# Silver Jubilee Issue



#### 25th ISSUE December 2008

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# The first PyNe newsletter was published in March 1996.

Since then a further 23 issues have been published as output from the integrated activity of the European commission network projects including ThermoNet and ThermalNet and the IEA Bioenergy Pyrolysis Task. Some of the highlights from these earlier issues are included as a reminder of some of the people and activities that PyNe has supported since 1996. (Page 5 and 6).

A proposal has been put to IEA Bioenergy for continuation of this task which we hope will thrive and continue to provide a global focus of fast pyrolysis of biomass for heat, power, chemicals, biofuels and biorefineries (page 2)



## **PyNe continuation IEA Bioenergy Task 34 Pyrolysis**

#### By Doug Elliott, PNNL USA

Task 34 with Operating Agent EU and Task Leadership of Tony Bridgwater is currently scheduled to conclude at the end of 2008. A proposal to continue the task has been presented and considered at ExCo 62.

The Task will be reorganised under a new Operating Agent, the US, and Doug Elliott has been designated to be the new Task Leader. The Task has been joined for 2009 by Australia, Germany, Finland and the US with the UK expected to join by the end of the year. Canada will observe and participate in the task for 2009 with potential to participate in the following triennium.

The work plan for the task for 2009 includes a primary effort of developing the work plan for the triennium 2010-2012 to put the Task back on the schedule with the other Bioenergy Tasks. During the year the participants will also develop country reports on the state of technology and R&D in biomass pyrolysis in their respective countries.

Areas of interest of the participating countries will provide the basis for the work plan for the next triennium. Topics identified are expected to emphasise commercialisation issues. for example, standards and specifications development with the specific subtopics of ASTM standards development and implementation and registration of bio-oil within the EU REACH program. Char utilisation and

lignin related effects

are also of interest, especially in light of biorefinery

applications. An expected deliverable is a published document on the State of the Art of bio-oil production and utilisation including a pyrolysis process and bio-oil database .

#### Contact

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### **PyNe** - where it started, how it evolved and where it could go

#### By Tony Bridgwater, Bioenergy Research Group, Aston University, UK

PyNe was first started in 1996 as separate activities supported by IEA Bioenergy as PYRA and the European Commission as PyNE. These were merged into PyNe after the initial three years. This issue contains highlights from the past 12 years through ThermoNet and most recently ThermalNet. During these 12 years, many meetings have been held around the world and many enthusiasts have contributed to the work and outputs, including 3 books dedicated to fast pyrolysis and international conferences community to work together to help in 1996, 2000 and 2004 with refereed proceedings. Some of the milestones are summarised on the front cover.

PvNe could not have been as successful as it has been without the enthusiastic and dedicated support of the members and I appreciate all the efforts so many have put into making PyNe successful, both through the European Commission and IEA Bioenergy.

Fast pyrolysis offers enormous potential benefits for fuels, chemicals, heat and power and PyNe offers an opportunity for the international achieve this potential. I very much hope that PyNe will prosper under Doug's leadership.

#### Contact

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# The Carbon Trust 'Pyrolysis Challenge'

#### By Robert Trezona, The Carbon Trust, London UK

The 'Pyrolysis Challenge' aims to invest £7-14m into large, commerciallyfocussed research and development projects in advanced biofuels over the next 3-5 years.

As part of its mission to accelerate the move to a low carbon economy, the Carbon Trust has identified pyrolysis oil from sustainable sources of biomass as having the potential to produce low-cost fuels with low system greenhouse gas (GHG) emissions - if it can be upgraded and integrated into the existing transport fuels infrastructure, such as refinery complexes. However, the properties of the oil produced from current fast pyrolysis processes are far from suitable for this direct integration. The Pyrolysis Challenge aims to produce oil with the properties required for integration either by modifying the pyrolysis process to produce better quality oil directly; or upgrading the oil before or at the refinery.

The Carbon Trust is therefore planning to work with a wide range of partners, from across the biofuel value chain, to deliver a breakthrough in this area. Partners include refinery technology developers, catalyst developers and research organisations involved in the study of pyrolysis processes, bioenergy and relevant related disciplines.

Through applied research and development, the expected outcomes of the Pyrolysis Challenge include:

- Proof of scientific and engineering principle for a novel process for low-cost and low GHG intensity upgrading of biomass pyrolysis oil
- Complete characterisation of the upgraded oil, including details of characterisation processes and the impact of different feedstocks
- An assessment of the likely commercial and environmental value of any associated co-products and processes for their exploitation
- Development of a large labscale or small industrial demonstration unit. Modelling of the full scale process economics, whole system GHG intensity and key technical parameters

Three consortia have been progressed to commercial negotiation and technical due diligence as below. The Carbon Trust intends to invest in one or more of these projects, and work is expected to start by mid 2009.

Continued .....





# Pyrolysis Challenge continued

#### Lead organisation: Axion Consulting

Contact: Roger Morton, rmorton@axionconsulting.co.uk

Partner organisations: Biffa, Conversion & Resource Evaluation, Biomass Engineering, Oxford Catalysts, Greenergy International, Catal, Carbolea Research Group, Aquafuels, Enviros, University of Limerick (Ireland), Lund University (Sweden), SEKAB (Sweden) and DeSmet Ballestra, (Italy).

**Proposed work:** Feedstock sourced from common organic waste streams will first be pretreated by a range of size reduction techniques. hydrolysed and fermented to produce ethanol (from the primary cellulose fractions) and a lignin-rich residue. This residue, which will have reduced oxygen content, will then be pyrolysed to oil in a gas phase fluid-bed pyrolysis unit. The resulting pyrolysis oil will be upgraded by water removal, a range of catalytic treatments for the esterification of acids, and partial hydrogenation. The properties of the resulting intermediate will be adjusted by additives to meet the requirements for blending into EN590 diesel.

#### Lead Organisation: Centre for Process Innovation (CPI)

Contact: Dr Graham Hillier, Graham.Hillier@uk-cpi.com

Partner organisations: Johnson Matthey, Sonhoe Energy Holdings, North East Biofuels, Graphite Resources, Tees Energy, Wilton Engineering Services, Wellman International, Imperial College, University of Teesside, Newcastle University, Aston University

#### Proposed work:

The consortium aims to produce fuels from biomass by upgrading pyrolysis oils so they can be blended into road fuels. A range of separation and catalytic processes will be investigated and tested at laboratory and pilot plant scales using several biomass sources. The project includes engineering, economic and systems engineering studies to optimise economic and greenhouse gas performance. The programme is designed to produce knowledge and hard data to underpin future scale-up and commercialisation and several offers to test the resulting fuels have already been received.

#### Lead Organisation: York Green Chemistry Centre

Contact: Dr Ashley Wilson, ajw7@york.ac.uk

Partner organisations: University of Leeds, Rotawave, Brocklesby Double-Green, Drax Power, UK Coal (Harworth Estates), Northern Foods and Renewable Energy Growers, and Conoco Phillips (Immingham).

#### Proposed work:

York has demonstrated highly controllable low temperature, microwave-activated pyrolysis process at the laboratory scale. Rotawave will build a semiscale microwave processor in a bespoke demonstrator facility located on an ex UK Coal site south of York. The new facility will be used to evaluate the effect of both physical processing parameters and chemical characteristics of the feedstock, on the properties of the resulting oil. The most promising oils will be evaluated for addition to process flows in a conventional oil refinery and for blending with biodiesel.





#### **UOP and Ensyn** to Form Joint Venture to Offer Second-Generation Biomass Technology

UOP LLC, a Honeywell company, signed a letter of intent with Ensyn Corp on 10th September 2008 to form a joint venture to offer technology and equipment to convert second-generation biomass into oil for power generation, heating fuel and for conversion into transportation fuels. UOP and Ensyn expect to finalize terms for the venture in the 4th quarter 2008.

The joint venture company will offer Ensyn's proven Rapid Thermal Processing (RTP) technology, which converts second-generation biomass like forest and agricultural wastes to bio-oil, also known as pyrolysis oil, for use in power and heating applications. The joint venture will also accelerate research and development efforts to commercialise nextgeneration technology to re-fine the bio-oil into transport fuels such as green gasoline, green diesel and green jet fuel.

"The widespread use of residual biomass — a clean, sustainable source of energy is a major step forward to reducing our carbon footprint and broadening our energy resources," said UOP Director of Renewable Energy and Chemicals Jennifer Holmgren. "We are confident that the combined resources of UOP and Ensyn will allow this venture to commercialise viable solutions for converting biomass to drop-in transportation fuels in the next three years."

RTP is a rapid thermal process in which biomass such as wood chips or straw is rapidly heated at ambient pressure to generate high yields of a light, pourable liquid bio-oil, which can be burned for energy in industrial burners and furnaces. This biooil also has the potential of being refined into transportation fuels.

"We are very pleased to align ourselves with UOP in order to jointly develop applications for transport fuels and to help us market our unique technology to the transport fuels sector as well as the heating and power markets," said Ensyn Chairman and CEO Dr. Robert Graham. "We believe this alliance will generate multiple commercial breakthroughs in the biomass-to -energy world."



The technology will convert cellulosic biomass to bio-oil for Industrial heating, power generation and transportation fuels.



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#### UOP and Ensyn Joint Venture continued

**UOP** launched its Renewable Energy and Chemicals business in late 2006. Since then, UOP has commercialised the UOP/Eni Ecofining process to produce green diesel fuel from biological feedstocks and has also developed process technology to produce renewable jet fuel. UOP has ongoing research efforts in biofuels, with specific focus on second-generation feedstocks working with organisations like the US Department of Energy (DOE) and DOE's National Renewable Energy Lab and Pacific Northwest National Lab.

Ensyn commercialised its RTP technology in the 1980s and has over 18 years of commercial experience producing bio-oil for various natural chemical and fuel products.

Ensyn currently operates seven commercial biomass processing plants in the US and Canada, producing numerous natural chemicals and energy products.

UOP LLC, headquartered in Des Plaines, Illinois, USA, is a leading international supplier and licensor of process technology, catalysts, adsorbents, process plants, and consulting services to the petroleum refining, petrochemical, and gas processing industries.

UOP is a wholly-owned subsidiary of Honeywell International, Inc. and is part of Honeywell's Speciality Materials strategic business group. For more information go to http://www.uop.com

Honeywell International is a US\$38 billion diversified technology and manufacturing leader, serving customers worldwide with aerospace products and services; control technologies for buildings, homes and industry; automotive products; turbochargers; and speciality materials. Based in Morris Township, N.J., Honeywell's shares are traded on the New York, London and Chicago Stock Exchanges. For additional information please visit http:// www.honeywell.com

Ensyn RTP unit in Renfrew, Ontario, Canada





# A Look Back at Previous Issues and the Evolution of PyNe



#### Issue 1. March 1996

#### The International Energy Agency Bioenergy Agreement & PYRA

The International Energy Agency has around 35 different implementing

agreements, one of which is the Bioenergy Agreement. This Agreement covers biomass production and harvesting; biomass conversion; and MSW management.

There are six activities in the biomass conversion task that are reviewing pyrolysis, gasification, combustion, biotechnology, integrated Bioenergy systems and system studies. The pyrolysis activity, known as PyRA, had its first meeting in May 1995. The meeting was to begin to establish standards for pyrolysis liquids and their properties for different applications. The second meeting in November 1995 was to establish a sound basis for collaboration with PvNe.

Progress in this activity will be reported through this newsletter.

#### Specialist Subject Groups in PyNe

Four specialist groups have been convened to study selected topics in more detail. The special topics are:

- 1. Pyrolysis Technology
- 2. Upgrading
- 3. Characterisation and Analysis
- 4. Applications

Interim summary reports for two of these groups are provided below to show there scope and direction

#### Upgrading



Rosanna Maggi: Group Convenor

#### Rosanna Maggi: Group Convenor

Upgrading covers any method of improving the crude bio-oil produced from fast pyrolysis so that it may be readily used in the application.

It is important to consider how much upgrading and what type is required for each application. It is essential to identify the possible customer and set a realistic price for the upgraded liquid.

#### Characterisation and Analysis



▲ Dietrich Meier: Group Convenor

#### Dietrich Meier: Group Convenor

#### Feedstocks

Knowledge about the properties of the feedstock for pyrolysis is important as they have an impact on the performance of the process and the product quality.

#### **Pyrolysis Products**

There are three main products from the pyrolysis of woody biomass:

- Liquid (incl. water)
- Char
- Gas

The interest of the group is basically focused on the characterisation and analysis of the liquid fraction which is the most important product from fast pyrolysis both in terms of yield and potential applications.



## Issue 10. December 2000

#### Progress in Thermochemical Biomass Conversion Conference

The Progress in Thermochemical Biomass Conversion Conference (PITBC) was held in Tyrol, Austria from 17 to 22 September 2000. It was the fifth in the series of these meetings organised by Tony Bridgwater.

The conference celebrated the progress made in thermal biomass conversion systems. Formal presentations, posters, workshops and discussions covering Combustion, Gasification and Pyrolysis were received by 165 delegates from 29 countries around the world.

A collection of papers from the 126 presented at the conference, 40% of which were on Pyrolysis, were published by Blackwell Science early in 2001.

#### The Future of PyNe

The proposal to continue PyNe was favourably evaluated by the EC. IEA Bioenergy also agreed to continue their support providing PyNe with all the benefits of a global network.



Kyriakos Maniatis, Vice Chairman of IEA Bioenergy and Operating Agent for PyNe.





The Scientific Committee for the conference



Tony Bridgwater proudly displaying his congratulatory plaque from the PITBC Scientific Committee and members of PyNe in appreciation of his contribution to Thermal Biomass Conversion.

#### Issue 20. July 2006

#### **Lignin Round Robin**

14 laboratories around the world began work on a Round Robin exercise on lignin pyrolysis employing both process scale testing and fundamental testing as available at individual laboratories. Potential laboratory participants and test types are listed below. The results will be published in 2009.

Laboratory	Process
Institut Francais de Petrol	Analytical, TGA
Aston University	Fluid bed, TGA,
	Py-GCMS
Forschungszentrum	Fluid bed,
Karlsruhe	Screw feed
ECN	Fluid bed
University Napoli	Batch
University Twente	Fluid bed
USDA-ERRC	Fluid bed, TGA
CIRAD	Analytical
BFHamburg	Fluid bed, EF
VTT	Py-GC-AED
PNNL	Analytical, TGA
NREL	Entrained flow





## Registration of Fast Pyrolysis Liquids under REACH

#### By Anja Oasmaa, VTT, P.O. Box 1000, 02044 VTT, Finland.



REACH, the new EU chemicals regulation requires that chemical substances on their own, in preparations and those which are intentionally released from articles have to be registered to the European Chemicals Agency (ECHA).

The regulation applies to substances manufactured in or imported to the EU in annual quantities of one tonne or more per company, unless the regulation indicates otherwise. The chemicals currently on the EU market which meet the definition of phase-in substances had to be preregistered before 1st December 2008. In EU-Biotox project (completed in 2005) led by CIRAD (France) and sponsored by European Commission DG TREN (EINECS number: 302-678-6. CAS number: 94114-43-9) data was created for registration of fast pyrolysis liquids under REACH. Detailed data can be found at http://

#### www.pyne.co.uk/?

<u>id=29</u>. Several companies ha ve already done the pre-registration.

#### Introduction

The European Chemicals Agency (ECHA) located in Helsinki, Finland will manage the registration,

evaluation, authorisation and restriction processes for chemical substances to ensure consistency across the European Union. These REACH processes are designed to provide additional information on chemicals to ensure their safe use and to ensure competitiveness of the European industry. The agency will take the best available scientific and technical data and socio-economic information into account before making any decisions. By assessing and approving testing proposals, the agency will be able to minimise animal testing.

#### The ECHA website

www.echa.europa.eu/

home\_en.asp is a single point of entry for all information on REACH. The website provides information access to technical guidance, frequently asked questions (FAQ's), software tools and helpdesks. You will also find the latest updates on guidance, tools and data on chemicals and the regulation.

#### SIEF—Subject Information Exchange Forum

A SIEF will be formed for each pre-registered substance with the same identity. The participants in a SIEF are all pre -registrants. A SIEF does not have a prescribed legal form but is a forum to share data and other information on a given substance. Participants on a SIEF are free to organise themselves in consortia or other forms of agreements as they see fit to carry out their obligations under REACH.

After January 1st 2009 a SIEF is formed when pre-registrants have agreed in a pre-SIEF that they manufacture or import the same substance. SIEF members need to nominate a 'Lead Registrant'. They will share and assess data and prepare common parts of the registration (joint submission). Compensation for sharing data is agreed among the respective SIEF members.

Information was mainly collected from www.echa.europa.eu/



# BWNG

# Registration of Fast Pyrolysis Liquids under REACH continued

#### Timeline

The planned implementation plan is summarised in the diagram.

#### What are the timelines? I June 2007 Entry into force I June 2008 I June 2008 Entry into operation Pre-registration of : >1 tonne/year CMRs >100 tonnes/year >100 tonnes/year

# **Diary of Events**

Compiled by Sara Burrowes, Aston University, UK

#### **Biorefinica 2009**

Date: 27-28th January 2009 Venue: DBU Osnabruck, Germany Website: www.biorefinica.de Registration by fax: +49 (0)541/9633-990

#### **CEP (Clean Energy Power) 09**

Date: 29th-31st January 2009 Venue: Neue Messe Stuttgart, Germany Organiser: RECCO GmbH Website: www.cep-expo.de/index.php? id=7&L=1 Email: redaction@energie-server.de Tel: +49 (0)7121 30 16 -0 Fax: +49 (0)7121 30 16 -100

#### 2nd Biomass World 2009

Date: 9-10th February 2009 Venue: Jakarta Website: www.cmtevents.com Contact: Mimi Berro Tel: +65 634 69145 Fax: +65 634 55928

#### **European Pellet Conference**

Date: 25th-26th February 2009 Venue: Stadthalle Wels, Austria Website: www.wsed.at Email: office@esv.or.at

#### **Ignition 2009**

Date: 11-12th March 2009 Venue: The Sage, Gateshead, UK Website: www.ignition09.co.uk/signup

#### Energy from Waste and Biomass

Date: 11th March 2009 Venue: Institute of Materials, Minerals and Mining, London, UK Website: www.ion3.org/events/waste Contact: Dawn Bonfield Email: dawn.bonfield@ion3.org Tel: +44 (0)1438 821 740

#### Building the Hydrogen and Fuel Cells Future

Date: 25th March 2009 Venue: National Exhibition Centre, Birmingham, UK Website: www.climate-changesolutions.co.uk Contact: Tatiana Panteli Email: Tatiana@climate-changesolutions.co.uk Asia—Pacific Power and Energy Engineering Conference (APPEEC

2009) Date: 28th-30th March 2009 Venue: Wuhan, China Website: www.srpublishing.org/ appeec2009submission/website/ appeec/index.aspx Email: apeec@srpublishing.org

#### **Bois Energie 2009**

Date: 2-5 April 2009 Venue: Lons-le-Saunier, France Website: www.boisenergie.com Contact: Gloria Miconi Email: gloriamiconi@bees.biz Tel: 0033 (0)3 8486 8932 Fax: 0033 (0)3 8443 2403



#### International Biomass Conference and Trade Show

Date: 28th-30th April 2009 Venue: Oregon Convention Centre, Portland, Oregon, USA Website: www.biomassconference.com

#### World Renewable Energy Congress 2009—Asia Region

Date: 19th-22nd May 2009 Venue: BITEC Exhibition Centre, Bangkok, Thailand Website: www.thai-exhibition.com/ wrec 2009asia/default.asp

#### Waste-Tech 2009

Date: 2nd-5th June 2009 Venue: International Exhibition Centre Crocus Expo, Moscow, Russia Website: www.waste-tech.ru Contact: Dr. Sergey Malygin, Waste-Tech Team, PO Box 105, Moscow, 105062, Russia Tel: +7 495 225 5986 Email: waste-tech@sibico.com

#### 17th European Biomass Conference & Exhibition from Research to Industry and Markets

Date: 29th June-3rd July 2009 Venue: The Congress Centre of Hamburg, Germany Website: www.conferencebiomass.com Contact: Ms Anna Andretta Email: papers@etaflorence.it