2025 GAS LIFT WORKSHOP

What is new in the API Gas Lift Handbook?

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Production Associates

ALRDC Gas Lift Workshop

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Agenda

API RP 19GLHB “Gas Lift Handbook” is a recommended practice covering all facets of gas lift from fundamental production concepts to details in valve design and unloading, gas processing, multiphase flow, optimization techniques, troubleshooting. Valve spacing design options include continuous and intermittent wells plus dual string installations. Each option has an operation guide to unloading, control, testing, and analysis. The GLHB is a living document with new material added to expand the scope of recommended practices: 1. Automation, 2. Gas Well Deliquification, and 3. High Pressure Single Point Injection. What are these new recommendations? Each section will be reviewed and highlights provided!

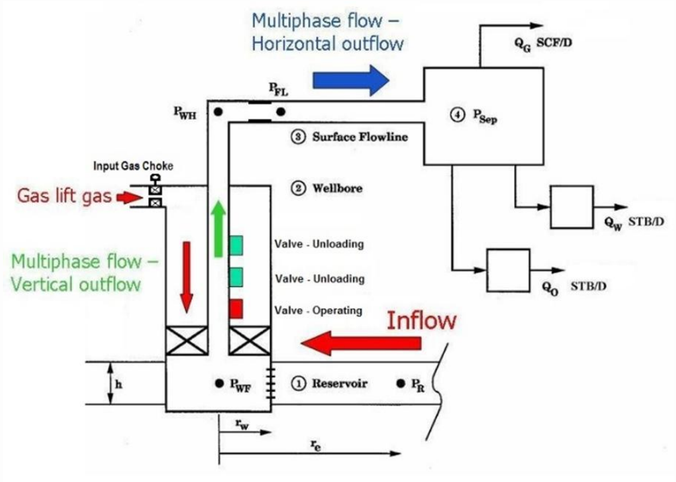
History

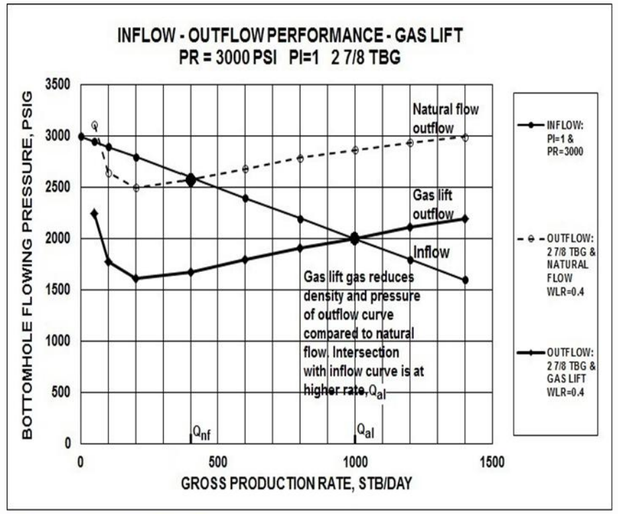
- API Gas Lift Manual Book 6 was issued in 1965, updated in 1984, and again in 1994. RP 19GLHB “Gas Lift Handbook” was issued in 2020 as a recommended practice (RP) incorporating previous editions of the Gas Lift Manual and RP documents 11V5-Operations, 11V6-Continuous Design, 11V7-Valve Repair, 11V8-System Design, 11V10-Intermittent Design. GLHB was written by David McCalvin, John Martinez, Mike Johnson, Tony Hord, Craig Pennington, Ian Schuur, Greg Stephenson, Reagan Wilkins, Tom Nations, Burney Waring under then chair Wayne Mabry.
- API Gas Lift Task Group started in 1978 and the first Gas Lift Workshop was held in 1980 to publicize the work of the Task Group.

GLHB - Gas Lift Fundamentals

RESERVOIR PRESSURE DRIVES FLUID TO SURFACE FACILITY; GAS LIFT GAS REDUCES DENSITY

- RESERVOIR PRESSURE AND PI FOR INFLOW
- TUBING OUTFLOW ALTERED WITH GAS LIFT GAS REDUCING DENSITY
- FLOWLINE OUTFLOW
- SEPARATOR PRESSURE
- REDUCED PRESSURE OF TUBING OUTFLOW GIVES INTERSECTION AT HIGHER ARTIFICIAL LIFT RATE, Qal

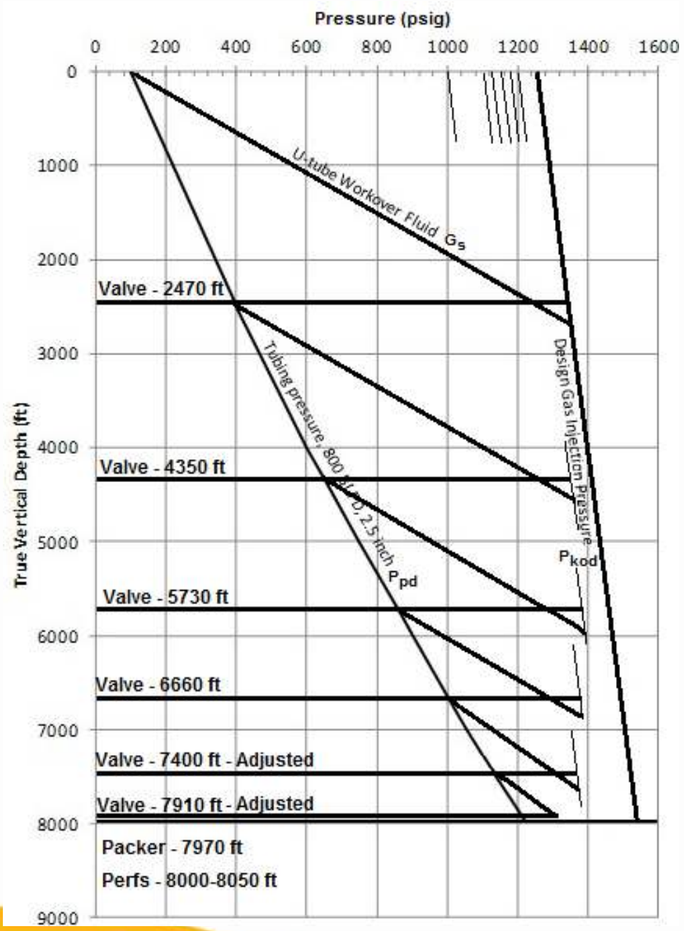


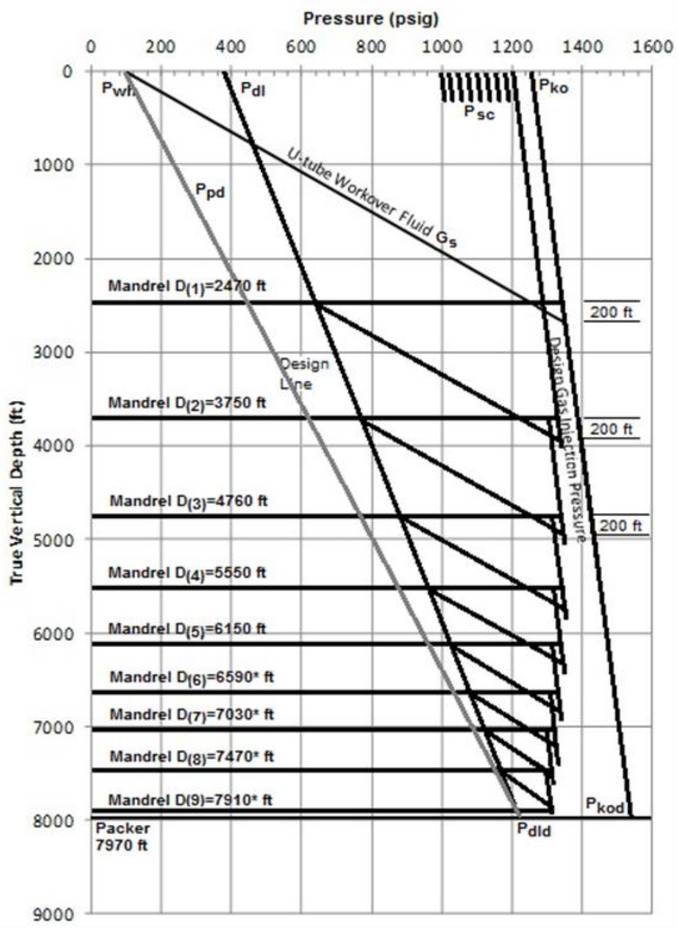


GLHB - Gas Lift Spacing Design

Valve Spacing Design – Graphical and Equations

- CONTINUOUS FLOW (CF-IPO)
- DESIGN LINE WITH CF-IPO
- INTERMITTENT FLOW IPO
- DUAL STRING – PPO
  - IPO – INJECTION PRESSURE OPERATED
  - PPO – PRODUCTION PRESSURE OPERATED





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GLHB - Gas Lift Unloading

Completion Practices

- CLEAN OUT DRILL FLUID PRIOR TO PERF OR RUNNING EQUIPMENT
- RUN CASING SCRAPER AND CLEAN OUT
- LEAVE FILTERED FLUIDS TO PREVENT VALVE CUTTING OR PLUGGING

Unloading Practices

- CAREFUL SLOW UNLOADING TO PREVENT EROSION
- ONE BARREL PER MINUTE DISPLACEMENT RATE (1 BPM)
- 1 BPM = 481 MSCFD AT 800 PSIG, GAS SG = 0.7
- 1 BPM = 622 MSCFD AT 1000 PSIG, GAS SG = 0.7
- 1 BPM = 770 MSCFD AT 1200 PSIG, GAS SG = 0.7

Unloading Practices

- 50 PSI GAIN IN TEN MINUTE INCREMENTS TO 400 PSIG
- 100 PSI GAIN IN TEN MINUTE INCREMENTS TO INJECTION PRESSURE
- OPTIONALLY – 20% to 25% OF DESIGN GAS RATE
- RECORD CASING PRESSURE – COMPARE TO DESIGN CLOSING PRESSURE AT EACH VALVE
- USE ACOUSTIC TOOLS TO CONFIRM UNLOADING FLUID LEVEL

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GLHB - Gas Lift Optimization

Wellbore Testing

- CONDUCT FLOWING PRESSURE – TEMPERATURE SURVEYS
- CO2 TRACER SURVEYS
- DISTRIBUTED TEMPERATURE TOOLS
- ACOUSTIC TOOLS FOR UNLOADING LIQUID LEVEL AND FOR TUBING ANALYSIS

Design Practices

- COMPRESSOR PRESSURE ENABLES LIFT NEAR THE PACKER WITH RUN TIME OF 99%
- DEHYDRATION TO CONTROL HYDRATES AND WATER ACCUMULATION
- PIG DISTRIBUTION LINES TO ELIMINATE SOLIDS AND LIQUID ACCUMULATION
- LOW PRESSURE GATHERING SYSTEM

Operating Practices

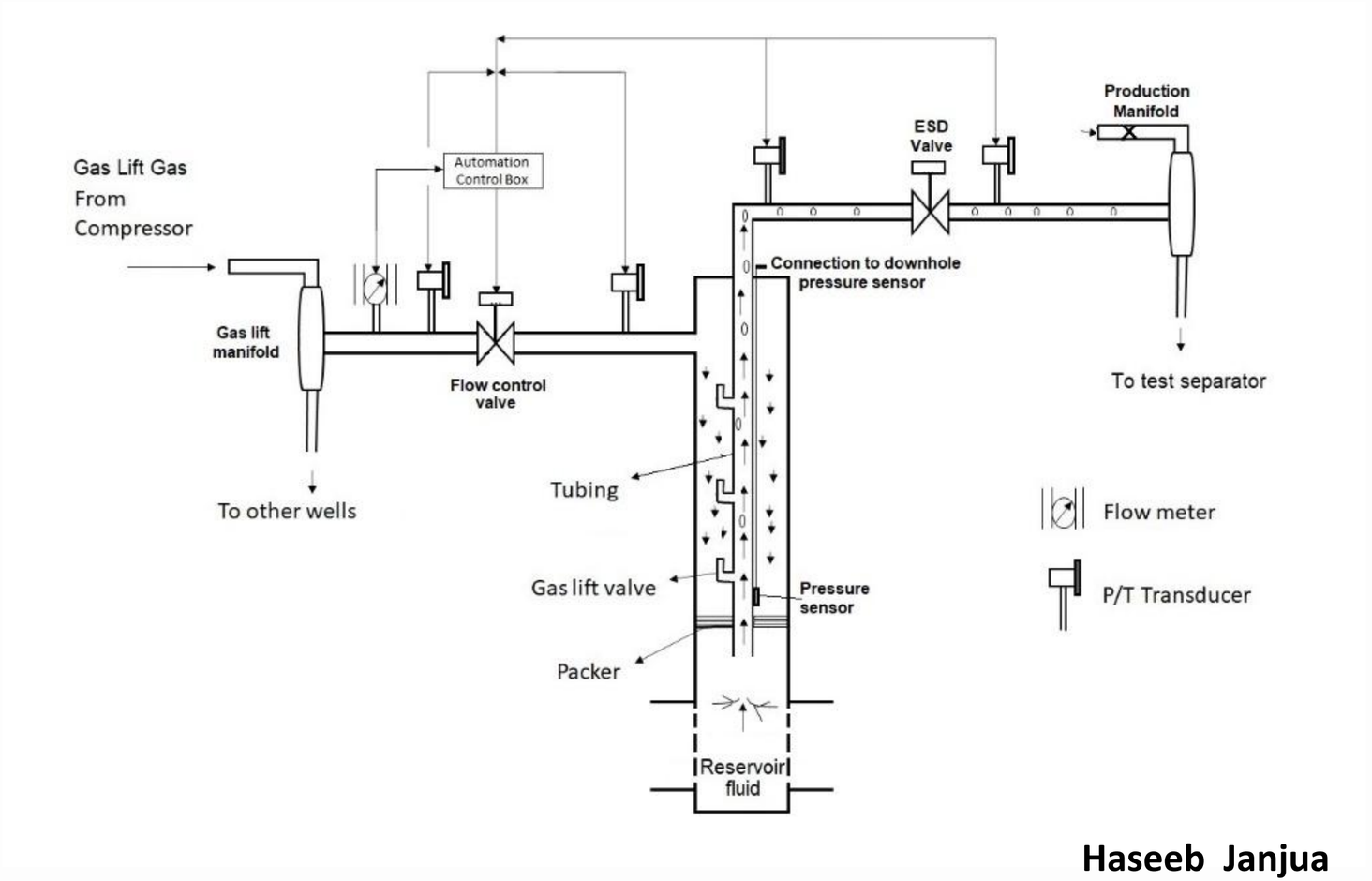
- METER, CONTROL, DH PRESSURE SENSOR EACH WELL
- WELL TEST TO ASSURE DEEP LIFT RELATIVE TO AVAILABLE INJECTION PRESSURE
- FIX SHALLOW INJECTION DEPTH PROBLEM
- MULTI-RATE TEST: 60% to 140% OF DESIGN GAS RATE – PICK OPTIMUM
- REPEAT PROCEDURE FOR ALL WELLS – ALLOCATE GAS

GLHB - Troubleshooting - Quick Matrix – Example 1 of 6

Trouble shooting steps	Action 1	Action 2	Action 3	Action 4	Action 5
1. Test well to establish a trend; retest well when gas lift performance decline suspected	Check instrumentation and meters to assure quality of test.	Check both lift gas and production wellhead valves to insure full open position.	Check production choke to assure full open.	Use sonic or infrared devices to detect partially plugged pipe or leaks at valves.	Fix instrument, plugging, or valve leaks, then retest well.
2. Well retest is off trend – review wellhead area	Inspect wellhead area for cold temperature or water condensation (sweating) at tubing spool as indicator of leaking tubing hanger seal. If leaking, wellhead maintenance team should inject sealant at hanger seal.	Inspect lift gas control valve choke. If cold and reduced lift gas rate, inject methanol to dissolve hydrate.	Compare casing pressure to design surface close pressure of each unloading valve; estimate depth of lift of current operating valve. Use in simulation.	Compare to simulation at well test rate, wellhead flowing pressure, downhole gauge pressure (DHPG). Adjust lift depth estimate until simulation run and well test match.	Change lift gas rate if simulation indicates deep lift will restore production rate. Retest well at reduced lift gas rate of 50%, increment lift gas rate to 70%, 90%, 110% lift gas.

GLHB - Gas Lift Automation - Addendum 1

- Introduction
- Automation Objectives and Practices
  - General
  - Automation Practices
  - Automation Systems
  - Automation Data Usage
- Gas Lift Automation Hardware and Software
  - General
  - Automation Hardware
  - Automation Database Information
- Section Summary



Haseeb Janjua

GLHB - Automation - Hardware and Software

- PRESSURE/TEMPERATURE/FLOW SENSORS BOTH SURFACE AND SUBSURFACE
- DATA LINKED TO SOFTWARE THAT CAN DIRECT CHANGES TO IMPROVE PRODUCTION AND/OR MAINTAIN STEADY FLOW
- SOFTWARE CONTROLS DEVICES
  - VARIABLE SPEED DRIVES
  - INPUT CONTROL OF GAS LIFT GAS
  - PLUNGER CYCLES
- SOFTWARE CONTROL OF TESTING
  - SERIES TESTING WITH CHANGED INPUT (GAS LIFT GAS OR VARIABLE SPEED)
  - OPTIMIZE PRODUCTION AND INPUTS
- SMART INSTRUMENTATION
  - LINKED TO SOFTWARE WHICH USES REAL TIME DATA FROM SENSORS
- STAFF TRAINED TO BECOME HARDWARE/SOFTWARE SPECIALISTS IN ADDITION TO PRODUCTION SPECIALISTS
- FAILURE DATA BASE TO AID REDESIGN

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GLHB - Gas Lift Automation - Addendum 1 – Work Group

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Joel Shaw	Silverwell
John Martinez	Production Associates
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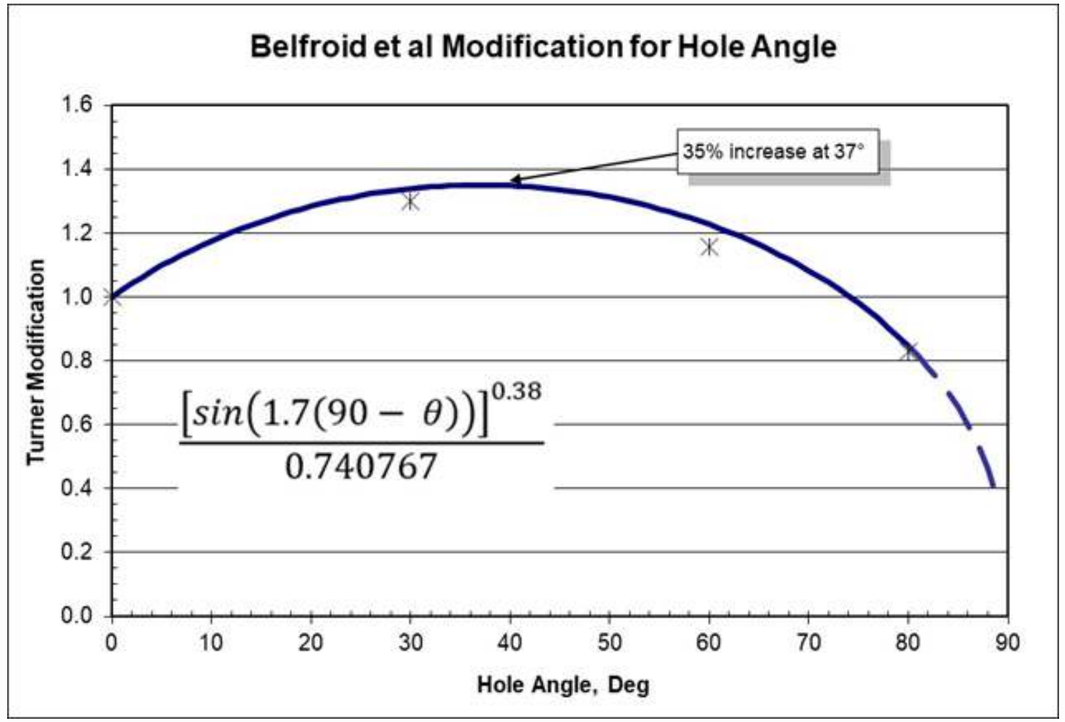
Johannes Visser	Chevron
Yula Tang	Chevron
Haseeb Janjua	Production Lift

GLHB - Gas Lift Deliquification - Addendum 2

- Introduction
- Deliquification Objectives and Practices
  - General
  - Practices
  - Methods
- Deliquification Equipment
  - General
  - Wellhead Pressure Reduction
  - Increase Above Critical Velocity
  - Gas Lift
  - Plungers
  - Chemical Injection
  - Pumps
- Section Summary



12

$$v_c = 1.7528 \left[\frac{\sigma(\rho_l - \rho_g)}{\rho_g^2}\right]^{0.25} \frac{[sin(1.7(90 - \theta))]^{0.38}}{0.740767}$$

GLHB - Deliquification – Practices and Methods

- **Practices**
  - Monitor Well for Surging Rate and Pressure
  - Adjust Choke to Increase Rate and Lower Wellhead Pressure
  - Obtain Surveys of Pressure Gradient and Liquid Holdup
  - Use Computer Simulation and Calibrate to Well Tests
  - Evaluate Compressors for Reduced Suction Pressure
  - Investigate Wellhead and Wellbore for Plunger or Coiled Tubing Installation
  - Evaluate Bottom as Sump for Pump Installation

13

- **Methods**
  - Reduce Wellhead Tubing Pressure
  - Increase Velocity with Diameter Reduction
  - Increase Velocity with Gas Circulation
  - Displacement with Plungers
  - Displacement with Pumps

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GLHB - Deliquification - Addendum 2 – Work Group

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Yula Tang	Chevron

GLHB - Gas Lift High Pressure Single Point Injection - Addendum 3

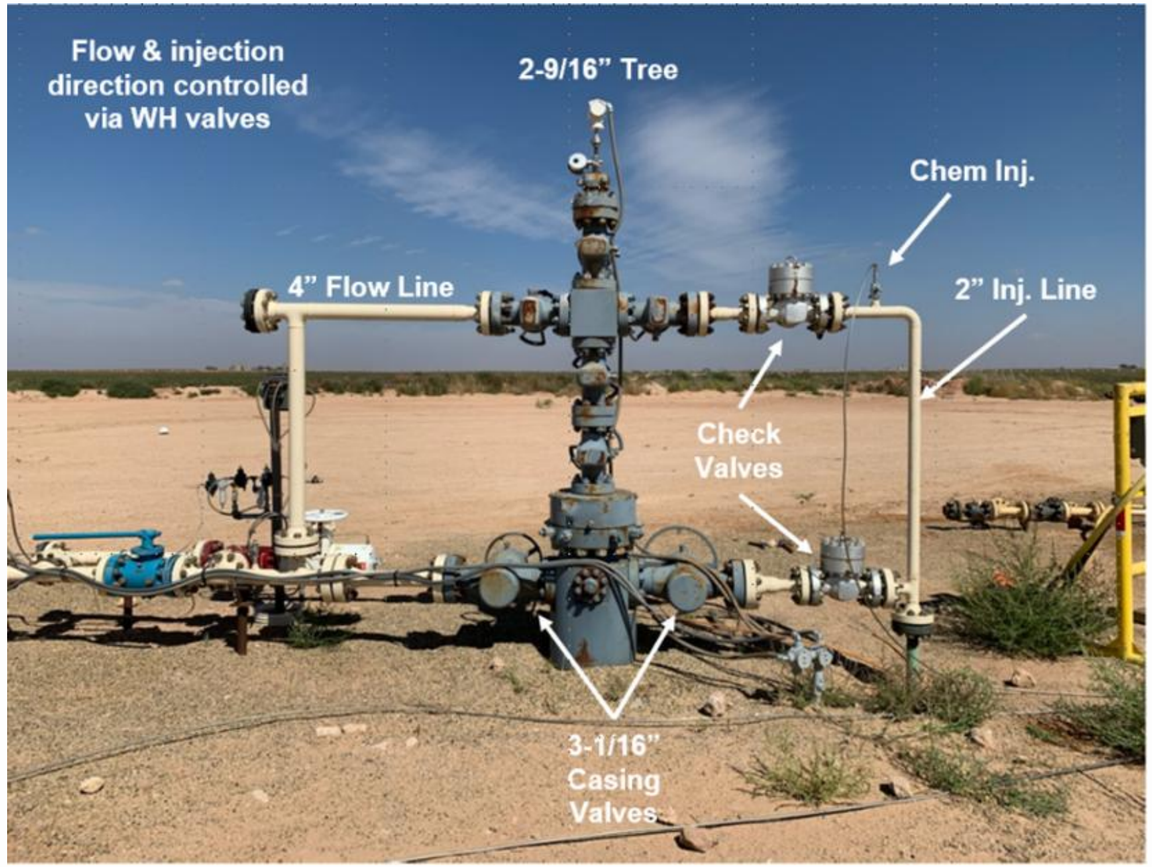
- Introduction
- Objectives and Practices
  - General
  - Practices
  - Methods
- High Pressure Single Point Injection Equipment
  - General
  - Wellhead, Casing/Tubing, Gas Piping
  - Compressors
  - Gas Conditioning
  - Chemical Injection
- Section Summary

15

- Conventional Gas Lift Less Than 1500 psig
- High Pressure Single Point Injection Greater Than 1500 psig to 5000 psig or More
- Lift From End of Tubing (EOT) or From Valve (Orifice) near EOT
- No Unloading Valves
- No Packer Permits Annulus Flow (Injection in Tubing)
- Switch to Tubing Flow (Injection in Annulus) at Lower Production Rate

GLHB - High Pressure Single Point Injection - Equipment

- **Wellhead, Casing/Tubing, Gas Piping**
  - Apply API 6A Spec to Wellhead
  - Apply API 5CT Spec to Casing and Tubing
  - Apply ASME B31.3 or B31.8 to Gas Piping
  - Apply Temperature Derating if Hot Gas is Used
- **Compressors**
  - Apply API 11P Spec to Compressors
  - Limit Compression (Pressure) Ratio to 4 to 1
  - Install Large Separators for Liquid Surges
  - Anchor Gas Piping Between Compressor and Wellhead
  - Evaluate Hydrate Potential



Will Nelle

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GLHB - High Pressure Single Point Injection - Addendum 3 – Work Group

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Rylan Dsouza	Interwell
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Rob Sutton	Consultant
Paulo Waltrich	LSU
Will Nelle	Flowco (Estis)
Yula Tang	Chevron

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Question Time

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