

## **Transforming Forest Biomass**

### **TRENDS IN WOOD TRANSFORMATION SYSTEMS**

- Wood has been transformed to produce methanol or wood alcohol for over 350 years
- When only including the costs of transforming wood to produce methanol (not considering all efficiencies/economics of methanol uses), wood has not been economically competitive to transform compared to other sources for producing methanol (natural gas).
- Methanol can now be produced from wood using sophisticated, efficient and environmentally neutral processes (e.g. flash pyrolysis, hydrothermal liquefaction so wet biomass can be processed).
- Most wood transformation systems have been designed for *large scale processing* of residues from agricultural or forestry wastes because of economic reasons.
- Today, wood is mainly being used as the sole fuel source in cogeneration plants (e.g. electricity, low-pressure steam production) and for heat/power generation by co-firing with coal or other fossil fuel sources

### **ISSUES WITH TRANSFORMING WOOD**

- It is best if wood is transformed to energy in an environmentally neutral process. Combusting wood (a common practice to produce energy) is not an ideal solution since it will contribute little to decreasing greenhouse gas emissions since its transformation is a source of CO<sub>2</sub> and pollutants – it's combustion is not chemically 'sustainable'.
- Because of the high bulk and "low energy density" of forest residues, the economics require an ability to process wood materials where transport distances are minimized. Thus, small, mobile processing systems need to be developed to reduce costs. Small-scale processors to transform wood materials should be efficient and economical when all the externalities (e.g. providing environmental services, costs of fighting fires, high unemployment insurance in rural communities, etc.) are included in the costs.

### **WOOD TRANSFORMATION INTO BY-PRODUCTS**

- Much information has been published on transforming biomass to by-products that includes forest residues.
- Wood can be used as a starting material to produce methanol using the two main processes: 1) *gasification*, and 2) *pyrolysis*.
- In the past 10 years, much engineering research and development has been conducted for the commercialization of the processes required for biomass conversion. In particular, European countries such as The Netherlands, Finland, Sweden, and Germany have been very active in this area.
- While not yet perfected, gasification or pyrolysis of biomass efficiently produces a liquid fuel such as methanol. There are two main chemical processing routes which have promise at this time:
  1. Fast pyrolysis in the field to "bio-oil" which can be economically transported to a more centralized processing site for conversion to methanol
  2. Gasification of wood to synthesis gas (a mixture of H<sub>2</sub> and CO) and subsequent conversion of syn gas to methanol.

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