Liquids Unloading Options for Natural Gas Wells

2012 Natural Gas STAR Annual Implementation Workshop

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Agenda

- **U.S. Production Sector Methane Emissions**
  - Methane losses
- **Liquids Unloading**
  - Plunger lifts
  - Methane savings
  - Is recovery profitable?
  - Industry experience
- **Partner experience** – Weatherford

Source: BP
2009 U.S. Production Sector Methane Emissions (397 Bcf)

- Storage Tank Venting: 14 Bcf
- Meters and Pipeline Leaks: 12 Bcf
- Other Sources: 13 Bcf
- Well Venting and Flaring: 217 Bcf
- Pneumatic Devices: 67 Bcf
- Offshore Operations: 37 Bcf
- Dehydrators and Pumps: 19 Bcf
- Compressor Fugitives, Venting, and Engine Exhaust: 18 Bcf

Bcf = billion cubic feet
Methane Losses – U.S. Production

- Over 550,000 producing gas wells in the U.S.
- Unmitigated emissions from gas production facilities are estimated to be 166 Bcf/year
- Common “blow down” practices to temporarily restore production can vent 50 to 600 Mcf/yr to the atmosphere per well
  - Estimated average 353 Mcf emissions per well per year
  - Worth over $1,000/ well-year at $3/Mcf
- The real economic loss is gas production

Source: Newfield
Plunger Lift Liquid Unloading

- Conventional plunger lift systems use well shut-in pressure buildups to efficiently lift columns of fluid out of well without venting
- U.S. gas wells have 150,000 plunger lifts
- Emission reductions using plunger lifts are 163 Bcf/year*
- Gas production is estimated to be as much as 10 percent higher with plunger lifts

*Assumes 40% of plunger lift systems equipped with “smart” automation, 50% reduction from plunger lift and 75% reduction from plunger lift with “smart” automation

Source: Weatherford
Increased Production is the Main Benefit of Plunger Lifts

Production Control Services
Spiro Formation Well 9N-27E

Plunger Lifts Installed
Smart Automation Well Venting

- Automation can enhance the performance of plunger lifts by monitoring wellhead parameters such as:
  - Tubing and casing pressure
  - Flow rate
  - Plunger travel time

- Using this information, the system is able to optimize plunger operations:
  - To minimize well venting to atmosphere
  - Recover more gas
  - Further reduce methane emissions
Methane Savings

- Methane emissions savings a secondary benefit
  - Optimized plunger cycling to remove liquids increases well production by 10 to 20%\(^1\)
  - Additional 10%\(^1\) production increase from avoided venting

- 500 Mcf/year of methane emissions savings for average U.S. well requiring unloading

Source: BP

1 - Reported by Weatherford
Is Recovery Profitable?

- Smart automation controller installed cost: ~$11,000
  - Conventional plunger lift timer: ~$5,000
- Personnel savings: double productivity
- Production increases: 10% to 20% increased production

\[
\begin{align*}
&= (\text{Mcf/year}) \times (10\% \text{ increased production}) \times \text{(gas price)} \\
&\quad + (\text{Mcf/year}) \times (1\% \text{ emissions savings}) \times \text{(gas price)} \\
&\quad + (\text{personnel hours/year}) \times (0.5) \times \text{(labor rate)} \\
&= \text{$ savings per year}
\end{align*}
\]
BP Experience

Daily Vent Volumes

Source: BP
Partner experience

- Weatherford experience in reducing methane emissions from liquids unloading
Contacts and Further Information

- More detail is available on these practices and over 80 others online at: [epa.gov/gasstar/tools/recommended.html](http://epa.gov/gasstar/tools/recommended.html)
- For further assistance, direct questions to:

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