The development and manufacture of complete systems for process, filling, and packing technology as well as intralogistics are the specialty of Krones AG from Neutraubling near Regensburg in Germany. The core areas of expertise of this globally leading company include the manufacture of bottle carriers for bottle cleaning machines that enable the safe transport of recyclable bottles through the automatic washing process. Krones has to date produced more than 15 million bottle pockets in an automated process directly from the steel coil and sealed them in bottle carriers between 1.5 and 6.3 m in length.

**Retrofit increases productivity**

A rising failure rate and a lack of replacement parts for the nonstandardized automation and drive systems made a retrofit a necessity in 2010. In the process, two systems for manufacturing bottle pockets from steel coil were newly automated. The key element was a reduction in cycle time in order to supply the heart of the system — the automated spot-welding system — sufficiently quickly. Each of the forming/welding stations was equipped with an articulated-arm robot and a second welding unit, which cuts cycle time. SINAMICS S120 converters ensure precise and dynamic movements in cutting to length, rolling, welding, and releasing. As a result, the cycle time at each of the two stations could be reduced from around 31 seconds to 18 seconds.

The system for automated spot welding of all bottle carrier variants via four simultaneously operating 4-axis welding heads was also modernized. Complex handling tasks needed to be performed here. The finished bottle pockets are fed in by their rear sides, aligned, and transferred to the welding area, while a 2-axis feeder positions the two steel carriers from the front side. Following manual
checks, the bottle pockets are welded at the top and bottom with the steel carriers. A stable bottle carrier is produced by then welding the bottle pockets one below the other.

**Precisely coordinated**

Eighteen drive axes must be precisely coordinated in order to safely prevent collisions. For this, the outdated servo technology was replaced with new SINAMICS S120 converters and servomotors from the 1FK7 series. The motion control is carried out by SIMOTION D445-2 motion controllers with CX32 controller extensions for additional axes. For simple data exchange, the SIMOTION system is simultaneously the slave of the SIMATIC S7-400 range controller and the master for the subservient SIMATIC ET 200M peripheral units. In order to meet customer requirements for quality and dynamics, Krones used the SIMOTION Handling Toolbox.

**Resource-friendly and standardized automation**

The SIMOTION Handling Toolbox is a standardized and modular software library that enables handling tasks to be carried out efficiently. It can be used to interpolate highly dynamic and yet mechanically gentle path movements. The movement path is defined independently of the machine kinematic. All typical kinematics, such as articulated-arm robots, are already supported by the system. During programming and start-up, the user can take advantage of helpful 3-D visualization tools provided in the Handling Toolbox.

**Handling with SIMOTION – advantages at a glance:**

- Preprogrammed commands for smoothing paths and turning welding guns
- Smooth integration into the existing system solution
- All common kinematics integrated within the system, e.g., articulated-arm robot
- Reduced engineering work with prefabricated solutions

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