

Report on workshops held from July 2006 to June 2008

**Influence of EHS (Environment, Health and Safety) measures on economic performance of bioenergy conversion processes (Vicenza, October 2007)**

The workshop (topic covers point 6 of the topic list) was moderated by Max Lauer. A presentation by Harrie Knoef showed practical examples from project work on small scale biomass gasifiers. In the course of the workshop, the following items were discussed

1. Examples of EHS measures;
2. Motivation for EHS measures (active, passive); and
3. Examples for the need of EHS measures to hedge and to improve economic performance.

As examples for EHS measures a list of possibilities was established:

- Additional systems (end of pipe) as filters, sound absorbers, combustors, detoxicators etc;
- Primary measures as technology adaptation or change;
- Hazard reducing systems as building structure able to avoid explosion pressure build up;
- Structural measures as proper choice of construction site;
- Risk analysis and risk management; and
- Organizational measures as safety rules and procedures, evacuation plans etc.

The motivation to adopt EHS measures was seen as both passive (to avoid hazards and risks) and active (to achieve economic advantages). Starting with the passive motivation, one could avoid hazards and risks

- of health and safety not accepted by society (explosion, emission etc.);
- of environment damage not accepted by society (water pollution, acidification, GHG-emission (?) etc.);
- to clients (interruption of production, unexpected cost, damage of plants and image etc.); and
- of loss of market position (example biomass ORC-process).

The most common passive motivation for project developers, in reality, is to get the permits needed for construction and operation of plants or processes. The conditions of authorities for the permits are based on the need to avoid hazards and risks for health and safety as well as for the environment.

Active motivation to take EHS measures is by actively improving the standing on the market. Examples discussed are:

- to get an advantage over competitors using SOTA technology (e.g. Diesel particle filters);
- to reduce cost and effort of maintenance and even operation cost (e.g. steam plants)
- to help your client to make a proper risk assessment and to show, that all EHS risks are covered.

As practical examples for the influence of EHS measures, the cases of fixed bed wood gasifiers CHP systems (presentation given by Harrie Knoef), recent catastrophic failures in wood based ORC-plants (report Max Lauer) and EHS of fine particles in wood combustion (Max Lauer referring to Thomas Nussbaumer) were discussed in detail.

As conclusions of the workshop the following statements were made::

- EHS measures cost effort and money and but are often basis of operation permission or CE certification procedure.
- From the economical point of view complete and documented EHS measures have positive aspects:
  - Better standing in relation to clients (risk assessment and mitigation, improved trust in technology)
  - Chance to reduce operation and maintenance cost
  - Helping to create a stable technology image and avoiding the risk of unforeseen image disasters.
  - It is better to implement more EHS measures as is SOTA in order to get an advantage compared to competitors. This point was seen for mature technologies. It was also discussed and stated, that for emerging technologies EHS measures beyond the legal needs or permit procedures would reduce implementation chances and should be avoided.

### **Biomass Potentials and the Effect of their Use on Social Economic Parameters (Vicenza, October 2007)**

Biomass potential analysis (point 3 of the topic list) is widely used for single project assessment and for national and international potential assessment in policy consulting. For technicians involved in technology development and technology implementation or project development the knowledge of biomass potential, analysis is essential. As most of ThermalNet members will use but not establish a potential analysis, the aim of the workshop was to understand how a potential analysis can be interpreted properly and where possible dangers of misinterpretation can be hidden.

Contents discussed in the workshop were:

1. Effect of the energetic use of biomass on social economic parameters
2. What is a biomass potential?
3. How to interpret a biomass potential analysis?
4. Common Statement

First the effects of energetic use of biomass on social economic parameters (labour, environment, national safety) were discussed.

For labour it was stated, that energetic use of biomass generates labour in developed countries of 70 - 400 persons per PJ. This is mainly unskilled labour and so biomass reduces the potential of generating skilled labour. The increase of social income by energetic use of biomass was mentioned to be 3 to 20 M€/PJ.

Effects of energetic use of biomass on the environment were discussed as impacts on soil quality and biodiversity, increase in emissions (in particular fine particles), and increase of transport activities. Impacts on soil quality can be important, if forestry and agriculture are not managed in a sustainable or at least environmental sound way. Effects on biodiversity can be positive or negative depending on the land use

change induced. The increase in emissions was discussed as a serious problem especially for biomass combustion. Especially, the fine particle emissions will probably increase in importance as it has been considered a serious health problem for a few years. Increase in transport activities may only be a local problem, because transport distances for biomass (on land) are limited, but nevertheless it is seen as a contribution to the environmental impacts of energetic biomass use.

Effects on national safety seem to be important. In the discussion, the diversification of the energy supply and the increase in independence was seen as positive aspects. The development of the last few months have shown, that these issues have to be discussed very carefully and the political boundary conditions have to be set in order to avoid unexpected developments, such as food price increases and the following international irritations and catastrophic situation in food supply, as is happening recently in some countries.

After discussing the effects of increased energetic biomass use on socioeconomic parameters, a discussion was held on the character of a biomass potential. Here in the workshop the theoretical access on biomass potentials was discussed:

1. Theoretic potential:  
ha \* yield/ha\*a (all biomass growing)
2. Technical potential:  
All you can collect from the theoretical potential (ecological restraints, agro technological restraints, topographic problems etc.)
3. Economic potential:  
All biomass available up to a specified cost level (taking into account the (elastic) price band of competitors on the market)
4. Realistic potential:  
All biomass available without inducing negative social or social economic impacts and respecting technology and market development issues.

Starting from the theoretical access of biomass potential assessment, Max Lauer presented some examples on agricultural and forestry biomass from a recent work done in Austria. It was made clear, that the different types of potential can have very different results and that the boundary conditions made in the different types are essential for the usefulness of the results produced.

The next step in the workshop was the discussion of how to interpret a biomass potential analysis. In the end of the discussion it was clear, that a biomass potential analysis can only be interpreted (and used), if the user can answer the following questions:

- What are the boundary conditions for the analysis?
- Are realistic restraints imposed? (technical, ecologic, economic)
- Are the legal boundary conditions discussed and respected?
- Are the economic and socio economic boundaries addressed?
- Is the motivation of the biomass producers (land owners/farmers) etc. considered?
- Who are possible competitors for the land use or the biomass and how are their interests considered in the analysis?

The workshop finished with an agreed statement on the use of potential analysis for biomass for energetic use:

*Potential analysis can only be used for project development or technology development, if the boundary conditions are clear and appropriate, and only, if the boundary conditions reflect the possible economic, social and social economic conflict areas*

It was further stated; that interpretation of bioenergy potential analysis is possible only strictly along these boundary conditions. It was mentioned, that biomass potential analysis is important for future biomass technology development. It shows limited resources and focuses the researchers on the need for more efficient technologies. As a last point it was stated, that bioenergy potential analysis should also be seen before the background of the highly volatile prices for biomasses in general and that the uncertainty of the result of these kind of analysis should be taken into account as long as these market volatilities are not stabilized.

### **Methodology Guideline on Techno-Economic Assessment (TEA) (Vienna, April 2008)**

It was agreed within ThermalNet that the topic of standardized TEA methods was difficult to handle in the limited time available in workshops. On recommendation of Prof. AV Bridgwater and with approval of the ThermalNet partners a “virtual workshop” was organized per E-Mail and the outcome, a “Methodology guideline on techno-economic assessment (TEA)” presented and discussed at the final ThermalNet meeting, April 2008 in Vienna.

The aim of this activity (covering point 1 of the topic list) was to produce and to agree on a common methodology guideline on techno-economic assessment and on standards and methods to be used in order to provide comparable and easily interpretable results. The guideline will enable comparable TEA work using the same specifications and definitions and procedures and to enhance the understanding on the choice of appropriate methods based on the specific quality of the project to be assessed.

The “virtual workshop” was organised by proposing contents, specifications and methods including description to all ThermalNet members in a consecutive way, so all items could be discussed several times and their description improved. The reaction was a lively discussion between some of the ThermalNet members and a number of contributions as suggestions on changes of the content, of some methods etc.

The “Methodology Guideline on Techno-Economic Assessment (TEA)” is submitted as deliverable 3B-4