

THE IMPACT AWARDS 09 – ENVIRONMENTAL IMPACT AWARD

Winner - The University of Nottingham, The microwave exfoliation of vermiculite

Background

Vermiculite is a naturally occurring mineral that is widely used in fireproofing, insulation and horticulture. In its natural form the mineral is in the form of thin layered platelets and the material must be 'exfoliated' to generate its desirable properties and commercial value. Researchers at the University of Nottingham have developed a more efficient, cost effective and environmentally-friendly method to exfoliate vermiculite.

Traditional processing methods are energy-intensive and the products are expensive to transport. Microwave exfoliation of vermiculite (a known process for more than 20 years) had been hindered by technical challenges and historically low energy costs – a situation that has changed significantly over recent times.

Knowledge transfer

Departmentally embedded technology transfer personnel spotted the opportunity and worked to link microwave expertise, market knowledge and funding sources together. A thorough review of previous attempts at microwave processing highlighted a relatively poor understanding of fundamental exfoliation mechanisms and the engagement with commercial exfoliators revealed a significant pull for new low-energy processing technology. Together with some limited proof of concept and IP reviews, a successful case was built for venture capital funding towards process design.

In late 2008 the team successfully completed development of a commercial scale continuous microwave exfoliation process that demonstrated the significant energy reduction (approximately 10% of current approach). This scalable, patent protected process represents the first successful utilisation of microwave power, which can uniquely exfoliate all commercial grades (sizes) of vermiculite.

Impact

Ongoing market engagement and the provision of demonstrations have provided unique insight into wider and unexpected environmental benefits of the new technology. Reduced dust and hot air production resulting from selective heating enabled further energy reduction as well as health and safety improvement through removal of large dust control equipment. Additionally, the quality of microwave exfoliated vermiculite is improved to the point where the degree of exfoliation can be precisely controlled and specific for the end use, reducing waste and raw material consumption. Plus, further process benefits are achieved as product cooling bins (previously commonplace) are no longer required as the microwave exfoliated product is 'hand-hot' seconds after exfoliation.

These environmental benefits, combined with attractive capital cost and payback times, make the innovative microwave processing solution a commercially viable solution for the industry, whilst also opening up new market opportunities that will further remove the requirement to transport the exfoliated product by road.