Plunger Well Vent Reduction Project

G.P.(Skip) Desaulniers
BP
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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.
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

- 2300 wells with ~1000 plunger lift systems.
- Load up a well with liquids = order a swabbing unit to lift the liquids out of the well.
- Tight Gas consideration – inflow issues.
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Initial Vent Reduction Project

- Automation project designed and funded in 2000.
  - Environmental project – funding justified on value of CO$_2$ credits and GHG mitigation commitments.
  - Upgrade existing RTUs & host system.
  - Developed new well control algorithms based on Load Factor and Turner rate.

- Pilot installations and testing in 2000.
- Achieved roughly 50% reduction in venting from 2000 to 2004.
RTU & Host

- Remote Terminal Unit
  - Is the wellhead computer to do the controlling of the process as well as communicate information back and forth to the central host.
  - ~$15,000/well

- Host
  - Is the office based computer / communication system that the operators interface with in order to make setpoint changes at the wellhead.
  - $50k - $750k
    - How fast, how many sites...
Recent 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.
  - Leaking chokes to sales (you lose pressure and give away the gas.)
- New automation tools to help recognize problem situations.
- Making believers out of the staff and management.
Myths

- There is always “another unique or different well”.
- After flow venting (after the plunger surfaces) is required to clean up the well.
- Increasing frequency of cycles cuts vent time.
- Tubing pressure can drop during shut-in.
- The 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” (vent 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.
Summary

- Great success thus far 4 bcf/yr to 0.8 bcf/yr
- 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.”