

# Tube Cleaning for Highest Standards

## Cleaning of Stainless Steel Tubes for Nuclear Applications

Low-particle cleaning of stainless steel tubes up to 24 meters long for nuclear applications cannot be achieved with standard systems. A global supplier of such tubes, searching for a solution, turned to the parts cleaning specialist HEMO, which then built and delivered a 60-meter-long, state-of-the-art cleaning system.

The customer was well aware that cleaning stainless steel tubes of varying lengths — from 1.0 up to 24 meters — with outer diameters ranging from 4 to 30 millimeters would not be a simple task. What they had underestimated, however, were the challenges involved in finding a suitable system provider. Thanks to the supplier's strong network, the request finally reached HEMO, headquartered in Ötisheim, Germany.

For HEMO Managing Director Andreas Fritz, inquiries from around the world are nothing unusual:  
„Especially for our tube cleaning systems, our export rate exceeds 90 percent. Designing systems that can handle lengths of up to 80 meters requires extensive experience and know-how, particularly when strict residual contamination requirements must be met while maintaining high throughput.“

### Annual Output: 6 Million Meters

This was exactly the case with the tube cleaning system for this company. The goal is to deliver stainless steel tubes of European top quality, which also includes strict residual contamination limits, with a maximum carbon residue of less than 20 mg/m<sup>2</sup>. Additionally, the system must meet high throughput requirements: six million meters of stainless steel tubes have to pass the cleaning line annually, consistently achieving the same high quality.



HEMO's experts have proven time and again with their cleaning systems that even the highest residual contamination requirements can be reliably met. Achieving the 20 mg/m<sup>2</sup> limit would have been feasible in any case. But the challenge, as Andreas Fritz explains, was different:

„For our hybrid systems, where aqueous and solvent-based cleaning steps can be combined freely, such tasks are standard. In this specific case, however, the goal was to meet the tube cleaning requirements using a streamlined system without its own aqueous cleaning stage, in order to operate as sustainably, economically, and quickly as possible.“

The ambitious targets were indeed realized in practice. The solution can be seen in the 60-meter-long Mild Hybrid TITAN system. The designation “Mild Hybrid” indicates that this is not a classic combined system with separate tanks for aqueous and solvent-based cleaners. In this configuration, the tank for the aqueous cleaner — and thus a major cleaning stage — was minimized. Water is only used at the end of the cleaning process, during the final rinse with steam.

#### Overview of the Mild Hybrid Cleaning Process

The complete cleaning process in this system is divided into four stages. In the first step, the cleaning chamber is flooded with approximately 6,000 liters of hot solvent. Once this vacuum immersion cleaning is complete, the solvent — a mixture of halogen-free hydrocarbons and modified alcohol — is returned to the flood tank via a filter unit. The next step is solvent vapor degreasing, followed by the previously mentioned water-based steam rinse. Finally, an intensive drying phase completes the process. All cleaning steps, as with conventional HEMO systems, operate under vacuum according to the proven VAIODCS process.



Two additional technical highlights significantly contribute to the exemplary cleaning quality of the system. In addition to ultrasonic assistance with 32 × 1.5 kW power, the cleaning chamber can be tilted by 4 - 10 degrees. This tilting of the basket significantly improves internal tube cleaning and, in combination with high-performance pumps, enables ultra-fast filling and emptying cycles — a crucial factor for completing the cleaning process within the short cycle time.

To provide the customer with maximum system flexibility, HEMO engineers implemented a simple yet ingenious solution. Using stainless steel section dividers, the 24.5-meter-long treatment chamber can be divided into segments of varying lengths. This allows the system to clean tubes of any length between 1 and 24 meters as efficiently as possible.

The tube cleaning system successfully passed its acceptance at the final location and meets expectations in every aspect. For a maximum batch weight of 3,000 kilograms, the cleaning process takes 60 to 120 minutes depending on the selected program. Andreas Fritz explains:

**„We can reliably meet both the residual contamination limits and the agreed throughput. The TITAN system also demonstrates how economical, sustainable, and efficient industrial parts cleaning can be nowadays.“**

Text: Ralf Högel