**Process Integration and Optimization**

 **Case Study - The Egyptian Western Desert Gas Complex Plant**

*M. Abu El Ela\*, I. Hassan\*\*, S. M. El-Marsafy\**

**Abstract**

The Egyptian Natural Gas Company (GASCO) handles its gas-processing activities through two processing plants; namely, Western Desert Gas Complex (WDGC) and Amerya LPG Recovery Plant (LPG). The WDGC receives and treats natural gas of 900 MMSCFD. It is designed to produce C2/C3 gas mixture to be used as feedstock to a future Ethylene Production Plant, commercial propane, LPG, sales gas and condensate. Currently, the WDGC recovers 75% of C2, 99% of C3 and 99.5% of C4 from the hydrocarbon entering in the gas feed stream. On the other hand, assessment of energy consumption in the entire plant showed that the energy efficiency recorded only 27%, which indicates that a large amount of heat is lost in the plant. The main target of the present research work is to apply energy conservation concept in WDGC through utilizing the heat dissipated in the gas compression area to provide the fractionation towers fired heaters with the required heat.

The research work was directed towards proposing three different scenarios through which dissipated heat is directed to areas of excessive heat consumption. HYSYS model was used to simulate the proposed scenarios in an attempt to boost the energy efficiency in the entire plant. The different proposed scenarios are, ultimately, economically evaluated to select the scenario which needs the least investment and gives the shortest pay-back period.

The study resulted in a reliable and applicable solution according to the technical and economical assessment. The modifications of the recommended scenario comprise incorporating two heat exchangers and performing some alterations in the piping system. The selected scenario would apparently lead to saving of the electric power used for air coolers in addition to minimizing the fuel consumption in the fractionation towers fired heaters. The economic phase of the study revealed that the total capital cost required to implement the recommended scenario is USD 3.85 MM, the annual total savings sum up to USD 1.0 MM/Y based on gas price USD 2.65 /MMBTU and the pay-back period is 4 years. Considering gas price of USD 6.5 /MMBTU, the total savings would jump up to USD 2.45 MM/Y and the pay-back period would obviously drop down to 18 months.

\* Faculty of Engineering – Cairo University – Egypt

\*\* Egyptian Natural Gas Company (GASCO) – EGPC – Egypt

This research work is an outcome of the cooperation protocol between the Egyptian Ministry of Petroleum and Cairo University, produced via the post graduate studies interdisciplinary program Natural Gas Engineering and Technology offered to engineers working in the Egyptian oil and gas sector. Gratitude and appreciation are due to GASCO for providing the research team with the necessary data. The authors would also like to thank Natural Gas Engineering Diploma students – Class 2013 for the deliberate effort they exerted in conducting the current research work under the supervision and guidance of the authors.