impact
INNOVATIONS

COLD SPRAY PROCESS

COLD SPRAY - HOW DOES THIS PROCESS WORK?

Cold gas spraying is the most recent method in the field of thermal spraying. In comparison to conventional thermal spray processes, cold gas spraying offers special advantages, because the spraying material is neither fused nor melted during the process. Thus, the thermal influence on the coating and the substrate material is kept low.

The high kinetic energy of the particles and the high degree of deformation during the impact on the substrate that is connected with it, allows the manufacturing of homogenous and very dense coatings. The range of coating thicknesses varies from just a few hundredths of a millimeter up to several centimeters.

There are mainly metallic coatings produced, which physical and chemical properties barely differ from the properties of the base material.

With the latest system technology of Impact Innovations GmbH a process gas - preferably nitrogen or helium - is put into a spray gun with a pressure of up to 50 bar (725 psi) and is heated up to a maximum temperature of 1100 °C (2012 °F) in the gun housing.

The subsequent expansion of the heated and high pressurized gas in a convergent-divergent nozzle down to ambient pressure results in the acceleration of the process gas up to supersonic speed and, at the same time, in the cooling down of the gas to a temperature below 100 °C (373 °F).

The spray powders are injected in the convergent section of the nozzle by using a powder feeding unit and carrier gas and are accelerated to a particle speed of up to 1200 m/s in the main gas stream.

In the highly focused spray jet particles impinge the - in most cases untreated - surface of the component, deform the particles and form a strongly adhesive/cohesive and low-oxide coating.

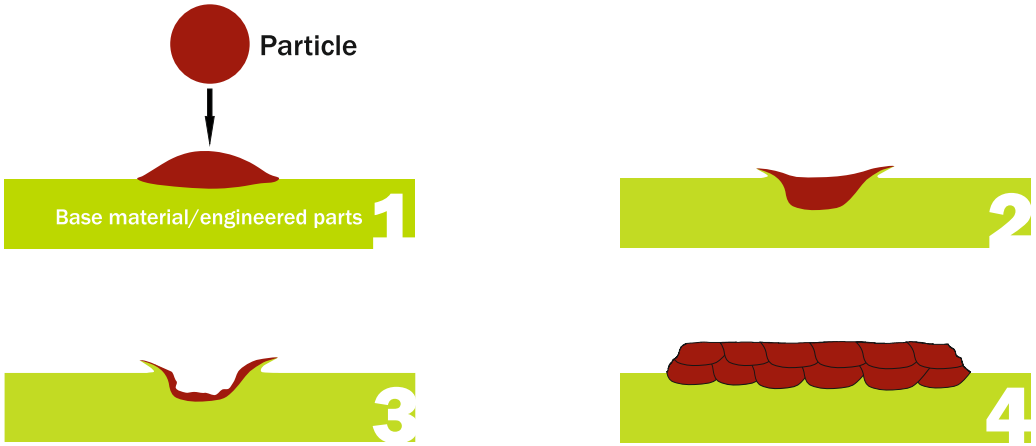
PARTICLE VELOCITY INFLUENCE

1 The coating particle has reached the minimum impact velocity which is needed to excite a bonding mechanism with the engineering part. This so called “critical velocity“ influences the coating material properties.

2 Since the impact velocity is higher than the critical velocity, the deformation and bonding quality of the particles increase.

3 When the impact velocity is too high (“erosion velocity“), more material is eroded than added. No coating is produced.

4 In order to excite dense and well-formed coatings, the impact velocity of the particles should be between the critical and the erosion velocity.



WHAT CAN BE COATED BY COLD GAS SPRAYING?

COATING MATERIALS

Metalls - e.g. Magnesium, Aluminium, Titanium, Nickel, Copper, Tantalum, Niobium, Silver, Gold, etc.
Alloys - e.g. Nickel-Chromium, Bronze, Aluminum-Alloys, Brass, Titanium-Alloys, MCrAlY´s, etc.
Mixed materials (Metal matrix combined with hard phases) - e. g. metal and ceramics, composites

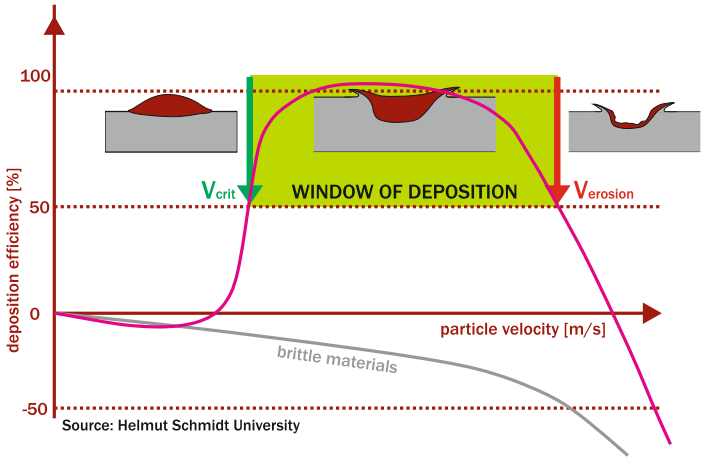
BASE MATERIALS

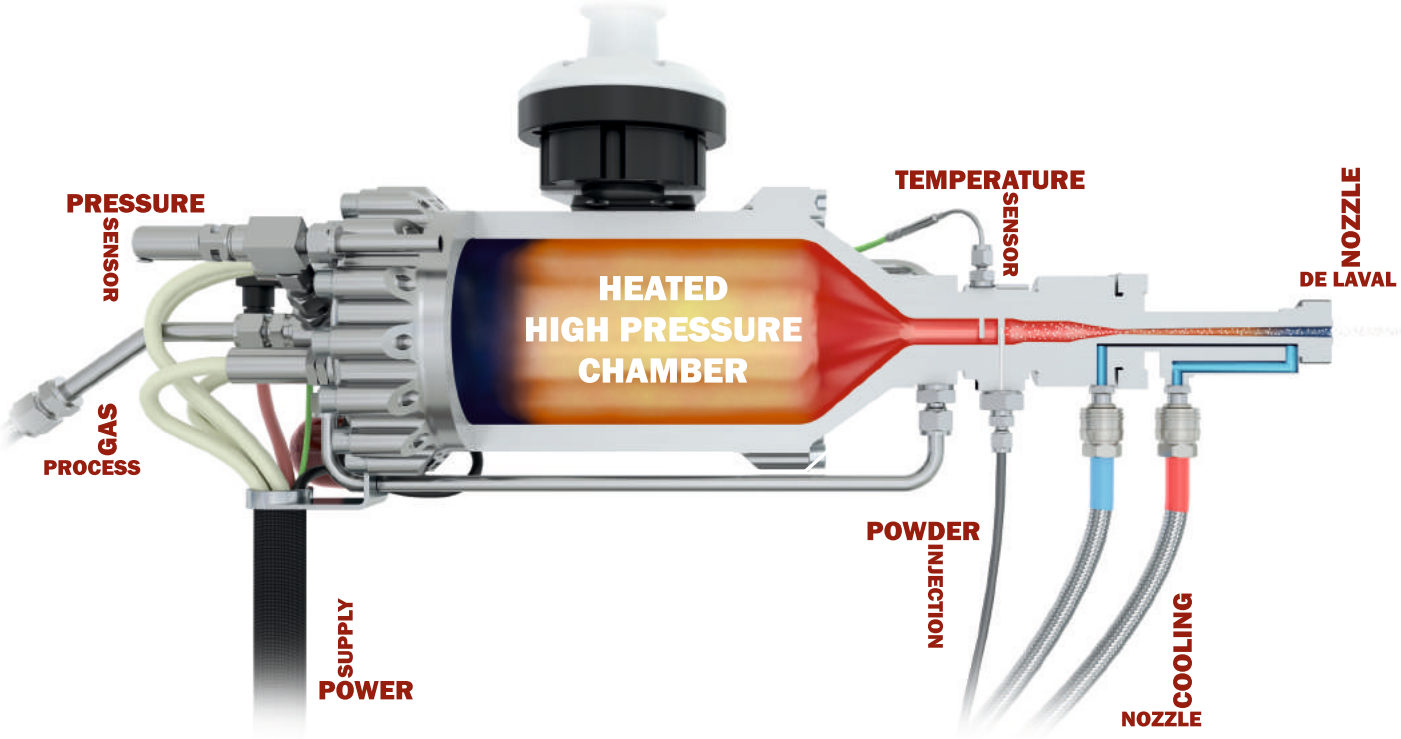
Metal engineered parts, plastics as well as glass and ceramics

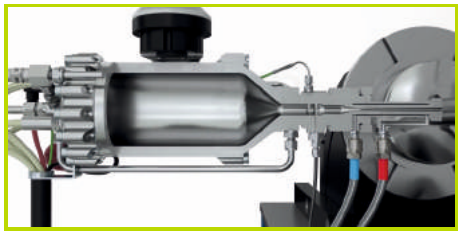
INDIVIDUAL PROCESSING

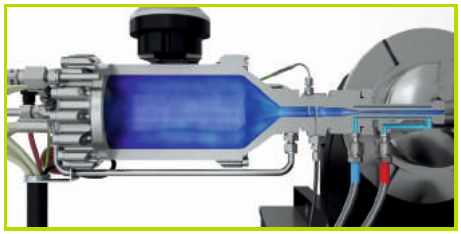
Every single coating material is individually processed.

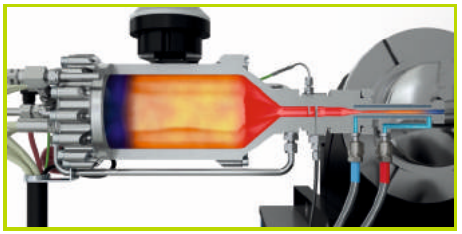
The processing of materials requires an individual adjustment of gas temperature and pressure. The combination of these two physical parameters defines the particle velocity and the quality of the coating. The window of the optimal spray velocity, limited by the critical and the erosion velocity is called “window of deposition“. Inside this window of deposition coating quality is influenced by parameters.

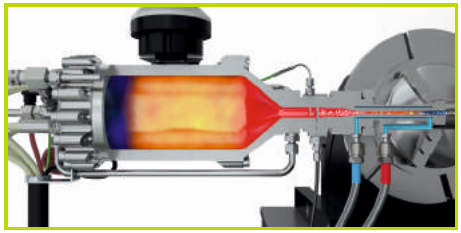


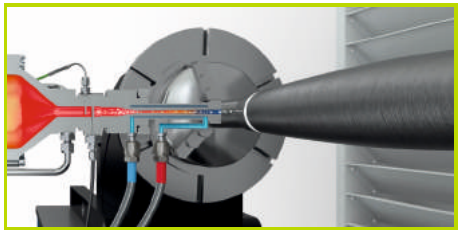

PRESSURE
SENSOR
GAS
PROCESS
HEATED
HIGH PRESSURE
CHAMBER
TEMPERATURE
SENSOR
NOZZLE
DE LAVAL
POWDER
INJECTION
COOLING
NOZZLE
SUPPLY
POWER

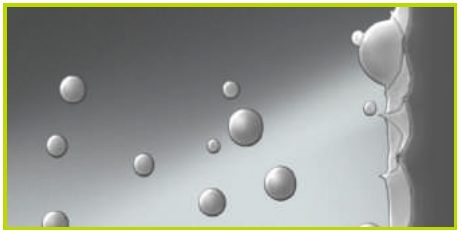












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