Water treatment in steel plants

Water management in a steel plant

Water is used in every plant of a steel mill and practically all functions of water are utilized in a steel mill. In steel plants， water is used for process and heat transfer purposes; while water losses in the process are unavoidable (evaporation， drift)， there is scope for further improvements in water use for environmental， energy efficiency， operational improvement and economic reasons.

The amount of water used in a steel plant varies considerably， depending on the availability of water， the technology used， the age and condition of the plant and

equipment， the type of process and the operating procedures of the plant. Water recycling also varies considerably in integrated steel plants. Water availability is one of the main factors determining the recycling rate. Water consumption in steel plants is mainly through evaporation， ejected from cooling towers or incorporated into the product.

The various terms for water used in steel industry production are as follows.

Process water - It is the water that comes in contact with the final product or with the material incorporated into the final product.

Cooling water - It is water that is used exclusively for cooling purposes.

Boiler feed water - It is the water introduced into the boiler for conversion to steam.

Sanitary and service water - It is water used for drinking， showering， general cleaning and flushing of waste.

Intake water - It is the water that is pumped from the source to the steel plant.

Make-up water - It is water added to the water system to compensate for water losses.

Recycled water - It is water that is reused in a closed loop within the water system， usually after water treatment.

Effluent - It is the water that is discharged from the water system.

Consumptive water - It is the water lost through evaporation or incorporation into the product.

Total water use - It is the water equal to the make-up water plus the water circulating in the system.

Water for other uses - It is the water used for dust control， shop floor cleaning， gardening， etc.

Most of the water used in a steel plant is for cooling， protecting equipment and improving working conditions for employees. A small but still considerable amount of water is used as process water for iron ore beneficiation， purification of raw gases (coke oven gas， blast furnace gas and converter gas)， quenching of coke and slag， and descaling of steel. Process water is also used as part of chemical treatment， such as solvent for acid pickling， matrix for rolling emulsions， cleaning， degreasing or rinsing the surface of steel plates. Process water is also used for electrochemical treatments， such as zinc or tin plating. A small amount of water is used for boiler feed water and sanitary and service water. Water used for dust control is categorized as other uses.

The amount of water used varies greatly from one steel mill to another. This wide variation depends on the access to water and is largely determined by geographical location and local regulations. A global survey of steel mills showed that input water figures ranged from 1 to over 148 cumulative/ton of crude steel， and discharge water figures ranged from 1 to 145 cumulative/ton of crude steel. Make-up water requirements depend on the facility's water treatment and recirculation facilities and typically range from 2 to 4 cubic meters per ton of crude steel.

There are many aspects of water management that are important to the steel industry. The following are these aspects.

Water as a medium for heat transfer and therefore related to energy efficiency

The source of water， in terms of quality and quantity

Water treatment and circulation， recirculation systems

Water balance and water flow diagrams

Costs associated with water

The level of water quality depends on the process of its use