2025 GAS LIFT WORKSHOP

The Benefits Of Gas Lift Optimization

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Agenda

- Accurate gas lift optimization consists of a combination of field data collection, real-time monitoring, and advanced analytical techniques. Gathering well parameters, monitoring casing and tubing pressures, and measuring static bottom hole pressure (SBHP) are essential steps in understanding actual well conditions. These data-driven insights will allow you to fine-tune gas lift systems for maximum performance.

- Field Data – (Non-SCADA Wells)

- Real-time Surveillance

- Analytical Tools / Software(s)

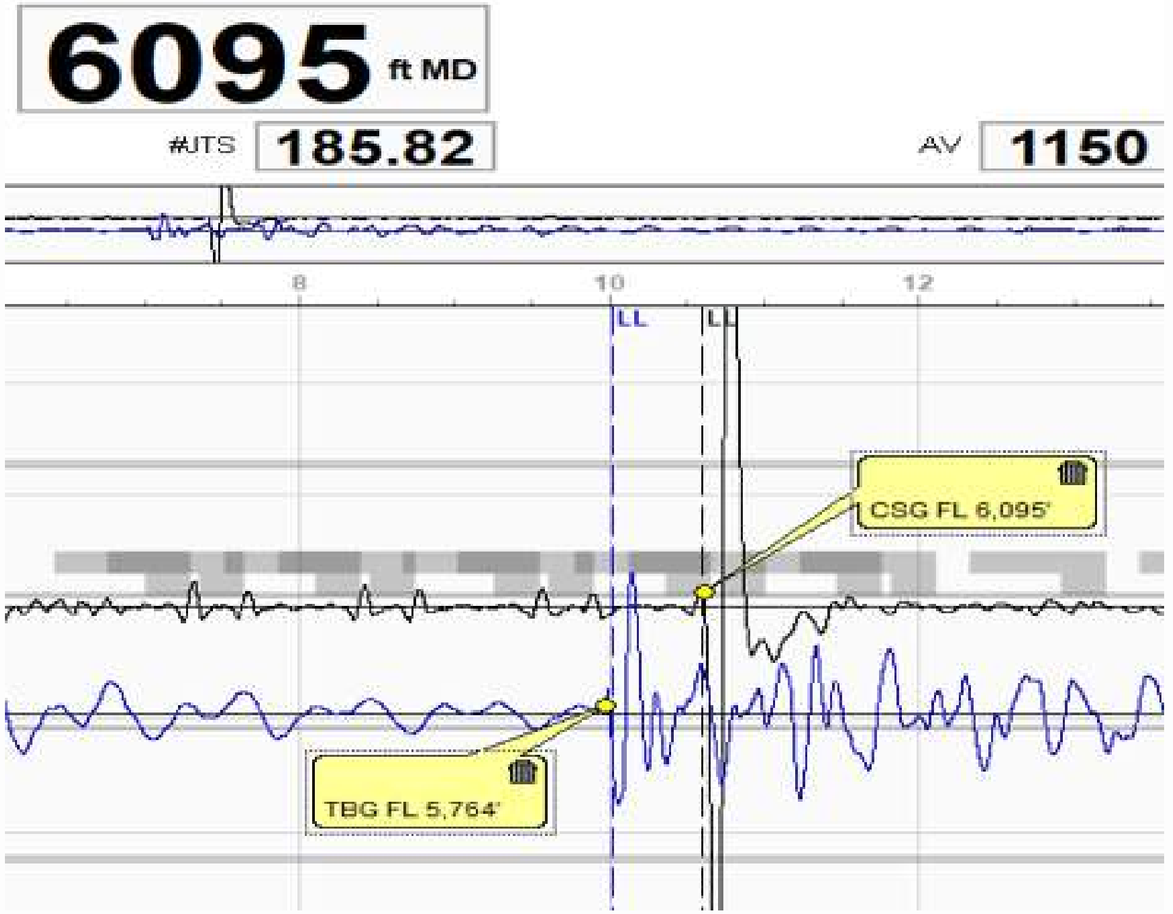
- By leveraging the above, operators can ensure that each well operates at peak efficiency, unlocking the full potential of gas lift optimization.

Field Data Collection

- **Gas Lift Schematic / Design** – Mandrel depths, GLV PSO, PSC, PTRO, Port sizes.
- **FWHT** – Temperature gun to measure flowing wellhead temp. This will help identify POI during NODAL.
- **Flowing Tubing and Casing Pressures** – Recording these pressures can help immediately identify a potential issue downhole when compared to the design.
- **Wellhead Configuration** – Chokes, flowlines, valves, blockages, etc.
- **Compression** – Centralized or on-site, gas meter, choke, how much injection gas is used.
- **Production** – Oil, Water, Formation Gas.
- **PSO vs actual** – Quick comparison of design PSO and flowing casing pressure can usually identify POI.

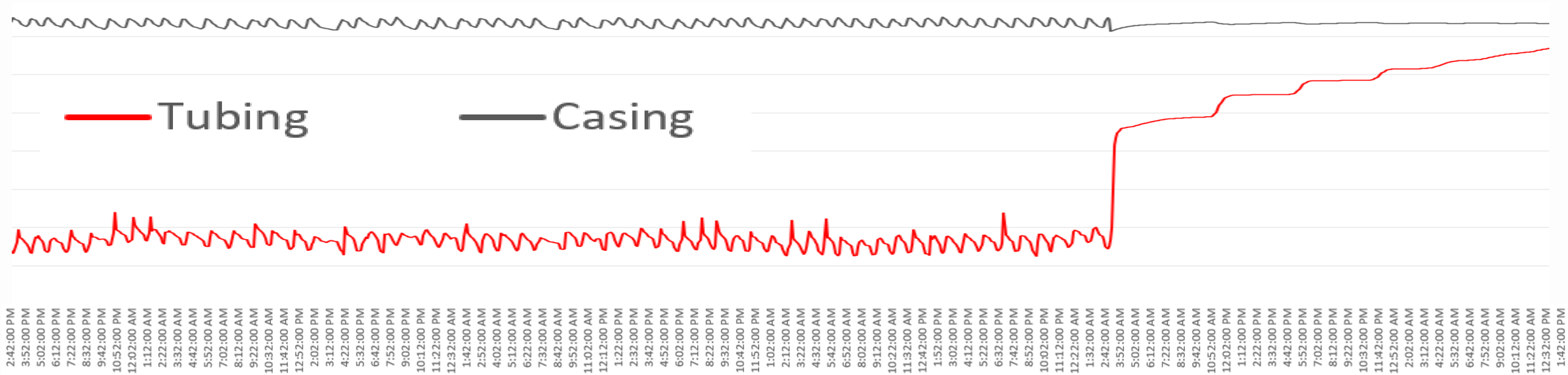
Fluid Levels

- **Flowing FL Shot** – Shut injection gas off, shoot both casing and tubing.
- **Shut in FL Shot** – Shoot casing and tubing after a 12hr -24hr shut in. A shut in fluid level shot will help determine an accurate SBHP for NODAL.
- **Packer Installed** – Must determine SBHP from tubing shot and build up psi.
- **Packer-less** – May use either tubing or casing to determine SBHP.



Data Loggers (12-24 Hours)

- **Flowing state** - Review trends for HIT, Valve throttling, Fluctuating pressures.
- **Shut in** - Review for pressure build up, equalization, leaks.

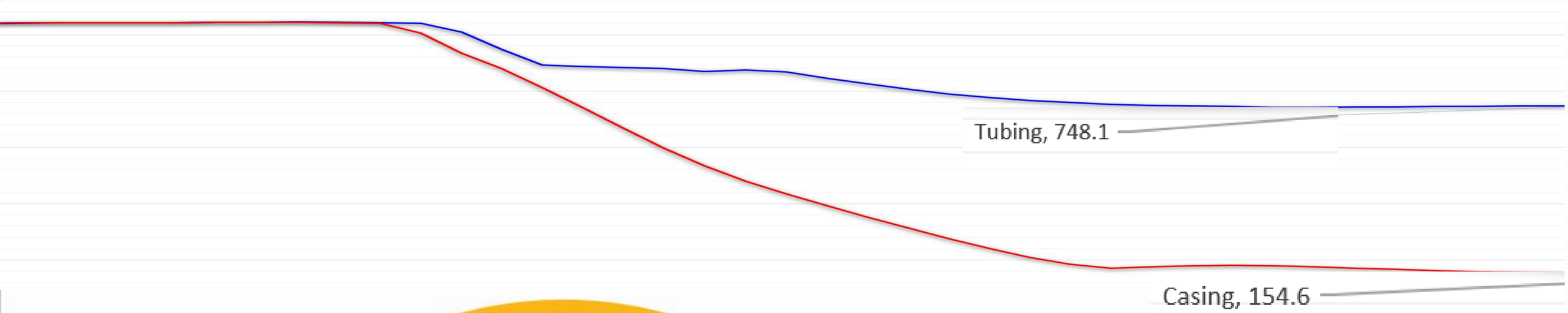


Tubing Integrity Test

- **Following the shut in for the accurate SBHP calculation:**

  - **Tubing Integrity Test** – If the well has a packer, a tubing integrity test is recommended. This test will identify any potential hole(s) in tubing or a failed gas lift valve and check valve. With data loggers still installed, we can record this test.

  - **Rocking Gas Lift Valves** – Pressure up the backside above the top valve's PSO and rapidly bleed off to perform to rock the valves of any debris.



Field Data Interpretation / Modeling

- **Evaluations**
  - Data loggers – What do the trends identify?
  - Flowing fluid level shot – does the operating psi match the PSO of the operating valve? Does the fluid level match the depth of the operating valve? Do any kicks show an open valve or HIT?
  - SCADA (If available) – Identify time frame of suspected issue.

- **Tubing Load Requirement** – Run a TLR (*Tubing Load Requirement*) calculation with current well conditions and gas lift design to determine POI.

- **NODAL Analysis** – Calculate SBHP from static FL, production, static psi build up. Create a model in Wellflo to derive a FBHP and IPR curve.
  - Critical Velocity
  - Gas Lift response
  - Gas lift diagnosis
  - Tubing size comparison

Tubing Load Requirement

- **What we can determine from a TLR Plot**

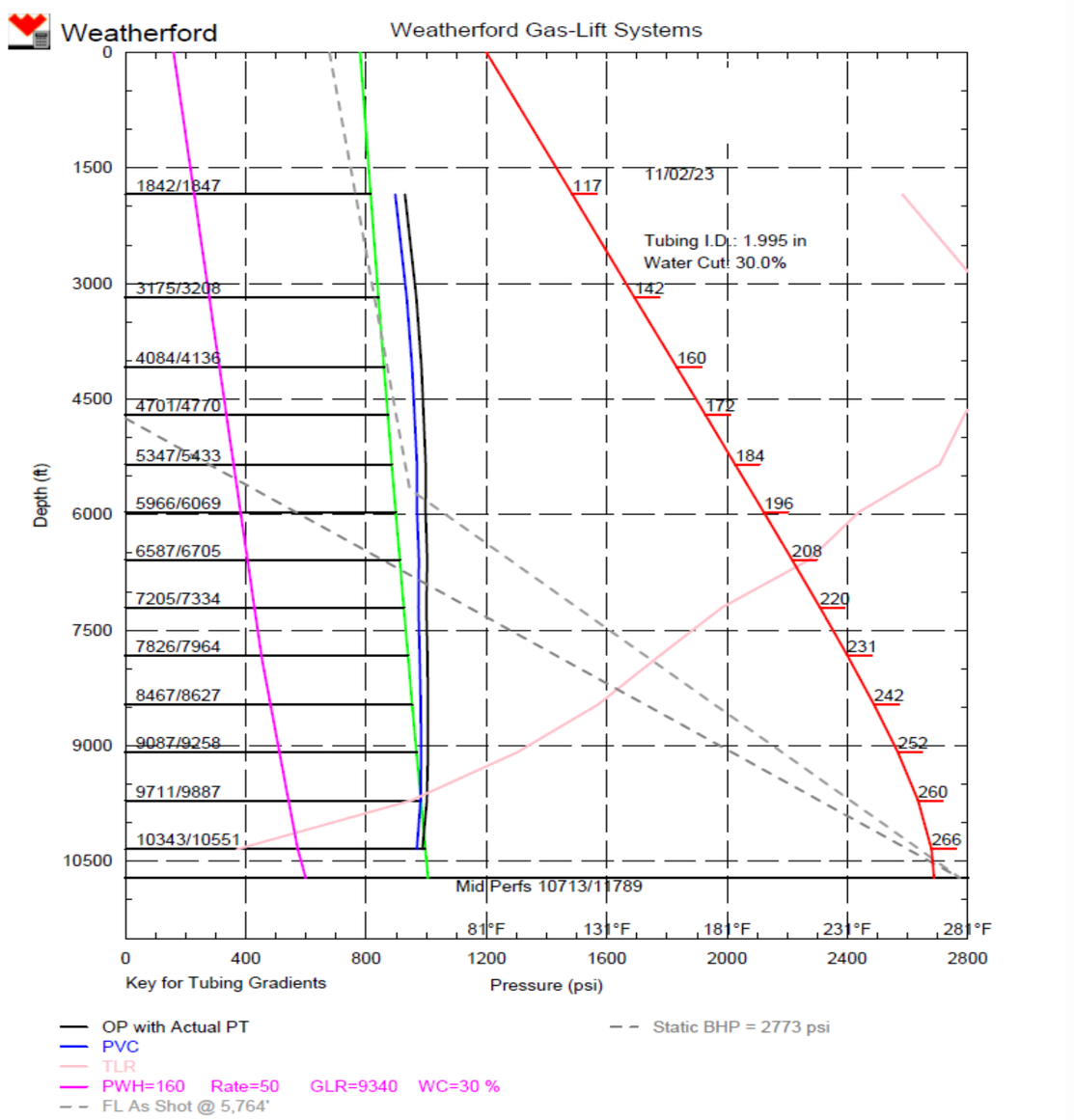
  1. Injection Point
  2. Fluid level confirmation of the injection point
  3. Calculated FBHP
  4. Possible communication
  5. Future recommendations

- **To generate a proper TLR**

  1. Good Data in = Good data out
  2. Wellhead temp is important
  3. You can calculate a TLR without a fluid level, but knowing where the fluid is in the annulus will confirm or disprove TLR findings.

- **Tubing Load Requirement** – Run a tubing load requirement calculation with current well conditions and gas lift design to determine POI. It will compare how the well was designed to produce vs. actual production.

#	TVD (ft)	MD (ft)	Valve Type	PTRO (psi)	Port Size (in)	TEF	TV °F	TCF	Act PT (psi)	OP 0 PT (psi)	CP (psi)	DELP (psi)	TLR (psi)	OP Act PT (psi)	PSO (psi)	PVC (psi)	PSC (psi)	Gas Lift Valve Status
13	1842	1847	C-2 TC	840	12	0.0484	117	0.8933	229	940	815	125	2583	929	894	897	862	**Closed**
12	3175	3208	C-2 TC	835	12	0.0484	142	0.8519	278	980	841	139	2872	967	906	935	874	**Closed**
11	4084	4136	C-2 TC	825	12	0.0484	160	0.8260	312	999	859	140	2893	984	905	953	874	**Closed**
10	4701	4770	C-2 TC	815	12	0.0484	172	0.8093	335	1007	872	135	2789	991	899	960	868	**Closed**
9	5347	5433	C-2 TC	805	12	0.0484	184	0.7927	359	1016	885	131	2707	998	893	969	864	**Closed**
8	5966	6069	C-2 TC	790	12	0.0484	196	0.7774	382	1016	898	118	2438	998	880	969	851	**Closed**
7	6587	6705	C-2 TC	780	12	0.0484	208	0.7629	405	1022	912	110	2273	1003	871	975	843	**Closed**
6	7205	7334	C-2 TC	765	12	0.0484	220	0.7492	429	1021	925	96	1983	1000	855	974	829	**Closed**
5	7826	7964	C-2 TC	755	12	0.0484	231	0.7363	452	1025	939	86	1777	1004	845	978	819	**Closed**
4	8467	8627	C-2 TC	745	12	0.0484	242	0.7240	482	1029	953	76	1570	1006	833	981	808	**Closed**
3	9087	9258	C-2 TC	735	12	0.0484	252	0.7136	512	1030	967	63	1302	1005	818	982	795	**Closed**
2	9711	9887	C-2 TC	725	12	0.0484	260	0.7050	542	1028	982	46	950	1002	800	981	779	**Transitional**
1	10343	10551	C-2 TC	710	12	0.0484	266	0.6994	573	1015	997	18	372	987	770	968	751	**Open**

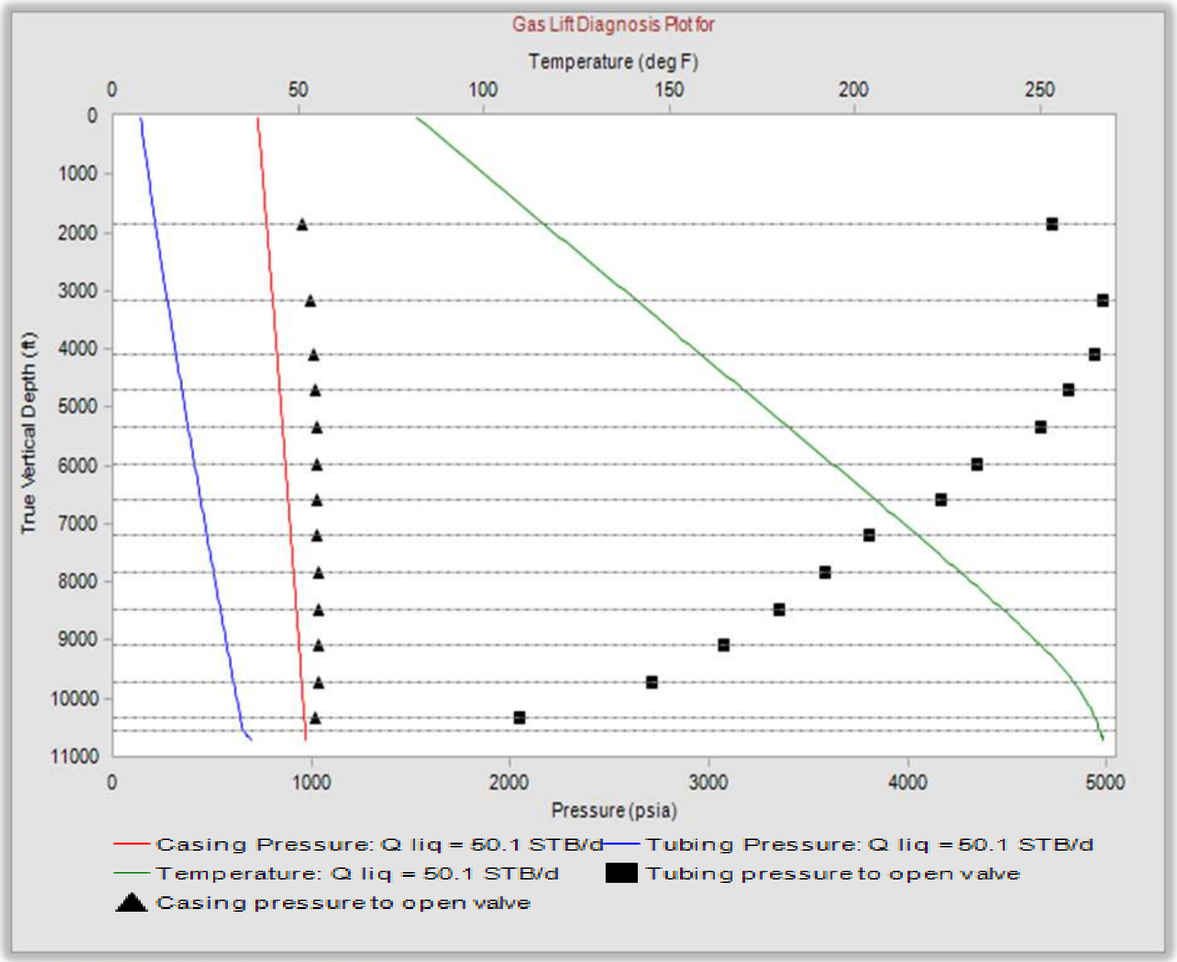


Well Model Configuration & Well Status

Flow Configuration	Tubing – 2- 3/8”
Flow Correlation	H&B (Comp.) x 1.000
API Oil Gravity	46
F. Gas Gravity	0.8
I. Gas Gravity	0.8
Water Gravity	1.02
Est. Res. Pressure	2773 psi
Est. Res. Temperature	267 F
Water Cut	0.30
F. Gas: Oil Ratio	1714
Test Pressure	704 psi
Test Rate	50 blpd
Productivity Index	.0363 stb/d/psi
Inj. Rate	415 mcf/d
Inj. WH Pressure	730 +/- psi
Prod. WH Pressure	140 psi
Point(s) of Inj.	10,884’

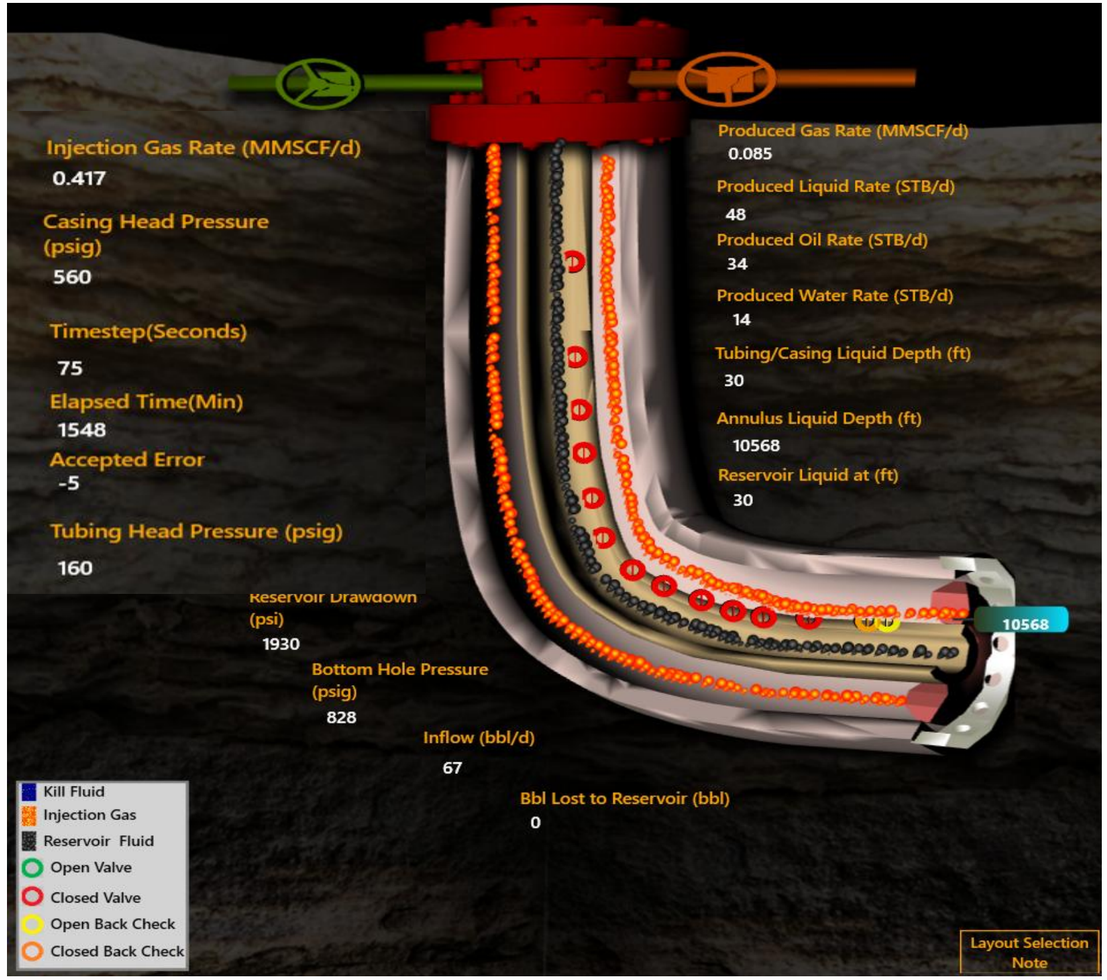
Notes on Values Derived (red)

- SBHP - 2773 psi derived from shut-in tubing fluid level
- FBHP of 704 psi
- FL inconsistent with POI at 10,884’



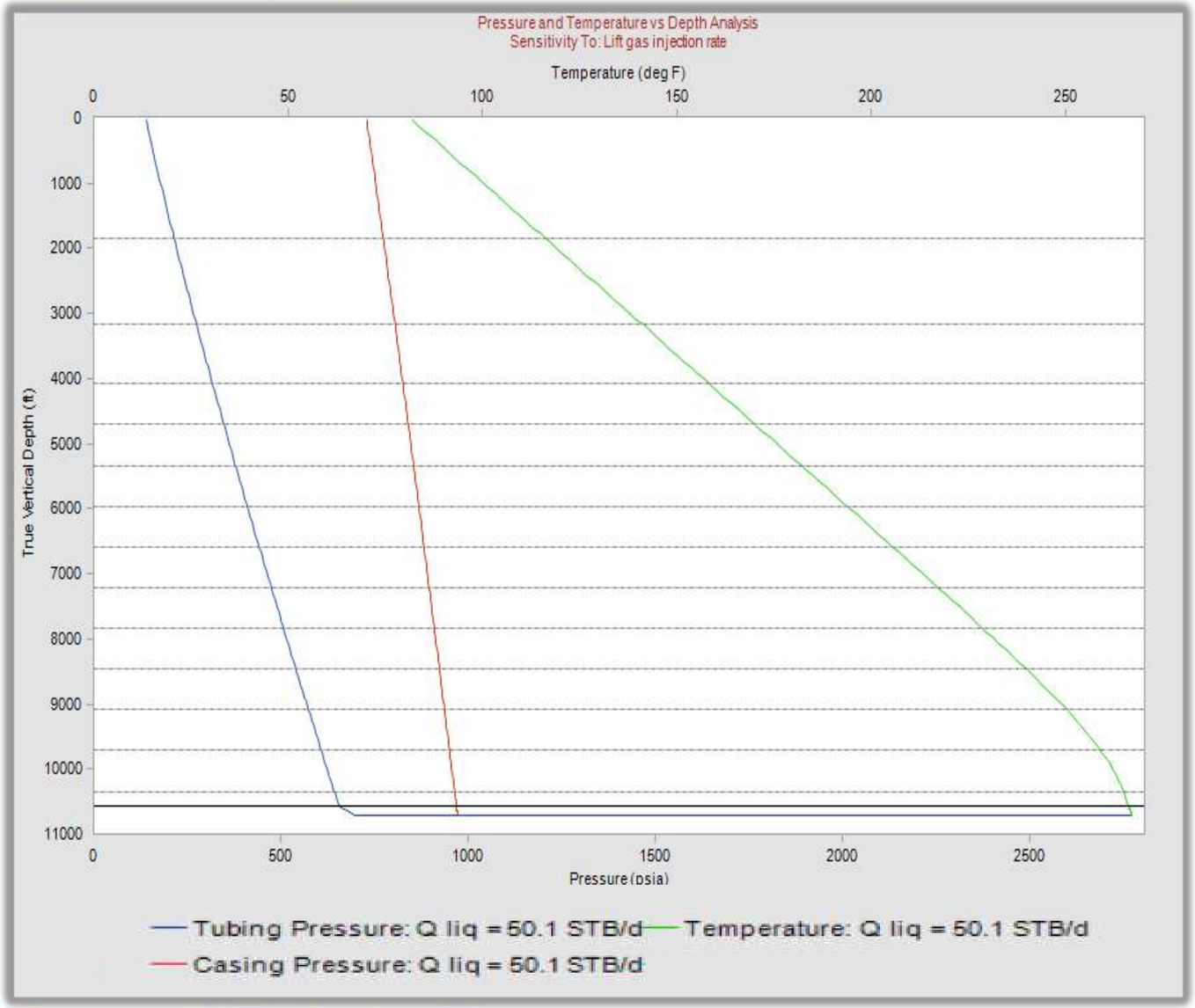
Modelling Validation

- **Dynamic Transient Modelling-** Simulates the dynamic behavior and characteristics of the gas-lift unloading process. It uses the transient modeling of flow in both the wellbore and the reservoir.
  - Configuring a model with the gas lift design that is installed along with current well conditions will simulate an estimated POI, which will confirm what the NODAL and tubing load requirement already have.



NODAL Analysis

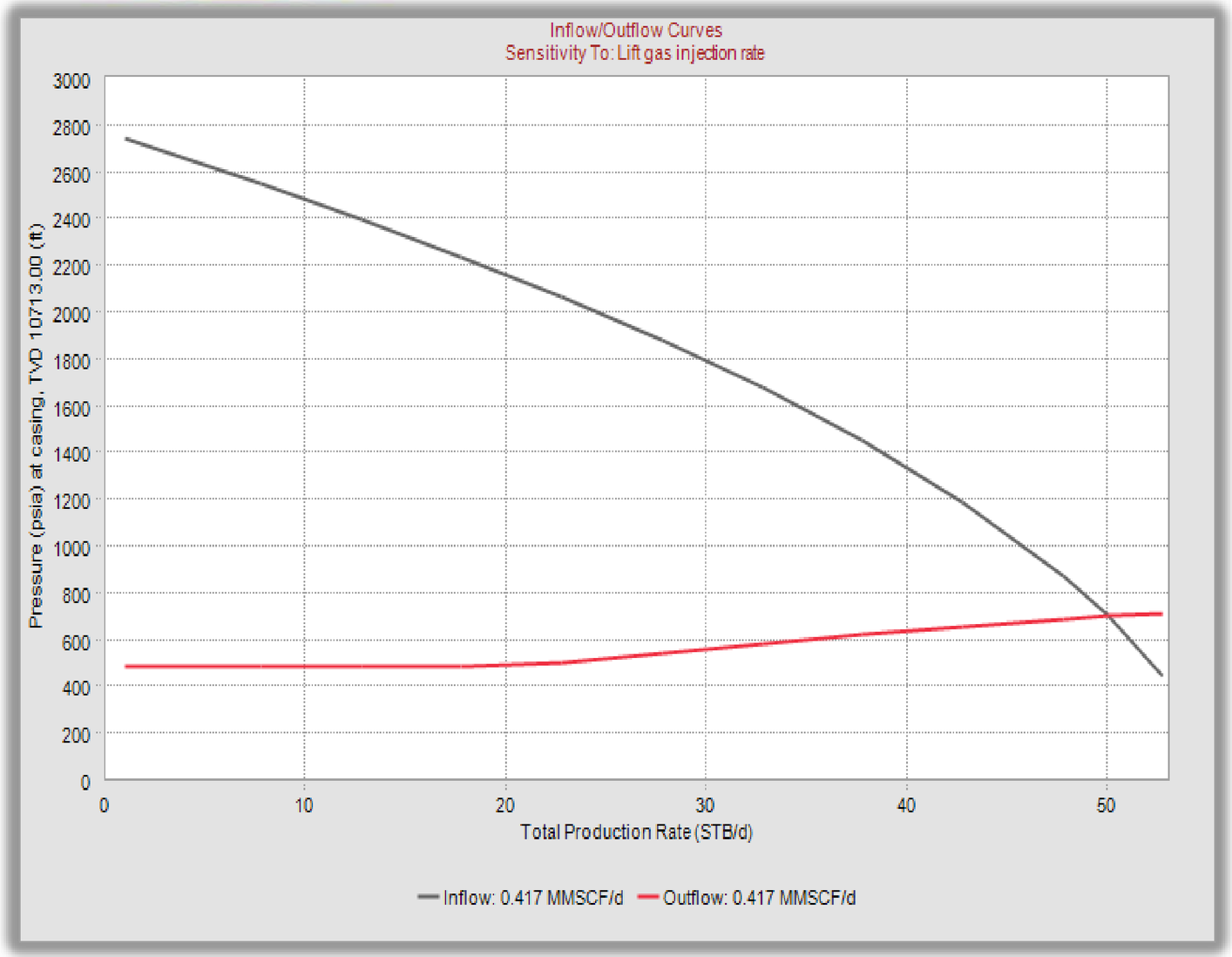
- After a model is built, NODAL analysis can be used to optimize the gas lift well if there are no equipment failures downhole.
- Sensitivities
  - IPR curve
  - Tubing size comparison
  - Optimal gas injection rate
  - Critical velocity



IPR Curve

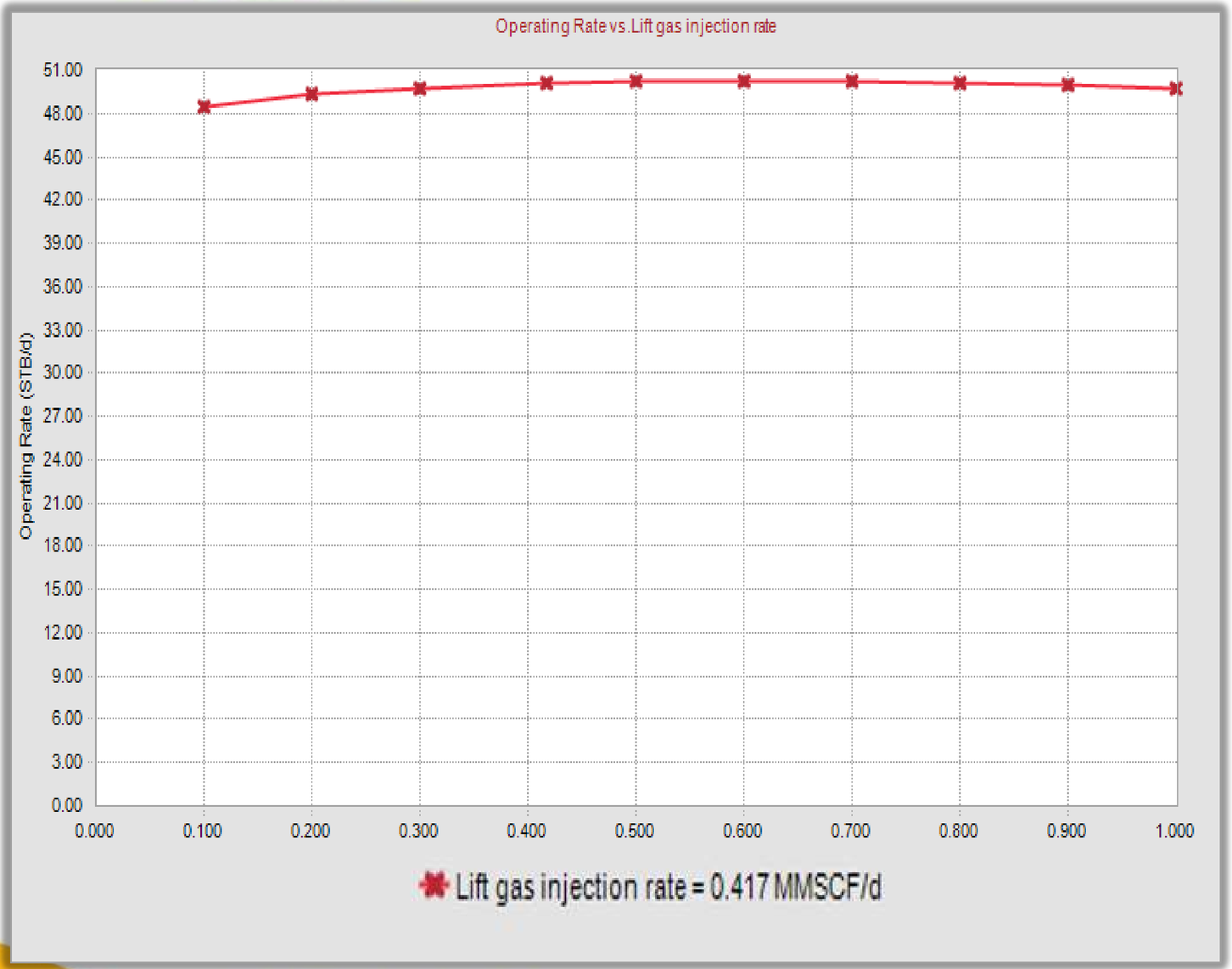
- Using the data gathered on-site we have built a model in Wellflo that will give us an accurate IPR Curve to evaluate.

- PI – 0.0363 std/d/psi



Optimal Gas Injection Rate

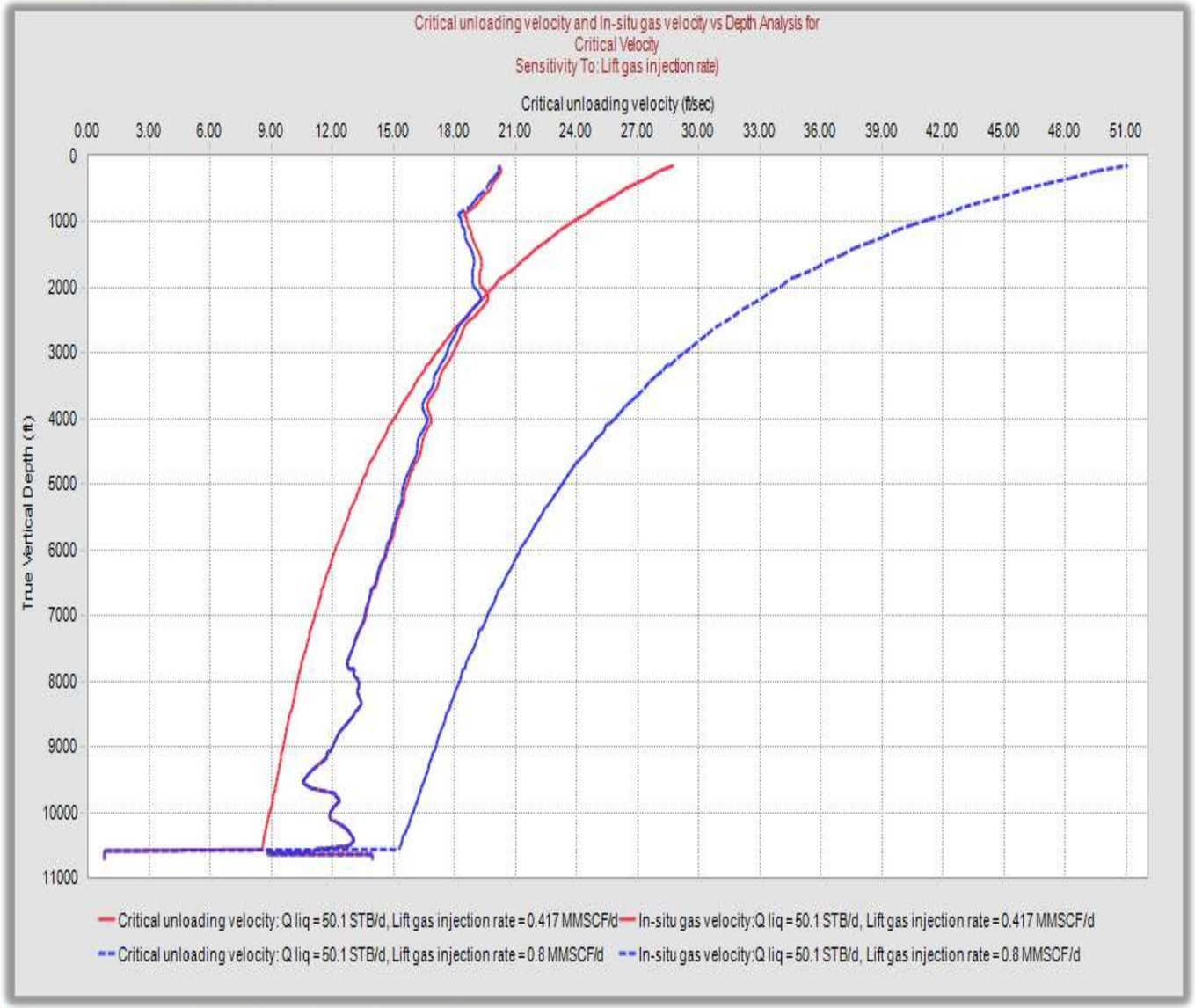
- Was the operator over/under injecting?
- With accurate data gathered on location, our NODAL will show us a gas lift response curve.
- More injection gas recommended if available.



Critical Velocity

- A NODAL on critical velocity will show if the well could be prone to liquid fall back or slugging.

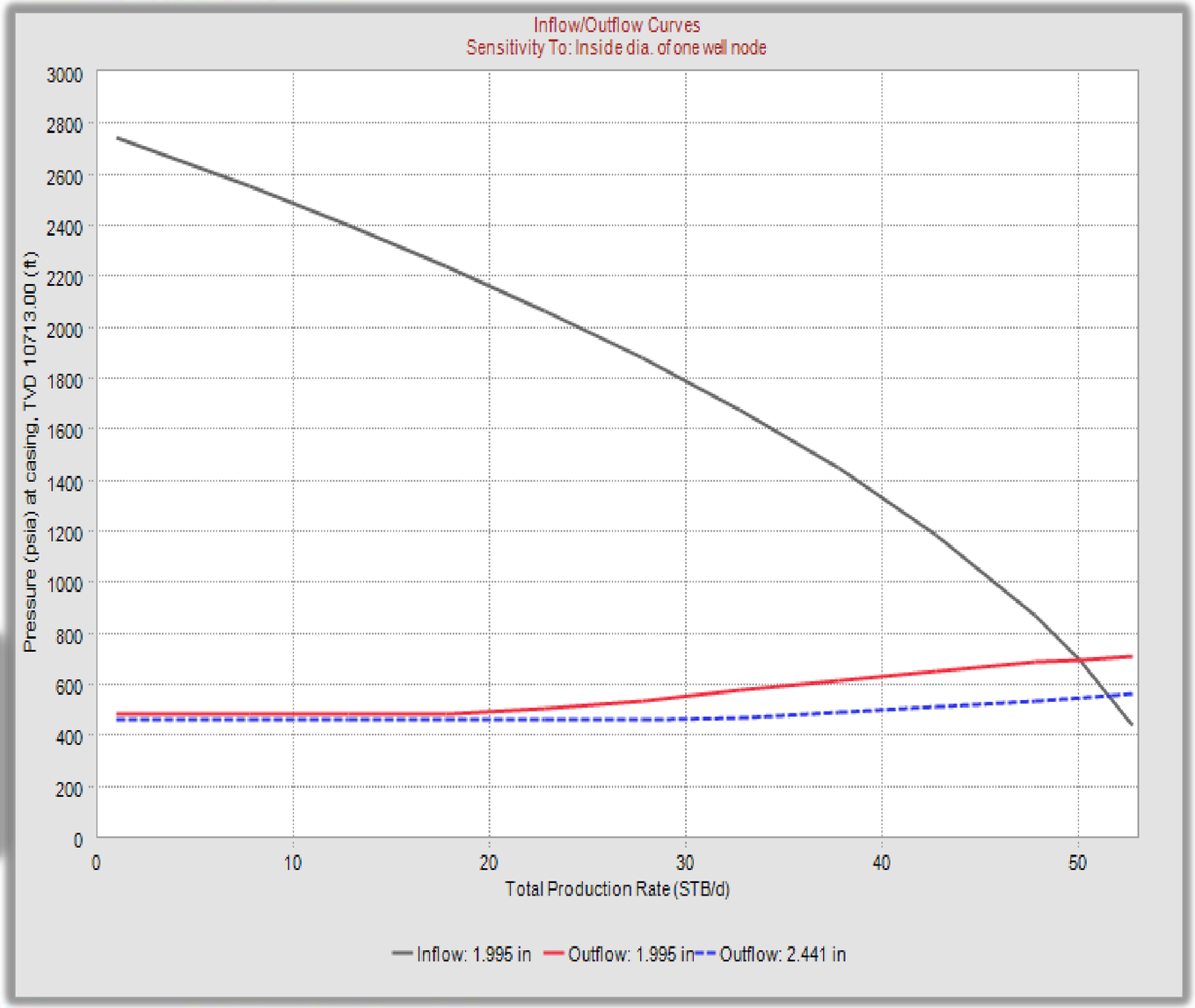
- We see that 417 mscf/d is just below critical whereas 800 mscf/d is above critical velocity.



Tubing Size Comparison

- How does the well respond when we compare tubing sizes?
- Is there any uplift potential by configuring the well with a bigger tubing size?

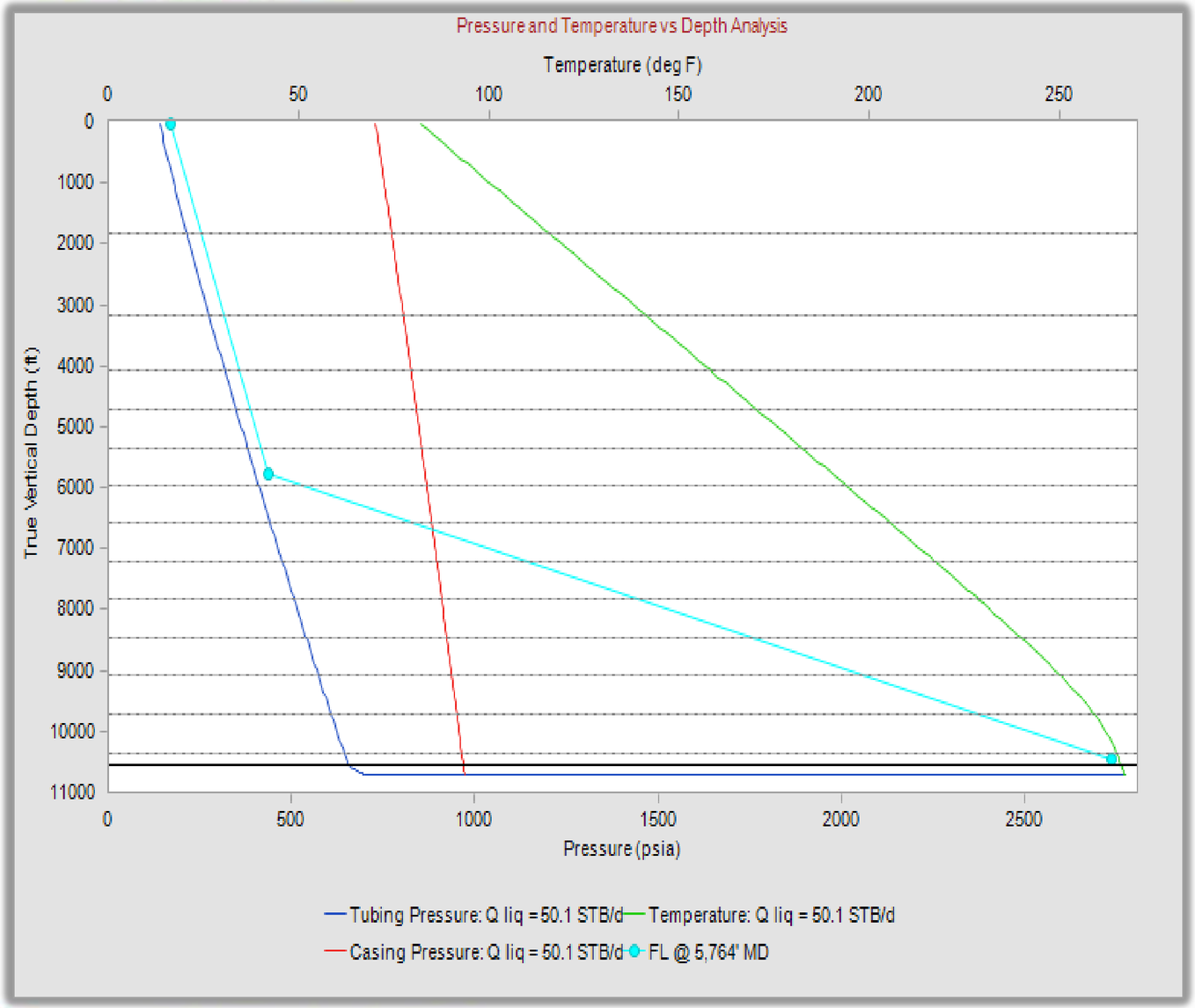
Operating Pressure	Liquid Rate	Oil Rate	Water Rate	Formation Gas Rate	Injection Gas Rate	Water Cut	Produced GOR	Injection MD	Status	Sens 1:Inside dia. of one well node
(psia)	(STB/d)	(STB/d)	(STB/d)	(MMSCF/d)	(MMSCF/d)	(Fraction)	(SCF/STB)	(ft)		(in)
698.00	50.10	35.00	15.00	0.06	0.42	0.3000	13611.57	10884.00	Stable	2.00
554.58	51.70	36.20	15.50	0.06	0.42	0.3000	13243.35	10884.00	Stable	2.44



Recommendation

- TLR, NODAL, and Dynamic Transient Modelling all confirm us a well that should be lifting on bottom. Flowing fluid level shot indicates that our POI is somewhere up hole.
- HIT, Failed or stuck valve?

- With an obvious failure based on pressure trends and modelling, a recommendation was made pull the well and replace with a conventional tubing flow design.



Production Before and After

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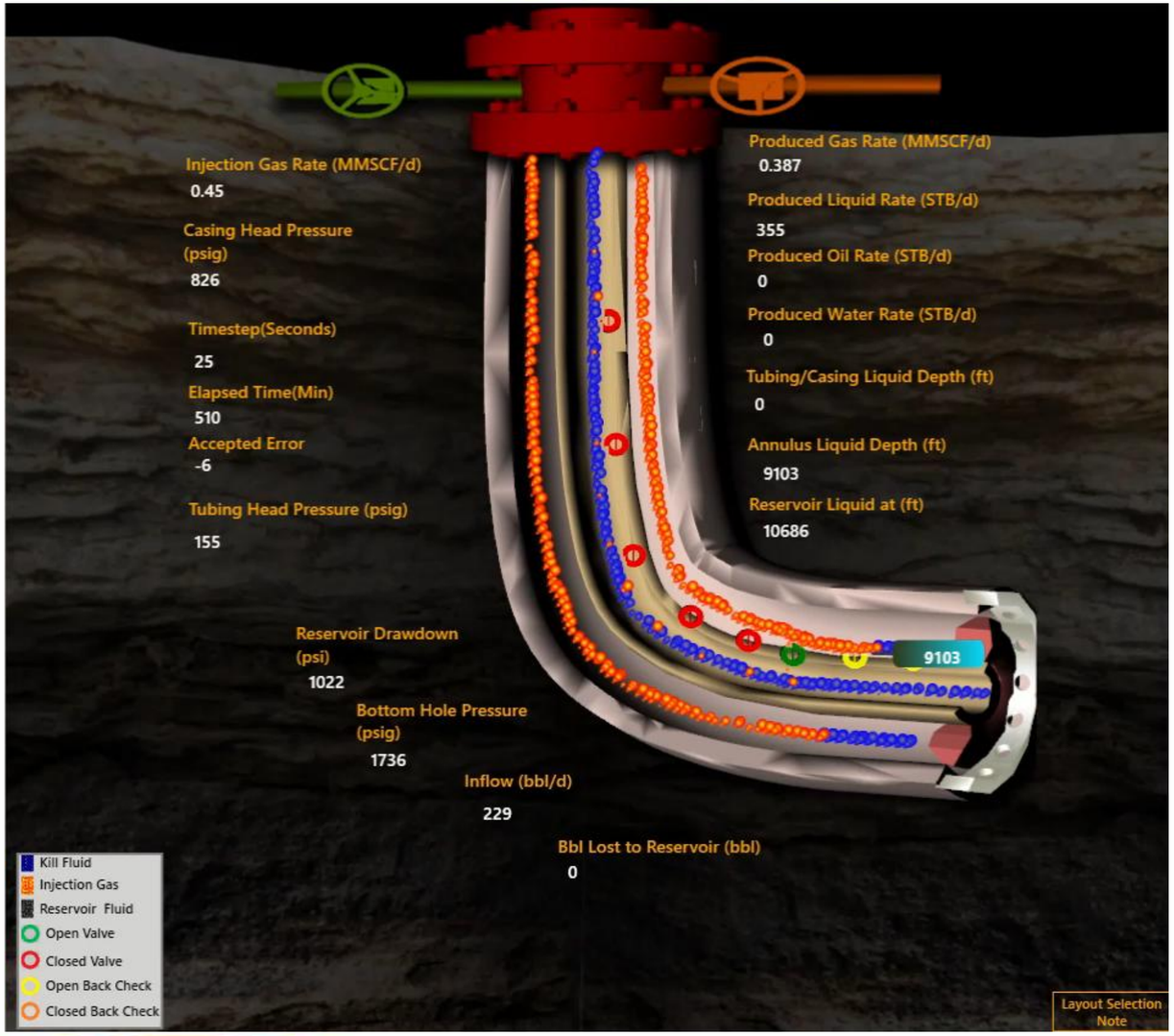

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Question Time

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