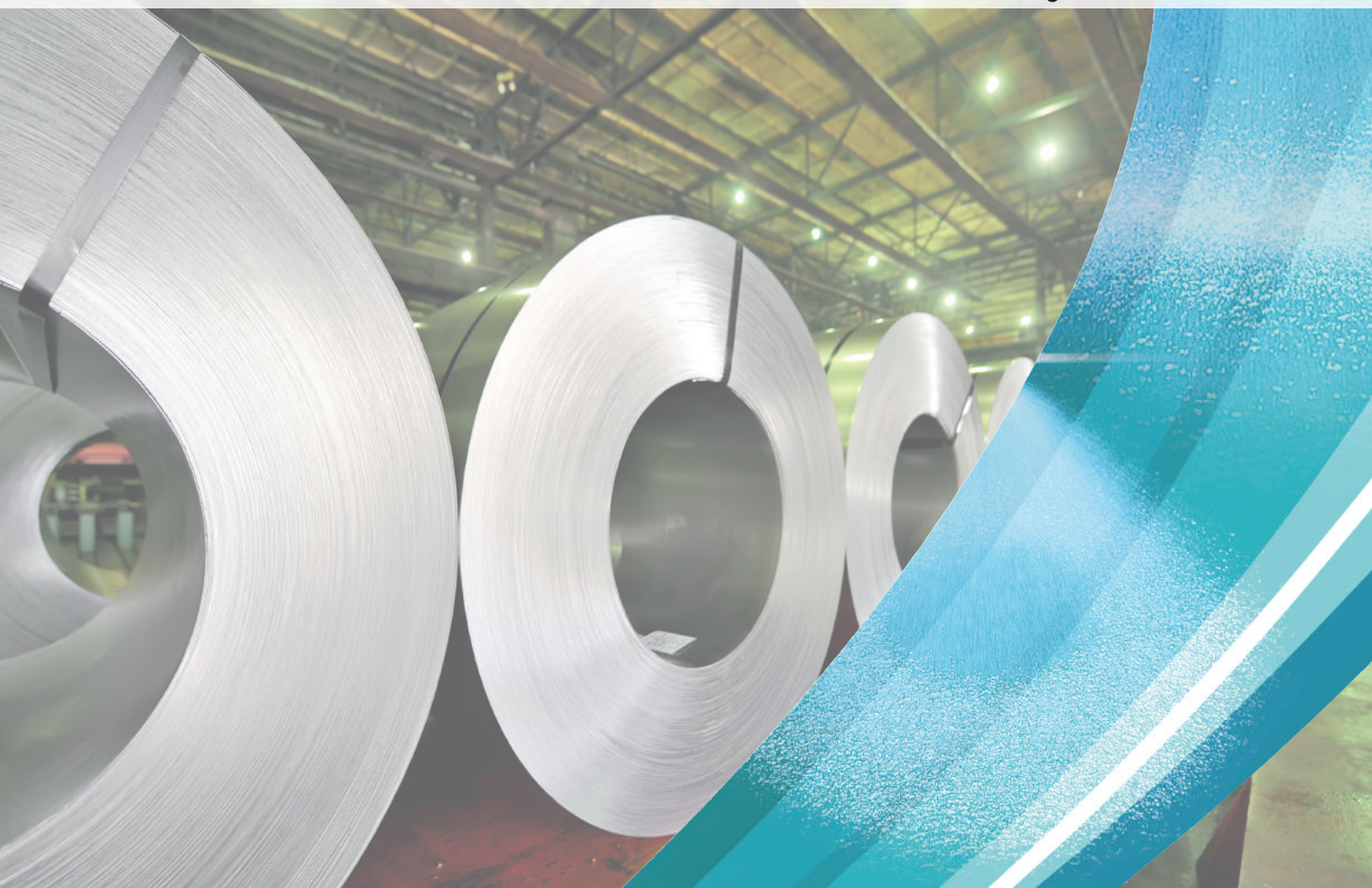




Our Japanese energy-saving nozzles for the Iron & Steel industry



IKEUCHI Spray Nozzles for Iron & Steel making processes

As “The Fog Engineers”, H. IKEUCHI & Co. is specializing in developing and manufacturing spray nozzles for over 60 years. We have always contributed to create unique products that guide manufacturers to a cleaner and effective production process, and also contribute to social development, protect the environment, and improve people’s lives.

Our involvement in the steelmaking industry goes back many years: we developed pneumatic spray nozzles for steelmaking applications in 1983, where they were used for cooling purposes in continuous casting operations as well as in other processes. Beside cooling, our spray nozzles are also used in processes including descaling, washing, surface treatment, and dust suppression.

As “The Fog Engineers” we understand the significance of droplet size and full evaporation for exhaust gas cooling. For example, to ensure maximum cooling effect without increased drainage. To achieve this, we have a wide range of nozzles with different droplet sizes and spray capacities to suit every request. Customers achieve lower running costs and minimal maintenance downtime with our clog-resistant nozzles and wide range of material options.

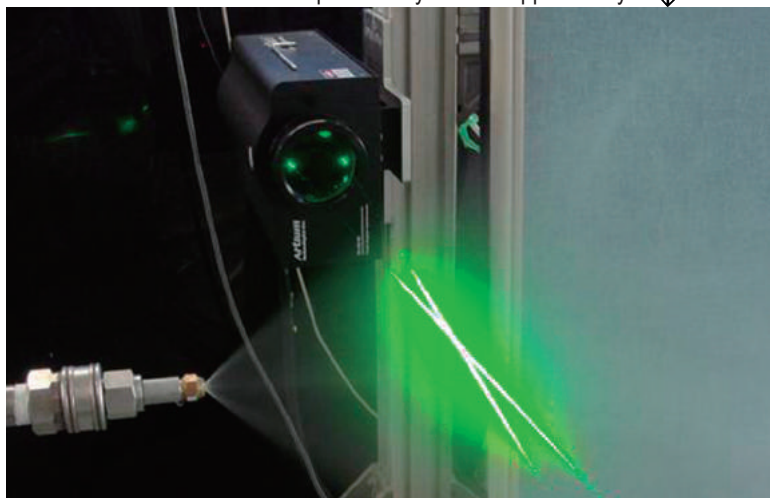
Because we have spent so many years devoted to learning everything possible about nozzles, we established our very own Cooling Division to especially focus on developing nozzles for cooling steel sheets and plates in steelmaking facilities, and nozzles for cooling gas. We have confidence in our ability to meet customer demands in this area as well.

In this leaflet, we introduce some of our leading nozzles from our wide line-up for iron and steelmaking industry.



Assessment of the spray performance →

Measurement of droplet size by Laser Doppler analyzer ↓



IKEUCHI Group - Japanese highly controlled, quality products

A high quality is our standard. Therefore, as a manufacturer we use advanced inspection equipment to guarantee the performance of the spray nozzles in terms of spray capacities and spray angles.

Innovation is key. Our R&D department are focusing in producing optimal nozzles to solve our customers’ issues.

Throughout the years, IKEUCHI Group has focused on improving our solutions to adjust to customers’ needs and offer the best solutions suitable for them.



Secondary cooling for Continuous Casting Machine

The effect of spray cooling depends on the fog, the cooling target, the environment and the cooling medium. We measure each aspect of the spraying performance in order to fulfill your demands.

For the secondary cooling process on the CCM, strong impact force is needed to break through the boiling surface. Through our 35+ years of experience, we can provide the optimum nozzles and layout. To cool down the steel slabs, it requires an even (uniform) spray distribution with a high impact as possible to ensure a smooth surface texture.

Nowadays, the demand for steel is getting more specific, such as high tensile strength steel, which needs more specific cooling characteristics. That is why we, at IKEUCHI, never stop to innovate. Our R&D department develop more and more new technologies to follow up the market's demand.

DOVEA series - Even flat pneumatic spray nozzles

Large turndown ratio with minimal variation in spray angle and distribution

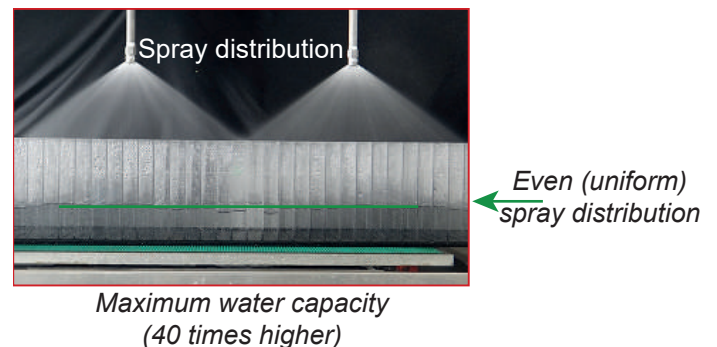
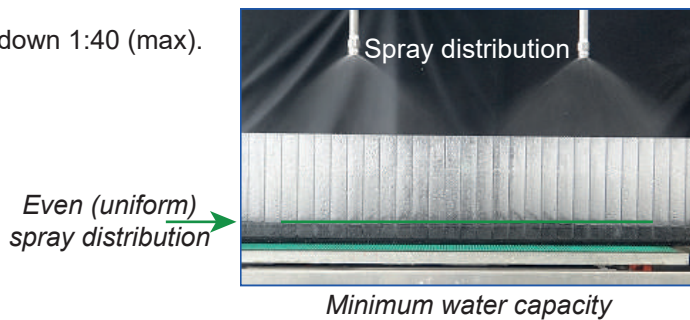
Pneumatic spray nozzle using compressed air, the DOVEA-nozzles can generate a large range of spray capacity without changing the spray angle.

By controlling the spray angle and distribution, you can produce different steel on the same CCM without changing the nozzle. Just adapt the spray capacity to the steel's characteristics. This allows to reduce maintenance time and stock arrangements.

With a stable even spray distribution, the cooling impact remains even on the entire surface of the steel without creating weak spots.



Turndown 1:40 (max).



Saving energy while maintaining a strong cooling performance

- Without needing a high air consumption, you can still generate a strong spray impact and benefit of a strong cooling performance.
- Air / water ratio = 5 at max water capacity.

Less clogging structure to keep a uniform cooling performance and to ensure a longer life time than conventional models

Hybrid nozzle: hydraulic/pneumatic flat spray nozzle

Patented

VVP+AS series



DDRP+AS series



Double usage: hydraulic and pneumatic nozzle all in one

- Hydraulic nozzle turned into a pneumatic one by activating the air check valve.
- Can be used as a hydraulic nozzle for high flow rates and as a pneumatic nozzle for better control at low flow rates, which allows an optimal control over a wide range of flow rate with minimal air consumption.
- Turndown 1:20 (max).

IKEUCHI's consulting service for secondary cooling performance efficiency

Simulation of flow rate distribution at surface of a beam blank





Descaling Nozzles

TDSS series - Water saving descaling nozzle (ultra-high pressure)

Patented

Water saving descaling nozzle achieving a higher impact with less water

With a unique patented nozzle tip design, TDSS series produces a razor-like sharp steam. It has no edge inside the orifice, which minimizes the loss of energy, maximizes the speed as well as the spray impact. Its unique design maintains the spray pattern as it reduces the wear of the material.

It sprays a thinner spray flow, which provides a stronger, deeper and sharper impact while increasing the erosion depth by 20% compared to conventional models.

Even with 10-20% less water, the TDSS provides the same spray impact as conventional models.

Longer lifetime thanks to its unique patented design

Even used under high pressure, the TDSS series' inside shape remains the same. Thus, the spray pattern never changes. Even when the material itself wears due to the pressure and working conditions, the inside shape will keep its shape.

After two years of comparison on production lines, it has been proven that TDSS-nozzles last more than 2 times longer than conventional nozzles.

Therefore, you can reduce your maintenance time and cost, as well as the replacement cost while increasing the descaling performance.

Increase the descaling performance by reducing the angle of installation

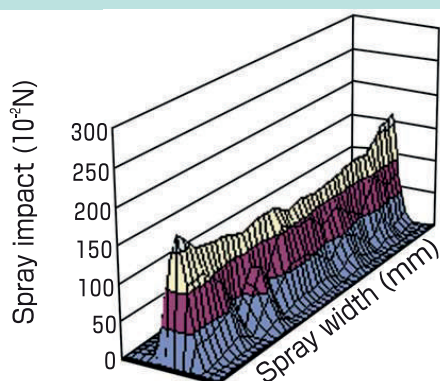
Avoid spray overlap and water interference, which weakens the spray impact force at the edges of the spray width, by scaling the offset angle down to 5°.

By doing so, you can reach an even spray impact and distribution in a multiple-nozzle alignment layout without losing the strength of the descaling impact.

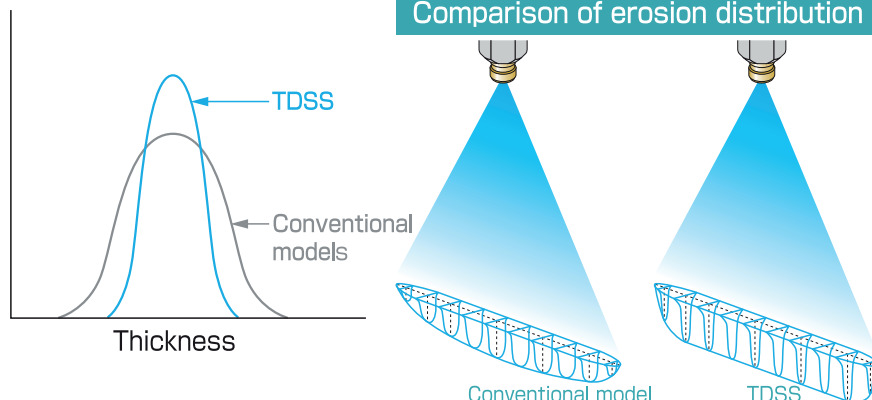
Our consulting service for descaling

We offer 2D and 3D data of measurements and simulation for the spray impact distributions.

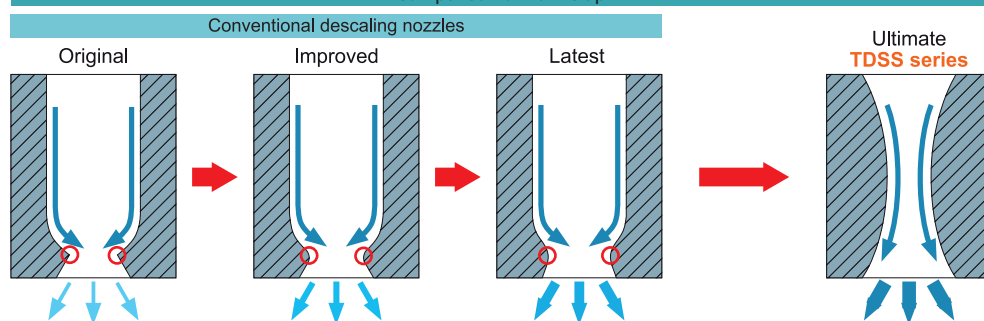
Spray impact distributions across width and thickness (for single unit)



Comparison of erosion distribution



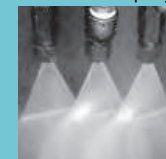
Comparison of nozzle tip



Offset angle 15°

Photo of spray

Photo of erosion test



Erosion depth: 0.6 to 0.9 mm (Nozzle: TDSS40083)

Interrupted spray impact due to interference with the nozzle's spray impact installed next to it

Offset angle 5°

Photo of spray

Photo of erosion test



Erosion depth: 1.0 to 1.3 mm (Nozzle: TDSS32083)

Less interrupted spray impact

For more detailed information about the TDSS series nozzle line-up, features, and technical information, please refer to the TDSS series Descaling Nozzle catalog (Leaflet No. TDSS080228-1 (J060811-1)E)



Exhaust gas cooling nozzles

Why cooling with fog is more efficient than with air?

The conventional way to cool down exhaust gas during iron and steel production is by extracting the outside air and mixing it with the exhaust gas to clean. However, as the air has a lower cooling capability, the cooling effect is inefficient. Furthermore, air takes up more space in volume in the pipe where the exhaust gas goes through to be cooled down and then cleaned. Thus, less gas can enter the pipe and the volume of gas cooled down is lower than expected.

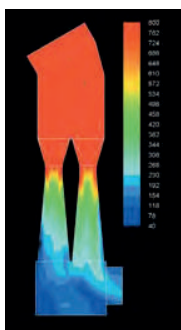
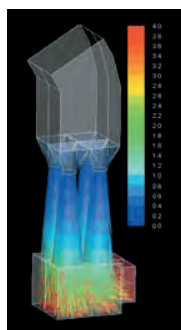
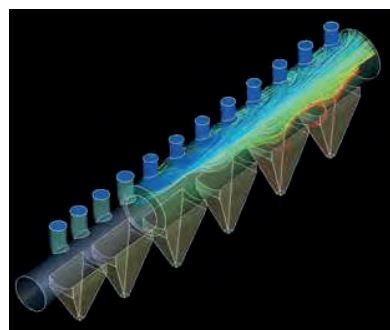
Cooling with fog is more efficient as cold water catches heat faster than air and takes less space in the pipe. That is why at IKEUCHI we recommend to cool down exhaust gas with fogging equipments.

IKEUCHI's consulting service for cooling

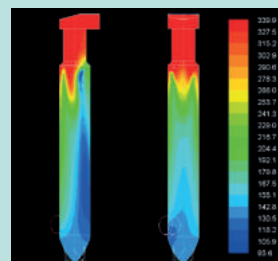
Cooling of high temperature flue gas, such as sintering exhaust, requires spray control and droplet diameters that enable complete evaporation.

To help with choosing the right cooling nozzle, we can perform a variety of measurements and simulations.

We use CFD simulation when selecting the nozzles and the control system to ensure the complete evaporation of the water sprayed from our cooling nozzles.



Thermo-fluid analysis data



Droplet diameter and speed reference



GSIMII series - Fine fog pneumatic spray nozzles for gas cooling

Efficient gas cooling nozzle

Used for pollution control, the GSIMII series fine fog pneumatic nozzle combines a large spray capacity with a fine fog spray of 50 μm (mean droplet diameter measured by Laser Doppler Method).

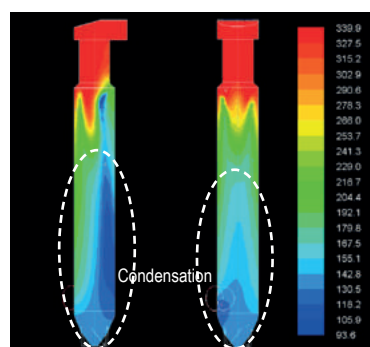
In the Iron and Steel making process, GSIMII series can be used for:

- Gas cooling before bag-filter or turbine;
- Cooling refractories of torpedo car, heating furnace and converter, before maintenance;
- Cooling converter shell before maintenance;
- Cooling flue gas from electric furnace, converter, sinter plant, etc.;
- Dust suppression at casting of scattered crude iron, casting of steel and rolling mill outlet.

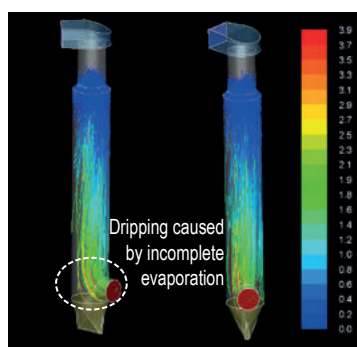
Available in spray angles of 60° and 20°, the GSIMII series can be, thus, installed in a smaller gas cooling tower (smaller than normal). Therefore, it reduces construction and maintenance costs.



(before)

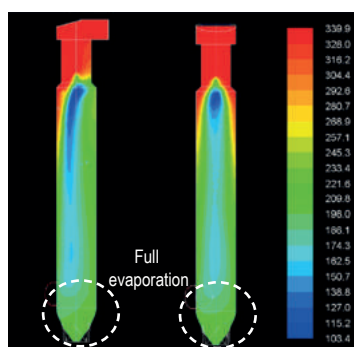


Exhausted gas temperature

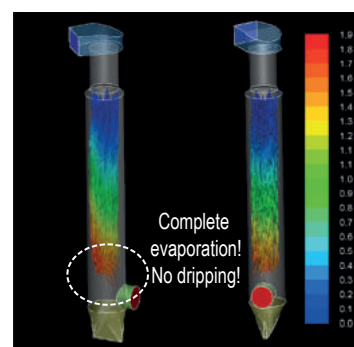


Sprayed water temperature

(after)*



Exhausted gas temperature



Sprayed water temperature

*Depending on suggested solution by IKEUCHI

BRASIKan® series for degreasing, rinsing and pickling on the surface of steel plates

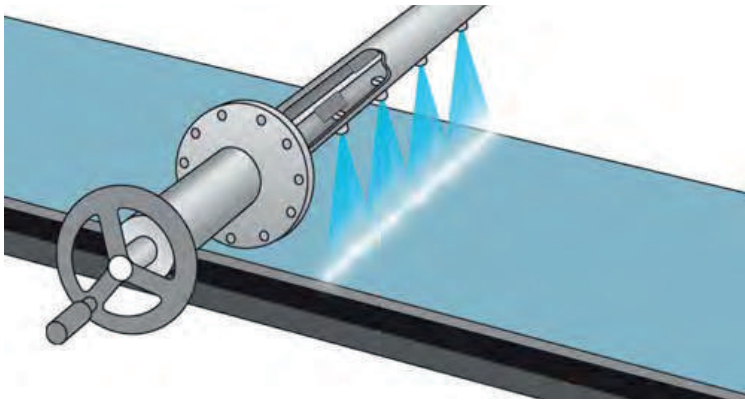
Manual brush-cleaning nozzle header

By turning the handwheel, an internal rotating brush scubs the nozzle orifice and remove foreign particles.

Air-driven automatic brush-cleaning nozzle header

Driven by air, the automatic brush-cleaning BRASIKan® series allows remote control of spray and cleaning mode. Therefore, it can be installed in narrow, inaccessible place.

With a timer, it can also be programmed to clean automatically.

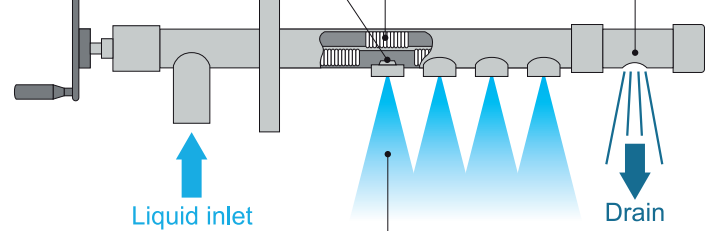


FEATURES

Design allows brushes to easily remove foreign objects.

By rotating an internal brush, nozzle orifices are cleaned thoroughly.

Foreign objects are flushed away while the internal brushes are rotated.



Brushes are turned by hand.

Mountain-shaped distribution to obtain a uniform spray distribution in multiple-nozzle arrangements.

Benefits of an anti-clogging spray header:

- Better productivity as no need to interrupt the production line;
- Both maintenance downtime and cost reduced;
- Higher product quality with steady spraying and a uniform cleaning / cooling;
- Simple to use with a drain, flushing out the foreign particles inside the pipe.

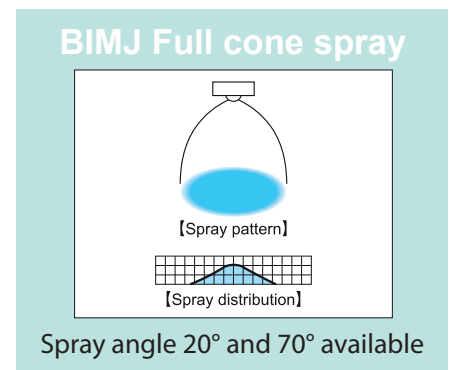
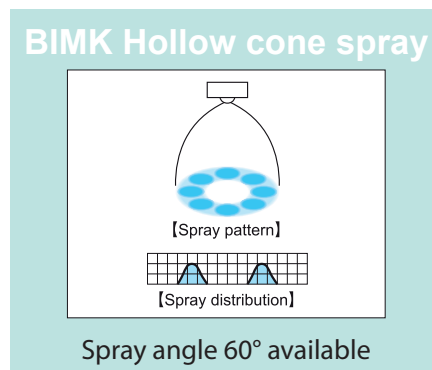
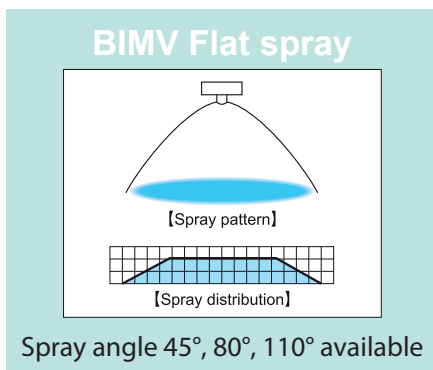
BIM series for cooling

Small capacity fine fog pneumatic nozzle

With a mean droplet diameter of 100 µm or less (measured by Laser Doppler method), the BIM series nozzle produces a fine atomization suitable for:

- Cooling steel sheet before top roll after galvanizing, and minimizing the spangle treatment at the continuous galvanizing line (CGL);
- Soft cooling of steel at the continuous annealing line (CAL);
- Cooling steel plates after coating and drying at the continuous coating line (CCL).

Available in 3 types of spray patterns:



BIM spray header used for minimized spangle

The BIM series nozzles can be integrated in a spray header to produce a uniform spray distribution across the entire spray area. It can spray on steel plates effectively and uniformly at high speed.

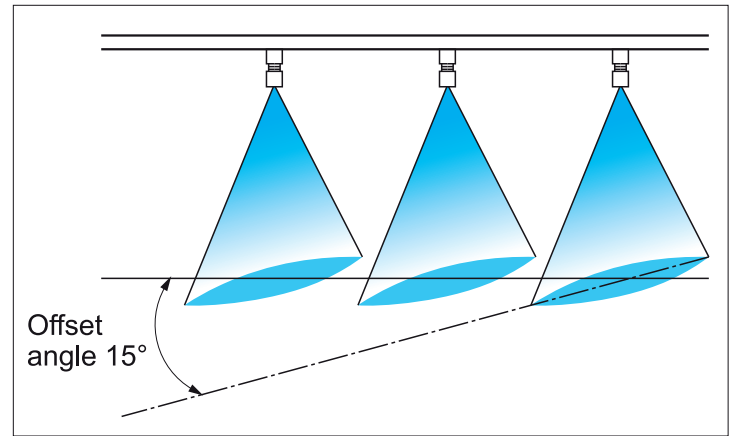
Compact, efficient, and easy installation and maintenance

The unique design of the BIM series minimizes clogging and achieves a long-time continuous spray.

VVEP series for cooling of plates and rolls in hot strip mills

- Even distribution nozzle, made in full metal, for roll cooling at the rough rolling and finish rolling
- Uniform spray distribution with a multiple nozzle alignment

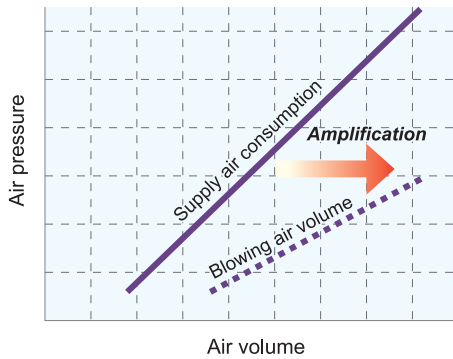
By positioning nozzles with an offset angle of 15° and overlapping at both ends, interference from adjacent sprays is prevented and a uniform spray distribution can be maintained.



Blowing off

Air nozzles - TAIFUJet series for blowing off during the surface finish process

Minimal air consumption

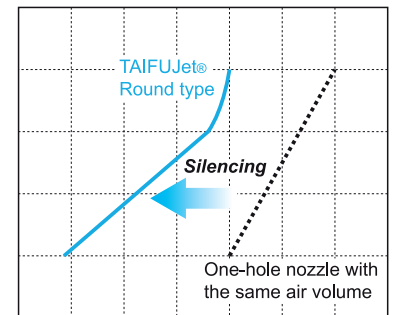


- Low air consumption / High spray impact

Due to its unique design taking the surrounding air and multiplying the air flow, the TAIFUJet series produces a powerful air current with high spray impact and minimal air consumption.

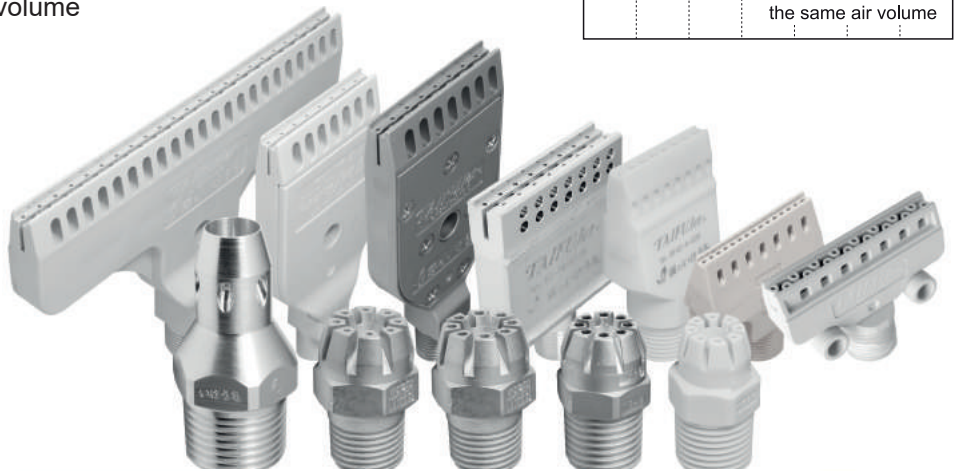
- Noise level reduced by more than 10 dB compared to a conventional one-hole air nozzle with the same air volume

Noise level comparison



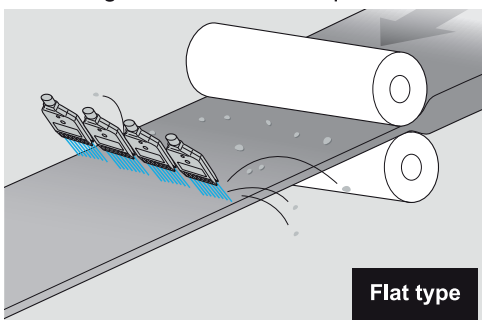
- 3 shapes available:

- Flat type for a uniform air flow in a multiple nozzle alignment configuration; its unique design boost the air flow by taking in the surrounding air;
- Space-saving long flat type designed for blowing air over greater widths, it is suitable for narrow places;
- Round type for pinpoint blowing with a high impact solid stream.

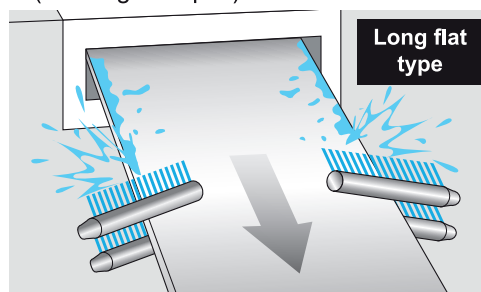


- Example of blowing off applications

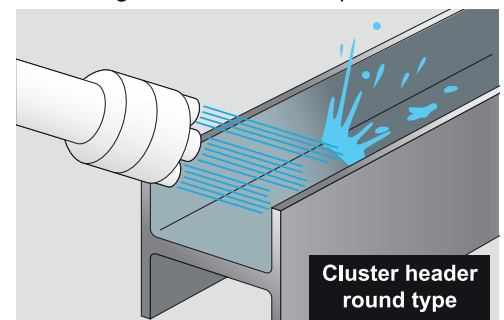
Blowing off dust from steel plates



Edge wiper for steel surface treatment (Blowing off liquid)



Blowing off water from shaped steel





Suppressing or containing dust can be done by either lightly wetting the substance you wish to contain, or by fogging. When suppressing dust by spraying water, our fogging units spray small water droplets the same size as dust particles. These water droplets collide with the dust particles mid air and weigh them to the ground.

○ Dust suppression during the iron and steel making process:

- at the conveyor lines for iron ore, limestone and coking coal;
- at the coke plant on CDQ;
- at the blast furnace for scattered crude iron;
- at the slag yard and pit;
- at the exit of the rough rolling stage;
- and any other process.

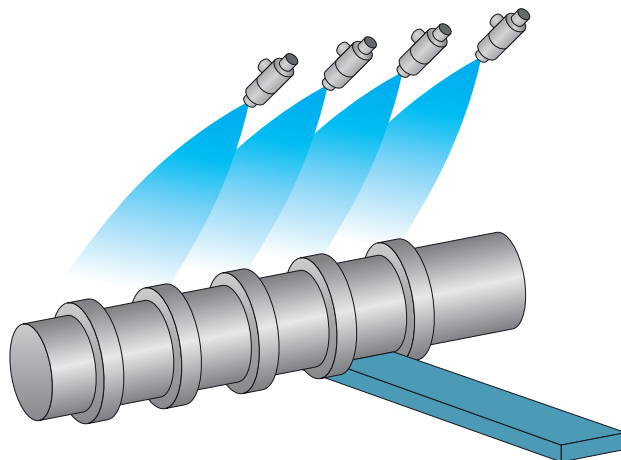
○ Which nozzles?

- Hydraulic nozzles:
 - VVP series (flat spray);
 - AJP series (full cone spray);
 - KB series (hollow cone spray).
- Pneumatic nozzles:
 - with compressed air: BIM series, GSIMII series.
- Air nozzles:
 - with air-suction: EJA series.
- Cooling Fan unit: CLJ series.

○ Benefits:

- Low cost dust suppression solution;
- Avoid loss of raw material (powder form);
- Avoid dust related defects;
- Prevent hazardous airborne contamination;
- Easy maintenance;
- Improve the working environment.

■ Dust suppression around exit of rolling mill



“The Fog Engineers” IKEUCHI EUROPE B.V.



IKEUCHI EUROPE B.V.



Merwedeweg 6,
3621 LR Breukelen
The Netherlands



Tel: 0031-20-820-2175



info@ikeuchi.eu



<https://www.ikeuchi.eu>



<https://www.linkedin.com/company/ikeuchieuropeb.v.>



“Taking the path less traveled”



「人の足跡を踏むな」