

Going Green—Recycling a Robot

By Shar Peters

Going green and recycling has become the environmentally right thing to do in homes and industry. Genesis Systems Group in Davenport, IA and FANUC Robots, NA in Rochester Hills, MI brought new life to a FANUC robot that was taken out of a welding production line and sitting in storage for over 24 months. Incorporating this idle robot into a new production line not only utilized a prior capital investment, but cut manufacturing expenditures as well.

This five-year-old FANUC M710i, 50kg capacity robot had very few production hours so it seemed like a good idea to put it to use in a new capacity. The idea to resurrect this old robot came into play when Genesis' customer was planning a production line to build a new model. The customer queried Genesis if it would be possible to retrofit a stored robot to dispense adhesive sealant and integrate it into this new production line. The structural and sealing adhesive material they hoped to use in the production line helps secure sheet metal panels to large weldments. When properly applied, the sealant reduces noise and vibrations, and provides the part with airtight protection from outside elements.

Previously, most of the adhesive sealant application was outsourced by the customer. Laborers manually applied the sealant in several locations around the frame using putty knives, battery-powered caulking guns and similar manual tools. "This was a messy, labor intensive and inconsistent method," comments Harlon Neumann, Director Industrial Market Segment for Genesis Systems. "No two operators put down a bead in the same manner or at the same speed. There were ergonomic, safety and waste issues." During the new model prototype build activities, it was common for operators to apply too much adhesive. The excess squeezed out resulting in a messy application and material waste. Sometimes not enough product was applied, resulting in an inferior adhesion or seal.



“After examining the product, processes and expectations, we felt we could retrofit their stored robot so it could communicate with dispensing equipment and be part of their new assembly line. We knew that applying the adhesive robotically would result in better quality control and a better end product,” says Neumann.

The first step was to ship the old robot back to Genesis Systems where it was checked out from a mechanical and electrical standpoint. Some external hardware was removed, updated software and new software options were added, as well as an auxiliary axis (external servo motor) package to allow integrated interfacing with the positioner and the dispensing equipment.

“One of the unknowns was whether this robot would have the reach needed for this production line,” remembers Neumann. “We used WeldPro FANUC simulation software to establish the reach parameters, ideal robot positioning and end-of-arm mounting configuration. We then determined that the retrofitted robot would be able to reach the parts as needed.”

Genesis, partnering with FANUC Robotics and Sealant Equipment and Engineering, along with the customer, partnering with Eckhart & Associates, Inc., for material handling, worked together to design the new line. This new line included a working platform, robotic dispensing, electrical controls, conveyors, part staging, lift tables, overhead material handling and manual assembly tools.

Neumann recalls that retrofitting the robot was a pretty straight-forward task, but the project as a whole required considerable preplanning, engineering, and innovation. Dispensing parameters and schedules were analyzed and established. The system had to be able to integrate into the roller conveyor line and work alongside hydraulic lifts and other material handling devices. Using a manual pass-through system, the operator needed to be able to easily push the part and rack into and out of the cell without the use of hoists or cranes.

Genesis designed a custom, robot-controlled servo turntable to integrate with the raised conveyor line, enabling the operator to push the horizontal holding rack containing the frame into the cell. The frame and rack automatically lowers onto rest pads and clamp devices integrated into the servo turntable. The rack holding the frame falls away from the frame as the table is

automatically lowered and clamped to the fixture. This fixture holds the weldments in a highly repeatable position while the turntable rotates it within the robot's reach for the multi-axis adhesive dispensing operations. Once complete, the turntable rotates and brings the frame back to the load/unload position. The frame is then automatically unclamped. The rack rises again, capturing the part. Once lifted, the frame and rack are manually pushed out of the cell on to the conveyor to advance to the next station where the sheet metal body panels are manually bolted to the frame.

A servo-powered dispenser, close robot-dispenser integration and careful programming techniques were used to achieve fast travel speeds, 500 – 800 IPM. This decreased the cycle time enough to allow other operations to take place within the robot cell.

“It was the perfect opportunity,” explains Neumann. “We incorporated multiple part-checking sensors into the operation ensuring that all of the small, manually welded brackets are in place before the assembly is sent to the paint operation. We added two non-contact laser sensors to the robot's dispenser valve mounting bracket.” Programs were created, using FANUC robot logic, to check for specific parts prior to dispensing the adhesive material.

“The robot is able to look for 20 different parts at this stage of the assembly.” Using the robot logic program functions, individual bracket descriptions identify which parts are missing. If missing parts are detected, an alarm message displays on the system operator interface display, signaling the operator to take action. This robotic function adds a quality control element to the project that wasn't part of the original plan. The overall cycle time for the adhesive application and part checking is less than five minutes, including the load and unload operations.

Some adhesive/sealant applications can be temperature sensitive so this requirement needed to be addressed during the dispenser equipment selection. A temperature-controlled, positive displacement adhesive dispensing system was incorporated into the FANUC robot system. This Temperature Conditioning Unit was recommended by the adhesive dispenser supplier based on information relating to temperature versus viscosity. This unit has a refrigeration cooling and electric heating water system that maintain a temperature of 88° F +/-1 degree. This sustains the

viscosity of the material throughout the dispensing system and the valves, producing a more consistent bead size.

A servo dispense meter, which is similar to a large syringe, accurately drives the material through the hoses and valves. When the adhesive sealant material is applied, its consistency is similar to creamy peanut butter. The bead size and dispensing rate are very well controlled and accurate. “We can lay down a 5 – 8mm diameter bead and travel 500 – 800 inches per minute. In addition, this system can dispense at 1500-2000 psi if required; considerably higher than a caulking gun,” relates Neumann. Bead size and positioning are important so the material squeeze-out around the frame is repeatable when the sheet metal panels are affixed.

After the adhesive is applied and the sheet metal panels are bolted on, the frames are moved to shipping pallets. The frames are transported to an off-site facility where they are painted. The adhesive remains uncured until it reaches a temperature of 160° - 200°F when going through the paint line. This process then cures or sets the adhesive material.

Neumann comments, “It was an interesting and rewarding project. The entire project resulted in increased productivity and better end quality. We were pleased that we were able to retrofit the older robot into this system.”

Not only did an idle robot find a home in this new assembly line, but also an improved process for applying the sealant adhesive was developed resulting in a better end product, ergonomic improvements, cost savings and increased throughput. In this case, going green meant breathing new life into an old robot and reducing material waste.

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About Genesis Systems Group

Genesis Systems Group is a recognized leader in robotic systems integration. In business since 1983, Genesis specializes in factory automation of robotic assembly and handling systems for welded, mechanical and adhesive assembly processes and machine tending applications. Genesis' solutions focus is backed by expertise in part processing, process development, system and tooling design, motion controls, manufacture, and implementation of industrial automation. With over 4,000 robotic welding system installations, Genesis has workcells located in over 40 states and 12 different countries.

Today, Genesis Systems Group's engineered solutions are used in manufacturing a number of different products; automobiles, construction and agricultural equipment, office furniture, trucks and trailers, lawn and garden equipment and recreational vehicles, to name a few. For more information log onto www.genesis-systems.com.