

## *Quality control and CT*

By David Moller-Gunderson, Customer Support Manager, phoenix|x-ray Systems + Services, Inc., St. Petersburg, FL\*

Quality control on the production lines is always a concern. A simple process error in one section of a line can cause the entire output of the line to fail, which can ultimately lead to scrapping an entire run of product or, in the worst case, a very costly recall. In order to prevent this situation, standard practice is to test a sample set of each run to ensure that product quality is where it needs to be.

Testing on the samples can be done in a variety of ways, but often destructive testing is required. This is both time consuming and costly; not only does destructive testing use hours of working time to prepare each sample, the product is lost after the testing. Depending on the testing requirements, this can become impractical fairly quickly. Because of this, non-destructive methods are used wherever possible. Traditional non-destructive testing – such as optical or electrical testing – will only give a finite amount of information about a part, however, and thorough testing practices may still dictate destructive testing.

X-ray inspection provides an alternative to destructive testing that not only leaves the product intact but is also significantly faster. Advances in both 2D and 3D X-ray inspection give results that are as good as, and in many cases far superior to, standard destructive testing methods.

2-dimensional X-ray inspection, when combined with phoenix|x-ray's patented OVHM (Oblique Viewing at Highest Magnification) technique on systems such as the nanome|x, allows viewing of the sample at angles of up to 70 degrees at magnifications of more than 20,000 times. At these magnifications, even the smallest defects in a product are readily visible, including those that are normally hidden beneath other components. Defects such as internal cracks, delaminations, inclusions, improper mechanical fit or excessive porosity are easily visualized without damaging the product, so that it might be repaired instead of simply sliced up and discarded. When combined with full automation and offline analysis, this allows a number of products to be checked with minimum input from the tester and minimum deviation from a standard test. Not only does this ensure that all products are tested equally thoroughly, it also gives a depth to the testing previously unavailable.

While most defects are easily visible with 2D X-ray inspection, sometimes only the amount of data traditionally provided by sectioning a part will do. For defects like voiding, sometimes the absolute location is critically important; while a void in the middle of a solder joint might not be a problem, a void at the surface could be catastrophic.

Sectioning presents its own problems. Often, if the defect is small enough, the process of grinding down the section you are interested in can destroy the very defect you are looking for. In addition, there is no way to put the part back together once it has been sliced up. This is where true 3-dimensional X-ray inspection, known as Computed Tomography or CT, can greatly benefit quality inspection. Instead of physically sectioning a part, a process which can take almost an entire day, CT systems like the phoenix|x-ray v|tome|x can create a 3-dimensional model in less than an hour, which can then be virtually sectioned. Not only is the part still intact, but any small defects that may have been destroyed by sectioning are left untouched. With defect detection down to 200 nanometers and a sample size of up to 3 feet in diameter, as well as the capability for standard 2D inspection, CT systems provide a versatile tool for any quality control situation.

There is a standard saying in problem solving: when the only tool you have is a hammer, everything looks like a nail. Standard non-destructive quality testing techniques are quite valuable to the production line. However, they miss enough defects that they cannot alone ensure the quality of a line. Destructive techniques can find those defects at the cost of the product lost to testing. X-ray inspection, both 2D and 3D, offers an alternative that both speeds up the process and allows for product repair. While it is not the only tool you'll ever need, it can quickly become one of the most important and valuable in your quality control toolbox.

For more information, contact: phoenix|x-ray Systems + Services, 111 2<sup>nd</sup> Ave NE Suite 303, St. Petersburg, Florida, [usa@phoenix-xray.com](mailto:usa@phoenix-xray.com), phone: 727-456-1465; fax: 727-456-1466.

\*This article was written and first published in USTech, May 2007.