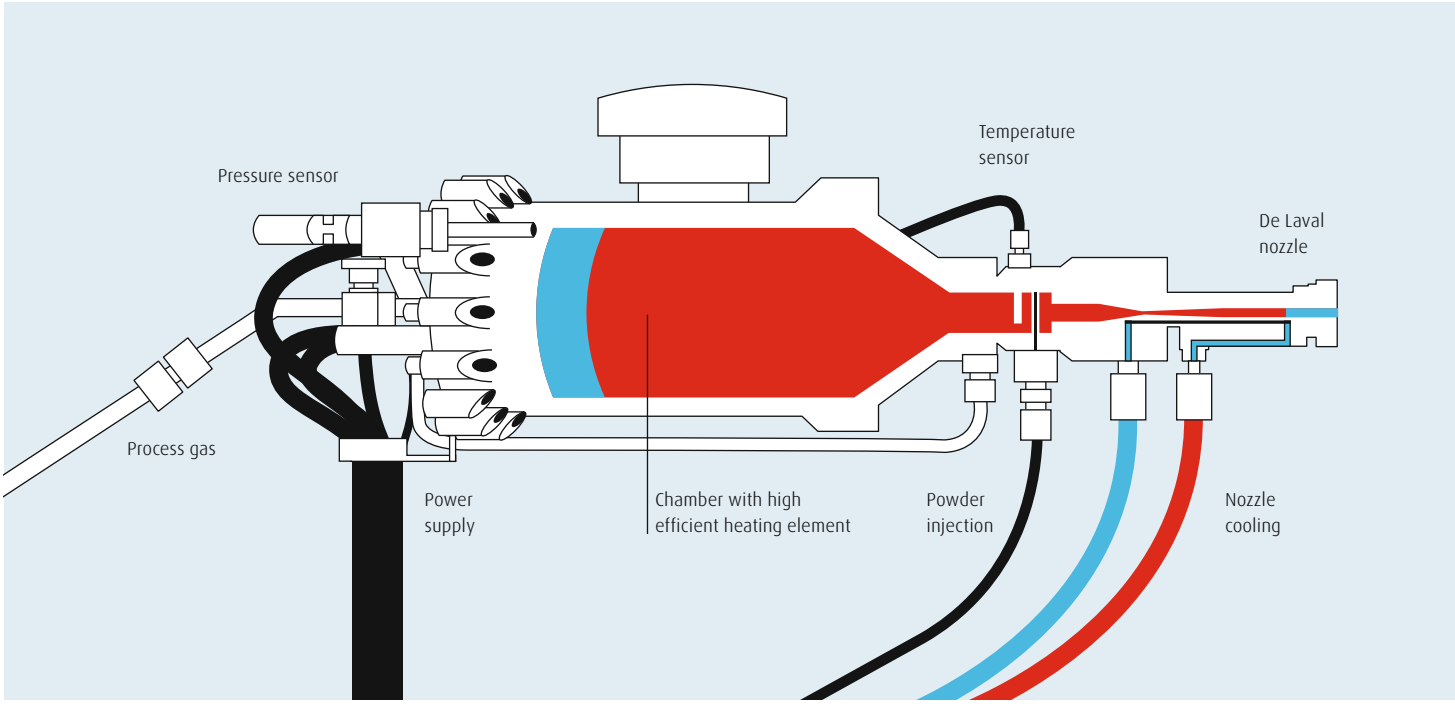
impact
We. Spray. Future.

LINSPRAY® Connect: Gases on Tap for Cold Spraying

The cold spraying process



Impact Innovations: Cold spraying leader

Founded in 2010, Impact Innovations is the global technology leader for cold spraying, a highly innovative process for surface coating and additive manufacturing. It outperforms the performance and productivity of conventional thermal spraying, making it ideal for new, cutting-edge coating, in-site repair/restoration and additive manufacturing applications. The company's goal is to establish the cold spray process as an industrially viable, plug-and-play technology, and thus bring the benefits of thermal spraying to an entirely new application spectrum not previously suited to conventional thermal spraying techniques.

From frying pans to space technology, the range of use cases is rapidly expanding. Cold spraying can be used, for example, to coat aluminum cookware with very thin layers of induction-capable ferromagnetic steel for improved heat transfer. It can coat brake discs for improved performance and reduced particulate emissions from the abrasion of brakes. In aerospace too, cold spraying is gaining traction due to its ability to manufacture parts such as rocket combustion chambers or rocket nozzles additively without wasting valuable material. The nuclear industry also relies on cold spraying for corrosion resistance in long-lasting storage and transport containers accommodating nuclear waste.

How does cold spraying work?

Cold spraying is a material deposition technique. It involves propelling tiny particles of powder (5 to 50 microns in diameter) made from metals such as magnesium, aluminum, titanium, nickel, copper, tantalum, niobium and silver and from alloys onto a – typically untreated – surface with the help of high-pressure industrial gases.

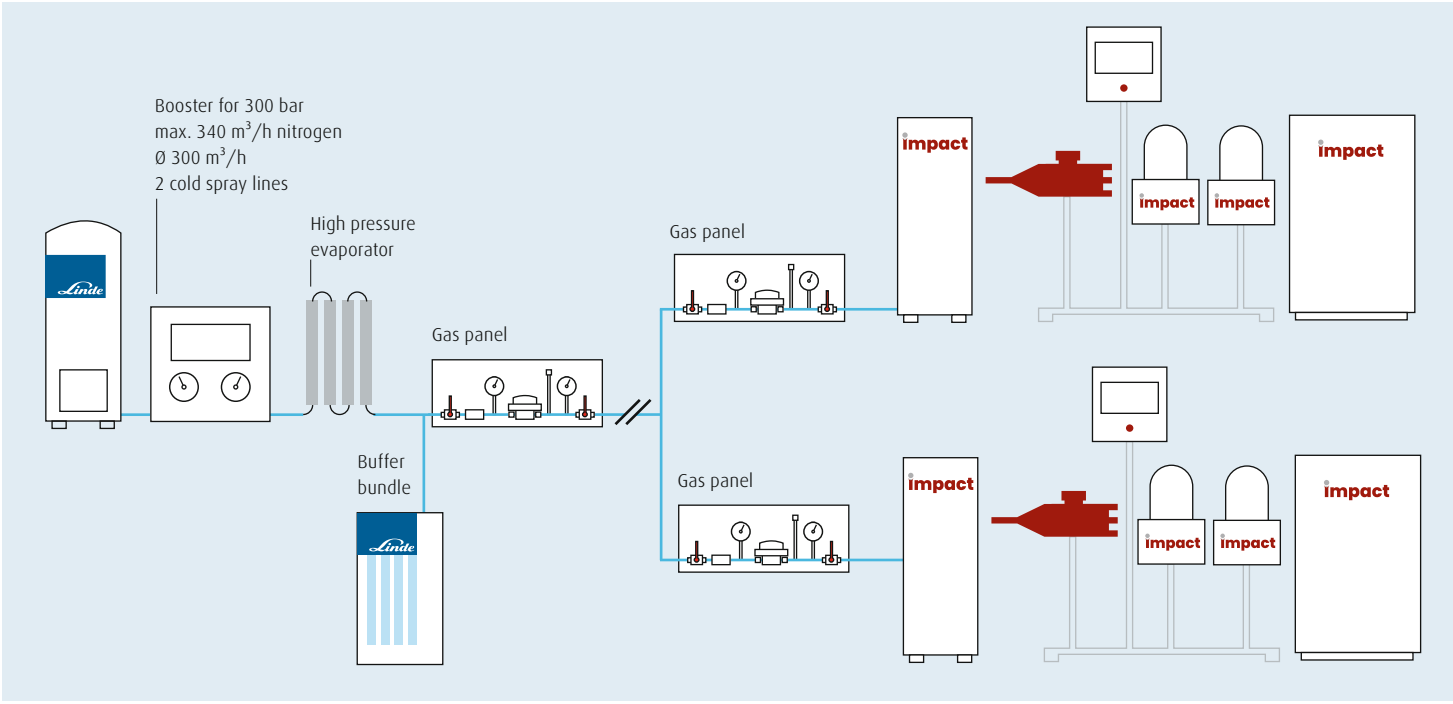
To generate the necessary level of kinetic energy, a process gas – usually nitrogen, helium or mixtures of these gases – is fed into the spray gun at a pressure of up to 60 bar (870 psi). There, the gas is heated up to a maximum temperature of 1100°C (2012°F) and it accelerates the metal particles through a supersonic nozzle to speeds of 500 to 1200 meters per second. On impact with the substrate, the highly focused spray jet particles impinge the surface to form a strongly adhesive/cohesive and low-oxide coating. These surface coatings can be anything from a few hundredths of a millimeter up to several centimeters in thickness.

The supersonic speed of the particles and the high degree of deformation on impact with the substrate enable extremely homogenous and very dense coatings. Unlike conventional thermal spray processes, cold gas spraying does not fuse or melt the powder during the process. This results in minimal thermal influence on the coating and the substrate.

Key success factor: Gas supply

The finish and durability of the final coating is heavily influenced by the gas supply system driving the impingement process. A stable, reliable stream of high-pressure, high-purity process gases is essential. This calls for precise control over temperature and pressure. These two gas variables determine the particle velocity and – by definition – the quality of the coating. As the properties of every coating material are highly individual, the process gas temperature and pressure must be carefully aligned with each cold spray application. Any fluctuations in temperature and pressure compromise coating quality; with rapid temperature changes even potentially damaging both the gas heater and the de laval nozzle at the tip of the spray gun.

Overview of one-stop Cold Spraying Solution including LINSPRAY® Connect



Teaming Up for Plug-and-Play Deployment

To address this high-pressure gas supply challenge, Impact Innovations teamed up with Linde, thus bringing two pioneers in the cold spraying space together. Linde's long-standing expertise and technology leadership in cold spraying, thermal spraying and gas supply systems was the perfect fit for market-leading Impact EvoCSII System.

Working in close collaboration, the companies developed LINSPRAY® Connect, a smart, reliable and safe gas supply solution designed specifically to meet the high-pressure specifications of Impact Innovation's cold spray system. LINSPRAY Connect helps customers to achieve a stable flow of high-purity process gases at the right temperature and pressure with minimal to no fluctuations.

In addition, LINSPRAY Connect brings greater intelligence to the gas supply solution so customers are free to concentrate on the spraying process rather than having to worry about their process gas. Reflecting both companies' plug-and-play vision, it supports integration into today's smart factory, automatically monitoring process parameters such as pressure, temperature and filling levels of the gas bundle or tank, and automatically sending real-time error messages in the event of deviations from the on-spec values. In addition, it can switch to an emergency gas supply or activate a safe shut-down in the event of an incident. And with an eye towards the rising adoption of cold spraying across new use cases, the entire gas supply system can seamlessly scale to support two or more lines.

The LINSPRAY Connect supply system includes cylinder bundles or a bulk tank for the process gas, a PRESUS® high-pressure boosting pump or a cryogenic pump, a high-pressure pipeline and evaporator as well as gas control panels.

Benefits of cold spraying with LINSPRAY Connect at a glance

LINSPRAY Connect combines with the Impact EvoCSII System to create a one-stop cold spray solution with "gas on tap". LINSPRAY Connect gives customers instant access to the wealth of experience that Linde has accumulated over the years with countless successful LINSPRAY installations. This experience now gives LINSPRAY Connect customers the precise and granular control over their gas supply that they need to roll cold spraying out to new and innovative opportunities. In addition to seamless scalability, LINSPRAY Connect will be particularly attractive to Impact Innovation customers with international operations as Linde can offer standardized, replicable gas supply solutions worldwide.

- → High-end solution bringing the productivity and innovation benefits of cold spraying to new markets
- → Predictable, reliable gas supply for high-quality cold spraying outcomes
- → Greater process control for less risk of damage to cold spray system
- → Real-time monitoring for reduced downtime
- → Fewer rejects and less rework
- → Integration into smart factory systems
- → Ease of scalability as needs grow

Impact Innovations GmbH
Bürgermeister-Steinberger-Ring 1, 84431 Rattenkirchen, Germany
info@impact-innovations.com

Linde
Danbury, CT 06810, United States
Phone +1 844 44LINDE (+1 844 445 4633), Fax +1.800 772 9985; 716.879.2040
contactus@linde.com, www.linde.com

Linde GmbH
Gases Division, Seitnerstrasse 70, 82049 Pullach, Germany
Phone +49 89 7446–0, info@linde-gas.com, www.linde-gas.com

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