



INDUSTRIAL BIOTECHNOLOGY IN DENMARK

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INTRODUCTION	3
I. RESEARCH AND INNOVATION	4
A. Public research funding	4
B. Pilot and demonstration plants	4
II. POLICY	6
A. Policies and regulations	6
B. Public procurement	6
C. Standardisation, labelling and certification	6
D. Access to finance	6
E. Communication	6

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INTRODUCTION

Denmark has long experience of designing and implementing programmes to promote biotechnology: the Danish research councils have been funding biotechnology research with specific initiatives since 1987. A large majority of Danish biotech firms are small, with less than ten employees. A major part of biotech activity in Denmark is conducted in larger firms that also have activities outside of biotechnology. This group includes pharmaceutical companies located in Denmark but also the world's two largest enzymes producers (Novozymes and Genencor-Danisco) which make Denmark one of the most active countries in the field of industrial biotechnology.

I. RESEARCH AND INNOVATION

Modern industrial biotechnology is a relatively new discipline, with major areas of knowledge still to be explored. Public support to research as well as the establishment of pilot and demonstration facilities to scale-up individual processes will therefore help in the development of a European bio-based economy.

A. Public research funding

The Danish Agency for Science, Technology and Education² (DASTI) is a member of the European Research Area for Industrial Biotechnology³ (**ERA-net IB**) as a partner.

The Danish Council for Strategic Research⁴ (DCSR) of the DASTI funds research and provides advice within politically prioritised and thematically defined research areas. The Council also helps to strengthen the interaction between public and private-sector research. Its Board appoints a limited number of programme commissions with the competency to grant funding. There are currently (August 2008) eight programme commissions. The budget for energy and environment was DKK 105 million in 2007.

The Danish Foundation for advanced technology⁵ (**Højteknologifonden**) has been established by the Danish government to stimulate research and innovation in technology areas where Denmark has special strengths and potential. Among other things the foundation has supported projects within energy, environment, food and health. For 2008, the Foundation has a budget of DKK 280 million.

A specific project on "Development of second generation bioethanol is running at the moment. The budget for this project is DKK 22 million.

The EUDP program⁶ - **Programme for Energy Technology Development and Demonstration** aims to strengthen development and demonstration within energy technology. The total budget for 2007-2010 is DKK 713 million, of which DKK 200 million must be spent on second generation biofuels. In 2008 the budget is DKK 210,6 million.

B. Pilot and demonstration plants

Most universities in Denmark have pilot facilities which can be used by for instance by SME companies for various trials.

Regarding funding, Denmark does not - at the moment - distinguish pilot and demonstration plants.

Biofuels

Today, there are two important Danish technology paths within second generation biofuels⁷:

- **The Maxi-fuels** concept developed by BioGasol at Biocentrum, Technical University of Denmark (DTU)

Maxi-Fuels, BioCentrum, Denmark Technical University, Lyngby

² <http://fi.dk/site/english>

³ <http://www.era-ib.net/>

⁴ <http://fi.dk/site/english/councils-commissions-committees/the-danish-council-for-strategic-research>

⁵ <http://www.hoejteknologifonden.dk/?id=29>

⁶ <http://www.ens.dk/sw16603.asp>

⁷ http://www.man.dtu.dk/upload/institutter/ipl/publ/2.gen%20bioethanol_for_transport_report.pdf

General, products, feedstocks	<p>“Maxi-Fuels”, is an integrated 2nd generation bioethanol pilot plant project. It is located at the BioCentrum at Denmark's Technical University. The project is a result of several years of strategic cooperation between public research and the industry. “Maxi-Fuels” refers to the fact that the plant is focusing on producing a maximum energy output in the form of bioethanol, biogas and hydrogen – and not feed. The raw material is straw, grass and biowaste of different kinds.</p> <p>The commercialisation of the Maxi-Fuels concept is now continued in the private spin-off company BioGasol. BioGasol will open its demonstration plant for cellulosic bioethanol production in Denmark in 2009. The demonstration plant will be located in Aakirkeby on the island of Bornholm. The demonstration facility will be one of the showcases at the UN World Climate Summit COP15 in Copenhagen 2009.</p>
Services	
Financing	<p>Maxi-fuels project is supported by public research fundings from the Energy Research programme under Danish Energy Authority. The Technical University of Denmark, Novozymes and Energy E2 (now DONG Energy) deliver co-financing. The project also receives funding from the EUDP program.</p> <p>The planned demonstration plants project will be supported by grants from the Danish Ministry of Climate and Energy. Project partners are Siemens AG, Grundfos A/S, Agro Tech A/S and Alfa Laval A/S.</p>
Contact	http://www.biogasol.com

- **The Integrated Biomass Utilization System (IBUS)** which is developed by DONG Energy A/S and is based on integrating the biofuel plant with a power plant

IBUS pilot plant, Skærbækværk in Jutland (closed facility)	
General, products, feedstocks	The project participants are Risø ⁸ , The Royal Veterinary and Agricultural University, Siccø ⁹ and TMO Renewables. The project is led by Inbicon (DONG Energy) – the main Danish power utility company. The second generation concept is focusing on the integration of bioethanol, feed and chemicals production with power production at large power plants. The raw material is wheat and straw.
Services	
Financing	Funding: 50 % (around €7 million) of the initial project budget is being funded by the European Commission. The project is also starting to get financial support from The Danish National Advanced Technology Foundation and Energinet.dk's ForskEL-programme
Contact	

MaxiFuels is considered to be a pilot plant. Inbicon/Dong has already begun building a demonstration plant which is expected to be completed by October 2009.

⁸ National laboratory. Now part of The Technical University of Denmark

⁹ A small independent agro-industrial development company

II. POLICY

Public authorities can promote the quick take-up of industrial biotechnology innovations by implementing a number of “instruments” or policy initiatives. This can be the improvement of the regulatory framework; the integration of specification for bio-based products in public procurement; the establishment of standardisation, labelling and certification schemes to overcome perceived uncertainty about product properties and weak market transparency; the development of financial instruments and supports to increase investments into research, technology development and innovation as well as the elaboration of communication and information campaign to communicate the benefits of bio-based products to users.

A. Policies and regulations

No information

B. Public procurement

Specific public procurement for bio-based products does not exist in Denmark. The issue is under discussion at the political level, but no concrete actions have been taken.

The government supports various voluntary/private initiatives such as energy saving campaigns.

C. Standardisation, labelling and certification

The Swan label¹⁰ applies in Denmark. This label was introduced by the Nordic Council of Ministers with the objective to promote a more sustainable consumerism with the goal of creating a sustainable society. In this voluntary system, the applicant agrees to follow a certain criteria outlined by the Nordic Ecolabelling in cooperation with stakeholders. These criteria include environmental, quality and health arguments. The criteria levels promote products and services belonging to the most environmentally sound and take into account factors such as free trade and proportionality (cost vs. benefits)

However, the label does not communicate specific bio-based properties / qualities as a specific labelling system for bio-based products does not exist.

D. Access to finance

One possibility for getting financial support is the Danish Energy Authority and its Energy Technology Development and Demonstration Programme (EUDP – see above Public research funding).

E. Communication

Industrial biotechnology companies are represented via the national association Dansk Biotek¹¹

¹⁰ <http://www.svanen.nu>

¹¹ <http://danskbiotek.customers.composite.net/>