Install Electric Compressors

Technology/Practice Overview

Description

Gas-fired engines are often used to run compressors, generators, and pumps. In some operations, part of the produced gas stream is used to power these engines. Methane emissions result from leaks in the gas supply line to the engine, incomplete combustion, or during system upsets. The majority of the gas from a "system upset" comes from compressor blowdown emissions and is the same for both gas engine and electric motor driven compressors.

Partners reported that installing electric motors in place of gas-fired units can decrease gas losses. Electric motors reduce the chance of methane leakage by eliminating the need for fuel gas, require less maintenance, and improve operational efficiency.

Operating Requirements

An electrical power supply is needed to implement this technology.

Applicability

Remote facilities with an available electrical power source and high maintenance cost may be good candidates for this technology.

Methane Emissions

Methane emissions savings are based on an emissions factor of 2.11 Mcf per year horsepower.[1] Partners have reported methane savings ranging from 40 Mcf per year up to 16,000 Mcf per year.

Economic and Environmental Benefits

Methane Savings

Estimated annual methane emission reductions	*32,800 Mcf per 5 reciprocating compressors replaced*

Economic Evaluation

Estimated Gas Price	Annual Methane Savings	Value of Annual Fuel Gas Savings*	Estimated Implementation Cost	Incremental Operating Cost	Payback (months)
$7.00/Mcf	32,800 Mcf	$11,900,000	$6,050,000	$6,200,000	13 Months
$5.00/Mcf	32,800 Mcf	$8,500,000	$6,050,000	$6,200,000	32 Months
$3.00/Mcf	32,800 Mcf	$5,100,000	$6,050,000	$6,200,000	Does not payback

** Only the value of fuel gas savings were considered, since the avoided methane emissions from the compressor are unburned hydrocarbons and, therefore, are included in the fuel gas savings.*

Additional Benefits

- Reduced fuel gas consumption
- Increased operational efficiency and reduced maintenance costs
- Faster permitting due to lower noise output and no emissions

- [x] Compressors/Engines
- [ ] Dehydrators
- [ ] Directed Inspection & Maintenance
- [ ] Pipelines
- [ ] Pneumatics/Controls
- [ ] Tanks
- [ ] Valves
- [ ] Wells
- [ ] Other

Applicable Sector(s)

- [x] Production
- [x] Processing
- [x] Transmission
- [ ] Distribution

Other Related Documents:

Install Electric Motor Starters, PRO No. 105

Convert Gas Driven Chemical Pumps, PRO No. 202

Install Electric Compressors (Cont'd)

Economic Analysis

Basis for Costs and Emissions Savings

Methane emissions reductions of 32,800 Mcf per year apply to the replacement of two 2,650 hp, two 4,684 hp, and one 893 hp reciprocating engines.

One partner reported replacing two 2,650 hp, two 4,684 hp, and one 893 hp reciprocating compressors with four 1,750 hp electric compressors. The total cost of replacement was $6,050,000 and includes the cost of the motor and the compressor.

Fuel gas savings of 1,700,000 Mcf per year apply to the 5 compressors replaced assuming 20% efficiency, a heat content of 1,020 Btu per scf of gas, and 8,760 hours of operation per year. When estimating the value of gas savings, only the value of fuel gas savings were considered since the avoided methane emissions attributed to the compressor are unburned hydrocarbons and are therefore considered to be included in the fuel gas savings.

Incremental operating costs are primarily electricity costs. Reduced maintenance costs would offset some of the electricity costs, and are assumed to be approximately 10% of the capital costs. Assuming 50% efficiency for the four 1,750 hp electric compressors and 8,760 hours of operation per year at a price of $0.075 per kw-hr, electricity costs would be $6,800,000 per year.

Discussion

Installing an electric motor in place of a gas driven engine will increase operational efficiency, reduce maintenance costs, and yield significant methane savings. The capital costs and the electricity costs, however, are higher for an electric motor compared to those for a gas driven engine. The primary reasons for implementation of this project are fuel gas savings and maintenance savings. An additional benefit is the faster permitting process as a result of lower noise output and no emissions. It should be noted, however, that the economics may vary significantly for transmission companies as a result of contractual agreements and ownership of the gas which would be responsible for the additional revenue included in this economic analysis.

Methane Content of Natural Gas

The average methane content of natural gas varies by natural gas industry sector. The Natural Gas STAR Program assumes the following methane content of natural gas when estimating methane savings for Partner Reported Opportunities.

Production	79 %
Processing	87 %
Transmission and Distribution	94 %

[1]Emission factor is based on Annex 3 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990—2009. The emission factor is for Compressor Gas Engine Exhaust and is calculated as shown below:

0.24 scf/HPhr x 8,760 hrs / 1000 = 2.1 Mcf CH4/HPyr