CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The results of column targeting study of reformer area are following. Alternative one can transfer heat between unit 100V5 and Hot stream 1 by adding side reboiler at tray 36 of unit 100V5. This alternative can save duty at reboiler of unit 100V5 from 4.9819 MW to 3.6903 Mw which it is about 25.93 % and overall save duty of this distillation column is about 13.91% and save the energy of unit 100-EA3 42.53% from 3.0568 MW to 1.7568 MW. The second alternative can transfer heat between unit 100V7 and Hot stream 1 by adding side reboiler at tray 25 of unit 100V7. This alternative can save duty at reboiler of unit 100V7 from 0.6801 MW to 0.2801 Mw which it is about 58.81 % and overall save duty of this distillation column is about 46.33% and save the energy of unit 100-EA3 13.09% from 3.0568 MW to 2.6567 MW.

This retrofit study delivered the following results. For the retrofit of aromatics area, the optimum minimum approach temperature was 10°C for incremental area efficiency. The area of existing plant is 7754.8 m^2 and ideal area is 2765.157 m^2. The area efficiency, α, of the existing network was 0.35657. It indicated that the existing design used the area inefficiently. Hence there were some scopes of process improvement. As the constant α targeting gives a conservative approach, the incremental α of unity was used to set the target of the retrofit. The scope of energy savings was 41.22 MW. Analyses of the existing design in actual case showed that there were eight process to process exchangers that transferred heat from above to below the pinch. Also, there were some violations of pinch analysis, like the hot utility exchangers supplying heat below the pinch point, and process modifications were needed.

All four designs had payback period of less than one year and had good scope for savings. Design option B and C are recommended for retrofit because both give the minimum utility costs and payback period.

In design potion B three new heat exchangers were added. These suggested retrofit design provided energy savings of 27.029 MW. The utility cost savings is $2,927,296. This required an investment of $ 1,759,505 with a payback period of just about 7.2 months.

In design option C four new heat exchangers were added, and one hot utility exchanger using MP stream, HEX 6, was removed as their duty tends to be zero. (In practice, they were not removed but would be used for heat exchangers of the new matches). HEX 4 transferred heat across the pinch in the existing network. By repiping it, it was effectively moved to above the pinch. These suggested retrofit design provided energy savings of 27.767 MW. The utility cost savings is $3,033,397. This required an investment of $ 1,891,553 with a payback period of just about 7.5 months.

The study showed that there was scope for improvement in HEN of an existing aromatics plant in aromatics area and the new network was designed using the network pinch method. It was found that targeting for maximum energy savings at each modification tends to give good trade-off between area and energy. In this case study the cost was dominated by utility costs.

5.2 Recommendations and Suggestions for Further Work

The study suggests modifications for the retrofit design of the HEN. These modifications can be further investigated for impact on the operational, control and safety constraints. The results would be used as a preliminary design for further detailed energy study of the process. The result of retrofit can be checked by doing in pilot plant.