Nozzles and Systems for the Metallurgical Industry

COMPETENCE IN THE METALLURGICAL

Lechler nozzles have been setting standards in quality, performance and design for over 125 years.

A wide range of specially developed and proven nozzles of many different designs and in a range of materials is available for applications throughout the processes of metal smelting, refining, casting, rolling and processing. You can also select from over 20,000 other Lechler nozzles for a very wide range of other applications – with new ones being added to the range daily!

Nozzle development

Commissioning and training by Lechler staff

INDUSTRY

A dynamic market with high expectations

Global steel production will increase dramatically in the years ahead. The globalisation of the steel industry is not yet complete.

Every year, new steel-making companies are being newly formed, with production plants on every continent. The trend is similar in the case of the aluminium industry and the producers of non-ferrous metals.

The metallurgical industry places stringent demands on its suppliers

Most metallurgical plant and machine builders are already organised and active globally. Process optimisations, along with new technologies, enable production capacities to be permanently increased and the product quality of the metals produced to be further improved.
Nozzles and nozzle systems play an important role here in all production stages.
The following basic requirements must be met for a successful partnership:

Great innovative strength in order to realise new technologies.

High problem-solving competence for ensuring plant availability.

Global organisation as a guarantee of customer proximity and worldwide service.

Lechler meets these requirements in full.

Wherever you are in the world, Lechler is close by and employs over 550 people

With production facilities in Germany, the USA, England, Hungary, India and China (2008), sales offices in France, Spain, the BENELUX countries, Sweden and Finland, and representatives in over 25 countries, Lechler has a global network of service stations. This guarantees technical support for plant operators, a supply of spare parts and ongoing training of maintenance staff throughout the world.

Everything is in Lechler's favour

Leadership in technology
We use advanced design and production technologies.

Process-related competence
combined with unsurpassed nozzle know-how allow us to find the optimum technical solutions.

A worldwide service network
A supply of spare parts and technically competent after-sales service are guaranteed.

Headquarters, Germany

Lechler Ltd., United Kingdom

Lechler Inc., USA

UNSURPASSED NOZZLE KNOW-HOW AND A WELL-FOUNDED KNOWLEDGE OF THE INDUSTRY

The plant builder's partner

With its innovative nozzle solutions, Lechler is always involved in the introduction of new technologies and also in the continuous further development of conventional processes.

A well-founded knowledge of the industry

As an active member of many different national and international associations (VDMA, VDEH, AIST, S.E.A.I. & S.I., ATS and EUnited) and via numerous technical publications, Lechler has become very familiar with the subject matter. Participation in EU research projects (RFCS) also has increasing Lechler's technological competence as its goal. Of course, you as our client also profit from this.
Significant changes to operating conditions with regard to throughput capacity and the product quality demands of modern materials can arise over the course of the very long service lives of metallurgical machinery.
Today the production of a wide range of material qualities also demands a much greater flexibility in the operating procedures and in maintenance. This is where existing plants often reach their limits.

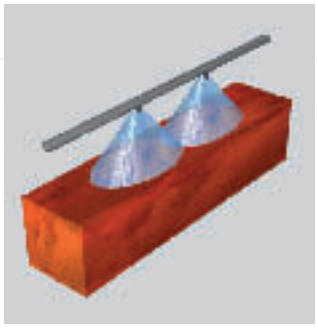
Besides the construction of new plants, one alternative can be the optimisation of existing ones. The most common reasons for this are:

- Identifying and remedying quality problems
- Improving ease of maintenance and lowering maintenance costs
- Increasing production by increasing the production speeds
- Changing the product formats and the material qualities (product mix)

In most cases, the decision involves a combination of the above reasons. It is therefore important for the aims to be clearly defined.

Lechler nozzle configuration

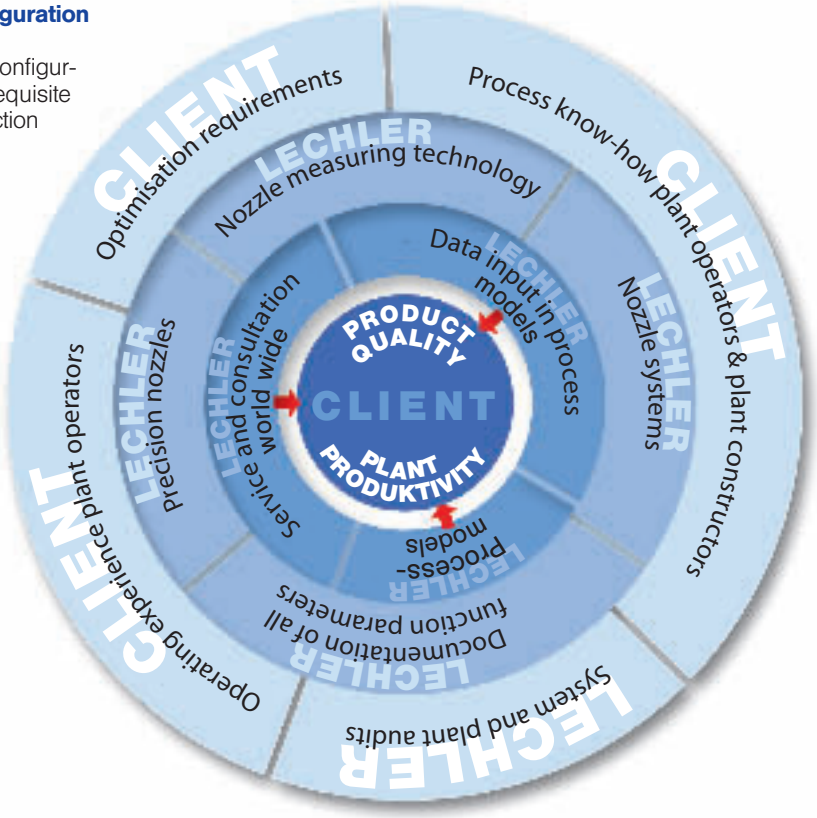
An optimum nozzle configuration is the main prerequisite for fulfilling the production and quality specifications of all plants.



New nozzle solutions open up many different possibilities for saving costs. The optimisation of nozzle systems can also make a significant contribution towards increasing production, quality and flexibility.
With the help of Lechler's own PC-based simulation programs, we can analyse the current situation and make optimisation suggestions based on state-of-the-art nozzle technology.

Lechler system audits

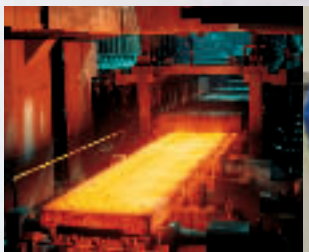
Roll cooling in hot- and cold rolling mills (steel, aluminium and non-ferrous) and also secondary cooling in continuous casting machines for steel are very complex systems and form part of the complete production processes. The full optimisation potential can often be determined only via a precise study of all the important details. Lechler system audits include an evaluation of the existing production, performance and quality data, along with a care-fully documented final report which, in addition to the collected and analysed data, also contains suggestions for optimising your system.



SPECIAL NOZZLES AND SYSTEMS FOR EVERY FIELD OF APPLICATION

- Precision nozzles
- Nozzles and application systems
- Nozzle configurations
- Application software
- Computer simulation
- Nozzle measuring technology
- Plant audits and process optimisation
- Maintenance and commissioning
- Training
- Spare part management

- Continuous casting of steel
- Hot and cold rolling of steel
- Hot and cold rolling of aluminium and non-ferrous metals
- Strip processing
- Other applications in metallurgical processes



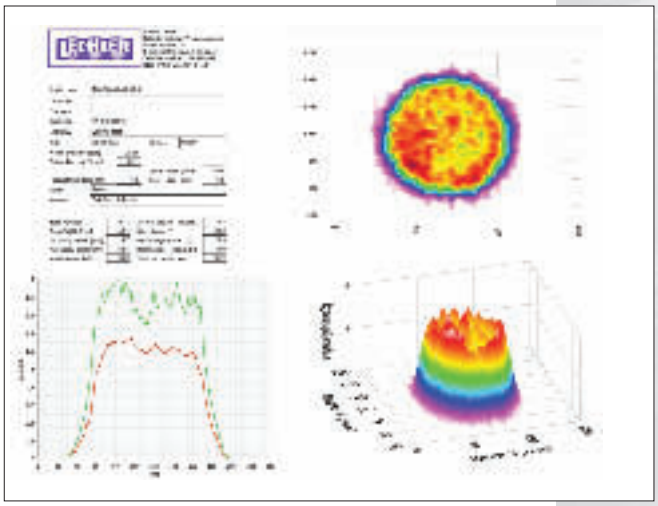
STATE-OF-THE-ART TECHNOLOGY TO ELMINTATE ALL RISKS

Data and facts that you can rely on

There are many reasons for our product's success: A very important one is that based on precise measurements, we are able to make reliable statements about the spray characteristic of a nozzle.
This provides reliable data for development, and also simplifies the evaluation for you with regard to fulfilling the exact purpose in the individual application - even before the nozzle has been integrated into your system. This saves time, reduces costs and ensures planning reliability.

We employ the latest methods to cover the entire measurement spectrum

- Flow rate
- Spray angle
- Spray shape
- Air flow measurement
- Droplet size measurement
- Droplet speed measurement
- 3D spray impact measurement
- Liquid distribution
- Spray videos
- Noise level measurement



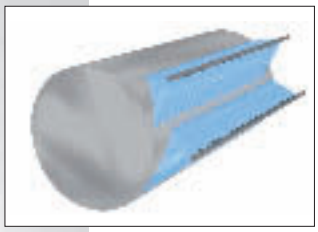
Documentation of a spray impact measurement

The performance data is determined with state-of-the-art measuring techniques and is documented accurately.

SIMULATING AND SUCCESSFULLY OPTIMISING PROCESSES

Computer technology provides you with a glimpse into your plant's future

Lechler uses in house developed application software programs in order to work out optimum solutions. This enables nozzle configurations to be simulated, analysed and depicted.
Lechler configuration programs have also been used successfully for many years during the design of new plants. Nozzle data from Lechler measuring technology forms the basis here for reliable calculations that reflect reality.



Roll cooling, strip cooling and lubrication

Lechler has developed a special computer program for optimising work roll cooling. The measured nozzle data and the installation conditions can be used to graphically depict (in the form of flow diagrams), analyse and improve the liquid distribution on the roll surface.
Strip cooling, cleaning and lubrication solutions can also be derived in this way.

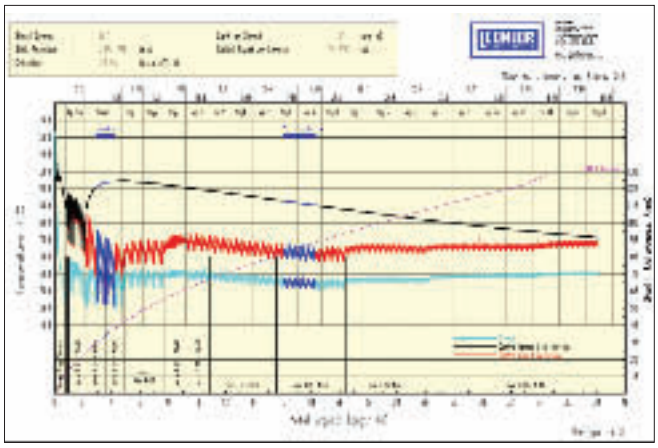
Solidification model for continuous casting machines

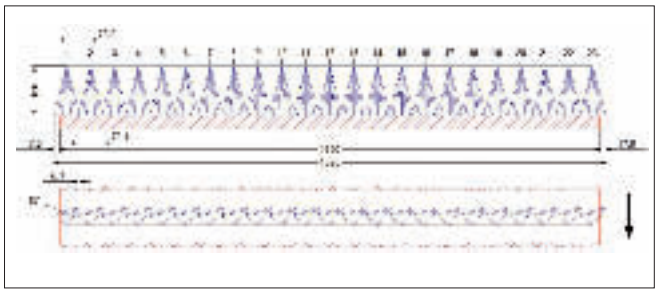
So that we can also be a competent consultation partner with regard to questions relating to the optimisation of nozzle configurations in continuous casting machines, Lechler has developed a solidification model with which benchmarking can be carried out within the context of a plant audit. On the basis of this and in line with the aims, it is then possible to investigate optimisation potentials in detail.

Lechler DESCALE

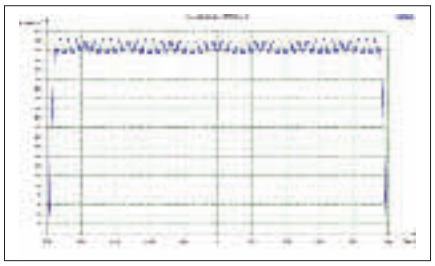
With the introduction of the SCALEMASTER® descaling nozzles in 1992, Lechler was the first nozzle manufacturer to develop and successfully use a configuration program.
Since then, most descaling plants of the largest and most renowned plant builders have been designed and constructed with Lechler DESCALE software.
Hundreds of descaling spray headers throughout the world have been optimised in this way. In all cases, with this tool Lechler has also made a crucial contribution towards increasing surface quality and plant efficiency.

Temperature profile of a continuous casting machine

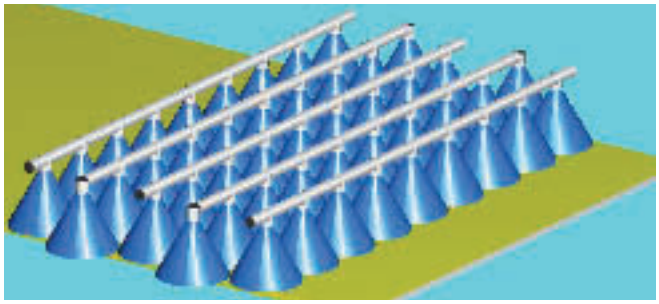




The Lechler DESCALE software optimises the nozzle arrangement on a descaling spray header

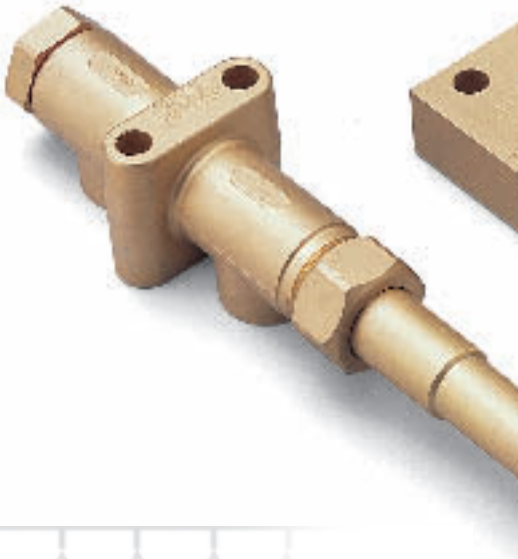


Liquid distribution for strip cooling



Visualisation of the nozzle arrangement for strip cooling

NOZZLES FOR OPTIMUM SECONDARY COOLING



At Lechler, you will find the right solution for every plant

It doesn't matter whether equipment for billet, bloom, slab or thin slab continuous casting machines is involved. The program ranges from standard single fluid nozzles for billet plants for more simple reinforced steels right through to special twin fluid nozzles (BilletCooler air mist nozzles) for plants in which very high-grade steels are cast for tyre cord or seamless pipes.

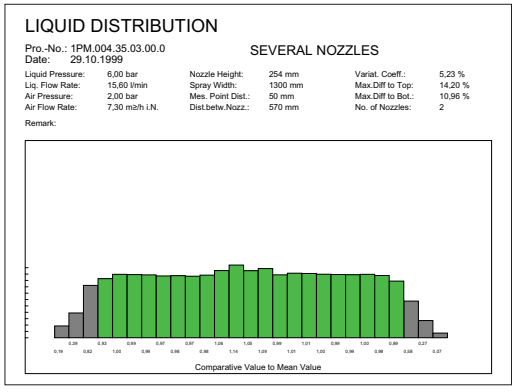
Modern slab continuous casting plants are in most cases fitted with specially designed and customised air mist nozzles of the Mastercooler type. This applies to both conventional thick slab plants and the more compact thin slab plants.

Preparation of a measurement of the nozzle heat transfer coefficient

Single fluid nozzles

Lechler single-fluid nozzles with a flat spray pattern or full cone nozzles are available with standardised flow rate and spray angle graduations. Rectangular nozzles produce a flat jet with a greater spray depth.
In addition to a standard program, variants of this nozzle family are designed especially for individual plants.

Liquid distribution measurement



LIQUID DISTRIBUTION

Pro.-No.: 1PM.004.35.03.00.0
Date: 29.10.1999

SEVERAL NOZZLES

Liquid Pressure:	6,00 bar	Nozzle Height:	254 mm	Variat. Coeff.:	5,23 %
Liq. Flow Rate:	15,60 l/min	Spray Width:	1300 mm	Max.Diff to Top:	14,20 %
Air Pressure:	2,00 bar	Mes. Point Dist.:	50 mm	Max.Diff to Bot.:	10,96 %
Air Flow Rate:	7,30 m3/h i.N.	Dist.betw.Nozz.:	570 mm	No. of Nozzles:	2

Remark:

Documentation of a liquid distribution

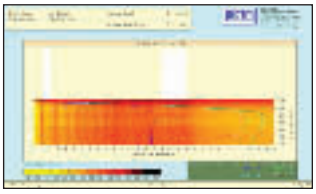
- Single-fluid nozzles with full cone, flat jet and rectangular spray patterns
- **Billetcooler** full cone air mist nozzles
- **Billetcooler** Oval air mist nozzles
- **Mastercooler** air mist nozzles
- Nozzle measuring technology and documentation
- Nozzle configurations
- Plant and system audits
- Conversion of the pipes and nozzle fittings of complete continuous casting segments
- Complete spray headers and spray rings

Air mist nozzles

With the **Billetcooler** series, Lechler offers the world's first air mist nozzle for secondary cooling with a defined full cone. The Lechler Billetcooler Oval is the first air mist nozzle for secondary cooling with which a spray depth of up to 60° is possible with a non-clogging single slot orifice. This enables larger surface areas between the support rollers to be cooled more evenly. This in turn reduces the risk of strand cracking.

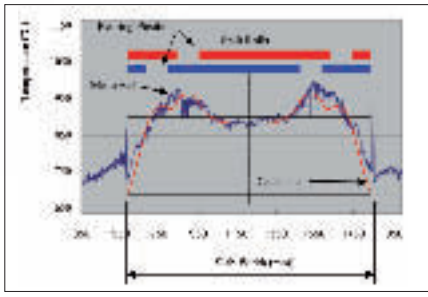
Air mist nozzles of the Billetcooler series should be used wherever the control range of single-fluid nozzles is no longer sufficient for the wide range of steel products in billet- or bloom casters, or when the nozzle's flow rate falls to well below 2 l/min.
Standard programs with a full cone spray pattern and with an oval spray pattern with likewise standardised flow rate, spray angle and spray depth graduations are available.
Defined spray patterns, high turn down ratios (min. to max. flow rate) and very large free cross sections (not liable to clogging) are the stand-out features of Billetcoolers.

Mastercooler SMART air mist nozzles are designed in line with the requirements of the secondary cooling system of each individual slab caster.
The water flow rate, the spray angle, the liquid distribution, the turn down ratio, the pipe length, the pipe shape and the type of connection are all adapted here.
To date, more than 100 slab strands have been successfully fitted with Mastercooler SMART air mist nozzles.

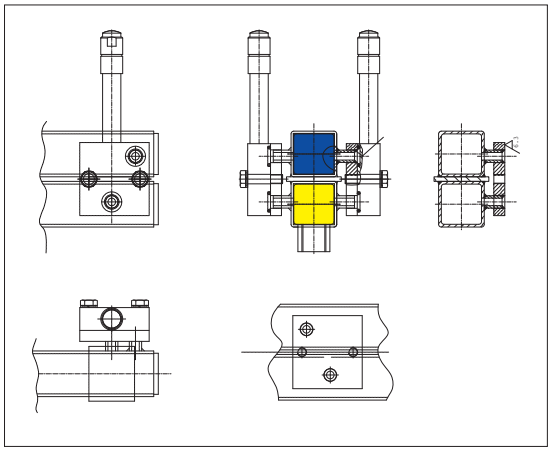


Strand temperature profile half width, total length

Mastercooler SMART® in slab plant



Temperature profile across strand, measured and calculated



Mastercooler SMART® installation

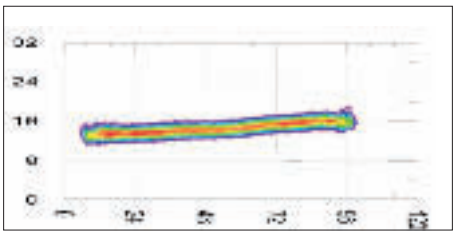
NOZZLES FOR MORE EFFECTIVE DESCALING

This is one of our specialist areas – hardly anyone knows more about this than we do

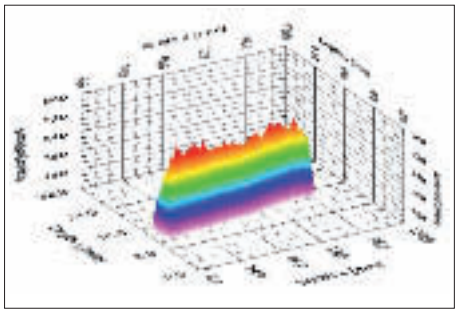
When steel is hot-rolled, the quality of the rolled product surfaces depends very significantly on effective descaling. The selection of the best descaling nozzles and their optimum arrangement is crucial here. Also, rising energy costs and ecological considerations are increasingly forcing rolling mill operators to define energy-saving measures and to implement them in the form of concrete measures.

The new **SCALEMASTER® - Superior** from Lechler has immediately started to set new standards in this area. When this nozzle was developed, the use of computer-based design methods (CFD) enabled us to largely eliminate internal liquid turbulences and pressure losses. This meant that a maximum impact increase could be achieved. Thanks to compatibility with earlier models, this allows even more effective descaling for the same energy input. In addition, it also opens up significant saving potentials due to reduced cooling of the rolled product by reducing the amount of water sprayed.

The use of new materials and the reduction in the number of individual components increase both service lives and operational reliability – two further economy advantages. Nozzle configurations can be determined quickly and reliably thanks to the combination of measured values and calculation models in conjunction with the Lechler DESCALE configuration software. This ensures planning reliability and is one of the reasons why globally, several hundred descaling systems have been very successfully fitted with Lechler SCALEMASTER® nozzles.

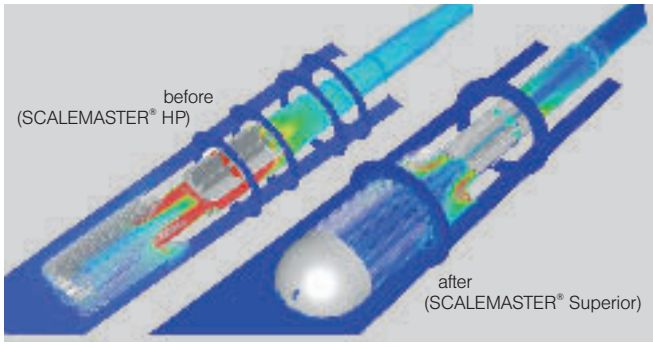


Descaling spray foot print protocol

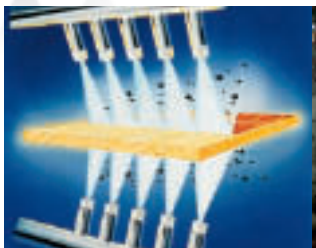


Three-dimensional representation of the impact distribution.

Stabiliser filter unit with optimised flow thanks to Computer Fluid Design (CFD)



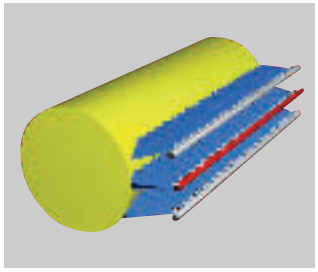
SCALEMASTER® SUPERIOR



PERFECT TECHNOLOGY FOR ROLL COOLING AND MUCH MORE

Lechler has a solution for all other nozzle applications in hot rolling

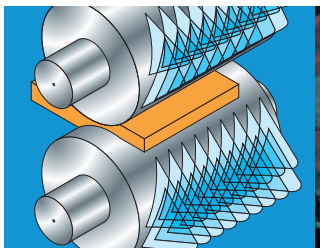
Only the optimal nozzle arrangements in roll cooling, for strip surface quenching (Anti peeling spray) in front of the roll bite or for interstand strip cooling guaranties a long service life of the work rolls and the required strip shape. Systems for strip surface inspection, measurements of strip thickness gauge and shape deliver only reliable data if the strip surface is free of dirt and water. With nozzles from Lechler very good results can be achieved here, too.



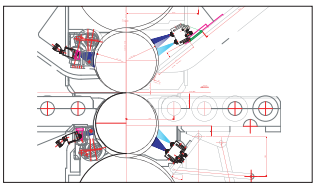
Roll cooling nozzle arrangement

Complete roll cooling spray header from Lechler

- Flat jet nozzles for roll cooling
- Flat jet and tongue nozzles for strip whiping in front of strip thickness gauge measuring units and surface inspection systems
- Nozzles for strip cooling in the run-out roller table
- Anti-peeling and interstand cooling nozzles
- **WHISPERBLAST**® air nozzles for blowing off strips in front of strip thickness gauges and surface inspection systems
- Studies and nozzle arrangement proposals
- Complete spray headers
- Application systems for the work roll lubrication (**LSC**)



NOZZLES AND SYSTEMS FO AND ECONOMY



Selective roll cooling system, individually planned

Modulax and EVA -nozzle valves for every rolling mill

Modulax-Superior valves

MODULAX SUPERIOR

SELECTOSPRAY® an indispensable actuator for shape control. It corrects reliably asymetrical strip shape defects and supports work roll bending

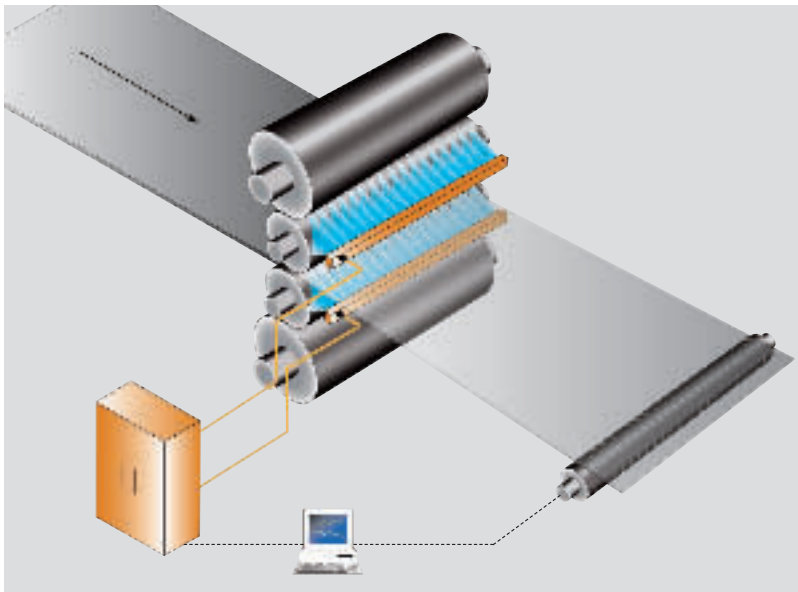
To date, more than 230 Lechler SELECTOSPRAY® roll cooling systems have been installed globally in cold rolling mills for steel, aluminium and non-ferrous metals, as well as in aluminium hot rolling mills and foil mills. Profit from our comprehensive know-how in this specialist area.

SELECTOSPRAY® Nozzle valves

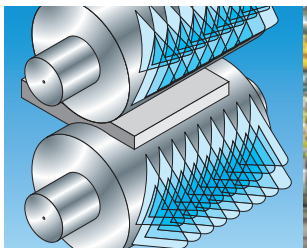
The new **MODULAX Superior** nozzle valve for electro-pneumatic control sets new standards with regard to operational reliability and plant availability, particularly for steel cold rolling mills and aluminium hot rolling mills. Zonings of 25 mm (**Mini-Modulax S**) and 50 mm are normal here.

The electrically controlled nozzle valves of the **EVA** series have proved to be optimally suited to aluminium cold rolling and foil rolling mills (50 mm zone division), as well as for rolling non-ferrous metals. 25 mm zone divisions are possible here too with the **Mini EVA** valve.

Other valve concepts are available with the **DSA** series.



Electrically controlled SELECTOSPRAY® system with EVA valve technology. (25 mm/1", 50 mm/2")



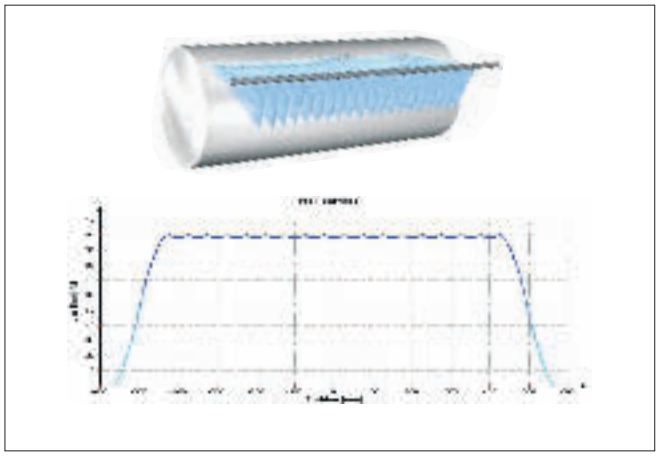
R INCREASING OF QUALITY

The Lechler **SPRAY CONTROLLER LSC** for controlling automated spray processes is the ideal solution for the following applications:

- Direct application (strip lubrication) for cold rolling of tinplate
- Application of corrosion protection oils to strips
- Application of separating agents when doubling aluminium foils
- Application of wet temper agents
- Lubricating work roll gaps
- Application of lubricating oils in tension levelling machines for strips

- Flat jet nozzles for roll cooling
- Flat jet and full-cone nozzles for strip cooling
- Direct application systems for the strip lubrication (**LSC**)
- Application systems for strip oiling and lubrication **(LSC)**
- **WHISPERBLAST**® air nozzles for blowing off strips
- Selective roll cooling systems **SELECTOSPRAY**® as an actuator for shape control
- Studies and audits of roll cooling in tandem lines
- Nozzle arrangement proposals
- Complete spray headers for optimising the roll cooling

Optimum strip flatness thanks to simulation of the nozzle arrangement



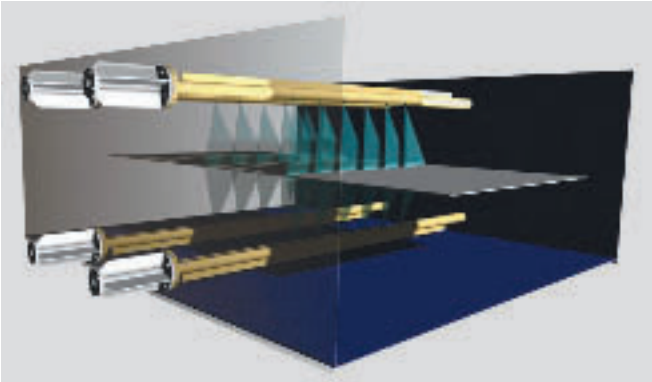
The LSC system ensures reliable control over the process variables, combined with optimum and even application of the fluid. This allows product quality and productivity to be increased, and operating costs to be reduced.

Control cabinet Selectospray system

Mobile spray platform LSC

VARIETY OPENS UP NEW POSSIBILITIES

Lechler is the specialist company for nozzle and spray technology.
Make use of the advantages of this wide product range

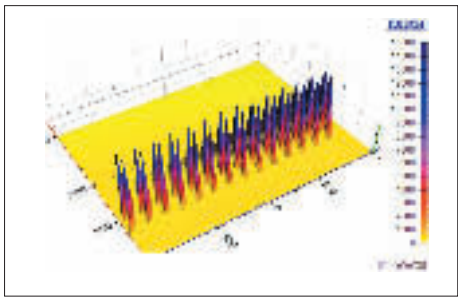


With Lechler nozzles, you can optimally fulfil all typical requirements on pickling, galvanising and tinning lines, on strip coating lines, and on continuous annealing lines. These include cleaning and rinsing processes, but also the direct application of acids, for example. A wide range of standardised flat jet, tongue and full-cone nozzles made of various materials such as PVDF, PTFE, polypropylene or stainless steel provide a broad basis for future-orientated and technically perfect solutions.

WHISPERBLAST® air nozzles made of stainless steel or plastic are used for blowing off strips or strip edges.

Special Lechler hollow-cone nozzles made of oxide ceramic, silicon carbide, titanium and palladium-titanium are installed for regenerating acid in picking lines after the spray-roasting process.

Self-cleaning spray pipes (the "STAMM" system) allow nozzles and the pipe inner walls to be cleaned in a matter of seconds during operation. This is done either manually or automatically by rotating a cleaning brush inside the spray pipe. This prevents unscheduled and expensive plant shutdowns, and safeguards the product quality of the strip.
If required, Lechler can also supply complete spray pipes made of polypropylene or PVDF for pickling lines. The optimisation of the nozzle arrangement can be incorporated as a task at the same time.



Liquid distribution of a nozzle arrangement

Self-cleaning »STAMM« spray pipe system

OTHER NOZZLE AND SYSTEM APPLICATIONS

Coke ovens

Coke quenching

Liquor flushing in the coke oven

Cleaning the coke oven battery doors

Gas cleaning and droplet separators

Blast furnaces and sintering plants

Combating dust and dust deposits on conveyor belts and transfer points

External wall cooling

Gas cleaning - gas cooling

Gas cleaning in the slag granulation

Steel production

Electric furnace hood cooling

Electrode cooling

Cooling the outer skin of the converter

Exhaust gas cooling and conditioning

Dust suppression

Continuous casting machines

Flushing the scale channels

Spraying off the slag during flame cutting

Roller cooling

Machine cooling

Mould spray cooling

Hot rolling

Settlement of oxide dusts in the stand

Intermediate stand cooling

Strip surface quenching to protect the work rolls

Strip spray-off and blow-off

Blowing off heavy plates upstream of the levelling machine

Crop shears blade cooling in pendulum shears

Ultra fast cooling / quecing of plates and strips

Strip cooling in the run-out roller table

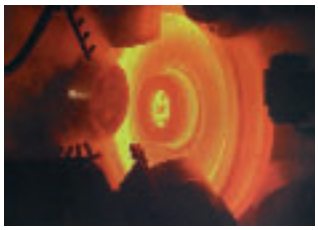
Rolled product cooling on the cooling bed

Forging and pipe production

Mandrel bar and tow bar cooling and lubrication

Descaling forged pieces

Roll cooling in railway wheel manufacture



Other applications

Gear lubrication

Pickling and flushing steel wire in pickling plants

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- ☐ Brochure »Roll Cooling«
- ☐ Brochure »Continuous Casting«
- ☐ Brochure »SELECTOSPRAY® Roll Cooling Systems«
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- ☐ Brochure »Water Stop Valve WSV«
- ☐ Brochure »Lechler Spray Controller LSC«
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