Achieving Stability in a Gas-lifted Well

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Achieving Stability in a Gas-lifted Well

- Maintaining an optimized production in a gas lifted well is one of the challenges in oil field operation.

- Un-optimized and unstable gas lifted wells:
  - Require more lift gas to achieve reasonable stability,
  - Fluid loss due to slug flow,
  - Affect other producing wells in the same lease,
  - Premature failure/damage of gas lift unloading valves,
  - More significant in wells with tubing pressure sensitive gas lift valves as oppose to the casing pressure sensitive gas lift valves and
  - Increased downtime due to frequent slickline work
Nozzle-Venturi will achieve constant flow within a short span, with very small DP between Casing and Tubing pressure, whereas Square edged Regular Orifice is in throttling range for a wide range of downstream (tubing) pressures.

More reliable if properly designed for current well conditions.
Operating Valve Gas Throughput
Slugging Case History Well-1

- Irregular slug flow with intermittent gas kicks
- Fluctuations in casing pressure due to valve interference
- Improperly sized orifice allowing gas slugs to enter into the tubing
- P&T survey indicated leaky unloading valves
Slugging Case History Well-1

Note: Casing pressure increased, high and steady and tubing flow is more stable.
Gas-lifted Well

Diagram showing:
- Gas injection into casing
- Gas lift valve
- Casing
- Tubing
- Point of gas injection into tubing
- Packer
- Perforations

Graph showing:
- FTP
- SCP
- Casing gas gradient
- Injection point
- Casing fluid level
- Static fluid gradient
- Flowing gradient below gas injection
- FBHP
- SIBHP
Slugging Case History Well-2

- Regular slug flow with continuous gas kicks
- No fluctuations in casing pressure as there is no valve interference
- Slugging mainly due to improperly (over) sized orifice allowing gas slugs to enter into the tubing
Slugging Case History Well-2

Well S/I. for GL work
Well Unloading

Tubing pressure
Casing pressure
Gas flow rate

53,137
131,67
0

12:00:29 AM 6/16/2006
8:00:29 AM 6/16/2006
4:00:29 PM 6/16/2006
12:00:29 AM 6/17/2006
Slugging Case History Well-2
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- **Results:**
  - Be able to save about 10~20% lift gas in those 2 wells
  - Helped other wells in the same lease to flow steady

- **Limitations:**
  - Venturi sizing (nozzle design) software is proprietary
  - Varying the lift gas rate is difficult as Venturi is designed for specific flow rate at certain well conditions

- **Conclusions:**
  - It is not necessary to change all the unloading valves for most surge problems and leaky valves are not the root or primary cause for surging but it is one of the root causes for fluid loss and gradual production decline.
  - Increasing the lift gas is not the remedy to control the tubing surge. It may be a remedy to overcome the leaks in unloading valves temporarily to certain extent.