit of local people
- Demonstration of solar thermal energy storage system for round-the-clock plant operation and utilization of sea water from Bay of Bengal to produce potable water.
- Integration of FO system and water storage tanks with existing solar thermal field and sea water intake and reject facility.

Vision:

To deliver customized technological solutions based on integration of Forward Osmosis (FO) desalination system with solar thermal field to address prevalent water challenges in an arid coastal village called Narippaiyur in Ramanathapuram District, Tamil Nadu located on the shores of the Bay of Bengal.

Deliverables:

- Demonstration of solar thermal driven 20,000 litres per day of desalinated potable water employing Forward Osmosis (FO) system.
- Scientific data generation, analysis and evaluation, database development, documentation and report submission, techno-economic analysis and supply of potable water
- Demonstration in the coastal village of Narippeiyur in Ramanathapuram district in Tamil Nadu through partnership of IIT Madras, DBT-Institute for Chemical Technology, Empereal KGDS and KGISL Institute of Technology are involved in developing this solution with pro-active DST involvement.



S. No	Description	Value
1	Solar energy collector area	620 m ²
2	Receiver Height	8 m
3	Number of mirrors	12

Solar thermal system implemented at Narippaiyur

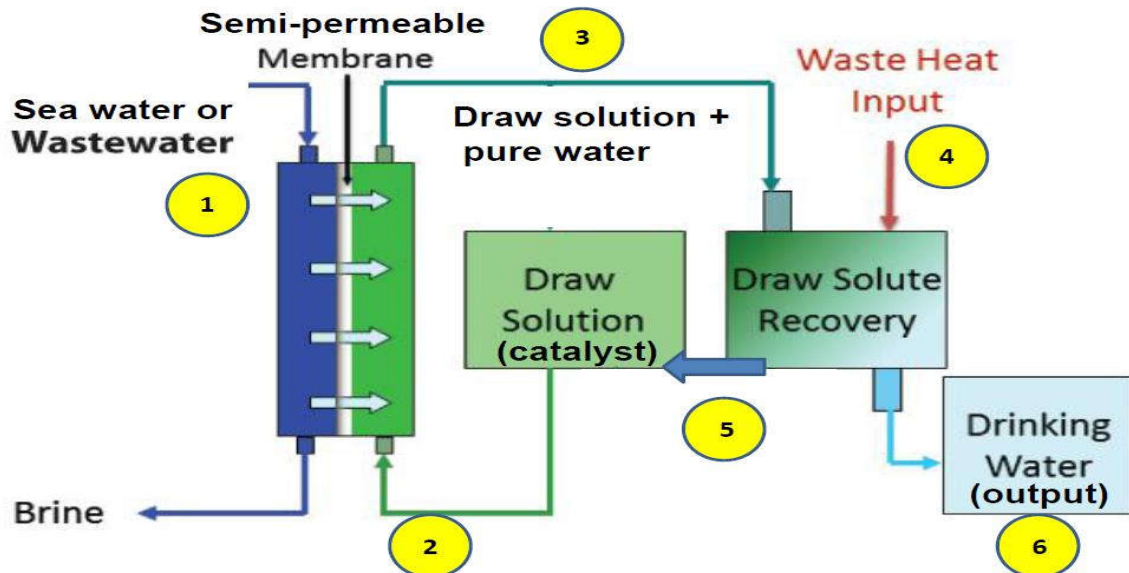
Desalination Process:

Solar thermal based forward osmosis is a promising technology for round-the-clock sea water desalination. **Forward osmosis can be used in a wide variety of applications, including**

- Treatment of sea water and brackish water
- Water with mineral salts and metals

- Treatment of industrial effluents with a high pollutant content. With increasing industrialization in India environmentally acceptable disposal of industrial pollutants is of national importance.

I. Process Steps of Forward Osmosis:



II. The potential advantages of FO systems are:

- Low energy consumption
- Low fouling propensity
- Low maintenance costs
- Infrequent membrane cleaning

Sea water FO technology operates at only 2 bar pressure while sea water Reverse Osmosis (RO) operates at as much as 60 bar pressure.

FO technology utilizes solar thermal energy and produces 20 m³/day of potable water drawing sea water from the Bay of Bengal. The system will be scaled up for future drinking water needs in that area.

Unique Aspects of the Project

I. Technical Aspects

- 100% renewable energy based
- Technological convergent solution
- Environment friendly
- Having the potential for scalable, replicable and sustainable plants

II. Sociological Aspects

- Relief of emotional stress of water scarcity
- Villagers health conditions will be improved
- Increase in local employment

III. Economic Aspects

- Increase in village economy
- Decrease in drinking water cost
- Businesses will move into the area with greater confidence

Participating Investigators:

DST Officials:



Dr. Sanjay Bajpai
Head-TMD (EW &O),
Department of Science and Technology,
New Delhi



Dr. Neelima Alam
Scientist-E, TMD (EW&O)
Department of Science and Technology,
New Delhi