advanced
clean production
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Case Study

Snow jet cleaning in hot stamping processes

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technology leader for advanced clean production

BAIER Prägetechnik (OEM)

As a machine manufacturer and market leader for hot stamping systems, BAIER Prägetechnik is part of the Kurz Group and acts as a global partner to the automotive industry, medical technology, and many well-known companies in the plastics industry as well as in the graphic arts sector. BAIER designs and builds machines and systems for surface finishing, marking, and decoration.

Requirement

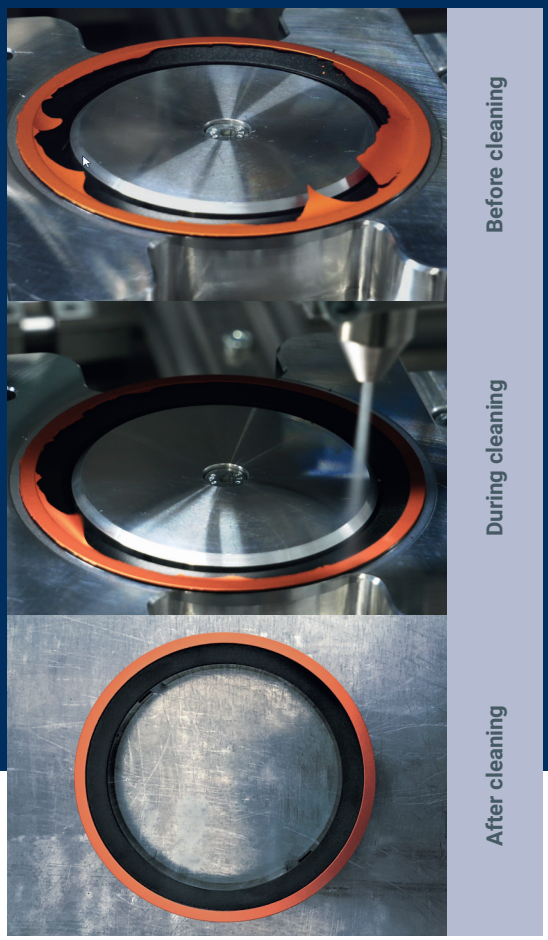
The requirement was to find a non-abrasive method for an automated production process to produce accurate decorative edges in a non-toxic, sustainable, and non-mechanical manner, based on the use of robots, nozzles, and CO_2 cleaning.

quattroClean
technology

CO_2 snow-jet cleaning

Objectives in manufacturing
Dry, particle and film free products

Features & benefits
- Dry, chemical-free cleaning
- Fast & efficient (no drying cycle required)
- Residue free
- Selective
- No chemicals or wastewater
- Kind on the environment (recaptured CO_2)
- Manual or automated



The solution

CO_2 snow – dry, efficient, and climate-neutral

The quattroClean snow jet technology is a dry, effective, and comparatively inexpensive cleaning solution that can be easily integrated into automated hot stamping production lines. The technology makes it possible to reliably and reproducibly remove not only filmic-chemical contamination but also protruding material from partial or plain surfaces. The cleaning medium is liquid, non-corrosive carbon dioxide, which is a by-product resulting from chemical processes and biomass energy production, and is therefore climate-neutral.

The method is already used in various applications for mass production of plastic components, including cleaning and deburring of components. The dry and residue-free cleaning technology is also used to remove particulate and filmic contamination before and after the hot stamping process.

The special design of the two-component concentric jet nozzle allows for excellent cleaning results with the quattroClean system. Liquid carbon dioxide flows through the nozzle and expands into fine CO_2 crystals as it exits. These crystals are then bundled by a separate jacketed jet of compressed air and accelerated to supersonic speed.

The jet of snow and compressed air has a temperature of minus 78.5 °C and can be focused as needed. When it hits the component's surface, four effects take place. The interaction of these mechanisms removes burrs reliably and reproducibly.

At the same time, particulate and filmic contaminants are cleaned off the surface. An integrated suction unit removes detached material residues from the cleaning module. To ensure consistent results, a sensor system monitors the jet's consistency at the respective nozzle. The supply of compressed air and CO_2 to the nozzle as well as the blasting time are also monitored. The values measured are stored automatically and can be transmitted via standard interfaces to a parent system to record all production data.

Conclusion

The quattroClean snow jet technology allows for dry, residue-free, and environmentally friendly cleaning of component surfaces. The method is very suitable for removing protruding material from hot-stamped plastic parts and from IMD parts (in-mold decoration process).

This technology is already being used in BAIER machines as a stand-alone or inline variant. In this process, a robot equipped with a CO_2 nozzle moves along the contour of the hot-stamped component and removes excess material from the component.

Simultaneous CO_2-induced embrittlement and shearing-off cause the protruding material to detach from the component. If the component is designed appropriately, an almost razor-sharp embossed edge can be achieved. This accurate and reproducible process is suitable for almost all materials as CO_2 snow jet cleaning is non-abrasive.

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