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Water Stewardship at Hindustan Zinc Limited – A Case Study of Dariba Smelting Complex, Rajasthan, India

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INTRODUCTION

Dariba Smelter Complex (DSC) is a unit of Hindustan Zinc Ltd (HZL). Hindustan Zinc is into zinc, lead and silver business and is one of the world's largest integrated producers of zinc and is among leading global lead and silver producers. HZL is one of the lowest cost producers in the world and are well placed to serve the growing demand of Asian countries.

DSC is one of the world's largest smelting complexes with lead and zinc smelting capacity of 6, 25,000 MT per annum. We are having both hydrometallurgical and Pyrometallurgical smelters along with captive power plants. Our main products are Zinc cathode, Lead cathode, Zinc ingot (PW and SHG) Lead ingot, High Grade Metal (containing Silver), and Sulphuric acid.

Our vision of integrating Sustainability into our operations and activities is guided by our group Sustainability Framework having three pillars: Responsible Stewardship, Building Strong Relationships and Adding and Sharing Value. Our operations are certified to ISO 9001, ISO 14001 and OHSAS 18001.

At HZL, we recognize the social, economic and environmental value of water and the increasing global and local concern of water scarcity. We understand that water is a key resource and needs to be used responsibly, balancing the needs of many different users.

Water Stewardship at DSC

At Dariba Smelter Complex, we follow 4 pronged approaches for water management as given below-

1. Zero Discharge- Effluent Treatment Plant followed by two stage Reverse Osmosis and Multiple Effective Evaporator
2. Advance Technology
 - Adiabatic Cooling Tower
 - Air Cooled Condenser
3. Responsible stewardship- Municipal Sewage Treatment Plant in Udaipur
4. Rainwater harvesting- Storm water drains and collection ponds

Zero Discharge- Effluent Treatment Plant Followed by Two Stage Reverse Osmosis and Multiple Effective Evaporator

Effluent generated from the Dariba Smelter Complex is treated in Effluent Treatment Plant (ETP) of 9000 m³/day capacity followed by 8850 m³/day capacity of two stages RO plant. The treated effluents conform to the prescribed standards and recycled in the process. Multiple Effect Evaporator (MEE) and Solar Evaporation Ponds have been provided to ensure "Zero Discharge".

Advance Technology- Adiabatic Cooling Tower

Hindustan Zinc installed its first adiabatic cooling towers (ACTs) to replace the conventional cooling towers. An adiabatic cooling tower operates as an air-cooled heat exchanger, rejecting heat from a process cooling medium to the surrounding atmosphere by means of either dry cooling (convective heat transfer) or wet cooling (a double convection cycle between water and air), in which water acts as the cooling medium for wetting the air and the cool air in turn cools the hot process water. ACTs reduce water wastage by almost 80% by operating in a closed circuit.

Achievement: Reduces water wastage by 80%

Air Cooled Condenser

Steam is generated in Waste Heat Recovery Boiler (WHRB) during roasting operation which is used for producing power in steam turbine and steam coming out from turbine exhaust is taken directly to the condensers and in return condensate back to the WHRB without water loss. Traditionally at HZL it was done through Water Cooled Condensers at the rated capacity of 65 TPH. The water consumption in cooling towers is assumed to be of around approximately 700 m³ per day. To resolve this in Roaster V Air cooled Condenser has been installed. It saves water consumption up to 95% when compared to traditional water cooled condenser. Air cooled Condenser (ACC) consists of 4 modules each having 6 nos. of finned tube bundle and one CT fan and utilizes atmospheric air to condense the steam.

Roaster V, virtually consumes no water with adoption of ACC and adiabatic cooling Towers, it is also worth mentioning that STG generate more power than the power consumed in Roaster V.

Achievement: Approx. 700 m³/day water saving is achieved through above initiative.

Responsible Stewardship- Municipal Sewage Treatment Plant in Udaipur

The STP is the first sustainable development project of its kind in Rajasthan and has been constructed as per a tripartite agreement between Hindustan Zinc, Udaipur Municipal Corporation (UMC) and Urban Improvement Trust (UIT). The STP is treating 20 million litres of sewage per day. It is vital for the city of Udaipur, which is witnessing rapid urbanization and is a popular tourist destination. It will treat city's sewage leading to a substantial reduction in sewage inflow to the lakes and help maintain the beauty of lakes. The treated water is acting as sustainable source for our operations. Additionally, it is generating manure that will be sold by UMC to local bodies.

Achievement: Reduction in fresh water consumption at smelters.

Rainwater Harvesting- Storm Water Drains and Collection Ponds

The Lead-Zinc smelter plant has process areas that have potential for contamination of rainwater and non-process area that has negligible contamination sources. Therefore separate drains have been constructed for collection of rainwater runoff from process areas and non-process areas. Accordingly, three nos. of storm water collection ponds have been constructed to collect contaminated rainwater runoff from process areas and one nos. of storm water pond to collect rainwater runoff from non-process areas. The storm water pond capacity is constructed to collect all the runoff at the highest rainfall intensity of about 60mm/hr. A network of pump and pipelines are installed to transfer all the water from the storm water pond to the ETP for treatment and reuse, thus allowing for collection of next rain.