HEMO
THE CLEANING SYSTEM

Fully Automated and Integrated Fine Cleaning

Hybrid Cleaning Concept for High-Vacuum Components

Components for high-vacuum technology are subject to the strictest cleanliness requirements. A fully automated parts cleaning line, consisting of five individual systems linked via a shuttle system, removes contaminants down to the level of a few atomic layers.

When exceptionally high standards must be met, inquiries often end up with the parts cleaning specialists at HEMO in Ötisheim, Germany. The company welcomes any technological challenges.
The project from Pfeiffer Vacuum GmbH in Asslar, Germany, was therefore a perfect fit: the highest demands on cleaning quality, fully automated operation, high parts throughput, automatic integration of a total of five cleaning systems — including the integration of legacy equipment from a third-party provider — and compliance with highest requirements regarding process safety, environmental protection, and sustainability.

HEMO's engineering team was as enthusiastic about the project as Managing Director Andreas Fritz:
„Meeting these requirements demanded not only our expertise in cleaning technology, but also gave us the opportunity to demonstrate our capabilities as a custom machinery builder. Of course, we wanted to implement the linking of all system components using our own shuttle system. This was a task that allowed us to showcase our holistic solution expertise."

Project Launch with Clear Objectives

At the start of the project, it became evident that the application engineers at Pfeiffer Vacuum had already conducted an in-depth evaluation of a new cleaning technology setup. Since the parts to be cleaned were metal components contaminated with emulsions and particles from prior machining or grinding processes, a two-stage hybrid cleaning process was favored for this application. „To meet the high parts throughput in a three-shift operation, we rely on a concept using multiple standard systems linked via a shuttle system. In this setup, we are complementing the existing equipment with three new high-performance HEMO cleaning systems," explains Andreas Fritz.

Aqueous Pre-Cleaning – Solvent-Based Final Cleaning

The first cleaning step is always performed on an aqueous basis, aiming to remove the bulk of adhering contaminants. While the water-based cleaning eliminates polar residues and particles, it does not yet achieve the specified cleanliness level required for final assembly.

Consequently, the parts always undergo a final solvent-based cleaning in the second step. The goal of this fine cleaning is to remove any remaining film-like contamination down to the level of a few atomic layers. "Since these parts are used in high-vacuum applications, even lowest amounts of oils, greases, or cleaning residues can result in total product failure. That is why the parts with the highest cleanliness requirements are processed at the end through our new HYBRID system," explains Andreas Fritz.

This HYBRID cleaning and degreasing system operates with a modified alcohol suitable for both organic and inorganic contaminants. All process steps are carried out under vacuum. In the first step, the parts undergo immersion cleaning with the liquid medium, followed by fine degreasing with solvent vapor, and finally, rapid, residue-free vacuum drying. The elevated temperature and the high-quality solvent continuously regenerated through distillation ensure unmatched cleaning and degreasing results.

> „In preliminary trials, we were consistently able to meet our customer's residual contamination requirements with full process reliability,"
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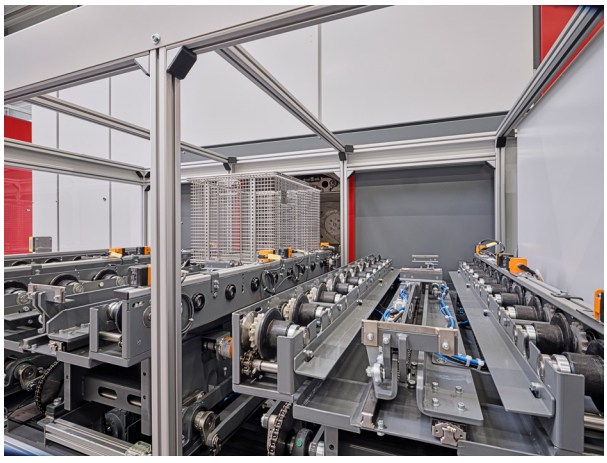
> HEMO CEO Andreas Fritz.

Fully Automated Transport and Loading via Shuttle System

At Pfeiffer Vacuum, the team was not only impressed by the cleaning results but also by the realization of the system on a footprint of just 18 x 7 meters. The linking of the cleaning line is fully automated via a shuttle system developed in-house by HEMO. In this setup, the shuttle has three transport positions for dirty, pre-cleaned, and final cleaned parts. Thanks to the strict separation of the manual loading and unloading stations, cleaned parts never come into contact with contaminated surfaces.



The shuttle picks up the baskets from the central loading station, transports them from system to system, and finally returns them to the discharge section. The baskets are coded with RFID chips that transmit program and product information from one system to the next. A central control computer manages the optimal flow of parts throughout the line.

The new cleaning line is also state-of-the-art in terms of environmental performance. It operates almost entirely without wastewater or exhaust emissions, and the cleaning media are largely recirculated without loss. Continuous maintenance of the cleaning fluids through filtration and distillation ensures long service life and supports both economical and environmentally responsible operation. Nowadays, parts cleaning cannot be more sustainable and efficient.

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