



MULPIC[®]
PLATE COOLING TECHNOLOGY

A INNOVATIVE SOLUTION FOR PLATE COOLING TECHNOLOGY

THE CHALLENGE

One of the most important processes in the production of high quality steel plate is the cooling process. The customers of modern plate mills are demanding products with higher strengths, increased toughness and better weldability.

Many of these products, such as high strength linepipe and ship plate, can only be produced by using online cooling in combination with microalloying and thermomechanical rolling practices.

To achieve the required metallurgical structure and mechanical properties, the cooling rates and cooling stop temperatures must be precisely controlled.

To cover the full product thickness range, the cooling power must be fully adjustable from very light cooling up to powerful direct quenching. In addition, the online cooling equipment must be capable of achieving homogenous cooling over the full length and width of the plates.

PRIMETALS SOLUTION

MULPIC® technology provides a single 'in-line' system, with the capacity to achieve the cooling rates and temperature drops required for Accelerated Cooling (ACC) and Direct Quench (DQ) cooling for a wide range of plate thicknesses.

The MULPIC® Cooling System, originally developed by the Centre de Recherches Métallurgiques (CRM), has been enhanced by Primetals Technologies to meet the needs of the modern plate production market.

Our experience and technical solution enables the production of plates with a uniform microstructure along the length and width of the plate.

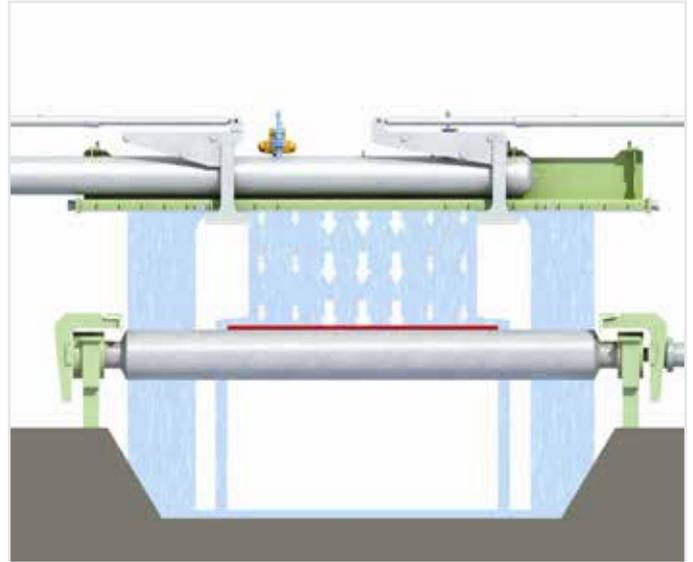




**THE BENEFITS OF PRIMETALS
MULPIC® PLATE COOLING
TECHNOLOGY**

- **Increased product range**
High cooling rates allows production of higher added value products
 - **Eliminate offline heat treatment**
The MULPIC® is located in-line with the rolling mill eliminating some heat treatment processes
 - **Uniform mechanical properties**
Uniform cooling results in uniform mechanical properties and increased yield
 - **Reduced alloying**
Accelerated cooling reduces the alloying required to reach the same mechanical properties improving weldability and reducing production costs
 - **Fully automated**
Adaptive model based automation ensures accurate, consistent cooling every time Operators are not required.
 - **Fully flexible**
Flow rate, speed, and unit length can all be adjusted to ensure the target cooling rate and cooling temperature are reached along the entire plate length.
 - **Improved Flatness**
Flow rates are adjusted top and bottom as well as across the plate width to produce flat plates
 - **Ease of maintenance**
Height adjustable stainless steel headers allow easy access for cooling header maintenance, while recessed cooling header nozzles are cobble resistant.
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FEATURES



LENGTH UNIFORMITY

Uniform control of temperature down the length of the plate is achieved using the following features:

Head and Tail Masking

The head and tail masking function allows a rapid reduction in flow to avoid overcooling the plate end positions, improving uniformity of properties along the plate length and increasing yield.

Speed Control

The rolling process gives a temperature rundown along the length of the plate. To compensate, the plate is automatically accelerated while cooling to achieve uniform cooling along its length.

Feed Forward Flow Control

The MULPIC® tracks localised hot and cold spots on the plate surface and automatically adjusts the flow to each header to further improve temperature uniformity.

WIDTH UNIFORMITY

The MULPIC® makes use of Crown Control Valves and an Edge Masking System to manipulate the flow of water across the plate width and achieve uniform cooling:

Water Crown Control

Crown Control valves, positioned within the top headers, gradually reduce the flow rate from the centre of the plate to the edges as indicated by the size of the arrows in the illustration above.

Water distribution is automatically set by the Level 2 Automation System depending on product thickness, width and water flow.

Edge Masking System

Movable Edge Mask trays divert the flow of water to avoid overcooling the extreme edges of the plate. Their positions are automatically set by the Level 2 Automation System



WATER FLOW CONTROL

Precise flow control is fundamental to accurate cooling. In order to achieve the performance potential of the MULPIC®, Primetals UK developed a high response flow control valve that gives accurate control for both very small and very large changes in position.

The unit is also very low maintenance with no adjustment necessary; with a fully automated calibration sequence.

The MULPIC® couples these valves with inline flow meters to close the flow control loop and provide accurate, repeatable performance.

By controlling the supply pressure, the MULPIC® achieves turn down ratios of 20:1.



HEIGHT ADJUSTABLE TOP HEADERS

During cooling, the MULPIC® top headers are positioned close to the plate surface.

For maintenance, the height adjust system lifts the top frame to provide access for routine inspection and maintenance.

Safety pins and safety rails ensure compliance with Environmental Health and Safety regulations.

MULPIC® HEADERS

Each 5m stainless steel header contains over 1000 nozzles.

This high density nozzle arrangement is the key to providing uniform transfer over the plate surface.

The recessed nozzle design gives a smooth surface for plates to glide over eliminating damage from turned up / down plates.

Water is kept clean with inline backwash filters and continual flow through the headers gives a long low maintenance life

A FULLY INTEGRATED SYSTEM, ENGINEERED TO PROVIDE MAXIMUM BENEFITS IN THE STEEL PLATE PRODUCTION PROCESS



MODULAR, FLEXIBLE DESIGN

Here at Primetals UK, we understand that no two rolling mills are exactly the same or have the same product mix. As such, the MULPIC® also needs to be tailored to suit individual demands.

A standard 24m long MULPIC® is the choice for most green field sites where the plant layout can be designed around modern rolling practices and the latest equipment.

Revamp situations require a more innovative approach to design around existing physical or process constraints.

In recent years, the novel use of large diameter hoses in place of rigid steel water supply pipes and the redesign of our zone separation sprays, has allowed us to install a MULPIC® in to spaces not previously possible.

HYBRID SOLUTIONS

Where space or budgets do not allow the complete replacement of an existing cooling system, this system can be enhanced by adding MULPIC® headers to it, or replace part of the old system with MULPIC® headers.

Primetals UK also offer the option to upgrade the automation system and control the entire hybrid unit.



**PRIMETALS
TECHNOLOGIES**
MULPIC®
CUSTOMER
REFERENCE
LIST

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