

#### IN THIS ISSUE:

Task 39 Special Session Overview .....	2
Summary of the 27 <sup>th</sup> Symposium.....	3
Brazilian Biofuels.....	4
Future Workshops & Symposia.....	5
Contact Info .....	7

#### EDITOR'S NOTES

Welcome to the thirteenth issue of the IEA Bioenergy Task 39 newsletter. In this issue, we provide you with a summary of our recent Special Session at the 27<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals, held in Denver CO on May 2. The list of panelists, and a summary of the session by topic, is found on page 2.

We also are including a short article by Dr. José Roberto Moreira of the National Centre of Biomass, Brazil, describing the bioethanol situation in Brazil. Dr. Moreira's contribution is greatly appreciated.

As always, we encourage all IEA Bioenergy Task members to make use of this newsletter, to contribute content, and to suggest changes that can further improve the document. We look forward to your future contributions! - [Warren Mabee](#)

#### FROM THE TASK LEADER

I am happy to report to you that we have made great progress in IEA Bioenergy, Task 39, Liquid Biofuels, over the past few months. In the last few weeks, as will be described in more detail within the newsletter, with the help of our colleagues at NREL, we were able to organize a very successful Special Session at the 27<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Denver. We have also commissioned three reports in the areas of biofuel policy and biodiesel development which I think will add significantly to our understanding of both issues. More information on these reports will be available in the next newsletter. Over the next few months, Task 39 will continue to be very active, hosting an international biotechnology symposium at the IUFRO 2005 Forestry Congress in Brisbane, Australia this August, as well as our IEA Task 39 Workshop in Lund, Sweden in October.

I would like to extend my personal thanks to Dr. Bärbel Hahn-Hägerdal and Dr. Guido Zacchi for their efforts in helping organize our Task 39 workshop which will be held in October, 2005, in Lund, Sweden. We are now finalizing the location and program of the meeting, and have put together a very exciting list of speakers for the workshop.

We are always looking for organizers, presenters and writers and all it takes to get started is an email to one of the Task executive members listed later in this article.

Best wishes from Vancouver! - [Jack Saddler](#)

#### UPCOMING MEETINGS

IEA Bioenergy will be hosting a session at the IUFRO (International Union of Forest Research Organizations) meeting, to be held in Brisbane, Australia from August 8 to 13, 2005. More details about this meeting, including registration and accommodation costs, can be found on the conference website at <http://www.iufro2005.com/>.

The next IEA Task 39 Workshop will be held October 12 to 14, 2005, in Lund, Sweden. This workshop is being developed as a short course on bioconversion, and will be organized into eight sessions over two days, with a restricted list of invited speakers or faculty (15) and a limited number of students attending (20), primarily from Sweden, Finland, Denmark, the Netherlands and the UK. If you are interested in participating, please contact me or refer to the attached one-page poster on the last page of this newsletter. Sessions will cover a range of liquid biofuels issues, particularly from the perspectives of policy, marketing and commercialization. The workshop will also highlight technical issues related to the lignocellulosics-to-ethanol process.

## IEA TASK 39 SPECIAL SESSION DENVER, CO, USA – 2 MAY 2005

[Warren Mabee](#)

An IEA Special Session, organized by Jack Saddler and Warren Mabee of IEA Bioenergy Task 39, was part of the 27th Symposium on Biotechnology for Fuels and Chemicals and held on May 2 2005. The panelists were each asked to provide a 5- to 10-minute presentation considering the question 'What is the key barrier to commercializing biofuels?' Long-time readers of this newsletter will recognize this question as one raised at our previous workshop, held in Kyoto Japan and described in Issue 12.

We assembled a number of leaders in biofuel development from both academia and industry. Academic participants included Bärbel Hahn-Hägerdal (University of Lund), Shiro Saka (Kyoto University), Bernard A. Prior (University of Stellenbosch), and Birgitte K. Ahring (BioCentrum-DTU). Industry representatives on the panel included Don O'Connor ((S&T)2), Quang Nguyen (Abengoa Bioenergy), Colin Mitchinson (Genencor), Joel Cherry (Novozymes) and Tony Sidwell (British Sugar). Regrets were received from Manfred Wörgetter (BLT Wieselburg) and José Roberto Moreira (National Centre of Biomass, Brazil).

Three themes were consistently raised by the speakers, including the importance of national programs to support research, development and demonstration; the continuing technical improvement required to ensure commercial success, and commercialization issues that have become relevant with the increasing importance of biofuels.

**National programs** were described for Sweden, Japan, South Africa, Denmark, and Canada. Sweden has built a unique R&D platform for the development of ethanol as a domestic renewable liquid fuel, ranging from dedicated research programs at the University of Lund, to a complete process development unit (PDU) with a scale of 10-100 liters in different unit operations, to an complete and integrated pilot plant with capacity of 2 tons of dry substance equivalent to 500 l ethanol per 24 hours. Japan has used the Kyoto Protocol to drive the creation of targets and policies on biofuels. A pilot biodiesel plant exists and operates in Kyoto City. South Africa recently published a white paper that addresses the national need to implement future renewable energy strategies; the government has recently attempted to stimulate biofuel production by reducing the fuel levy by 30%. No coordinated national bioenergy research program currently exists at present, although much interest exists. Denmark has seen increased interest, particularly in bioethanol during recent years. New ideas have been developed in Denmark such as the Danish Bioethanol Concept developed by DTU and Risø, and the VEnzin Platform developed by Elsam, both of which are now being piloted. Large-scale commercialization of

lignocellulose-based bioethanol is awaiting results from these tests. Canada has four primary and two secondary barriers to the development of an ethanol market in Canada. These include high ethanol price, inefficient market organization, finance risk and business risk (primary), as well as price distortion and excessive/inefficient regulation (secondary).

It was noted that a variety of **technical bottlenecks** remain, particularly for bioethanol production from lignocellulosics. In the future, we will require continued research in the areas of (a) pretreatment, (b) enzymatic hydrolysis, (c) microbial conversion of biomass component sugars to ethanol and/or to other pathway products, (d) process integration, and (e) feedstock-process interactions.

**Commercialization issues** described include market barriers, the need for biofuel-friendly market mechanisms and demonstration plants, and the need for inexpensive enzymes. The issues around creating markets for energy technologies will be dealt with in the private sector, while governments will work in partnership with market actors to ensure there are real opportunities for technologies to make the difficult transition from laboratory to market.

British Sugar described a theoretical Renewable Fuel Transport Obligation that might be useful in the UK as a means of minimizing regulatory burdens and sustainability risks while providing greater market certainty for producers. Abengoa is developing biomass ethanol production technologies, and are building pilot facilities in York, NE and a commercial demonstration plant in Spain. Genencor and Novozymes described work carried out with the DOE for the past 4-5 years to develop cost-effective enzymes for the conversion of lignocellulosics, and achieving a 30-fold reduction in the cost of enzymes. This makes total lignocellulosic ethanol costs about 1.5x the cost of starch-based ethanol.

We are very happy to report that the IEA Special Session had a record 200+ attendees and drew a very enthusiastic response from the crowd, indicating the importance and relevance of the topic. In the general discussion, the issue of genetically modified organisms was raised with reference to on-site enzyme production. The cost of enzymes was questioned and the future of dilute acid hydrolysis in biomass-to-ethanol was discussed. Our success was such that, due to time constraints, the session had to be closed before all audience members could ask their questions. We would like to thank members of the panel, and the audience, for their contributions and look forward to further discussion!

Please contact the individual panel members if you would like to obtain copies of their presentations.

## **SUMMARY - 27<sup>TH</sup> SYMPOSIUM ON BIOTECHNOLOGY FOR FUELS AND CHEMICALS DENVER, CO, USA – 1-4 MAY 2005**

[Warren Mabee](#)

The most recent symposium, held in Denver at the beginning of May, was marked by record attendance and by a very large number of high-quality presentations. The sessions included a number of technical discussions on aspects of bioconversion, but also attempted to address some of the larger, non-technical challenges that biofuels must meet in coming years.

Session 1A examined feedstock supply and logistics. Presentations ranged from assessments of biomass residue availability, to mechanisms for energy crop production. Several speakers focused on the chemical composition of available biomass, and the potential yields of biofuel from this material. Finally, the economics of biomass were considered and modeled in the context of biofuel production. The extreme importance of biomass availability to process economics was highlighted.

Session 1B considered issues around enzymatic catalysis and engineering, primarily as it relates to lignocellulose-to-ethanol production. This session provided an excellent overview of the dramatic improvements that have been made over the last few years in reducing enzyme costs through innovative application and process streamlining. Industry-government partnerships were shown to be a very effective mechanism to spark research success.

Session 2, held on the morning of May 2, examined the current status of biorefineries and their potential in the future. Several processes were discussed in this section, leading to fuels including bioethanol and biodiesel. Economic considerations regarding biorefinery operation and success were considered.

Session 3A examined plant biotechnology and feedstock genomics, and was a forum for addressing the use of new gene-based tools, and potentially GM plants and trees, in a biofuel strategy. A large amount of fundamental research in this area has provided us with a number of new tools and increased understanding of the potential for biomass to fuel pathways.

Session 3B examined pretreatment and hydrolysis issues, and served as an update on technical issues around bioethanol production. Issues including biomass recalcitrance, enzyme reactivity, enzyme cocktail composition, hydrothermal treatments, steam-explosion pretreatment, and acid hydrolysis were considered.

Session 4 examined industrial biobased products. The potential of several products, including succinic acid and butanol, cement additives, and polyhydroxyalkanoate (PHA) bioplastics, was considered. The importance of co-products to any biofuel strategy is well documented, and is reflected in the growing knowledge base for a wide variety of potential value-added outputs.

In Session 5, microbial catalysis and metabolic engineering was examined. A number of pathways for fermentation of hydrolyzed streams were considered. Gene-based tools for improving these pathways were discussed, and the potential of process simplification for biofuel production was presented.

Session 6, a review of bioprocess research and development, continued the dialogue around process platform development and the inherent potential related to different bioprocessing approaches.

Two Special Topics were considered in the afternoon of May 2. The IEA Special Session (Special Topic A) has been discussed on previous pages. Special Topic B addressed the importance of changing attitudes about biomass as a sustainable energy supply. This session considered non-technical, political goals including the need for energy security and improved environmental performance. The inclusion of this special topic indicated the rising importance of integration between policy development, technical research and commercial strategies to achieve a successful biofuel economy.

## BIOETHANOL SITUATION IN BRAZIL

*José Roberto Moreira*

*Brazilian Reference Center on Biomass - CENBIO*

The National Alcohol Program was implemented in Brazil in 1975 with the purpose to produce large amount of ethanol from sugarcane for use as an automotive fuel displacing gasoline. At that time its major motivations were the large country expenditures in hard currency for oil importation and the surplus on sugarcane plantation.

The Program has performed quite satisfactory for almost 30 years. Technical and economic barriers were removed in very different time scales. Technical progress allowed the design of neat alcohol cars as early as 1979 and the use of a 10% alcohol blend on gasoline already in 1975. The more challenging neat alcohol car achieved high drivability around 1983 when problems caused by ethanol corrosion of some few traditional auto parts were properly fixed. The economic barrier required much longer time and only by 1999 all government subsidies were eliminated and alcohol had to compete commercially with gasoline. During 24 years ethanol price showed a continuous decline mainly through the "learning-by-doing" process. But even today, with neat ethanol prices commercialized in service station at 55 to 65% of blended gasoline price with 25% alcohol, different taxation regime from the federal government is a useful driver for pushing consumers interest in the product. Gasoline, as others fossil fuels, collects federal and state taxes, but it receives a higher charge than renewable, including neat ethanol. This higher tax represents 20% of the final price of gasoline and if not present would set neat ethanol prices at around 75% of the price of gasoline. Considering the lower efficiency (25%) of the same volume of alcohol compared with gasoline the conclusion is that both fuels would have the same price for the final user.

Nevertheless, present expectation is that alcohol should continue to be consumed in expanding quantities since the taxation model should not be changed, the neat ethanol car has excellent drivability, the issue of global emissions is well divulged and debated in Brazilian society and the large number of employments created in rural areas is well appreciated by society.

On top of these advantages another important motivation was the development of low-cost flexible fuel vehicles for the Brazilian market. Its cost is so low that several auto manufacturers launched the new model, which has the capability to use neat ethanol, gasoline (which has a 25% ethanol blend) and any combination of both, at the same price as the exclusive gasoline or neat ethanol models. This kind of technology was very much appreciated by car buyers that were always concerned with price fluctuation of gasoline and ethanol. In 2004, twenty five percent of all cars sales were due to flexible fuels cars. For 2005 almost all car manufacturers assembling cars in Brazil will offer the flexible fuel model. This technology success is understood as a significant push for the Brazilian car industry to develop new technologies, which may open even further the car exportation market.

Other advantages should also be commented. One is the significant cost reduction observed in the sugar industry, since almost all ethanol producers transform sugarcane in sugar and ethanol. Brazil has been the leading sugar exportation country since the year 2000 and has the lowest productions cost for this product. Electricity cogeneration in sugar/alcohol mills is becoming very common and is being performed by some 20 sugar mills. The technology is quite interesting since surplus thermoelectricity is generated using sugarcane residues, which were already being consumed to produce heat and electricity for the mill operation. Such renewable electricity is already commercial, but with a new program of the government it should be responsible for the generation of 1400MW by 2006, involving another 20 new participants. Future expectation is far brighter since there are more than 300 sugar/ethanol mills in operation and, in principle, all can be electricity suppliers.

## FUTURE WORKSHOPS/SYMPOSIA

### **Symbios: 2<sup>nd</sup>-Generation Automotive Biofuels**

May 18-20, 2005  
Stockholm, Sweden  
<http://www.ecotraffic.se>

### **2005 World Renewable Energy Congress**

May 22-27, 2005  
Aberdeen, Scotland  
<http://wrec2005aberdeen.co.uk/>

### **WasteTech – 4<sup>th</sup> International Trade Fair and Congress on Waste Management**

May 31, 2005 - June 3, 2005  
Moscow, Russian Federation  
<http://www.sibico.com/waste-tech/2005>

### **3<sup>rd</sup> Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems**

June 5-10, 2005  
Dubrovnik, Croatia  
<http://www.dubrovnik2005.fsb.hr/>

### **ENGVA Annual Conference**

June 8-12, 2005  
Bolzano, Italy  
<http://www.engva.org/>

### **A Profitable Environment for NGVs**

June 8-12, 2005  
Italy  
<http://www.engva.net/bolzano2005/>

### **15<sup>th</sup> Annual EPAC Ethanol Conference**

June 12-14, 2005  
Cody, WY  
[www.ethanolmt.org](http://www.ethanolmt.org)

### **Renewable Energy Finance Asia**

June 15-16, 2005  
Hong Kong  
<http://www.greenpowerconferences.com>

### **BIO 2005 Annual International Convention**

June 19-22, 2005  
Philadelphia, PA  
<http://www.bio.org/events/2005/>

### **21<sup>st</sup> Annual Int. Fuel Ethanol Workshop & Expo**

Kansas City Marriott Downtown Hotel & Kansas City Convention Center  
June 28-July 1, 2005  
<http://www.fuelethanolworkshop.com/>

### **Non-CO<sub>2</sub> Greenhouse Gases (NCGG-4)**

Utrecht, The Netherlands  
Jul. 4 - 2005 to Jul. 6 - 2005  
<http://www.milieukundigen.nl/pages/ncgg4/>

### **1<sup>st</sup> International Biorefinery Workshop**

July 20-21, 2005  
Washington, DC  
[www.biorefineryworkshop.com](http://www.biorefineryworkshop.com)  
**Energy 2005**

August 14, 2005  
Long Beach, CA  
[www.energy2005.ee.doe.gov/](http://www.energy2005.ee.doe.gov/)

### **18<sup>th</sup> Annual Ethanol Conference & Trade Show**

August 16-18, 2005  
Omaha, Nebraska – Qwest Center Omaha  
[www.ethanol.org](http://www.ethanol.org)

### **International Conference and Trade Fair for Hydrogen and Fuel Cell Technologies**

Aug. 31 - 2005 to Sep. 1 - 2005  
Hamburg, Germany  
[http://www.hamburg-messe.de/h2expo/h2\\_en/start\\_main.php](http://www.hamburg-messe.de/h2expo/h2_en/start_main.php)

### **Green Power Central and Eastern Europe**

September 7-9, 2005  
Prague  
<http://www.greenpowerconferences.com/events/GreenPowerCEE.htm>

### **Bioenergy 2005 in Wood Industry: International Conference and Exhibition**

September 12-15, 2005  
Jyväskylä, Finland  
<http://www.finbioenergy.fi>

### **Eastern Biofuels Conference & Expo**

September 13-15, 2005  
Warsaw, Poland  
[www.renewableenergyaccess.com/rea/events](http://www.renewableenergyaccess.com/rea/events)

### **HolzEnergie 2005**

September 22-25, 2005  
Augsburg, Germany  
[www.ihe-woodenergy.com](http://www.ihe-woodenergy.com)

### **RENEXPO 2005**

Sep. 22-25, 2005  
Augsburg, Germany  
[www.renexpo.de](http://www.renexpo.de)

### **ISAF XV: 15<sup>th</sup> Int'l Symposium on Alcohol Fuels**

September 26-28, 2005  
San Diego, CA  
[www.eri.ucr.edu](http://www.eri.ucr.edu)

### **14<sup>th</sup> European Conference and Exhibition: Biomass for Energy, Industry and Climate**

October 17-21, 2005  
Paris, France  
[http://www.conference-biomass.com/Biomass2005/conference\\_Welcome.asp](http://www.conference-biomass.com/Biomass2005/conference_Welcome.asp)

### **Bioenergy 2005**

Oct. 25 - 2005 to Oct. 27 - 2005  
Trondheim  
[www.bioenergy2005.no](http://www.bioenergy2005.no)

**Eurolipids: Int'l Trade Fair for Fats & Oil**

November 2-4, 2005

Messe Frankfurt, Germany

<http://www.mfa.de>**Clean Vehicles and Fuels European Symposium and Exhibition 2005**

Nov. 8 - 2005 to Nov. 10 - 2005

Stockholm, Sweden

<http://www1.stocon.se/cleanvehicles/9/10620.asp>**World Biofuels Symposium-China**

November 13-15, 2005

Beijing, China

[www.worldbiofuelssymposium.com](http://www.worldbiofuelssymposium.com)**Green Power Mediterranean**

November 15-16, 2005

Rome, Italy

<http://www.greenpowerconferences.com/events/greenpowermed.htm>**Asia Biofuels Conference & Expo**

December 6-8, 2005

Manila, Philippines

[www.asiabiofuels.com](http://www.asiabiofuels.com)**11<sup>th</sup> Annual National Ethanol Conference: Policy & Marketing**

February 20-22, 2006

Las Vegas, Nevada

<http://www.ethanolrfa.org/nec.shtml>**Renewable Energy 2006**

October 9-13, 2006

Makuhari Messe Japan

[www.re2006.org](http://www.re2006.org)



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## CONTACT INFORMATION

Please find information below for both the IEA Bioenergy contacts and IEA Bioenergy Task 39 contacts. Additional information is available at [www.iea.org](http://www.iea.org) and at [www.ieabioenergy.com](http://www.ieabioenergy.com)

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Lund University and IEA Bioenergy Task 39 'Liquid Biofuels' is proud to announce a

## Workshop on Biofuel Commercialization

A 2-day meeting designed to give individuals, in particular graduate students, postdoctoral fellows, and industry/government representatives, a solid understanding of the opportunities and challenges associated with liquid biofuels.

*If you are considering a career in biofuel research or development,  
this meeting is for you!*

**Day 1: Technical bioconversion - lignocellulosics-to-ethanol**

**Day 2: Policy and commercialization – liquid biofuels**

### ORGANIZERS

Lund University: Bärbel **Hahn-Hägerdal**, Guido **Zacchi**, Christian **Roslander**

IEA Bioenergy Task 39: Jack **Saddler**, Warren **Mabee**

### LOCATION

**Ystad, Sweden at the Hotel Continental**

(just south of Lund/[www.hotelcontinental-ystad.se](http://www.hotelcontinental-ystad.se))

### DATES

**October 12-14, 2005; Agenda** ➡

### REGISTRATION

**For details, contact Caryn Morizawa**

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Tel +1-604-822-2176 Fax +1-604-822-8645

**Registration closes June 15, 2005**

***Space is limited!***

***Register early to ensure your place!***

OCT 12	EVE	Welcome, Faculty Introductions, Informal dinner
OCT 13	AM	Pretreatment Hydrolysis
	PM	Fermentation Process Integration
OCT 14	AM	National Programs Alternative biofuels
	PM	Policy instruments Commercialization

For more information about the International Energy Agency's Bioenergy Program, please see [www.ieabioenergy.com](http://www.ieabioenergy.com)

For more information about Lund University, please see [www.lu.se](http://www.lu.se)

For more information about IEA Bioenergy Task 39 'Liquid Biofuels', please see [www.task39.org](http://www.task39.org)

