One Step Ahead

PROCESS ECOLOGY

Improving Operational Efficiency of Glycol Dehydrators

Case Study

Process engineering and optimization
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Improving Operational Efficiency of Glycol Dehydrators

Improving the operational efficiency of glycol dehydrators has become a priority for oil and gas companies that are looking for opportunities to decrease air emissions (benzene, methane, VOCs) and optimize fuel gas use. Process Ecology worked with a major operating company to improve the operational efficiency of 12 glycol dehydrators to deal with benzene emission concerns, non-compliance with AER Directive 039 and potential for fuel gas optimization. The proposed work included site visits by experts with extensive knowledge of fire heaters and glycol dehydrators followed by detailed computer modelling and simulation of the units to determine the operational envelope and optimization constraints. All data required to perform the evaluations were gathered by these experts with the assistance of plant personnel.

Several opportunities to improve environmental and energy efficiency aspects were identified during this assessment of glycol dehydrators. A major recommendation was to process the gas from two compressor units into a single dehydrator, with improvements in dehydration efficiency, glycol circulation rate, and benzene emissions – It is relevant to note that this location had been dealing with high benzene emissions that were very close to the regulatory limits. By merging production through a single dehydrator, the benzene emissions were reduced well below the site limit, eliminating the potential non-compliance and resulting in *both methane emissions reductions and savings of approximately $80,000 in capital expenditures.*

Regarding fuel gas optimization opportunities, Figure 1 summarizes potential fuel gas savings identified at the 12 dehydration plants. As seen from Figure 2, there is a range of potential cumulative savings between $70,000 and $270,000. A considerable amount of fuel gas reductions is directly related to the use of dry gas as a stripping agent in the regeneration still; it is technically feasible to eliminate the use of stripping gas in many of these plants although some may still need the gas during the hot summer months.

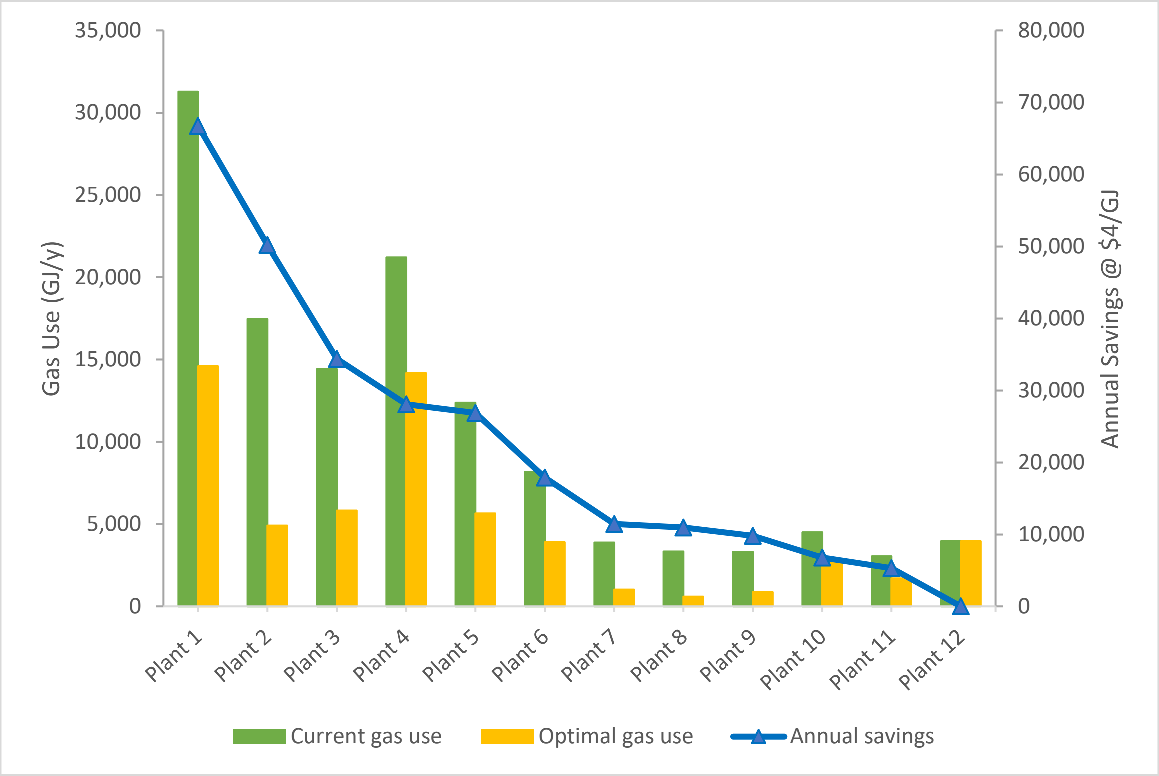

Figure 1. Fuel gas savings results.

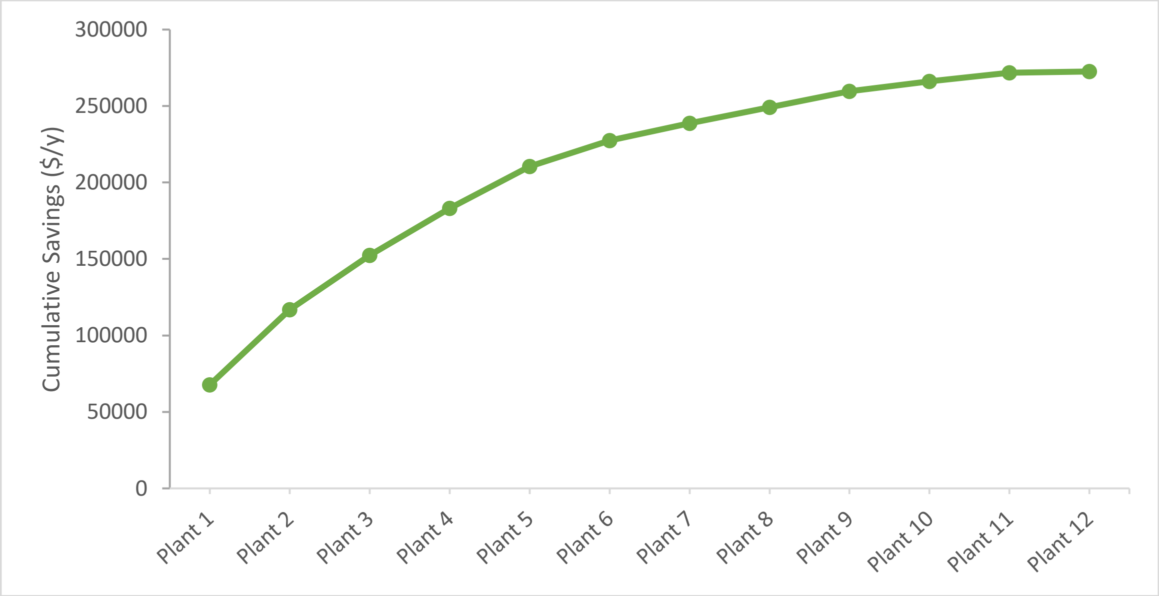

Figure 2. Cumulative savings for twelve dehydration units.

To capture these opportunities some modifications and actions must be taken by the operating company as follows:

- Combine production of two compressor units into one dehy and the other should be shut in.
- Glycol pump replacement may be required in several cases. Ten out of the twelve dehydration plants operate electric pumps of different characteristics; it will be required that operations personnel determine the actual minimum circulation rates for all these pumps to decide whether pump replacements/modifications are needed to capture the savings.
- Contactor performance issues were identified at Plant 2; the packed tower should be evaluated initially via glycol rich/lean water content analysis.

Environmental Impact: Air Emissions

The results of the dehydrator optimization opportunities in terms of potential air emissions reduction are presented in Figure 3. Benzene and greenhouse gas (GHG) emissions are based upon the results of simulation model runs.

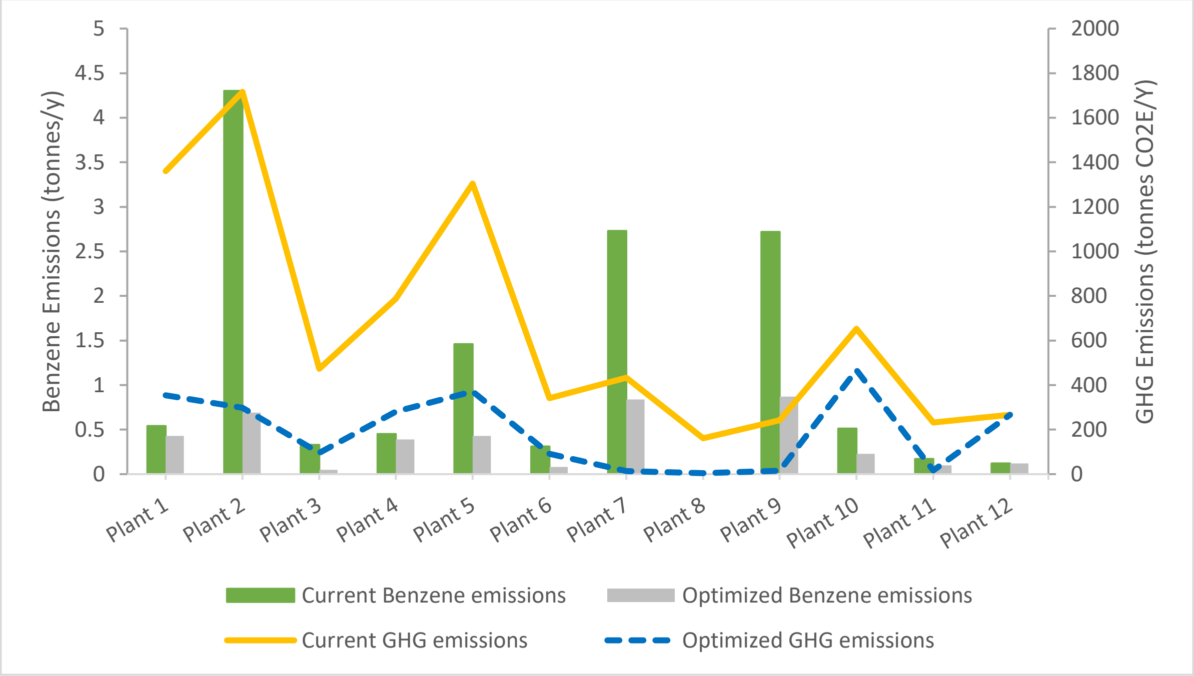

Figure 3. Benzene and GHG emissions reductions.

Methodology:

The Process Ecology team worked with operations personnel to perform the following activities as part of this work:

(1) Units checked and relevant data collected.

(2) Series of process simulation calculations are performed to evaluate the operational limits of the system and determine the optimal conditions for each dehydrator.

(3) A Key outcome of the site visits is a refresher for operations personnel of the dehydration process optimization parameters.

The methodology followed during this work is outlined in Figure 4.

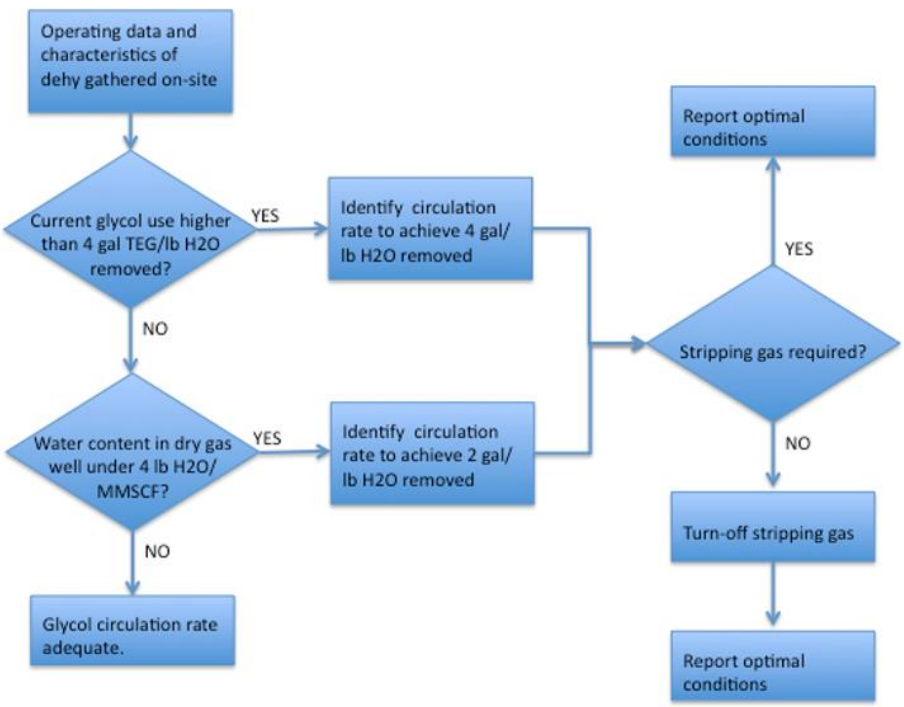

Figure 4. Optimization methodology.

All but one unit were found to have potential for fuel gas conservation and emissions reductions while ensuring the dehydration process continues to operate properly. To capture these opportunities, Process Ecology suggested operational changes and in some cases pump replacement requirements.