

7 March 2012

Appendix 1.

Pyrolysis and bio-oil Q&A

1. What is bio-oil produced with fast pyrolysis?

In fast pyrolysis, biomass, such as wood chips, are heated very rapidly to about 400–600 degrees Celsius. In this temperature the organic substances of the biomass are released in a matter of seconds forming gases. The pyrolysis gases are quickly cooled down to about room temperature, in which case the gases condense to liquid, i.e. bio-oil.

2. What is bio-oil used for?

Bio-oil is excellent for energy production to replace liquid fossil fuels, such as heavy fuel oil. Bio-oil can be used as an energy source for example in heat production or in the process industry. The use of bio-oil reduces carbon dioxide emissions by more than 70 % compared to fossil fuels.

3. What is bio-oil made of?

Bio-oil can be produced with pyrolysis from almost any biomass, but Fortum uses Finnish wood-based raw material, such forest residue, in its bio-oil production in Joensuu. By using Finnish wood based biomass, it can be ensured that the raw material of bio-oil has been produced sustainably and the raw material production does not compete with food production.

4. What advantages does an integrated bio-oil plant have?

A bio-oil plant connected to a power plant in a fixed way is very energy effective because the bio-oil production can use excess heat that the power plant would otherwise lose. Since the bio-oil is produced from the same raw material as is already being used at the power plant site for electricity and heat production, the bio-oil production will also benefit from existing fuel logistics.

5. What kind of impact does bio-oil use have on the environment?

The use of bio-oil also has a significant positive environmental impact: by using bio-oil for energy production, green house gas emissions can be reduced by more than 70 % compared to fossil fuels. The annual bio-oil production in Joensuu will be about 50,000 tonnes, which corresponds to 200–250 GWh in fuel energy. With this amount of energy district heat can be provided for about 24,000 medium-sized flats (about 70 square metres each) or 10,000 detached houses with only small CO₂-emissions.

The CO₂-emission reduction of heating is 59,000 tonnes per year. In addition, since the bio-oil is also almost sulphur-free fuel, the SO_x-emissions will also decrease by 320 tonnes per year compared to the emissions of heavy fuel oil, for example.

6. What kind of research has been conducted for the project? Has Fortum received an investment subsidy for the project?

Bio-oil production with fast pyrolysis has been studied by a cooperative consortium of Fortum, Metso, UPM and VTT for several years, and the technology has been developed at VTT laboratories and with Metso's test equipment. The integrated fast pyrolysis technology is based on VTT-patented technology, and Metso's engineering. The construction of the bio-oil production plant will be implemented in close cooperation with Metso. The Ministry of Employment and the Economy has granted Fortum €8.1 million in a new technology investment subsidy for the project.