Fugitive Emissions Equals Fugitive Dollars

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Texas A&M University
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Methane

CH$_4$
Methane

Lewis Diagram
Methane

Citi Bank Diagram
Passive Detection

Liquid Storage Tank Leaks
Active Detection
Over-Flight
Site Location

South of Kingsville, TX
Two Passes

Thief Hatch Opened

Thief Hatch Closed
First Pass
VRU
Turned On
Second Pass
VRU Turned Off

Thief Hatches Open
Point Source
How much is lost?

The production sector accounts for 44% of the CH4 emissions in the oil and gas industry.

Fugitive Emissions

Estimated loss of 131 Million Tons*
or
Estimated
$2 Billion of Lost Revenue

* CO2 equivalent tons
Source: EPA - Inventory of U.S. GHG Emissions and Sinks 1990 -2004
What to do with vent gas?

$6.00/Mcf
Three Main Sources

Offshore Platforms
Tank Batteries
Gas Pneumatic Controls
How to Limit Emissions
& Make Money at the Same Time

Vapor Recovery

Plunger Lifts

Compressed Air Controls
Why Vapor Recovery

Even water can have dissolved gas in solution. This is mostly true for deeper wells (>10,000 ft.).

Light volatiles from condensate can be captured (high Btu content).

Crude oil can yield as much as $2 per bbl of vapor.
## Vapor Recovery Costs

<table>
<thead>
<tr>
<th>Capacity (Mcfd)</th>
<th>Compressor Horsepower</th>
<th>Capital Costs($)</th>
<th>Installation Costs($)</th>
<th>O&amp;M Costs ($/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5 - 10</td>
<td>15,125</td>
<td>7,560 - 15,125</td>
<td>5,250</td>
</tr>
<tr>
<td>50</td>
<td>10 - 15</td>
<td>19,500</td>
<td>9,750 - 19,500</td>
<td>6,000</td>
</tr>
<tr>
<td>100</td>
<td>15 - 25</td>
<td>23,500</td>
<td>11,750 - 23,500</td>
<td>7,200</td>
</tr>
<tr>
<td>200</td>
<td>30 - 50</td>
<td>31,500</td>
<td>15,750 - 31,500</td>
<td>8,400</td>
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<tr>
<td>500</td>
<td>60 - 80</td>
<td>44,000</td>
<td>22,000 - 44,000</td>
<td>12,000</td>
</tr>
</tbody>
</table>

Note: Cost information provided by Natural Gas STAR partners and VRU manufacturers.
Four Steps

1. Identify Possible Locations for VRU.
2. Quantify the Volume of Emissions.
3. Measure the Site.
4. Evaluate Cost Benefits.
Example

With API Gravity of 38°

Separator Pressure = to 40 psi

Production of 1000 bbl/day

Vapor Emissions Rate = 43 Scf/bbl

Total Vapor Captured = 43 Mcf per day

Source: EPA
Why Plunger Lifts

Plunger Lifts Limit
Blowdown

Limited Venting or Flaring
Plunger Lifts
Plunger Lift Benefits

Revenue from Increased Production

Avoid Title V Issues

Fewer Workovers
Plunger Lift Evaluation

Common Requirements for Plunger Lift Applications

- Well blowdowns and other fluid removal techniques are necessary to maintain production.
- Wells must produce at least 400 scf of gas per barrel of fluid per 1,000 feet of depth.
- Wells with shut-in wellhead pressure that is 1.5 times the sales line pressure.
- Wells with scale or paraffin buildup.
Plunger Lift Pay Back

14 Wells at Midland Farm Field, Texas
Before Plunger Lift
Total Production 2510 Mcfd

30 Days After Plunger Lift Installation
Total Production 3869 Mcfd

Source: World Oil, November 1995
Question

If a 10,000’ well with a 8” casing and 214.7 psig shut-in pressure is vented weekly how much money is lost annually?
Answer

$15,864
Annually

Cost of a plunger lift ≈ $8000
Gas Pneumatic Case Studies

How much are you losing?

- Unocal Fresh Water Bayou Facility -
After installing the compressed air controls
increased throughput by 69,350 Mcf annually.

$416,100

Source: EPA
Gas Pneumatic Case Studies

Conversion Project Cost

$60,000
Gas Pneumatic Case Studies

In South Louisiana Chevron – Texaco converted 10 facilities to compressed air at a cost of $40,000.

Annual payback at today’s prices $138,000
For More Information

Useful Web Sites

http://www.epa.gov/gasstar/

http://www.fe.doe.gov/index.html

http://www.pttc.org/

http://www.icfi.com/Markets/Environment/