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CO2 snow-jet cleaning – cost effective component
cleanliness to meet individual demands**

CO₂ Snow-Jet Cleaning – Cost Effective Component Cleanliness To Meet Individual Demands

Mounting cleanliness requirements and the increasing complexity of metal parts call for innovative cleaning techniques – such as the purpose-built CO₂ snow-jet cleaning machine made by acp GmbH. Integrated into production lines or as a stand-alone solution, this technology enables filmy and particulate contamination to be removed gently and efficiently in an environmentally-safe way.

Instead of CO₂ pellets, the snow-jet cleaning technique developed by acp – advanced clean production GmbH uses liquid carbon dioxide as a jet medium. Fed from cylinders or tanks, it has an infinite shelf-life. In contrast with standard snow-jet processes which use a single-component nozzle, the system developed by the Esslingen-based company has a cleaning head composed of a patented, supersonic two-component ring nozzle. On exiting the nozzle, the liquid carbon dioxide expands to form a mixture of snow and gas which makes up the core jet. Compressed air is also added as a jacketed jet to accelerate the CO₂ snow to supersonic speed. Not only is the resulting cleaning effect of the accelerated jet much more effective than that achieved with systems using a single-component nozzle but also the technique requires significantly less CO₂ and compressed air.

Dry, residue-free cleaning process which is easy to automate

The CO₂ snow-jet technology developed by acp uses a combination of chemical, thermal and mechanical actions to remove particulate contamination (e.g. particles, dust) and filmy contamination (e.g. oils, processing media, anti-corrosion coatings) from just about any material in a dry and residue-free way. Another advantage of the system is that it is cheap and easy to automate, enabling surfaces to be cleaned in-line at low cost.

Adapted to requirements

With its specific features, the versatile, easy-to-handle CO₂ snow-jet cleaning technology can be implemented as a cleaning process in a wide range of technological fields. Typical areas of application include precision and micro-cleaning of components, workpieces and parts as well as surface activation. For example, the technique can be used to remove contamination after chipping processes. It is sometimes integrated into existing systems such as CNC-processing centers, resulting in efficient fully-automated processes with the required degree of cleanliness. Another application where considerable optimization and savings potentials can be achieved is the selective cleaning of functional areas of parts such as sealing, bonding and joining surfaces. Such areas often need to be much cleaner than the rest of the component. For example, the Swedish company Volvo Construction Equipment AB uses the technique developed in Esslingen to clean gear parts in-line before they are laser-welded. A leading manufacturer of 3-D laser machines has integrated the CO₂ snow-jet technology into his sys-



The CO₂ snow-jet technique offers significant time and money saving potentials for cleaning functional areas such as sealing, joining and bonding surfaces.

tems to enable residues in the μ -range to be removed from highly filigree shapes. One application which is becoming increasingly popular is the in-line cleaning of workpiece carriers in assembly and handling systems. The aim here is to prevent cleaned components from being re-contaminated by the workpiece carriers. The technique is also implemented in silicon wafer manufacture to remove sawing residues cost-effectively which cannot be completely detached using traditional methods. This reduces reject rates significantly.



The nozzle array is ideal for cleaning large parts with three-dimensional structures. The modular design of the system permits optimum adaptation of the treatment area to the geometry of the component.

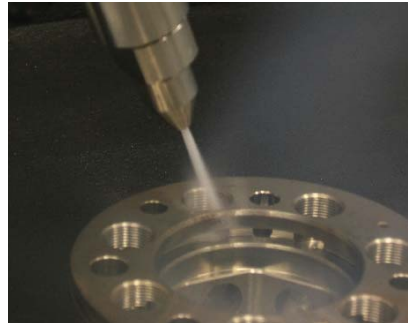


To ensure that parts are sufficiently clean for the subsequent laser welding process, welding surfaces are cleaned with CO₂ in-line beforehand.

Cleaning

Nozzle array for cleaning large surface areas with exceptional results

A nozzle array equipped with one or more cleaning heads enables the patented, highly-efficient technique to precision clean components with large surface areas and 3-dimensional structures, such as metal or plastic attachment parts for the automotive industry. The modular construction of the nozzle array can be optimally adapted to clean three-dimensional structures. Highly-flexible interfaces allow the cleaning system to be easily integrated at low cost into automated processes, for example into painting cubicles. The workpieces are handled by a robot or axis system. The extreme flexibility of the complete system also enables cycle times to be adjusted to meet individual requirements.



The environmentally-harmless CO₂ snow-jet technology has technical, economical and ecological advantages. The cleaning process is dry and residue-free.

uses no chemicals or solvents which would subsequently require careful disposal. Furthermore, compared with traditional wet-chemical cleaning, the CO₂ snow-jet technology is also much more efficient with regard to energy consumption. No energy is needed to heat, distil or prepare the cleaning media or to dry components. When pre-treating metal or plastic parts before painting, no Powerwasher or dyer to remove retained water is needed, thus reducing the amount of space required for pre-treatment to a minimum.

The numerous advantages of the CO₂ snow-jet technology offer enormous potentials with regard to productivity and optimization and economisation measures while improving cleaning quality at the same time.

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For further information on this topic please see also interview with Mr. Karl-Heinz Menauer, Managing Director of acp GmbH on page 16.



The module is highly-compact and easy to automate, making it child's play to integrate a CO₂ snow-jet cleaning system into existing production processes.

Environmentally-friendly and energy-efficient

CO₂ snow-jet cleaning is an environmentally-safe process. In contrast with wet-chemical cleaning methods, the technique produces no waste water and

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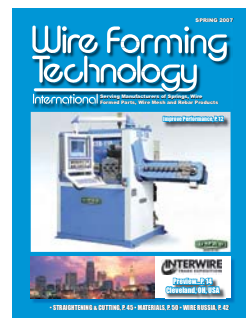
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