WATER TREATMENT

Time for a rethink

Water treatment specialist Dr Richard Coulton considers how the iron and steel industry could improve its approach to water

Water is an important and often overlooked component in iron and steelmaking. The amount used depends on the process, but the average is around 50m³/tonne. Yet in the past, water treatment, for both discharge and re-use, has been of secondary importance, with water treatment plants lacking investment.

However now that the iron and steel industry is starting to recognise the full cost of water, it’s receiving more attention. So how can steelworks make better use of this limited and expensive resource?

The first step is to develop a water balance for the plant and develop a water usage strategy. This means identifying:

- The amount and quality of water required for each process
- Options for reducing water demand for each process (leakage prevention)
- Opportunities for water re-use and minimisation, for example by mechanically dewatering sludges to maximise water recovery and minimise waste generated
- Options for upgrading existing water treatment facilities to improve water quality.

Water treatment

Water treatment starts with processing the raw water entering the works. Typically this involves adding coagulant and flocculant to promote solids liquid separation and removing solids in some form of clarifier. Whilst the chemistry of water treatment has not changed much over the last 20 years, the method of dosing control has considerably advanced. Online instrumentation can now automatically adjust the chemical dosing rates according to the raw water’s characteristics. Upgrading the instrumentation and control can improve treated water quality and reduce operating costs.

Dewatering

Water is commonly used for scrubbing contaminants from blast furnace and basic oxygen steel processes. The water generated from these scrubbers contains significant amount of suspended and dissolved solids. Depending on the source these may have a low pH (blast furnace) or a high one (basic oxygen steel). Historically treatment of these streams has been achieved by blending the high and low pH waters to achieve a circum neutral pH, then precipitating most of the dissolved solids prior to settling the solids out of suspension in large lagoons. These lagoons are periodically excavated and the accumulated solids taken to landfill.

However as the disposal of liquid waste to landfill is illegal in the EU, European steel plants are faced with the challenge of periodically excavating and dewatering a large quantity of sludge over a short period. The alternative is to dewater the solids on a continuous ‘little and often’ basis, leaving the lagoons free for water storage purposes.

With this approach the waste streams can be blended in a more controlled environment producing a more consistent treated water pH, resulting in a lower dissolved solids concentration. Also the solids can be dewatered to a lower residual moisture content (reducing the tonnage sent to landfill) and the size of the treatment plant is substantially reduced.

Scale removal

The removal of scale from water used in cooling towers potentially form a suitable breeding ground for Legionella bacteria. Consequently, where the water is recirculated (such as in electric arc furnaces) the risk of bacteria build-up must be controlled by treating the water with biocide. The amount of biocide used depends on the suspend solids content of the water. So controlling the suspended solids content in the cooling water (a relatively low cost process) will minimise the cost of biocide treatment.

Biocide optimisation

The elevated water temperatures found in cooling towers potentially form a suitable breeding ground for Legionella bacteria. Consequently, where the water is recirculated (such as in electric arc furnaces) the risk of bacteria build-up must be controlled by treating the water with biocide. The amount of biocide used depends on the suspend solids content of the water. So controlling the suspended solids content in the cooling water (a relatively low cost process) will minimise the cost of biocide treatment.

Conclusion

As these few examples show, there’s real scope for the iron and steel sector to adopt a smarter, more holistic and strategic approach to water treatment. Those who do will improve their profitability and sustainability.

Author

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