HEMO
THE CLEANING SYSTEM

Hybrid Cleaning Hits the Mark

Low-Particle Cleaning of Precision Parts and Tools

Regardless of operating conditions – precision parts and tools must function reliably. To maximize product quality and eliminate malfunctions, a renowned manufacturer of weapons relies on the most advanced production technologies, which require near-particle-free parts cleaning.

In the production of precision parts and tools, this internationally successful company utilizes state-of-the-art coating processes such as PVD technology. PVD, or Physical Vapor Deposition, is a process in which a metal vapor — partially ionized — reacts with specific gases to form a micrometer-thin coating with the desired composition. This allows the manufacturer to impart precise properties to its precision parts, including hardness, adhesion, and friction characteristics, ensuring optimal performance and reliability.

Low-Particle Parts Cleaning as a Fundamental Requirement

A key to successful PVD coating is the high cleanliness level of the parts to be coated. According to Andreas Fritz, Managing Director at parts cleaning specialist HEMO in Ötisheim:
„Conventional parts cleaning cannot meet the stringent cleanliness requirements needed before coating. Our hybrid cleaning systems, which combine aqueous and solvent-based cleaning steps, are the perfect solution for such demanding applications. In trials, we were quickly able to demonstrate that near-particle-free cleaning can be guaranteed. However, achieving this required us to use the full scope of our system."

What Fritz refers to becomes clear when looking at the impressive HYBRID PVD system, installed directly within the manufacturer's PVD coating line. With dimensions of 10,000 x 4,900 x 3,450 mm (L×W×H) including loading, the cleaning machine — with its two solvent-based and five aqueous cleaning stages — is comparatively compact. Nevertheless, to integrate the system into the constrained available space, it had to be executed in two sections.

Hybrid Cleaning Removes Organic and Inorganic Contaminants

The HYBRID PVD is recognized as a benchmark in fine cleaning due to its pioneering combination of aqueous and solvent-based cleaning processes. In this technology, all process steps are carried out under vacuum, merging the advantages of both cleaning worlds — water and solvents — to deliver outstanding results for both organic and inorganic contaminants.

With this system, HEMO demonstrates what is technologically possible today. It features two solvent-based stages for pre- and fine cleaning, as well as a total of five aqueous cleaning stages. In the aqueous section, two different media — an alkaline and a neutral cleaner — are used. This provides a significant advantage for the user, as emphasizes Volker Hösel, Chief Technician at HEMO:

> „With our HYBRID PVD, our customer can perfectly clean parts made from a wide range of materials — from aluminum and non-ferrous metals to steel and stainless steel. This allows the entire spectrum of precision parts and machining tools to be processed through the system.“

Flexible Batch Size and High Throughput

The batch size is 1,350 x 480 x 400 mm per basket, but can be split into two baskets if needed. The system's maximum throughput depends on the cleaning program: in the basic solvent program, output reaches five batches per hour, while in the more complex hybrid program, it is two batches per hour.

In a typical hybrid cleaning process, the parts first undergo pre-cleaning with a solvent, followed by multiple cleaning stages using one of the two available aqueous media, and finally a solvent-based fine cleaning. The goal of this final cleaning step is to remove any remaining film-like contamination down to the level of a few atomic layers. An ultrasonic system with nine kilowatts of power further ensures the required cleaning quality. The last two steps are solvent vapor degreasing and vacuum drying.

To consistently meet the extremely high cleanliness requirements, HEMO left nothing to chance in designing the system. Andreas Fritz recalls: „We really paid attention to every detail. The cleaning chamber is hand-polished inside, the turntable is electropolished, the piping is designed to be as dead-space-free as possible, and the stainless steel valves between the filter and cleaning chamber are welded without flanges. The cleaning chamber is ventilated through specialized HEPA filters to prevent recontamination of the parts from the ambient air.“
With this comprehensive approach, HEMO has succeeded in consistently meeting the customer's strict cleanliness requirements.

System Operation More Comfortable Than Ever

For system control, HEMO relies on proven technology: a Siemens Simatic S7-1500 PLC with a high-resolution operator panel is used. The visualization of all process steps is exceptionally clear. All necessary process parameters, such as temperature, pressure, and cycle times, can be set and adjusted via the operator panel. In total, up to 99 different cleaning programs can be stored.

What users particularly appreciate is the ease of operation. Selecting the correct cleaning program is almost fully automated via QR codes. Each cleaning basket is equipped with a QR code, which is read by a fixed scanner at the loading station. Each scanned code corresponds to a specific cleaning program, which is automatically assigned to the system via the production control system. This also allows process data and serial numbers to be recorded, making the cleaning process fully transparent and traceable at all times.

„The HYBRID PVD has been in operation since September 2022 and has met the expectations in every respect. Our customer is extremely satisfied with the cleaning quality, and the system's operation is efficient and sustainable, not least thanks to the automatic dosing of the cleaning media," concludes Andreas Fritz.

Text: Ralf Högel