Industrial components cleaning

Robotics | Experts in Man and Machine
The advantages of Stäubli robots in cleaning processes

The aim of industrial component cleaning is to remove unwanted contaminants in solid or liquid form quickly and without residue. A typical example is the cleaning of oily impurities and chips from components after machining. Optimization through improved quality and reliability of the parts and components comes first. Component cleaning can include pre-treatment before painting, coating, gluing, etc. or as the final step after production, right before assembly. Particularly in the automotive industry, the constantly increasing quality requirements and cleaning standards means that without consistent robot automation; the standards cannot be met.

**Typical range of components for cleaning**
In every mechanical component in which liquid media circulates, dirt particles can cause damage to sensitive components or even destroy them. This includes:
- Engine blocks, cylinder heads, oil pump components, camshafts, steering housing, brake master cylinders, ABS and VSC valves
- Oil and gasoline pump housings, gear components, sheet metal components, control cylinders, ABS valve bodies and engine block liners.

**Component cleaning process**
During the cleaning steps, predominantly liquid media supported by heat and individual treatment parameters are used. Thanks to their unique design, Stäubli robots can significantly improve cleanliness and productivity. They offer:
- **Flexibility**
  - Precise handling of various components with complex shapes
  - Workpiece or tool leading solutions
  - Easy adaptation to production fluctuations
- **Reliability**
  - Accurate repeatability in part positioning
  - Oil and gasoline pump housings, gear components, sheet metal components, control cylinders, ABS valve bodies and engine block liners.
  - High-precision trajectory control
  - Better cleaning results
  - No component damage

**Increased productivity:**
- Faster coverage of the cleaning area
- High speed
- Compatibility with hostile working environments (temperature, chemistry, noise)

**Operation under extreme conditions:**
- Wet room environment
- Use with acidic and alkaline cleaning agents
- Low detergent volume
- Optimization of the plant layout thanks to simple integration options

**Optimized TCO (Total Cost of Ownership):**
- Reduced maintenance of cleaning solution
- Lower detergent consumption
- Lower energy consumption

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Stäubli cleaning robot within your component cleaning system

- Pre-Cleaning
  - Component identification
  - Loading the cleaning cell
  - Injection flood bath cleaning

- Cleaning
  - Water jet deburring

- Rinsing
  - Water spray cleaning deionised water

- Drying
  - Water spray cleaning
  - Drying
  - Unloading on outfeed conveyor
PRECLEANING

Brush deburring

Robots can also perform deburring with special brushes. You can either bring the component to the brush or the brush to the component. By selecting the second option, brushes can be used as tools in automatic tool changer systems. Stäubli robots allow any component-brush alignment and ensure machining can be done from all directions and angles. This is the only way to meet demanding surface requirements, even with complex component geometries.

Vapor degreasing

Steam degreasing is suitable for removing oils, grease and emulsions from slightly contaminated components. The solution is heated to the boiling point and the component cleaning takes place with the solvent vapor. Due to the temperature difference between the hot steam and the cold component, condensation occurs on its surface which results in a rinsing effect with a pure degreasing action. Thanks to their unique design and closed structure, Stäubli HE robots are perfect for automating these wet room applications.

High pressure water jet deburring

The water jet consists of a spray solution (water or oil) under high pressure, generally between 300 to 3500 bar, depending on the material to be deburred. Thanks to their six-axis, Stäubli robots can also achieve difficult-to-reach locations, small holes or complex geometries within deep, small-diameter holes. The six-axis machines meet the highest requirements in terms of position accuracy and flexibility. This improves the cleanliness while allowing marks, scratches or thermal effects on the sensitive components to be excluded.
CLEANING PROCESS

Injection flood bath

This process involves the rapid flooding of an empty container in which the robot places the components to be cleaned. While the cleaner reacts to the components, the convection currents due to thermal or mechanical movement contributes to loosening the contamination on the metal surface. Depending on the application, the process can be optimized with ultrasound or injection flooding. Stäubli robots accomplish the component handling with flexibility, reliability and speed.

A ceiling-mounted Stäubli RX160 HE loads components into a cleaning tank.
Water spray cleaning

Spray cleaning is one of the more classic processes in cleaning systems. Using the kinetic energy of the spray jet, with support from the cleaning agent, the dirt particles are released from the component's surface. The spray jets' pressure is generally between 6 to 8 bar and between 20 to 25 bar for more demanding cleaning tasks.

The cleaning result depends on the nozzle orientation on the surface to be cleaned. Relative movements between component and spray nozzle can lead to an improvement in results. That is why Stäubli robots, using the water jet nozzle as a tool, are able to achieve excellent cleaning results.

The spray cleaning is also suitable as a final cleaning step, especially with the high demands for the degree of cleanliness. Even the smallest adhering particles are washed away. The encapsulated and pressurized TX90 HE is designed for these tough applications and proves itself with flexibility, path accuracy and precision.

Drying

Pre-drying of the components is achieved by intensive air drying. Optional vacuum drying gives best results. For the drying of components, suitable compressed air, convection, vacuum methods or any combination of these are used. During this final step in the cleaning process, Stäubli robots take over the component handling, ensuring short cycle times.
Suitable for all cleaning processes from deburring to drying

HE, this abbreviation is currently causing a stir within the automotive industry, especially for the automated cleaning of transmissions, turbocharger housings, crankcases, camshafts and more. The acronym stands for Humid Environment, the term used for Stäubli six-axis robots that are designed for use in damp rooms and are now increasingly being used in component cleaning lines. In principle, the HE robots are the first choice for all applications which come in to contact with liquids and cleaning agents. These robots, which were originally intended for use in the food, machine tooling and water jet cutting industries, have proven to be a huge hit for component cleaners.

This development began in 2000 when Stäubli received their first requests for these applications. As a result they worked on the overprint option for the robots, modifying the case treatment and coating processes to better protect the surfaces. In 2007, the first HE robot with overpressure option, special sealing and lacquering was launched into the market, withstanding even the toughest operating conditions. These robots are suitable for a multitude of tasks, from assembly and handling all the way through to active cleaning using high-pressure water jets.

### THE STÄUBLI HE ROBOT RANGE

#### Added values

- Optimum cleanliness, arm motion freedom and production reliability
  - All cables and pipes routed through the arm removing obstacles from the work area
  - Enclosed structure
  - Limited retention areas
- Precise trajectory performance
  - Improved cleaning quality
  - Reduced rework costs
- Eliminating complex cable management
  - Connections directly on the robot forearm
- Work in difficult environments
  - Vertical outlet
  - Complete protection of connection
- Optimum use of the work area
  - Less floorspace needed
  - Large work envelope
- Superior precision, above average service life, reduced maintenance
  - JCS gearbox designed by Stäubli
  - Pressurized and protected structure
- Flexible integration on the production line
  - Various mounting options

### Specifikationen

<table>
<thead>
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<th>Maximum payload</th>
<th>Nominal payload</th>
<th>Reach at wrist</th>
<th>Number of axes</th>
<th>Repeatability to ISO 9283</th>
<th>Multiple mounting attachments</th>
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* Under conditions
SUCCESS STORY

Deburring vehicle components within a washing cell

With the REZ robot deburring cells from Maschinenbau Silberhorn GmbH, components can be deburred and cleaned simultaneously with a water jet at up to 2,000 bar. At the heart of the systems are Stäubli’s special humid environment (HE) robots, which are specially designed for use in damp rooms.

These systems are used in the automotive industry for the deburring of complex components. Deburring with a high-pressure water jet has two key advantages: components can be effectively deburred and at the same time cleaned to a high standard due to the high kinetic energy of the water jet.

The task of the Stäubli HE robot is the handling of the components. The waiting component is picked up and moved along a precisely predetermined path by the six-axis robot, where it is cleaned and deburred by the high-pressure water jet. Once completed, the finished component is returned to the production line. “What sounds simple in theory is a sensitive process that requires a lot of expertise,” says CEO Franz Silberhorn. “After all, these systems are used to deburr and clean high-precision products for the automotive industry.”

When used over many years, the robots must function flawlessly in their stainless steel cells while being continuously exposed to water spray and 100% humidity. The fully encapsulated and pressurized six-axis robots with HE finish master these extreme conditions and have proven themselves without any restrictions in the deburring cells.

Customer benefits:

- Performance: high speed and accuracy for shorter cycle time
- Resistance to alkaline and acid environments
- Reliability: more than 10 years of experience in component cleaning
- Consistency: robot with lowest maintenance requirements
Global presence of the Stäubli Group

www.staubli.com