



SPRAY TECHNOLOGY FOR THE STEEL INDUSTRY



IMPACT TESTING

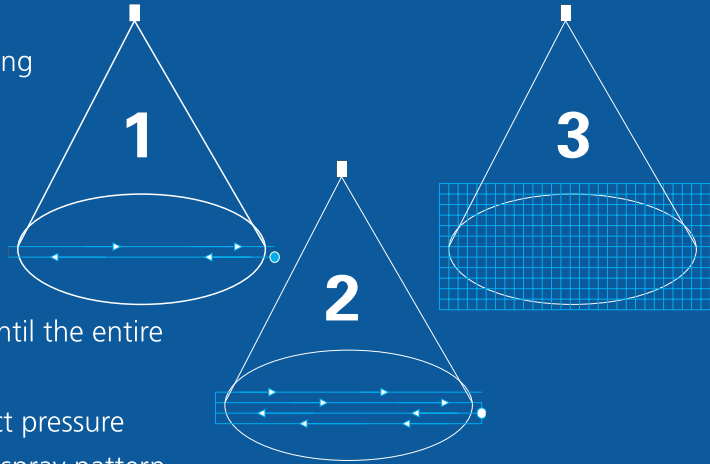
OVERVIEW:

Impact can be calculated using theoretical calculations. However, these calculations do not account for turbulence, spray rebound and splash back – all of which can have a significant effect on impact. To determine actual impact, the data must be collected and analyzed. In the absence of a commercially-available piece of test equipment that measured all the required attributes, we designed our own impact tester to collect data on two axes. From this, we can determine the impact force, lateral distribution and transverse distribution.

HOW THE IMPACT TESTER WORKS:

We typically compare performance of several different nozzles using different operating conditions to ensure optimal scale removal.

- The load cell of the impact tester first moves to the outside of the spray pattern
- It then traverses through the spray taking measurements at predetermined intervals
- The load cell continues back and forth through the spray unit until the entire spray area has been covered
- The data from the testing provides coverage information, impact pressure values and the uniformity of the impact distribution across the spray pattern



DESCALE HEADER DESIGN

OVERVIEW:

DescaleWare®, our proprietary software for header layout and nozzle selection, helps ensure the best possible results in your operating environment.

The software:

- Determines which nozzles provide the desired performance in your environment
- Graphically displays the header layout including nozzle type, spacing, coverage, spray height, lead angle and impact values
- Is suitable for use with all steel shapes



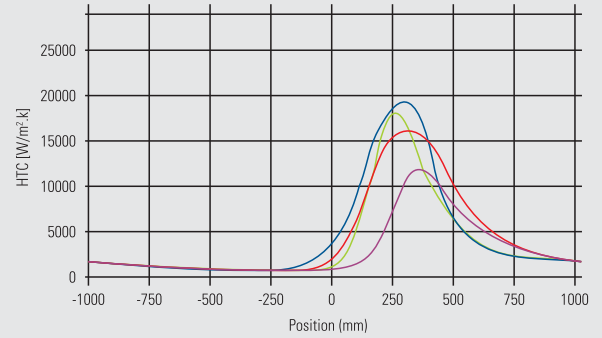
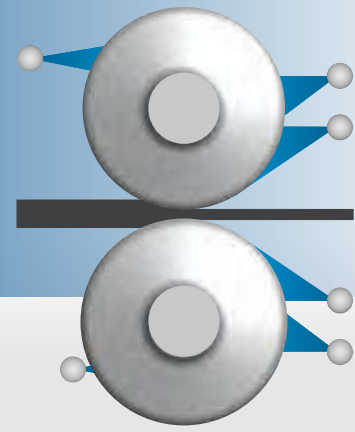


ROLL COOLING ANALYSIS

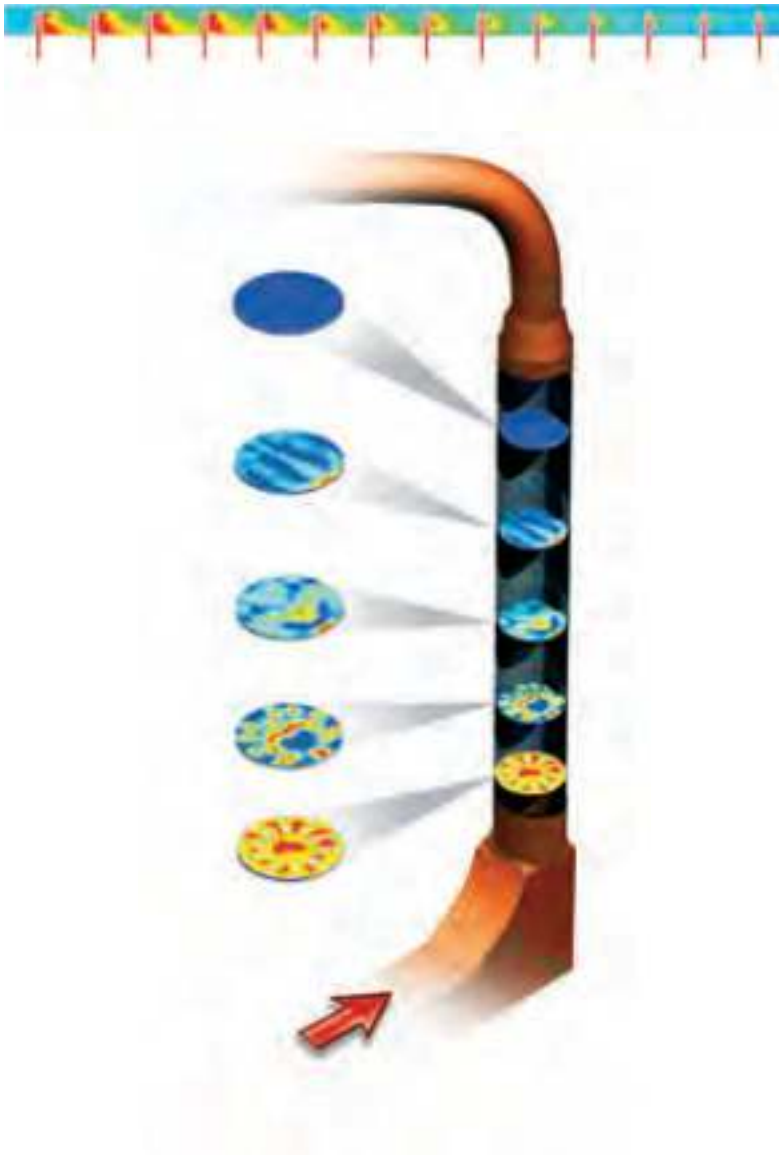
OVERVIEW:

We offer a full-range of services for roll cooling optimization:

- Analysis to determine the current profile and recommendations on how to improve the profile distribution. This includes evaluation of spray patterns, nozzle and header locations
- Heat transfer analysis and recommendations on possible changes to the current roll cooling configuration to improve performance including how best to use available water



COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING



OVERVIEW:

We use Computational Fluid Dynamics (CFD) modeling To help achieve an optimized spray solution. Simulation provides more information about the key factors that impact the success of an application. Modeling allows us to investigate many parameters that may be difficult or impossible to replicate in a laboratory environment. Our models use known inputs collected in our spray laboratories instead of theoretical data. This proprietary data improves model accuracy and illustrates flow patterns, velocity, turbulence, droplet trajectories, internal system pressure and more.

Typical uses for CFD modeling include:

- Determination of optimal header size and nozzle placement
- Descale header design validation
- Turbulence analysis in descale header design
- Gas cooling/conditioning analysis to determine lance and nozzle placement in ducts, scrubbers, furnaces, cooling towers and more
- Internal flow characteristics of spray nozzles under specific operating conditions



Spraying Systems Co.[®]

Experts in Spray Technology



SPRAY HEADERS

OVERVIEW:

Whether you require a spray header for descaling, cooling, cleaning or rinsing we can help. We design and build headers for a wide range of operations throughout your mill. Headers can be built in a wide range of shapes, styles and materials to accommodate any nozzle type.

SPRAY HEADER TYPES:

- **Descal headers** – round, square or straight headers designed for high pressure operation
- **Roll cooling headers** – can be equipped with a wide range of nozzles, including different sizes or types on a single header; multi-row headers also available
- **Oiling headers** – options include zone-control, heated, non-heated and recirculating designs
- **Brushless spray headers**
 - PVDF headers equipped with PVDF nozzles for use on pickling lines or prior to galvanizing
 - Stainless steel headers for strip cleaning prior to galvanizing
- **Self-cleaning spray headers with internal rotating brushes** - ideal for use with recirculated or basin water; automatic and manual versions available
- **Laminar flow headers** – standard and slit-style versions are available for efficient, cost-effective cooling



SPRAY LANCES

OVERVIEW:

Spray lances are most commonly used in conjunction with gas cooling nozzles such as our FloMax[®] nozzles. Typical installation is in ducts, towers and furnaces. Spray lances are built-to-order.

The more common designs include:

- 0°, 45° or 90° lance configurations with quick release or bolt-on flanges and optional cooling jackets, purge tubes and protective tubes
- Multiple nozzle lances with inline or nozzle clusters.
- When solutions are needed to meet challenging physical spaces or hostile environments, we can design and manufacture lances in a wide range of styles including insulated, water- and steam-jacketed, recirculating and retractable, in high-temperature and corrosion-resistant materials. If required, manufacturing to meet local codes is available along with testing in accordance with ANSI[®] and ASTM[®] standards.

