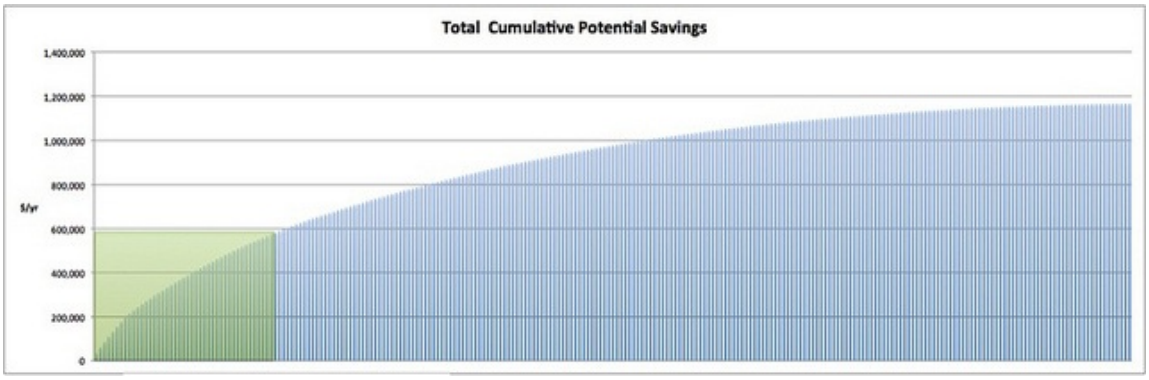
Air emissions and energy in natural gas dehydration: A review of Western Canada's trends and opportunities

Since the introduction of AER Directive 039 in 2007 to control benzene emissions from glycol dehydration facilities, Process Ecology has been supporting upstream oil & gas (UOG) operators with an innovative methodology for the efficient management of air emissions and energy from natural gas glycol dehydration and refrigeration units.

The potential for emissions and energy reduction is very significant once reliable and actionable information is available. The goal is to leverage data gathering efforts beyond reporting and compliance into effectively managing energy and emissions.

Based on a sample of over 400 operating dehydration plants in Western Canada, air emissions, fuel gas consumption and potential opportunities for optimization at these facilities were evaluated. Benzene emissions, the main concern of regulatory agencies, have clearly shown a downward trend, even after factoring in the impact of recent reductions in natural gas production volumes.

The results of an engineering screening for optimization opportunities reveal that, for a sample of operating dehydration plants and considering a gas price of $2/GJ, there are realistic opportunities for over $1MM/yr of fuel gas savings with no/low capital expenditures. As shown in the following figure, 50% of the available savings can be found in 45 locations (out of the 250 locations displayed in the graph).



A focused effort to optimize the locations with the largest potential would bring fuel gas savings of over $500,000 or close to 300,000 GJ/y of fuel gas.

The fuel gas saving relies on glycol circulation rate reductions at dehydration plants and includes the following considerations associated with reduced glycol circulation rates:

1. Lower reboiler duty for the regeneration still with a consequent reduction in fuel gas combustion.
2. For units operating with gas-driven glycol pumps (Kimray), there is a reduction in the fuel gas that is used as motive force to pump the glycol.
3. Current glycol circulation rate was compared to a conservative rule of thumb of 4 gallons of TEG per pound of water removed. The difference between these rates determines the potential.
4. Where stripping gas is in use, no consideration has been made to reduce/eliminate that use of fuel gas, although in many cases, this is also a significant optimization opportunity.
5. The heating value of the fuel gas is calculated based on the composition of the produced dry gas at each location

It is also worth noting that many of the fuel gas savings opportunities are found in locations where there are no benzene emissions.

In conclusion, the opportunity for dehydration optimization in Western Canada remains significant; regulations for environmental protection, such as AER D039, can lead to safer working environments and improved process operation with simultaneous benefits for the environment and the economy.

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