

Description

Real Time Micro-focus X-ray is an extension of digital radiography and uses related technology to that used for scanning electron microscopy. It enables X-ray images to be viewed in real-time and allows for computerised treatment of the images to enhance resolution or to enable pattern-recognition algorithms to be used.

Its main application is to the inspection of electronic components and small critical parts. TWI has acquired an X-Tek HMX225 micro-focus X-ray system.

This is an advanced system, capable of resolving details down to $5\mu\text{m}$, and with up to 160 times magnification. It has the following characteristics:

- 5 μm Focal Spot Reflection Target X-ray Source, 25 - 160 kV or 25 to 225 kV, 0 - 2000 μA (non-continuous) 60 or 225 Watt
- 5 axis fully programmable manipulator
- Maximum scan area 480 x 510mm (480 x 680mm in 2 scans)
- Geometric Magnification up to: 160x
- System Magnification up to: 400x
- Feature recognition: down to $1\mu\text{m}$

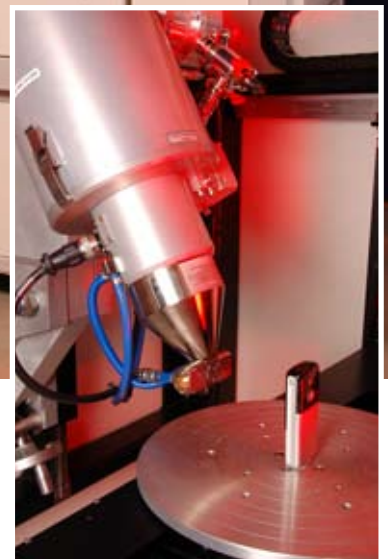
The sample can be manipulated with 5 axes of freedom, whilst continuously viewing the image on a monitor. Defects can be rapidly located, zooming in for detailed analysis.

The system functions as follows. The X-ray source generates a continuous beam of X-rays from a $5\mu\text{m}$ spot. The beam passes through the sample placed on the manipulator turntable, and casts an X-ray shadow onto the intensifier window.



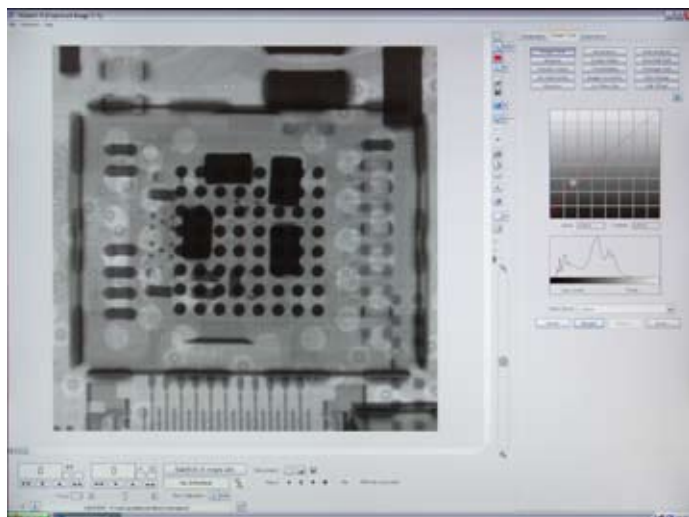
TWI's X-Tec HMX225 micro-focus X-ray system, also showing the X-ray gun directed at a mobile phone.

The intensifier converts the X-ray shadow into a visible image, which is recorded by a digital video camera and displayed on a monitor. The magnification of the sample depends on its position between the X-ray source and intensifier. Moving the sample towards the X-ray source enlarges the X-ray shadow, showing



greater detail. Even when operating at maximum magnification, the ultra fine X-ray spot ensures the monitor image is always sharp.

The associated software enables contrast enhancement, image integration



Micro-focus X-Ray image of a PCB

NDT Services from TWI

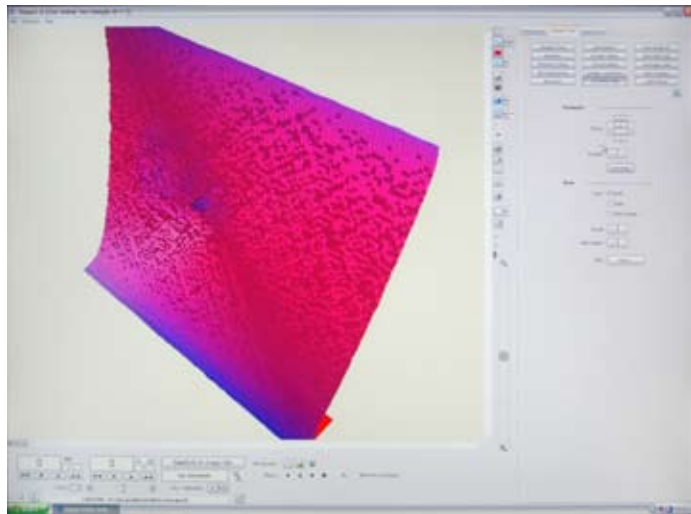
and background subtraction. Special functions, such as automatic die attach void and wire sweep calculations, graphic displays and colour enhancement are available for more critical analysis.

When used for PCB inspection, a so-called 'Golden Image' can be created of a perfect component. The image obtained for a PCB in production can then be subtracted from the Golden Image. Differences indicate possible flaws in the production component. This technique is similar to that used in Automated Optical Inspection (AOI).

Flaws in components are sometimes revealed through the use of a radio-opaque dye.

Applications

In addition to the application of micro-focus X-ray to the inspection of PCBs, TWI also uses it to inspect many small safety critical components particularly for the aircraft and aerospace industries – gauges, valves, sensors, turbine blades, etc. TWI is also currently investigating its use as one technique in an integrated system for PCB inspection. Other techniques for potential inclusion in the overall inspection system are automatic optical in-spection (AOI) and thermal / infrared imaging. This work is being under-taken in the Microscan collaborative project partly funded by the European Commission.



Micro-focus X-ray image showing damage in a plastic composite pipe. This is revealed by flooding the material with radio-opaque dye.

For more information on the services offered in this leaflet, contact:

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