

Green Industrial Chemical Reactor using Tuneable Frequency Microwaves



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Department of Trade and Industry

Client:

Department of Trade and Industry

School:

General Engineering Research Institute
Biomolecular Sciences
Pharmacy and Chemistry
Built Environment

Staff:

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Project:

The chemical industry is a major contributor to employment, technology and wealth creation in Europe. To maintain this position, the chemical industry is constantly seeking to increase yields and reduce production times.



Prof. Ahmed Al Shamma'a and Dr. Andy Shaw from the General Engineering Research Institute

Microwaves operating with a frequency of 2.45GHz are able to drastically reduce chemical reactions from hours, under conventional heating, to just minutes and in addition produce more controlled reactions required to create eco-friendly green chemistry. Currently only a laboratory system exists for producing a few cc of chemicals.

This Department of Trade and Industry and European Community sponsored project aims to develop a multipurpose prototype chemical reactor using microwave chemistry, for the continuous production of bulk chemicals at commercial production rates (kg/hr). This will be achieved by combining, for the first time, both centrifugal technology and microwave sources having tuneable frequencies within the range 2GHz to 26GHz. The availability of the tuneable frequency will allow the microwave process to be optimised at all stages of its reaction to generate maximum product yield.

Client benefits:

- The experiments will create a wealth of new information, from which it may be possible to elucidate the mechanism of how microwave energy is able to substantially speed up these polar chemical reactions
- The project will have a tremendous impact on the pharmaceutical industry by producing kg of chemical products rather than few cc
- So far the team involved has published six refereed papers at international conferences, given a presentation at the House of Commons and submitted further two journal paper
- The team is also in discussion with a number of companies who are interested in the application of chemical reactors that use tuneable microwaves, such as Protensive (UK), Surface transform (UK), FELDEC (UK), Organon (France) and Mercachem (Netherlands)

