

Optimising the European Bio-refinery processes

★ The use of biomass for fuel, chemicals, materials and a range of products will make it a major contributor to European sustainable development. But first Europe has to nurture an infrastructure of cooperation to create effective bio-refinery processes explains **Franck Dumeignil**

The development and implementation of bio-refinery processes is the prime goal of the Framework Programme Seven funded EuroBioRef project, as today's bio-refineries are reliant on a limited number of biomass sources, are not optimised for efficiency, and there is a disconnect between the many stakeholders involved in this young industry.

Biomass is a 'wonder-resource' if correctly refined with potential for not only fuels, but also a number of products such as chemicals, polymers and materials, to the point where it could be a driving force for a sustainable economy. Efficiency in the bio-refinery processes is key and by integrating the stakeholders involved at all levels – new synergies, cost efficiencies and improved methods can be achieved.

Today, most of the existing bio-refinery concepts use a limited number of raw materials and technologies, based around a single type of biomass – the focus is usually on producing biofuels (biodiesel or bioethanol). Only a fraction of the

biomass is converted into higher value chemical products.

A state-of-the-art bio-refinery is represented eg. by an integrated bio-ethanol production including fermentation of biomass, distillation of ethanol, treatment of by-products in a bio-gas unit as well as combined heat and power generation, covering the energy demand of the processes. Excess methane/electricity is exported to the public grids.

The EuroBioRef project is illustrating what is possible in the next wave of bio-refinery design. In contrast to existing concepts, the EuroBioRef project will develop a highly integrated and diversified concept applying multiple feedstocks, multiple technologies and multiple bio-products. The approach means that various production platforms can be analysed in order to choose optimised economic solutions throughout locations in Europe.

Re-vamped for efficiency

The project has a specific aim to overcome

the fragmentation in the biomass industry. This will mean decisive actions will be taken to facilitate better networking, coordination and cooperation among a wide variety of actors.

There are 28 project partners involved in the EuroBioRef project from 14 different countries, comprising of large and small chemical and biochemical industries, as well as academics and researchers from the whole biomass value chain, and also relevant European organisations.

Specifically, the new concept will adopt a flexible and a modular process design adapted to large-scale but also small-scale production units, which will be easier to install in various European areas.

The overall efficiency of this approach will be a vast improvement to the existing situation and will ensure the production of bio-jet fuels and multiple products in a flexible and optimised way and take advantage of the differences in biomass components and intermediates. It should also improve cost efficiency by as much as 30 per cent through



improved reaction and separation effectiveness, reduced capital investments, improved plant and feedstock flexibility and reduction of production time and logistics. Further, it will reduce by 30 per cent the energy used and produce zero waste. Raw material management will also mean that a reduction of feedstock consumption will be possible to the tune of at least 10 per cent.

Large-scale research, testing, optimisation and demonstrations of processes in the production of a range of products will be necessary.

In contrast, the EuroBioRef concept achieves integration across the whole system, from feedstock to product diversification and adapts to regional conditions, integrating into existing infrastructure, minimising risks to investors. The flexible approach means widening bio-refinery implementation to the full geographical range of Europe and offers opportunities for export of bio-refinery technology packages to more local markets and feedstock hotspots in developing countries – for instance in

“ The EuroBioRef project is illustrating what is possible in the next wave of bio-refinery design. In contrast to existing concepts, the EuroBioRef project will develop a highly integrated and diversified concept applying multiple feedstocks, multiple technologies and multiple bio-products ”

Reducing risk to investors

For a bio-based economy to become possible it was realised that a new Europe-spanning integrated approach was needed at the refinement stage. For instance, currently, the standard bio-refinery concept relies on massive economies of scale at one-dedicated site to achieve higher performance. It implies risks for investors, as logistical requirements drastically increase with the size of a single plant, and market dynamics may cause simplistic product output optimisation to fall short.

Eastern Europe there is high potential based on feedstock availability but as yet there are no existing bio-refineries. Bio-refineries are presently confined to the North and West of Europe.

The EuroBioRef project is ultimately looking to bridge the gap between the Agriculture industry and Chemical industry by integrating the whole biomass chain. It has the potential to re-energise bio-mass production, grow the industry and achieve the original dream of biomass sustainability across the whole of Europe. ★

At a glance

Full Project Title

EUROpean multilevel integrated BIOREFinery design for sustainable biomass processing (EuroBioRef)

Project Partners

CNRS • ARKEMA • BORREGAARD • Novozymes A/S • METEX • CRES • HTAS • ISFTA/CERTH • PDC • Danish Technological Institute • TUDO • MERCK • FEUP • RWTH • CIRCC • WSKRZ • OBR PR • SINTEF • SOABE • UMICORE • NYCOMB • Imperial College London • ORGACHIM • ALMA • UWM • OLEON • ECOINT • EUBIA

Contact Details

Project Coordinator, Franck Dumeignil
 UCCS - Unite de Catalyse et de Chimie du Solide - UMR 8181
 Universite Lille Nord de France
 Universite des Sciences et Technologies de Lille - Batiment C3
 59655 Villeneuve d'Ascq Cedex
 T: +33 3204 34538
 E: franck.dumeignil@univ-lille1.fr

Franck Dumeignil (Left)
 Kent Washington (Right)



Project Coordinator

Franck Dumeignil gained his PhD in 1998. He is Professor at USTL and Vice-Director of the Unité de Catalyse et de Chimie du Solide.

Project Manager

Kent Washington is currently completing his PhD in Project Management at the SKEMA business school.



contents

02 Luc Hendrickx
Director of UEAPME
SMEs and innovation

06 Subscriptions
How to get on the
subscriptions list
Become a regular reader

07 Editorial comment
Editor introduces the issue
Believe the climate experts

08 R&D focus
Topical science, and research
related news stories
A round-up of European
innovation

18 Adel El Gammal
Secretary General of EPIA
Plan for European
Photovoltaics

22 George McGavin
A Q&A interview
Famous researcher despairs
at deforestation

26 CICERO
Transport and escalating emissions
Dire implications for climate

28 Ashbridge winner
Winning essay on innovation
Creating value from a low
carbon economy

34 Renewable house
HQ in Brussels for energy
Conversion to renewable
sources - on premises

37 Speech technology
Marcel Wassink, VP at Nuance
New systems for healthcare

40 Ilias Iakovadis
Deputy Head of ICT Health Unit
for the European Commission
eHealth innovations for Europe

**42 New protocols for
intensive care**
Project by Per-Olof Grände
Physiology-based
treatment protocols

**44 Biomechanical
simulations for AAA**
New diagnostic research
Building tools to model
risk for aneurysms

**46 Essential research into
diabetes**
Erik Gylfe and Anders of
Tengholm, Uppsala University
Tackling a difficult disease

**48 MYC: A promising
target for therapy**
New hope for cancer therapy
Research that may hold
important answers

50 CMIAG
Li Bai from Nottingham
University
Medical image analysis

**52 Treating Type-1
diabetes**
Survival for transplanted islets
A new clinical method

**54 Hunting for clues to
Type-2 diabetes**
Erik Renström expands on
his research
Disturbed phasic
insulin release

**56 Micro-RNA's and their
role in diabetes**
Research into Micro-RNA's
Regulating insulin and
glucagon

58 Fighting disease
Paul Dyson argues the case
for a funding issue
Antibiotic research must
continue

60 SERO-TB
Developing a simple test for TB
Improving TB diagnosis

62 The immunity question
Anna Blom's research
Why innate immunity is vital

64 Protective mucus
Study by the University of
Gothenburg
How the colon protects itself

**66 Small molecule
therapeutics and
chemical tools**
Targeted molecule therapies
Potential for drug development

68 DEDOM
Modelling of the
metal-organic interface
Multi-disciplinary research

**70 Wireless sensor
networks**
The greatest invention since
the Internet?
Great possibilities for WSNs

72 EURON
Marie Curie initiative
Neuroscientists network for
progress and careers

74 FLOVIST
Reducing aircraft
noise pollution
Aero-acoustic experiments

76 The art of music
Swedish art-based project
Expanding field of art music

**79 Under the covers of
new art**
Interview with Ole Lutzow-Holm
University of Gothenburg

**82 Supercomputers to
simulate the brain**
Prof Anders Lanser
Understanding brain functions

84 New approach needed for teaching maths and science

Study of why teaching methods are crucial
Changing the attitudes of disinterest and fear

86 Understanding the permafrost

Research from Lund University
Melting permafrost affects climate

89 Climate secrets beneath the sea

Sea-sediment study gives clues to history
Climate indicators research

92 Cycles of the sun

Alex Brandenburg expands on his sun related study
Model of the solar dynamo

94 Accelerated rate of change in the Arctic

Prof Katarina Abrahamsson
Greenhouse gases in biological exchange processes

96 Optimising European Bio-refinery processes

Infrastructure development
Improving chances for biomass as major European fuel

98 INSPIRE

Specialists for world energy market
Improving energy efficiency

100 OTAG

Tracking and tracing cattle
New collar and software system for monitoring livestock

103 Back Issues

Order your copy now
Catch up on previous Projects

104 Sens-it-iv

Alternatives to animal testing
Realising the power and potential of genomics

108 Ethical and accurate testing

Interview with Helma Hermans
Allergen testing strategies

110 Making plastic fantastic

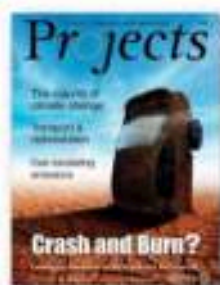
Reducing environmental impact of plastic waste

112 Chemtronics

Chemistry for nanoelectronics
Building nanodevices

114 Nanoscale sets agenda for concrete

We speak to Karen Scrivener
NANOCEM consortium's research



Projects

EDITORIAL

Editorial Director William Davis
wdavis@bpl.uk.com
Editor-in-Chief Richard Forsyth
rforsyth@bpl.uk.com
Editor Patrick Truss
ptruss@bpl.uk.com
Editorial Assistant Tom Spencer

PRODUCTION

Production Manager Ben McCluskey
ben@bpl.uk.com
Design Daniel Hall
dcsign@bpl.uk.com

CIRCULATION

Circulation Manager Karen Norman
knorman@bpl.uk.com

PUBLISHING

CEO Chris Hull
chris@bpl.uk.com
Finance Director Adam Henshaw
adam@bpl.uk.com
Finance Manager Louise Keane
louise@bpl.uk.com
Account Manager Drew Cameron
drew@bpl.uk.com
Account Executive Dan Williams
danw@bpl.uk.com
Account Executive Sam Davis
sdavis@bpl.uk.com
Account Executive James Barsby
jbarsby@bpl.uk.com
Account Executive Adelle Kehoe
adelle@bpl.uk.com
Commercial Director Don Weerasiri
don@bpl.uk.com

ABC application approved January 2009

British Publishers
media with influence



British Publishers Ltd

The Old Chapel,
Fairview Drive,
Redland,
Bristol BS8 6PH,
United Kingdom

t: +44 (0)1179 200 034
f: +44 (0)1179 166 557
e: info@bpl.uk.com
www.britishpublishers.com

© British Publishers Ltd December 2009
ISSN 2040-7335



recycle

When you have finished with this magazine please recycle it