

BIOSYNERGY Newsletter No. 5

Welcome to the fifth newsletter of the Integrated Project BIOSYNERGY on biorefineries, co-funded under the 6th Framework Programme for Research and Technological Development of the European Communities.

Prior to the massive use of fossil fuels, human kind was dependent on biomass to meet its energy demands. The breakthrough of crude oil, in the 19th century, provided a cheap and easy to handle liquid fuel source that helped the development of the world and improved standards of living.

Nowadays, the increasing demand for petroleum by emerging economies and the political and environmental concerns about fossil fuels, combined with declining petroleum resources, make imperative the shift towards an economical and energy-efficient biobased economy.

The BIOSYNERGY project aims at supporting the transition towards a biobased economy by developing competitive and environmentally friendly manufacturing routes for a range of products from biomass, using novel technologies combined in advanced biorefinery concepts.

BIOSYNERGY update

During the first 7 months of 2009, in order to boost the dissemination of project results, three workshops were organized to present the BIOSYNERGY preliminary results obtained during the first half of the Project (2007-2008). Brief reports of these workshops are presented below. Full reports, presentations etc. are available for down loading at the project website: www.biosynergy.eu

Training workshop: “Adding Value to the Sustainable Utilisation of Biomass”, June 12th 2009, Ghent, Belgium.

A workshop in which the first version of the developed Biorefinery Training Course was presented was held in Ghent, Belgium, on the 12th of June 2009 as a side event of the Fifth International Renewable Resources & Biorefineries Conference.

This three day international conference consisted of plenary lectures, oral presentations and poster sessions aiming at bringing together academic researchers, industrial experts, policymakers and venture capital providers to discuss the challenges emerging from the transition towards a

biobased economy and to present new developments in this area.

In this context, the BIOSYNERGY project, in cooperation with IEA Task 42 Biorefineries, organized a workshop for the introduction of the BIOSYNERGY training course under the title “Adding Value to the Sustainable Utilisation of Biomass”.

The Training Course consisted of the following lectures:

- General Introduction on Biorefinery - *Prof.dr. Johan Sanders (NL)*
- Definition & Classification - *Dr. Gerfried Jungmeijer (AT)*
- Lignocellulosic Feedstock Biorefinery – BIOSYNERGY and beyond - *Dr. Hans Reith (NL)*
- Green Biorefinery - *Dr. Michael Mandl (AT)*
- Marine Biorefinery - *Dr. Maria Barbosa (NL)*
- Sustainability Assessment - LCA *Dr. Gerfried Jungmeijer (AT)*

The workshop and the discussion were chaired by René van Ree (Wageningen UR, A&F).

This successful event was attended by more than 60 scientists and company representatives with an active interest in (development of) biomass based technology and products. A document containing the presentations is available at <http://www.biosynergy.eu/publications/biorefinery-course-presentations/>. The intention is to further develop the Training Course for future use.



René van Ree introducing the Biorefinery Training Course at the Ghent workshop on June 12th 2009

International Biorefinery workshop, 22nd June 2009 in Madrid, Spain

On the 22nd June 2009, Abengoa Bioenergía Nuevas Tecnologías, in collaboration with Genoma España, IDAE and CIEMAT organised an International Workshop on Biorefinery in Madrid, Spain. The main objectives were:

- General review of the state-of-the-art of different technologies on Biorefinery
- Identification of new opportunities for the biofuel sector
- Analysis of perspectives for the development of the Biorefinery business in a short/medium/long term, and
- Evaluation of incentives in terms of financing of new projects, regulatory aspects and sustainability.

The event was co-organised and sponsored by the BIOSYNERGY Project and CIEMAT – Centre for Energy, Environment and Technology Research through the Singular and Strategic Project “On Cultivos” of the Spanish Ministry of Science and Technology. Co-organizers were also: Genoma España; IDEA, Institute for Energy Diversification and Saving and the Institute for Energy of the EC Joint Research Centre (JRC).

This Biorefineries workshop was held at the Spanish Ministry of Industry premises in Madrid. About 200 representatives of the R&D sector, companies, governments and other organizations participated in this successful event.



Coordinator Hans Reith presenting preliminary results and conclusions of the IP BIOSYNERGY in the Madrid workshop.

The workshop comprised several working groups devoted to various aspects of biorefineries from obtaining raw material, with special attention for algae and energy crops, to the perspectives of bio-based products synthesis, including various biochemical and thermochemical biomass conversion processes.

Furthermore, a round table meeting was included with the aim of evaluating incentives for the development of Biorefinery business in terms of financing of new projects, regulation and sustainability issues.

With regards to the IP BIOSYNERGY, the goal of this workshop was to present and discuss the project results, R&D highlights and challenges with stakeholders from the public sector, industry and R&D organizations.

An overview of the project and the results and (preliminary) conclusions thus far were presented by project coordinator Hans Reith in a dedicated session of the Workshop with approx. 60 attendants.

The presentation, entitled *Lignocellulosic feedstock biorefinery for co-production of chemicals, transportation fuels, electricity and heat – Overview of the IP BIOSYNERGY (FP6)*, by J.H. Reith, R. van Ree, R. Capote Campos, R. R. Bakker, P.J. de Wild, F. Monot, B. Estrine, A.V. Bridgwater, A. Agostini, is available at the project website.

The workshop was opened by Enrique Jiménez Larrea (IDAE General Manager) and Juan Antonio Rubio (CIEMAT General Manager) and involved participation of well-known experts in each working area: companies including Abengoa Bioenergía Nuevas Tecnologías, Acciona, Elcogas, Choren Industries, Borregaard, DOW, Repsol and Ecofys; and public centres such as the most prestigious Spanish and European Universities and Research Centres: Aston University, IFP, Energy research Centre of the Netherlands, CENER, CIEMAT and the Joint Research Centre of the EC.

With the very high relevance of the speakers and the round tables participants and more than 220 attendees this workshop can be considered a major success in terms of knowledge dissemination and stakeholder involvement on the perspectives of biorefinery and its various aspects in the context of international sustainable development and the dissemination of results from the IP BIOSYNERGY.

Advanced Biorefinery Concepts and Technologies workshop on 2nd July 2009 in Hamburg, Germany

The workshop ‘Advanced Biorefinery Concepts and Technologies’ was organized as a side event

of the 17th European Biomass Conference & Exhibition 'From Research to Industry and Markets' that was held in the Congress Center Hamburg on 2nd July 2009.

The goal of the workshop was to present and discuss the project results achieved so far with stakeholders from the public sector, industry and R&D organizations. The workshop was well attended by more than 50 scientists and other interested persons.

During the workshop R&D highlights and challenges were presented by researchers actively involved in the project.

Project Coordinator Hans Reith, who chaired the workshop, summarized the BIOSYNERGY results and conclusions to date.

The overall goal of the Integrated Project BIOSYNERGY is to develop sound techno-economic processes (from lab-scale to demonstration at pilot-scale) for integrated production of fuels, chemicals, power and heat from lignocellulosic biomass.

The aim is to develop integrated, synergetic biorefinery concepts, using advanced fractionation and conversion processes, and combining biochemical and thermochemical pathways. Furthermore the project will identify the most promising biorefinery chains for Europe based on energy efficiency, environmental performance, socio-economic aspects and costs.

The IP BIOSYNERGY places particular emphasis on valorisation of residues from cellulose ethanol production. The assessed feedstocks include wheat straw and soft and hard wood as representatives of major European biomass streams.

The presentations in the workshop highlighted the objectives, the partnership, an outline of the R&D and the preliminary results of the IP BIOSYNERGY about half way in the project life cycle. At the current status of the project the following preliminary conclusions can be drawn.

- The Research and Technological Development in the IP BIOSYNERGY shows good progress and provides a basis for large-scale valorization of C5 sugars and lignin. In the final project phase scale-up is planned for several conversion routes.
- Development of integrated Lignocellulose biorefinery technology combining bioprocesses, chemical processes + Combined Heat and Power production offers good perspectives to fully exploit the potential of lignocellulose feedstocks.
- Pretreatment and enzymatic hydrolysis are critical process steps for fractionation and

important cost drivers in the biorefinery and therefore for the quality of the end products and overall techno-economic feasibility.

- Pretreatment technologies need to be optimised toward a particular goal.
- Enzymes are a major processing tool in the Lignocellulose Biorefinery. Further development and cost reduction are needed.
- Integrated development of the trajectory feedstock-pretreatment-hydrolysis-fermentation is required.
- Lignin valorization (at least in part) to chemicals is an important tool for economic profitability and for reduction of the carbon footprint of a lignocellulose biorefinery. Within the IP BIOSYNERGY the direct application of (organosolv) lignin and enzymatic lignin conversion show promising results for lignin valorization.
- Separation technology development is vital for both biochemical and thermochemical processing technologies
- Development of integrated biorefinery processes including chain optimisation forms a major success factor and is also one of the major challenges. This includes technical process integration but also the integration of environmental and socio-economic aspects.



Zoi Nicolaidou (CHIMAR – GR) presenting results on advanced chemical conversion (WP4) at the workshop in Hamburg on 2nd July 2009

BIOSYNERGY fact-sheet

BIOSYNERGY aims to use BIOMass for the SYNthesis of bio-products – chemicals and/or materials – together with the production of secondary enERGY carriers – transportation fuels, power and/or CHP – through the biorefinery approach. The research is focussed on the development of advanced and innovative fractionation and conversion processes combining biochemical and thermo-chemical pathways, and process development from lab-scale to validation at pilot-scale.

The total budget of BIOSYNERGY is 13.4 M€. The project receives financial support from the Sixth Framework Programme for Research and Technological Development of the European Communities (Contract No. 038994 / SES6). The Communities' financial contribution is up to 7.0 M€ in the form of a grant to the budget. BIOSYNERGY started on 01.01.2007 and will last for four years, until the end of 2010.

The project work programme is divided into nine inter-related Work Packages (WP):

WP0: Management activities

WP1: Advanced physical/chemical fractionation

WP2: Innovative thermo-chemical conversion

WP3: Advanced biochemical conversion

WP4: Innovative chemical conversion and synthesis

WP5: Conceptual design Biorefinery pilot plant ABNT, Salamanca

WP6: Integral biomass-to-products chain design, analysis and optimisation

WP7: Demonstration at pilot-scale

WP8: Training and knowledge dissemination

For more information, publications, workshop proceedings and other dissemination activities please consult the project website:

www.biosynergy.eu

The participants in BIOSYNERGY

The project consortium includes 17 partners from industry, academia and research from 10 EU countries:

- **ECN** – Energy research Centre of the Netherlands (NL) – project coordinator
- **ABNT** – Abengoa Bioenergy S.A. (ES)
- **CEPSA** – Compania Espanola de Petroles S.A. (ES)
- **DOW** – DOW Benelux B.V. (NL)
- **VTT** – VTT Technical Research Centre (FI)
- **ASTON** – Aston University (UK)
- **A&F** – WUR Agrotechnology and Food Innovations B.V. (NL)
- **ARD** – Agro Industrie Recherches et Développements (FR)
- **IFP** – Institut Français du Pétrole (FR)
- **CRES** – Centre for Renewable Energy Sources (GR)
- **BTG** – Biomass Technology Group (NL)
- **JR** – Joanneum Research (AU)
- **BIOREFINERY** – Biorefinery.de (DE)
- **GIG** – Central Mining Institute (PL)
- **JRC** – Joint Research Centre – Institute for Energy (NL)
- **CHIMAR** – Chimar Hellas S.A. (GR)
- **TUD** – Delft University of Technology (NL)

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The BIOSYNERGY consortium at the progress meeting in Solihull (Birmingham - UK) 1-2 April 2009