

Study of utilization of ASEAN biomass in a large-scale plant –Optimization of ethanol production from woody biomass-

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From the viewpoints of the reduction of environmental load such as CO₂ emission and the realization of sustainable society, biomass becomes attractive. Since ASEAN area has a high ability for biomass production, a large-scale plant of biomass conversion can be constructed. Although there are many conversion processes for biomass, they were considered in economy. That is, in the process, the products should have market value. Liquid fuels such as BDF and ethanol are attractive because they can be used for vehicle. On the other hand, feedstock must be also considered. A conflict between food and fuel should be avoided in the utilization. Furthermore, the great amount of feedstock is required for a large-scale plant. Woody biomass can be stably supplied by planting. From these backgrounds, the process of ethanol production from woody biomass was examined as study of utilization of ASEAN biomass in a large-scale plant. In this study, process design and pinch technology were performed for this process.

In the process design, latest technologies were examined. That is, the process consisted of saccharification using sulfuric acid, fermentation and membrane separation. The mass and heat balance in the process were calculated by process simulation. It is found that ethanol of 1.07t/h could be produced from woody biomass of 5.00t/h. Also the temperatures and pressure in each unit or each stream and the yield of products were estimated. From these results, it is found that the duty of 47.5GJ/h was required for the ethanol production of 1.07t/h in the base case.

In order to improve the efficiency of the process, the pinch technology was examined. In the base case, though the steam of 100K was generated from each unit, it could not be enough utilized due to its lower temperature level. Therefore, a heat pump was used to increase the temperature. The steam of which temperature was increased could be used as heat source for each unit which required heat and it could cover the whole process. Consequently, the energy

consumption of 61% was saved.

In addition, a power generation using a residue from the saccharification could generate electricity which was over the demand in the process. Finally, it was shown that the process did not require with external energy.

In this study, the process analysis involving the pinch technology was developed and the usefulness was shown.