

A NEW APPROACH TO NATURAL GAS SEPARATION

Conventional technology of natural gas processing requires many separation steps from acid gas treating to hydrocarbon recovery, etc. The biggest drawback of the conventional gas processing is that these steps demand large usage of energy. Additionally, in the traditional technology it is rather difficult to control the emission of green house gases and toxic gases (such as methane, carbon dioxide, and hydrogen sulfide) to the environment.

The problems associated with the traditional gas processing have initiated our motivation to develop a new technology so that natural gas conditioning can be conducted in a conservative manner such that minimal energy is used, emissions to the environment are minimized, and the maximum amounts of hydrocarbons are recovered. In this work a new approach to gas processing is introduced. This new technology is adapted to a separation scheme and a model is proposed. For the scope of this project, the new technology is specifically designed to remove only acid gases (CO_2 and H_2S).

In this work, the removal of carbon dioxide and hydrogen sulfide is studied. For this project, we have conducted two case studies. In the first case study, there is only CO_2 gas present in the feed at a composition of 9%. The results show a reduction of CO_2 composition to 2%. In the second case study, we add H_2S gas to the feed to study the overall performance of this technology when both CO_2 and H_2S gases are present. The calculated results show satisfactory reductions of CO_2 from 9% to 1% and H_2S from 5% to 0.04%. PRO/II simulations provided necessary process values so that economic comparisons could be made between the amine unit and the new technology. In order to mimic a practical case in natural gas conditioning, feed gas flow-rate of 63,030 lb-mole/hr or 576 MMCF/day is used*. Using these conditions the total annualized cost of the amine unit and the new technology are determined to be \$32.12M and \$13.8M respectively for case study 1, and \$39.7 and \$15.8M for case study 2.

The new technology is attractive from an economic viewpoint in both case studies. The determining factor of this cost advantage is due to the energy savings in the new process. Furthermore, the new technology has the potential to have much less environmental impact because of the nature of the separation.

* The gas flow-rate and composition is generously provided by Williams from their Milagro gas plant.