

Summary

This literature study investigates and determines the important properties of the main types of biomass and the handling equipment. The main properties for solid biomass differ from the main properties for liquid biomass, which is why the whole report is divided into two parts. The material properties for solid biomass are length, width, height, particle size differentiation, moisture content and bulk density. For liquid biomass, these are dynamic and kinematic viscosity, and flash, pour and cloud point.

The common bulk handling equipment has been investigated in this report. The equipment of six harbors have been researched. Next to these six harbors, the main crane manufacturers of the world have been researched as well. When this overview was complete, some distinction could be made between different handling solutions. In solids handling, the differentiating properties are mobile / fixed, continuous / discontinuous, outreach and handling capacity. Transferring liquids, two different types of pumps are used, displacement and velocity pumps. The differences between the two types of pumps are high / low viscosity, capacity, capacity control and the existence of back-pressure.

Not only the transfer of biomass in the harbor has been researched, but transshipment terminals and transfer to the hinterland have investigated as well. In the Netherlands, many solid and liquid biomass is put on inland barge. In other countries, using railway cars is far more popular, which results in different handling solutions. Rotterdam is largely connected to an European wide pipeline network, through which many tonnes of crude oil are being pumped to Belgium and Germany.

From this study it can be conclude that the relatively new products being liquid and solid biomass will not have significant influence on the design of handling equipment. A huge increase in biomass trading volume will off course have significant influence on the design of harbors itself. Most chemical storage companies are expanding their capacity to be able to handle the increased trade in liquid biofuels. These expansions do not differ substantially from their existing storage tanks, only the coating inside the tanks could differ. Solid bulk handling companies have to do some more adaptations. The most traded solid biomass are sensitive for humidity and contact to water, which consequently demands covered handling

and storage solutions. Furthermore, a well ventilated storage room is necessary to prevent fires from self-igniting. Finally, the appearance of dust could result in legislation demanding for preventions against environmental impact. Specially designed equipment for handling solid biomass could be interesting, but won't be economically interesting until a European (accepted) standard has arised.