Large scale economic growth, increasing population, industrialization and growing demand for fresh water is driving Indian desalination market

The widening gap between growing water needs of ever growing population and diminishing fresh water sources has made India today a water stressed country. According to TechSci Research, in India alone, more than 200 million people do not have access to safe drinking water. The Indian industries consumed about 50 billion cubic meters of water, out of which thermal power plants responsible for generating about 60% of electricity demand, consumed 77% of total industrial consumption. The establishment of ultra mega power plants (UMPP) to fulfill the growing electricity demand and the growth of other industrial sectors such as pharmaceuticals, chemicals, and refineries will strain the thin water resources.

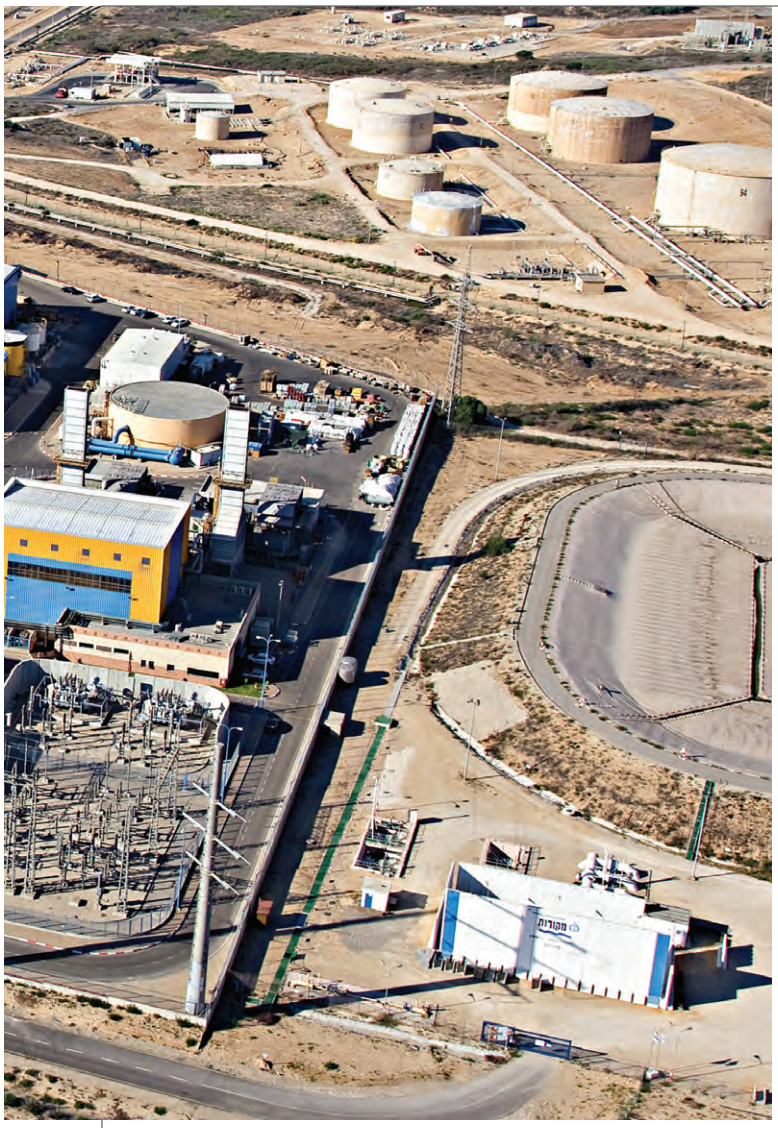
The Central Water Commission projects the annual water demand to touch 1500 BCM in 2050 which is more than the utilizable or internally renewable water resources.

"The emerging scenario in the country is alarming," states Dr PK Tewari, President, Indian Desalination Association, adding that there are already areas in the country like the coastal regions of Tamil Nadu, Andhra Pradesh, Gujarat, Western Rajasthan, Maharashtra, which face perennial water shortage.

Meeting the water requirement amongst various entities such as agriculture, industries and domestic pose a challenge before the Central and state governments. Water security is a fundamental requirement for sustainable development and one of the solutions to meet this growing fresh water demand is through desalination.

"Large scale economic growth, increasing population, industrialization and growing demand for fresh water is driving Indian desalination market, which is all set to grow faster than anticipated and would prove to be a growth engine for global water desalination industry in the coming years," opines Rishabh Sethi, Managing Director, SPML Infra.

According to recently published report by TechSci Research "Indian Water Desalination Plants Market Forecast & Opportunities, 2017" India water desalination market is all set



DESALINATION

Easing India's Water Woes

Although high cost is involved in setting up and operating a desalination plant, with emergence of new energy efficient technologies and solutions desalination is likely to become more economical and easily used alternative for meeting water security need, Lovina Kinny finds out..

to grow at CAGR of 22% for next five years.

There are around 1,100 desalination plants functional in India. "Desalination of sea water and brackish water is one the oldest, most feasible and identified solutions to counter the problem of water scarcity," states Sanjeev Kumar, Head – Marketing IDE Technologies.

Desalination primarily is a technology used to convert high saline water (seawater for example) into potable/ process applications and its usage is limited mainly to states having a large coastal line.

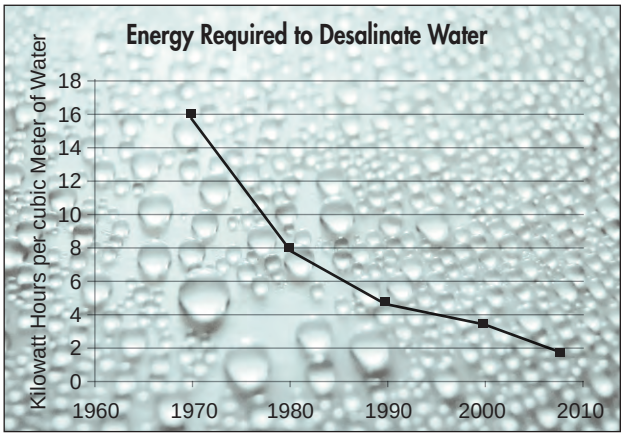
Coastal states like Gujarat, Tamil Nadu, Andhra Pradesh, Kerala and Maharashtra have seen desalination plants coming up in big way. "Although, Gujarat and Rajasthan are dry states, at the same time, they have a long coastal line, making desalination a very obvious choice to cater to the regional demand," opines Alok Gupta, Founder Envecologic.

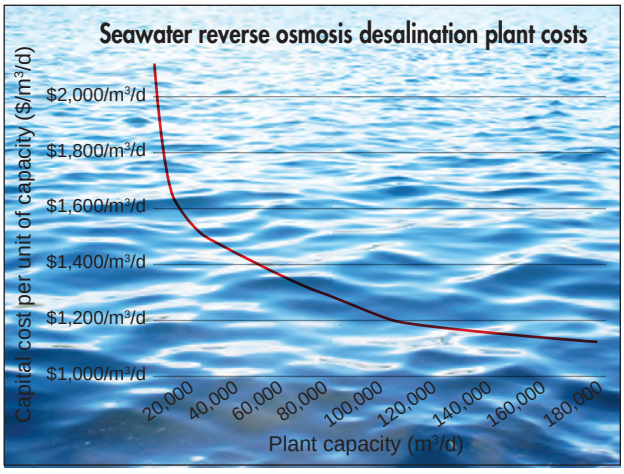
Gujarat, which was once considered a water scarce state, today under the initiatives of the Gujarat government, has the maximum desalinated water generation capacity in the country. Similar, governmental support in Tamil Nadu has enabled the state to be the 2nd highest desalinated water generation state in the country, contributing 24% in total desalinated water capacity in India. The state recently has announced four large size seawater desalination technology projects ranging from 400 mld, 150 mld to 1OO mld.

Moreover, large projects such as Krishnapatnam port and Kasnau-Matasukh Lignite Mines are scheduled to be functional in the coming years. Other notable desalination projects include the Minjur Desalination Plant near Chennai, India, the largest desalination plant in South Asia, which produces 36.5 million cubic meters of water per year. Further, desalination plant at Nemmeli, Chennai scaled up to reach full capacity of 100 million litres of sea-water per day in 2013.

Reliance Industries Ltd., India's largest private sector company, has ordered its first seawater reverse osmosis (SWRO) solution from IDE Technologies. Reliance chose IDE's SWRO

CPCL's desalination plant in Ennore





desalination solution to meet the increased water capacity needs of the plant at one of India's largest oil refineries. In March, 2013, a consortium of Japanese and Singaporean companies signed a pact with the Gujarat government to build a 300 mld desalination plant in Dahej, involving an investment of about ₹3,000 crore. VA Tech Wabag, having bagged ₹3,000 crore worth of new orders in the first nine months of 2013 itself, is seeing large opportunities in sea water desalination and municipal waste water recycling projects across India. Essar Group further is in the process to bid for desalination plants, water distribution and sewage facility works

"This shows a clear increase in acceptance of seawater desalination technology as an alternative to conventional water resources," opines Kumar adding that the trend will continue in future, rather will be manifold.

Although desalination water technology has been widely used in water scare states; it still has to pick pace in a big way. Factors like cost of production, opposition from NGOs, other water treatment process have acted as a deterrent.

It is true that that high cost is involved to set up and operate a desalination plant thus making desalination an expensive option for water stressed country like India. It is easier to find desalination plants in much larger numbers in countries like Saudi Arabia where money and energy are not painful constraints.

"High capex to set up the plant and high opex, particularly owing to the high energy price (which already has its own supply constraints), make desalination expensive in India relative to other traditional sources of procuring water," opines Gupta.

The huge gap between the water tariff expectations and actual cost of desalination (per kilo liter of desalinated water) is yet another challenge, informs Sethi. Traditionally, he elaborates, the consumers in India are used to pay nothing or very little for waters supplies. Only recently, for example, in few of the municipalities in India the water tariff has been set around ₹10/KL and tariff moves up in steps of usage. As per a conservative estimate, producing desalinated water using the desalination process, O&M cost alone including cost of power,

Seawater has the highest of total dissolved solids which needs to be removed in comparison to any other water available and thus a little higher cost.

chemical, membrane replacements and skilled professionals is in excess of ₹35 per kilo liter. Cost to set-up the desalination plant is of course additional. Further, the raw water quality in India is such that it often requires a complex pretreatment system, driving up capex and the O&M cost, which again has negative impact on the cost of producing desalinated water.

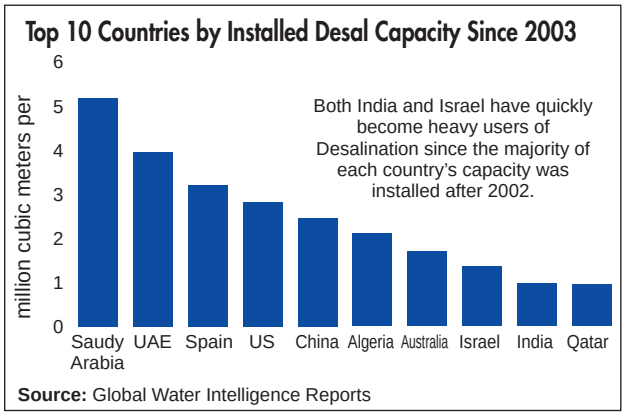
Further, availability of power and its increasing cost is another challenge. In order to run a successful desalination plant, access to a stable un-interrupted 24x7 power supply is a major requirement. But in the state of Gujarat, Tamil Nadu and Rajasthan where traditional source of fresh water is either depleted or non-existent, desalination remains the option to make potable water available to residents and industries.

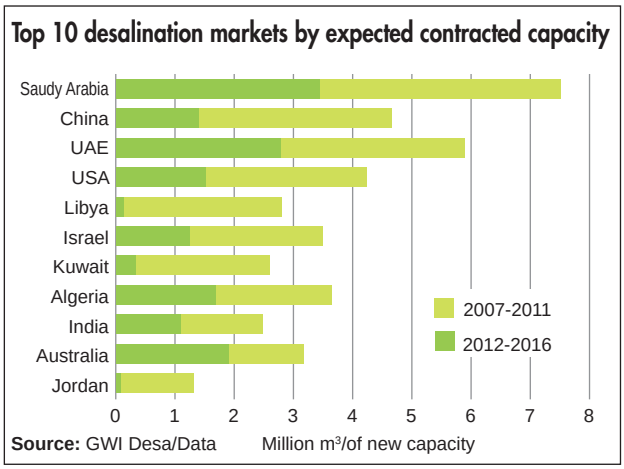
"India is posed to add very huge capacities of desalination in next five years; hence it may not be prudent to say that desalination has not picked up in a big way in India," opines Sharma.

The other cost involved is the cost of discharge, adds Gupta. For every million liters of sea water treated, only 40% is made potable and while the remaining 60% of concentrated saline water has to be discharged back into the sea. The means of properly disposing of the concentrate flow should be figured out right in the beginning by conducting feasibility studies. "The cost of disposal could be significant and could adversely affect the economics of desalination," he adds.

A little higher cost of producing water per liter in comparison to conventional technologies may be the main deterrent for adopting desalination as a solution. While saying so, one must bear in mind that seawater has the highest of total dissolved solids which needs to be removed in comparison to any other water available and thus a little higher cost, views Sharma.

Protests against desalination projects from environment groups and NGOs related to disposal of concentrate and impact on marine life raises question on the growth of desalination plants near the coastal lines. The process of desalination has its own effect on environment as desalination plants discharge wastewater (brine) back into the sea that affects coastal water quality.





By applying new energy efficient technologies, the cost of desalination will considerably decrease as the cost of chemicals used for membrane cleaning and membrane replacement will be reduced

"Desalination projects need proper planning and infrastructure to deal with it in an environmentally friendly manner," opines Sethi.

As many industrial units are installing plants for water recycling and reducing water usage this, in turn, according to Frost & Sullivan report, will reduce the opportunities for desalination plants.

However, S M Chakrapani, Addl. Vice President – Water Division, Tecpro Systems Ltd sees no significant deterrents for adopting desalination as a solution. Technologies are available, and so are system integrators and implementers.

The only causes of worry, according to Chakrapani, are the extremely long and arduous processes of getting statutory and environmental clearances. A regular sea water desalination plant will need at least 14 statutory clearances, if not more. The time taken for getting the clearances can be anywhere between 8 to 12 months. This delay will cause an increase in capital costs. What is required urgently is a single window statutory clearance towards encouraging the setting up of more desalination plants.

Inspite of the cost issues, regulatory hurdles, environment protests, market for desalinated water is constantly growing in India because the demand for water is fast accelerating and there is a growing urgency to reduce this demand supply gap. Desalination therefore according to industry experts is suitable provided new and new technologies are developed that would bring down the cost significantly.

Continuous research are undertaken to seek alternative and economical technology of desalination as it will be one of the vital source of freshwater for water stressed and starved countries across the globe. Nuclear technology is one such technology that helps reduce costs for energy intensive process of desalination. Further growing environmental concerns have forced attention towards developing solar desalination technology.

A recent breakthrough in desalination technology has led to the development of a new method for removing the salts from seawater. The new method uses a "water chip" and a small electrical field to separate the salts from the seawater. While the new method currently only removes about 25% of the salts from the water, the researchers believe that further work will improve the level to achieve almost 99% removal rate, which is necessary for producing drinking water.

Another new discovery by New Jersey Institute of Technology is a direct-contact membrane distillation (DCMD) system that can efficiently make drinking water out of up to 20% salt-concentrated water. "Normal seawater has a salt concentration of about 3.5%," explains Sethi, "which means the new system can reprocess the same seawater several times. This system can produce about 80 liters of drinking water from 100 liters of seawater."

As the research is aggressively going on to develop technology for low cost desalination, MIT researchers have developed a new approach using a different kind of filtration material: sheets of graphene, a one-atom-thick form of the element carbon, which they say can be far more efficient and possibly less expensive than existing desalination systems. The common method by reverse osmosis uses thick membranes to filter the salt from seawater and uses extremely high pressure which is energy consuming and the membranes are about a thousand times thicker than graphene. The new graphene system operates at much lower pressure, and thus could purify water at far lower cost.

The new membrane being developed by researchers in USA has a novel surface topography and chemistry that allow it to avoid clogging and membrane damage due to salt ions, bacteria and other impurities build up on the membrane's surface that requires higher energy and chemicals for costly cleanup and membrane replacement.

The other breakthrough research has promised to reduce the energy requirements of desalination by a large extent. The three technologies i.e. forward osmosis, carbon nanotubes and biomimetic will be commercially available for desalination.

Sethi believes that while applying these new energy efficient technologies, the cost of desalination will considerably decrease as the cost of chemicals used for membrane cleaning and membrane replacement will be reduced. Desalination will become more economical and can easily be used as a viable alternate water resource.

The Indian desalination market though in the development stage of its life cycle, with government support and private sector participation will help in the growth of this market. India currently is one of largest desalination markets and will see a huge expansion in capacity addition both from private players and municipal corporations. "There lies a bright future ahead for desalination as both municipal and industrial segments are likely to fall in line eventually," opines Feroz Khan, Manager – Technical, Aquatech. EPC World