

Application Report Ecoclean GmbH / Steel Automotive GmbH

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High-quality degreasing and cleaning in bulk containers – Stamped and metal-formed parts with surfaces ready for adhesive-bonding and welding

Where stamped and metal-formed items for the automotive industry come off the press at one-second intervals, part cleaning presents a challenge. This is particularly true where adhesive-bondable, weldable or corrosion-protected surfaces are specified. One supplier solves these requirements with the aid of a large-chamber solvent-based cleaning system. The machine allows components to be cleaned in Euro pallet cages and custom plastic transport containers.

At Steel Automotive GmbH of Grossbottwar in the Swabian region of Germany, around 99 per cent of the company's output of stamped and formed metal parts are destined for the automotive and auto supplier industries. Founded in 2004, this internationally active, medium-sized enterprise can nevertheless look back on an over 100-year tradition in metalworking. It evolved from the construction tinsmith's shop established by Gottlob Stahl in 1900, which later developed into a stamping and metal-forming operation under the management of the founder's grandson, Hermann Stahl. Today, the portfolio of products and services ranges from engineering and toolmaking through stamping and metal-forming technology to component assembly. In addition, the company produces ladder hinges and hybrid elements that combine knitted wire mesh and metal-formed parts into elastic links designed to reduce vibrations and noise.

Downstream process determines cleanliness requirement

For its production of stamped and metal-formed parts, around 120 tons of material are supplied to the company's site each day. These consist of different grades of steel, galvanized or stainless steels, and aluminum. From this stock the company produces, e.g., diverse parts for car seats, steering column adjusters, and housings for in-car electronic systems, anti-lock brake devices and airbag activating systems. Some of these parts undergo up to 20 metal-forming operations, using a pool of around 15 automatic stamping presses with a press force of 150 to 1000 tons. In some cases, this process involves the forming of screw thread.

Depending on its function and further processing, each item must meet different cleanliness specifications. "Many parts are subsequently laser-welded or adhesive-bonded. These surfaces must be de-greased and cleaned accordingly. With housing components, particulate cleanliness additionally plays a key role", notes Michael Kuppinger, who is in charge of production equipment planning at Steel Automotive. On steel parts, moreover, a temporary anti-corrosion treatment is specified to protect the product during transport and storage.

Parts cleaned in bulk must not get damaged in the process. "If laser cut edges or threads are damaged during transfer/tipping operations, the part will have to be scrapped. On our stamping lines we therefore use conveyor belts with a magnetic surface which adapt automatically to the container fill level, so that each part gets transferred into the transport container very gently", explains Michael Kuppinger.

Cleaning in the transport container

When markedly growing demand called for an expansion in production capacity, it was necessary to invest in an additional press as well as in a new cleaning system. "We closely looked at the diverse equipment solutions and plant manufacturers, from multi-chamber immersion to continuous cleaning technologies and solvent-based processes. In our trials we examined the overall logistics in addition to the cleaning result. It emerged that our purposes were served best by Ecoclean's solvent-based EcoC-duty system. This large-chamber system enables us to clean the parts directly

inside the transport container, thus eliminating transfer operations and minimizing the risk of product damage", reports the equipment planner.

Clean and dry despite use of non-optimal containers

The modular cleaning system relying on a hydrocarbon medium is designed for batches measuring 1250 x 840 x 970 mm and weighing up to 1 ton.

Adapted to Steel Automotive's specifications, the EcoC-duty comprises two high-grade steel flood tanks to hold the hydrocarbon cleaner and a mixed hydrocarbon cleaning and preserving medium, respectively, for the vapour degreasing, injection flood washing and preserving process steps. A powerful vacuum drying system comes as standard on this Ecoclean (formerly Dürr Ecoclean GmbH) machine.

Most of the stamped and metal-formed parts are shipped in custom plastic containers. These are lower than standard pallet cages, and their base is only around half the latter's size. For the rest, the company uses Euro pallet cages with an interior lining of cardboard. Since the plastic containers have only a small opening, they are less than ideally suited for the cleaning operation. "Ecoclean offered to let us perform cleaning trials with our containers at a company using a similar large-chamber system. We were impressed by the results, as the parts came out of the machine degreased and cleaned to specifications, as well as fully dried. Even the cardboard lining in the pallet cages is still in place", comments Michael Kuppinger. In the cleaning process, the containers are tilted through up to 45 degrees. This product movement ensures that all parts are uniformly reached by the cleaning medium and that any hydrocarbon still in the container after the drying cycle will be duly removed.

In order to compensate for different container heights, the EcoC-duty acquired by Steel Automotive is equipped with an automatic basket lid placement feature. The hydrocarbon medium is reconditioned via a two-stage filtration process with a coarse and a fine filter, plus an integrated distillation system.

Simple operation boosts process reliability

The cleaning machine has been in use five days a week, in three shifts, since August 2017. Each batch consists of either two plastic containers or one Euro pallet cage. The part-specific cleaning program is selected via a barcode reader. As the item number on the product tag is scanned, the machine's controller assigns the appropriate program. "This solution proposed by Ecoclean, along with the straightforward menu structure and plain-text messages, ensures a high level of process reliability", explains the equipment planner. Moreover, the large-chamber system impresses with its cost efficiency in day-to-day operation. So far, only the solvent loss due to dragout has to be replaced. The equipment planner is satisfied with the machine's energy consumption as well. This is certainly due in part to the fact that the flood tanks are heated entirely by waste heat from the distillation system, without requiring any additional energy input. "The installed load is equal to 90 kW. Measurements performed by ourselves show an actual consumption of 42 kW. Thus, the plant not only fulfils our requirements optimally but also meets economic targets", adds Michael Kuppinger.

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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.