

## Case Study

### Developing a non-destructive methodology for identifying a faulty electronic component housed in a module:

The SEAM Research Centre was approached by a company, which specialised in the manufacturer of varistors, with an intriguing problem. A few defect varistors, which are typically only a few mm in length, were mistakenly embedded in an electronic circuit board housed within a sealed module (made from dense plastic). To discard the whole batch of modules would have caused significant economic loss to the company. Using its XMT capabilities the group at SEAM were not only able to identify the modules containing the defective varistors but also the actual failure modes within them.

The successful outcome of the study highlighted the power of the x-ray tomography technique. This allowed the company to validate x-ray tomography as a unique non-destructive inspection technology for the identification of this type of fault potentially saving the company considerable money and time.

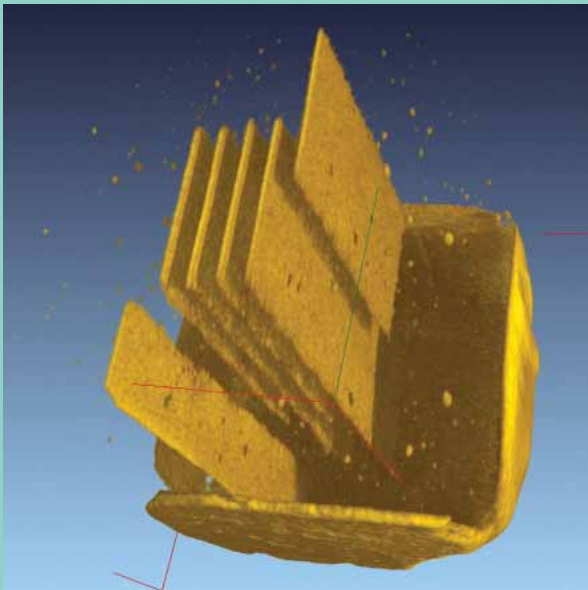


Figure 3. Typical x-ray microtomography 3D model of the misaligned electrodes in a defect varistor.

## Types of services offered by SEAM

- Consultancy
- Characterisation & Failure Analysis
- Strategic research partnership programs (short, medium and long term)
- Technology Transfer (from lab work to pilot line to commercial scales)

## Commitment to Excellence

SEAM's highly qualified and experienced technical staff include dedicated personnel for both x-ray microtomography and microwave processing equipment. SEAM pursues an uncompromising focus on excellence in support of its clients needs. By drawing academic support from various Engineering and Science faculties within WIT, SEAM can provide an unprecedented range of world class services to its industrial clients.

## Contact

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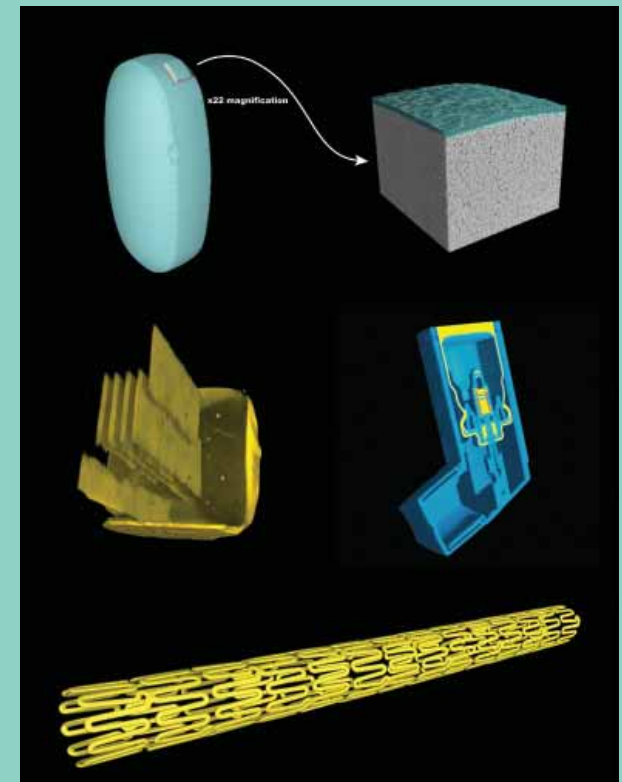
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## South Eastern Applied Materials Research Centre

An Applied Research Enhancement Initiative



Provider of innovative solutions through niche expertise



SEAM Research Centre is funded by Enterprise Ireland's Applied Research Enhancement programme whose mission is to generate regional economic activity through the creation of a strong applied research base.



Waterford Institute of Technology

## What can SEAM offer to industries?

To prosper in today's competitive environment, companies must strive to minimise cost and at the same time seek to improve product performance. To successfully compete globally it is increasingly necessary for both indigenous and multinational companies based in Ireland to engage in applied research. SEAM Research Centre can assist industries wishing to expand their horizons by providing access to:

- Leading edge diagnostic tools such as X-ray Microtomography (XMT)
- Unique processing tools such as a 1 m<sup>3</sup> cavity Microwave furnace
- Thermal and microstructural characterisation tools such as Dynamic Mechanical Analyser, Differential Scanning Calorimeter, Scanning Electron Microscopy, etc.
- Research support through working with in-house experts in a wide range of materials

## What is X-ray Microtomography (XMT) and what can it really do for industries?

XMT can be considered as a miniaturised industrial version of medical CT or CAT scanning. The strengths of the technique include:

- Non-destructive visualisation of the interior and exterior of objects in 3 dimensions at high resolution
- Quantitative analysis of porosity, cracks, foreign particles, inclusions and voids
- Data output is integrable with Finite Element Analysis (FEA) software for device analysis and design optimisation

The versatility of XMT can be exploited through its application to various industrial sectors including medical, life sciences, engineering and food.

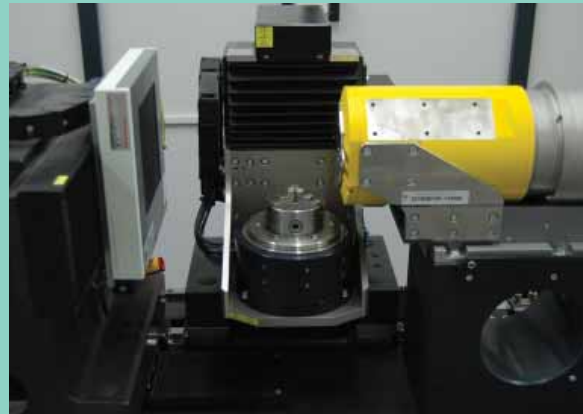


Figure 1. SEAM's state of the art XMT system showing the x-ray gun, manipulator stage and digital detector.

## What does Microwave (MW) technology bring to industries?

As a novel alternative tool for processing wide variety of materials, microwaves can be used to process polymers, ceramics, chemicals, minerals and many other materials.

Key features and its associated benefits of MW process technology are:

- Rapid ⇒ significant process cycle time savings
- Precise control ⇒ improved product quality
- Volumetric heating ⇒ energy savings
- Selective ⇒ synthesis of new materials, waste remediation
- Low CO<sub>2</sub> emission ⇒ greener process



Figure 2. SEAM's 1 m<sup>3</sup> cavity MW furnace allows large components to be processed.

## SEAM's other key capabilities are:

- Finite Element Analysis (FEA):
  - Components and systems
  - Patient specific FE analysis
  - In-situ stress state of implantable bio-medical devices and surrounding biological structures
- Synthesis and characterisation of:
  - Polymeric materials
  - Adhesives
  - Functional ceramics, glass and glass-ceramics
  - Nano-powders for active and passive electronic device applications
- Failure analysis of:
  - Medical devices and bio-material components
  - Structural and electronic components
- Thermal and micro-structural analysis for design optimisation