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 CO₂-rich produced gas since some gas production is rich in CO₂. 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 CO₂-rich gas may be a better choice for tank blanket gas than methane-rich natural gas.

**Operating Requirements**
Acid is formed when the CO₂ 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 CO₂-rich produced gas or a nearby gas processing plant with acid gas removal.

### Economic and Environmental Benefits

#### Methane Savings

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

#### Economic Evaluation

<table>
<thead>
<tr>
<th>Estimated Gas Price</th>
<th>Annual Methane Savings</th>
<th>Value of Annual Gas Savings*</th>
<th>Estimated Implementation Cost</th>
<th>Incremental Operating Cost</th>
<th>Payback (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7.00/ Mcf</td>
<td>2,000 Mcf</td>
<td>$14,900</td>
<td>$3,000</td>
<td>$0</td>
<td>3 Months</td>
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<td>4 Months</td>
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<td>2,000 Mcf</td>
<td>$6,400</td>
<td>$3,000</td>
<td>$0</td>
<td>6 Months</td>
</tr>
</tbody>
</table>

*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 CO₂ content
Methane Emissions

Methane emissions savings assume the Partner reported compositions of the natural gas blanket (90 percent methane) and the CO₂-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 CO₂-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 CO₂-rich gas to the produced water tank. Minor additional O&M costs are associated with operating the rich CO₂ 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 CO₂-rich produced gas. Using produced gas as the blanket gas, operators can avoid purchasing natural gas and/or loss of a valuable product.