



# SPRAY TECHNOLOGY SOLUTIONS

FOR NO<sub>x</sub> CONTROL



*Spraying Systems Co.*<sup>®</sup>  
Experts in Spray Technology



# EFFECTIVE AND EFFICIENT NO<sub>x</sub> CONTROL

Regulations for nitrogen oxides (NO<sub>x</sub>) emission are becoming stricter and stricter. It is now, more than ever, essential for organisations to control the NO<sub>x</sub> in waste incinerators, steel mills, cement kilns, power plants, pulp & paper recovery boilers and other manufacturing operations.

Through the use of advanced spray technology, Spraying Systems Co. is an important partner to control your NO<sub>x</sub> emissions. Based on your specific situation our engineers design an appropriate solution to inject ammonia or urea into the gas stream. This can be used both for Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR).

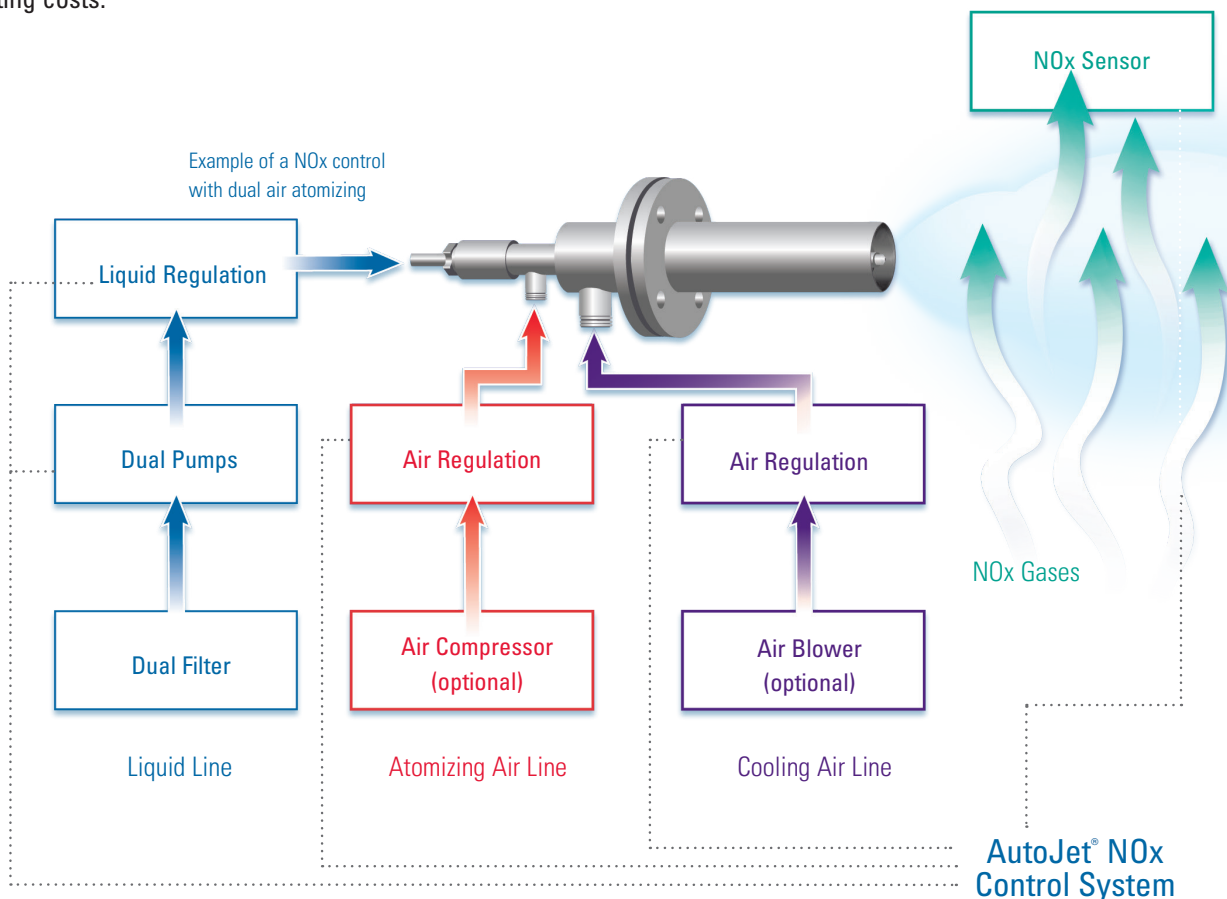
With over 80 years of spray technology experience Spraying Systems Co. is uniquely qualified to help you with your NO<sub>x</sub> control needs. Our dedicated solution consists of:

- AutoJet® NO<sub>x</sub> Control system
- Nozzles (atomizing or hydraulic)
- Lances (standard or custom)
- Computational Fluid Dynamics (CFD)

To ensure the proper solution is installed our industry-leading research and testing services evaluate your requirements and help ensure your performance goals are met.

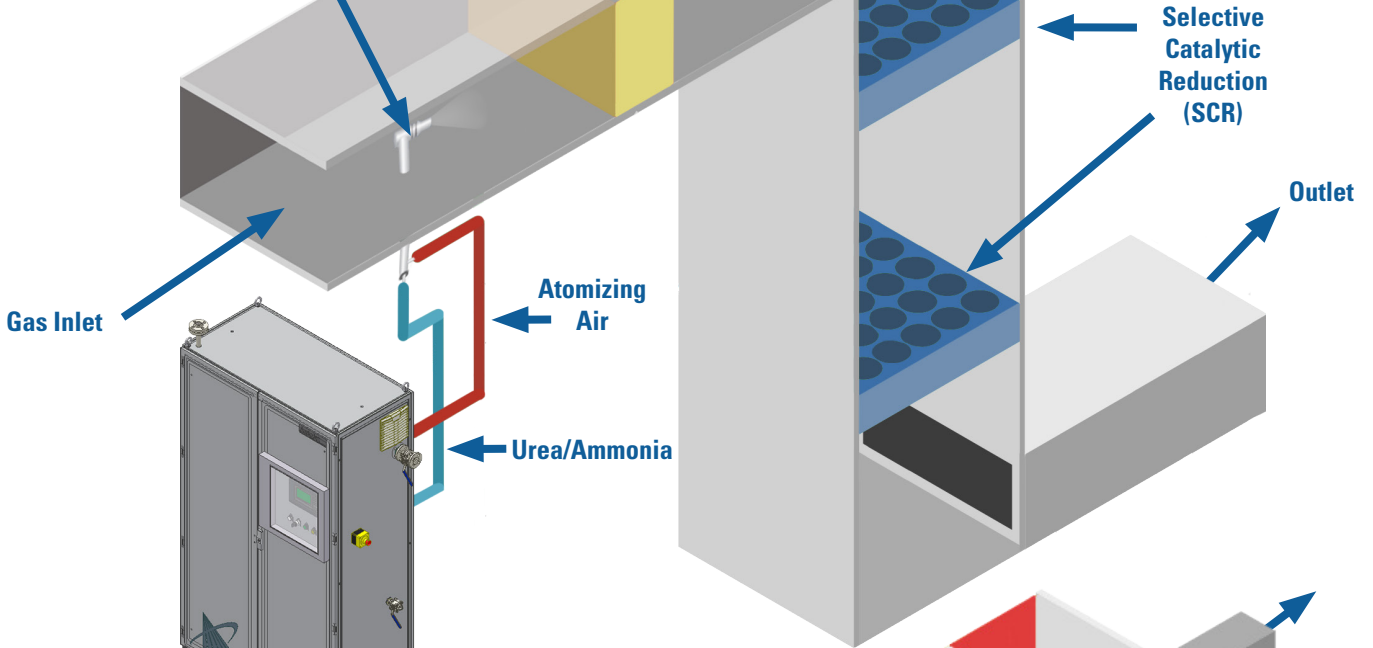
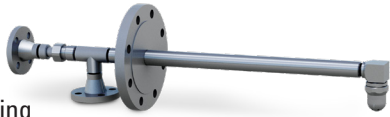
## HOW OUR NO<sub>x</sub> CONTROL SYSTEM WORKS

The NO<sub>x</sub> Control System continuously monitors feedback from the NO<sub>x</sub> sensor(s) and regulates the system response by proportionally adjusting liquid and air flow to the injector nozzles. This closed loop system provides the highest level of control possible. It is easy to install and requires minimum installation space. Once installed, the system provides maximum operational reliability and minimal operating costs.



## Nozzles and lances

Precise control of liquid injection and distribution using appropriate nozzles improves chemical reaction, reduces ammonia slip and prevents fouling of the catalyst grid.

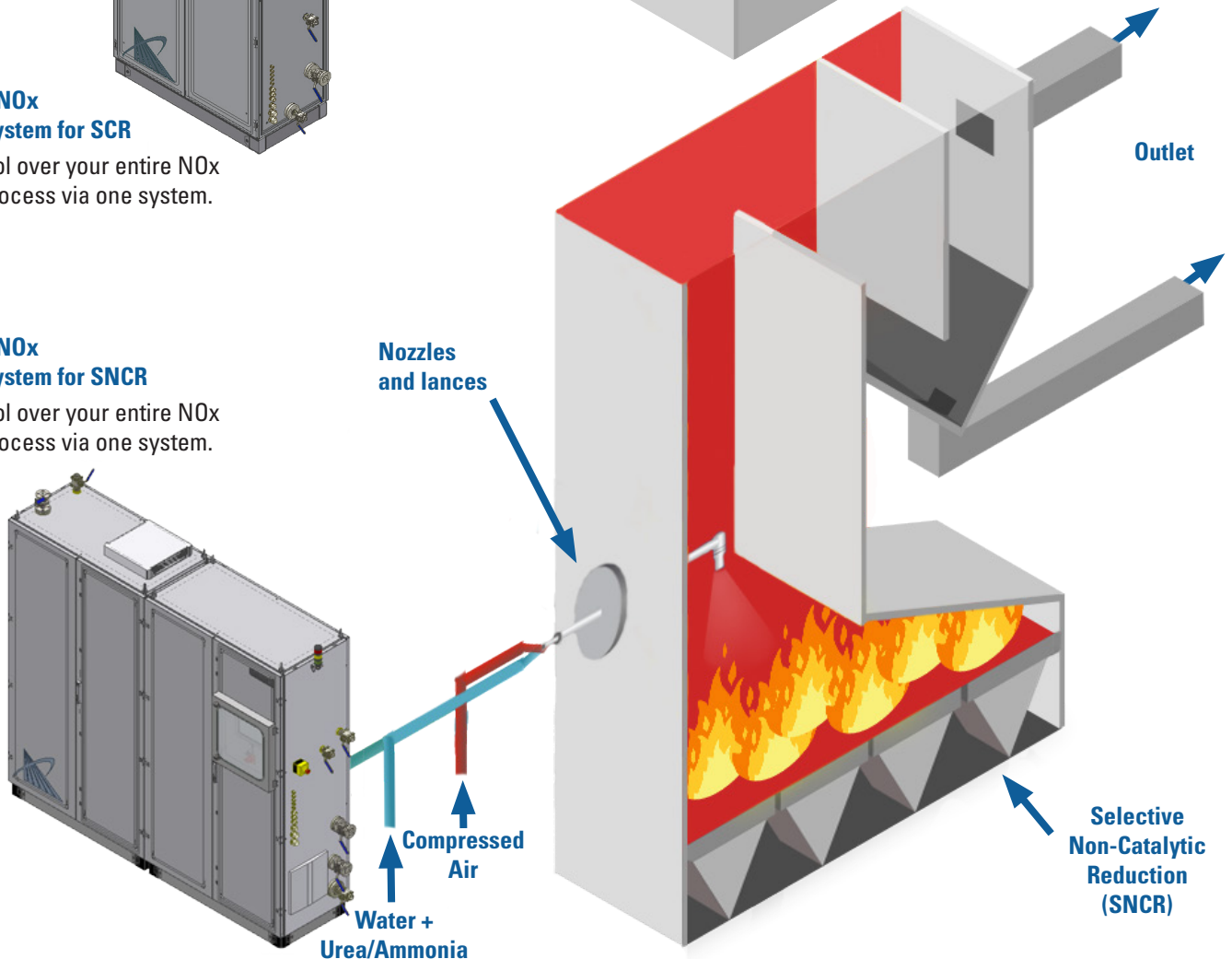


## AutoJet® NO<sub>x</sub> Control System for SCR

Full control over your entire NO<sub>x</sub> control process via one system.

## AutoJet® NO<sub>x</sub> Control System for SNCR

Full control over your entire NO<sub>x</sub> control process via one system.



# AUTOJET<sup>®</sup> NO<sub>x</sub> CONTROL SYSTEM

The AutoJet<sup>®</sup> NO<sub>x</sub> Control System controls all system components and ensures optimized performance without operator intervention.

## OPTIMAL PERFORMANCE

The AutoJet<sup>®</sup> NO<sub>x</sub> Control System monitors and automatically adjusts the closed loop system. Liquid and air flow to the nozzles is regulated based on the data that's collected via the NO<sub>x</sub> sensor.

## PLUG & SPRAY

All AutoJet<sup>®</sup> NO<sub>x</sub> Control Systems are pre-programmed with parameters and function screens specific to NO<sub>x</sub> control applications so you're ready to go.

## TOTAL AUTOMATION

Total automation minimizes labor and downtime: The system controls all components – nozzles, pumps, sensors and other hydraulic/pneumatic components. Operators are only alerted, via a warning signal, if there is a problem that can't be resolved automatically.

## BUILT FOR RELIABILITY

Emergency modes, system redundancy, intelligent fault sensing and a patent-pending continuous system integrity check. These are just a few of the reasons why you can count on long-term, trouble-free performance.

## EASY INTEGRATION

Easily integrate the AutoJet<sup>®</sup> NO<sub>x</sub> Control System with other systems via communication protocols (Profinet, Profibus, ...).

## REMOTE SUPPORT

Remote support is available thanks to the built-in router.

## NO<sub>x</sub> CONTROL SOFTWARE FEATURES

- Multiple PID regulation for controlling ammonia/urea injection with dual-fluid nozzles
- Fast response time and minimum energy consumption
- Limited need for maintenance
- Dual VFD pump management and dual filtration
- Intelligent error detection and continuous system integrity checking
- Multiple protection levels with password protection
- Nozzles, complete with flexible and quick connections for coupling with fixed utilities





# THE RIGHT NOZZLE FOR YOUR OPERATION

A wide range of nozzles can be used for ammonia and urea injection. The operating conditions will determine which nozzles provide the proper performance. To validate nozzle selection and placement CFD modeling is recommended.

## NOZZLES TYPICALLY USED FOR SCR AND SNCR NO<sub>x</sub> CONTROL INCLUDE:

### Air atomizing nozzles

- 1/4J Series nozzles
- FMX FloMax® nozzles
- Standard and Anti-Bearding FloMax® nozzles

### Hydraulic spray nozzles

- FullJet® full cone nozzles
- WhirJet® hollow cone nozzles
- VeeJet® flat spray nozzles



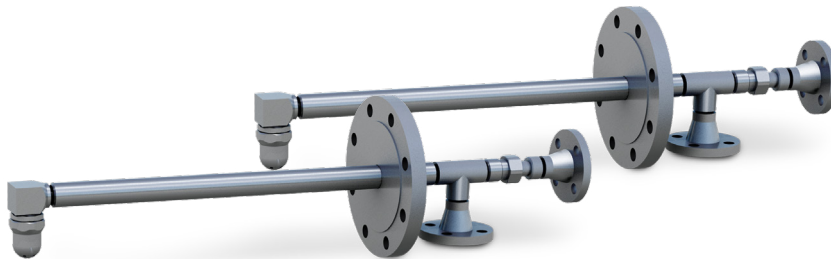
## ADVANTAGES OF OUR NOZZLES

### REDUCED MAINTENANCE

Replacement of the nozzle or just the air cap can be done without special tools. Spraying Systems Co. nozzles require minimal maintenance.

### EFFECTIVE EVEN IN HARSH ENVIRONMENTS

A wide choice of materials ensures optimal nozzle performance even in high-temperature and corrosive applications. Typical materials include 316 and 310 stainless steel, HASTELLOY®, Stellite® and reaction-bonded silicon carbide. Others are available upon request.



# THE RIGHT LANCE FOR YOUR NOZZLE

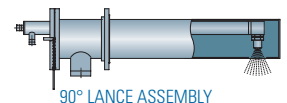
Choosing the right lance is just as important as selecting the right nozzle. Whether you need a standard lance or a built-to-order injector for a challenging environment, Spraying Systems Co. can help. We'll assist you in selecting the correct device for easy integration and optimal nozzle performance for your NO<sub>x</sub> control application.

## MOUNTING OPTIONS AND EASY INSTALLATION:

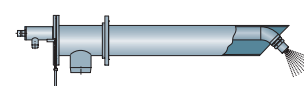
0°, 45° and 90° lightweight lances are available in standard materials with quick-release or bolt-on flanges. Adapters, cooling jackets, purge tubes and protective tubes can be added. Automatically retractable and custom lances in a wide range of materials and configurations for challenging spaces are also available.



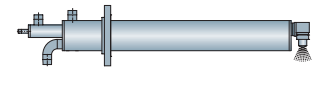
0° LANCE ASSEMBLY



90° LANCE ASSEMBLY



45° LANCE ASSEMBLY



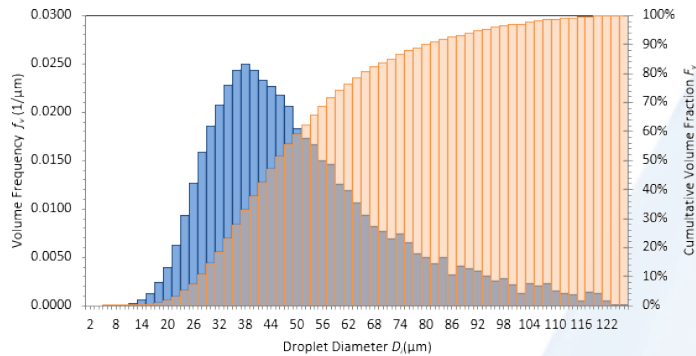
90° LANCE ASSEMBLY



## UNDERSTANDING DROP SIZE IN NO<sub>x</sub> CONTROL IS CRITICAL

Many problems can result from improper drop size. This can result in improper coverage or flue gas penetration, and by consequence increased ammonia slip and reduced efficiency.

To make sure you get the performance you're looking for we always recommend to run CFD calculations to determine the type of nozzles and the number of nozzles required and how they need to be positioned.



## COMPUTATIONAL FLUID DYNAMICS (CFD) AND NO<sub>x</sub> CONTROL

### CFD IS THE SCIENCE OF PREDICTING

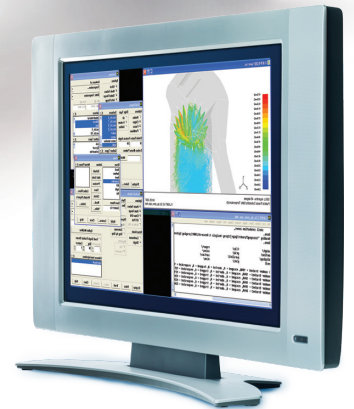
- Fluid flow
- Mass transfer
- Heat transfer
- Chemical reactions

CFD uses numerical methods and algorithms to solve and analyze problems involving fluid flows. Sophisticated software performs the millions of calculations required to simulate the interaction of fluids and gases with related physical phenomena.

### WE USE CFD TO OPTIMIZE:

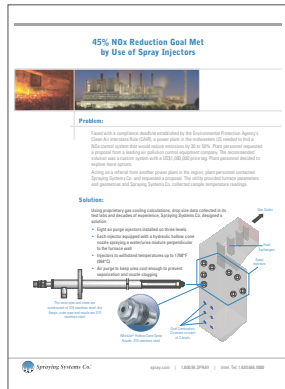
- NO<sub>x</sub> reduction
- Liquid and gas flow in scrubbers, towers and ducts
- Internal flow characteristics in spray nozzles

CFD models illustrate flow patterns, velocity, temperature, gas/liquid distributions, droplet trajectories, pressures within the entire system and impact forces and stress caused by liquid flow.



# OTHER HELPFUL RESOURCES

## Case Study: 45% NO<sub>x</sub> Reduction Goal Met by Use of Spray Injectors



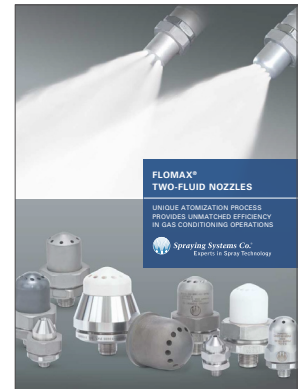
## Flomax®-S Nozzles



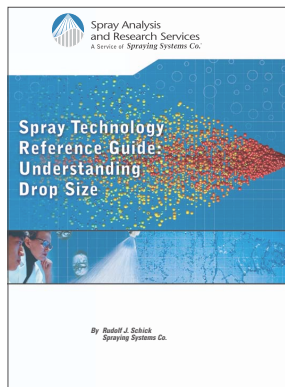
## A Guide to Optimizing Spray Injector Performance



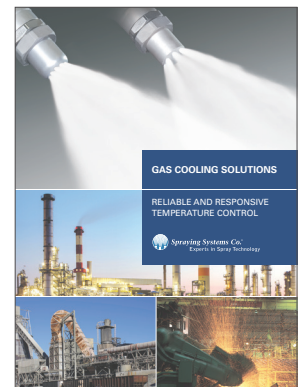
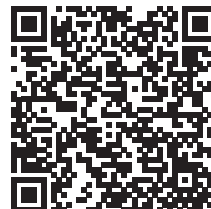
## FloMax® Air Atomizing Nozzles



## Spray Technology Reference Guide: Understanding Drop Size



## Gas Cooling Solutions



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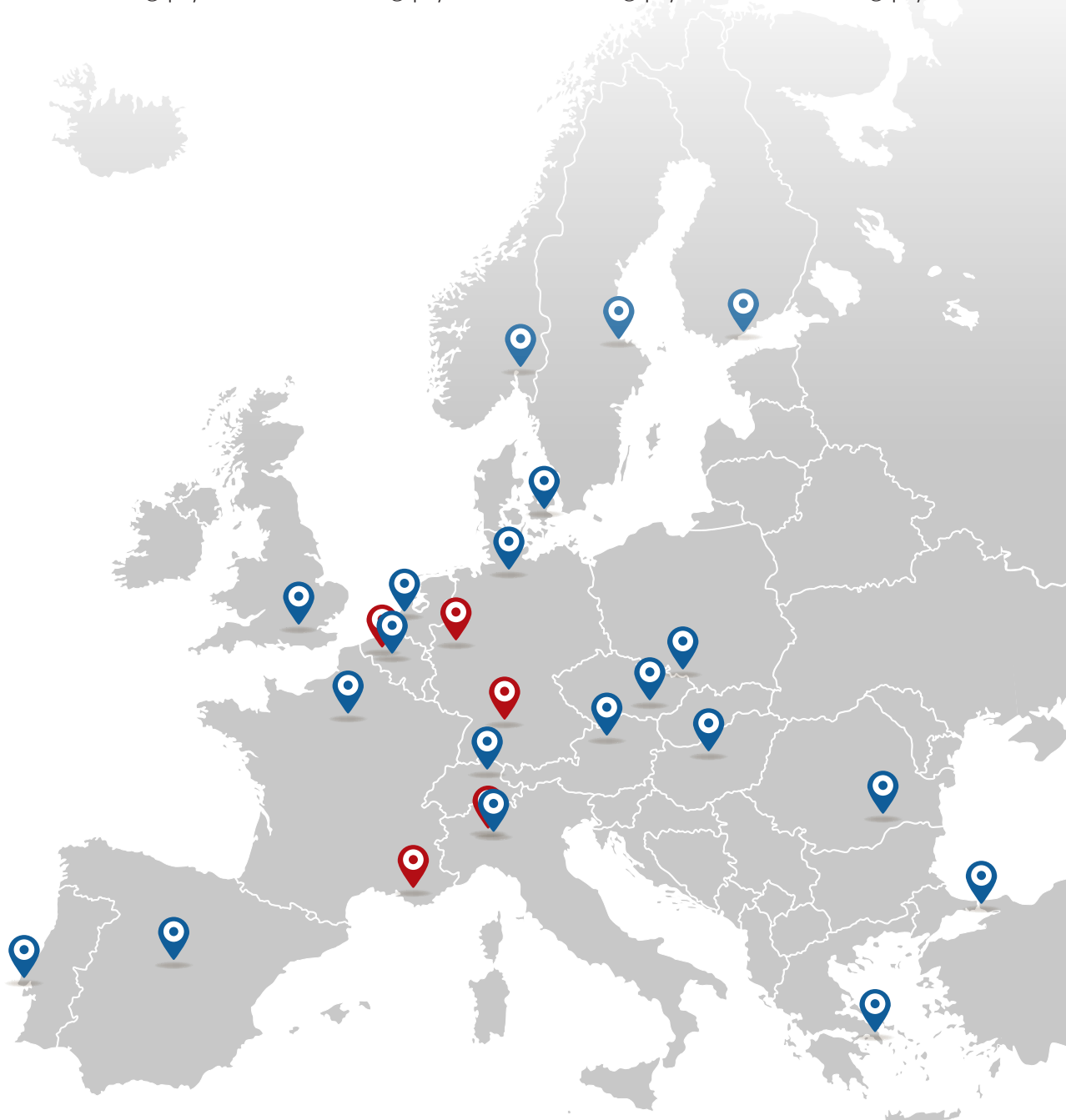
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