Plunger Well Vent Reduction Project

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Plunger Lift

- An inexpensive method to lift fluids from gas wells using a vertical pig.
- Requires energy buildup in the casing or near wellbore reservoir to lift the plunger to surface.
- Inadequate energy or too much fluid causes well to over load and die.
- Venting to atmosphere (zero pressure) instantaneously increases differential pressure allowing well to flow.
Initial Vent Reduction Project

• **Automation project** designed and funded in 2000.
  – Environmental project – funding justified on basis of GHG mitigation commitments and gas loss value.
  – Upgraded existing RTUs & host system.
  – Developed new well control algorithms based on Load Factor and Turner rate.

• Pilot installations and testing in 2000.
• System sweep in 2001.
• Achieved roughly 50% reduction in venting from 2000 to 2004.
Why is venting wells a bad thing?

- Vented gas is lost, never to be utilized as an energy source.
- Potential energy needed to lift liquids is depleted.
- Potential safety hazard.
  - Combustible mixture in the air.
  - High velocity plunger strikes on the wellhead.
- Global warming due to GreenHouse Gas emissions.
Issues

• ~1000 of the 2300 wells are plunger lift wells.
• Lose a well – order a swabbing unit to lift the liquids out of the well.
• Tight Gas consideration – inflow issues.
Actions Taken

• Interviewed control room staff and worked closely with the field automation team leader.

• Developed two pilot studies in order to make changes with some scientific control.

• Established a new procedure based on plunger lift expertise and pilot well analysis.

• Incorporated new procedure into 2nd pilot.
And the solution was...

- Smarter automation (settings and code.)
- Minor maintenance changes at wellsite.
- New automation tools to help recognize problem situations.
- Making believers out of the staff and management.
Vent Pilot List B –
Applied Vent Procedure Set points 11/10/05
SVR LIST 70 Wells - Apply Vent Procedure set points 3/16/06
Myths

- There is always “another unique or different well”.
- After flow venting is required to clean up the well.
- Increasing frequency of cycles cuts vent time.
- Tubing pressure can drop during shut-in.
- Reservoir does not have enough energy for plunger lift.
Lessons Learned

• Plunger velocities mean nothing if the well vents.

• A well can generally be run in “safe mode” and continue to produce.

• Load Factor is difficult to understand and evaluate.

• Need to have the option to adjust the Turner rate – critical velocity.
New Tools / Awareness

• Added vent volume to all production plots
• Automated e-mail of vent volumes summaries
• Weekly review of vent volumes in production meeting
• Added daily vent volume application to FDA
• Flow time greater than sales valve open time display
• Increasing tubing – casing pressure differential report
Daily Vent Minutes By Asset Team

- San Juan (Manz)
- Nav Dam
- GCU
- Animas (Cedar Hill)
- Total
Summary

• Great success thus far 4.0+ bcf/yr down to less than 0.8 bcf/yr

• Incremental reductions are increasing difficult

• Technology is only a piece of the solution - most significant recent reductions are due to revised operational practices

• Requires constant focus – Teams deliver on current goals

• Operational beliefs have shifted from “We must vent to produce” to “Venting is one of our last options”