CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study focused on modelling of aqueous ammonia process for CO_2 capture. Aqueous ammonia process can be divided into two sections which were CO_2 capture and ammonia abatement section. In the CO_2 capture section, the optimal concentration and CO_2 lean loading of aqueous ammonia solution were found to be 6% by weight and 0.25 mole CO_2/mole NH_3. In the ammonia abatement system, the concentration and CO_2 loading were 6 ppm by weight and 1.2 mole CO_2/ mole NH_3. The overall optimal energy used in the regeneration of both CO_2 capture system and NH_3 abatement system was 8601 kJ/kg CO_2 which was similar to the one modeled by Zhang and Guo (2013). This study also focused on the comparison of energy requirement and capital investment cost of CO_2 capture processes from post-combustion carbon dioxide capture process with and without heat integration based on the flue gas from a coal burning 180 MW_e power plant. The conceptual HEN design using the GAMS model and was then validated using the Aspen Plus simulator were in good agreement in terms of heat reduction. Energy requirement and annual operating cost savings of the integrated process compared to the basic process were about 40.6% and 12.8 % for MEA, 58.1 % and 26.5 % for ammonia, and 50.03 % and 17.7 % for IL (EmimAc), respectively. The total capital investment cost of the integrated aqueous ammonia process was 29.95 MM$ and the annualized operating costs were about 4.94 MM$ per year. Moreover, the regeneration temperature was around 85 to 95 °C where low-grade thermal energy could be utilized.

5.2 Recommendations

Many studies have been improving the simulation of MEA-based CO_2 capture process or finding new absorbent materials in order to improve the performance of the absorbent. Aqueous ammonia is one option that can be used as absorption material in CO_2 capture process instead of using conventional MEA. However, the main

drawbacks of using aqueous ammonia are the high volatility and the complicated process. Therefore, not only the modeling of the process should be done properly, but also the cost evaluation of the process must be investigated. The cost evaluation in this study is roughly estimated in the same way by **multiplying factor by factor**. Therefore, there are many additional cost factors that need to be taken into account in order to ensure the capital investment cost, annual operating cost of the aqueous ammonia process are close to reality. Further studies about cost evaluation need to be performed in deeper details to figure out the accurate final cost exact number.