

**ENGINEERING  
YOUR SPRAY SOLUTION**



## **Nozzle Lances and Systems for Gas Cooling and Conditioning**



**VarioCool®**

# EFFICIENT COOLING AND CONDITIONING WITH LECHLER NOZZLE LANCES AND SYSTEMS

Lechler is Europe's No. 1 and is also one of the leading suppliers of nozzles and systems worldwide. For over 135 years, we have pioneered numerous groundbreaking developments in the field of nozzle technology. We combine comprehensive nozzle engineering expertise with a deep understanding of application-specific requirements to create products that offer outstanding performance and reliability.



## Innovative solutions for a trending market

Lechler is your innovative and reliable partner in all matters relating to gas cooling and conditioning. Always with the aim of employing our expert knowledge to optimize your process.

Efficient gas conditioning offers a wide range of approaches to reduce costs and increase efficiency. A prerequisite is that the respective processes are thoroughly understood and that the gas conditioning is adapted accordingly.

## The right solution for every requirement

With our wide range of nozzles and gas conditioning systems, we offer the perfect solution for every application. Every plant naturally comes with its own set of challenges.

Our nozzle lances and systems have proved in different applications and plants all over the world:

- Cement and lime industry
- Waste incineration plants
- Power plants
- Steel industry
- Glass industry
- Chemical industry

**We rise to these challenges and work with you to develop the best solutions for your business. We support you with comprehensive consulting services ranging from process analysis to turnkey solutions.**

1879



Company founded by Paul Lechler

1893



Patent for liquid atomization

1962



Sales offices set up in Germany

1978



Expansion to the USA and then to other countries

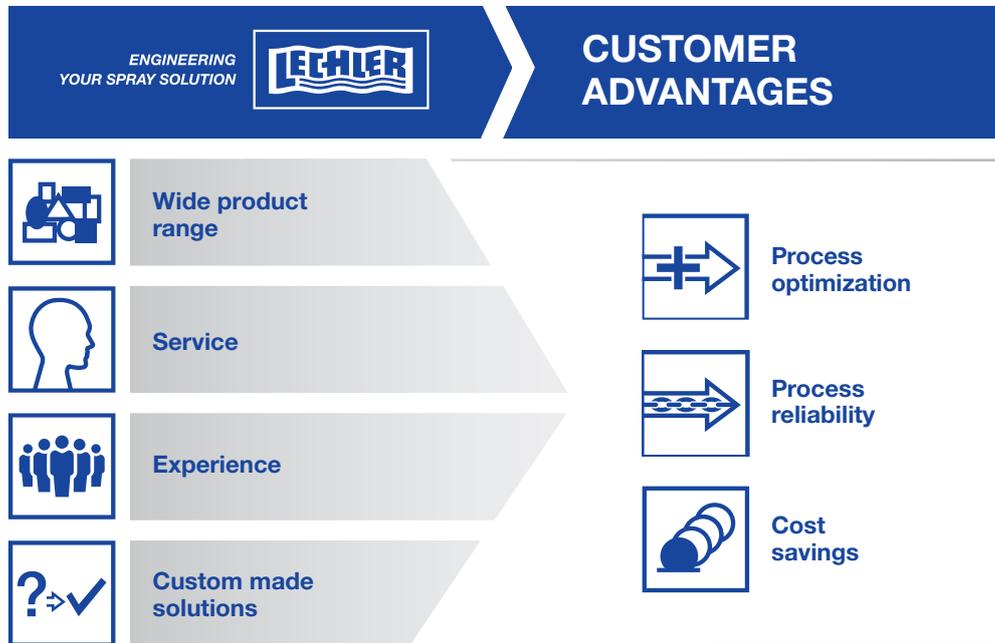
# COMPETENCE – THE ADVANTAGE OF MULTIPLE PERSPECTIVES

For many years now, nozzles and spray systems for industrial gas conditioning have been an integral part of our Environmental Technologies portfolio. An international team of outstanding engineers and process engineers continuously develop new solutions and adapt them to new challenges.

Through the use of global databases and close cooperation with external specialized institutes and renowned plant manufacturers, we have built up an interdisciplinary knowledge base – and with it optimal process integration.

Our constant exchange of experiences with plant operators means we are always in tune with the latest developments and can react proactively to them.

To provide you with local support, we are represented all around the globe – with locations in the USA, Great Britain, India, China, ASEAN, France, Belgium, Italy, Finland, Hungary, Spain and Sweden, as well as sales partners in almost every country.



## Costs under control

In most processes with hot offgases generally extreme environmental conditions prevail. We manufacture our nozzles from highly resistant materials with minimal wear.

The long service life of our high-quality components for valve skid units and systems does not just reduce the pure

costs of spare parts, but also decreases downtimes and maintenance costs. In addition, customer-specific systems lower the operating costs to a minimum.

Twin-fluid nozzles allow for an application-optimized fine droplet spectrum, whereas spillback systems do away with compressed air altogether to reduce the energy consumption.

**Our job is to identify the appropriate solution in each case and then adapt it perfectly to the on-site conditions.**

1988



Environmental Technologies division founded

1995



Production, sales and administration are concentrated in Metzingen

2010



Expansion of production with new 13,000 m<sup>2</sup> production hall

2016



Opening of the ultra-modern Development and Technology Center in Metzingen

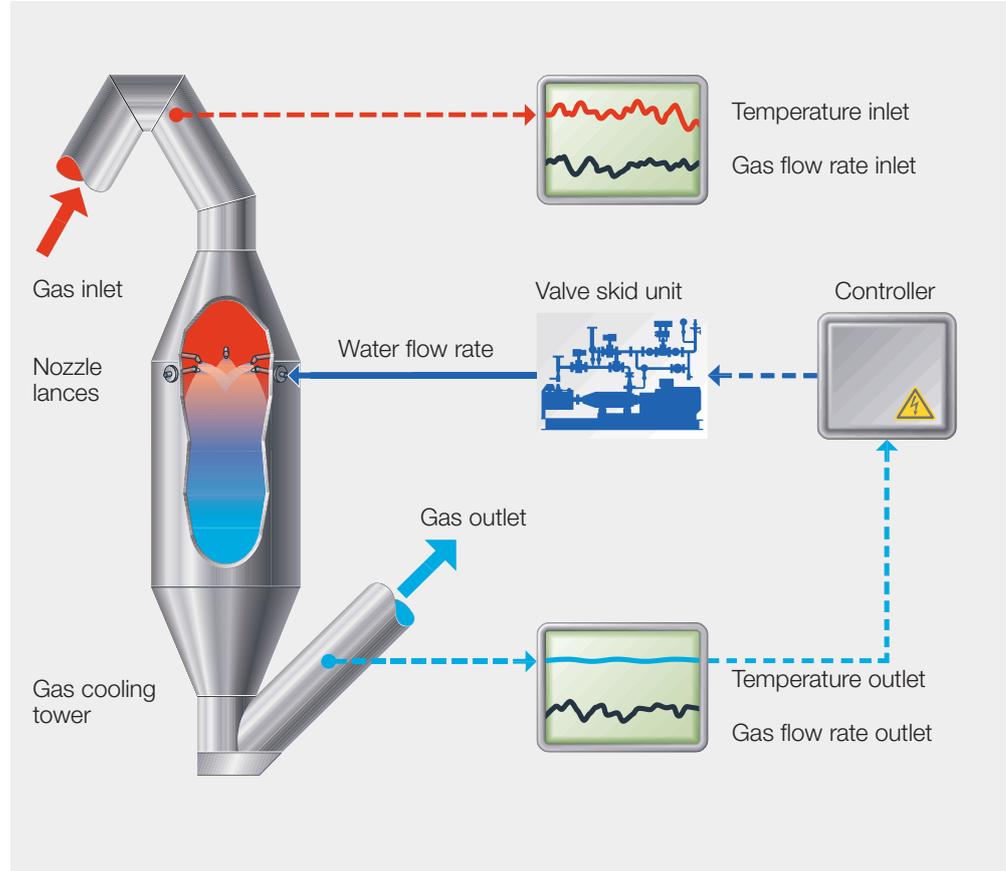
# LET'S OPTIMIZE YOUR GAS COOLING PROCESS

Our work begins with a detailed joint analysis of the process-related data, the various operating states and framework conditions. This also includes energy consumption considerations.

For this we are backed by a global network of specialists and our own expert advisors. In order to obtain an optimal and comprehensive design of the cooler and of the associated injection system, a large number of interacting variables and different operating conditions need to be taken into account. Thanks to our many years of experience, we are able to assist you in calculating the amount of water and dimensioning the evaporation distance.

For implementation, we offer both twin-fluid or spillback systems. We configure your system in line with the process data and the cooler size, thus giving you an optimum solution.

As Europe's No. 1 nozzle designer and manufacturer, Lechler attaches particular importance to the careful selection of the nozzle design and is able to fall back on a uniquely wide range of different functional principles.



We supply you with completely preassembled and tested valve skid units with defined interfaces. Each of the components is perfectly tailored to the function of the nozzle lances and their on-site connections.

## Beyond gas cooling

**Our nozzle lances aren't limited to gas cooling. They have proven their performance and efficiency in a wide range of applications such as**

- Nitrogen removal (DeNOx SCR and SNCR)
- Spray drying
- Spray absorption
- Fluid injection in circulated fluidized bed coolers, mills etc.



Cement and lime industry



Waste incineration plants



Power plants



Steel industry



Glass industry



Chemical industry



# CHOOSING THE RIGHT NOZZLE



Best results are achieved in gas cooling and conditioning processes only when detailed knowledge of process-specific requirements is available to assist in the choice of nozzles.

**We will provide you with comprehensive advice taking your system and the applications you require into account. Our portfolio includes nozzles made of different materials for a wide range of droplet sizes and spray angles. The combination of your specific process requirements and our decades of experience results in a tailor-made solution for your needs.**



# Spillback nozzles

## Atomization without compressed air



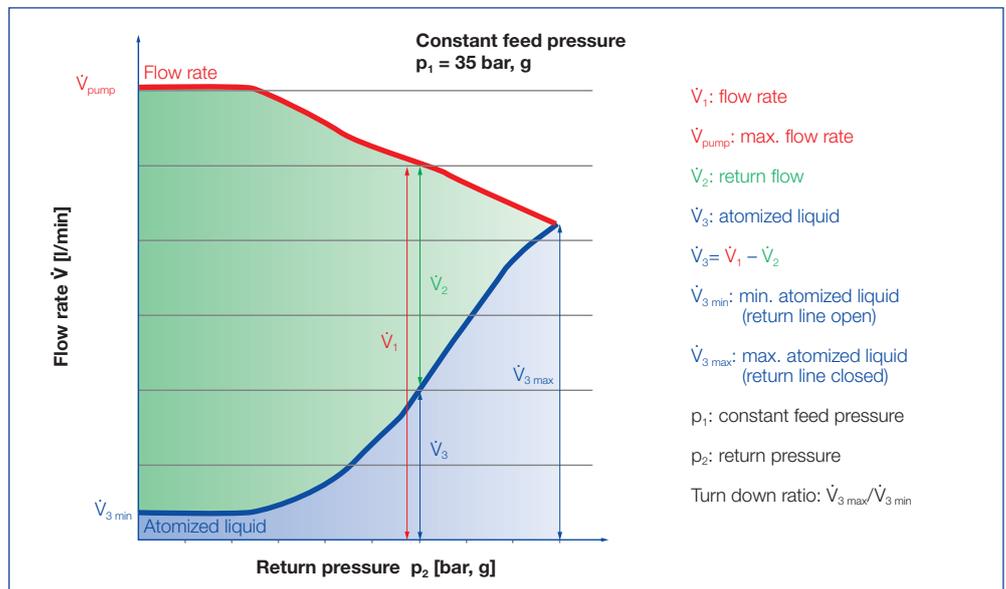
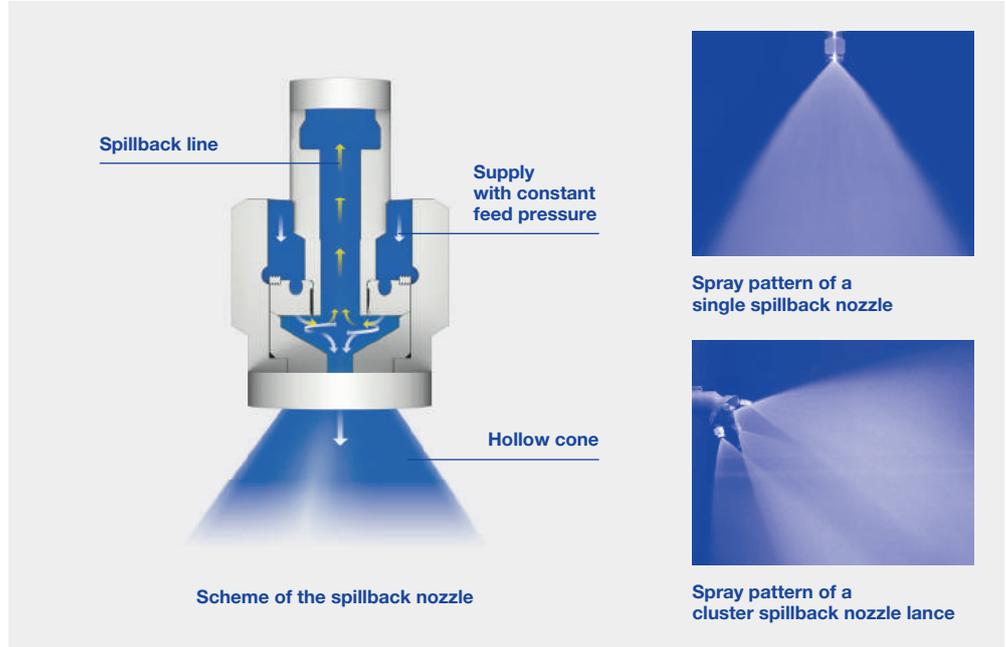
**Lechler spillback nozzles** atomize liquids as a fine hollow cone.

This special single-fluid nozzle works according to the pressure atomization principle. The water is sent to the nozzle with a relatively constant feed pressure, independent of the atomized flow rate.

The amount of liquid injected is adjusted via a control valve in the spillback line, whereby part of the flow is taken from the inlet flow rate and returned to the tank. The maximum atomized flow rate is achieved with the control valve closed.

Uniform and fine liquid atomization is achieved across the entire control range.

The atomized flow rate can be distributed over cluster heads with up to six small nozzles. This results in a total spray angle of approximately 120°. This wide distribution of liquid over the entire duct is advantageous for reducing the number of lances.



### Use:

- Gas cooling in medium-sized and large gas cooling towers

### Properties



**Spray angle of the individual nozzles**  
90° or 60°  
as hollow cone



**Low operating costs** as no atomizing air required



**Execution**  
as single or cluster nozzle lances possible



**High turn-down ratio**  
of up to 12:1



**Even and fine liquid atomization**  
over the entire control range



**Typical pressure range**  
of 35 bar, g in the supply line at the nozzle

# VarioJet® nozzles

Twin-fluid nozzles with low air consumption despite large outlet angle



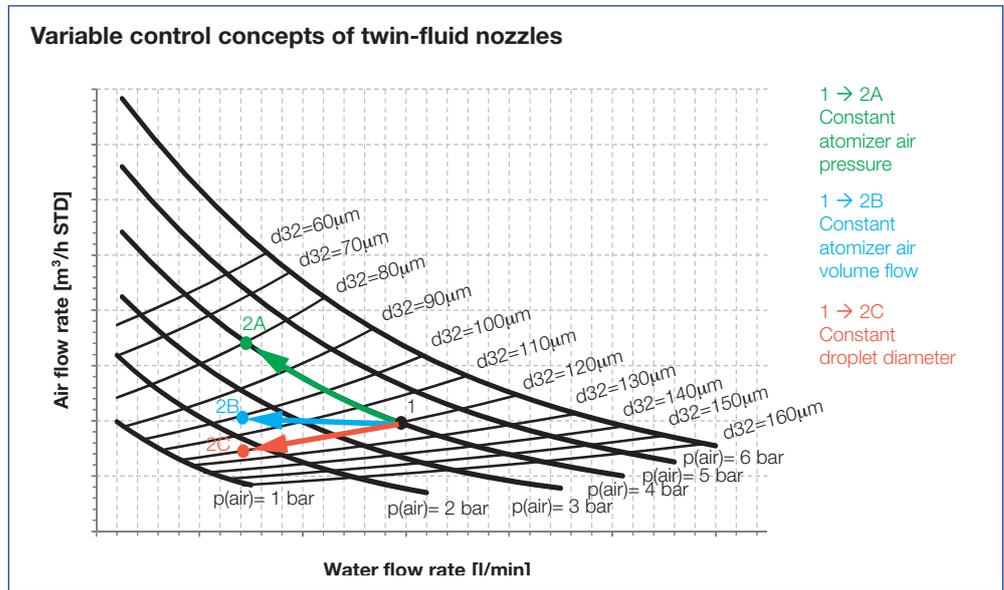
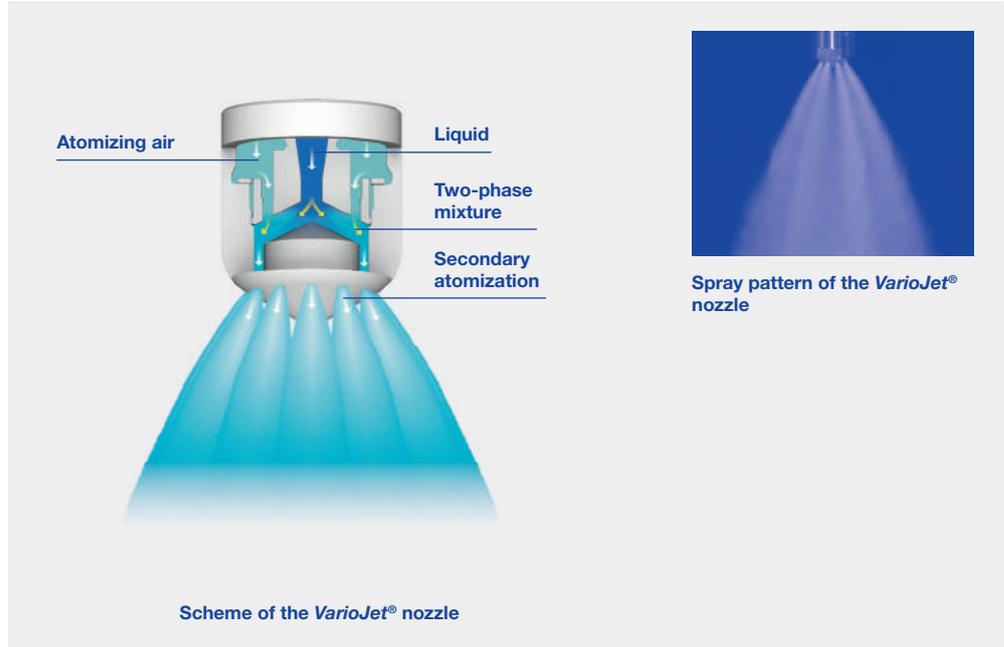
**Lechler VarioJet® nozzles** atomize according to the principle of internal mixing. With this twin-fluid nozzle, the water is fed in axially via a bore hole.

After arriving at the cone tip, the liquid is split up into a thin liquid film. This thin liquid film is split into finest droplets by the atomizing air in the mixing chamber. The resulting two-phase mixture is then atomized a second time when exiting via several bore holes arranged in a circular fashion.

Thanks to the innovative design of the nozzle, a spray with a large outlet angle is achieved. This is characterized by an even liquid distribution as well as a fine droplet spectrum with a low specific air consumption.

The fineness of the droplet spectrum is decisively influenced by the air/liquid ratio and by the pressure level of the two flow rates. As a general rule: the higher the air/liquid ratio and the higher the pressure level of atomizing air and liquid is, the finer the droplet spectrum.

The large free cross-sections in the nozzle keep the risk of clogging and the maintenance effort to a minimum.



**Use:**

- Gas cooling in gas cooling towers as well as gas-bearing pipes (ducts)

**Properties**



**Large spray angle** (60°, 90°) for good coverage of the cross-section of the duct



**Adjustment of the droplet spectrum** by changing the air/ fluid ratio



**Clog-resistant** thanks to large free cross-sections without internal fittings



**High turn-down ratio** up to 20:1



**Low air consumption**



**Typical pressure range**  
Liquid 1–9 bar, g  
Atomizing air 1–6 bar, g

# Laval nozzles

## Twin-fluid nozzles for a wide droplet spectrum in special applications

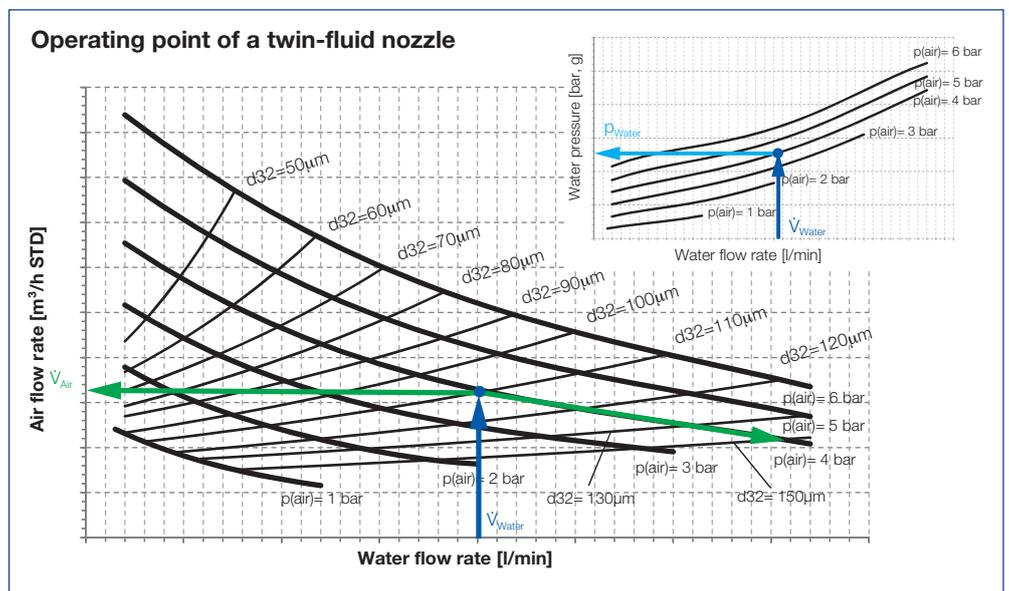
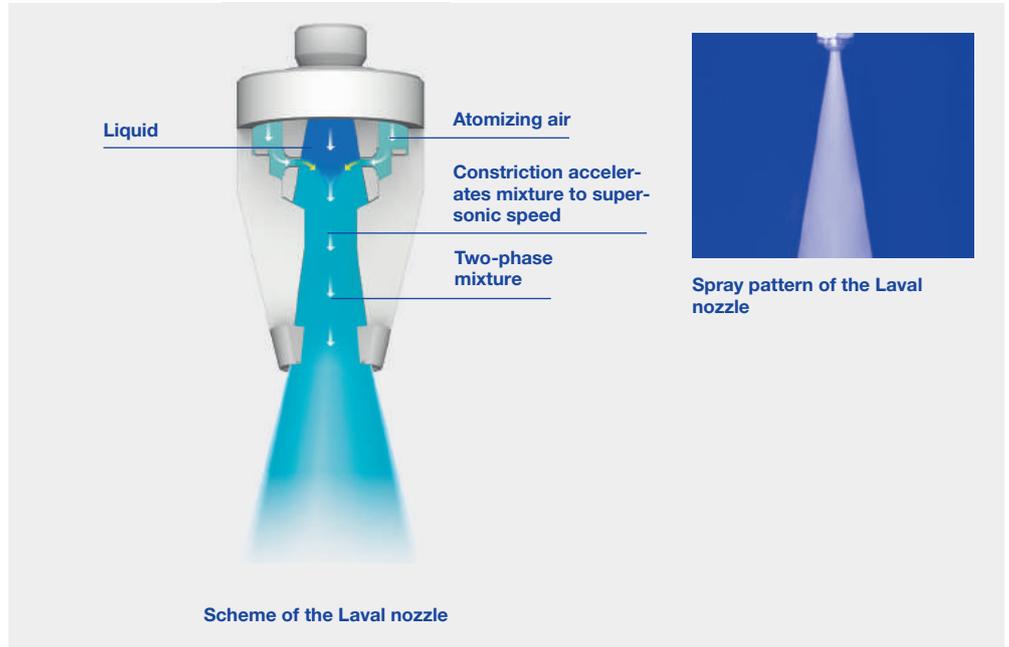


**Lechler Laval nozzles** atomize liquids as a fine full cone. These twin-fluid nozzles work according to the supersonic principle.

A dual-phase mixture is created from atomizing air and liquid in the mixing chamber inside the nozzle. The shape of the nozzle causes this mixture to be accelerated to supersonic speed, resulting in an extremely fine atomization of the droplets.

By changing the air/liquid ratio, the droplet size and the droplet spectrum can be adapted within a wide range. The large free cross sections of the nozzle also allow atomization of viscous or solids-laden liquids.

Choosing the right material prevents wear even where abrasive media are present, and enables use at high temperatures.



### Use:

- Gas cooling in gas-bearing pipes (ducts) and medium-sized and small gas cooling towers
- Injection of solids-laden water
- Introduction of lime water in the desulfurisation process
- Injection of aqueous ammonia or urea solution for the DeNOx process (SNCR/SCR)
- Chemical process engineering (spray dryers etc.)

### Properties



**Small spray angle** (15°), suitable for small cross-sections and horizontal ducts



**Adjustment of the droplet spectrum** by changing the air/liquid ratio



**Clog-resistant** thanks to large free cross-sections without internal fittings



**Very large turn down ratio** of 20:1 (in some cases up to 40:1)



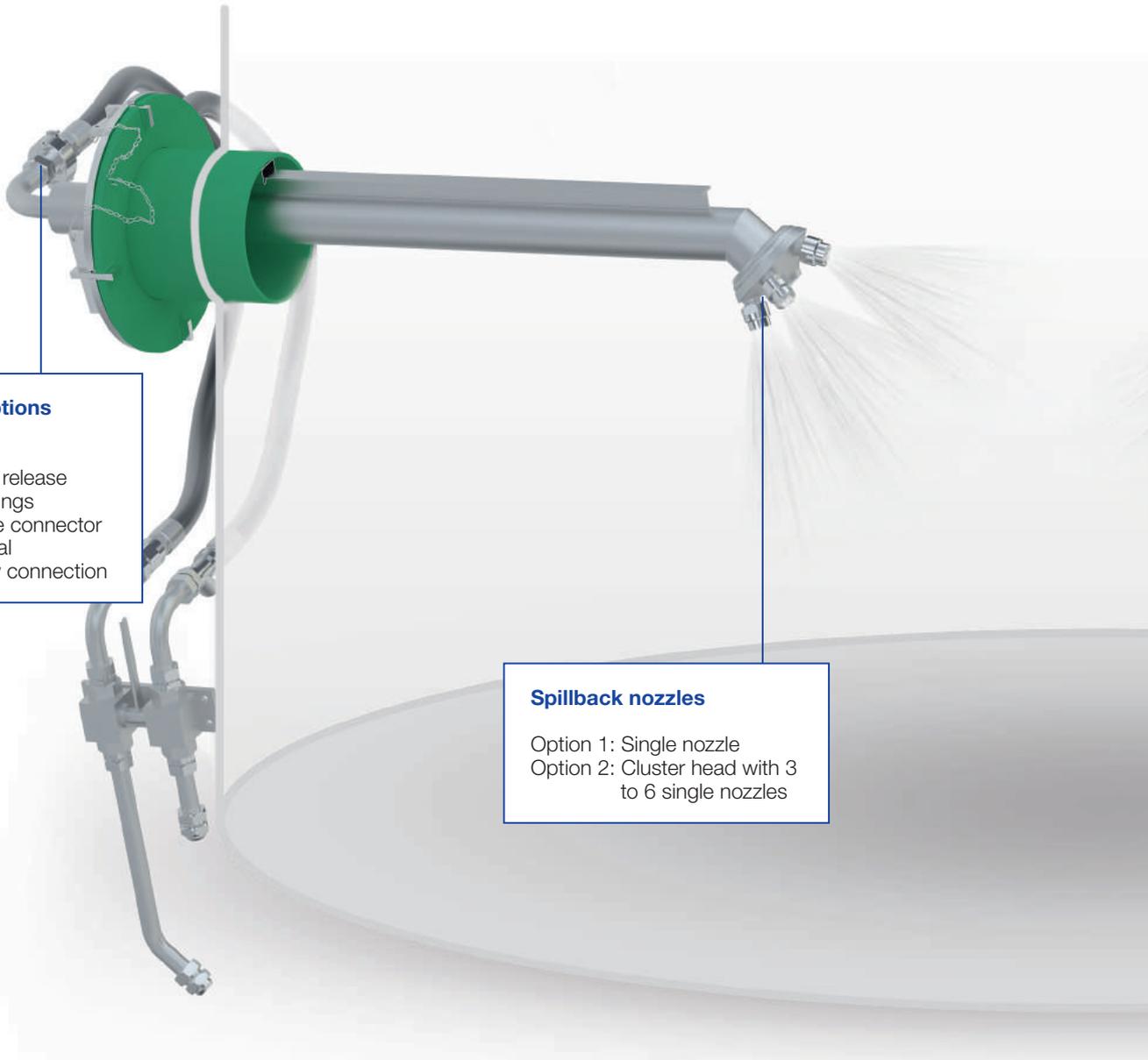
**Very fine droplet spectrum**



**Typical pressure range**  
Liquid 1–6 bar, g  
Atomizing air 1–6 bar, g

# Nozzle lances

## Highest spraying accuracy in the flue gas duct



**Connection options  
Accessories**

Option 1: Quick release couplings  
Option 2: Flange connector  
Option 3: Conical screw connection

**Spillback nozzles**

Option 1: Single nozzle  
Option 2: Cluster head with 3 to 6 single nozzles

**Lechler nozzle lances** ensure optimal spray placement and alignment in flue gas ducts. The choice of nozzles and the consideration of local conditions and process-related matters means they can be individually adapted to the respective requirements.

The nozzles themselves have a low-maintenance design and can be quickly cleaned or exchanged with minimal effort.

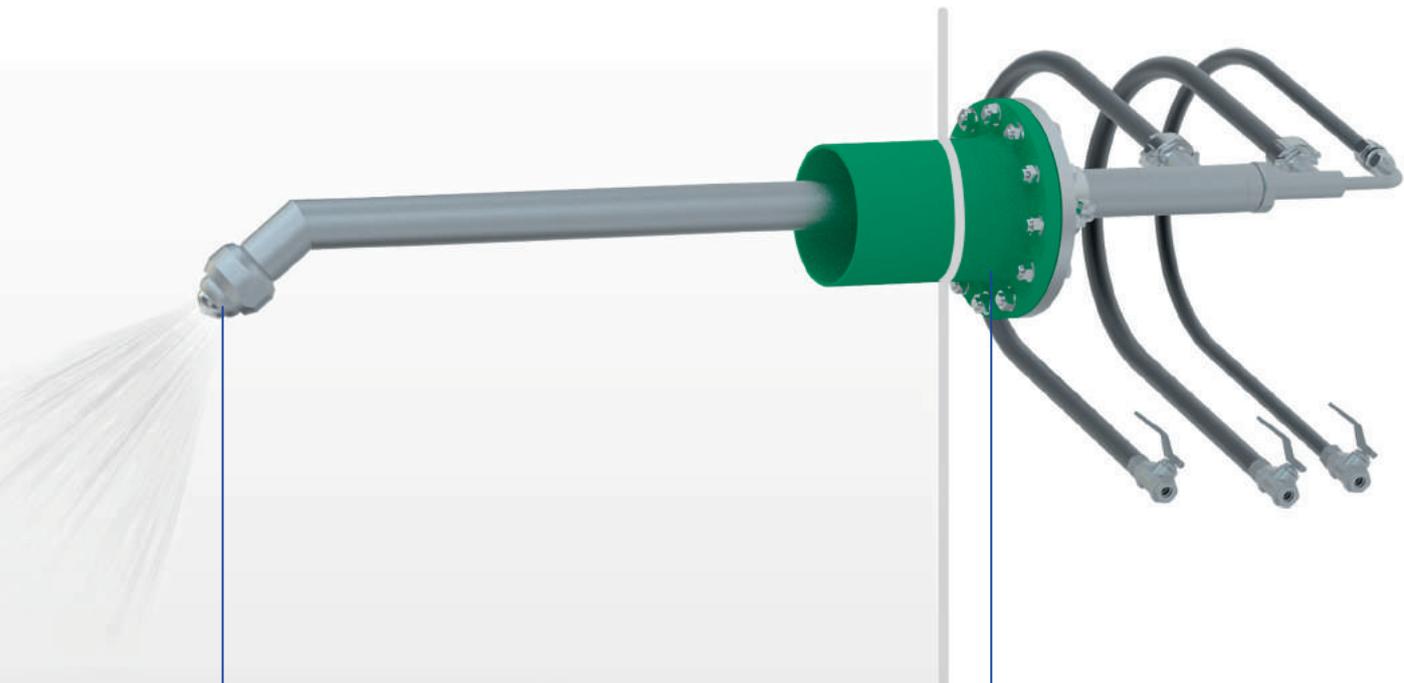
The robust, high-quality stainless steel construction ensures a high degree of functional reliability. Lances are available in a variety of material to suit specific process requirements.

Lechler nozzle lances are available with many options, including but not limited to:

- Protection tube to increase the service life in case of higher temperatures, high dust loads and aggressive gases, with barrier air as an option

- Wedge flange, standard flange and special flange in accordance with customer requirements
- Guide rail to facilitate lance installation
- Shifting device to change the insertion length – with or without gastight sealing
- Expansion joint or stuffing box for expansion compensation at high temperatures
- Assembly connecting piece with flange connector for welding onto flue gas duct
- Further special customizations including wear protection, insulation, water cooling or coating
- Pre-assembled accessory kits for process media connections (e.g. quick release couplings, shut-off ball valves, strainers)

**Lechler nozzle lances are manufactured in line with ultramodern production processes and according to the state of the art.**

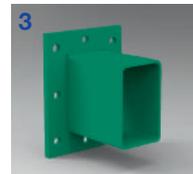
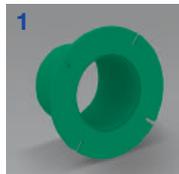


**VarioJet® nozzle**

- Option 1: Without protection tube and without protection cap
- Option 2: With protection tube and with protection cap

**Flange connections**

- Option 1: Wedge
- Option 2: Standard flange e.g. DIN, ANSI etc.
- Option 3: Special flange according to customer specification



**Material**

Lances are manufactured from stainless steel (316/316L) as standard, but depending on requirements can also be made of chemical and high-temperature resistant materials.

Accessories are available in galvanized steel or stainless steel and the hoses are available in rubber or stainless steel.



**Talk to us**

Each gas cooling tower and flue gas duct is different. Which is why standard solutions do not always make sense. Speak with us and let us work together to find the best solution for your purposes.



# VarioCool® gas cooling system

## For a perfectly tailored solution

**Our valve skid units for regulating the flow rates of water and atomizing air are individual customer-specific solutions. Based on the requirements in each case, our first step is to design an overall concept and select the best components in order to create a perfectly tailored solution.**

### First-class engineering

To perform our engineering, we determine all relevant parameters and define the plant's design. This includes determining the nominal widths and pressure levels as well as designing the pumps and control valves. We draw up the P&I diagram and make detailed equipment and signal lists as an option. Of course, the project is fully documented to ensure that technology and processes can be quickly traced even after years of use.

### High-quality components

An exact knowledge of the characteristic properties of our nozzles is key here. For only a complete system that is coordinated to how the nozzles function and operate will ensure smooth and economical operation of the gas cooling system. The service life of the products used is key to a plant's profitability. Unexpected failures can quickly lead to plant stoppages and costly production outages. Which is why we fit our valve skid units with high-quality components from well-known manufacturers as standard and the most important functional components are even realized in redundant design.

The components are interconnected with pipes and mounted on a stable base frame with eyelets for crane transportation, at the same time ensuring that all components for operation and maintenance are arranged in an easily accessible manner.

### Tested quality

The design (e.g. dimensioning of nominal widths) and production are in line with the latest state of the art and comply with all relevant standards. They are equally subject to the Lechler quality management system certified to DIN EN ISO 9001, as is the final acceptance. Before delivery, the valve skid unit undergoes a pressure and tightness test and is checked by our experienced engineers. This will avoid any problems during commissioning.

### Control concept from the nozzle specialist

Numerous installations of VarioCool® systems, years of commissioning experience, plus expertise in nozzle technology all contribute to the constant improvement and optimization of Lechler control systems. By installing a control solution from Lechler you will benefit considerably from this wealth of experience. The flexible and fully automatic concept can be perfectly adapted to your process. You will have start-up and shut-down scenarios and dynamic process conditions under perfect control with our solution.



## Option packages for our VarioCool® valve skid units

### Electrical wiring of the components:



#### Junction box

All components except the pump motors are wired to a junction box within the valve skid unit.

This assures that the customer has a central connection point for all electrical components and measuring devices for further processing in the higher-level control.



#### Control cabinet with complete PLC

All components including the pumps are wired to a control cabinet. The control cabinet is integrated into the base frame of the valve skid unit.

The complete injection control is tested in accordance with valid electrical standards and regulations and allows all relevant process parameters to be visualized over a control panel on the control cabinet.

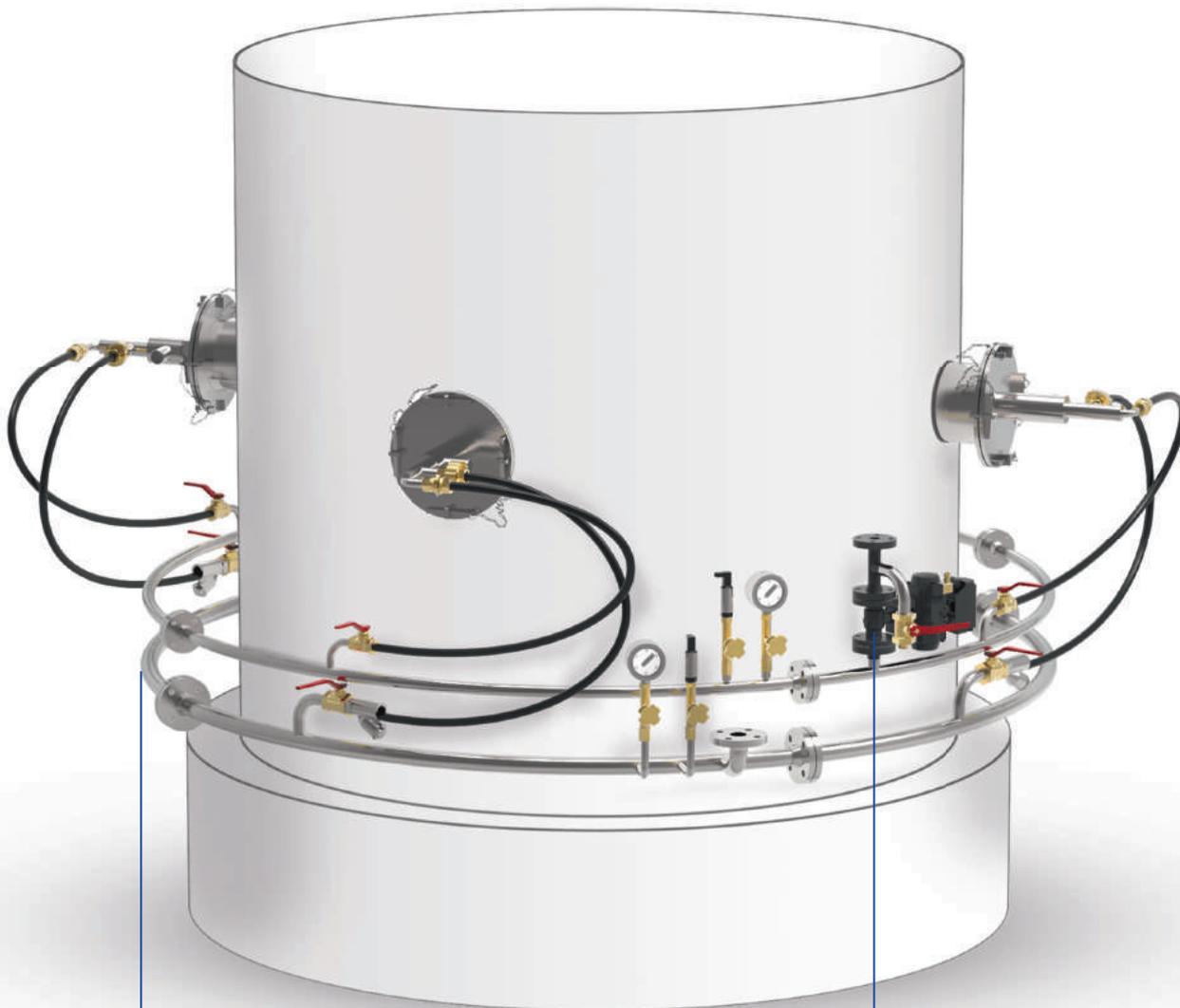
Specific configuration and extensive testing make commissioning much faster. Communication and the exchange of signals (setpoint, plant status, error messages) with the customer's logic system is carried out via PROFIBUS or PROFINET.

The control has several modes of operation such as automatic mode and manual mode for tests during plant downtimes. In the event of faults, our engineers can quickly perform a remote diagnosis via the installed modem without the need for an on-site visit.

# VarioCool® gas cooling system

For a perfectly tailored solution

## Extended scope of delivery



### Ring mains

Ring mains are usually used to supply the lances. Lechler supplies ring mains and headers together with the corresponding brackets for welding onto the flue gas duct. Accessories such as pressure transmitters and manometers plus the appropriate connections for the lances and supply lines are also included in the scope of delivery.

### Purge air connection

In order to increase the injection turn-down ratio, individual lances or lance groups can be connected or disconnected. If the disconnected lances are in the flue gas duct, the rest of the fluid should be purged. Vaporization and deposits in the lance can be prevented in this way.



**Water tank**

A water tank made of steel or plastic serves as a reservoir for the valve skid unit and guarantees injection operation for a certain period of time in the event of the water supply failing. Its size is adapted to the injection quantity. The components for tank filling and level monitoring are included in the scope of delivery.



**Barrier air fan**

In order to protect the nozzles and lances from dust deposits and/or high temperatures, barrier air is frequently applied to them.

For this purpose, Lechler supplies fans geared to the specific application with various optional attachments such as a throttle valve, suction filter and silencer.



**Temperature measurement**

For a constantly regulated outlet temperature, it is very important for the response characteristics of the temperature sensors to be adapted to the ambient conditions. Lechler provides the appropriate thermometers and assists you in defining the installation position.



**Talk to us**

Do you require an option that is not listed? Or are you having planning issues? No problem. Tell us what your requirements are. We will find the appropriate solution and ensure a seamless integration.

# ENGINEERING AND SERVICE

## Our experience for your success

With our experienced engineering team, you have a competent contact for your project at all times – from technical design and detail engineering to commissioning and the replacement of spare and wearing parts. You will benefit from direct contact and fewer communication channels to enable smooth completion of your project.

## Exclusive solutions

Lechler offers a system solution tailored to your application and plant-specific conditions. We use only high-quality components from renowned manufacturers for our valve skid units. If you choose a system with a control, you will get a complete solution for your gas cooling and conditioning requirement from a single source.

## Reliable service is part of our agreement

Lechler is Europe's No. 1 nozzle manufacturer. A key factor for this success is our service. For even after your system has been delivered, you are in good hands with Lechler. We offer a worldwide commissioning service provided by employees with many years of experience. A signal and performance test ensures optimal system operation taking all operating and safety aspects into consideration. An important point of commissioning is also the detailed briefing of operating and maintenance personnel in the operation and maintenance of the plant.

We are your competent partner who will provide you with assistance to solve your problems. Our on-site service for preventive maintenance ensures continuous operation. We will be more than happy to draw up a maintenance contract tailored to your needs.

## From digital to real

Each individual design of gas cooling and conditioning systems is based on innovative software. CFD calculations are used for flow optimization. Using a 3D tool, we identify the optimum liquid distribution in the duct together with the necessary lance arrangement.

Our drawings are created using state-of-the-art design engineering software.

## Extensive documentation

Our nozzle lances and systems are designed and manufactured in line with the current standards and regulations. New plants are always delivered with project-related documentation containing all relevant information for commissioning, operation and maintenance. Lechler will also provide a verbal description of the function and control concept where desired.

## Future-proof

Lechler systems are built to withstand harsh conditions and enable reliable and long-term operation. But we too have to lend to the extreme process conditions. Which is why it is all the more important to us to have a guaranteed long-term supply of spare parts for wearing parts – worldwide. With our global network of representatives, we offer a worldwide platform for contact and advice. You will find your competent contacts on the Lechler website.



Address of supply:  
-----  
Customer:  
Project:  
Project-No.:



# CFD ANALYSIS

## Fluid Dynamics simulation as a process optimization tool

### For us, perfection is not just a promise, but is based on calculation of computational Fluid Dynamics (CFD).

No matter what the spray application, the goal is always to achieve the maximum effect with the minimum possible use of material, spray media and energy. It is therefore essential to have a detailed understanding of how spray mist is formed and propagated. This is made possible by computer-aided simulation of the flow processes (CFD – Computational Fluid Dynamics) of one or more substances in static or dynamic environments taking into account heat and mass transfer.

These simulations incorporate our many decades of know-how from the field of nozzle development. Initially, CFD was only an internal tool which helped us to develop a desired nozzle more quickly and precisely. The completion of our high-performance cluster with a processing power of around 8,500 GFlops means that we can now offer our know-how as a service. We simulate nozzle applications and processes individually for your environment and your requirements. So that your processes also run perfectly in real life.

### Our services:

- Calculation of the flow field including pressure losses with one or more flowing media in pipes and fittings
- Spray propagation including heat and mass transfer with the surrounding gases under practically all conceivable ambient conditions
- Calculation of internal nozzle flows and prediction of the spray pattern, water distribution and spray characteristics down to droplet sizes in the near-nozzle range

### Your advantages:

- Maximum efficiency as regards:
  - the use of expensive consumable media
  - geometric dimensions of the overall spray process
- Through targeted optimization of:
  - nozzle selection
  - nozzle operating point (taking into account your pumps, compressors and blowers)
  - liquid distribution
  - droplet sizes
  - inflow and outflow of your process gases in relation to the spray process (with the aim of achieving uniformity and reducing pressure losses)



**You can't just guess at perfection, it must be precisely calculated**

The flow behavior of gases is significantly determined by the geometry of the environment. By applying computer simulation using computational fluid dynamics (CFD), our specialists can detect unequal gas distributions as well as turbulence. Depending on the specific conditions, these issues can be resolved in different ways. Installing baffles, perforated plates or even repositioning nozzles can be simulated to achieve the desired flow characteristics. The result of optimized gas flow via CFD can significantly reduce energy and/or material requirements.

**Optimization of the gas flow in the gas cooling tower**

**Benefits:**

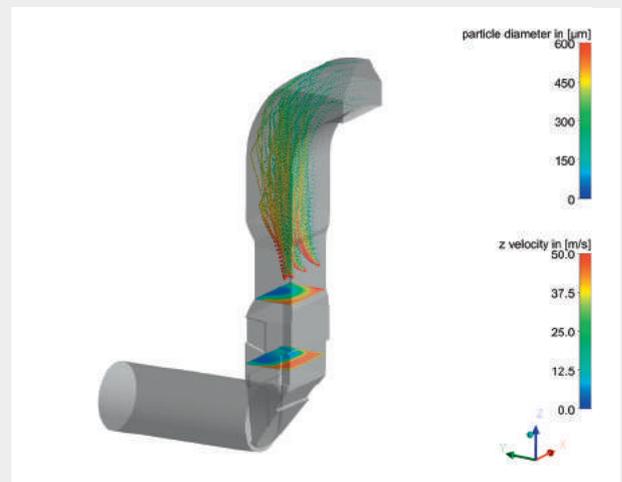
- Efficient cooler operation thanks to lower atomizing air consumption and/or lower connection pressures at the nozzle lances
- Wet ground avoided as well as possible caking on the inner wall of the cooler
- Stable process in various load cases



**Optimization of SNCR process – best possible selection and placement of nozzles**

**Benefits:**

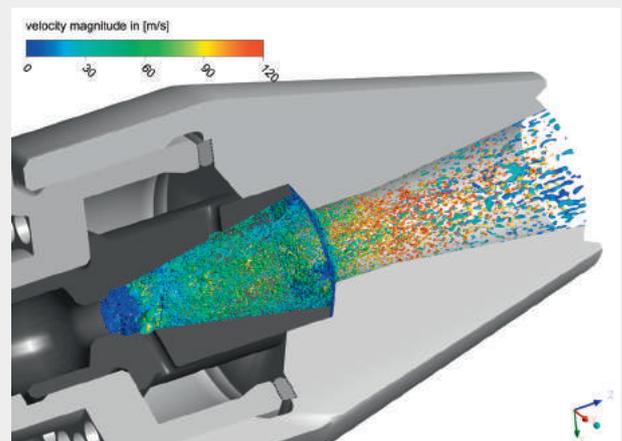
- Reactive ammonia vapor is present where the gas containing nitrogen (NO<sub>x</sub>) flows
- Avoidance of unnecessary NH<sub>3</sub> slip, meaning efficient use of the ammonia solution
- Best possible reduction rates of nitrogen oxides



**Design and continuous optimization of our products**

**Benefits:**

- Optimal atomization effect
- Efficient use of the connected atomization media
- Reduction of the required nozzle connection pressures
- Individual nozzle development in the shortest time





# MEASURING TECHNOLOGY HOW OUR RESOURCES HELP US ACHIEVE PRECISION

## What we are doing before we do it

At Lechler, exact measurements have long been the basis for clearly defined spray characteristics. The data obtained in our laboratories form the foundation for any development and make it easier for our customers to choose nozzles for specific applications. This saves time, lowers costs and provides planning security.

## Advanced technology

We have further expanded our research capacities by opening our own Development and Technology Center.

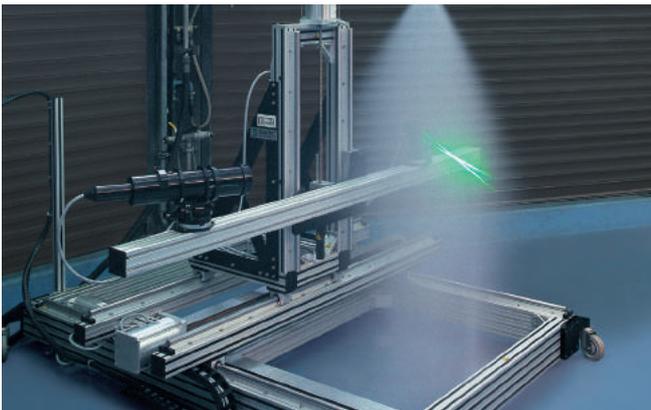
A highlight here is a laser-assisted phase doppler anemometer. As one of the most modern optical measuring procedures, it measures the velocity and the diameter of spherical droplets simultaneously and without contact. Using the data obtained, spectra can be reliably derived for particle size distributions and velocities.

Measurements range from tiny water droplets in the micrometer region to very large droplets of around 8 millimeters. These are performed with a high temporal and spatial resolution.

Individual positions in the spray can be automatically approached and measured with extremely high accuracy – in x, y and z directions.

## International cooperation

We at Lechler value the importance of international cooperation. For this is often what opens up new perspectives on a problem. In addition, cooperation offers us the possibility of testing nozzles in very special test environments and of discovering new use scenarios in this way.



## Our unique selling point: Practice-based knowledge

Since it was founded, Lechler has stood out for its development of new technologies. In more than a century we have successfully filed a large number of patents. Starting with the “Centrifugal Sprayer” from 1893 and going up to state-of-the-art technologies of the 21st Century. We will continue this proud tradition into the future, and our new technical center will be key to doing so. After seven years of construction, the Lechler Development and Technology Center was opened in the summer of 2016. Since then it has offered everything nozzle developers dream of on a surface of over 600 m<sup>2</sup>. In addition to extensive measuring facilities, state-of-the-art test benches with a wide range of pump performances are available to measure and investigate sprays, from microfine mist to fuller sprays with varying jetting characteristics.

# MEASURING TECHNOLOGY THE LECHLER DEVELOPMENT AND TECHNOLOGY CENTER

## Our measurement range:

- Precise and reproducible measurement of droplet sizes and speeds in sprays
- Measurement of complete sprays or of local positions in a spray
- Documentation of the spectra for particle size distribution and velocities
- Determination of the Sauter mean diameter and of many other variables relevant for process engineering
- Measurement of very dense sprays using state-of-the-art laser technology
- Measurement of tiniest droplets in the  $\mu\text{m}$  region and measurement of very large drops of up to 8 mm
- Measurement of droplet velocities up to 200 m/s
- High temporal and spatial resolution
- Positions in the spray can be automatically approached and measured with extremely high accuracy – in a 3-dimensional space in x, y and z directions
- Very large measuring range allows measurement of very wide particle spectra
- The size and velocity of each individual droplet is detected
- Error-free results in accordance with ISO 9001
- Spray characteristics over area mapped in 3D
- Detection of positive and negative velocity components

## Measurement validation of our calculation models taking the example of a gas cooling tower

### Key figures of our experimental cooler with industry partners:

- Approx. two megawatts of thermal performance
- Use of single-fluid and twin-fluid nozzles under the most realistic conditions possible
- Flexible variation of inlet and outlet temperatures
- Monitoring of droplet sizes and numbers in several levels
- Detection of the evaporation rates of injected sprays
- Use of more than 50 sensors of different kinds for the precise detection of all operating parameters



## QUALITY WITH A SYSTEM

Lechler products are used in a wide variety of sectors and applications.

Which is why the products' requirements are often very specific to certain applications. We define the term "quality" as the extent to which our products fulfill our customers' individual requirements.



We are certified according to internationally recognized standards. Conscientious working and constant quality controls have always been carried out at Lechler, from materials receiving, development and production right through to shipping. So that our products keep what we promise in their daily use.



### Talk to us

Your requirements are the first step towards a solution. We are more than happy to help you solve your individual tasks. Tell us your objectives and we will take care of the solution. If the solution is not yet available, we will tailor-make one for you. That is our promise.

# FOR YOUR QUESTIONS

## QUESTIONNAIRE

Nobody knows your process and requirements better than you. Your knowledge is critical to us in order to find the optimal nozzle for your application.

Simply send us the completed questionnaire or enter your information online.

**ENGINEERING YOUR SPRAY SOLUTION** **LECHLER**

**Data collection sheet for calculating a gas cooling system**

Dear customer,

In order to solve your gas cooling problem, we need certain data known to you and indispensable for computing.

Company: \_\_\_\_\_ Date: \_\_\_\_\_  
 Address: \_\_\_\_\_ Company: \_\_\_\_\_  
 \_\_\_\_\_ Phone: \_\_\_\_\_  
 \_\_\_\_\_ E-Mail: \_\_\_\_\_

**1. Gas data**

Gas composition (in case of several plants): \_\_\_\_\_

Gas composition (Vol.-%)	CO <sub>2</sub>	O <sub>2</sub>	N <sub>2</sub>	H <sub>2</sub> O	Others

Other substances of gas (SO<sub>2</sub>, HCl, CaCl<sub>2</sub>, etc.): \_\_\_\_\_ (highest) (lowest)

Gas content in gas: \_\_\_\_\_  
 Water content in the reaction area: \_\_\_\_\_  
 Mass of the gas: \_\_\_\_\_ (highest) (lowest)

**2. Conditions on Site**

Are gas cooling tower dimensions fixed?  Yes  No (height: \_\_\_\_\_ (m) diameter: \_\_\_\_\_ (m))  
 Are nozzle dimensions fixed?  Yes  No (height: \_\_\_\_\_ (m) diameter: \_\_\_\_\_ (m))

Available reaction distance: \_\_\_\_\_ (m)  Reaction distance to be determined

Reaction of gas:  Single fluid  Two fluid  Three fluid

Nozzle type:  Single fluid  Two fluid  Three fluid

Complete expansion required?  Yes  No

Is water reaction system already in operation?  Yes  No (in case the question is irrelevant, marking "N/A")

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Data collection sheet for design of a gas cooling system

[www.lechler.de/environmental/questionnaire\\_gascooling](http://www.lechler.de/environmental/questionnaire_gascooling)



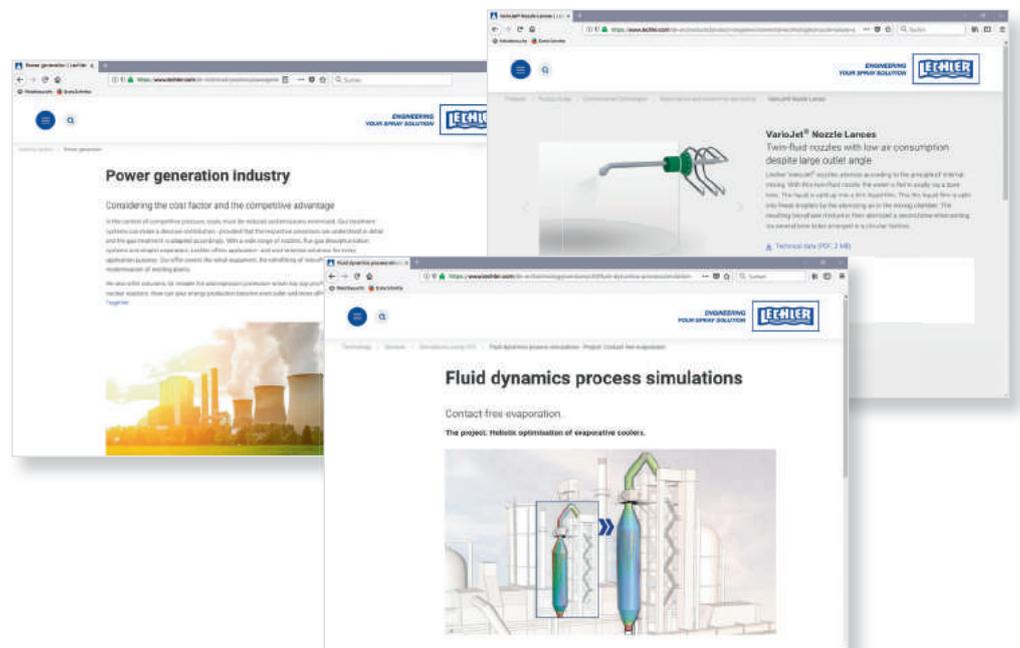
Data collection sheet for design of a DeNOx system

[www.lechler.de/environmental/questionnaire\\_denox](http://www.lechler.de/environmental/questionnaire_denox)

## FULL INFORMATION IS JUST A CLICK AWAY: THE LECHLER WEBSITE



Our website contains further information on our products as well as useful resources.

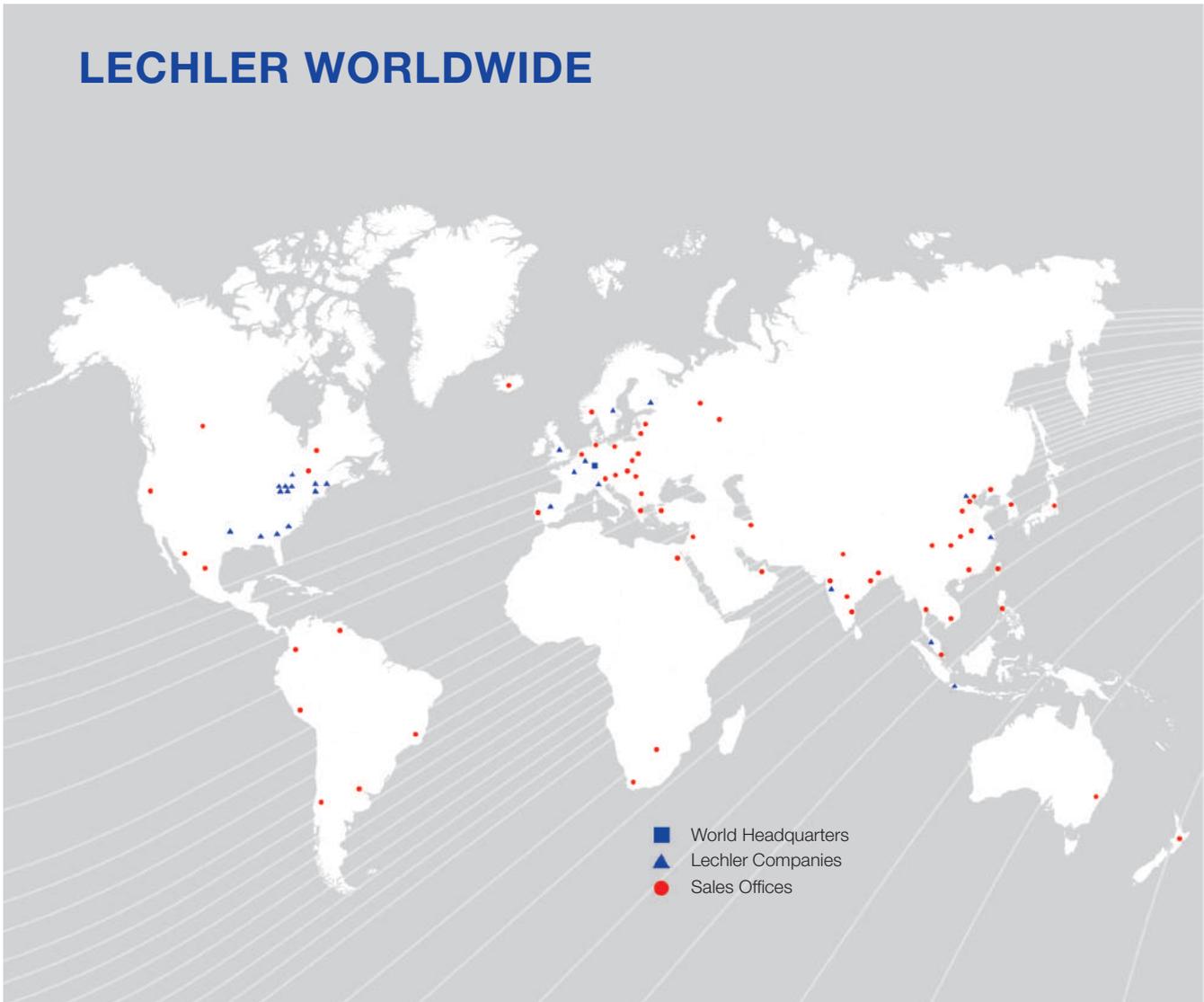


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