

Solving the Challenges of Changing Product Requirements with Flexible Manufacturing

Introduction

As many manufacturers worldwide strive to respond to consumer markets that are constantly demanding new and more products, designing processes for them is a major challenge. Companies like Philips Electronics may have SKU lists that number in the hundreds with updates, changeovers and short delivery times requiring high adaptability in their manufacturing operations. Consumer products companies, electronics and medical device manufacturers, medical device and even food processors are increasingly turning from hard automation and offshoring to flexible automation for the ability to adapt quickly and for opportunities to make their operations more lean.

Adapting to Product Changeover Requirements with Flexible Automation

Flexible manufacturing can deliver many benefits to manufacturers: work cells that can be easily changed, streamlined material flow, quality control, precision and consistency of parts, higher payloads, faster changeover, greater control of data, cleaner operations due to less human interaction and possibility most importantly, the ability to future-proof operations.

Robotics with vision and conveyor control, along with flexible feeding mechanisms, play a large – and critical role – in many flexible manufacturing operations today. With flexible robots, manufacturers can now change over to the production of different products quickly - without the need for extensive re-programming or changing of tooling or equipment

Faster, more accurate, and multi-arm robots bring the ability to run different products on a production line, perform a wide variety of repeatable tasks, and handle multiple applications, contributing greatly to flexible work cells. These capabilities, along with more sophisticated robotic end effectors, flexible feeders instead of hard automation and autonomous indoor vehicles (AIV) instead of hard conveyances, are enabling efficient product changeover and flexibility that reduce costs and time to market.



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Flexible, Smart, Efficient

Utilizing flexible industrial and mobile robots combined with seamless integration of vision with motion control (referred to here as smart vision systems), manufacturers can accommodate constant product updates, changing volume requirements, and addition of new features.

Take, for example, a company like Philips that manufactures shavers in its facilities in The Netherlands. With over 600 different shaver SKUs, using robots to create future-oriented assembly concept design of work cells redefined what it meant to be flexible in small-parts feeding applications. To learn how Philips delivered on a ground-breaking assembly concept for over 600 products, and enabled them to reshore production from China to the Netherlands profitably and efficiently, read the Case Study

In many operations, racking and un-racking of parts and picking from bins where thousands of components are involved are commonplace. Management of parts handling in a scenario this complex leverages many of the more sophisticated capabilities found in today's industrial and mobile robots:

- Ability of mobile robots, like the Adept Lynx AIV, to carry raw materials and assembly parts from station to station within a factory, effectively becoming the production line
- Ability to automate management of an AIV fleet
- Flexible parts feeders, grippers, and sophisticated end-effectors
- Vision guidance systems enabling takeover of additional work contents and locations
- Independent operation of work cells affording high availability
- Ease of programming for controllers, using language of choice
- Visual inspection systems

Today's vision systems are sophisticated, and when tightly integrated into the robot's motion controller, can recognize the position and orientation of products to be handled. Flexible automation in combination with machine vision can improve the consistency, speed, repeatability, and efficacy of an inspection process, tracking pass and fail parts as well as failure modes. This provides a key advantage for quality improvements by rejecting bad product early and allowing in-line adjustments, keeping products within quality specifications without disrupting the entire process line.

Big Side Benefits: Lean Strategies and Re-shoring

Lean manufacturing strives to reduce a manufacturer's production cycle time using resources efficiently and minimizing waste in the process. Whether applied to a single line or an entire factory, lean strategies focus on flow, efficiency and adding value, allowing manufacturers to reduce time to market, increase capacity, boost throughput and lower costs.

Flexibility can be considered the most important building block of lean manufacturing. New flexible robots with the ability to quickly change tooling and ensure consistent repeatability make them ideally suited for lean production lines. Unlike humans, robots can be programmed for consistent optimization giving them the ability to save time, simplify production and streamline manufacturing. It is this same reliability that allows robots to reduce defects and thus reducing waste and improving quality.

With industrial and mobile robots as part of a manufacturing operation, these lean benefits may be achieved:

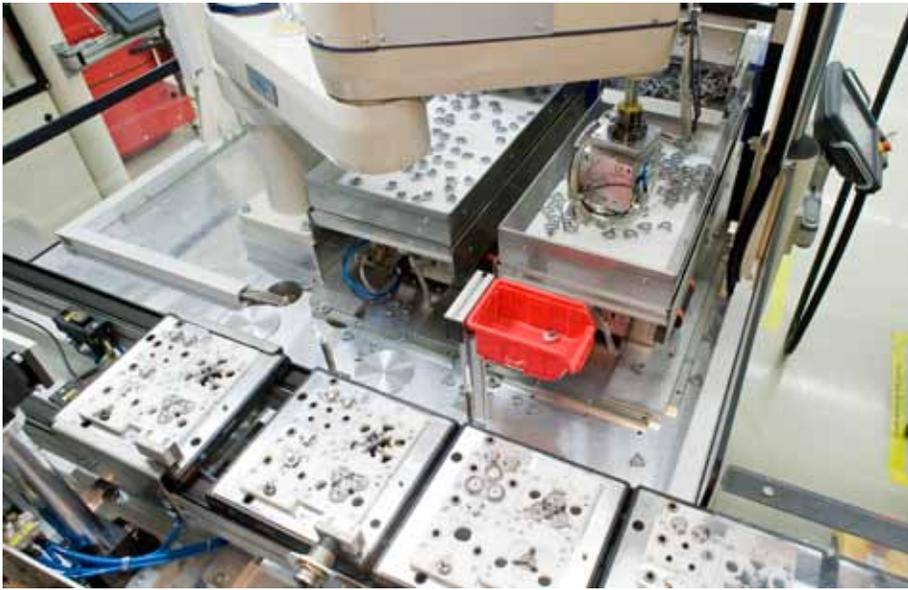
- Higher per cycle utilization with robots that can handle multiple applications
- High level of sustainability with ease of programming and re-programming
- Downtime, operator wait time, waste/scrap and labor costs are minimized with flexible material handling
- Minimum number of process stations required since the robot can convey a part back to a station as many times as is needed
- Validation of reach, cycle times, motion paths and positioning before production go-live to maximize efficient processes with simulation software
- Workplace safety results in reduced waste and productivity caused by fear of injury
- Extended return on equipment investment

Besides minimizing wasted resources, the above benefits can be leveraged in re-shoring efforts, where manufacture of high-value short life-cycle products is brought back from previously offshore facilities. The significant benefits to be had such re-shoring were found in an MIT Re-shoring Report* (need to credit report) to bring reduced time-to-market and hidden supply chain costs, enhanced product quality and control, and protection of intellectual property.

Conclusion

For the ultimate goal of meeting customer demands in the most efficient possible manner, robotics is a powerful tool in the creation of a flexible and lean production line. Industrial and mobile robots deployed intelligently can result in lines that can be reconfigured quickly, efficiently and easily as needs change. They offer consistency, reliability, repeatability, and most importantly, the flexibility manufacturers need to efficiently use their resources, maximize flow and minimize waste.

Adept Technology offers cost-effective flexible manufacturing to companies worldwide with industrial and mobile robotic equipment that can support automation of a flexible work cell or re-shoring of an entire manufacturing operation.



Electric Shavers being manufactured by an Adept Cobra robot from flexible feeders.



Flexible robotic workcells being fed by Adept Lynx AIV's.