

END-USER PERSPECTIVES

Tata steels itself for further water demand in growing Indian operations

As it publishes its 110th annual report and prepares for another domestic growth spurt, India's steel behemoth opens up to GWI about where the water obstacles and their solutions lie.

Tata Steel was founded in Jamshedpur in the state of Jharkhand 110 years ago and has since grown into a multinational steel conglomerate, with the scale and complexity of its water needs rising accordingly. Headquartered in Mumbai, with operations in 26 countries and a commercial presence in 50 across five continents, its activities range from mining to finished steel goods. The group has doubled its capacity in India over the last decade, largely on the back of enhanced performance at the historic Jamshedpur facility and a greenfield project at Kalinganagar (Odisha). The Jamshedpur operations have an annual capacity of 10 million tonnes, while the company's board approved a five million tonne per year (MnTPA) expansion of the Kalinganagar plant in December 2017, which will take the domestic capacity to 18 MnTPA by 2022.

To support this growth in a country with increasing water stress issues, Tata Steel is focusing on water conservation initiatives at its operational facilities: in 2017, it achieved its lowest ever water consumption at Jamshedpur and its lowest ever effluent discharge figure overall, with 12% and 16% reductions respectively in 2016. In December 2016, the Jamshedpur works underwent assessment by the Confederation of Indian Industry Green Business Centre and was awarded a Platinum Green-Co rating, the first and only integrated steel plant in the country to achieve the top award. To drive their conservation efforts, the sustainability team uses external assessors such as the Dow Jones Sustainability Index and the Confederation of Indian Industry, as well as reporting its climate change and water data to the Carbon Disclosure Project. Sanjiv Paul, vice president of safety, health and sustainability, and his team spoke to GWI about the sustainability challenges that face such diversified operations and how they plan on tackling them.

Answered by: Sanjiv Paul, Vice President, Safety, Health and Sustainability, and team; Tata Steel Ltd.

GREEN STEEL

Sanjiv Paul leads Jamshedpur Town Services Division, aka Tata Steel's "Green City".



Source: Tata Steel

What are your main sources for process water?

The main source of process water for both our manufacturing sites (Jamshedpur and Kalinganagar) is partly adjoining river basins and partly the recovered water from our manufacturing process. A state-of-the-art 15,140m³/d central effluent treatment plant (CETP) has been recently commissioned in Jamshedpur to recycle wastewater and convert it to clarified water quality (see box, facing page). This has helped us reduce our freshwater intake by 25% over the last four years. At our Jamshedpur Unit, while

the crude steel capacity has doubled over the past decade, the freshwater intake has been reduced by adopting the three 'R' principles of reduction, reuse & recycling.

What is water used for in your production process?

Clarified water is used for the direct and indirect cooling of steel and in cooling towers. Demineralised water is used as boiler feed water for steam and power generation. We also use soft water for roll cooling and heat exchanges, and recovered water for Linz-Donawitz-steelmaking (also known as Basic Oxygen Steelmaking), coke quenching, landscaping and low-end applications.

How do you treat your process water?

Because the raw water is natural river water, it normally contains suspended particles, which we treat in a mechanical clarifier and with a chemical process. This clarified water can then be easily used in our industrial process application. For demineralised and soft water needs, we remove mineral salts through a system of ion exchange resins.

How do you treat your wastewater? What technologies do you deploy to recycle water?

We have multiple treatment stages in our wastewater treatment plants to enable us to reuse the water through six to eight cycles before it is discharged. To achieve this, we use chemical treatment, gravity settling, a thickener and also a mechanical filtration system comprising sand and press filters.

Large volumes of our wastewater are collected in cooling ponds, passed through a suspended solids removal process, and reused for low-end applications. A portion of our effluent is converted into clarified water using a clariflocculator, dual media filter and ultrafiltration/reverse osmosis (UF/RO) membrane system. The effluent from our coke process contains three ►

“ We are working towards zero effluent discharge, with the aim of achieving it in 2020.

Sanjiv Paul, Tata Steel

major contaminants: phenolic compounds, cyanide and ammonia. These are treated through aerobic and anaerobic biological processes which convert the organic effluent into sludge to be removed and reduce contaminants in the water to permissible limits.

We are working towards zero effluent discharge, with the aim of achieving it in 2020. At the moment, the effluent is discharged into the river once it meets the norms of discharge, which is checked with online analysers installed in all the drains and connected to the Central Pollution Control Board server.

What are your main challenges when treating the wastewater?

A big challenge for us is the varied nature of our effluent streams, which each need a different treatment process. We also have a high level of total dissolved solids (TDS) and around 80% of our contaminants are chloride-based. The removal of these dissolved solids requires UF and RO membranes. We also have to handle the disposal of suspended and dissolved solids removed in the clarifier and RO processes and the sludge produced in the coke effluent treatment system. This treatment also requires the cultivation of bacteria, a high chemical consumption and high TDS levels which are complicated to deal with.

Which treatment technology or combination of technologies have best suited your operations?

We have found that clarifiers, sand filters

KEY FIGURES	
Annual revenue	\$80.05 billion (2017)
Average annual production	11.68 million tonnes (2017)
Freshwater consumption	38.4 million m ³ (Jamshedpur; 2017)
Wastewater recycled	17.69 million m ³ (Jamshedpur; 2017)
Water efficiency ratio	3.83 m ³ /tonne crude steel (Jamshedpur; 2017)
Clarified water profile	BOD: < 30 mg/L COD: < 230 mg/L TSS: < 100 mg/L TDS: < 600 mg/L pH: 6-8.5

Source: Tata Steel

and duplex filters are best for the removal of suspended particles in our water. RO and demineralisation are best suited to the removal of dissolved solids.

How do you pilot new technologies? What is your current strategy for procuring new technologies?

We have tested a coke breeze process, the adsorbing of coke plant effluent in fine dust coke breeze that we can send to a sinter plant to be reused in furnaces. This was a successful pilot, however the space constraints in our existing plant make it difficult to implement. We have also piloted an unsuccessful blast furnace gas cleaning

plant (GCP) effluent cleansing through a biological oxidation method. Our research & development team has had success in removing cyanide and chloride from wastewater. This research was published and produced a patent. Further research on wastewater is in progress at our in-house laboratories.

New technologies are always adopted on the basis of sustainability and proven effectiveness.

Is there a technology gap - challenges that you currently cannot solve with existing technology?

Our main issue at the moment is the utilisation of solid waste generated from the RO plant – we would like to be able to make better use of this. The sludge generated out of the CETP is currently being used in the sinter-making processes.

Have you looked into solutions involving the Internet of Things? Could they help you with your water resources and wastewater management?

Our water consumption is being measured and monitored online through a GPRS/GSM-based system, with data captured in an Internet Transaction Server (ITS). Both live and historical data are made available, so we have better control over our water use. We also track all of our effluent with respect to quality and quantity, with the data transferred to the Government's environmental regulatory bodies, the Central Pollution Control Board and Jharkhand State Pollution Control Board. Individual departments' effluent quality is also posted on our intranet to better monitor discharge levels. ■

FROM STEEL TO PLATINUM

Tata Steel's Jamshedpur facility has gone from founding India's first industrial city to being the country's first Platinum GreenCo certified integrated steel plant.



Source: Tata Steel