Case Study Ecoclean GmbH / SFS intec AG

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Use of modified alcohol instead of perchloroethylene for cleaning deep-drawn and extruded parts – Innovative machine technology doubles throughput and boosts cost-efficiency

At SFS intec AG's plant in Flawil/Switzerland, a need to expand capacity as well as environmental considerations called for the replacement of an existing cleaning system using perchloroethylene. The company opted for an EcoCcore unit tailored to its specific requirements. The new cleaning system supplied by Ecoclean relies on modified alcohol. Thanks to innovative cleaning technology, it doubles the throughput at reduced per-unit costs while further enhancing cleaning quality.

The history of SFS began in 1928 with the Stadler hardware store in the town of Altstätten. Today, SFS Group AG of Switzerland is the global leader in mechanical fastener systems and precision formed components. These items find their uses, e.g., in the automotive, construction, mechanical fastening, electrical, electronics, aeronautical and medical equipment industries

Cleanliness for safety-relevant automotive parts

Serving the automotive industry and its tiered suppliers, SFS intec AG manufactures cold-formed and deep-drawn components as well as plastic injection mouldings and assemblies, e.g., for airbags, restraint systems, brakes, and active and passive safety devices. The production of these safety-relevant parts takes place at the company's European headquarters site, as well as in Asia and North America. The plant at Flawil in the Swiss canton of St. Gallen makes deep-drawn and extruded items of various metals, e.g., steel, nickel-plated steel strip, copper, brass, and aluminum. Each of these parts is cleaned after leaving the press. "In the cleaning process, it is necessary to meet

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the specific customer's demands regarding particulate cleanliness. And needless to say, the parts must also be free of grease", explains Markus Stäheli, head of Surface Technology at SFS intec in Flawil. Since the application involves the removal not just of particles, abrasion residue, emulsions and pressing or drawing fluids but also of chlorinated cutting oils, the company used to run a solvent-based cleaning system relying on the use of perchloroethylene (PCE).

Focusing on throughput and eco-friendliness

As the existing system had reached its capacity limit, investment in a new one was needed. Naturally, the new plant was to provide a certain capacity reserve for the future. In addition, SFS intec at Flawil wanted to do away with perchloroethylene in order to improve its environmental performance as well. With this set of specifications in mind, the company contacted three equipment manufacturers of which Ecoclean finally won the contract. The SFS Group was already using around 25 cleaning machines – including six EcoCcore systems – worldwide from this manufacturer. This innovative solvent-based system with its transparent glass design supports the use of both hydrocarbons and modified alcohols. Operating under a full vacuum, it comes with an extensive standard equipment list which comprises, e.g., two flooding tanks, heat recovery, full-flow and bypass filtration, and various additional features to improve its cleaning performance and quality while cutting per-unit costs at the same time.

Changeover from PCE to modified alcohol

„Ecoclean informed us in great detail about the capabilities of this new system and the use of modified alcohol. We were thus able to attain our objective of improving the site's environmental performance", says Markus Stäheli. Nevertheless, removing the chlorinated oils from the product proved a challenge. This was resolved jointly with Solvadis, the chemical supplier, who conducted extensive oil compatibility tests and solvent analyses that yielded a suitably stabilized modified alcohol. At SFS intec, solvent quality is tested regularly using the chemical supplier's test kit. If necessary,

the solvent can be perfectly adjusted again with the aid of a matching stabilizer to maximize its service life. The results were validated through cleaning trials conducted with an EcoCcore at one of the equipment manufacturer's test centers. „Ecoclean really gave us good support in connection with our switch from PCE to the partially polar solvent", Markus Stäheli notes.

Superior throughput in volume production

As for the second objective, i.e., boosting capacity to accommodate future growth, the EcoCcore is perfectly equipped for this purpose by design. With a work chamber designed for part containers measuring up to 670 x 480 x 400 mm as standard, it can handle a batch volume exceeding that of its predecessor by about one-third. Accordingly, SFS intec can now combine four (instead of two) of its commonly employed 480 x 320 x 200 mm cleaning baskets to form one batch, thereby doubling throughput. The maximum batch weight amounts to around 200 kg. As for the 670 x 480 x 300 mm part containers also used by the company, a special adapter allows these to be used in the new machine as well.

Tailor-made machine concept

„Apart from increased machine capacity, a slightly shortened cleaning cycle contributes further to the system's enhanced throughput", Markus Stäheli adds. This is owing to an EcoCcore engineering concept aimed at delivering high cleaning performance and quality. It includes features such as, e.g., an innovative preliminary steam degreasing step. With this technology, the oil-carrying distillate is not passed into the flood tank, contrary to common practice, but is directed straight into a distillation unit of nearly double capacity. This design minimizes oil deposits in the flood tank while counteracting an oil enrichment of the solvent.

In order to meet SFS intec's high cleanliness standards, the machine concept was suitably customized. Thus, the unit is equipped with an ultrasonic system in addition to its standard injection flood-wash functionality. As an innovative feature, the ultrasound can be used simultaneously with the filtration function, with the volumetric

flow rate being frequency controlled. Particles are thus discharged concurrently as they are removed and cannot settle in the work chamber. Filtration is performed by a bag filter with integrated magnetic separation plus a downstream cartridge filter in the case of flooding tank No.1, while flooding tank No. 2 is served by two cartridge filters. A further option ordered by SFS is an add-on module comprising a third flood tank for a preservation step. All stainless-steel tanks are designed without internal heater fittings, which does away with chip and dirt traps.
Given the floorspace situation at SFS intec, the maintenance hatches are configured as roll-up doors of matching design.

Fully-automatic process

The machine is loaded via a twin-track roller conveyor on which the loads are placed. The operator removes the routing documents for the job and scans their bar code with a reading device. The plant control system automatically selects the part-specific cleaning program and starts it once the door of the work chamber has closed. Due to the great diversity of parts, SFS intec uses around 50 cleaning programs. The various process parameters, such as the times and intervals for the injection flood wash and steam degreasing cycles, the ultrasound power and duration, and the drying operation can thus be adapted accurately to the parts being cleaned. "With cleaning times of between 6 and 9 minutes, we achieve an outstanding cleaning quality with the EcoCcore. Moreover, the cleaning process has definitely become more cost-efficient", Markus Stäheli delightedly reports.

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The SBS Ecoclean Group (formerly Dürr Ecoclean) develops, produces and markets forward-looking machinery, systems and services for industrial part cleaning and surface treatment applications. Its globally leading solutions help companies around the world in conducting efficient and sustainable manufacturing to high quality standards. The client base comes from the automotive industry and its suppliers in addition to a broad range of market sectors ranging from medical equipment, micro technology and precision devices through mechanical and optical engineering to power systems and aircraft industry. Ecoclean's success is based on innovation, cutting-edge technology, sustainability, closeness to the customer, diversity and respect. The Group employs a workforce of approx. 900 at its 12 sites in nine countries worldwide.