

Mobile robot colleagues on wheels increase productivity and worker safety at Scott Fetzer Electrical Group

A mobile fleet of Universal Robots will now receive daily work orders to solve ever-changing tasks with high mix - low volume electronics manufacturer Scott Fetzer Electrical Group (SFEG) in Tennessee. The collaborative robots have optimized production by 20 percent, taking over monotonous and potentially hazardous tasks from employees now reallocated to more rewarding jobs.

When the first UR5 robot arrived at Scott Fetzer Electrical Group (SFEG), it was quickly named “Waldo”, inspired by the popular “Where’s Waldo” books featuring a friendly fellow that keeps appearing in new places amongst crowds of people.

“One day Waldo would be bending sheet metal, the next day he would be performing pick and place tasks, and the third day we would take him to Manufacturing Day at the local high school,” says Matthew Bush, Director of Operations at SFEG that manufactures a wide range of electrical motors and components.

The fact that the Universal Robot are re-deployable and can operate with no safety guarding right next to humans is a radical break away from traditional industrial robot that usually stay hardwired behind safety guarding, fenced off from people. The UR robots are a new type of robot classified as *collaborative* due to their interactive design that makes it easy to set them up for a new task as well as their built-in safety system that enables the robot arm to automatically stop operating if it encounters objects or people in its route.

Traditional robots a challenge

Matthew Bush came across this new automation solution as he was looking for ways to make SFEG more competitive on the global scale, while taking more advantage of existing machinery.

“One of our biggest challenges is we’re a high mix-low volume producer, most of our lines don’t run all the time, so trying to find a way to put robots on the line in the traditional sense was a very big challenge,” says Bush, elaborating on his goal:

“We wanted to build a mobile, flexible robot force. The only way we would accomplish this was with a collaborative robot. We only saw a couple of offerings and the UR robot was the only robot that we thought could do the job. It’s got the speed and precision of a standard industrial robot with the ability to move around and work next to humans.”

SFEG placed the UR robots on pedestals with wheels and is now building the fleet of mobile UR robots deployed throughout the sheet metal department, integrating them in the entire production cycle from cutting the initial blank on the blanking press to forming, folding and final assembly of the electrical components. Additional robots are planned to help tend the turret presses and press brakes.

“We want to have robots standing by, waiting for a job to do. When the staff arrives in the morning, we’ll have work-orders printed for employees to wheel the robots over to the tasks at hand that day.”

The UR robot as a pace setter

General Manager at SFEG, Rob Goldiez explains how productivity and consistency on lines with UR robots improved:

“Before we had the Universal Robots on our transformer line, we averaged about 10 parts per person per hour, that’s up to 12 parts per person per hour now, so about a 20% increase having a pace setter with the Universal Robots working hand in hand with our people.”

The UR robots working the motor field line are a UR5 and a UR10 robot named after their payload in kilos. The UR5 is placed at the end of the line right next to an employee that hands the robot a motor field part. The UR5 picks up the part, puts it in a holder, picks up a wire cutter to trim the wires, and then places the part for the UR10 robot to pick up and place on a conveyor for final assembly.

The two UR robots work in tandem and communicate their position to each other through Modbus socket connections.

“We can interlock multiple robots together and read through Modbus the TCP connections and robot status. We can also pass information along to other software packages, and collect data. It opens up a lot of doors to do a lot of things we’re just now beginning to look at,” says Principal Engineer at SFEG, Jamie Cook.

Implementation time reduced up to 50%

Before the UR robots arrived, he was a little “antsy” about the new collaborative technology, having not programmed cage-free robots before. A UR robot comes with a touch screen pendant that all programming is done through. Directing the robot arm can be done either through arrow keys on the screen, or by simply grabbing the robot arm and “teaching” it the desired moves between waypoints. That eliminated the structured text programming Cook usually had to code when working with traditional robots.

“It was really easy to learn and it went much smoother than I anticipated. I did it with minimal training just looking through the operator manual and following the intuitive user interface. I would say it took a third to half of the implementation time out of it based on previous experiences I’ve had.”

Collects data in life cycle testing

One of the new applications now using the UR robots for data collection is in the live testing of new designs, where the small motor manufactured at SFEG is placed in the customer product.

“We then use one of our mobile robots to turn the product’s switch on and off, running it for a minute on, 30 seconds off, for the next 400 hours. It’s a quick way for us to perform life cycle testing. We didn’t have to set up a lot of equipment; the initial program took us only about 5 minutes to create,” says Matt Bush.

The robot collects data pertinent to the test such as max amperage, average amperage and the number of cycles completed and transmits that data to a data storage.

“It’s enabled us to actually engage our customer in the testing as well, they’re excited to see us use new technology to push our design faster into production. It gives us an advantage over our competitors thousands of miles away in low-cost source countries. We’re now winning orders against Chinese competitors and bringing back work that used to be sourced in China as well.”

“Let the robots get carpal tunnel”

As SFEG looked for tasks to automate, eliminating monotonous and potentially dangerous tasks was the number one priority. Another task now handled by the mobile UR robot fleet is filling epoxy into circuit boards.

“In the past, employees would make up a big batch of circuit boards and they would stand there and manually fill them with two-part epoxy and send them down the curing line. Today, the robot does that all day long enabling us to go to a one-piece flow,” says Bush.

“This is an example of an application that would not happen with a stationary robot as we have to move the robot in and out of the cell every day to dismantle the epoxy machine and clean up the cell,” says the Operations Director, who also emphasizes the safety hazards now avoided on the motor field line by having a UR robot handle the wire cutting.

“It’s a potential carpal tunnel syndrome application cutting about 16,000 wires a day by hand. So we thought that was a great place to put robots – let them get carpal tunnel!”

Saved by “Thelma and Louise”

The wire cutting UR5 working in tandem with the UR10 has been embraced by the staff that named the new robotic team “Thelma and Louise”. According to Line Lead at SFEG, Sebrina Thompson, the naming arose when personnel first thought the robots were driving them off a cliff.

“When the robots first came out on the floor, employees were very anxious as they thought they would be replaced. But the robots handle a lot of tedious tasks for us now, enabling us to focus on more challenging jobs. My colleagues are constantly trying to find out where we can put the next robots,” says the Line Lead, who also enjoys operating the UR robots.

“I was surprised how simple it was. If you can work a smart phone, you can pretty much work these robots.”

SFEG has reallocated employees that used to handle tasks taken over by robots to other production areas where the company has seen growth or to fill holes due to natural attrition.

“We’re seeing about 1 to 1 movement of people from where we put in a robot to allow to move person to another area of the business. We have 14 robots from Universal Robots right now and as we have all

those implemented, we expect to be able reposition 14 employees. It has allowed us to be much more flexible as a manufacturer,” says General Manager Rob Goldiez.

Next: Robots on armature line and at varnish oven

One of the next robot tasks currently being developed at SFEG is putting c-clips on armatures. At the varnish oven, two UR10s will be loading and unloading baskets with motors. One UR10 is already deployed at the end of the varnish conveyor, working as a simple transfer station, moving baskets between lines.

“The reason we chose to use a UR10 there wasn’t because it was the most effective way to do it. We had an extra UR10 sitting idle; it was very simple to integrate, and it gave us the ability to completely control the conveyor line throughout the day. It saved us money as we didn’t have to go out and spend another nine to twelve thousand dollars on another transfer station,” says Bush who is currently experiencing a payback period between 12 and 14 months on the UR robots.

“We’re looking at everything we’re designing now new to make sure we can assemble it with a robot. If we can’t put that together with a robot, we’ve got to go back to the drawing board and try again.”

The UR robots at SFEG were purchased through distributor Cross Automation covering the South Eastern part of the U.S. where Sales Engineers Karl Bentz is experiencing an increased demand for the collaborative robots.

“We’re seeing a lot of interest from tier one & two automotive suppliers with applications that replace some of the ergonomically unfavorable tasks performed by employees. The medical device industry here is also starting to use this new type of robots for tasks such as laser marking and assembly. As was the case at SFEG, once we sell one UR robot, the customer starts realizing what other tasks they could automate.”

Sidebars:

About Scott Fetzer Electrical Group

SFEG combines expertise in transformers, power supplies, motion controls and drive systems with a U.S. based manufacturing footprint to create a platform of new product development. SFEG is located outside Nashville in Fairview, Tennessee. The company was formed in 2010 to bring together the capabilities of three Scott Fetzer Company business: France Power Solutions, Northland Motor Technology, and Kingston Products.

www.sfeg.com

About Universal Robots

Universal Robots’ product portfolio includes the UR3, UR5 and UR10 robot arms named after their payloads in kilos, the robots all feature 0.1 mm repeatability and span in reach from 19.7” in to 51.2”. Innovative force-sensing technology makes the robots stop operating when encountering an employee, eliminating the need for safety guarding in most scenarios where prior risk assessment deems the robot

safe to operate in proximity to humans. Of the more than 6,000 UR robots currently deployed in over 50 countries worldwide, 80% of these operate with no safety guarding. Programming is intuitive as users simply grab the robot arm to teach the desired movement, or program through the touch screen. The Polyscope GUI runs on a Linux OS platform for easy customization of specific tasks and tools. The corporate headquarter is in Odense, Denmark, where all development and production is carried out. In North America, the company has its main office in Long Island, NY, and is now also opening locations with sales and tech support on the West Coast and in the Mid-West. The robots are sold in North America through a network of 24 regionally based distributors.

www.universal-robots.com

Suggested captions with corresponding image titles:

All high res images can be downloaded here:

<https://www.dropbox.com/sh/dwy2brv4lslw3l5/AABzQGqooT6N94OCp-c4aPDca?dl=0>

(Mobile fleet main)

Scott Fetzer Electrical Group has deployed a fleet of mobile Universal Robots to handle a wide range of tasks throughout their sheet metal production.

(UR 10 transfer station)

A UR10 transfers baskets of motor field parts from the varnish oven conveyor to outbound conveyor.

(Waldo)

The first UR5 arriving at SFEG was aptly named “Waldo” inspired by the popular “Where’s Waldo” books featuring a friendly fellow that keeps appearing in new places amongst crowds of people.

(Thelma&Louise)

A UR5 and a UR10 robot work in tandem moving motor field parts through a wire cutting application and on to a packaging conveyor for final assembly. The robot team communicate with each other through Modbus and have been named “Thelma & Louise” by the employees.

(Matt programs Waldo)

Director of Operations, Matthew Bush, programs “Waldo” for new tasks. “One of our aims in putting these robots in place is to bring production back to the U.S. We want to employ Americans and put us back to work making products that matter. The robots are allowing us to do that, so that’s a big push that we have throughout design and throughout manufacturing.”

(Teach method)

A UR robot comes with a touch screen pendant that all programming is done through. Directing the robot arm can be done either through arrow keys on the screen, or by simply grabbing the robot arm and “teaching” it the desired moves between waypoints.

(operator_touchscreen)

The employees working on the line at SFEG can easily operate the UR robots using the arrow keys on the

touch screen. "If you can work a smart phone, you can pretty much work these robots," says Line Lead Sebrina Thompson.

(wirecutter)

Instead of having an employee manually cut 16,000 wires per day by hand, the UR5 robot now handles this task, eliminating the risk of workers getting carpal tunnel syndrome.

(UR10_sheetmetal_mobile1&2)

The mobile UR10 robot is being deployed at a stamping machine in SFEG's sheet metal department.

(UR10_sheetmetal_mobile3)

Having the UR robots placed on pedestals on wheels mean that they can quickly move between tasks, after the UR10 has completed a production run at the stamping machine, it is being set up to tend the box folder and TOX press.

(epoxy closeup)

One of the tasks now automated by UR robots is filling epoxy into circuit boards.

(robot in epoxy application)

Having a UR5 robot handle the epoxy filling of circuit boards has enabled a dynamic, single part flow production at SFEG that previously had employees prepare big batches at a time.

(epoxy robot installed)

The epoxy application could not have been realized with a stationary robot as the robot needs to move in and out of every day to allow for the cell to be dismantled and cleaned.

(epoxy robot programmed)

Employees at SFEG are now promoted from operators to robot programmers.

(future applications)

Unloading baskets of motor field parts at the varnish oven is one of the future applications that will be handled by the collaborative UR robots.