

Task Force Tips

Vision-guided collaborative robots deliver fast return on investment in production of fire hose valves.



CHALLENGE

Task Force Tips in Indiana has integrated robots with machine tools as far back as 1990. Those robots however, were dedicated to working only on the machine they were installed with and could not be moved to other machines:

"So what happens is the machine wears out first and now you have a \$100,000 robot that you can't do anything with. We had heard of collaborative robots that could be used in a much more flexible manner, so we decided to explore this new technology," says CEO at Task Force Tips, Stewart McMillan.

SOLUTION

Task Force Tips installed one UR10 robot and two UR5 robots to tend CNC machines, a fourth UR5 is mounted to a table on wheels and moved between tasks. A scenario McMillan calls "a fundamental paradigm shift":

"A major impediment in the past to using robots was the security fencing required around the machine. The beautiful thing about the UR Robots is you don't need all that guarding. We can roll the table with the robot right up to the machine and in a few minutes teach the robot to load parts."

Production Supervisor at Task Force Tips, Cory Mack explains how the UR robots have reduced staffing requirements from seven to three operators:

"Now it only takes about one hour per operator per shift to operate the robot, which includes laying out parts and staging the robot. That means the robot is running for 21 hours unassisted, so we're looking at savings of just about 34 days to pay for the robot."—Cory Mack, Production Supervisor

The work of UR5 Robots

Having the two UR5 robots work in tandem has also helped optimize production. As blanks arrive on an inbound conveyor, the first UR5 robot uses vision guidance to identify and pick up the blanks, then inserts the blank into the first milling machine. The UR5 then takes out the half machined part already in the lathe and hands it over to the other UR5. The second robot inserts that part into the second machine, takes out the complete machined part and places it on the outbound conveyor, where an operator places the parts onto anodizing racks, completing the cycle.

It's a process that – as Task Force Tips' Automation Specialist Adam Hessling puts it – looks very impressive, but was deceptively easy to do. He refers to himself as a "journeyman machinist" with no specific robotics programming experience. Both the robot handoff and the vision guidance use the MODBUS communication protocol registers in the UR robots controller.

When the UR5 places the unmachined part in the lathe, the robot's force detection will identify if the part is misshapen, has some burrs from the saw cut or if there are machining chips in the chuck jaws.





"When the robot tries to reach the set waypoint for placement and there's an obstruction which causes the force on the end of arm to exceed 50 Newton; which I programmed as the threshold, it knows something is wrong," says Hessling who has programmed the robot to then apply an air blast to try and clean whatever debris is in the way.

The robot will go through the air blast several times and if it still can't place the part, the robot tells the machine to execute a "chuck wash" cycle, which uses the machine's high pressure coolant system to dislodge debris from the chuck jaws. If the part still can't load after the coolant wash, the popup appears on the robot's touchscreen, instructing the operator to clear any debris from the chuck jaws and press continue. If the issue persists, there is another popup which halts the program entirely. The operator can then diagnose the problem, fix it, and restart production.

"I would estimate that the robot fixes the "failure to load" issue about three or four times per hour, which has really helped us eliminate downtime. The operator only needs to intervene about once per shift, sometimes never," explains Hessling.

Freeing up personnel from machine tending has also played an important role in increased product quality.

"When our employees are not worried about keeping a machine running all the time, they have a lot more time to visually inspect the machined products. Part quality has really gone to a whole other level with the UR Robot in place, while allowing our personnel to come up with new ideas and better ways to improve our production," says the TFT Production Supervisor, who is now testing the UR robots in deburring, packaging, and laser machine applications.

