



# HPGL – Delaware Basin Case Study

Victor Jordan – Estis Compression

▶ Bryce Ratchford – Devon Energy

Aaron Aab – Devon Energy

ALRDC Artificial Lift Workshop



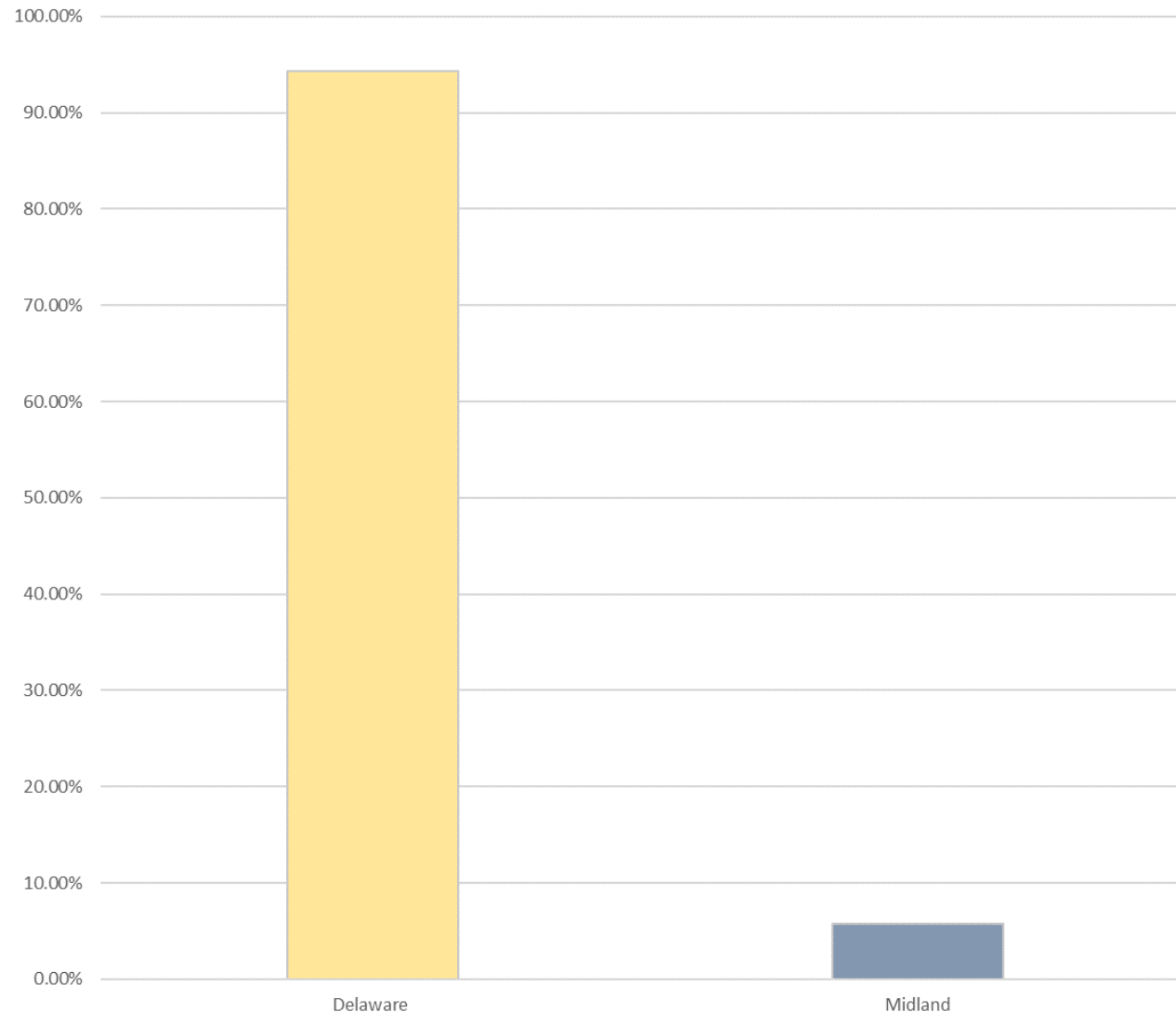
# Agenda

- ▶ HPGL by the Numbers
- ▶ What is HPGL?
- ▶ HPGL's Controllable Variables & Their Affect on FBHP
- ▶ Devon HPGL Case Study
- ▶ Conclusions
- ▶ Acknowledgements & Questions

# 2021 Permian HPGL Application Statistics



2021 HPGL Applications Basin Breakdown



**+594 Applications**

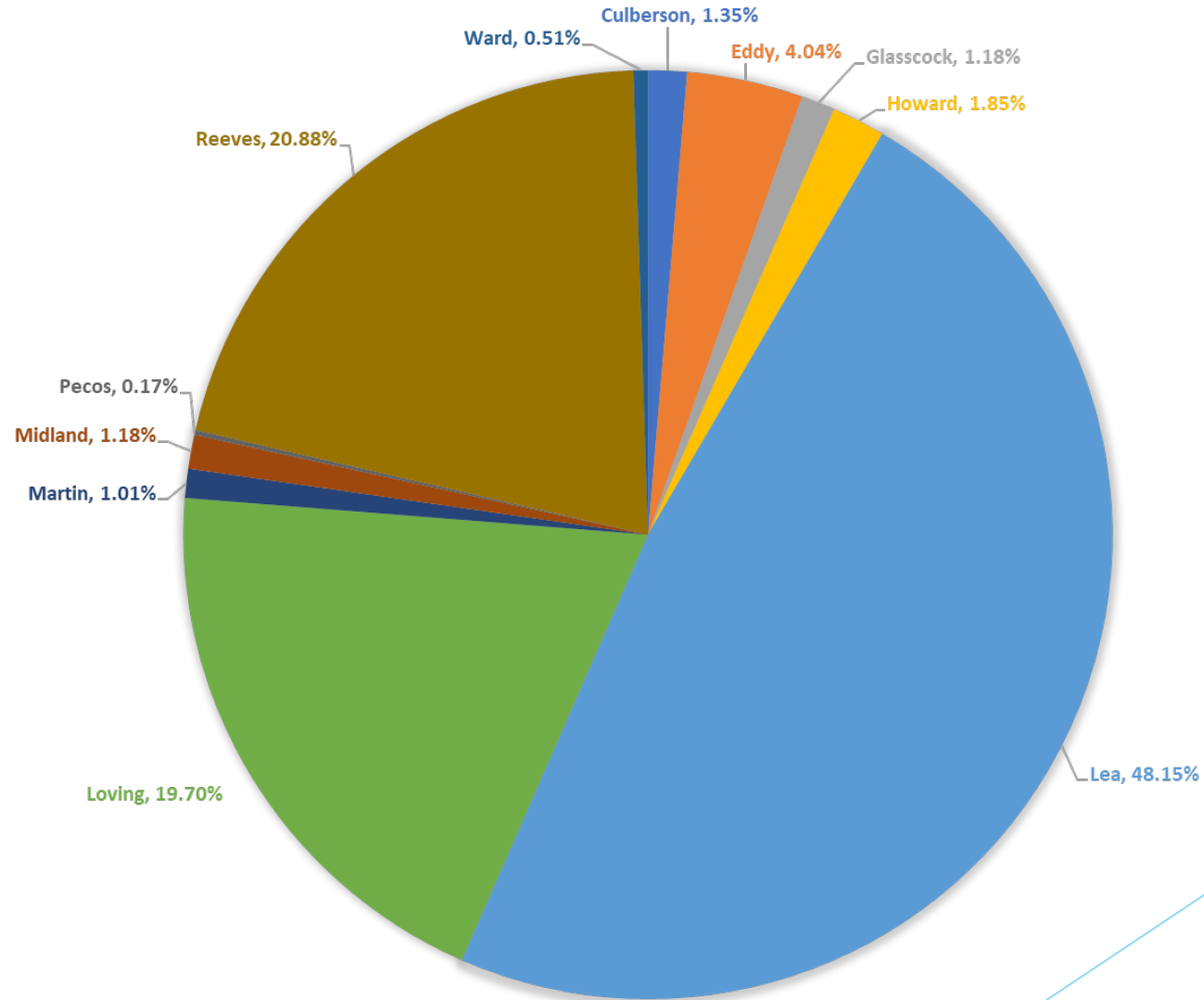
## Formations

1st Bone Springs	Wolfcamp A
2nd Bone Springs	Wolfcamp B
3rd Bone Springs	Wolfcamp C

# 2021 Permian HPGL Application Statistics



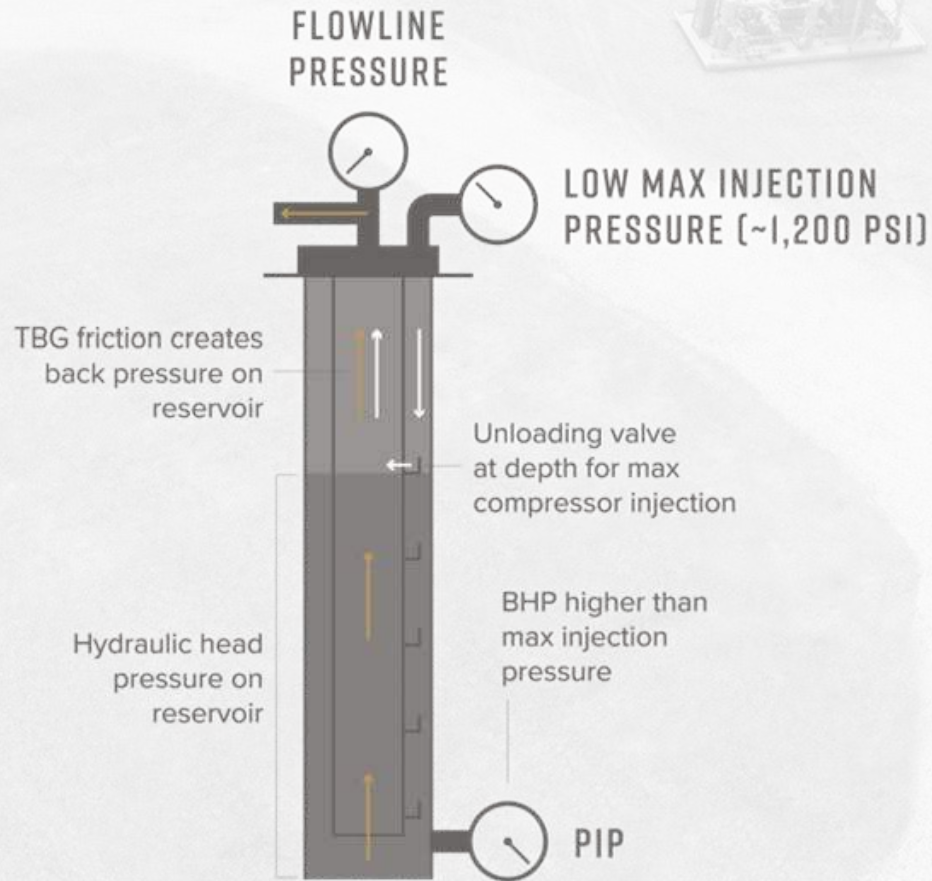
2021 PERMIAN HPGL APPLICATIONS - COUNTY BREAKDOWN



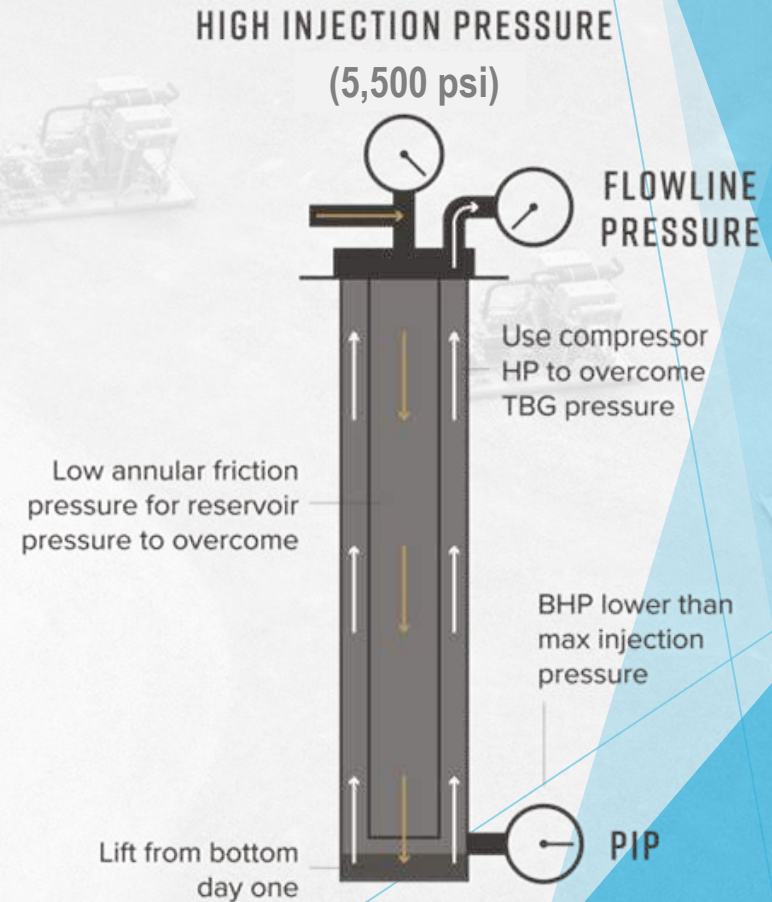
# What is HPGL?



## CONVENTIONAL



## THE WOLF HPGL





- **Injection Rate**

- Unloading Phase: Increasing flowing GLR decreases FBHP via decreasing the density of the produced fluid
- Critical Velocity Phase: Supplement produced gas to maintain a total produced gas rate above critical rate

- **FWHP**

- Directly affects flowing bottom hole pressure

- **Cross Section Flow Area**

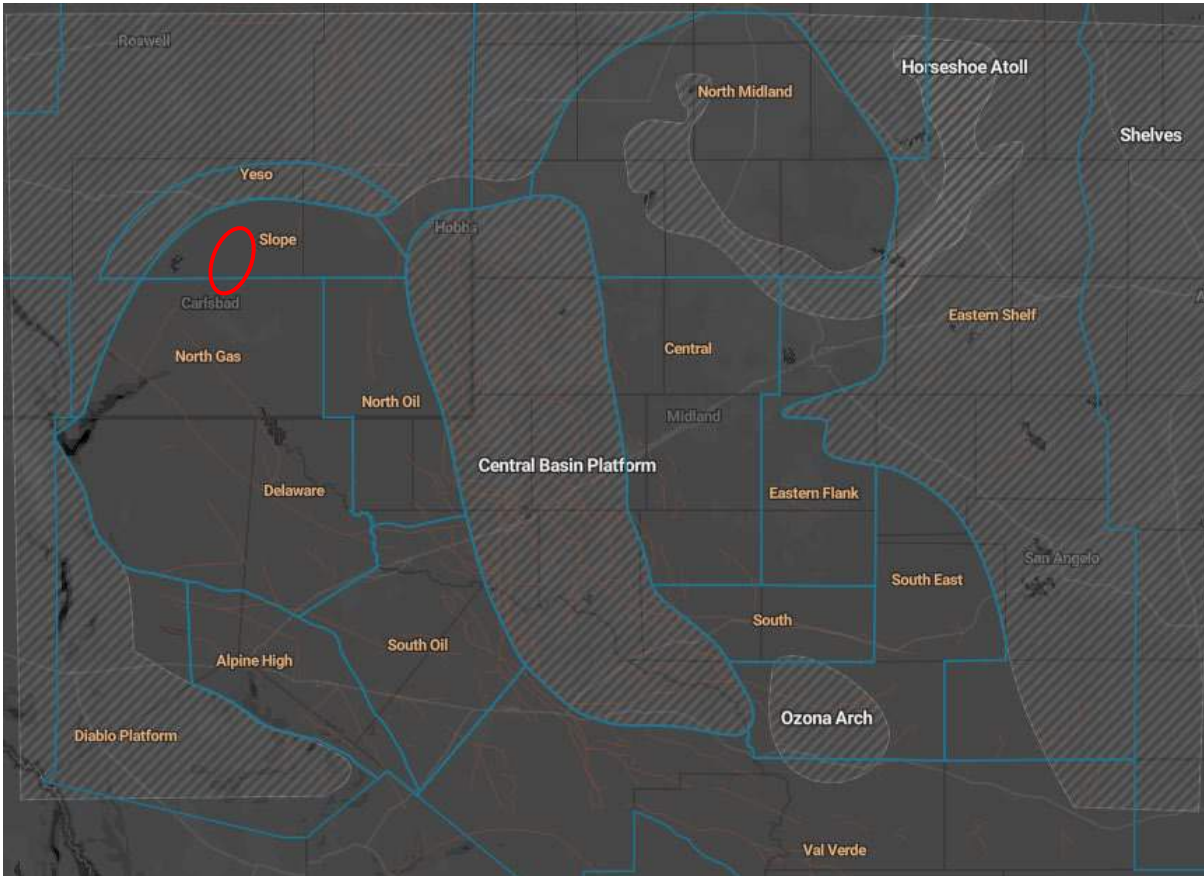
- Reduces frictional component which in turn reduces flowing bottom hole pressure

- **Lift Point**

- Deepening lift point allows lightening of entire column of fluid from date of first production

Flow Path	Equiv. ID (in)	Area (in <sup>2</sup> )
2-3/8" 4.7# Tubing	1.995	3.13
2-7/8" 6.5# Tubing	2.441	4.68
3-1/2" 9.3# Tubing	2.992	7.03
2-7/8" x 5-1/2" 20# Annulus	3.816	11.44
2-3/8" x 5-1/2" 20# Annulus	4.146	13.50
1-5/8" x 5-1/2" 20# Annulus	4.493	15.85
1-1/4" x 5-1/2" 20# Annulus	4.612	16.71

# HPGL Case Study Overview

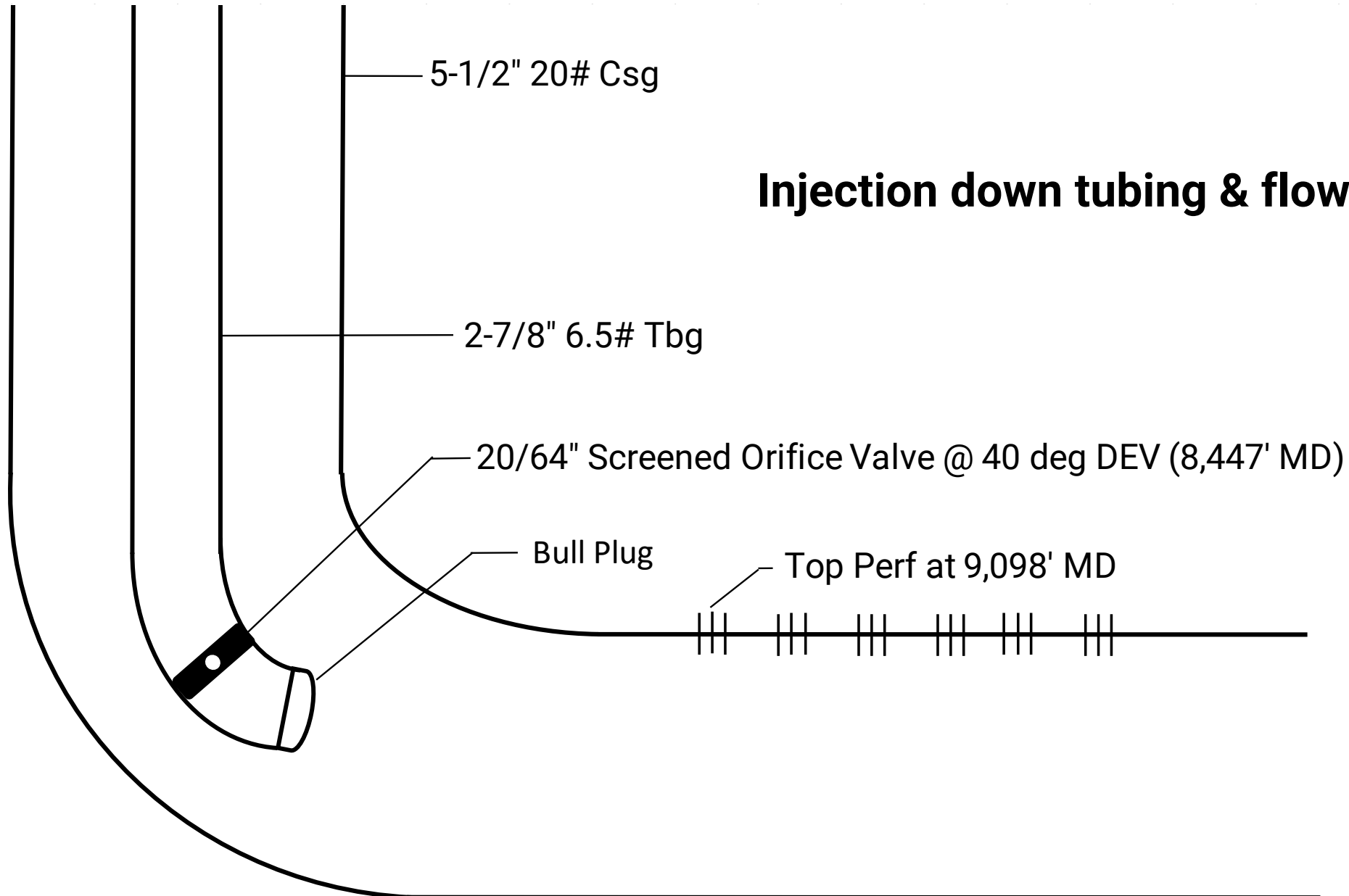


- ▶ Well Count: 9 (2 HPGL + 7 CGL)
- ▶ Basin: Delaware
- ▶ Field: Burton Flat Deep
- ▶ Reservoir: 3<sup>rd</sup> Bone Springs
- ▶ Mean Lateral Length = 9,953'
- ▶ Completion Design: 1,500 lb/lat ft & 670 gals/lat ft
- ▶ Mean GOR = 1,928 scf/bbl
- ▶ Mean GLR = 894 scf/bbl
- ▶ Time Period Analyzed: 1<sup>st</sup> 356 days of Production

# HPGL – Simplified Wellbore Design



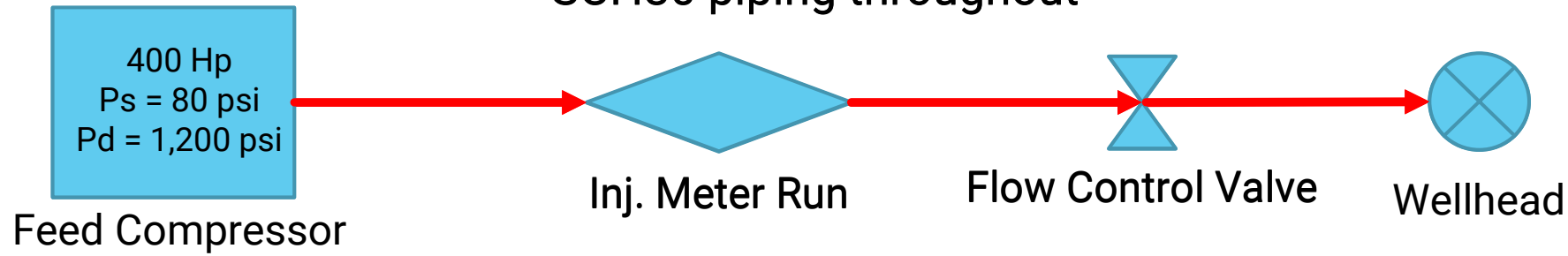
**Injection down tubing & flow up the annulus**



# Surface Injection Line Modification

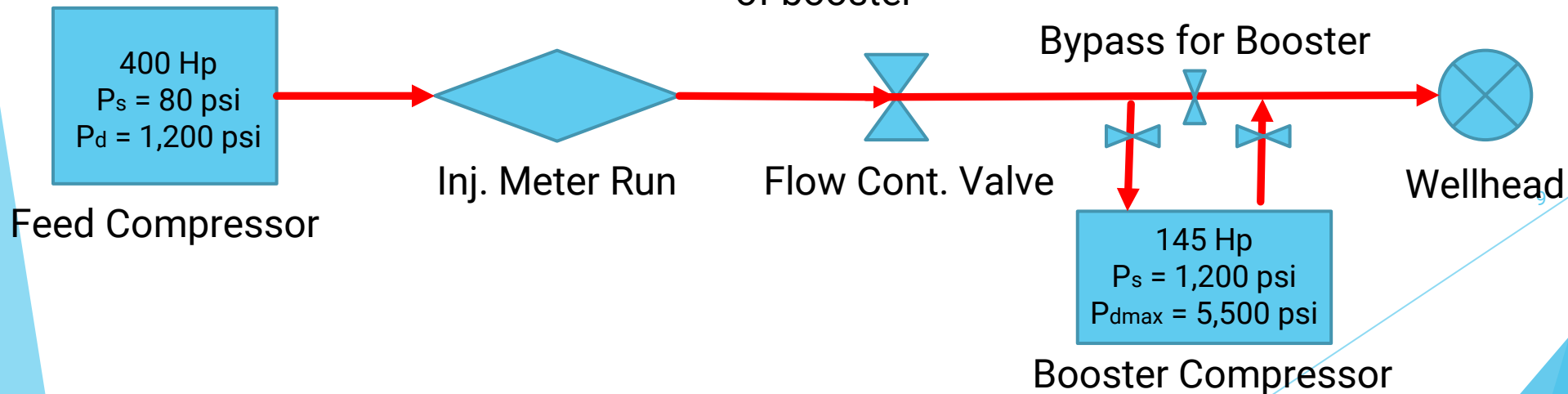
## CGL

SCH80 piping throughout

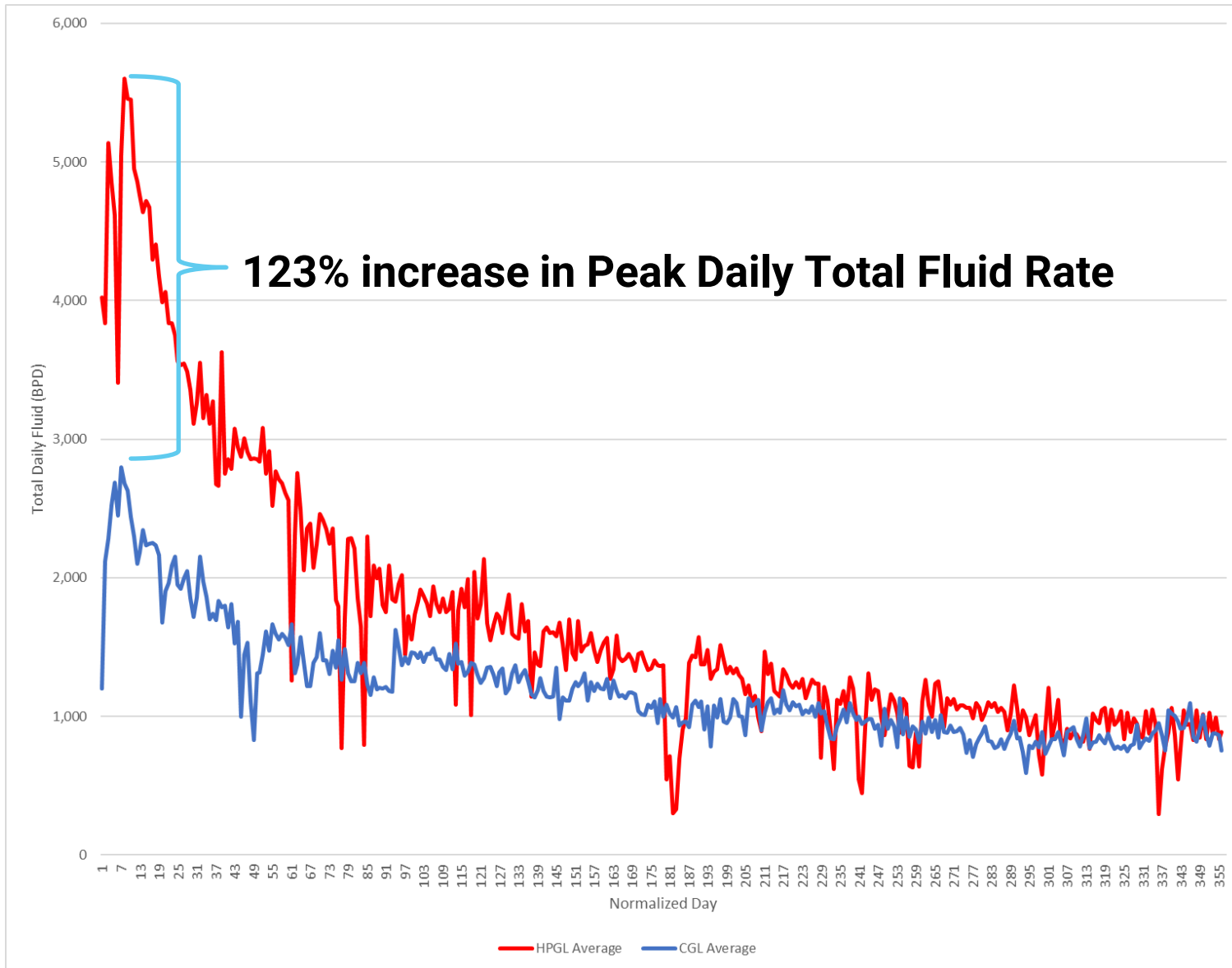


## HPGL

SCH80 piping upstream of Booster, SCH160 piping downstream of booster



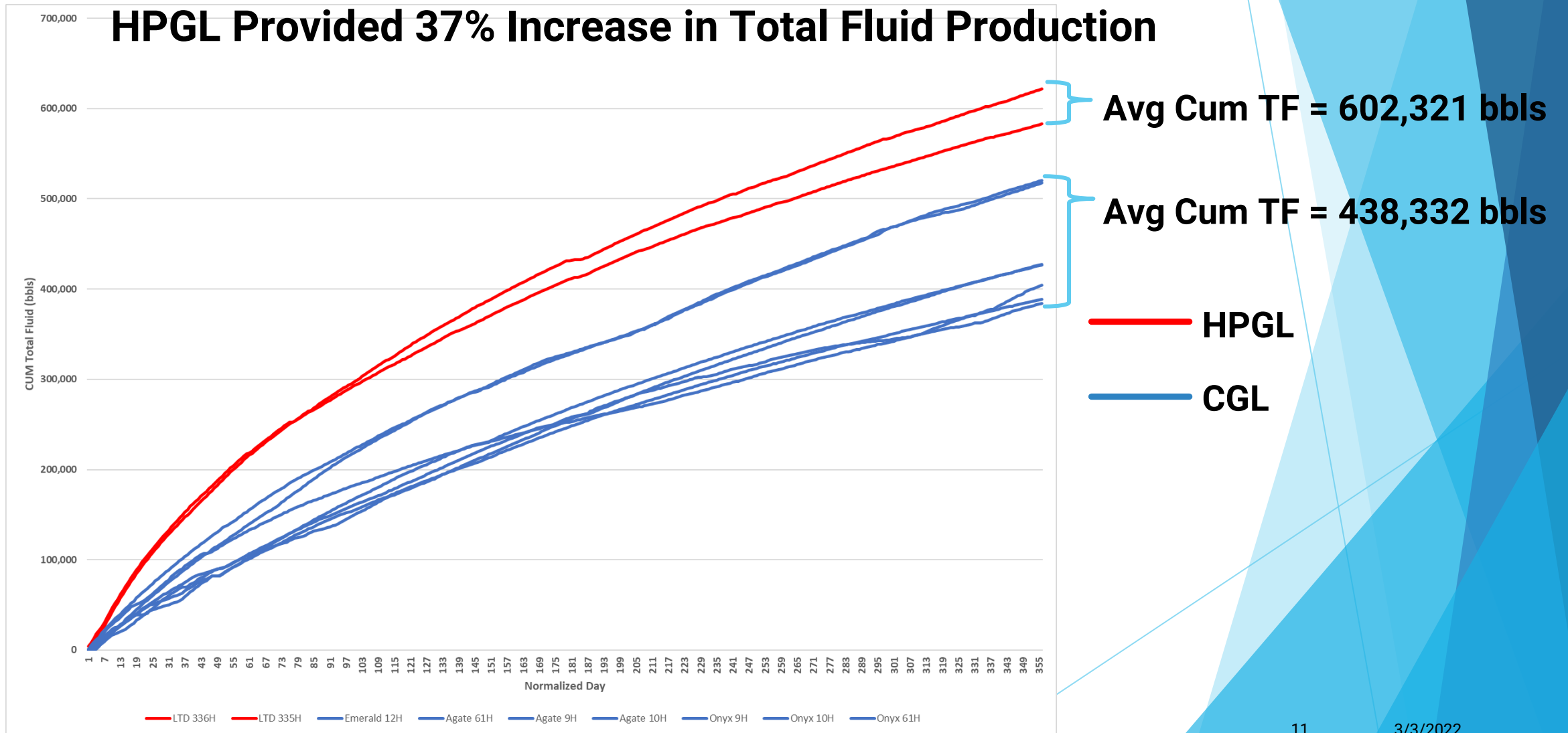
# Average Daily Total Fluid Comparison



— HPGL  
— CGL

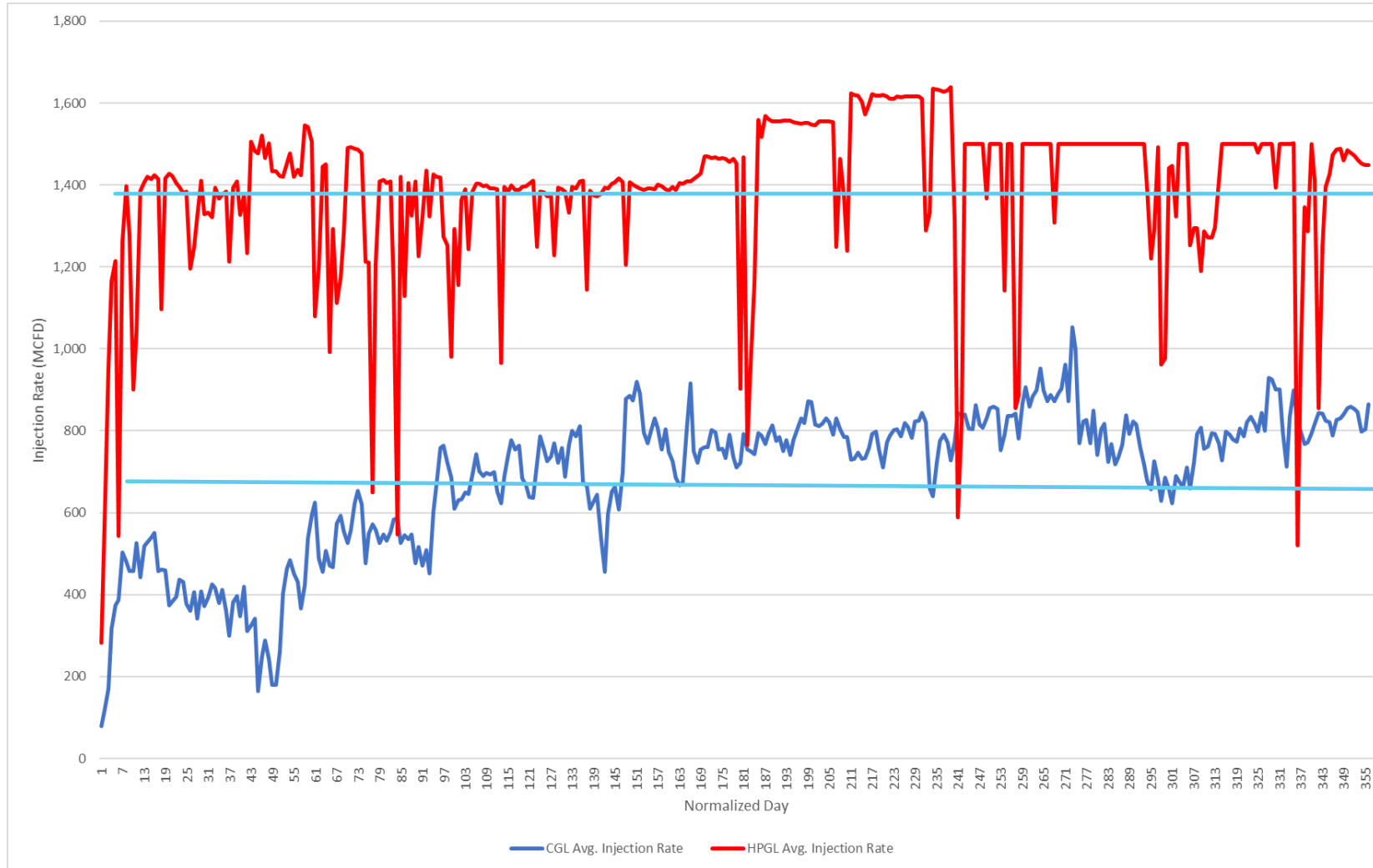


# Cum Total Fluid Comparison





# Average Injection Rate by Lift Type



**Avg. IR = 1,390 mcf/d**

**Avg. IR = 687 mcf/d**

**HPGL**

**CGL**



## Economics Summary

- ▶ CGL Well Set Avg NPV10 = \$4.48 MM/well
- ▶ HPGL Well Set Avg NPV10 = \$5.02 MM/well
- ▶ HPGL provided, on average, a 12% increase in NPV10
- ▶ Attributed to accelerating production at a minimal increase in CAPEX and OPEX



# Conclusions

- ▶ Mitigates workovers due to less (1 in this case) moving parts down hole
- ▶ Highly reliable compression system with total availability greater than 97.7% (Mechanical Availability of 99.2%)
- ▶ HPGL doubled the peak fluid rate of CGL
- ▶ 37% increase in total fluid produced from HPGL versus CGL wells
- ▶ Minimal incremental CAPEX associated with HPGL installation over that of CGL installation
- ▶ HPGL increased NPV10 12% over that of CGL wells
- ▶ Devon is currently adding HPGL applications to its assets



# Acknowledgements & Questions

Special thank you to ALRDC, Devon Energy,  
and Estis Compression!

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-Lift Workshop, they grant to the Workshop, the Artificial Lift Research and Development Council (ALRDC) rights to:

- ▶ Display the presentation at the Workshop.
- ▶ Place it on the [www.alrdc.com](http://www.alrdc.com) website, with access to the site to be as directed by the Workshop Steering Committee.
- ▶ Links to presentations on ALRDC's social media accounts.
- ▶ Place it on a USB/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 Artificial Lift Learning Course. A similar disclaimer is included on the Artificial Lift Workshop webpage.

The Artificial Lift Research and Development Council and its officers and trustees, and the Artificial Lift 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 Artificial Lift Learning Course and their company(ies), provide this presentation and/or training material at the Artificial Lift 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 warranties of title, non-infringement of copyright or patent rights of others, merchantability, or fitness or suitability for any purpose.