Convert Water Tank Blanket from Natural Gas to Produced CO_2 Gas

Technology/Practice Overview

Description

Crude oil production often contains water, which is separated at the wellhead. The produced water is saturated with methane and light hydrocarbons at the pressure of the gas/oil/water separator. This water is normally transferred to a fixed roof storage tank where a drop in pressure releases gas from the solution. This gas can also mix with the air in the tank to form an explosive mixture. To exclude oxygen from the water tank and prevent a hazardous situation, some operators blanket the vapor space in the tank with natural gas. As the tank fills and empties of water, the produced gas and blanket gas are emitted into the atmosphere through the roof vent.

One Partner reported switching the water tank blanket from natural gas to CO_2-rich produced gas since some gas production is rich in CO_2. This acid gas is typically handled in one of three ways: A) separated in gas processing plants, B) vented to the atmosphere, or C) injected into a crude oil reservoir for enhanced oil recovery. This CO_2-rich gas may be a better choice for tank blanket gas than methane-rich natural gas.

Operating Requirements

Acid is formed when the CO_2 dissolves in the produced water. As a result, the water tank must be internally coated to protect against corrosion.

Applicability

This practice can be implemented where there is a source of CO_2-rich produced gas or a nearby gas processing plant with acid gas removal.

- ☐ Compressors/Engines
- ☐ Dehydrators
- ☐ Directed Inspection & Maintenance
- ☐ Pipelines
- ☐ Pneumatics/Controls
- ■ Tanks
- ☐ Valves
- ☐ Wells
- ☐ Other

Applicable Sector(s)

- ■ Production
- ☐ Processing
- ☐ Transmission
- ☐ Distribution

Other Related Documents:

Install Downhole Separator Pumps, PRO No. 705

Installing Vapor Recovery Units on Storage Tanks, Lessons Learned

Economic and Environmental Benefits

Methane Savings

Estimated annual methane emission reductions	*2,000 Mcf per tank*

Economic Evaluation

Estimated Gas Price	Annual Methane Savings	Value of Annual Gas Savings*	Estimated Implementation Cost	Incremental Operating Cost	Payback (months)
$7.00/Mcf	2,000 Mcf	$14,900	$3,000	$0	3 Months
$5.00/Mcf	2,000 Mcf	$10,600	$3,000	$0	4 Months
$3.00/Mcf	2,000 Mcf	$6,400	$3,000	$0	6 Months

** Whole gas savings are calculated using a conversion factor of 94% methane in pipeline quality natural gas.*

Additional Benefits

- Useful outlet for produced gas with high CO_2 content

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Methane Emissions

Methane emissions savings assume the Partner reported compositions of the natural gas blanket (90 percent methane) and the CO_2-rich replacement gas (5 percent methane). The Partner reported saving 32,600 Mcf per year of methane by converting the water tank blankets on 9 units at a water treatment station from fuel gas to CO_2-rich produced gas.

Economic Analysis

Basis for Costs and Emissions Savings

Methane emissions savings of 2,000 Mcf per year is based on engineering estimations for blanketing a 4,000-barrel water tank that is emptied twice a week. The value of fuel gas saved by this practice generally has a good payback. Required capital costs are estimated to be $3,000 and include design and installation of piping to direct CO_2-rich gas to the produced water tank. Minor additional O&M costs are associated with operating the rich CO_2 line. Costs assume that the water tanks are already internally coated for corrosion protection.

Discussion

The payback for this project is favorable and is often less than one year. Economic implementation relies on the availability of CO_2-rich produced gas. Using produced gas as the blanket gas, operators can avoid purchasing natural gas and/or loss of a valuable product.

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 %

EPA provides the suggested methane emissions estimating methods contained in this document as a tool to develop basic methane emissions estimates only. As regulatory reporting demands a higher-level of accuracy, the methane emission estimating methods and terminology contained in this document may not conform to the Greenhouse Gas Reporting Rule, 40 CFR Part 98, Subpart W methods or those in other EPA regulations.