

# NEXT-GENERATION WORK ROLL COOLING IN HOT ROLLING



Tata Steel Europe's adoption of an unconventional cooling process will improve water and energy conservation as well as the surface and strip quality of its hot-rolled products.

## THE CONTEXT

Cooling of work rolls is an important process in producing hot-rolled steel. An inadequate cooling process leads to poor strip and surface quality in hot-rolled products, as was the case in Tata Steel Ijmuiden's Hot Strip Mill 2 (IJM HSM2). The company felt that the problem could worsen after it revamped its operations in 2020 to hot roll even more challenging grades and strip geometries with respect to surface quality, and realised that it needed to take action immediately to prevent this.

It initially attempted to make improvements in the conventional spray cooling system, such as maximising wetness parameters, minimising the wet angle and experimenting with different entry-to-exit water flow ratios. However, this had no effect as the existing cooling system was already operating at maximum capacity. This prompted the company to look for more efficient and novel ways of cooling the work roll, preferably one that used less water at a lower pressure.

## THE INNOVATION

In order to improve the surface quality of its steel strips -- this was costing the company around €9 million a year in rejected coils and additional work -- IJM-HSM2 decided to do a full-scale production trial run using high turbulence roll cooling (HTRC) at its second rolling stand in the mill's finishing section. HTRC is a novel way of roll cooling using a high turbulent flow regime. This is done at a high flow rate but at a low pressure. HTRC not only significantly improves the roll's surface but it also makes high-pressure pumps, which are needed for conventional spray cooling, redundant, leading to potential savings of over €1 million per annum on electricity costs alone. The HTRC trial operation has been on since August 7, 2018 without any operational issues, and has resulted in good roll surface quality as it has increased the cooling efficiency while using less water.

## KEY CHALLENGE

### TO DEMONSTRATE THE ADVANTAGE OF THE HTRC TECHNOLOGY

Since the risks and costs of inadequate work roll cooling are very high, managers prefer to use tried-and-tested technologies and the HTRC process is not common in hot strip mills. The company thus had to convince its managers that conventional spray cooling would not be able to do the job any better, and that HTRC would be the ideal solution to the problem of poor surface quality faced by the mill.

## POTENTIAL IMPACT

Once implemented, the HTRC technology has the potential to reduce Tata Steel Europe's operating costs by

**€3 MN**