



Summary Minutes

Task 34 Pyrolysis meeting - Espoo, Finland

June 29–30, 2010



*Doug Elliott,
Task 34 Leader
gives an update
on the Pyrolysis
meeting held in
Finland*

All participating national team leaders were in attendance. In addition, Corder Peacocke of CARE was a contributing expert and other visitors to the meeting included Iva Jovanovic (US-PNNL), Ashwani Kumar (CA-NRC), Christian Lindfors, Heini Lehtonen, and Anssi Källi (all from FI-VTT) and Kai Sipilä, the Finnish ExCo member.

Country Reports

Country reports were presented by the national team leads from the two new participants, Canada and the UK. Fernando Preto, CanMET Energy, the representative from Canada and Tony Bridgwater, Aston University, the representative from the UK, made the presentations.

SOTA publication

A State of the Art publication based on the country reports presented here and at the last meeting was discussed. A number of journals were suggested as appropriate for such a paper including Biomass & Bioenergy, Energy & Fuels, Renewable & Sustainable Energy Reviews, and Journal of Energy Sources. Dietrich will check the suitable journal for this type of review.

Norms and standards

ASTM - There was discussion about future standards, such as a turbine fuel standard or one for a low solids content (< 0.5 wt-%) grade boiler fuel. Doug will discuss with Ensyn about additional standards at this time.

REACH - Christian Lindfors presented the status. Christian will check if research units producing above 1 tonne bio-oil will also have to register the oil production. In addition, Christian will search the list of toxicity tests needed for Reach.

MSDS - It was decided to prepare an updated MSDS in which the requests of Reach are taken into account.

It was decided that the Biotox results need to be reviewed to segregate slow and fast pyrolysis results for use in the MSDS. Tony will ask Philip Girard to share the Biotox toxicity data on a confidential basis with the Task 34 members. The data of fast and slow pyrolysis liquids should be separated in order to have a more realistic picture of the toxicity of fast pyrolysis oils. Corder asked the permission of Philip Girard to share the Biotox data on

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transportation with Task 34 members. This data is available to the Task because EU paid 100% of the project and owns the data. Task funds can be used to have experts to classify the data.

EFSA smoke flavoring health report

Dietrich gave a presentation on the methods and results of the EFSA smoke flavoring analysis and assessment. This presentation provided insight into the complications in governmental assessment by committee and the uncertainties added by using a relatively inconsistent product like bio-oil.

Analysis/methods development

Doug presented a summary on sulfur analytical methods and instrumentation. Anja presented some recent comparison of S analyses. The detection limits for the analyses are crucial when low S contents are analyzed. Doug pointed out that the solubility of the sample has to be ensured. Fernando will check the correlation of S in the fuel to SO_x emissions. It was discussed that S analysis is becoming more important when increasing amounts of agricultural residues are being used as raw material, and that companies need to know the values, even though they are below the limit. It was also discussed, if the value for S is reliable with ICP, Anja promised to check. Doug agreed to provide a review of the sulfur analytical methods with further consideration of a round robin in the future.

Anja presented the status of viscosity and stability methods. The various

methods were discussed. Viscosity by falling ball should be tested. Comparison data on kinematic and rotational viscometer is presented in the VTT report on bio-oil analysis, <http://www.vtt.fi/inf/pdf/publications/2001/P450.pdf>. The effect of char on stability was discussed. Foster Agblevor, while at NREL, published data on this.

It was agreed that ASTM D 445 is very accurate, Anja reported that the standard and the capillaries were chosen so that values would be comparable, the same ones are being used for diesel and mineral oils.

It was agreed that "Stability" should be better defined.

Corrosion testing at ORNL was discussed. Anja has sent them some material and can provide new data. Summary of material corrosion can also be found in the VTT reports <http://www.vtt.fi/inf/pdf/publications/2001/P450.pdf> and <http://www.vtt.fi/inf/pdf/publications/1997/P306.pdf>. The latest data will be summarized this fall in VTT Publication 731, an update of the earlier 450 and 306 reports. Early corrosion results can be found in reports from John Scahill at NREL.

Use of TAN for pyrolysis oil was discussed. The interpretation of the TAN curve is difficult. Anja and Doug will publish soon a paper on the meaning of TAN in measurements of bio-oils. Presently TAN values are viewed as too high, refineries don't want pyrolysis oil. However, no one correlated TAN with corrosivity. TAN values for pyrolysis oils differ substantially from the values

for mineral oils. It is very easy to make mistakes when interpreting TAN curves with bio-oil. It was suggested that TAN might be included in a Round Robin after Anja and Doug have published.

PAH is an increasing concern. Analysis is very difficult to do; special equipment is needed, and trained, competent operators to do it. It is easier to send samples to one specialized laboratory.

Round Robin

As a round robin (RR) is a good example of collaboration, which is highly esteemed by ExCo, it was agreed that a RR will be organized within the Task. Potential subjects for the RR were any of those discussed above. In addition, an earlier survey of the members included molecular weight, polycyclic aromatic hydrocarbons, flash point, solids, ash, and carbonyl methods. The members discussed and agreed to the following:

- two pyrolysis oil, one from wood and one from agrobiomass, will be included;
- possible oil producers will be contacted: Ensyn (Fernando), Iowa State U (Doug), VTT (Anja), PyTecwood and KTI-straw (Dietrich), Aston-softwood (Tony) – dead-line for getting agreement was set for August 15, with the intent to ship oil by the end of September;
- oil producers are asked to provide information on the oil – at a minimum, the feedstock, production date, and storage conditions (the oil could be 2-3 months old as the aging rate is low)

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- minimum needed amount of oil is 30 liters
 - 1 liter/laboratory
 - possibly 23 laboratories
- Participating laboratories should be contacted by national team lead in each participating country
 - Finland – VTT
 - Germany – VTI, KIT, Fraunhofer
 - UK – Aston, Leeds, York, Imperial
 - Canada – CanMet, AgCan, NRC, Ensyn, UWO, Saskatch
 - USA – PNNL, NREL, USDA, MSU, UMass, RTI, VATEch, ISU, UOP
- VTT will first check the quality (perform aging test) of the oil before distribution;
- VTT will provide the detailed instructions to the stability test;
- Sample bottles for the aging test (50 ml Pyrex bottles) will be shipped with the oil;
- Requested analyses will be: water, viscosity, stability; optional analyses: density, solids, TAN, GPC;
- The aging test and viscosity change measurement will be performed on 3 separate days (within 10 days of the first analysis).

Transport standards for bio-oil

Cordner Peacocke, was invited to join the Task meeting and provide a review and update of the transport standard that he first studied in the 1990s. An important outcome of the review was the recognition that flash point was not definitive in all cases and that sustained combustion was an alternate consideration in defining the transport classification.

It was decided to focus on lowering the bio-oil

classification to non-flammable liquid. VTT and PNNL will carry out a specific 'Sustained combustibility test' ISO 2592:2000 described in the transportation legislation. Anja has already discussed at VTT of getting ignition tests done with pyrolysis oils in order to classify fast pyrolysis liquids as nonflammable liquids. The discussions will continue in the fall.

ExCo reporting

It was reported to the participants that a new Technical Coordinator has been employed by the ExCo. In further deliberations, the ExCo has agreed that the annual technical reports are not sufficiently useful to justify their investment. Task interactions will be further emphasized including a meeting of all task leaders prior to the next ExCo meeting to develop such efforts. Task 34 should have a proactive plan of collaboration, like the current effort with Task 42.

Task 34 should stake a claim on bio-oil upgrading to hydrocarbon fuels. A conference could be proposed as the end of BIOCOUP (April 2011). A jointly sponsored journal issue on upgrading bio-oil to hydrocarbon fuels could be proposed.

Torrefaction was also discussed as a potential topic, but it drew little interest. A joint paper on pyrolysis of torrefied biomass was proposed by Aston and PNNL.

Kai Sipilä raised a question if this group could provide data on transportation ways and costs for pyrolysis oils, perhaps in cooperation with IEA

Bioenergy Task on International trade.

Website input

The website has been updated for the new triennium. The participants are requested to send any further update material to Irene Watkinson: i.i.watkinson@aston.ac.uk

Newsletter input

It was decided to publish the Newsletter only as an electronic form. Irene can distribute the Newsletter if she is provided by e-mail addresses. Per ExCo directive, non-member countries can be included in the distribution list. The national team leaders should provide their input to the email distribution list in the form of an Excel spreadsheet by September 15, 2010.

A second issue of the newsletter will be published by the end of the year. All inputs should be sent to Irene before mid November. Input (2 items/country representative) is being requested in the form of minimum 500 word submission with 2 to 3 images or diagrams (0.5 Mbit in size), logo of the company.

All – General news from each country, something on the institute and pyrolysis research in the country

Anja – Slow pyrolysis research in Finland/Fagernäs

Dietrich – PyTec/Choren status
Doug -- TCS news, TX A&M pyrolysis of algae, HTL in USA, UOP IBR

Fernando – ICFAR, ABRI Tech/Peter Fransham

Tony – Bio10 review, CarbonTrust project

Doug Elliott

Task 34 Leader