Optimization of Gas Wells

Gordon Gates
Bp America

Deliquification Specialist
Running Plungers in the Past

• Lack of science with operating plungers (Pigs)
• Lack of effective optimization algorithms
  – Patents, products, reinventing the wheel
• No one common approach
• Expertise was in the hands of the vendors not the operating companies
• Vendors usually have obstacles to success:
  – Access, sponsorship, cost constraints, lack of data from operator, operator expertise, line of products
  – How do vendors overcome obstacles?
What does Optimization mean to Operators

- Does the plunger run up and down the tubing
- Does the plunger miss an arrival occasionally
- Does the plunger stick on surface
- Do I have to either shut the well in and/or vent it to get the plunger to surface
- How much of the operator’s time does it take to operate plungers
- Does it cause compressor problems
- Is daily gas up or down
What is Optimization

- Optimization on most wells that are not borderline depleted or too much water is:
  - Achieving the lowest (average) Bottom Hole pressure at the end of the tubing possible
  - Achieving consistent plunger cycles
  - Consistent daily gas rates
  - Adapting to systems upsets and changes
  - Not having to visit or make changes until the plunger wears out
Why not visit well?

- If the operator visits the well he/she might only have enough time to visit 30 wells or so if there are minimal problems
- Large fields and many wells per optimizer
- In most artificial lift cases, to do effective optimization the operator must visit well? (true but)
- We do visit the problems wells
  - Prioritize based on safety and impact on production
Optimization by control

There are several methods, I prefer this one

- A routine or algorithm that uses some type of rate to shut the well in
  - Line pressures usually change during afterflow and that can cause the well to shut in shorter or longer periods of time
Optimization by control

- It uses time to estimate when the plunger is on bottom so it can open the well if the well is strong enough and is not loaded too much (we are developing a tool that tells us when the plunger is on bottom so we do not have to add a fudge factor)
  - It looks at the load factor after time to see if the plunger will arrive if the well opens. This addresses the fact that the well may be too weak or for some reason it has too much liquid to get an arrival (does not address inflow, might in future)
What should cycles look like on an optimized plunger well
One complete cycle
So how can we optimize this 8000’ well?

If I reduce this after flow can I reduce Shut in time?

I can reduce shut in time.
Plunger Cycles

How much Shut in time do you see here? I might need this time to get to bottom.
Definition of An Optimized Plunger Well With A Conventional Plunger

- A gas well with the shortest shut in time possible where the plunger reaches bottom and the right amount of after flow that gives you a liquid slug that prevents the plunger from arriving too slow or too fast.
- If the well is open one minute longer than allowed to get to bottom the well should have no afterflow other than enough to clear lines or vessels.
Questions?????
Copyright

Rights to this presentation are owned by the company(ies) and/or author(s) listed on the title page. By submitting this presentation to the Gas Well Deliquification Workshop, they grant to the Workshop, the Artificial Lift Research and Development Council (ALRDC), and the Southwestern Petroleum Short Course (SWPSC), rights to:

- Display the presentation at the Workshop.
- Place it on the www.alrdc.com web site, with access to the site to be as directed by the Workshop Steering Committee.
- Place it on a CD for distribution and/or sale as directed by the Workshop Steering Committee.

Other uses of this presentation are prohibited without the expressed written permission of the company(ies) and/or author(s) who own it and the Workshop Steering Committee.
Disclaimer

The following disclaimer shall be included as the last page of a Technical Presentation or Continuing Education Course. A similar disclaimer is included on the front page of the Gas Well Deliquification Web Site.

The Artificial Lift Research and Development Council and its officers and trustees, and the Gas Well Deliquification Workshop Steering Committee members, and their supporting organizations and companies (here-in-after referred to as the Sponsoring Organizations), and the author(s) of this Technical Presentation or Continuing Education Training Course and their company(ies), provide this presentation and/or training material at the Gas Well Deliquification Workshop "as is" without any warranty of any kind, express or implied, as to the accuracy of the information or the products or services referred to by any presenter (in so far as such warranties may be excluded under any relevant law) and these members and their companies will not be liable for unlawful actions and any losses or damage that may result from use of any presentation as a consequence of any inaccuracies in, or any omission from, the information which therein may be contained.

The views, opinions, and conclusions expressed in these presentations and/or training materials are those of the author and not necessarily those of the Sponsoring Organizations. The author is solely responsible for the content of the materials.

The Sponsoring Organizations cannot and do not warrant the accuracy of these documents beyond the source documents, although we do make every attempt to work from authoritative sources. The Sponsoring Organizations provide these presentations and/or training materials as a service. The Sponsoring Organizations make no representations or warranties, express or implied, with respect to the presentations and/or training materials, or any part thereof, including any warrantees of title, non-infringement of copyright or patent rights of others, merchantability, or fitness or suitability for any purpose.