Improved manufacture of high-value products

Stratophase, a UK-based SME, is leading a £1.2 million project to maximise yield and minimise waste within high-value manufacturing processes.

The opportunity

There is a global business opportunity for continuous product monitoring in liquid production environments, in particular for novel systems that provide non-disruptive, safe, accurate and real-time feedback on the quality of the product. A consortium of GlaxoSmithKline (GSK), Green Biologics and the Centre for Process Innovation (CPI), led by Stratophase, is developing a new sensor system applicable to a wide range of markets involved in the manufacture of liquid based products. The project is focused on two key sectors; chemical pharmaceuticals and biofuels. In order to successfully address the business opportunity the programme output will be the development and real-world demonstration in commercial applications of an in-line or immersed liquid monitoring technology.

The results

The ability to control processes involving liquids has traditionally relied upon online determination of primary measurements such as flow rate, temperature, pH, etc. Typically, these measurements do not sufficiently reflect the compositional changes that may be occurring within the process. The ability to measure key indicators, directly related to relative concentration of reagents/products/by-products in real-time and inline, offers increased rigour of process monitoring and improved process control. The implementation of Stratophases’s inline real-time compositional monitoring technology offers a route to significant environmental and economic benefits across a range of market sectors including petrochemicals, food and beverage and fine chemical production.

Whether the process requires multipoint determination of composition as the liquid progresses through multiple stages, or multiple identical processing steps are occurring in parallel (see diagrams over-leaf) the sensor technology must have the flexibility to offer cost effective deployment of multiple measurement points, hence allowing the user economic access to maximum process information. This information will enable process engineers to actively monitor throughout a production process enabling increased efficiency and effectiveness. Increasing the ability to track critical parameters during manufacturing processes can save both money and energy with benefit including an increase in product quality and production efficiency and profitability.

The primary objective of the project is to enable an increase in quality control in liquid-based production environments. The impact of the project will have many spill-over benefits to the UK and the wider world. For Green Biologics, CPI and GSK the commercial benefit is better quantified in terms of ‘quality improvement’ and waste reduction (lower costs). Improvements of ~20-

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Project Details

The project partners are GlaxoSmithKline, Green Biologics, the Centre for Process Innovation and Stratophase.

The total project investment is £1.2 M and the Government funder is the Technology Strategy Board.

Contact

Dr Sam Watts
Business Development & Commercial Officer
Stratophase Ltd
Unit 10a, The Quadrangle
Premier Way
Romsey
Hampshire
SO51 9DL
sam.watts@stratophase.com
www.stratophase.com

Or

Dr Tom Jenkins
Biosciences KTN
tom.jenkins@biosciencektn.com
www.innovateuk.org/biosciencesktn

30% are expected through this project to the pharmaceutical and biofuel manufacturing systems being developed by consortium partners. Estimates of the addressable markets for the project from available data include:

<table>
<thead>
<tr>
<th>Market</th>
<th>Market Value 2012</th>
<th>Sector Value (projectable portion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process monitoring devices</td>
<td>$6.4bn</td>
<td>($128m+)</td>
</tr>
<tr>
<td>BioFuels</td>
<td>£1.2bn</td>
<td>(£100m+)</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>$9bn</td>
<td>($90m+)</td>
</tr>
</tbody>
</table>

All three of these markets are growing markets with annual growth rates predicted at 4% for process monitoring devices, 12.3% for biofuels over the next 10 years and 5.5% for pharmaceutical production. Both the biofuel and pharmaceutical markets are undergoing not only increasing demand but raising pressure in terms of environmental impact, efficiency and costs.

The image to the left shows a prototype insertion probe, using Stratophase’s sensor technology, for use in batch fermentation processes.

‘The Biosciences KTN facilitated introductions to some of the key companies involved in the Apples Consortium’

The pharmaceutical industry accounts for around 0.6% of UK GDP and the UK is one of the world’s largest exporters of pharmaceuticals by value, with exports of £12.2 billion in 2005. The improvements being targeted through the project could have important impacts to further increase process efficiency in this high-value export market. The global industrial biotechnology (IB) market is estimated to be worth between £150 - £360 billion in 2025 with the UK IB market worth between £4 - £12 billion. The process improvements being targeted through the project could therefore make a significant added-value contribution to these emerging sectors in the future.

The Biosciences KTN is sponsored by the Technology Strategy Board, the Scottish Government, European Regional Development Funds, Defra, BBSRC and NERC.


2 http://www.berr.gov.uk/files/file51144.pdf