

HEMO Cleaning Systems with an innovative World Premiere

Solvent-Based Parts Cleaning with Heat Recovery

The famous gear and transmission manufacturer IMS Gear operates one of the world's most advanced hardening plants at its Donaueschingen, Germany, site. Recently, a world premiere started its operation there: a solvent-based parts cleaning system heated using the waste heat from the hardening furnaces.

Industry 4.0 at the IMS Gear hardening plant, with its nearly 50 employees, is daily production reality. All production facilities are digitally networked. At the control station, every production activity can be monitored in real time. Every process step for each individual part is documented in detail and can be retrieved at any time. This expertise is increasingly in demand from customers, primarily in the automotive industry. The parts range includes highly demanding components such as diesel engine injectors, e-bike drives, and similar products. Reinhold Heizmann, General Manager of the Hardening Technology Business Unit, explains: "We have transformed from a traditional in-house hardening shop into a successful commercial heat treater. Today, about 70 percent of our work is for external customers. Each year, over 100 million parts leave our facility. Our goal is to set standards both in quality and in sustainability and efficiency. That is why heat recovery from the hardening furnaces was a must for our new parts cleaning system."



Technological Challenge

The problem: No parts cleaning system provider offered heat recovery for solvent-based processes. Even HEMO had no solution for this customer requirement in its portfolio. As a first step, IMS Gear received a solvent cleaning system with electrically heated, accompanied by the promise that heat recovery from the hardening furnaces would be retrofitted within a year—a bold commitment at a time when a concrete technical solution was still a long way off.

Milestone for Solvent-Based Systems

The design and implementation of high-temperature heat recovery occasionally pushed the HEMO team to its limits. "We had to develop and build the entire system in-house. It started with the piping, continued with the complex design and in-house construction of a highly efficient shell-and-tube heat exchanger, and ended with the software development," explains Managing Director Andreas Fritz.

Today, approximately 130 °C hot steam supplies the heaters of the cleaning system, which previously had to be electrically heated before the heat recovery system was installed.

Energy Savings of Over 200,000 Kilowatt-Hours Per Year

Currently, the waste heat from two hardening furnaces is being utilized for heat recovery, with the connection of one in preparation. The furnace exhaust, at approximately 360 °C, passes through a shell-and-tube heat exchanger, where water is heated and then converted into steam in a downstream steam generator.

The resulting steam, at around 130 °C, supplies the heaters of the cleaning system, which previously had to be electrically heated before the installation of the heat recovery system. "With this technological jump, we are already achieving annual electricity savings of over 150,000 kilowatt-hours. The potential is far from fully tapped. With the connection of a third hardening furnace to the heat recovery system and further optimizations, savings of over 200,000 kilowatt-hours per year are achievable. The ultimate goal should be operation without any electrical supplemental heating," emphasizes IMS Gear Production Manager David Am Ende.

In shift operation, the solvent cleaning system impresses not only with its excellent energy efficiency but also with highest cleaning quality, even for large batches weighing up to two tons. "The system cleans extremely thoroughly, allowing us to effortlessly meet the stringent standards of the automotive industry. The average cleaning time per batch is only around 30 minutes, an outstanding figure that can vary depending on contamination level and batch weight," explains Am Ende.



The waste heat from the hardening furnaces is used for heat recovery.

Loading from Two Sides Possible

Another special feature: the system can be loaded from both sides. On the rear side, loading is fully automatic via a driverless UniLoader, which retrieves the parts from the high-bay warehouse, loads the cleaning chamber of the system, unloads the cleaned parts afterwards, and returns them to storage. Additionally, the system can be loaded directly from the front with a forklift. The batches supplied via auto-loader measure 910 × 610 × 610 mm, while the larger batches feeded via forklift measure 1220 × 800 × 950 mm.

The customized system operates according to the VAIODS process (Vacuum Assisted Inorganic Organic Cleaning System) using non-chlorinated hydrocarbon solvents, modified alcohols, or mixtures. All process steps run under vacuum. First, the parts undergo immersion cleaning with a liquid medium, followed by degreasing with solvent vapor, and finally rapid, residue-free drying under vacuum. The elevated temperature levels and the high solvent quality maintained through continuous distillation ensure excellent cleaning and degreasing results.

“We are completely satisfied with what is probably the world’s first solvent cleaning system with high-temperature heat recovery. This technology sets new standards in efficiency and sustainability. The pioneering spirit of everyone involved has truly paid off,” says Heizmann.



The system can be loaded both manually from the front with a forklift and fully automatically from the rear.



HEMO CEO Andreas Fritz (left) and IMS Gear Production Manager David Am Ende inspecting the system.