CHAPTER VIII

CONCLUSION

This thesis represents an application of simulator (PRO/II) as a tool for debottlenecking the topping unit capacity. The simulator is used to model the existing process and to simulate for debottlenecking capacity. The exiting unit can handle a slight capacity increase (45 KBD = 12.5%) but can not handle the higher capacity increase, e.g., 50 KBD (25% increase). Thus, the chosen case studies are of 50 KBD and 60 KBD (50% increase). For simulated results, bottlenecks occur in all sections (separation, heat exchanger network and utility sections) of topping unit. Those problems are solved as follows:

1. Separation section which refers to all distillation columns requires the column modifications.
   - Internal tray modification handle slight bottlenecks (less than 94%flooding).
   - Random packing replacement can handle a serious bottlenecks.
2. Heat exchanger network requires the pinch analysis for redesign the new HEN.
3. Utility section which refers to heaters and coolers can be debottlenecked by adding new units, usually, in parallel connecting.

After the existing unit has been debottlenecked, it must be evaluated in economic terms for decision to invest or not. For results, both capacities (50 and 60 KBD) are economically viable. They yield high profit rates (about 50%) and short payback period (about 2 years). Comparing two alternatives (50 and 60 KBD), 50 KBD is more attractive for debottlenecking than 60 KBD because of less process bottlenecks which requires less modification. For example, column bottlenecks at 50 KBD occur at the top section of column and the bottom pumparound (15 actual trays in total 34 trays) while column bottleneck occur from the top tray to the feed tray (30 actual trays in total 34 trays). Also, a new HEN at 50 KBD requires 20%area increase while a new HEN at 60 KBD requires 50%increase.

This Thesis Benefits

The base model of this work is very useful not only for debottlenecking crude capacity, but also for identifying equipment malfunctions, finding the optimum operating conditions, and training engineers or operators. In addition, it can lead to future studies in broader scopes such as simulating all processes in this plant or other refinery plants. Although this thesis yields many benefits, it should be improved in the future works as follows:

1. Use the simulator which can integrate the design of column and HEN, because PRO/II Version 3.3 used in this work excludes the pinch analysis to design HEN. In this work, HEN is designed by free hand with pinch analysis, and tested by rating in PRO/II.
2. Accurate cost data should be used in economic evaluation for the detail design because the economic evaluation in this work is the preliminary design with the rough cost data (±20%error [20,25]).
3. Plot plant must be checked for handling the required space for new equipment.