2025 GAS LIFT WORKSHOP

Conventional One-Inch Long Dome Valve

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Weatherford®

ConocoPhillips

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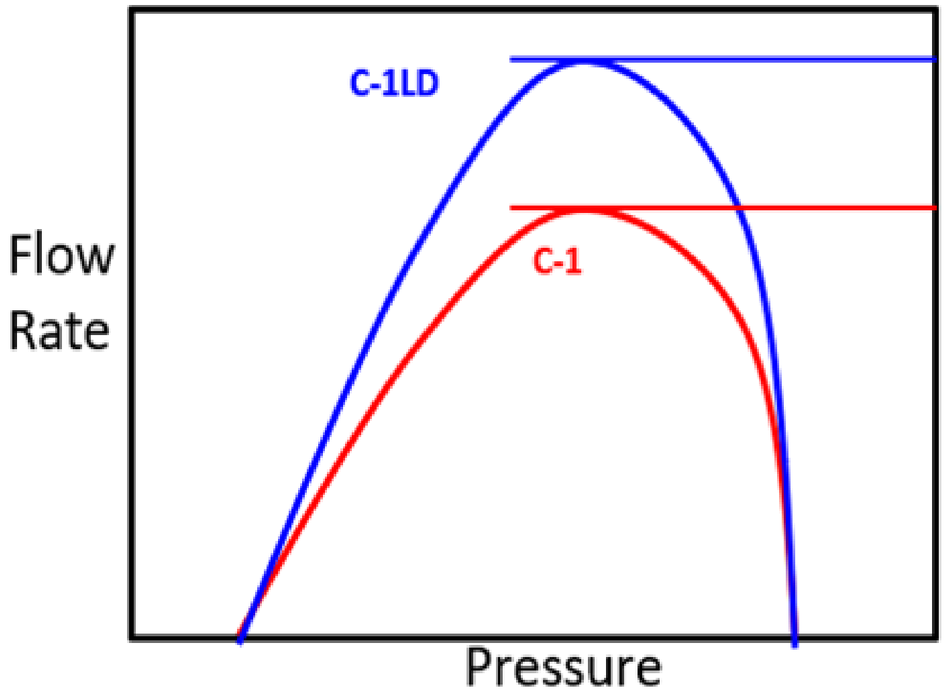
Agenda

- **Solution to Customer Needs**
  - Goals of the new valve
- **Features and Benefits**
  - Gas Passage
  - Load Rate
- **Data**
  - Results from lab testing
  - Down hole applications

Objectives

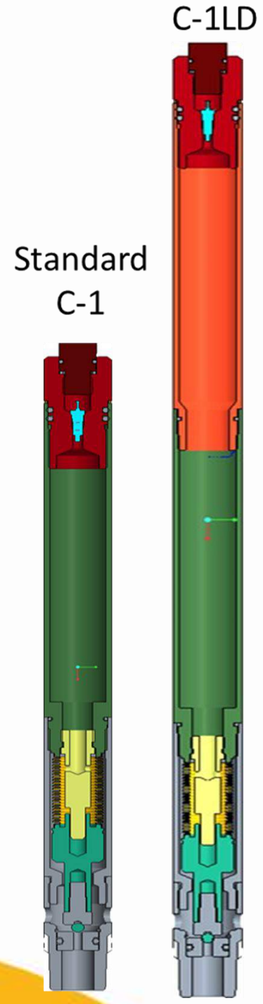
- Create a valve that performs more like a 1.5” valve that will fit in 5.5” casing on 2.875” tubing.
  - Improve load rate
  - Allow greater gas passage
  - Reduce muti-pointing
- Data Collection
  - Run in lab test to API Spec. 19G15 validation
  - Field tests



Gas Lift Valve Performance trend of lower load rate

Standard 1” vs the Long Dome

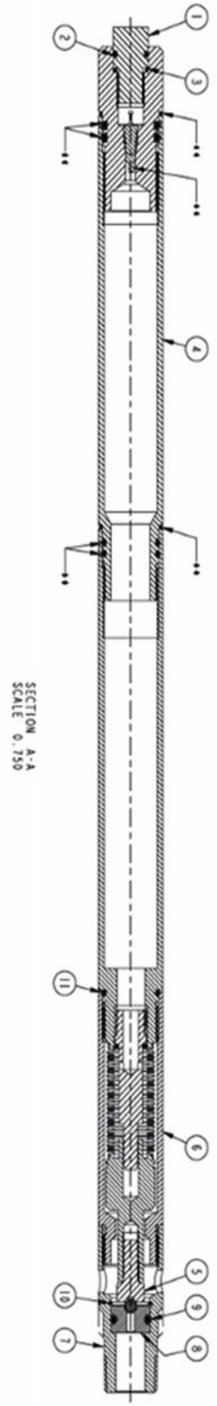
- Similarities:
  - Bellows
  - Seats/stems
  - Materials
  - Port sizes
  - Tail plugs
  - Dill cores
  - Silicon/dampening fluid
  - O-rings/seals
  - Monel gasket
  - Dome cap
  - Can be ran on a 4’ mandrel
  - R Value



- Differences:
  - The long dome extension doubles the dome volume.
  - The long dome has an additional Monel gasket and additional O-rings.
  - The long dome will need to be ran on a 6’ mandrel if dual checks are ran.

Features and Benefits

- Double the Nitrogen dome volume
- Allows an increase of gas-lift injections rate up to 32%
- Lowers load rate by 38%
- Allows additional Stem travel with less overburden pressure to open gas lift valve
- Reduce multi-pointing
- Enhance production rate or efficiency by injecting gas deeper in well
- Less sensitive to temperature changes
- More controlled and prolonged single-point injection
- Can help reduce slugging
- Low-cost method of enhancing flow performance
- Increase compressor efficiency/decrease CO2 Emissions



Load Rate

- The load rate of a gas lift valve refers to the amount of pressure increase required to move the valve stem a certain distance.
- Load rate is a measurement of the valve stem's resistance to movement and is crucial for predicting how much the valve will open at a given pressure differential.
- Load rate is a fundamental property of GLVs that quantifies how "stiff" or "soft" a valve is.
- A higher load rate means the valve requires a greater pressure increase to move the stem.

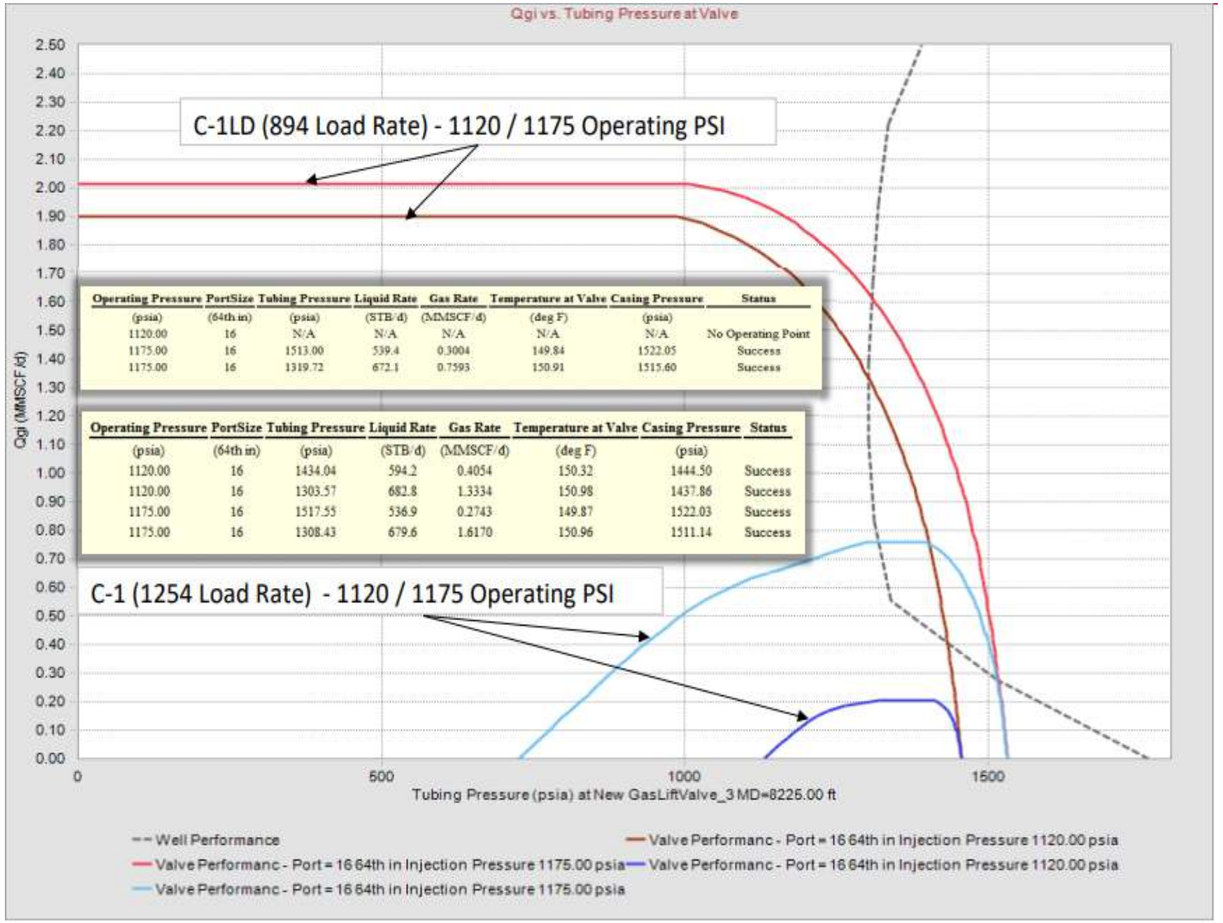
- Lowering the Load Rate
  - Allows additional Stem travel with less overburden pressure to open gas lift valve
  - Allows greater gas passage
  - Reduces multi-pointing
  - Allowing more gas injection in deeper valves
  - Enhancing production rate or efficiency
  - Improves pressure management which helps stabilize gas injection and reduces valve sensitivity to pressure fluctuations

Multi-Pointing

- Multi-pointing is when there are multiple points of injection
- Multi-pointing can lead to instability and inefficiency in the well performance
  - Gas distribution becomes uneven and often unpredictable
- Things that can cause multi-pointing
  - Leaking valves/valve failures
  - Over injecting for single point injection
  - Holes in tubing
- Multi-pointing occurs in every well at some point
- The goal of gas lift operations is to have single point injection as deep as possible to maximize draw down and production.
- Single point injection can help reduce slugging.

Gas Passage

- Gas passage refers to the volume of gas that can pass through a gas lift valve under given conditions.
- When the total volume of injected gas in a well cannot pass through one valve pressure can build in the casing opening the valve above causing multi-pointing.



Operating Pressure (psia)	PortSize (64th in)	Tubing Pressure (psia)	Liquid Rate (STB/d)	Gas Rate (MMSCF/d)	Temperature at Valve (deg F)	Casing Pressure (psia)	Status
1120.00	16	N/A	N/A	N/A	N/A	N/A	No Operating Point
1175.00	16	1513.00	539.4	0.3004	149.84	1522.05	Success
1175.00	16	1319.72	672.1	0.7593	150.91	1515.60	Success

Operating Pressure (psia)	PortSize (64th in)	Tubing Pressure (psia)	Liquid Rate (STB/d)	Gas Rate (MMSCF/d)	Temperature at Valve (deg F)	Casing Pressure (psia)	Status
1120.00	16	1434.04	594.2	0.4054	150.32	1444.50	Success
1120.00	16	1303.57	682.8	1.3334	150.98	1437.86	Success
1175.00	16	1517.55	536.9	0.2743	149.87	1522.03	Success
1175.00	16	1308.43	679.6	1.6170	150.96	1511.14	Success

Trial Wells

- All wells on the same pad.
  - 3 wells with the long dome, 4 wells with standard with the standard 1” valve.
- 5 wells have 13 stations
  - 1 well with standard valves has 10 stations
  - 1 well with the long dome has 12 stations

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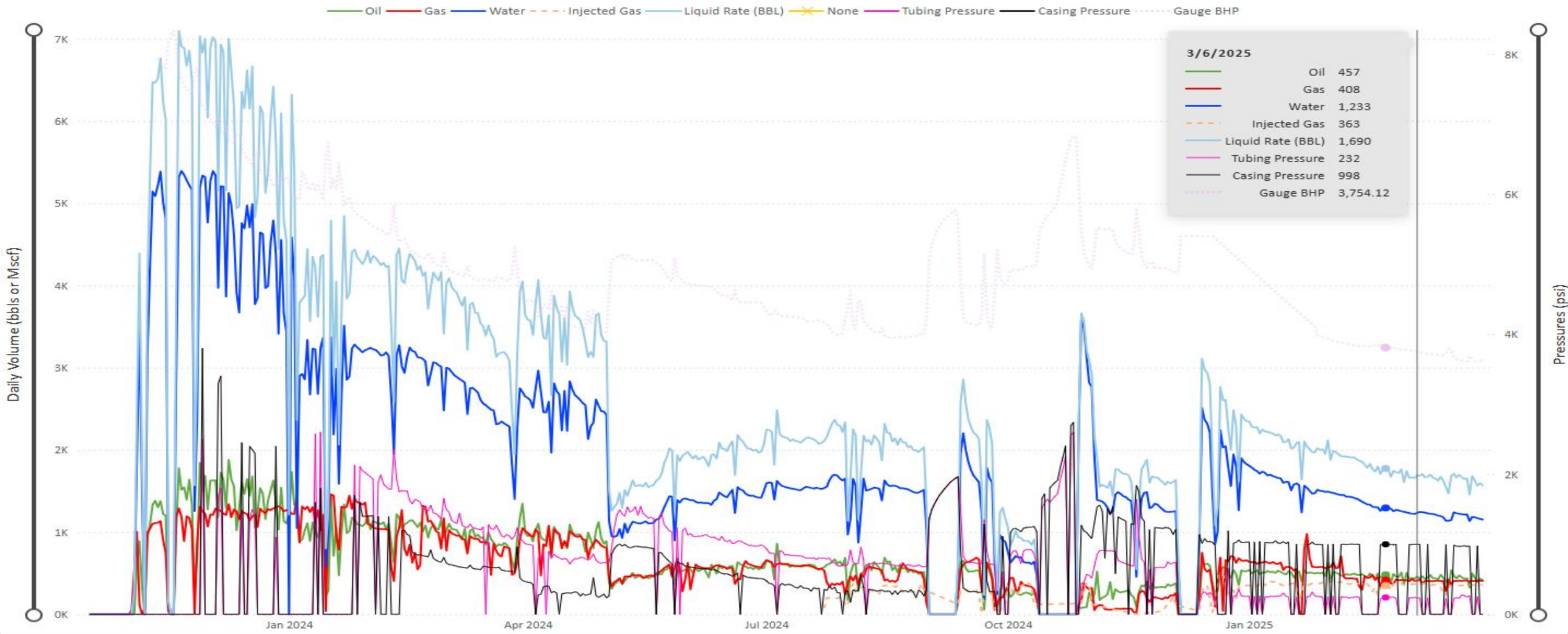

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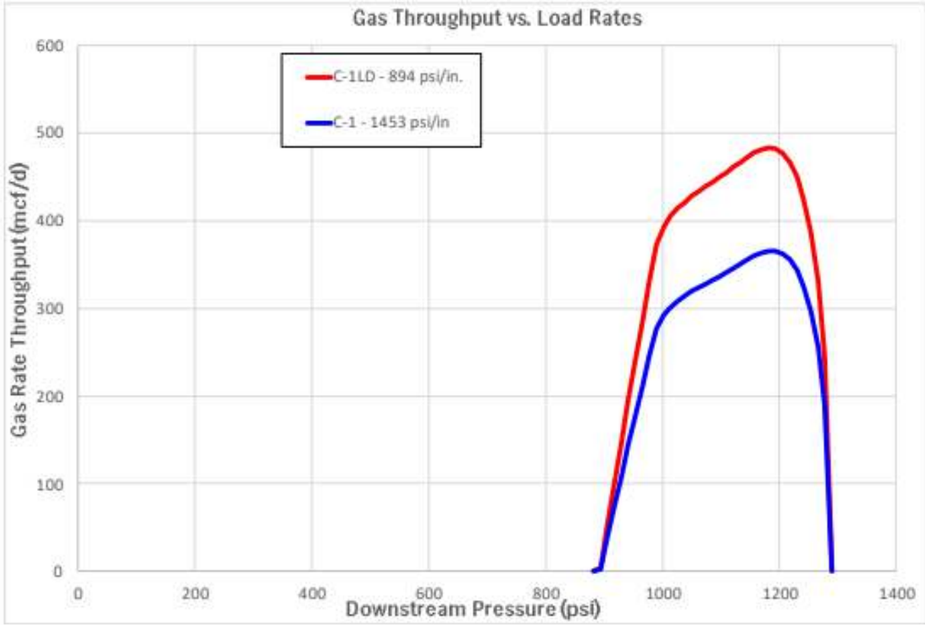
Lab Tests

- 7 16 port valves tested to API 19G2 second addition standards.
- Load rate reduced 14-38%
- Stem travel increased by about 0.013”
- Up to 32% increase in gas passage

Valve Model	800 psi TRO		1,200 psi TRO		2,000 psi TRO	
	Load Rate	Stem Travel	Load Rate	Stem Travel	Load Rate	Stem Travel
C-1	1,453	0.125	1,503	0.129	2,149	0.137
C-1LD	894	0.137	1,005	0.143	1,850	0.150
Reduction	38%		33%		14%	

*API 19G2, Second Edition, 7 valves tested.

C-1 and C-1LD Load-Rate and Stem-Travel Test Comparison



Conclusion

- The standard 1” Conventional valve is the most popular gas lift valve in the Permian by far due to 5.5” casing and 2.875” tubing being the most popular combination.
- The Conventional 1” Long Dome valve has considerable advantages such as lowering load rates, increasing gas passage, reduces multi-pointing, etc. over the standard 1” valve.
- The lab tests and down hole trials have shown noticeable improvement with the long dome valve.
- Several operators have begun standardizing the long dome as the valve of choice for a majority of their conventional gas lift applications.

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- Weatherford
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- ALRDC Gas Lift Workshop

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Question Time

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