Inline and Near-Line Precision-Part Inspection

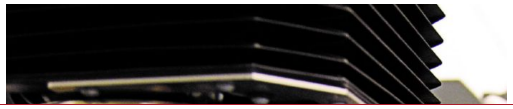
March 31, 2020

LOU KREN
Senior Editor

A metal stamping hotbed, the Connecticut River Valley boasts large numbers of metal formers producing small electrical and medical parts at high speeds. The parts, which may find their way into cell phones or endoscopes, for example, demand strict quality control, and should these pieces fail, so will the end products. Yet production needs don't always enable time-consuming off-line inspection.

To learn how to measure while staying on schedule, *MetalForming* reached out to Jonathon O'Hare, global program manager of CT systems at Hexagon Manufacturing Intelligence, which provides measurement equipment for shop-floor and quality-room use. Drawing on experience in working with such metal formers, O'Hare explains why vision systems placed in production lines and nearby, often outfitted with cameras and augmented by final-inspection quality-control-lab equipment, provide for effective measurement solutions.

"Camera systems made an impact in measurement and inspection for precision stamping primarily because they are fast," O'Hare says. "They



Inline vision systems typically offer no-touch visual inspection using CCD cameras measuring features in a single plane. Near-line inspection (as shown here) may include touch probes. Further easing shop-floor incorporation, these systems often contain their own light sources, matched in color and intensity, and positioned to most effectively capture and render part and feature images.

measure a complete field of view within a few seconds, and use algorithms to process the data. Through a method called segmentation, they break up pixel data from one image in order to evaluate rapidly multiple features."

Inline measurement via vision systems typically involves no-touch visual inspection using charge-coupled device (CCD) cameras measuring features in a single plane, with parts moving nonstop to keep production moving. Near-line inspection may include multiple-sensor setups and perhaps touch probes.

Convenience is Key

The use of inline and near-line vision systems, despite a commonly held belief, aren't necessarily driven by rapid, high-volume production, but more by the convenience of bringing measurement to production instead of the other way around, and the number of operations requiring such measurement.

"Though many of these systems do handle high-speed production of small components relative to contact sensors, it has more to do with convenience," says O'Hare, noting that often metal formers find it easier, if

locations for measurement. “The number of operations also helps determine the use of these vision systems. If a part or component requires inspection between separate operations, it becomes even more critical that the path of these parts isn't disrupted any more than required. Should a stamping operation require forming in stages, with inspection needed at each stage, bringing the parts offline to a machine for measuring, then sending them back for the next operation creates a lot of movement, along with production delays and the possible need for more process or tool setup work for the returning parts.”

These inline and near-line vision systems prove remarkably hardy and able to handle most temperature environments encountered on the stamping-shop floor. Further easing shop-floor incorporation, these systems often contain their own light sources, matched in color and intensity, and positioned to most effectively capture and render part and feature images.

The systems carry their own lighting due to the need for pixel clarity.

Considering Precise Measurement for Your Production Line?

Is inline or near-line inspection ideal for your small, precision parts? Jonathan O’Hare, global program manager of CT systems at Hexagon Manufacturing Intelligence, suggests asking the following questions when exploring the measurement/inspection path for determining the level of needed capability:

the various production equipment, then a measuring system can help with production machinery and tool setups. And, should production machinery or tooling require frequent adjustments, a measuring system helps.

2. What outgoing inspection requirements are required by the part customer(s)? Part customers may be pushing quality requirements back to the stamper. This requires rigorous inspection and quality control to avoid rejected parts and scrap.
3. What are the scrap rates? This goes back to the control question. For a stamper making the same types of parts all day long with very little scrap, the cost of a measuring/inspection solution may not make sense.
4. The general bottom-line question to ask: How much does the ability to precisely control a process and its output save a stamper overall? A stamper should determine if a measuring solution enables greater productivity. Does the ability for a customer to guarantee the quality of its products constitute a selling point for the stamper, justifying the cost of such systems and their implementation?

"The image area is lit from different directions, and then a series of LEDs around the camera lens enables users to provide light in various orientations," O'Hare explains, citing typical flexible setups. "The system is calibrated for a particular type of lighting, a particular type of camera and other factors. No need for users to set up unique shop-floor lighting."

Setups Tailored to Feature Measurement Needs

Applications of this technology abound for precision metal formers, as vision systems find use in batch and continuous forming and assembly operations for electronic consumer goods and medical devices, among others. Electronics for mobile phones offer a typical example.

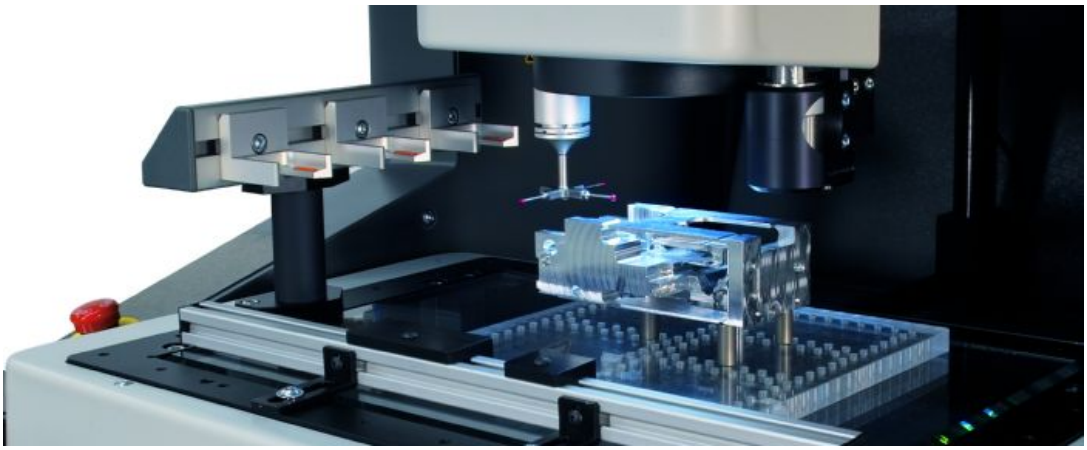
"Mobile phones feature small switches and similar parts as well as supports and framing to house the various components in an assembly," says O'Hare. "The hole locations in these small stamped parts, for example, must be precise to ensure proper assembly, and vision systems can measure for the needed tolerances within the process."

Some specialized systems for inline image processing place cameras at multiple angles, taking quick images of parts coming through on

"Taking images from different angles via multiple cameras allow capture of edges and other features not normally visible when capturing with a straight-on camera setup," O'Hare says. "In a matter of seconds, data are collected and analyzed. An electronics part such as a completely flat backplate can be measured with a single, straight-on camera. But multi-camera and multi-sensor systems can be used for more-complex stamped parts with features on more than one side. These systems will measure everything in a single setup, and typically are found in medical-device components that require exceptionally high quality control."

Such applications might employ multiple measurement methods, according to O'Hare, including a CCD camera to measure straight ahead—say, to confirm hole locations on one part face—and other methods for more challenging side features such as the depth of a groove.

"Here, a focal white-light sensor may be employed," he says. "Though more expensive, this sensor is highly accurate, providing precise depth measurement." Such multi-sensor capabilities, notes O'Hare, are found in the Optiv Performance CMMs offered by Hexagon Manufacturing Intelligence.



Multi-camera and multi-sensor systems can be used for more-complex stamped parts with features on more than one side, and even can measure depth. These systems will measure everything in a single setup, and typically are found in medical-device components that require exceptionally high quality control, notes Jonathon O'Hare, global program manager of CT systems at Hexagon Manufacturing Intelligence.

Incorporation of various measurement methods point to the complementary nature of inspection technology and its availability to metal formers, enabling use in all manner of applications. Optical systems may employ the aforementioned touch probes in near-line inspection to measure deep features, a task impossible with optical measurement alone, and/or employing the white-light sensors for tinier depth features.

What's clear is this: If a metal former requires feature measurement, inline and near-line systems possess the range and capability to get it done. **MF**

Industry-Related Terms: Color, Drawing, Forming, Scrap, Lines, Point
View Glossary of Metalforming Terms

See also: ***HEXAGON MANUFACTURING INTELLIGENCE***

Technologies: ***QUALITY CONTROL***

Comments

Must be logged in to post a comment. Sign in or Create an Account

There are no comments posted.

QUALITY CONTROL

Metrology Software Boasts New Subscription Model

March 10, 2020

PRESSROOM AUTOMATION

Modern Press Controls Deliver Horsepower

BRAD KUVIN *February 26, 2020*

MATERIALS

New Controls and Automation 'Future-Proof' an Aluminum-Stamp...

February 26, 2020

QUALITY CONTROL

Okay Industries Promotes Roy Brewster to Quality Manager

Wednesday, October 27, 2021