

# Improve Efficiency with Flexible Automation

and eliminating health and safety issues.

A great example of flexible automation is at the state of the art Tesla Motors Factory in Fremont, CA. As Chris Anderson says in his book *Makers: The New Industrial Revolution*:

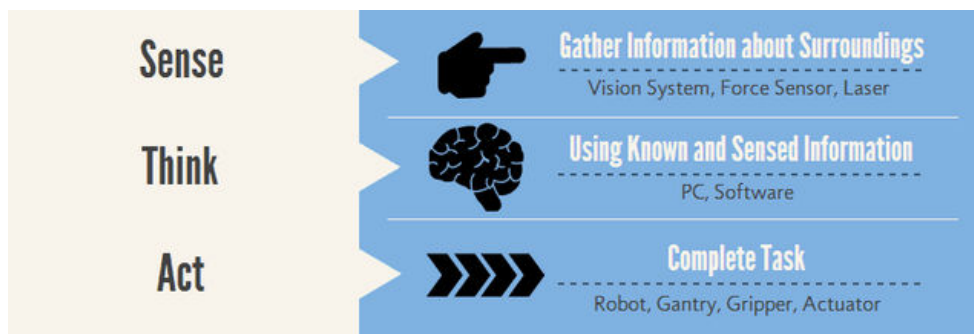
“Tesla has built the most modern factory in the world. It happens to build cars, but it could build anything. It is not just automated, it’s a veritable robot army. Hundreds of general-purpose KUKA robot arms do everything from metal-bending to assembly. Flat-topped robot vehicles carry car chassis around, charging themselves on inductive pads as they go. Robot painting arms from Fanuc can open car doors to spray around them, and then close them again when they’re done.”



As you can see, Tesla utilizes large 6 axis robotic arms and robotic Automated Guided Vehicle's to make their assembly process flexible. However, robots themselves typically have no sensing ability and rely solely on their mechanical repeatability to complete a task. Therefore there are many other components that go into this system to provide sensing and smarts to these robots (and NO you don't have to use an expensive robot to have a flexible solution – really!).

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When someone is looking to design and integrate a flexible work cell or assembly line, they should start by making sure their system contains these 3 main components of a Flexible Automation system;



## Flexible Automation Example Application

Let's say that you have a CNC machine that you would like to machine parts on an 'as needed' basis to eliminate stocking of components. When a production run starts, the work cell will be told a quantity of a certain part to manufacture. A fixed automation system may include a machine tending 6 axis robot with a tool changer for each type of part, a set rack or jig that will be manually loaded, and safety components. This solution requires significant floor space for tool changing, safety, and rack.



A possible Flexible Automation approach to this cell would include the following components

- Microscan Vision Hawk Smart Camera
  - Smart Camera to be used to locate and ID unmachined part by dimensions and/or 1D/2D symbols, (Sense / Think)
- SCHUNK SDH Gripper with integrated Force Sensors
  - 3 Finger Servo Gripper will be used to pick ID'd part and place into CNC. The force sensors would be used to confirm picking of part (Sense / Act)

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- Universal Robot UR10 Collaborative 6 Axis Robotic arm
  - Move gripper to location provided by Smart Camera, place part into CNC and close CNC door. (Act / Think)

Each of these 3 components work together to meet the Sense, Think, Act criteria of Flexible Automation. This solution has the adroitness and versatility to not just handle a machine tending application, but potentially other sorting or pick and place applications down the road!

Some benefits of this proposed solution would be;

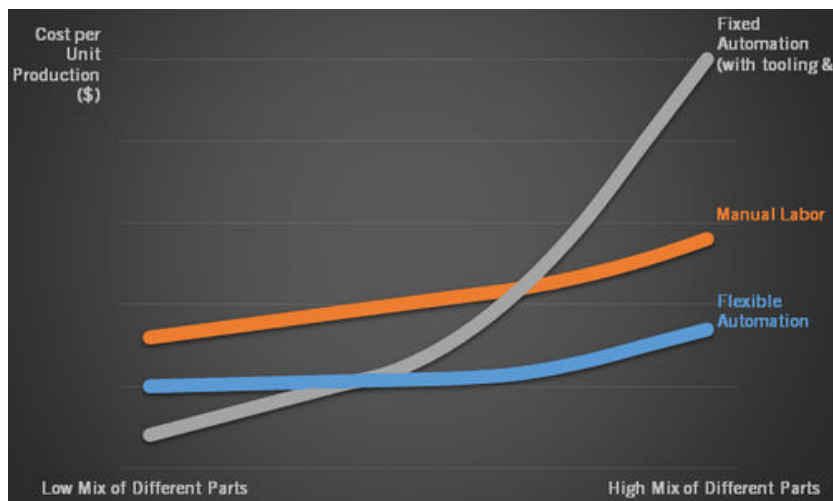
- Reduce cell size by removing tool changing stations and rack for each part
- Decrease floor space footprint by using a collaborative robot (cobot) and potentially eliminating safety guarding
- Decrease cost of low value-adding labor by being able to ID and locate parts versus being placed in a rack manually
- Robotic cell can evolve with product and can easily be re-tasked to handle future production
- Keeps the production cost flat by eliminating the need for custom tooling and fixturing on future products

This last item is key and truly unique to Flexible Automation. By being able to adapt and re-task on the fly, you can keep production cost fixed whether you are manufacturing a small batch of parts or a large run of parts. This is becoming critically necessary for many US based producers to compete in a low-volume marketplace.

The graph below demonstrates the value that a Flexible solution can bring when compared to Fixed Automation and Manual production. If you look at the Return on Investment for a Fixed solution, it only makes sense for low mix production (i.e. making the same part over and over). Once production goes to medium / high mix, manual labor prevails. This is something that has kept many facilities from automating in the past.

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But with Flexible Automation, you can keep your costs in line and have a much quicker ROI:



So what type of solution did we come up with for the Contract Manufacturer mentioned above?

Our system will have to know the status of the conveyor that it is placing a circuit board, so we needed something to sense the encoder signal from the conveyor. Universal Robot recently came out with an update that integrates conveyor tracking into the robotic controller. Therefore we selected a UR5 (UR5 AE3) 6 axis robot arm to think and interpret the conveyor position as well as utilize the built in Stack & Destack Wizard to load the circuit boards to the correct location. To act on these signals by picking a circuit board, we used a strategically designed vacuum gripping head that could be used on any number of board designs. This gripper will be coupled to the UR5 (UR5 AE3) robot to achieve the desired outcome. Once the production run is complete for this board design, this cell can easily be re-tasked versus sitting in a storage closet collecting dust.

So whether it's a large scale system like Tesla or a single Machine Tending station, when your automation solution is designed to Sense, Think, and Act it will provide you with the flexibility to re-task and handle future production.

No matter what your industrial application is, Cross robotics specialists can help you determine the right robot and accessories to automate it. Contact us today.