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A case study on Water conservation

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Abstract —*'WATER', being the most valuable and essential requirement of all the living organisms on Earth, requires the most effective management of its usage to make it available for the future centuries to come. From everyday activities of humans to almost all the industrial processes, water is the basic requirement of all. Therefore, to have enough quantity of water as and when required, there comes into picture the concept of 'WATER CONSERVATION' which includes various ways of storing fresh water, extracting water from possible sources, treating waste water, managing its storage and utilization effectively, etc. It does not mean that once you conserve water, you will have enough of it for the days to come. There also comes the question of preserving it in the right way and maintaining it to make it worth utilising. And this technique is known as 'WATER MANAGEMENT'. Water Management includes planned set of activities for collecting, storing, making the best use of the available water resources to fulfil the water demands and treating waste water.*

Keywords- *Water conservation, Water harvesting, Recycle & Reuse*

I. INTRODUCTION

'TATA CHEMICALS LIMITED', being a huge name in itself, is located on a dry part of India and of course it will be interesting to know how it satisfies its gigantic water demands throughout the year. Its challenge of water management is what makes it a curious point of discussion and study. The Plant, located on the West Coast of India, has products like Soda Ash, Caustic Soda, Pure Salt, Vacuum Iodized Salt, etc. Its location being one of the driest regions in India, the need of the hour at the plant is to meet the water requirement challenges every day. Therefore, the plant undertakes various methods of Water Management, Water Conservation, Waste Water Disposal, etc. 'TATA CHEMICALS LIMITED' at Mithapur has made ample efforts to make itself dependable on its own conserved water round the year. Its water conservation and management techniques are the ones which have been covered in this Project. The Water Management methods include high quality water generation from Salt Plant, Water Conservation, Water Pinch Principles, etc. Water Management initiatives come up with effective Water Conservation tricks in the complex like Thermal Desalination, recycling treated sewage, sea water RO etc. This project report portrays detailed methodologies of the water conservation efforts carried out in the complex.

The break-through in its history has been attaining ZERO dependency on outside sources of fresh water supplies. Located in an area chronically short of fresh water supplies, the plant has radically revamped the entire technology of water usage in the Soda Ash Plant. By a series of actions pivoted around Substitution, Conservation and Captive Production of fresh water, the Plant virtually paved the way for its unrivalled growth.

II. FACTORS ARISING NEED FOR WATER CONSERVATION AT THE PLANT

TATA CHEMICALS LIMITED is located at Mithapur on the West Coast of India which is one of the driest regions having -

- Unpredictable and low rainfall
- Average rainfall being 400mm
- Perpetual scarcity of fresh water
- 5-6 mm evaporation per day.

Therefore, the primary objective of the plant has been to satisfy its year round requirements of water and in turn not to hinder its production process anyway. Thus, from this point of view, scarcity of water demands a well-managed Water Conservation Plan.

Lack of Fresh Water Sources:

Being on the West Coast and having Arabian Sea by the side, the plant at Mithapur - The City Of Salt has only the sea water as its primary source of water. Sources of fresh water include only the rainfed lakes. Thus to maximize its fresh supply to the activities, Water Conservation has been one such way to sort out the water crisis since years. Treating the sea water for usage and other such techniques make the water source for the plant survive.

Providing Water to the Communities:

Apart from the above mentioned processes to conserve water, the plant not only looks for its own benefits in terms of water availability, but it also takes the communities around it into consideration. There are:
• Well Recharges
• Deepening and Desilting of Ponds and Wells
• Construction and Repair of Check Dams
• Deepening of Community Wells
• Water Harvesting Structures
• Dams
• Underground Storage Tanks
• Water Shed Projects.
These create an ample amount of water storage capacity for the community for a smooth livelihood. Other Biotechnology applications like the Malara green Cap Project add another step to the effort. Thus, this Social approach of the plant also asks for a proper Water Conservation System.

III. WATER CONSERVATION POSSIBILITIES AT THE PLANT

1. **Sea Water:**
Of course, without a second though, Sea is the biggest water source for the plant. Somehow or the other, most of the water supply revolves around it. Therefore, the complex has to have ways to get out fresh water out of this saline water. And TATA CHEMICALS has successfully discovered methods to treat Sea Water and hence effectively used this possibility of Water Conservation. These methods include -
• Thermal Desalination
• Softening
• RO
• Osmosis
• Cooling System
• Microbiological Fouling
• Degasser Unit.

2. **Waste Heat:**
Waste Heat of Ammonia Distiller Effluent is used to produce DM Quality condensate of 4800 Cubic /meter per day. State of the Art Desalination Plant is used for the process.

3. **Sewage:**
Sewage outcome of the Township is utilized and treated. Around 3000 Cubic Meter Sewage is produced per day. This treated Sewage is then used in various ways such as -
• Partly Recycled and Reused for toilet flushing in the township
• Partly used for Horticulture purposes
• Used as Manure in Township Gardens.

IV. WATER CONSERVATION METHODOLOGIES

1. Desalination:
It is a Thermal Process where:
• DM Quality condensate is generated
• Steam to Water generation Ratio is 1:4
• Condensate generated is 7000 Cubic Meter per day
• Vacuum Salt produced is 1800 MTPD.

2. Reverse Osmosis and Nanofiltration:
These methods are used to treat Sea Water. Applied pressure in excess of osmotic pressure reverses water flow direction. Hence the term 'Reverse Osmosis'. Thus water passes from Pure Water Compartment to Salt Water Compartment to dilute the Salt Water.

3. Cooling:
The Sea Water used as Cooling Media in Heat exchanger & Boiler. The steps include:
• Sea Water Analysis
• Microbiological Analysis
• Cooling Towers, etc.

4. Recycling and Reuse:

These are basically used for treating the Township Sewage. Treatment Process used for the Sewage includes:
• Septic Tanks
• Drying Beds
• Manual Screens
• Equalization Tanks
• Aeration Tanks
• Submerged Diffusers
• Secondary Clarifier
• Flash Mixer Tanks
• Clariflocculator
• Pressure Filter Feed Sump and Pressure Sand Filter.

V. PROJECT METHODOLOGY

1. High Quality Water generation from Salt Plant.
2. Substitution of cooling water by seawater in cooling towers.
3. Substitution of process water by treated seawater for brine preparation.
4. Water conservation within complex.
5. Internal generation of water from Steam Jet Refrigeration & Waste heat desalination, RO Plant.
6. Nanofiltration for growth needs.

VI. CONCLUSION

It has been concluded that Mithapur site has been able to achieve zero dependency on ground water by adopting various in-house water conservation measures as well as management of water through rain water harvesting methods and water recycle or reuse (Maximum part is recycled) and thus create self-dependency.

