Cooling Water Management in Steel Hot Rolling Mills

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Due to availability, low cost and its high specific heat capacity, water is an especially desirable heat transfer medium in industrial processes. Steel production is a water intensive process where large quantities are used indirectly through heat exchangers or directly by spraying water through nozzles to cool the equipment, process fluids and intermediate/final steel products [1].

Direct and indirect cooling induces a temperature rise in water and causes significant increase to the concentration of dissolved solids. Furthermore, direct contact with hot steel enriches the water with a variety of pollutants in particulate forms and emulsions (i.e. ferric oxides and oil/grease). Such utilization of water increases the corrosion, scaling and microbiological growth in the cooling water systems and results to decrease in equipment performance and heat transfer efficiency, increase of the maintenance cost, and ultimately leads to destruction of equipment [2, 3]. The implementation of Best Available Techniques (BAT) for cooling water systems in iron and steel production is to minimize the above problems, achieving high level of environmental protection [4-6].

The present study presents an overview of the qualitative and quantitative characteristics of the contact cooling water cycle at a steel hot rolling mill, where the cooling water circuit is fed with make-up water from reverse osmosis of saline water. It is concluded that the application of Best Available Techniques (BATs) with efficient cooling water management through the use of recirculation cooling water systems, with cooling towers, accompanied by appropriate monitoring has led to significant improvements. Freshwater consumption was decreased by 85%, wastewater discharge was reduced by more than 95%, suspended solids content was reduced to <20 ppm, and the levels of metals and other pollutants were minimized (iron<5 ppm, zinc<2ppm, nickel<0,5 ppm, total chromium<0,5 ppm and total hydrocarbons<5 ppm). In addition there is further potential for valuable by-products to be recovered, total cost performance to be reduced and performance of the equipment to be improved. The above results are a good example of how sustainable management can be implemented in the steel industry.

References

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