



**2022 GAS LIFT
WORKSHOP**

Integrated Surveillance System for Gas Lift

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ALRDC Gas Lift Workshop

June 20-23, 2022

ALRDC.COM

Agenda

- Importance of Surveillance and Optimization
- Nexus Data Model: The foundation
- Well Modeling Capabilities
- Surveillance Tools in Nexus
- Well-by-well Optimization and Design using SNAP
- Related Work

Surveillance and Optimization

Why do it?

- Increase production
- Reduce Downtime
- Reduce OPEX
- Reduce CAPEX

Better surveillance enables:

- Faster problem ID
- Production enhancement
- Reduced failure frequency
- Better lift efficiency

Nexus Data Model: The Foundation

WELLBORE PROPERTIES

Wellbore Construction*

Fluid Properties

Reservoir Properties

System Properties

Flowline Pressure (psi)

170

Casing Pressure (psi)

185

Tubing Pressure (psi)

1050

Well Head Temperature (F)

95

Save

Cancel & Return

Created by System Migration • 03 Jun 2020

Updated by System Migration • 03 Jun 2020

System Properties

Save

Cancel & Return

Created by System Migration • 03 Jun 2020

Updated by System Migration • 03 Jun 2020

GL Installation Report Template: The Easy Button







GL Installation Report Template: The Easy Button

Step 1: Oxy PE fills out top three sections and sends to vendor with RFQ.

[illegible]


Occidental Petroleum

WORLDWIDE OPERATIONS & ENGINEERING
 ARTIFICIAL LIFT
GAS LIFT INSTALLATION REPORT (VER 1.5)



Business Unit: Permian Resources
 Lease /Field: Sand Dunes
 Well Number:
 Installation Number: 3
 Job # / Install Report #: 1020103
 AFE #:
 Install Reason: Optimization

Rig Number (ID): n/a
 Company Man: n/a
 OXY Witness: Zetha's Mujica
 Ops. Supervisor: Travis Johnson
 Shipper Area: San Angelo

Gas Lift Vendor: Priority
 Gas Lift Designer: Danny Perez
 Field Technician: Justin Dock
 Slickline Company: Schlumberger
 Slickline Operator:
 Previous Pull Date: 1/22/2020
 Previous Pull Reason: Lift Revision

Date of latest revision: 1/22/2020
 Gas Lift Start Date: 1/23/2020
 Gas Lift Start Time: 12:09 PM
 Problem Well: NO

= Minimum data for upload to NexuS

Clear Input Data

WELL GEOMETRY

KB Core Depth	O.D.	Weight	L.D.	Top	Bottom
	[IN]	[Lb/Ft]	[IN]	[Depth]	[Depth]
Casing	5.5	20	4.778	0	22271
Liner	Select...				
Open Hole	n/a	n/a			
Tubing	2.375	4.7	1.995	0	12695
Tubing	Select...				
Lifting/Landing Sub[ft]	# of Its		Total Tubing Tally		

Directional Survey Included? YES

	Top [Ft]	Bottom [Ft]
Packer / EOT Depth	12694	12695
DH Gauge Depth	12062	12070
Top/Bottom Perfs	12114	22115
PBTD		22212

DESIGN PARAMETERS

FLUID AND RESERVOIR PROPERTIES

Prod. Oil Gravity:	44	[API]	SPECIAL CONDITIONS Corrosive Fluid: NO Scale: NO Asphaltenes: NO Paraffin: YES Iron Sulphide: NO Special Application: NO
Prod. Gas Gravity:	0.83	[SG]	
Prod. Water Gravity:	1.05	[SG]	
Prod. GOR:	2581	[scf/STB]	
Bubble Point Pressure:		[psia]	
Static Reservoir Pressure:	3800	[psia]	
Reservoir Temp:	178	[F]	
Productivity Index (PI):		[STB/d/psi]	
Test Liquid Rate:	805	[STB/d]	
Test Flowing BHP:	1317	[psia]	

OPERATING CONDITIONS

Flowing WH Press:	170	[psig]	Total Liquid Rate:	805	[STB/d]
Wellhead Temp	100	[F]	Water Cut:	39	[%]
Max. Avail. Injection Pressure:	1150	[psig]	Total Gas Oil Ratio:	2581	[scf/STB]
Max. Avail. Injection Rate:	1200	[MSCFD]	CO2 Percent:	0	[%]
Operating Injection Pressure:	1150	[psig]	N2 Percent:	0	[%]
Operating Injection Rate:	1300	[MSCFD]	H2S Percent:	0	[%]
Injection Gas Gravity:	0.77	[SG]			

Flow Type: Annular Flow

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GL Installation Report Template: The Easy Button

Step 4. Once completion is installed, update as-run depths...

MANDREL DETAILS

Installation Date: 5/29/2018

Number of Stations: 12

Nom. Tubing Diameter: 2.375 [in.]

Manufacturer: Weatherford

Series: SIFO-1EC

Type: Side-pocket

Pocket ID: 1 [in.]

Pocket Construction: Forged

Orienting?: Yes

Porting Configuration: Annular Flow ("EC")

OD/Major OD: 4.240 [in.]

Minor OD: 2.91 [in.]

Overall Length: 81.75 [in.]

Minimum ID: 1.901 [in.]

Ext. Test Pressure: 5000 [psi]

Part/Model Number: 1732-XXX

#	MD ft	SIZE	MFG	SERIES	Pocket ID inches	Pocket Construction	Orienting?	Porting Configuration	Major OD inches	Minor OD inches	Min ID inches	Overall Len inches	Ext. Test Pressure psi	Part / Model Number
1	2,233	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
2	3,620	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
3	4,777	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
4	5,639	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
5	6,434	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
6	7,228	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
7	8,023	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
8	8,785	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
9	9,578	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
10	10,373	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
11	11,167	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
12	11,996	2.375	Weatherford	SIFO-1EC	1.0	Forged	Yes	Annular Flow ("EC")	4.240	2.910	1.901	81.75	5000	1732-XXX
13														
14														
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23														
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25														

GL Installation Report Template: The Easy Button

Step 5. Drag and drop worksheet into Nexus...

Surveillance

Well File

Activity Logs

Well Tests

Equipment

Wellbore Diagram

Job History

Downtime

Attachments

Well Data

Chemical Treatment



WELL INSTALLS

+ Add Install

Import

Export CSV

Export Prosper

	Install Number	MOP	Install Date	Start Date	Stop Date	Run Days	Pull Date	Reason for Pull	Specific Reason	Component	Sub Component	Failure Category	Failure SubCategory	Failure Cause	Failure SpecificCause	Classificati
 	1	GASLIFT	03 Jun 2020	03 Jun 2020		161										

Surveillance

Well File

Activity Logs

Well Tests

Equipment

Wellbore Diagram

Job History

Downtime

IMPORT NEW INSTALL

Click to browse for files or drag file here to upload

Upload

Cancel & Return







GL Installation Report Template: The Easy Button Success!!!

W/30025441950100





STEPHENSON, GREG

WC-1H-ST1 | Equipment

WELL INSTALLS

	Install Number	MOP	Install Date	Start Date	Stop Date	Run Days	Pull Date	Reason for Pull	Specific Reason	Component
 	3	GASLIFT	22 Jan 2020	23 Jan 2020		113				
 	2	GASLIFT	22 Jan 2020	23 Jan 2020		113				
 	1	GASLIFT	05 Nov 2019	05 Nov 2019		192				

WELLBORE PROPERTIES

	Completion Date	Updated By	Updated Date	Casing Outer Dime...	Casing Weight	Casing Inner Dime...	Top Perf MD	Top Perf TVD	Bottom Perf MD	Bottom Perf TVD	Plug Back MD	Plug Back TVD
 	22 Jan 2020	Stephenson, Greg	15 May 2020	5.5	20	4.778	12240		22115			
 		System Migration	05 Nov 2019	5.5	20	4.778	12240		22115			

Install Import
Imported Successfully

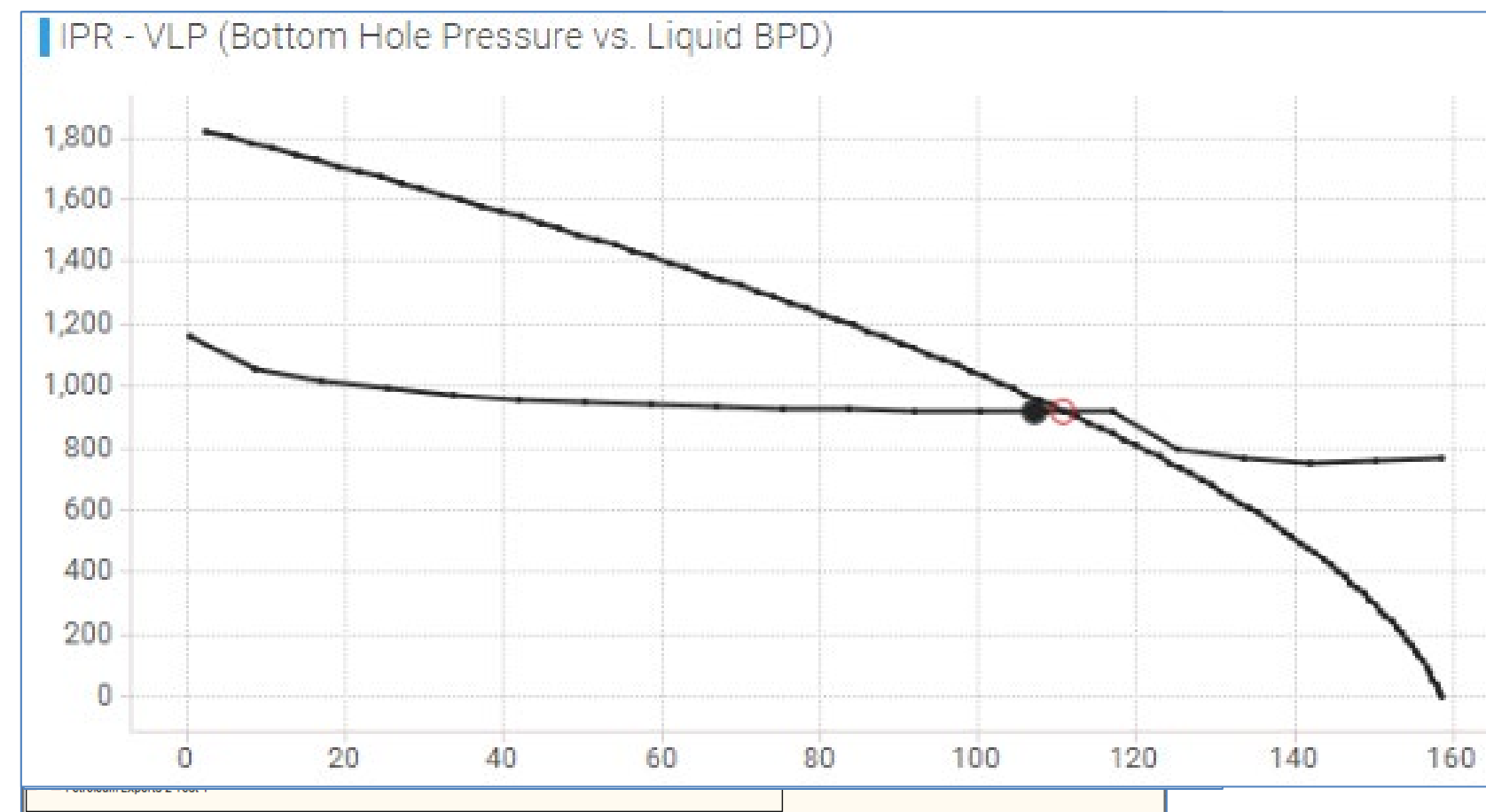
GL Installation Report Template: The Easy Button



Automatic Model Generation

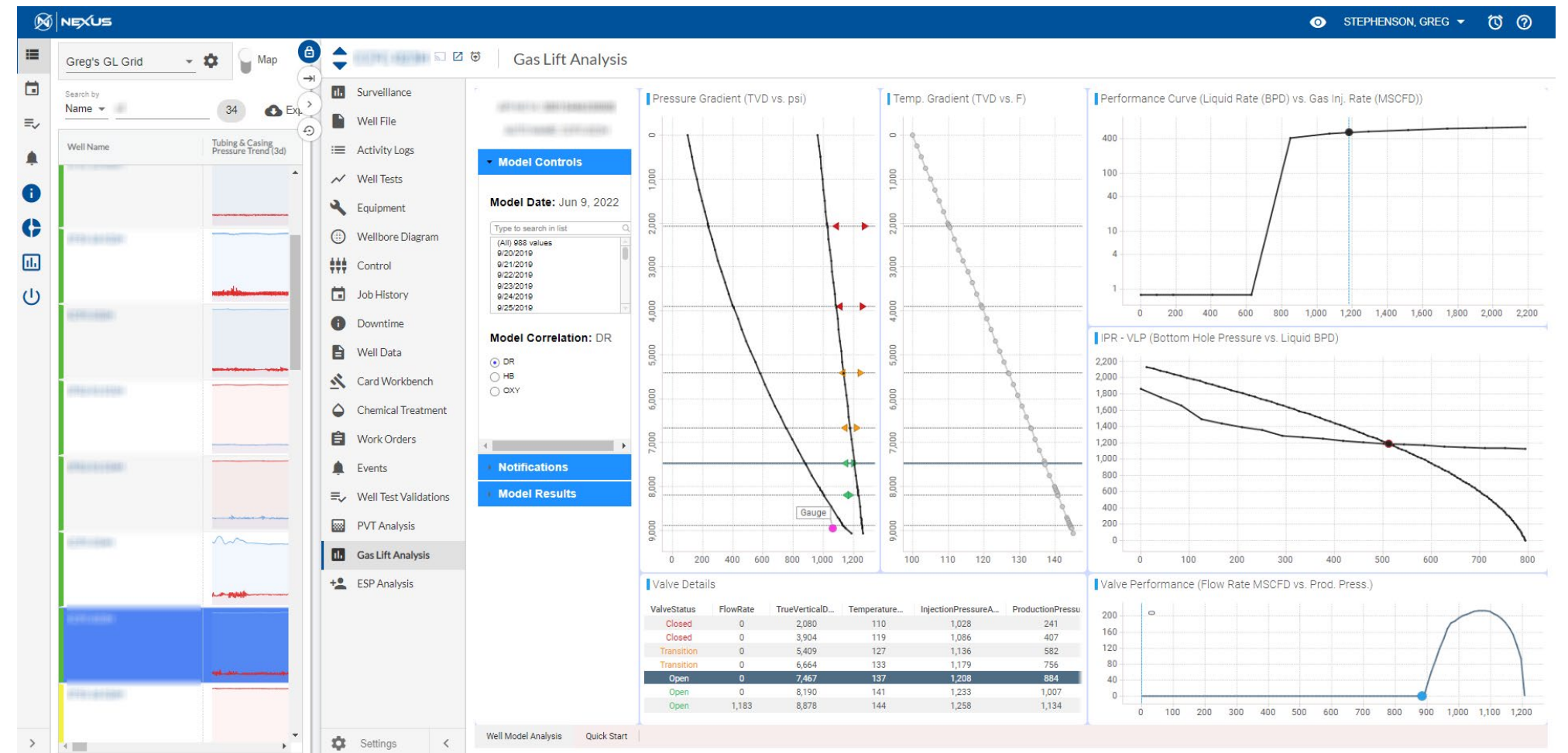
Once data is populated in Nexus, models can be generated automatically through:

- Prosper
- SNAP
- NexusNodal



Nexus offers a wealth of gas lift surveillance tools, including:

- Screening tools / management by exception
- Trending
- Well Tests
- Fluid Level History
- Job History
- Activity Log
- Downtime Reporting
- Failure Analysis
- GL Analysis Dashboard



We've come a long way from Barton recorders...





The figure displays three screenshots of the SNAP 2.867 software interface, used for well design and analysis.

Left Screenshot: Well Design Overview

- General:** Shows a schematic of the wellbore, PVT, Gas Lift Details, Inflow, Completion, Sensitivities, and Actual Data.
- Report:** Displays the "Gas Lift Design Report" for the file "C:\ProgramData\SNAP\GasLift.rpt". The report includes the date "06/10/22", the version "SNAP 2.867 5/27/2022", and the engineer "Stephenson".

Middle Screenshot: Pressure and Temperature Profile

- Y-axis:** True Vertical Depth (ft) from 0 to 8000.
- X-axis:** Pressure (psia) from 0 to 1400.
- Legend:** Production pressure (red line), Unloading gradient (purple line), Injection pressure (green line), Valve depths (black dots), Casing Pres @ valve (green line), Open Valve Spread (green line), Closed Valve Spread (green line), Operating condition (black line), Rsvr DrawDown At Perfs (green line), Valve Model PresTbg @ Orifice (green line), Wellbore Model PresTbg @ Orifice (green line), Survey Pres Data (green line), Mandrel locations (black dots), and Packer Depth (black line).
- Data Points:** Key pressure and temperature points are listed along the depth axis, such as 2302 : 2303, 3252 : 3252, 4005 : 4007, 4750 : 4761, 5527 : 5548, 6275 : 6302, 7021 : 7056, and 7644 : 7681.

Right Screenshot: Gas Lift Performance Graphs

- Top Graph: Bottom Hole Pressure (psia) vs Total Liquid Rate (stb/d)**
 - Y-axis:** Bottom Hole Pressure (psia) from 0 to 2400.
 - X-axis:** Total Liquid Rate (stb/d) from 0 to 120.
 - Legend:** Hydraulics Base (red line), IPR Base (green line), and IPR Test points (orange diamonds).
- Bottom Graph: Gas Passage Rate Q_{gi} (mscf/d) vs Production pressure P_{pd} (psia)**
 - Y-axis:** Gas Passage Rate Q_{gi} (mscf/d) from 0 to 1000.
 - X-axis:** Production pressure P_{pd} (psia) from 0 to 1200.
 - Legend:** ValvePerClearinghouse 7681 ft Camco_BKO-3 (red line), Operating production pressure at this valve (green line), and Pressure to open valve above this station (green line).

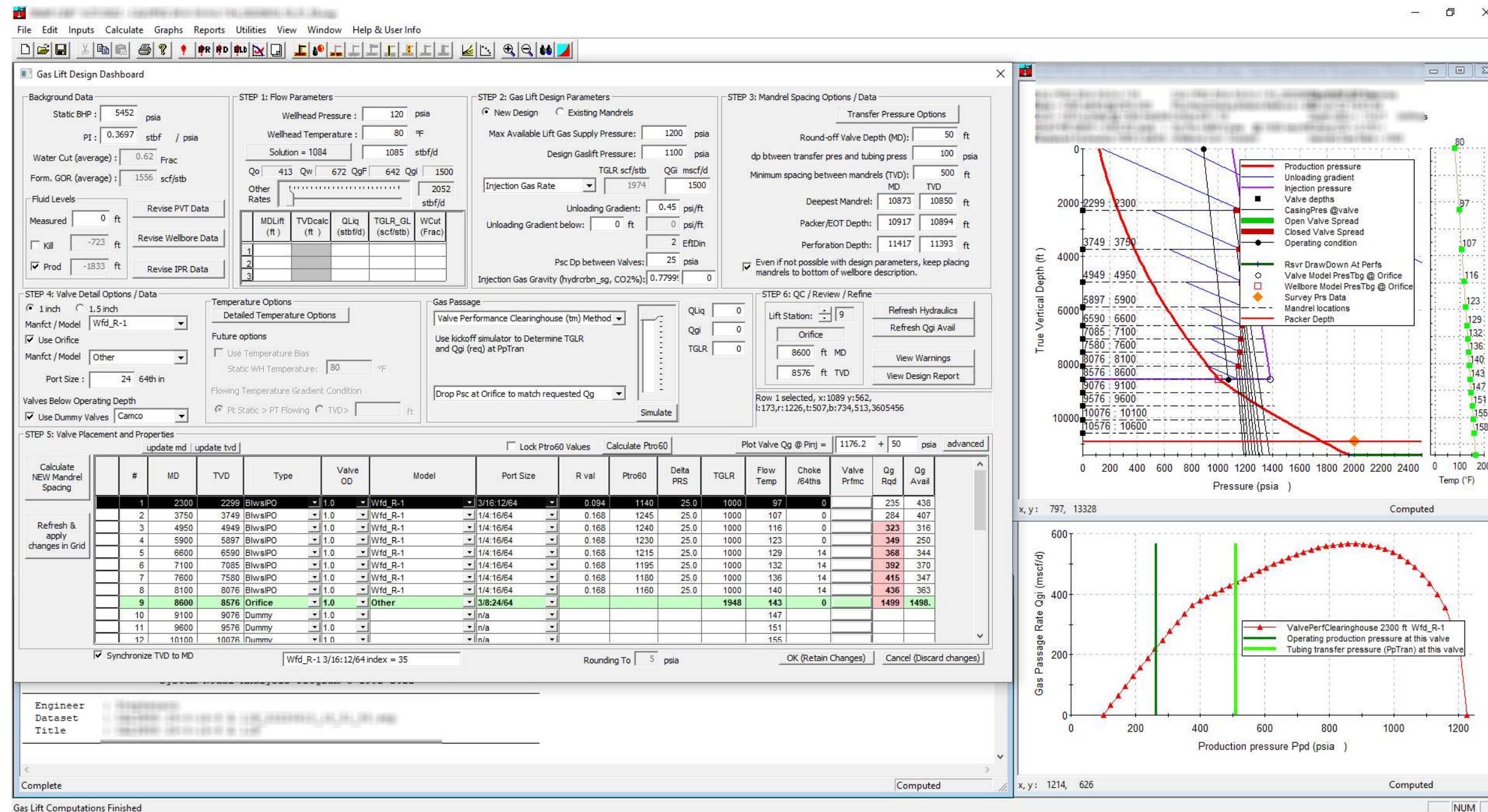




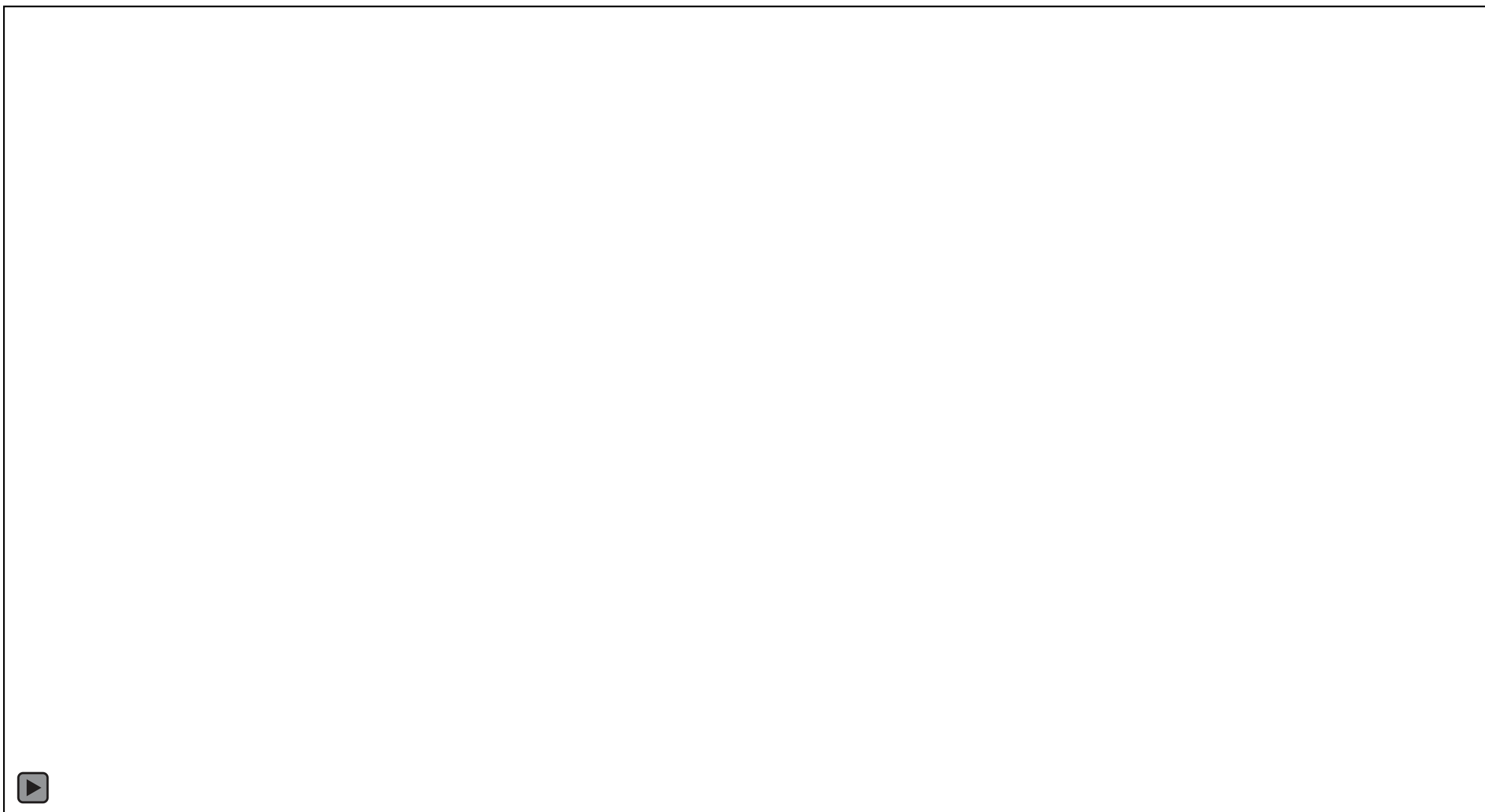
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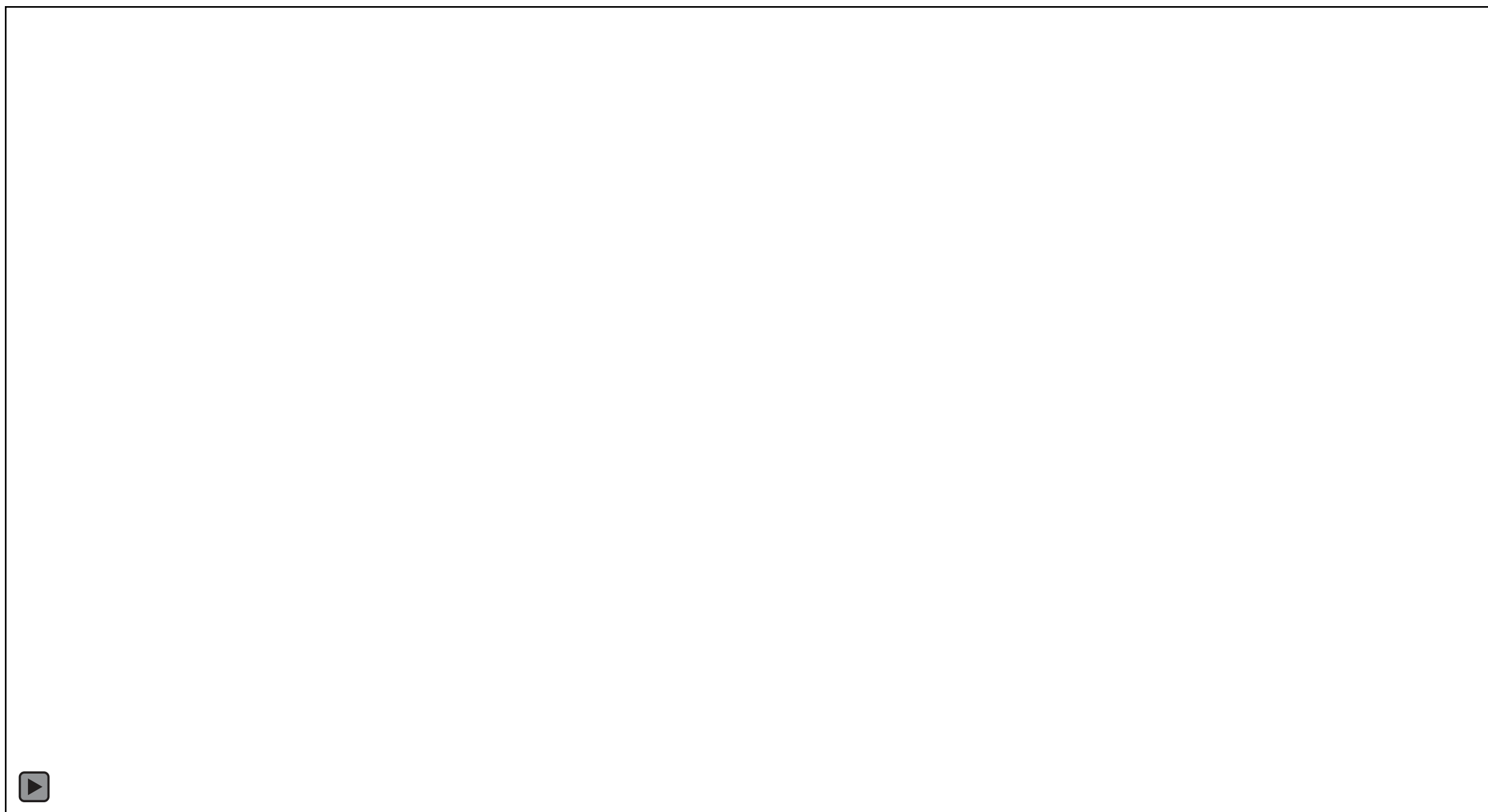
Using Valve Performance in Design



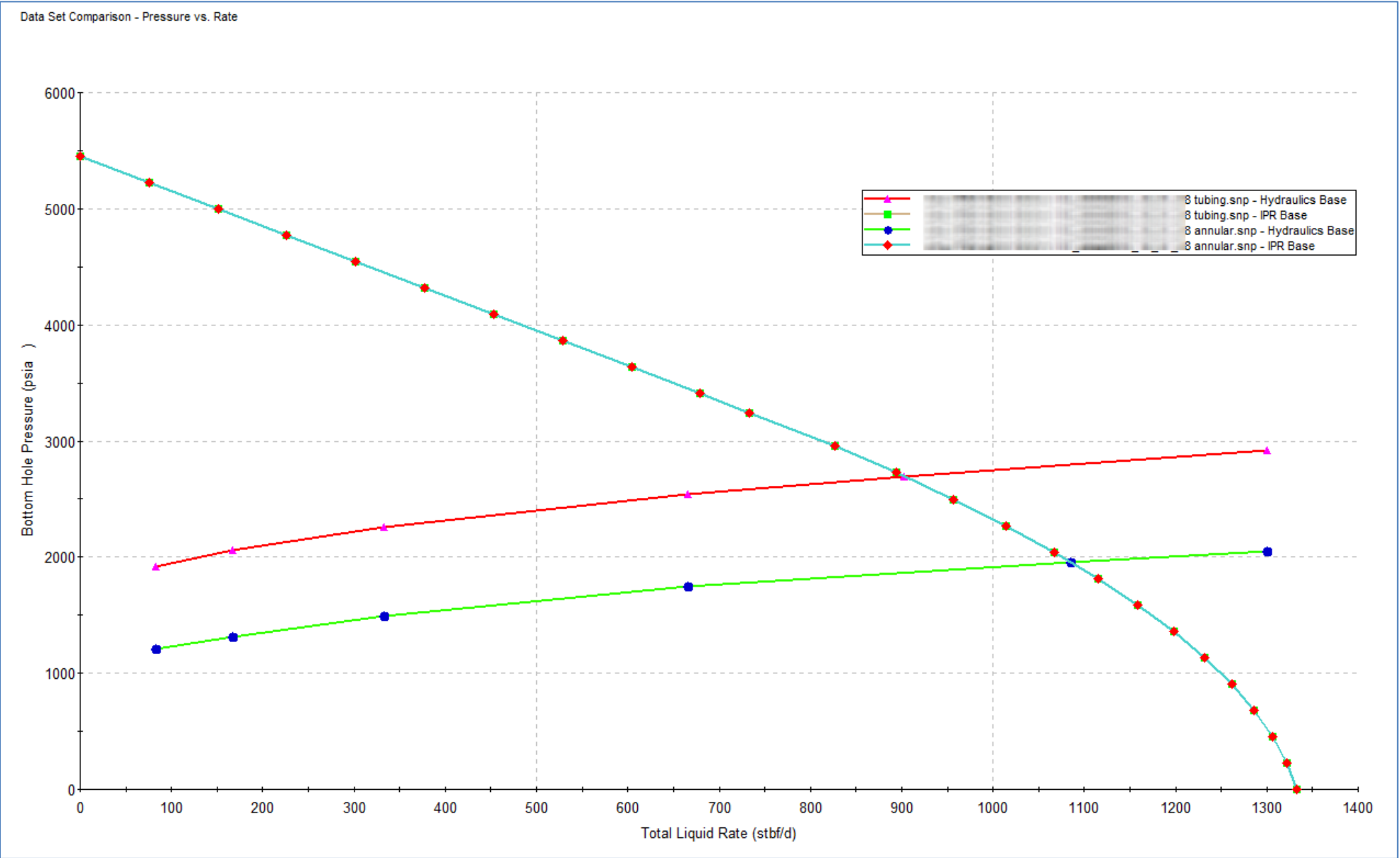
Using Valve Performance in Design



Using SNAP to Evaluate Completion Options



Using SNAP to Evaluate Completion Options



Other Related Surveillance Activities

- Closed-loop GL Optimization (see SPE 209756-MS)
- Realtime Diagnostics
- Dedicated AL Team
- Failure Reviews
- Well Reviews
- Vendor Audits
- Corrosion Management
- Emissions Monitoring and Reduction



Questions?

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