Automation Today

The latest advancements in optical 3D measurement and automation technology will enable the factory of the future to reach new heights of manufacturing efficiency and productivity.

The trend toward automation is well underway. The International Federation of Robotics estimates that about 1.3 million new industrial robots will be installed in factories around the world by 2018. To put it another way, "Industrial robots are conquering the world." So says the organization, based on the interest in the technology from many different industries, from automotive to aerospace. The "Industry 4.0" concept of linking the factory world with the virtual one has been taking off, much like the demand for continuous quality improvement.

It's no secret that manufacturing continues to become more automated, and manufacturing output per worker is on the rise. According to the National Association of Manufacturers, the hourly output for all workers in the manufacturing sector has increased by more than 2.5 times since 1987, while durable goods manufacturers almost tripled their labor productivity over that time frame.

As manufacturers chase higher productivity and higher quality, interest in smart factories continues to grow. If you are curious about these factories of the future, you are not the only one. According to a survey done by SME, more than half of manufacturers plan to invest in advanced manufacturing technologies within the next two years.

Why Advanced Manufacturing?

Achieving competitive advantage was the top factor driving the need for advanced manufacturing improvements, according to the SME survey respondents. They also listed factors such as growing business opportunities, improving production efficiencies, adapting to customer needs, and improving quality. For those companies who have already invested in advanced manufacturing, they said they had seen improvements in product quality and reliability, faster production speed, lower production costs and improved performance of finished products.

It takes a range of technologies to realize these benefits. SME found that advanced software, industrial robotics, advanced sensing, measurement and process control, and additive manufacturing were among the most popular areas for investment.

As manufacturers struggle to fill highly skilled production positions—according to NAM (National Association of Manufacturers), "80 percent of manufacturers report a moderate or serious shortage of qualified applicants for skilled and highly skilled production positions"—technology may need to step in to fill the gap.

Whether the drive for automation is to improve productivity, respond to the skills gap, or just remain competitive, factories of the future will need to operate at increasingly higher levels. This means reducing measurement time and providing in-process measurement, thus streamlining quality control processes. The market is demanding that inspection moves upstream. In other words, it is key to catch defects as early as possible.

Manufacturing is quickly evolving—as seen in smart factories, lean thinking, and increasing automation—and requires moving quality assurance alongside production. One way to improve quality involves optical 3D imag-

ing systems and robots. The latest advancements in optical 3D measurement, robot integration and automation technology allow manufacturers to develop new solutions to enable the factory of the future today.

A New Solution

One such technology is the FARO Cobalt Array Imager. It is a metrology-grade, non-contact 3D sensor that provides easy integration onto the production floor to streamline in-line quality control and improve inspection cycle times. The Cobalt Array Imager can be paired with a robot to automate the digitization, inspection and verification of parts at any point of production, and provides several installation options. With the multi-imager array, enabled by the Cobalt's proprietary onboard processing, an unlimited number of 3D imagers can be combined to scan simultaneously into a single computer.

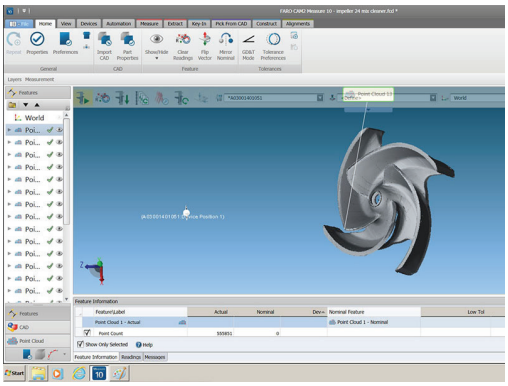
Automated Metrology

Manufacturers are continuously seeking to maximize productivity and automate workflows throughout the factory. New advances in metrology make it possible to automate critical quality inspection processes. An example of automated metrology would be mounting a Cobalt sensor onto a robot. The Cobalt sensor is synchronized with the movements of the robot such that the robot is able to position the sensor at various points around the part or assembly being inspected, and accurately capture 3D measurement data. The captured data is then compared to a CAD file to determine if the part or assembly is within its allowed tolerances.

Another example of automated metrology would be to use Cobalt sensors in multi-imager array configurations wherein an unlimited number of Cobalt sensors work together to inspect a part or assembly. This arrangement eliminates the need for a robot because the multiple Cobalt sensors may be set up to surround the part or assembly being inspected. Multi-imager arrays expand the scan area to deliver rapid and automated inspection of all surfaces of an object, dramatically reducing cycle time.

The robot arrangement can actually be combined with the multi-imager array configuration to allow multiple Cobalt sensors to be mounted on a single robot; or, for inspecting very large parts and assemblies, multiple Cobalt sensors may be mounted on several robots to essentially surround the object or assembly being inspected.

Regardless of whether a Cobalt is mounted on a robot, or multiple Cobalt sensors are used in a multi-imager array configuration, the technology behind the Cobalt reduces cycle time and increase productivity by automating measurement.



How it Works: Cobalt Explained

The Cobalt allows for repeat part measurement, providing a fast and accurate go/no-go solution. It provides 3D scanning on the shop floor or assembly line. Using structured blue light technology, the Cobalt projects digitally generated patterns of light onto a surface. Cameras capture the pattern, and the 3D point cloud is calculated from the known pattern and geometry.

What does the inspection look like? It moves quickly. The blue light flashes for two seconds. Two cameras capture the

data as the car door panel is measured. The point cloud processing occurs within the Cobalt unit itself. It can be arranged in various setups: a manual deployment, or automated deployments with either integration with a robot and/or in multi-imager array configurations. When Cobalt imagers are grouped together, the result is a broader range of coverage in the same amount of inspection time. For example, when multiple Cobalts are mounted on a robot, there is a further reduction in on-site measuring time and increased productivity.

Applications

Automotive, aerospace and machining industries would all benefit from the technology, as would any industry with a constant need to innovate and attain high accuracy. Any automated quality control and assembly verification would be a good fit for the system. Consider the car door panel example. The system would be able to inspect millions of points at once, quickly and accurately. Inspection throughput times are shortened, but without sacrificing anything in the process.

The application possibilities include first article inspection, sheet metal inspection, and tool and die inspection. The system solves inspection issues ranging from casting inspection for minimum material tolerances, forging inspection for defects, inspection of complex geometries such as air-foil, machines part inspection at the point of fabrication, and mold inspection for surface finish and geometry. This solution works for injection molded part inspection, hand lay-up part inspection, and could also be used for Production Part Approval Process (PPAP) and reverse engineering.

Return on Investment

Although new technology may sometimes come with a corresponding new technology price, the system is available at an affordable price point and allows for a fast return on investment. Operators can maximize productivity by reducing the cycle time needed for inspections. In addition, scrap and rework can be eliminated as operators are able to recognize part deviation early in the inspection process. In its various setup configurations, the Cobalt Array Imager is one of a number of dimensional metrology solutions that automates both at-line and off-line quality control and inspection.

Sources

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FARO Technologies | 250 Technology Park | Lake Mary, FL 32746

www.faro.com • 800.736.0234