**Non-$CO_2$ Greenhouse Gases:** Methane

**Source/Sectors:** Natural Gas Systems (Production; Processing; Transmission)

**Technology:** Replace gas starters with nitrogen (A.1.2.1.13; A.1.2.3.11)

**Description of the Technology:**
In the United States and worldwide, many efforts have been made to identify and implement mitigation options to reduce methane emissions from the natural gas sector (USEPA, 2003). For example, the Natural Gas STAR program is a voluntary partnership between US EPA and the oil and gas industry to identify and implement cost-effective technologies and measures to reduce methane emissions. The measures to reduce methane emissions from the natural gas systems can be grouped into the following mitigation strategies: prevention, recovery and re-injection, recovery and utilization, and recovery and incineration (Hendriks & de Jager, 2001).

Small gas expansion turbine motors are often used to start internal combustion engines for compressors, generators, and pumps in natural gas production. These starters use compressed natural gas to provide the initial push to start the engine, but use of them results in methane emissions. Replacing natural gas with nitrogen will completely eliminate the venting of methane (USEPA, 2004a). 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 (USEPA, 2004a).

**Effectiveness:** Good

**Implementability:** Applicable to all compressors with gas pneumatic starter motors.

**Reliability:** 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 (USEPA, 2004a).

**Maturity:** Good

**Environmental Benefits:** Methane emission reductions

**Cost Effectiveness:** 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 (USEPA, 2004a).

- Capital Costs (including installation) : <$1,000
- Operating and Maintenance Costs (annual): $100-$1,000
- Payback (Years): 0-1

**Industry Acceptance Level:** Enron Corporation and Marathon Oil Company work as a partner for this option (USEPA, 2008).

**Limitations:** 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 (USEPA, 2008).

**Sources of Information:**


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