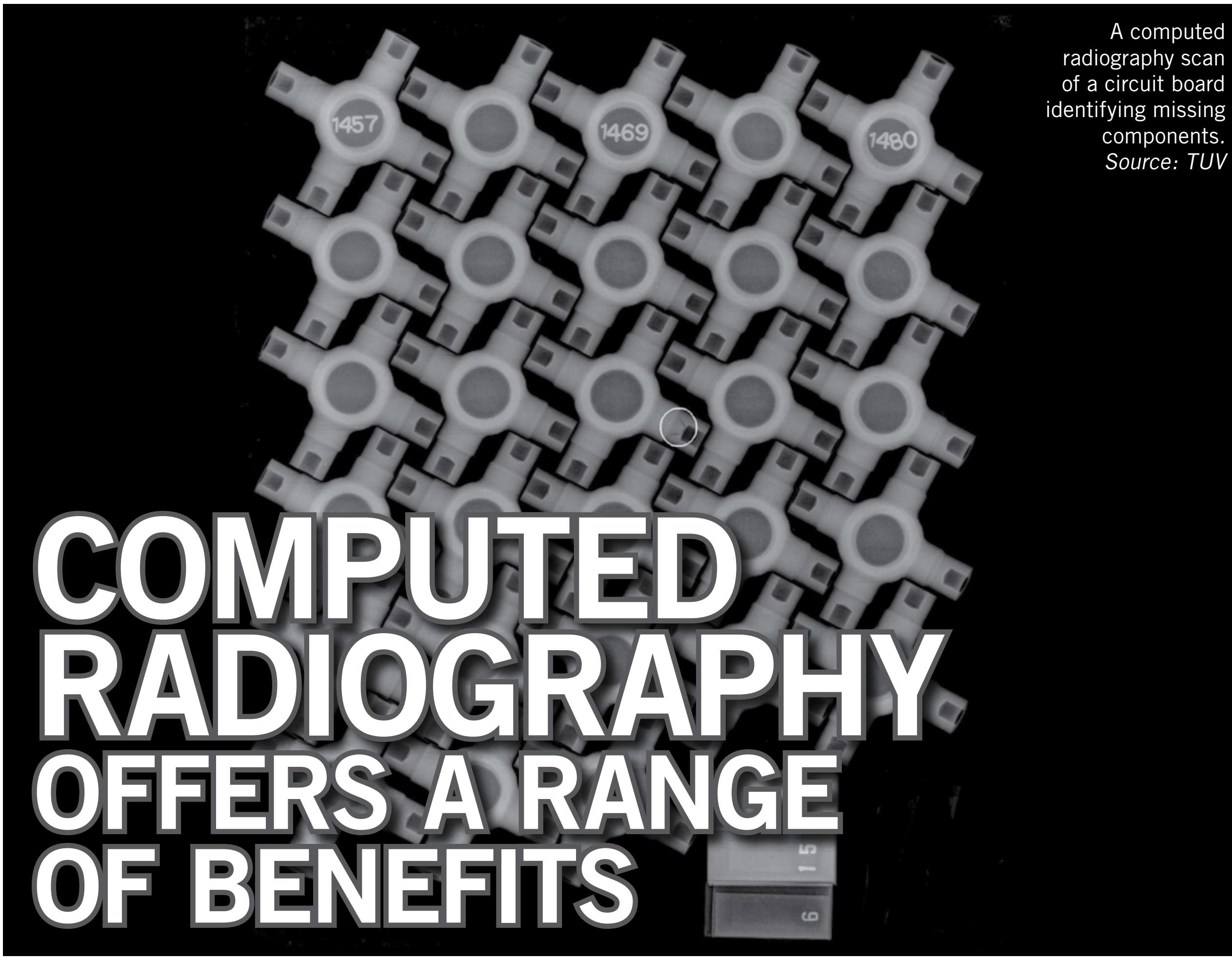


A computed radiography scan of a circuit board identifying missing components. *Source: TUV*

COMPUTED RADIOGRAPHY OFFERS A RANGE OF BENEFITS

As more inspectors have turned to CR, the inspection equipment has been steadily improving, offering manufacturers faster and more precise and cost-effective NDT results than ever before.

By Mike McDaniels

In the NDT world, radiographic examinations are a technician's staple. Different types answer various inspection and application needs: Computed radiography (CR) is best for aluminum and steel castings, electrical parts, and a wide range of manufactured components. CR can also be used with gamma radiography to inspect very thick-walled steel castings, and has been gaining momentum as digital data storage and retrieval increase in popularity. Environmental concerns over silver recovery efforts and film-developing chemicals as well as increasing film and material prices are all pushing CR forward.

As more inspectors have turned to CR, the inspection equipment has been steadily improving, offering manufacturers faster and more precise and cost-effective NDT results than ever before. The article will discuss the benefits of CR in general as well as describe the functions and benefits of the latest CR equipment available today.

Nuts & Bolts of CR

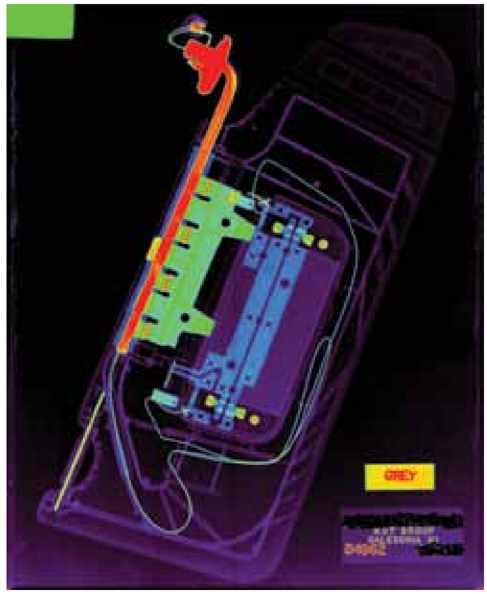
CR is a technique that captures a radiographic image on phosphor imaging plates in lieu of conventional film and saves it in an electronic format for further examination. Unlike "prompt-emitting" phosphors used in conventional phosphor-intensifying screens, the CR image plates retain the latent image that remains stable until it is cleared by the white light in the unit after the image has been scanned and stored. This process makes the plates reusable for many shots. Depending on how much radiation they are exposed to, one could potentially get thousands of exposures on one plate.

The image is scanned with a laser to stimulate the phosphor, causing it to release its stored energy in the form of visible light. This phenomenon is known as photostimulable luminescence. Like conventional intensifying screens, the intensity of stimulated luminescence is directly proportional to the number of X-ray photons absorbed by the storage phosphor.

CR Benefits Up Close

The CR inspection process is similar to conventional radiography (RT) but has a few key differences. A source of radiation, such as X-ray, cobalt, iridium or selenium, is selected based on the thickness and material of the part, and the procedure according to which the part needs to be radiographed, for example, AMS STD 2175 and ASTM E 1742 used for a wide array of tests on castings. Some procedures have not yet adopted the use of CR, but it will not be long before many will accept the digital medium over conventional film.

Today's computed radiography equipment produces high-quality, high-resolution images that are significantly more precise than those captured on film. *Source: TUV*



A computed radiography scan shows chevrons in a casting. *Source: TUV*

Reduced Exposure Time & Energy Requirements

The exposure process begins with placing the camera and imaging plate on the opposite sides of the object to be radiographed. When both items are in place, the radioactive source is remotely positioned to allow for a narrow beam of intense radiation to be directed towards the inspection object and imaging plates. In addition to using CR with a source, a company can also use fixed equipment in cabinets to make the necessary exposures.

During each exposure, the electromagnetic radiation passes through the examined object and interacts with the imaging plate. However, the energy required to capture an image on a CR plate is much less than that required for film, with exposure times significantly shorter. In most cases, the energy and time required are reduced by about half. This allows the use of smaller, lower intensity sources and decreases the radiation area and impact on nearby activities. The CR plates can display a wide range of thicknesses on a part, reducing the amount of exposures necessary to get a full coverage of the subject and enabling CR technicians to view multiple thickness areas in one exposure.

Quick Results Without Chemical Processing

After the exposure, the plate is placed on the scanner and the image is read, digitized and displayed on a specialized high-resolution monitor. Some CR systems have feed mechanisms in the equipment that eliminate the need to touch the plates, helping to prolong the life of the plates. The CR scanner is also equipped with filters preventing them from taking in dust in the air or dirt that might be on the cassettes.

In film radiography, processing requires 10 to 15 minutes and then the film must be checked for density before a technique can be established. In CR, scanning takes about two to four minutes and the image is ready to evaluate—a great improvement in productivity. New CR equipment can scan plates of various sizes, speeding up the processing time. Plates can be made for many different lengths so technicians are not restricted to the traditional film lengths that limit the portion of the component they can shoot at once.

Moreover, CR eliminates the need for film and photo-developing chemicals as CR plates last a long time with respectful handling. That, in turn, reduces the cost of inspection. The digital medium is also friendlier to the environment as no chemicals are employed. In short, the need for film storage is gone, space in the lab is increased, no chemicals are being used, and the impact on the environment is lessened.

High Quality of Images

Today's CR equipment produces high-quality, high-resolution images that are significantly more precise than those captured on film. CR plates offer a greater dynamic range as compared to film, allowing a broader in-depth evaluation of the material. The image is adjustable for sharpening, edge enhancement and gray scale equalization. Images of defects found in the part can be enlarged and viewed on the CR system for closer evaluation. In addition, defects can be measured on the system with a click of a mouse.

Enhanced Archiving and Retrieval

All images can be stored digitally and transferred to any digital storage device, including flash drives, external hard drives, DVDs, CDs and memory cards. The images can be recalled at any time with the CR system or can be read at any computer in a JPEG format, which, through the application of appropriate software, allows manufacturers to view the radiographs at their locations to verify production processes as well as share and duplicate them.

Additionally, digital media decreases archiving facility requirements and makes documentation and retention of inspection results easier than with traditional RT. With CR, a company can put all copies of the inspection results and images onto a disk or other suitable media, reducing paper and film costs. The digital records last much longer than film, which can degrade over time and became illegible. CR images can be recalled years later without losing their resolution or sensitivity.

Less Room for Mistakes

CR typically entails fewer return trips for re-shoots due to artifacts on film or exposure errors. During an RT snapshot, a number of variables can affect the quality of the image, such as too little or too much exposure time, film compromised by temperature or humidity, and contaminated or over-used chemicals.

Tools of the Trade

CR equipment has improved dramatically over the past several years. The machines feature an increased number of fans and vents to prevent dirt or dust from getting in the equipment, and filtered positive air pressure in the scanner keep damaging particulates out, significantly reducing maintenance. CR software has also become increasingly user-friendly and sensitive in displaying images.

Just as digital technology has taken over communication in everyday life, so is the NDT industry gradually crossing the bridge from traditional to computed radiography. Customers expect the quality and convenience afforded by digital media, and inspection equipment manufacturers support the trend with improved and easy-to-use products. **NDT**

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