

Technology Strategy Board

Driving Innovation



Sustainable manufacturing for the process industry

**COMPETITION FOR FEASIBILITY
AND COLLABORATIVE R&D FUNDING
FEBRUARY 2012**

EPSRC

Engineering and Physical Sciences
Research Council

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COMPETITION FOR FEASIBILITY AND COLLABORATIVE R&D FUNDING

Summary

The Technology Strategy Board is to invest up to £5m in feasibility projects and collaborative research and development to encourage the development and commercialisation of innovative approaches to sustainable manufacturing in the process industry.

Innovation in sustainability is vital for the continued success and growth of the UK process industry, including for the bulk and fine chemical, pharmaceutical and biotech, agrochemical, coatings and lubricant, food and drink, home and personal care, mining, water, construction materials, and oil and fuel sectors.

We aim to encourage innovation in manufacturing steps that improve economic performance, benefit the environment and have a positive social impact.

Up to £4.6m is available for collaborative R&D projects, which must be business-led and include an end user. Up to £400k is available for feasibility projects, which must be business-led and may be collaborative or led by single companies.

Collaborative R&D projects should last one to three years and will attract up to

50% public funding. Feasibility projects should last six to nine months and will attract up to 75% public funding.

The competition opens on **27 February 2012**. The deadline for applications for feasibility funding is at noon on **25 April 2012**. There is a two-stage process for collaborative R&D funding. Expressions of interest must be submitted by noon on **25 April 2012** and the second stage for invited applicants opens on **21 May 2012**. The deadline for final applications is at noon on **4 July 2012**. A briefing day for potential applicants for feasibility and collaborative R&D funding will be held on **8 March 2012**.

Background and challenge

Sustainable manufacturing is of critical importance across the process industries, including the bulk and fine chemical, pharmaceutical and biotech, agrochemical, coatings and lubricants, home and personal care, food and drink, mining, water, construction materials, oil and fuel industries. In all these sectors, there is a drive for faster, more effective product design and manufacture in order for the UK to become more globally competitive.

The development and exploitation of sustainable processes is a key requirement for the continued success and growth of industries that use the output of the chemical industry. It ensures the sector can manufacture both new and existing products in an ecologically sound manner, often with substantial cost savings and other commercial benefits.

There are a number of ways in which chemical companies can improve their use of raw material and move towards more environmentally friendly processes. These include more effective chemical synthesis with nearer to 100% efficiency; use of continuous instead of batch manufacture; development of processes with alternative or even no solvents; and new approaches such as flow chemistry. The development of new or better catalytic routes is another important enabler and can be a key factor in the economic and technical viability of a process.

Sustainable manufacturing processes are also important for companies that use chemicals to manufacture products in downstream sectors where emphasis is likely to be on the reduction of waste and use of energy and water. The carbon footprint of a product through its complete life cycle may also have some relevance to the manufacturing and distribution process.

An effective link between industry and academia is important to facilitate innovation, as is the combination of multi-disciplinary expertise. Multi-functional teams formed at an early stage in development ensure that the resulting processes are highly sustainable, industrially relevant, economically viable and scalable. Industry needs to consider all manufacturing steps, including product work-up, materials handling, distribution and supply chain management. The 12 principles of green chemistry (*Green Chemistry: Theory and Practice*, Paul Anastas and John Warner, Oxford University Press) provide a useful framework of opportunities. (Visit <http://portal.acs.org/> and search for the principles of green chemistry).





Scope

We will fund projects that support the development and commercialisation of innovative approaches to sustainable manufacturing for the process industry. The following examples are illustrative and not exhaustive. Innovative process development based on other approaches will also be considered.

Changing batch to continuous processes

Many processes operate in batch mode, which can have the advantage of flexibility and ease of process control. However, moving to continuous processing often provides significant advantages when compared to batch processing including:

- lower capital, operating, and working capital costs
- greater control over product quality and more predictable scale-up
- greater sustainability due to less waste, 'greener chemistry' and a lower carbon footprint
- faster to market or to add capacity
- enabling the manufacture of products with increased novelty or complexity

Application of continuous processing could be in steps such as chemical reaction, formulation, mixing, curing, cooking, crystallisation or separation.

Novel catalysis

Reaction kinetics are key in determining process economics, including capital costs of scale production and operating costs. Innovation in catalysis, through improved conversions or lifetimes, can therefore radically change process economics. Many existing catalysts use metals that are expensive, toxic or difficult to source and there is scope for innovation using technologies that reduce or remove these disadvantages. Alternatively, novel catalysis may enable a novel reaction step that was not feasible before or enable

milder process conditions in which sensitive finished products can survive.

Innovative heat management or input in process

Most processes require the input of energy or result in the output of energy during the process cycle. Even where the net heat balance is modest, large amounts of energy may be needed due to separate stages which are highly endothermic and exothermic. Changes to the process that minimise the absolute energy requirement either by altered thermodynamics, heat management through the process or co-production can have a significant impact on process sustainability. Use of novel alternative sources of energy input such as ultrasonics or microwaves can also radically reduce energy consumption.

Solvent-free reactions or use of novel solvents

Solvents play a fundamental role in determining the characteristics of a process, and choice of appropriate solvents has always been a major task in process optimisation. Solvents can, however, have a negative environmental impact. Isolation of the product from the solvent phase can be extremely energy intensive or introduce other sustainability challenges in the reaction process. Carrying out the process free of solvent where feasible can deliver major advantages. Alternatively, use of novel solvents, for example supercritical CO₂, can both enhance the reaction process itself and offer more sustainable work-up options.

Process measurement and analysis

Innovation in process frequently requires innovation in process measurements. A move from off-line to on-line analysis, for example, can deliver substantial benefits in terms of cycle times and process control and can improve product quality, consistency and enable better process understanding.

Looking for partners to work on your project? Go to **_connect** (www.innovateuk.org/connect) to find collaborators and networks.

Capital investments in the process industries are often substantial, with a lifetime of many decades. Projects based on existing plant that include upgrades or innovation in process steps are not excluded from the scope.

All applicants must show how their project will make an overall positive contribution in terms of economic, environmental and social impacts – the triple bottom line – taking into account the full product life cycle. Where appropriate, projects should use life cycle methodology to calculate the reduction in carbon footprint through the use of targeted innovation. It is suggested that the CCaLC Carbon Footprinting Tool (funded by the Carbon Trust, Engineering and Physical Sciences Research Council and the Natural Environment Research Council) is used, which is available at www.ccalc.org.uk.

Applications should be in process industry sectors, including but not limited to bulk and fine chemicals, pharmaceutical and biotech, agrochemicals, coatings and lubricants, home and personal care, food and drink, mining, water, construction materials, oil and fuel. Projects across multiple process industry sectors, for example across the food, chemicals, biotech or pharmaceuticals sectors are encouraged.

Manufacture in the process sector is a strong generator of export earnings for the UK. Projects which can clearly demonstrate they will generate additional export sales are encouraged.

The development of industrial biotechnology routes to existing or new biologically derived feed-stocks are specifically excluded from the scope.

Funding allocation and project details

We have allocated up to £4m to fund projects in line with the above scope. The Engineering and Physical Sciences Research Council (EPSRC) has expressed interest in supporting this competition and will contribute up to a total of £1m to projects. Additional funding from EPSRC may be available for parts of projects (work-packages) where there is a significant high-quality academic component and in particular for those projects that demonstrate added value to its existing portfolio by building on, or being complementary to, existing EPSRC research programmes. These include EPSRC centres for innovative manufacturing. Applicants invited to apply for stage two of this competition are advised to identify any potential work-packages at that stage.

Feasibility Projects

Up to £400k is available for businesses that are considering entry into their chosen market, need to conduct small-scale technical feasibility studies and want to test and develop projects for future larger funding competitions.

Projects must be business-led and may or may not be collaborative. They should last six to nine months and will attract up to 75% public funding. The maximum total project size is £100,000.

Key dates

Feasibility studies	
Competition opens	27 February 2012
Briefing Day	8 March 2012
Registration deadline	18 April 2012 noon
Deadline for applications	25 April 2012 noon
Decision to applicants	1 June 2012
Collaborative R&D	
Competition opens	27 February 2012
Briefing Day	8 March 2012
Registration deadline	18 April 2012
Deadline for receipt of expressions of interest	25 April 2012 noon
Second stage opens for invited applicants	21 May 2012
Deadline for receipt of full applications	4 July 2012
Decision to applicants	10 August 2012

Collaborative R&D

Up to £4.6m is available for businesses that have selected their chosen market or markets. Projects must be business-led and collaborative and include an end user. They should last one to three years and will attract up to 50% public funding. The maximum total project size is approximately £1m.

Application Process

Feasibility study projects

This is a single-stage competition that opens on **27 February 2012**. The registration deadline is at noon on **18 April 2012** and the deadline for applications is at noon on **25 April 2012**.

Collaborative R&D projects

This is a two-stage competition. It opens on **27 February 2012**. The registration deadline is at noon on **18 April 2012** and expressions of interest (EOI) must be submitted by noon on **25 April 2012**. These are assessed by an independent panel of experts. Selected applicants are invited to submit a full application. The second stage for invited applications will open on **21 May 2012** and the deadline for applications from invited projects is at noon on **4 July 2012**.

Note: All deadlines are at noon.

More information

To apply for this competition you must first register with us. You can do this by going to our web page for this competition at **www.innovateuk.org** under Competitions. When you register you will get access to all the supporting information you need to read before you apply, including the *Guidance for Applicants* and the application form.

Competition helpline:
0300 321 4357

Email:
competitions@innovateuk.org

Publicity

As part of the application process all applicants are asked to submit a public description of the project. This should adequately describe the project but not disclose any information that may impact on intellectual property, is confidential or commercially sensitive. The titles of successful projects, names of organisations, amounts awarded and the public description will be published once the award is confirmed as final. Information about unsuccessful project applications will remain confidential and will not be made public. E-mail pressoffice@tsb.gov.uk with any queries.

The Technology Strategy Board is a business-led executive non-departmental public body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve quality of life.

Collaborative research and development is part of the Government's Solutions for Business portfolio.

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