

## SEAM microwave technology – a bridge between WIT research and industry



One cubic metre cavity Microwave Furnace

**The beneficial use of microwaves for cooking food is well known. However, the same principle is increasingly being applied to the processing of a wide variety of materials including polymers, composites, rubber, ceramics, chemicals, minerals and wastes. The interest in microwave heating arises from key characteristics that are not available with conventional electrical and gas fired heating routes.**

Some of the main features and associated benefits of microwave processing technology are:

1. It has the ability to heat rapidly and this gives rise to significant process cycle time savings
2. It can heat the product all the way through at the same time giving rise to energy savings
3. It has precise control ability and this provides improved product quality
4. It has selective heating ability and this helps in the synthesis of new materials and
5. It has lower carbon dioxide emissions thus leading to a greener process.

However, the use of microwaves for processing materials is not straightforward and requires a thorough understanding of microwave-material interaction behaviour. This is because materials differ in their responses to microwave heating and not all materials absorb microwaves. Microwave

processing thus poses challenges and requires research to be undertaken prior to each application.

To exploit the beneficial use of microwaves, SEAM (South Eastern Applied Materials Research Centre) has procured a state of the art, one cubic metre cavity microwave furnace to carry out research for various materials processing and waste remediation applications. Funded by Enterprise Ireland's Applied Research Enhancement Initiative and scheduled for launch in January 2009, SEAM aims to establish industry-academic collaboration in the two key areas of its niche expertise: X-ray Micro-tomography and Microwave processing technology.

To overcome the challenges posed by microwaves, SEAM will utilise the

expertise of staff from the Engineering and Science faculties within WIT. Significant expertise exists within these faculties to carry out research for various industrial applications. The large size cavity microwave furnace allows large components to be processed, thus facilitating commercial scale activities. The availability of another state of the art X-ray Micro-tomography facility at SEAM's disposal will complement the microwave research as products processed using microwaves can be examined using X-rays.

SEAM thus plays a dual role in providing a world class service to its industrial clients and also in serving as a platform for WIT researchers wishing to enhance their academic research profile. While SEAM's X-ray Micro-tomography can serve as a leading edge diagnostic tool for anyone wishing to non-destructively examine the internal details of their product component, its Microwave processing technology can be regarded as an applied research tool that bridges the gap between WIT research and industry. Whether to reduce the curing times of thermosetting polymers (from more than seven hours to less than 30 minutes), to initiate chemical reaction through selective heating of elements/compounds or to acquire a faster densification rate in ceramic processing, microwaves exhibit significant innovative potential that is waiting to be exploited.

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SEAM's state of the art X-ray Micro-tomography facility