Convert Engine Starting to Nitrogen

NaturalGas EPA POLLUTION PREVENTER

Partner Reported Opportunities (PROs) for Reducing Methane Emissions

PRO Fact Sheet No. 101

Applicable sector(s):

■ Production ■ Processing ■ Transmission and Distribution

Compressors/Engines	■
Dehydrators	☐
Pipelines	☐
Pneumatics/Controls	☐
Tanks	☐
Valves	☐
Wells	☐
Other	☐

Partners reporting this PRO: Enron Corporation, Marathon Oil Company

Other related PROs: Install Electric Starters, Reduce Frequency of Engine Starts with Gas, Install Electric Compressors

Technology/Practice Overview

Description

Internal combustion engines that power pumps, compressors, and generators frequently use high-pressure natural gas stored in a volume tank as an energy source for starting. The gas is expanded across a small turbine motor that turns the engine until it starts. Starter motor gas is typically vented to the atmosphere.

Partners have eliminated methane emissions from engine starts by replacing natural gas with compressed nitrogen. This practice simply fills the startup volume tank with compressed nitrogen as necessary to support the frequency of engine startups. No facility changes are necessary except a high-pressure nitrogen fill connection.

Methane Savings: 1,350 Mcf per year

Costs

Capital Costs (including installation)

■ <$1,000 ☐ $1,000 – $10,000 ☐ >$10,000

Operating and Maintenance Costs (annual)

☐ <$100 ■ $100-$1,000 ☐ >$1,000

Payback (Years)

■ 0–1 ☐ 1–3 ☐ 3–10 ☐ >10

Benefits

Reducing methane emissions was a primary justification for the project.

Operating Requirements

Either the high-pressure startup gas system must be very tight (no leakage) or nitrogen re-supply made just prior to startups to ensure an adequate volume of high-pressure nitrogen. Re-supply of compressed nitrogen must be arranged on a schedule coinciding with engine startup frequency.

Applicability

This practice is applicable to all compressors with gas pneumatic starter motors.

Methane Emissions Reductions

Conversion to nitrogen completely eliminates the venting of methane to the atmosphere and the leakage of methane through the gas shut-off valve. Typical production site compressor engine startups vent 1 to 5 Mcf of gas with each attempt, while field engines often require multiple attempts. Blowdown valves of a size and pressure differential similar to the gas shut-off valve leak up to 150 scf per hour or 1.3 MMcf per year.

Economic Analysis

Basis for Costs and Savings

Methane emissions reductions of 1,350 Mcf per year apply to converting one startup volume tank to nitrogen supporting ten engine starts per year. The volume tank is filled prior to startup to avoid leakage losses of nitrogen.

Discussion

This practice can pay back quickly. The cost of compressed pipeline quality nitrogen is about $5 per Mcf delivered within 50 miles from commercial supply. For compressed nitrogen supply coinciding with startups, the value of avoided natural gas loss from leakage and startup vents may offset nitrogen costs. An associated benefit is reduced gas starter corrosion and maintenance costs when replacing the use of sour gas with nitrogen.