Synopsis
Reducing Methane Emissions: Best Practice Guide
Energy Use
November 2019
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This Synopsis describes actions that an organisation can take to help manage methane emissions. Any actions or recommendations are not mandatory; they are simply one effective way to help manage methane emissions. Other approaches might be as effective, or more effective in a particular situation. What readers choose to do will often depend on the circumstances, the specific risks under management and the applicable legal regime.
Checklist
Methods of reducing methane emissions from energy use

- Keep an accurate inventory of where natural gas is used as fuel.
- Use electrical power or pneumatic power using compressed air or nitrogen.
- Improve the energy efficiency of gathering operations and other equipment.
- If natural gas needs to be used, improve the efficiency of fuel combustion.
- Track your progress in reducing fuel use.

Natural gas, which consists mainly of methane, is used as a fuel throughout oil and gas operations, for compression, generating electricity, heating, dehydration and removing acid gas. Equipment that uses natural gas as a fuel is generally designed to have at least 98% combustion efficiency (that is, at least 98% of the gas will be burned), so some methane is released as unburned gas. This is known as methane slip. Even though methane slip is generally a small percentage of the fuel used, in operations that use a significant amount of energy, methane slip can be a major source of emissions.

Using natural gas as a fuel also results in emissions associated with the engine burning the gas, such as emissions from cylinders or rod packing. Reducing the amount of natural gas used as fuel at oil and gas operations helps reduce methane emissions, and may cut energy costs.

Methane emissions from energy use (using natural gas as a fuel) can be reduced by doing the following.

- Using electricity or other types of power instead of natural gas
- Making processes more efficient, which reduces the amount of energy used
- When natural gas must be used as a fuel, improving the efficiency of the combustion engines

Reductions in fuel costs mean that the cost of options may be recovered in a few months to a year.

Methods of reducing methane emissions

Install electrical compressors
Compressors fired by natural gas, which are used in gas gathering and transmission, can be replaced with electrically driven compressors (if an electricity supply is available). This eliminates methane slip on the site. However, it may not reduce the total methane slip across the whole supply chain if the electricity is generated using natural gas as a fuel. Even if natural gas is used to generate the electricity used to power compressors, overall emissions for all operations may still be reduced. Using electrical compressors also eliminates emissions from engine components.
Replace natural gas used in compressor starter motors with electrical starters or pneumatic starters using air or nitrogen
In the natural-gas industry, combustion engines are often started using gas-expansion turbine motors. The starter motors use high-pressure natural gas, which is stored in a tank. To start the compressor, the gas is expanded through the starter turbine then vented.

Each start-up uses approximately 1.4 cubic meters of gas for every 100 horsepower of motor size. Methane emissions can be eliminated by using compressed air or nitrogen instead of natural gas. If electricity is available, the gas-expansion turbine motor can be replaced by an electrical motor.

Make more efficient use of energy in gathering lines
Gathering systems deliver gas from networks of wells to processing plants. The volume of gas processed and the capacity of the network changes because of changes in production, liquid and hydrate building up in the gathering lines, changes in the composition of the gas and changes in atmospheric and weather conditions. Extra compression and energy use may be needed at times for the network to function and to prevent flaring of gas. The capacity of a gathering system can be increased, and energy use reduced, through frequent clearing of lines (pigging) and minimizing the build-up of liquid and hydrate through line heating or chemical injection, although some of these operations may lead to venting. Increasing the capacity of a gathering system may also prevent flaring (see the best-practice guide on flaring).

Install automated air-to-fuel ratio controls
Engines in natural-gas supply chains are run under a variety of loads and air-to-fuel ratios. Low air-to-fuel mixtures (rich burn) are used when a greater horsepower is needed. High air-to-fuel mixtures (lean burn) are used when lower horsepower and greater fuel-efficiency are the goals. Rich burn results in more unburned fuel (mainly methane) and fewer emissions of nitrogen oxides (NOx). Lean burn produces lower methane, but more emissions of NOx. Installing automated air-to-fuel ratio control systems allows the performance of engines to be maximized by adjusting air manifold pressure and temperature, and improving the delivery of fuel to the combustion chambers. These controls might also allow captured hydrocarbon emissions to be used as fuel. Overall assessments of emissions should consider emissions of methane, carbon dioxide, unburned hydrocarbons and NOx.

Replace compressor-cylinder unloaders
A cylinder unloader is used to adjust the output of a reciprocating engine, by adjusting the volume of the cylinder. Cylinder unloaders release methane through leaking o-rings, covers and pressure packing. Unloaders that need frequent maintenance can also lead to emissions and shutdowns. Replacing unloaders can reduce methane emissions and may also reduce maintenance and unscheduled shutdowns.
Further information

MGP Website:
www.methaneguidingprinciples.org

OGCI:
https://oilandgasclimateinitiative.com

CCAC OGMP:

IEA Methane Tracker:
https://www.iea.org/weo/methane

Natural Gas STAR Program:
https://www.epa.gov/natural-gas-star-program