CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Energy cost minimization is a vital thing that every plant needs to concern. There are several techniques that can be applied such as Pinch technology or optimization using mathematical programming. This study was based on existing operation of gas separation plant. This plant has three main distillation columns which are demethanizer , deethanizer and depropanizer and ten heat exchangers. Simulation program was an important tool for this work because this work was based on existing condition. Since few measurements were collected so they were not enough for analysis. The rest value in this research came from the simulation results.

This research was started with identifying the optimum operating condition. Feed stage and reflux ratio were varied and product compositions in the product streams of all distillation columns were studied. The results showed that all distillation column were already in optimum condition. According to energy consumption, main utilities which have been consumed in this plant come from cooling water, refrigerant and the last utility comes from steam at reboiler of three distillation columns. Column grand composite curve (CGCC) of each column was plotted together. The overall energy consumption in distillation columns can be further reduced by heat integration between columns. CGCCs showed that deethanizer and depropanizer column could be integrated; however, with the limit of equipments, the heat integration between these two columns was not possible. After that, grand composite curve (GCC) was plotted in order to study heat integration and identify the scope of modifications that could occur in the process. Moreover, GCC and CGCCs were plotted together. It was found that there was scope of integration occurring between the process and the columns.

To retrofit the existing plant, four alternatives were proposed using various techniques as inspection and integration. For example, in alternative No.3 if one heat exchanger was added to the deethanizer column it would save energy on both the deethanizer main reboiler and cooling tower load at the outlet of sale gas. Normally, the main reboiler used steam as a hot utility but this exchanger would reduce the heat load on main reboiler therefore utility cost would be less. This alternative would save

energy consumption 54.9% on main reboiler E70401 (6197.782 kW) and 67.9% on cooling water load of E70601 (6197.782 kW) or 36.96 % of total steam consumption and 26.14% of total cooling water consumption. By the ways, all modifications must conform to the maximum tolerance of equipments and also the position of them in the plant.

Data reconciliation is a technique that can enhance the measurement reliability. 79 variables were measured and 348 variables were not measured in this plant. This technique could correct all measured variables and additional 31 variables could be given.

There were some recommendations in this study. Firstly, retrofit using optimization technique is currently widely used so that in the future if these two techniques can be applied together it probably creates the new alternative design of retrofit. Secondly, since this work was based on existing plant, any modification needed to be consulted with the process engineer to consider the possibility of any changes that have to be done.