

## **Handling of dishwasher housings**

### Starting point / Task definition

BSH Bosch und Siemens Hausgeräte relies increasingly on automation for the manufacture of its dishwashers. Therefore the company also planned to automate the application of bitumen sound-deadening pads to dishwasher housings. The pads have to be seated accurately to ensure maximum sound-proofing and a clean fit when BSN installs the housings.

### Implementation / Solution

#### Handling of dishwasher housings

The task is now carried out by four KUKA KR 125 robots, working together as a pair in each of two cells. Before the order was placed, extensive tests were carried out using an experimental gripper, a leased robot leased from KUKA, and a camera-based position detection system. Then at an early stage in the project, the simulation software KR SIM was used to support cycle time analyses, collision detection and reachability checks.

One of the KR 125s picks up one housing at a time from a workpiece carrier, positions it in its gripper by means of suction, and then clamps it in the end-effector in such a way that it is held precisely in the defined position ready for application. The second robot picks up a bitumen pad from a stack using its suction gripper and applies it precisely to the rear panel and one side of the housing. Because each of these pads is used to insulate two sides of the housing, the robot has to bend it 90 degrees. To do this, it heats each pad at the predefined bending point. This is done on a centering table with integrated infrared heating elements. Previous to this, an image recognition system measures the position of the pad. Taking the measurement data into account, the KR 125 applies the insulating material to the housings with 100% precision, if necessary adjusting the position of its gripper before picking up the pad. Then the other robot sets the housing back down on its workpiece carrier, on which it is automatically carried through a furnace. The two robots in the following cell are responsible for insulating the roof and the remaining side of the housing.

The PC-based robot controller monitors whether a pad and a housing are present, and sends a corresponding signal to the image recognition system. Moreover, the robot controller notices if the KR 125 picks up two of the pads instead of one.

### System components / Scope of supply

Four KUKA KR 125 robots  
Four PC-based KUKA robot controllers, including control panel with familiar Windows interface  
Four adjustable suction grippers  
Robot programming  
Commissioning

## Results / Success

### High flexibility

The KR 125s are more flexible than linear handling devices, and are therefore the most efficient automation solution for BSH. The robots can carry out various process steps, such as rotating and positioning, without having to set the parts down between steps. They also provide more gentle handling.

### High repeatability

By converting the station to the use of robots, BSH has obtained several long-term benefits: greater repeatability in the application process, and thus also higher process reliability and quality.

### Greater productivity

The robots have increased the company's productivity thanks to their reproducible processes, short cycle times and availability of almost 100%.

### Improved working conditions

The use of these robots has led to a significant improvement in working conditions for employees. The major problems were the proximity of the furnace, and the loads which have to be handled, since in each shift some 1,000 housings are cycled through the robotic cell. Since a housing together with its pad weighs seven kilograms, the operator

had to lift – without any mechanical aids – materials with a cumulative weight of seven tonnes per shift.

#### Long reach

BSH chose this robot type, with its load-bearing capacity of 125 kilograms, based on the weight of the gripper and the parts which had to be lifted, as well as its reach of 2.5 meters.

#### Economic advantages

BSH anticipates that the payback period will be less than two years. Another important consideration are the economic benefits provided by this automation, and their contribution to the viability of the Dillingen plant.

#### Comprehensive training

All of the employees who work with the robots have received training at KUKA College, so they have absolutely no trouble operating them.