Intelligent Robot Solutions

FANUC Robotics

Application: Machine Tending

Industry: Machine Tools
Products Used: (9) FANUC Material Handling Robots

Robots are used for machine tending.

Challenges:

This manufacturer of machined castings and forgings now uses robotic automation to meet their customers' stringent demands for speed and quality. Previously a manual process, human limitations had prevented them from achieving throughput and consistency requirements for a major contract to manufacture automotive drive shaft components for sport utility vehicles and full size trucks. In addition, the company had safety and ergonomic issues for employees due to repetitive activities. Consequently, frequent employee absenteeism made production planning nearly impossible.

Operating three shifts per day, the company used a manual operation for one year before deciding that automation was needed. The manual system, which typically yielded 80 pieces per hour, did not achieve production goals of 118 pieces per hour.

"We realized that in order to position ourselves as a world class manufacturer, we needed to implement leading-edge technology," said the vice president. "On this project, speed and quality were the highest priorities because when it comes to automotive manufacturing, there is no margin for error."

Solution:

FANUC Robotics America, Inc. was selected to provide a turnkey solution because of FANUC Robotics' reputation for having reliable products and systems expertise. In addition, the customer appreciated having a supplier within close proximity to their manufacturing facility. Although FANUC Robotics is headquartered near Detroit, its full-service facility located just outside of Chicago took complete responsibility for the design, build, installation and service of the system.

This customer has a system design philosophy of: "Factory within a factory." This meant that they needed a series of robotic work cells linked through a common part transfer conveyor. "FANUC Robotics understood what we were trying to accomplish and encouraged an atmosphere of teamwork," said the vice president.

The fully automated system incorporates nine material handling robot models. The customer provided the pallets, part fixtures, safety fencing, conveyor equipment, PLC hardware and other peripherals.

Challenges *(cont.)*

According to the customer, production complexity was another key factor in the decision to go with robotics. In addition to the many different processes and types of machinery involved in the production of finished parts, the company was challenged to balance cycle times between each process. With the manual operation, it became difficult to overcome bottlenecks in the system, preventing them from achieving their desired production goals.

Solution *(cont.)*

Each robot is equipped with HandlingTool and Collision Guard software, custom grippers and a control interface to the equipment and conveyor. The HandlingTool software package provides built-in functions, menu-driven prompts and point-and-shoot position teaching, making it easy for operators to create and run programs. Collision Guard allows a robot to sense a potential collision along any axis and stops robot operation in time to minimize damage to the end-of-arm-tooling, the part or the robot.

The entire system consists of ten consecutive processes that are linked via conveyor. Raw parts are first manually loaded into a “face and center” machine before being conveyed downstream through nine automated machining processes. At each “stop” along the conveyor, parts are automatically loaded and unloaded by robots. First, an M-6*i*, capable of lifting up to 13.2 pounds, picks raw parts and places them into a CNC lathe for machining. The robot then places finished parts onto a part pallet that is located on the conveyor. Next, each full part pallet makes its way to an LR Mate 100*i* tabletop model robot which loads and unloads parts into and out of a small broach machine. In the next process, another M-6*i* alternately loads and unloads parts onto one of two fixtures of a large broach machine for further processing. A third M-6*i* moves parts into and out of a boring operation.

In the final processes, an S-430*i*F, which can lift up to 286 pounds, sequentially loads and unloads parts into and out of four machines that perform various groove and ream operations. Following this operation, parts are loaded and unloaded by a fourth M-6*i* robot to and from a drilling operation, then conveyed to another LR Mate 100*i* for a spline roll machining process. Next, an M-16*i* robot, capable of lifting up to 35 pounds, handles parts two at a time into a heat-treat operation. Finally, a fifth M-6*i* is used to load and unload parts for grinding.

In addition, as a result of the robotic system, the customer has experienced significant competitive advantages including:

- accurate and consistent part loading
- a reduction in part defects
- increased productivity - typically 120 pieces per hour
- improved control of the entire manufacturing system
- less cost per piece
- flexibility to meet future production demands