Nozzles and Systems for the Metallurgical Industry

Steel
Non-ferrous metals
Aluminium
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!
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 650 people

With production facilities in Germany, the USA, England, Hungary, India and China, 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.
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 EUUnited) 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 benefit 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 carefully documented final report which, in addition to the collected and analysed data, also contains suggestions for optimising your system.
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

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

Documentation of a spray impact measurement
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.
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.

**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**

Preparation of a measurement of the nozzle heat transfer coefficient.

<table>
<thead>
<tr>
<th>LIQUID DISTRIBUTION</th>
<th>SEVERAL NOZZLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro. No.: 1PM002.30.0.0.0</td>
<td></td>
</tr>
<tr>
<td>Date: 29.10.1999</td>
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</tr>
<tr>
<td>Liquid Pressure: 6.00 bar</td>
<td>Nozzle Height: 250 mm</td>
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<tr>
<td>Air Pressure: 2.00 bar</td>
<td>Max. Point Dis.: 1500 mm</td>
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<tr>
<td>Air Flow Rate: 7.00 m³/h</td>
<td>Max. Diff to Top: 0.24 %</td>
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<tr>
<td></td>
<td>Min. Diff to Bot.: 0.15 %</td>
</tr>
<tr>
<td>No. of Nozzles: 2</td>
<td>Max. Diff to Bot.: 0.19 %</td>
</tr>
</tbody>
</table>

Remark: Comparative Value to Mean Value

0.19
0.39
0.82
0.93
1.00
0.99
0.99
0.97
0.98
0.97
0.98
1.06
1.14
1.05
1.09
0.99
1.01
1.01
1.00
0.99
0.89
0.58
0.27
0.07
**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.
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.

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Lechler nozzles combined with our process know for better roll cooling results

Only optimal nozzle arrangements guarantee highest productivity of a rolling mill. Therefore, roll cooling systems and headers shall be designed to extract heat from the rolling process in a controlled and efficient way that assures optimum control of Roll Temperature.

Lechler Thermal Roll Cooling Study better roll cooling results

A roll cooling study is a systematic and structured approach and delivers a wide range of benefits by determining the potentials optimized nozzle and header arrangements offer with regard to improvements in product quality, productivity and reduced operation costs.

The final study report provides solutions focussing on:
- Maximum heat extraction for Minimum coolant volume applied
- Symmetrical thermal profiles on the work rolls (minimum gradient in temperature)
- Controlled thermal Crowns
- “Normal” Steady state roll temperatures
- No differentials in the thermal conditions between the top and bottom work roll
SELECTOSPRAY® an indispensable actuator for shape control. It corrects reliably asymmetrical strip shape defects and supports work roll bending.

To date, more than 300 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.

The Principle

To achieve precise cooling control, the roll barrel is "divided" into zones, each of which has coolant precisely applied to it by MODULAX valve controlled spray nozzles. Each of the zonal sprays can be operated independently of the others either manually, by push button control, semi automatically by a PLC, or automatically in connection with a shape control system. The SELECTOSPRAY® system can be used in conjunction with any of the shape control systems currently available, the roll zoning being dimensioned to exactly match that of the shape metering roll involved. Zone widths for both automated and manually controlled systems are available, widths in general use being between 25 mm and 100 mm.

The SELECTOSPRAY® includes complete headers, air hoses and control cabinet.
**LECHLER COMPETENCE AND EXPERTISE**

Of paramount importance for any roll cooling application is how the sprays impinge on the roll surface. An effective and precise footprint geometry is the fundamental requirement to establish a Uniform cooling from top to bottom work rolls and transversely across the cooling area resulting in an optimal heat extraction across the spray cooling area on the roll.

When designing a spray header Lechler arranges the sprays without interference or creating hot and cool bands in adjacent cooling zones. The nozzle flow rates spray angles are taken into account besides the positions of the spray headers in the mill for the design of the optimal nozzle offset and impingement angles in order to obtain the best heat transfer.

**Lechler SELECTOSPRAY® valves**

The proven Modulax valve design is available in three different versions:

- Pneumatically controlled with the solenoid in the control cabinet outside of the mill
- Electro-pneumatically with the solenoid directly attached (DSA)
- Purely electrically controlled (EVA)

All valve versions have very large coolant entry ports, are easily removable from the header front and are protected by the header itself. All valves carry self aligning flat jet nozzles.

**Lechler SELECTOSPRAY® valves (MODULAX)**

- Liquid to air pressure ratio 2:1
- Very large internal free passages
- Uses standard shop air
- Simple design, only one moving part which is the piston

**Electro-pneumatic valve actuation (DSA)**

- Each valve has its own dedicated solenoid directly attached.
- Shorter response time.
- Air for the pilot operation is fed by a single tube directly into the header and instantly available when the electrical solenoid is activated.
- Solenoids can be supplied in either normally open or normally closed.

**Electric valve actuation (EVA)**

- Especially in rolling mills where inflammable rolling oil or kerosene is used as a coolant and without need for compressed air.
- Large orifices for a laminar flow and a stable spray.
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 fulfill 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 pickling 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.

STRI P P R O C E S S I N G

VARIETY OPENS UP NEW POSSIBILITIES

Self-cleaning "STAMM" spray pipe system

Liquid distribution of a nozzle arrangement
CASTING AND ROLLING MILL TECHNOLOGY

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 / quenching 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
Yes, I want to get detailed information on Lechler products

Please send me the special information:

☐ Catalogue »Precision Spray Nozzles and Accessories«
☐ Brochure »Roll Cooling«
☐ Brochure »Continuous Casting«
☐ Brochure »SELECTOSPRAY® Roll Cooling Systems«
☐ Brochure »SCALEMASTER Superior®«
☐ Brochure »SCALEMASTER® HP«
☐ Brochure »MicroSCALEMASTER®«
☐ Brochure »Water Stop Valve WSV«
☐ Brochure »Lechler Spray Controller LSC«
☐ Brochure »VarioCool® Gas Conditioning Systems«
☐ Brochure »Measurement Technologies«
☐ Special interests:

Our Address:

Name

Company/Department

P.O. Box/Street

Postcode/City

Country

Phone

E-mail