



T1000

STANDALONE MONITORING

TOKU INDUSTRY – MULTIPLE SOLUTIONS



HOW OUR IOT SYSTEM WORKS



CORE COMPETENCIES

- CREATE A CLOUD BASED PRESSURE MONITORING SYSTEM THAT CAN ADAPT TO MANY OPERATIONAL AND LEAK DETECTION PROCESSES
- DEVICE, CLOUD, INTERFACE SOLUTION WITHIN IIoT FRAMEWORK
 - Leak Detection
 - Vessel Pressure Tracking and Reporting
 - Pump, Machine Operations
 - Pump Efficiency
 - Pig Tracking
 - Tank Level

T1000 DEVICE - Class 1 Div 1



illumass

TORY NUDD
TOKU INDUSTRY

Available apps

DEVICES	PIPELINES	HIERARCHIES	PEOPLE

ORGANIZATIONS	SIGNAL GENERATOR	ALARM REPORTS

FEATURES AND FUNCTIONS

- HIGH RESOLUTION DATA PREVIOUSLY NOT AVAILABLE IN MONITORING AND WIRELESS DATA TRANSMISSION INDUSTRY
- FULLY AUTONOMOUS POWER, COMMUNICATIONS AND DATA STORAGE IN A SINGLE DEVICE. OTAD, PROGRAMMABLE
- INSTALLATION AS SIMPLE AS A GAUGE – Cover the entire field in hours, no contractor needed
- BUILT FOR EXTREME SERVICE
 - Pressure, Sensor & Ambient Temperature, Voltage, Charge Rate and Service Diagnostic Data points



MAP

View all of your locations and latest pressure readings on the map, as well as access graphs.



LOCATIONS

Find the hierarchy of all your locations here and access graphs.



PEOPLE

View the names and contact information for all Illumass users within your organization.



REPORTS

View and download reports for devices.



SIGNAL GENERATOR

Generate signals.

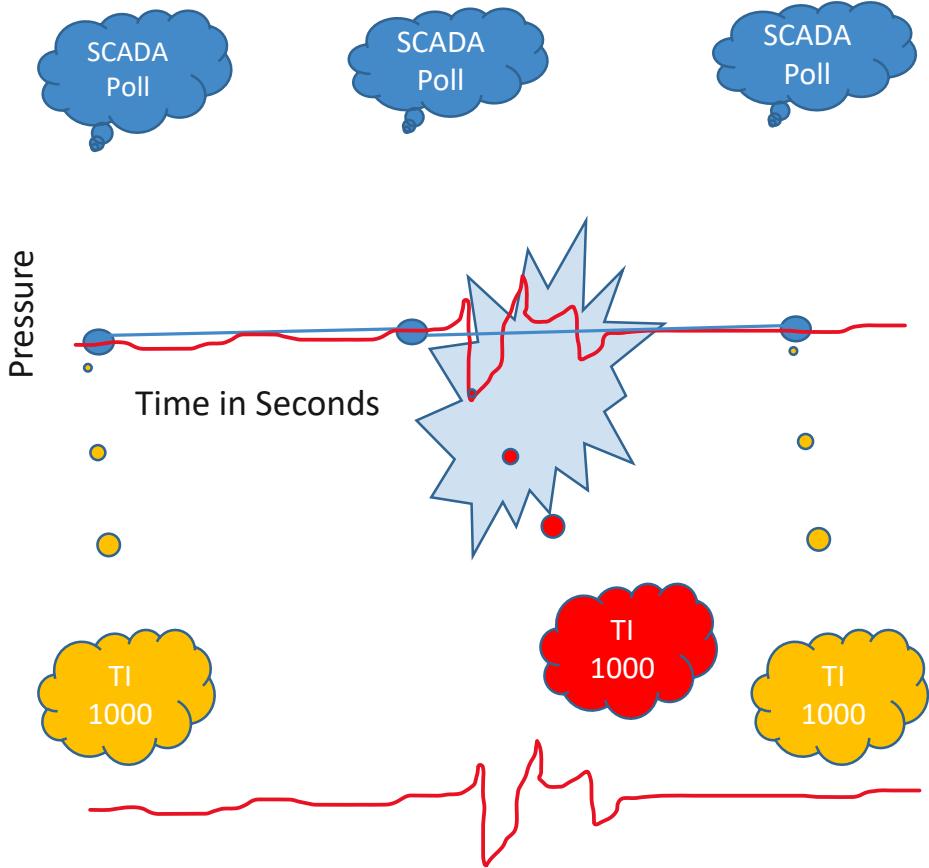


CUSTOMERS

Update and create Illumass customers.

 BUILT TO EXPLOIT THE FACT THAT MOST OPERATIONS STAFF WILL BE MANAGING THEIR POSITIONS USING A SMART PHONE AND DESIGNER APPS

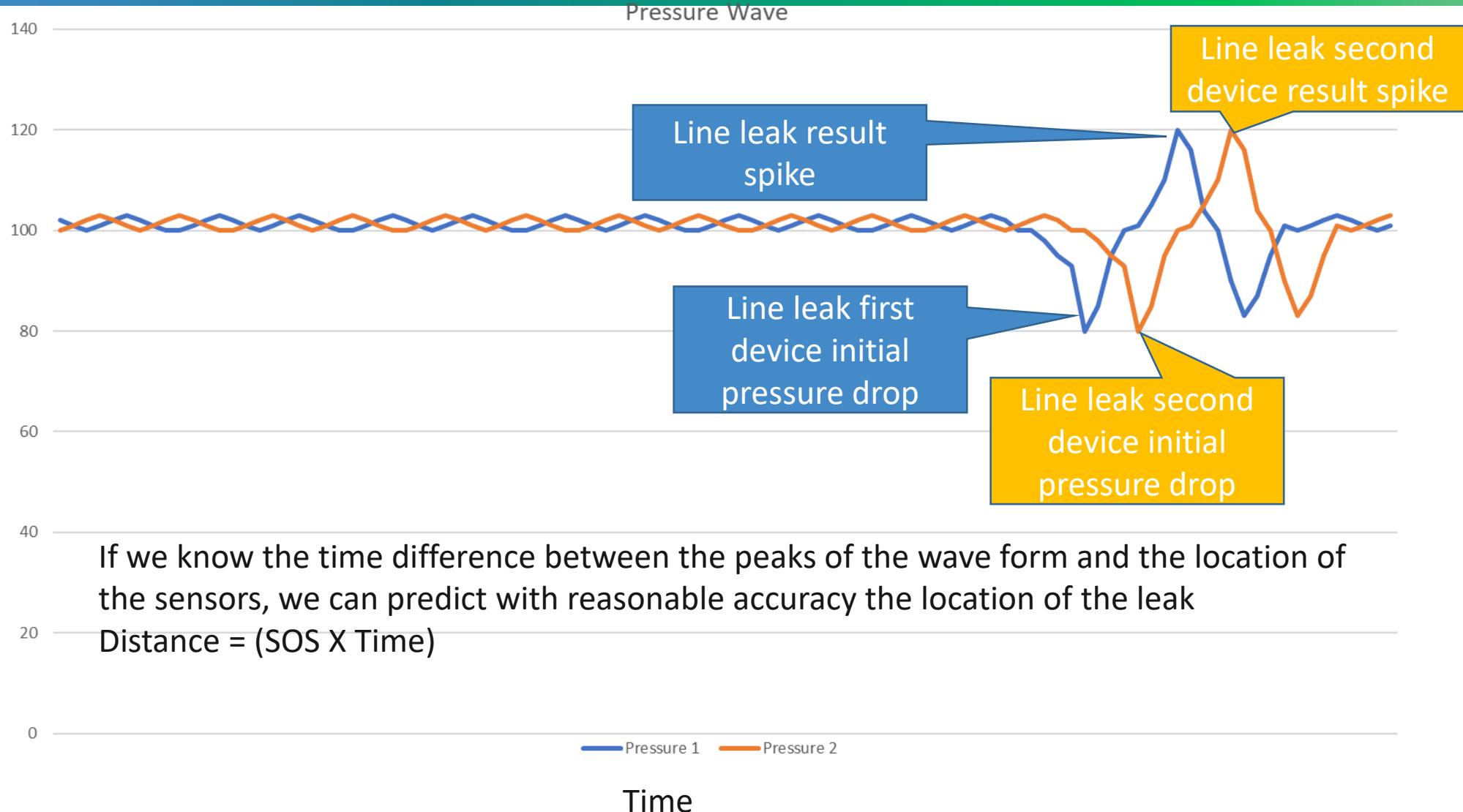
T1000 REMOTE MONITORING DEVICE



It's all about timing...

- ⌚ SENSOR SCAN RATE IS CAPABLE OF 1000'S/MINUTE. EVERY SECOND IS CAPTURED
- ⌚ ALL DATA IS **PUSHED** TO HOST ON **SCHEDULE** **AND** ON **EXCEPTION** – WHILE **SCADA MISSED** THE EVENT
- ⌚ EVERY DEVICE'S DATA POINT IS SYNCED TO THE SYSTEM CLOCK
- ⌚ SYNCHRONIZED DATA POINTS MEAN THAT THE DATA HAS A WAVEFORM THAT TELLS A STORY
- ⌚ HIGH RESOLUTION DATA IS SIMPLY NOT AVAILABLE IN MONITORING AND WIRELESS DATA TRANSMISSION INDUSTRY... UNTIL NOW

SCADA FALLS SHORT ON LEAK DETECTION

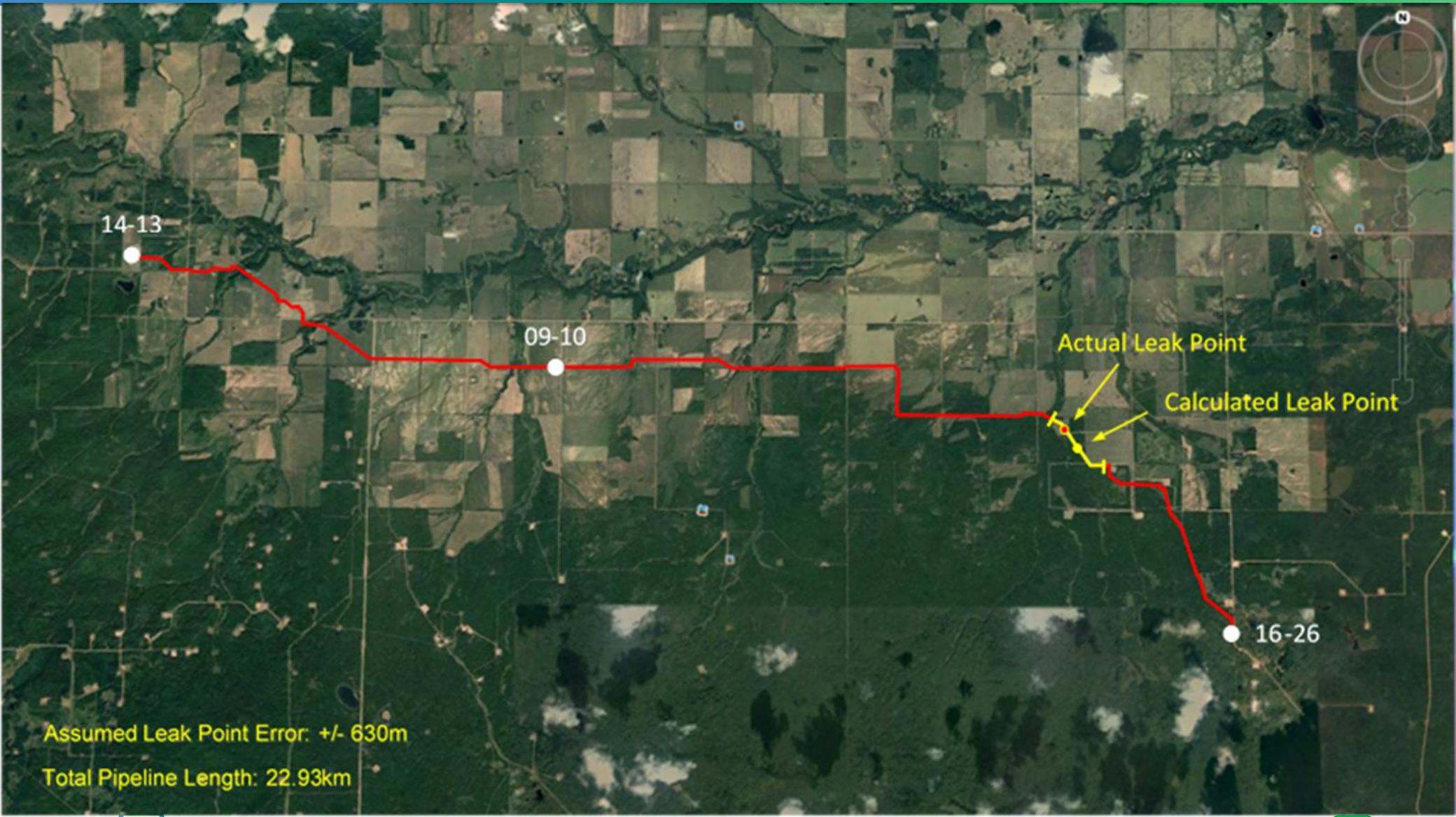




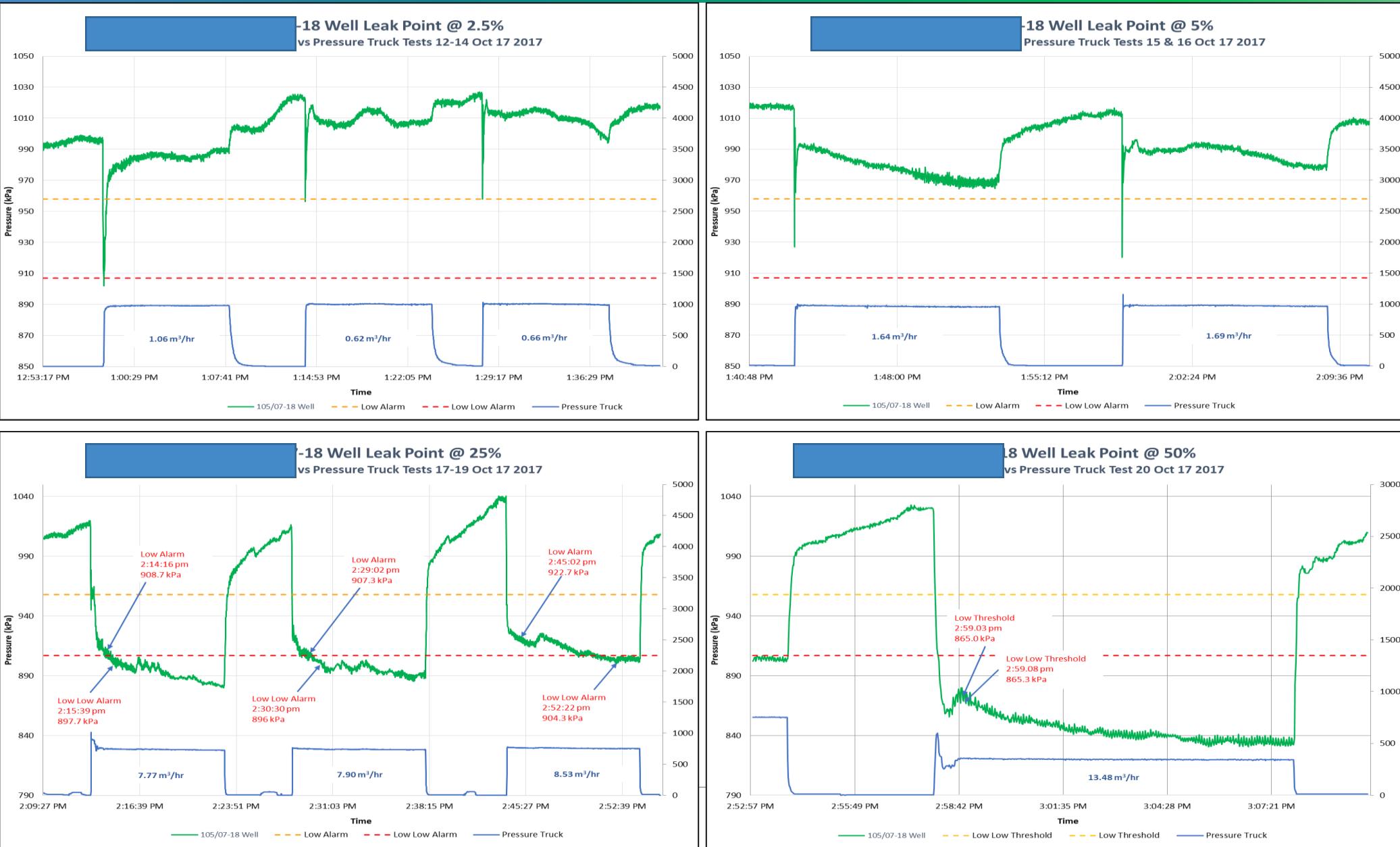
What does a
leak or rupture
look like?

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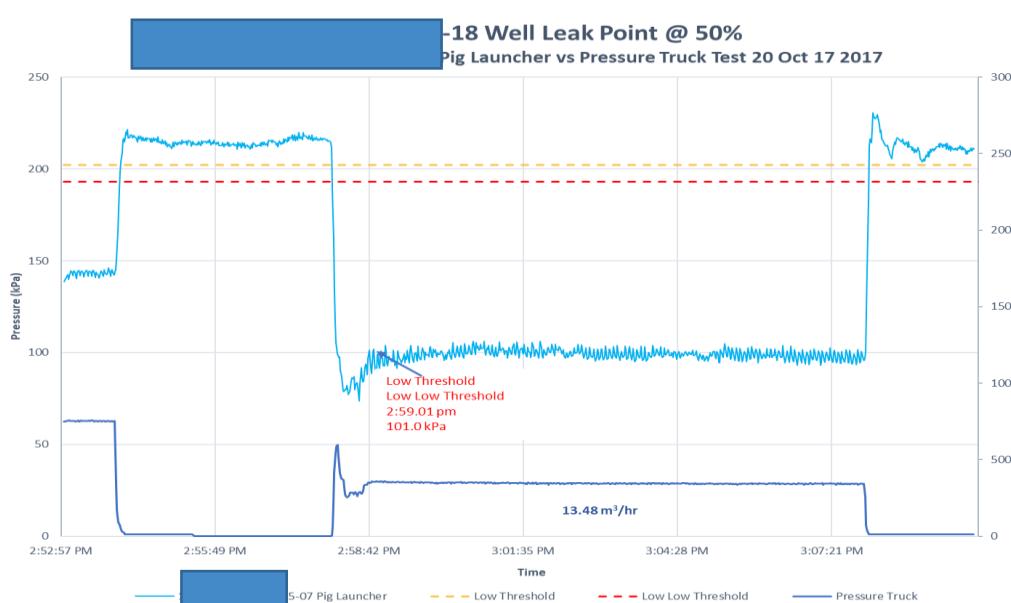
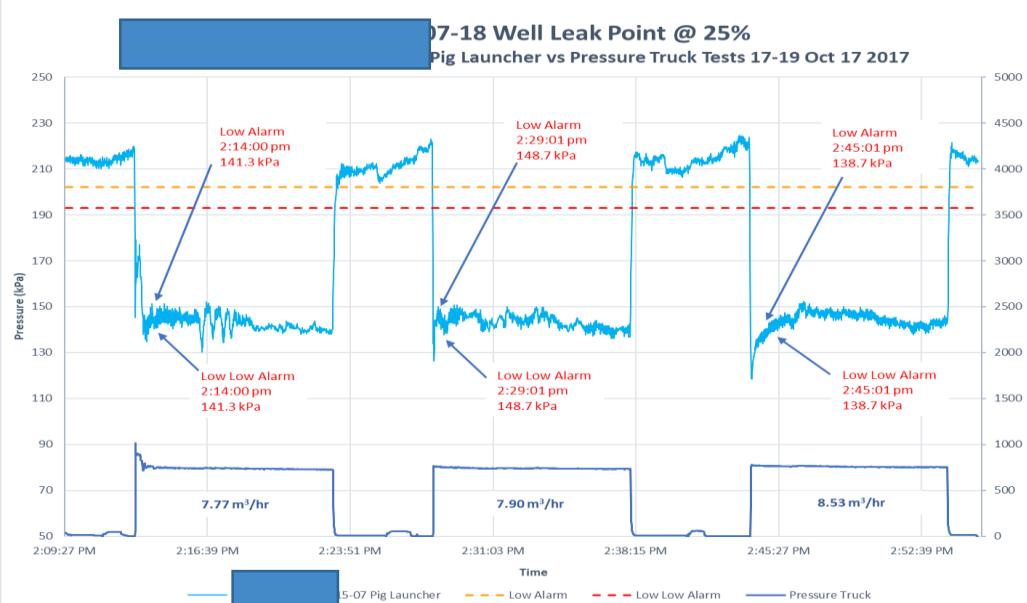
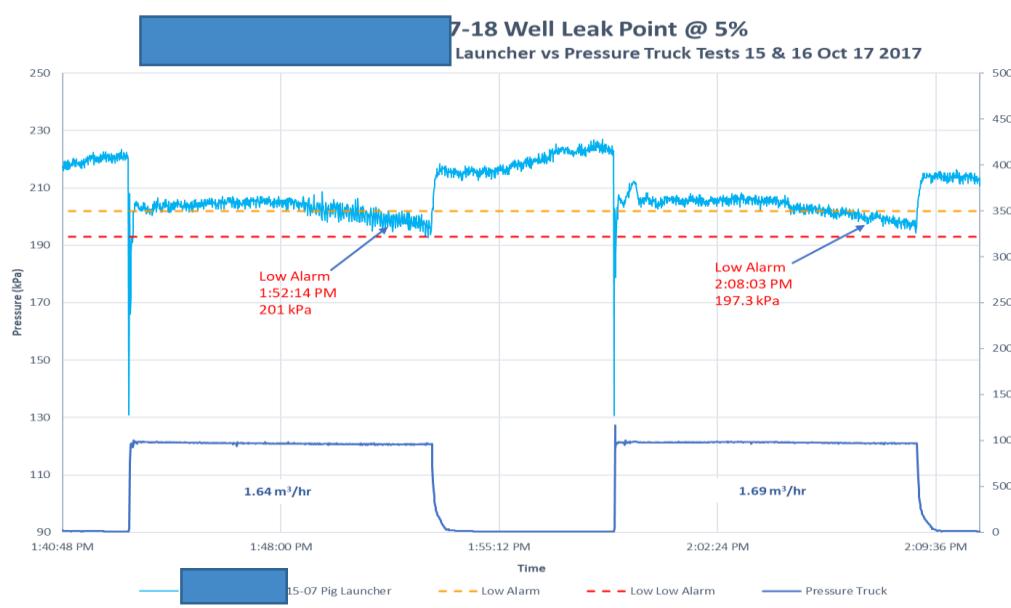
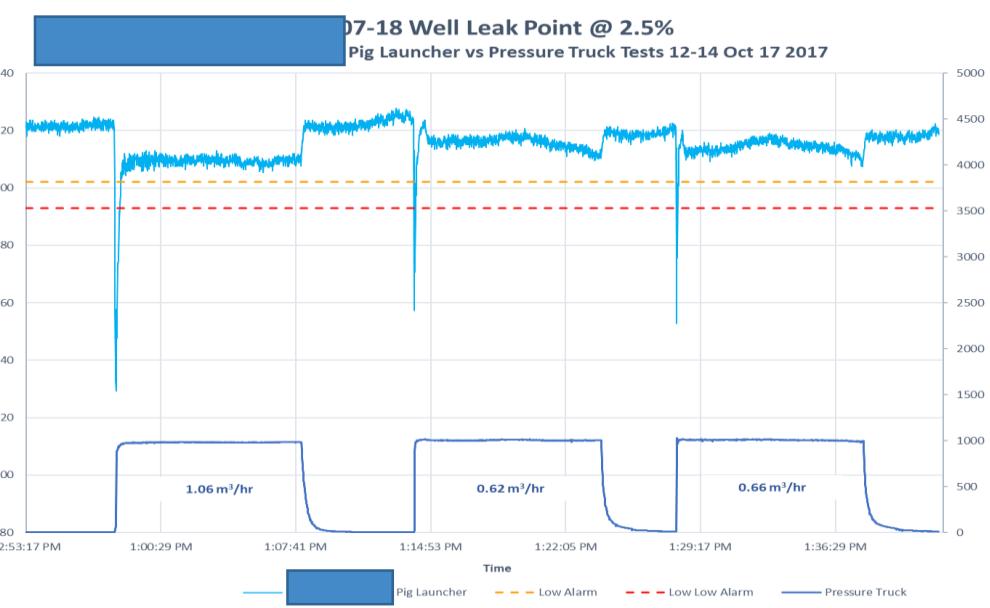
ACTUAL LEAK POINT vs CALCULATED POINT



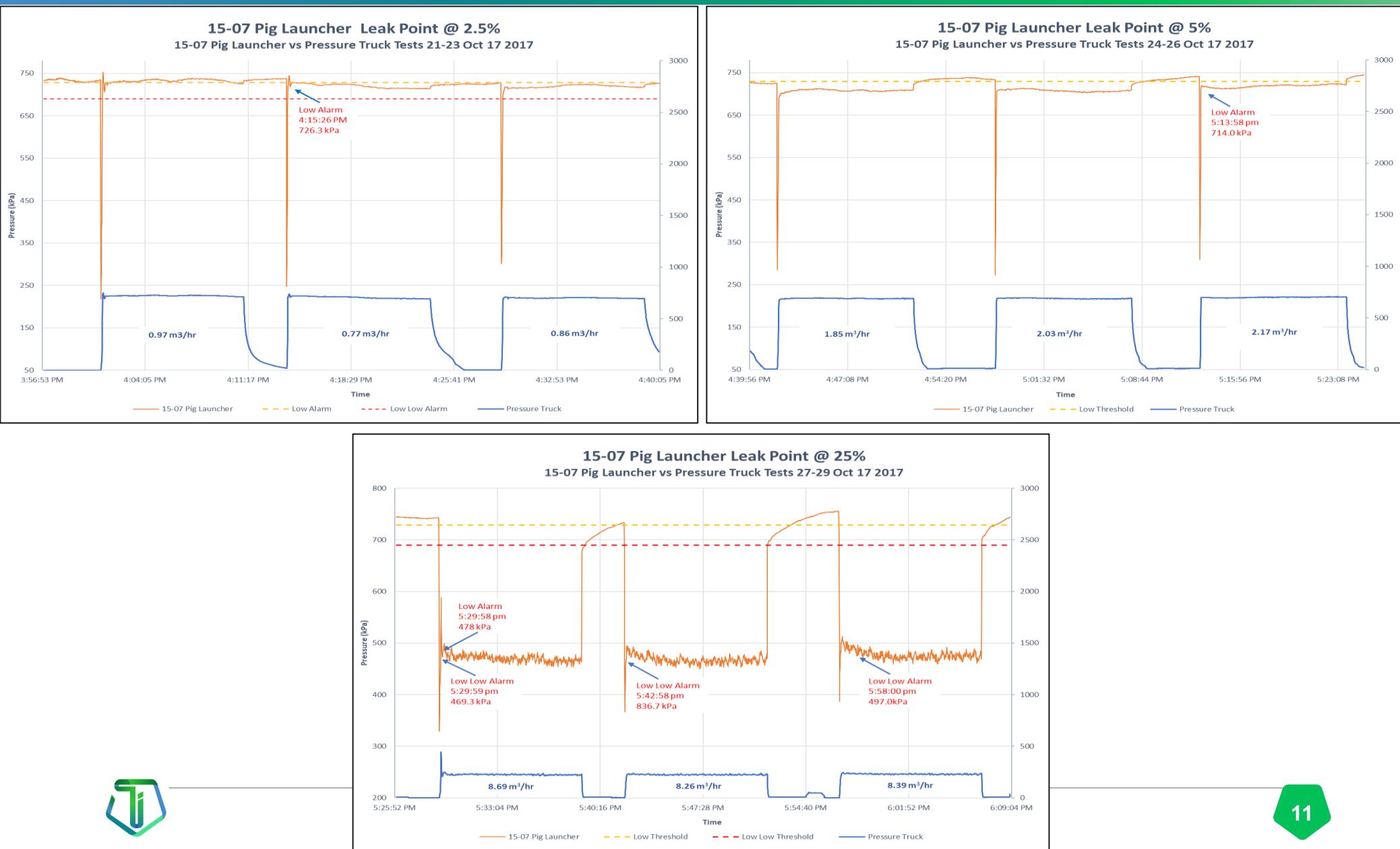
LEAK LOCATION – DEVICE ANALYSIS (Less Distant from leak)



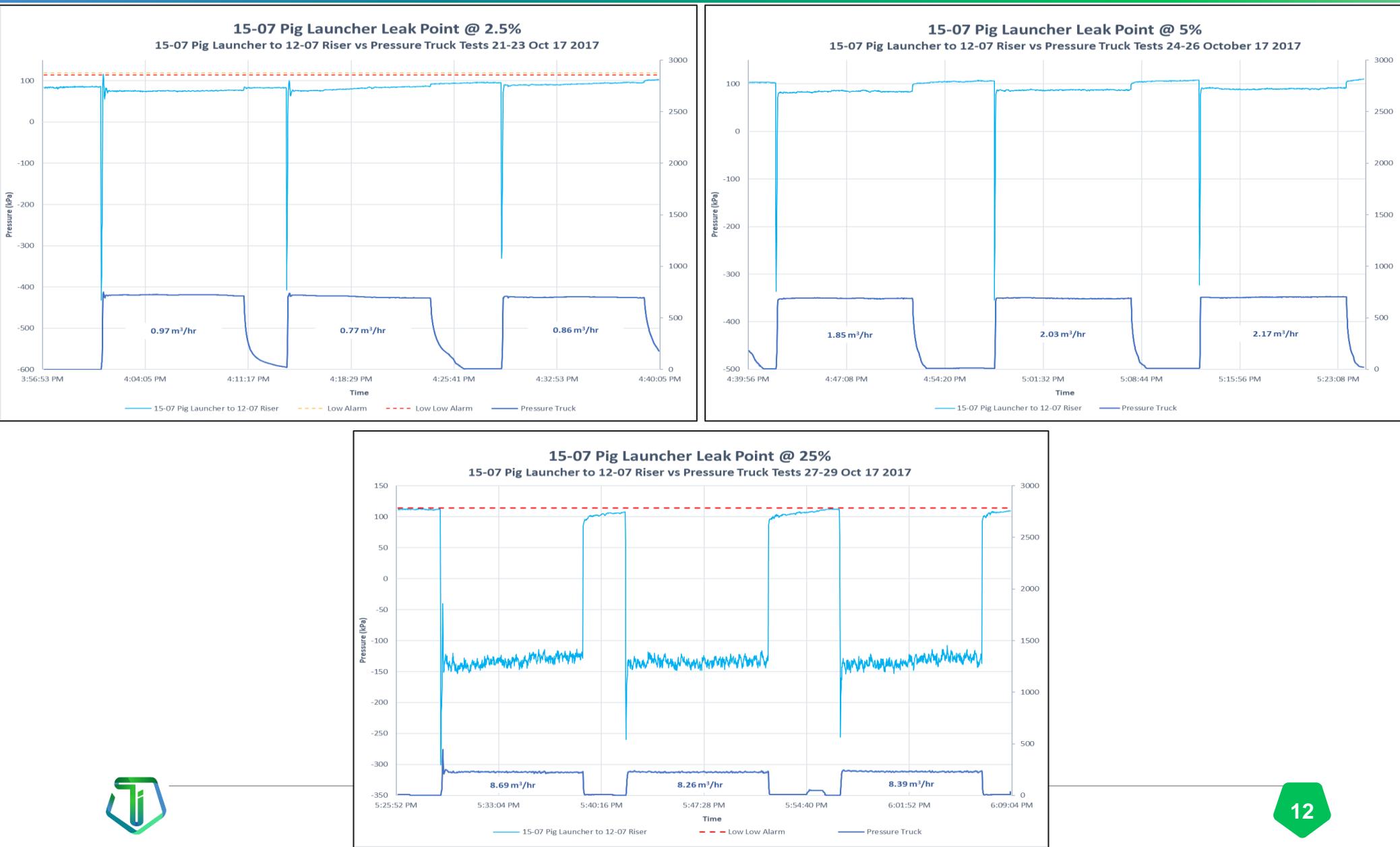
LEAK LOCATION – DIFFERENTIAL ANALYSIS



LEAK LOCATION – DEVICE ANALYSIS (Closest to leak)



LEAK LOCATION #3 – DIFFERENTIAL ANALYSIS





Extended
Rupture Data

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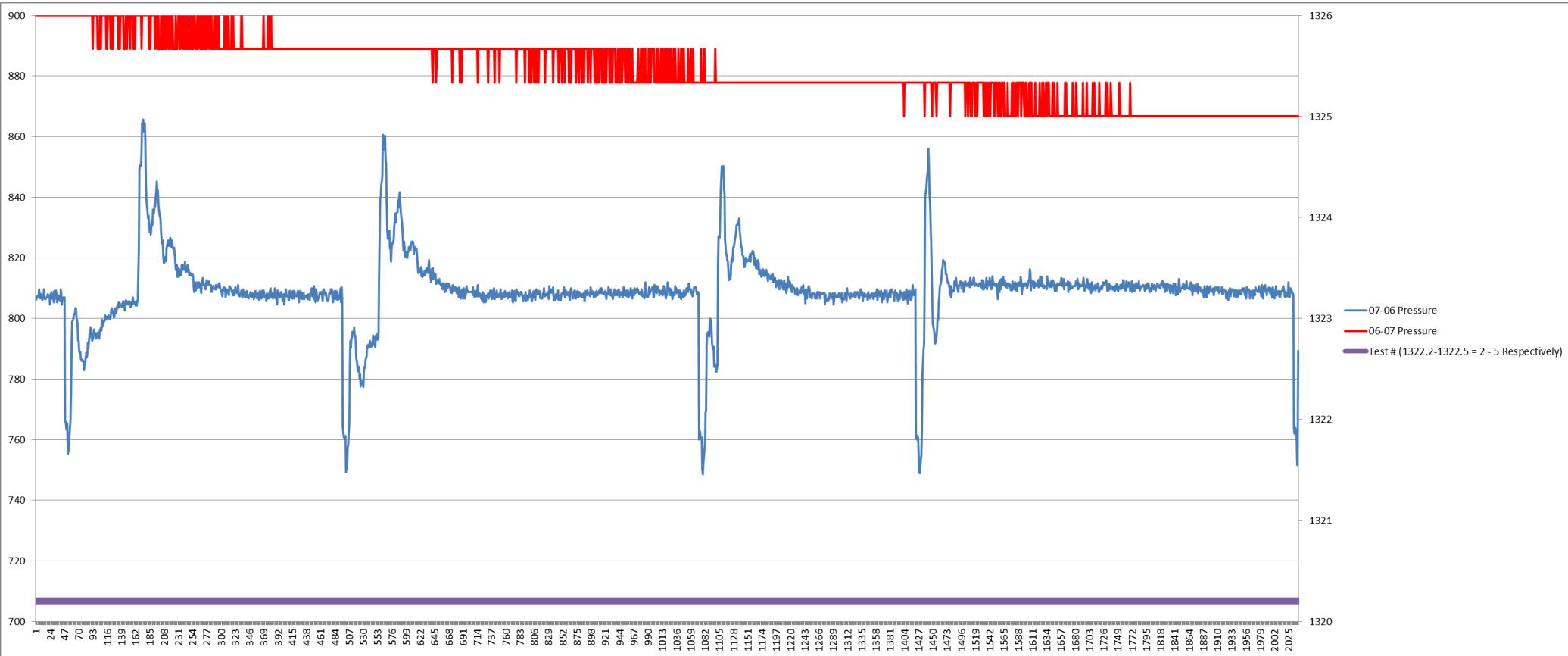


TYPICAL LEAK SIMULATION DATA 5 Tests



Parameter	Test 3, Choke 11% Open				
Time of Test MST	12:43	12:52	12:59	13:09	13:15
Begin Line Pressure (kPa)					
End Line Pressure (kPa)					
Duration of Test/Leak (seconds)	120	60	30	15	7.5
Start Tank Volume (m ³)	4.5	4.61	4.66	4.7	4.71
End Tank Volume (m ³)	4.61	4.66	4.69	4.71	4.72
Approximate Offloaded Volume (m ³)	0.11	0.05	0.03	0.01	0.01
Approximate Flow Rate (m ³ /min)	0.055	0.05	0.06	0.04	0.08

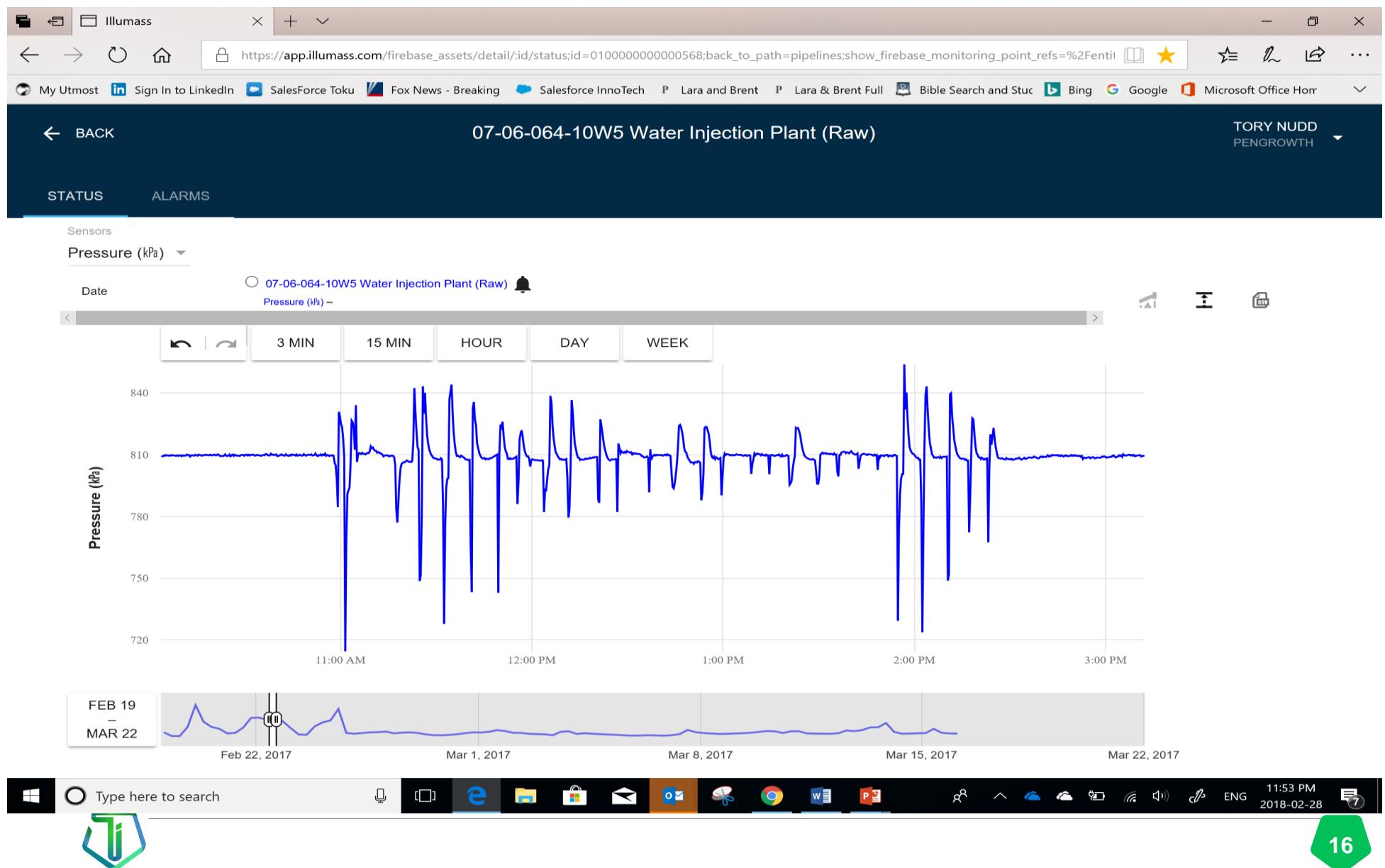
LIQUID LINE MONITORED 20Km FROM LEAK



Notice the repeatable 1-2 KPA “bounce” 20 km upstream from the actual leak



28 REPEATABLE LEAK SIMULATIONS



ILLUMASS TOOLS

The screenshot shows a web-based application titled "Map – illumass". The top navigation bar includes links for "Login | Salesforce", "Choose a Username | Salesforce", and "Map – illumass". The user is identified as "Petro Ninja" with the name "Tory Nudd" and affiliation "Grizzly Resources".

The left sidebar features a "Search" bar and a "Active Locations" button. Below these are three collapsed categories: "Operational", "Injection Well System", and "Producing Wells".

A central map area displays a "Pad Site" labeled "16-25-078-08W6". A callout box provides detailed information about the site's components:

Name	Daily flow rate (m³/d)	Time
16-30 Injector Totalizer (SCADA0003-01)	0.0000	4 minutes ago
16-30 Injector Wellhead Pressure (TIP000799)	1,521.3	38 minutes ago
Pipeline Riser Pressure (TIP000456)	1,454.7	34 minutes ago

At the bottom of the map interface, there are buttons for "SAT" and "TOPO" imagery, and a "mapbox" logo.

The taskbar at the bottom of the screen shows the Windows Start button, a search bar with the placeholder "Type here to search", and various pinned application icons including File Explorer, Microsoft Edge, Excel, Google Chrome, Microsoft Word, Microsoft PowerPoint, and Microsoft Word.

The system tray in the bottom right corner displays the date and time as "7:04 AM 2019-02-26".



ILLUMASS TOOLS

The screenshot shows a web browser window with three tabs open:

- Login | Salesforce
- Choose a Username | Salesforce
- Locations – Illumass

The main content area displays a "Locations" page. On the left, there is a search bar and a hierarchical tree view under "Operational". The tree includes "Injection Well System" which contains several pad sites and one well, and "Producing Wells".

The right side of the screen shows a detailed card for the well "11-35-078-08W6". The card includes the following information:

- 11-35-078-08W6**: Well
- Coordinate, UWI**: (dropdown menu)
- Users (1)**: Kurt Sandboe
- Measurements**:
 - Name: 11-35 Injector Totalizer (SCADA0009-01)
 - Daily flow rate (m³/d): 0.0000
 - Time: a few seconds ago
- Device and alarm thresholds**:
 - Name: Injector (TIP000838)
 - Pressure (kPa): 2,737.4
 - Time: 30 minutes ago
- Device and alarm thresholds**: (another section)

At the bottom of the screen, the Windows taskbar is visible with various pinned icons and the system tray showing the date and time.



ILLUMASS TOOLS

The screenshot shows a web browser window with three tabs: 'Login | Salesforce', 'Choose a Username | Salesforce', and 'Locations – Illumass'. The main content area displays a 'Locations' page with a sidebar for 'Operational' sites, including 'Injection Well System' and 'Producing Wells'. A modal dialog box is open for '11-35-078-08W6 (Injector)'. The dialog title is 'Edit pressure thresholds for 11-35-078-08W6 (Injector)'. It contains four checked threshold options: 'High high' at 5000 kPa, 'High' at 4300 kPa, 'Low' at 3800 kPa, and 'Low low' (unchecked). Below these are 'Advanced options' with fields for 'Set time' (10 seconds), 'Clear time' (10 seconds), and 'Hysteresis' (10 kPa). The 'SAVE' button is at the bottom right of the dialog. To the right of the dialog, there are sections for 'Ambient temperature alarm thresholds' and 'Pressure alarm thresholds', both listing the same threshold values.

Locations

Search

Operational

Injection Well System

- 01-31-078-07W6 Pad Site
- 06-35-078-08W6 Pad site
- 08-25-078-08W6 Pad Site
- 08-35-078-08W6 Pad Site
- 09-25-078-08W6 Pad Site
- 11-35-078-08W6
- 16-25-078-08W6 Pad Site
- 16-26-078-08W6 Pad Site

Producing Wells

Edit pressure thresholds for 11-35-078-08W6 (Injector)

Threshold Level	Value (kPa)
High high	5000
High	4300
Low	3800
Low low	

Advanced options

Set time: 10 seconds

Clear time: 10 seconds

Hysteresis: 10 kPa

CANCEL SAVE

TIP000838

Ambient temperature alarm thresholds

alarm thresholds set for ambient temperature. Set a threshold and it will show up here.

Pressure alarm thresholds

High high: 5,000.0 kPa
High: 4,300.0 kPa
Low: 3,800.0 kPa

Sensor temperature alarm thresholds

alarm thresholds set for sensor temperature. Set a threshold and it will show up here.



GRAPH

ALARMS

Pressure (kPa) ▾ Pressure (kPa) ▾

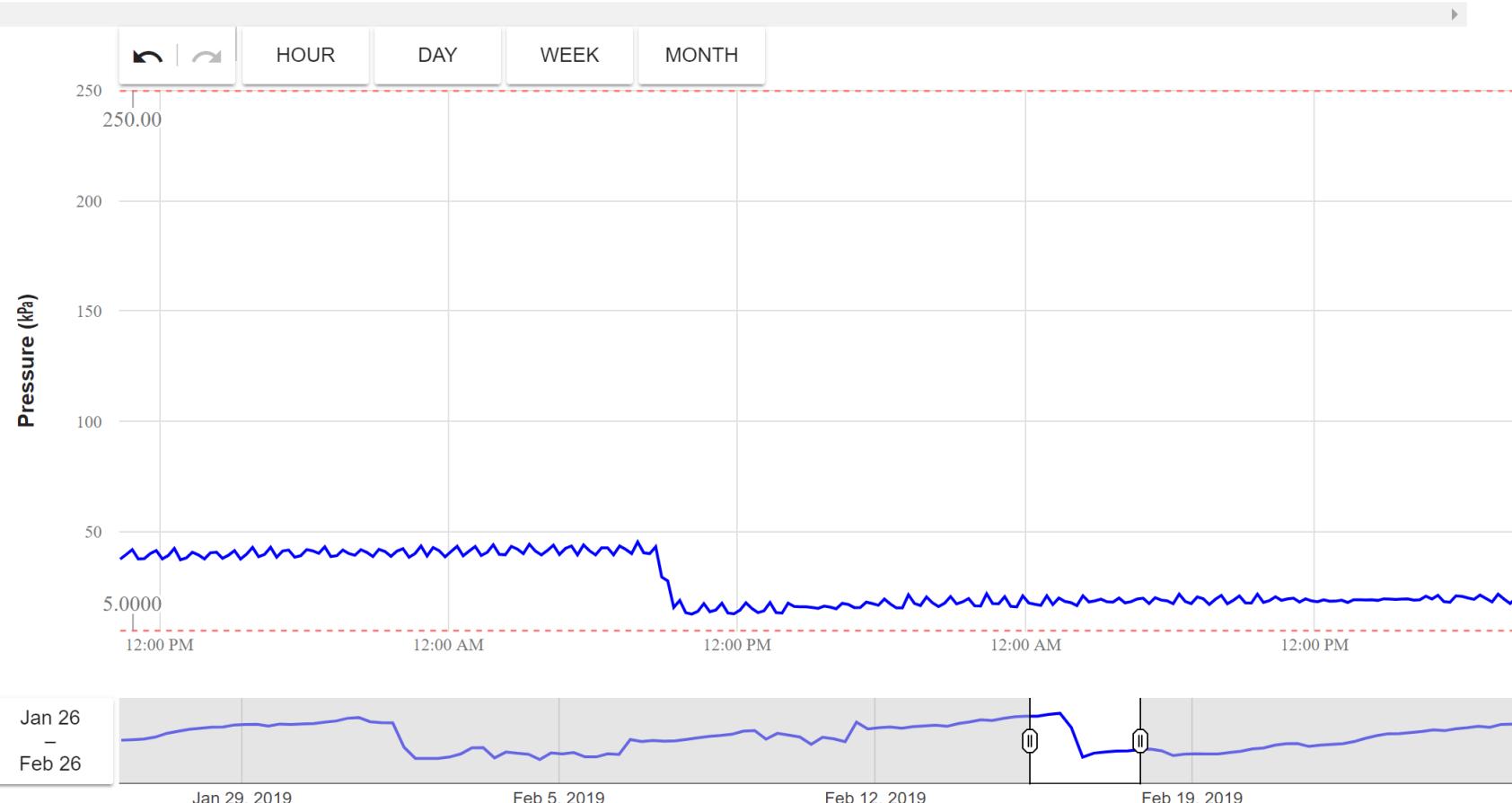
Date

Feb 15, 2019, 11:37:30 AM

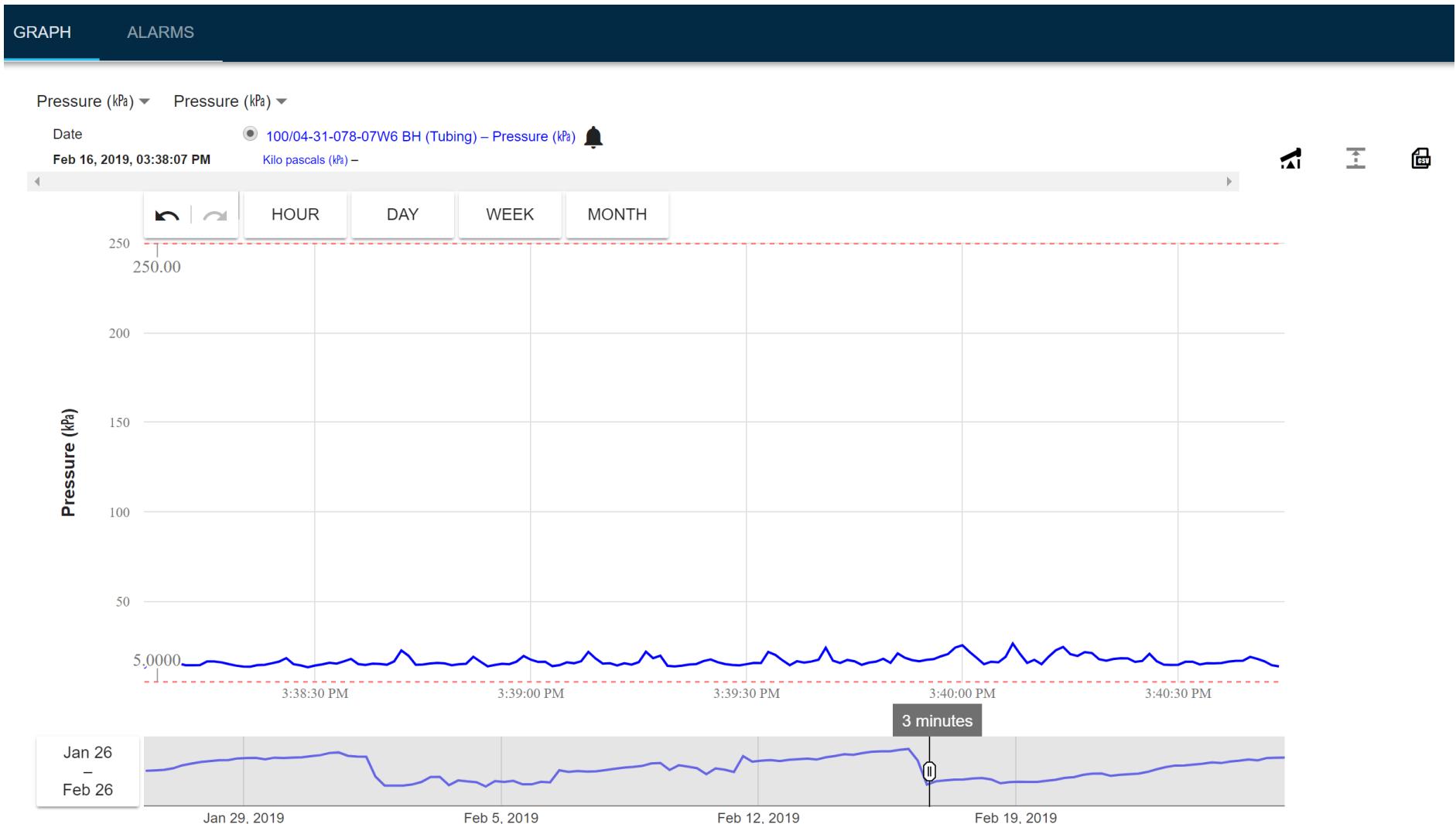
100/04-31-078-07W6 BH (Tubing) – Pressure (kPa)



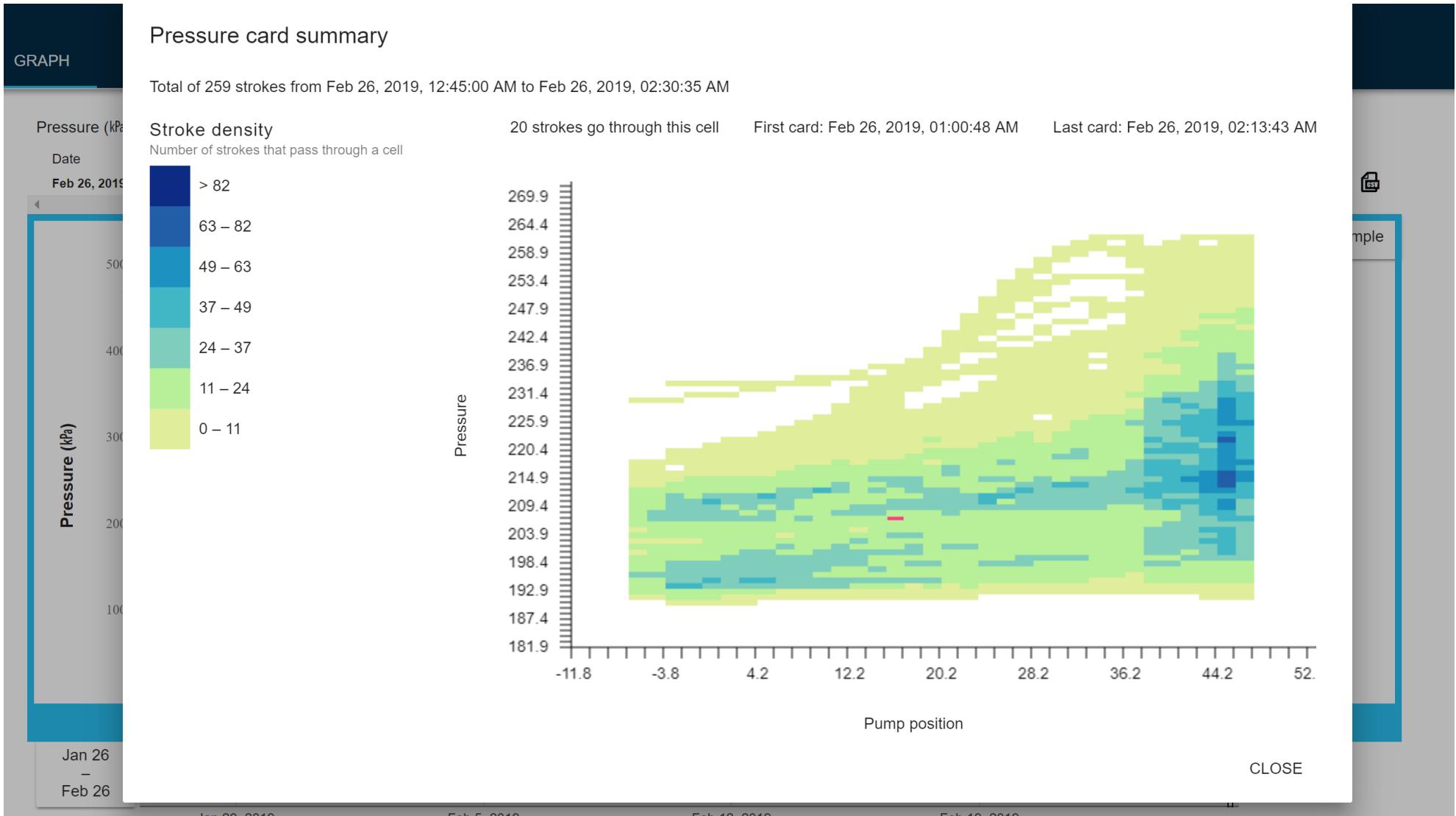
Kilo pascals (kPa) 40.142 kPa



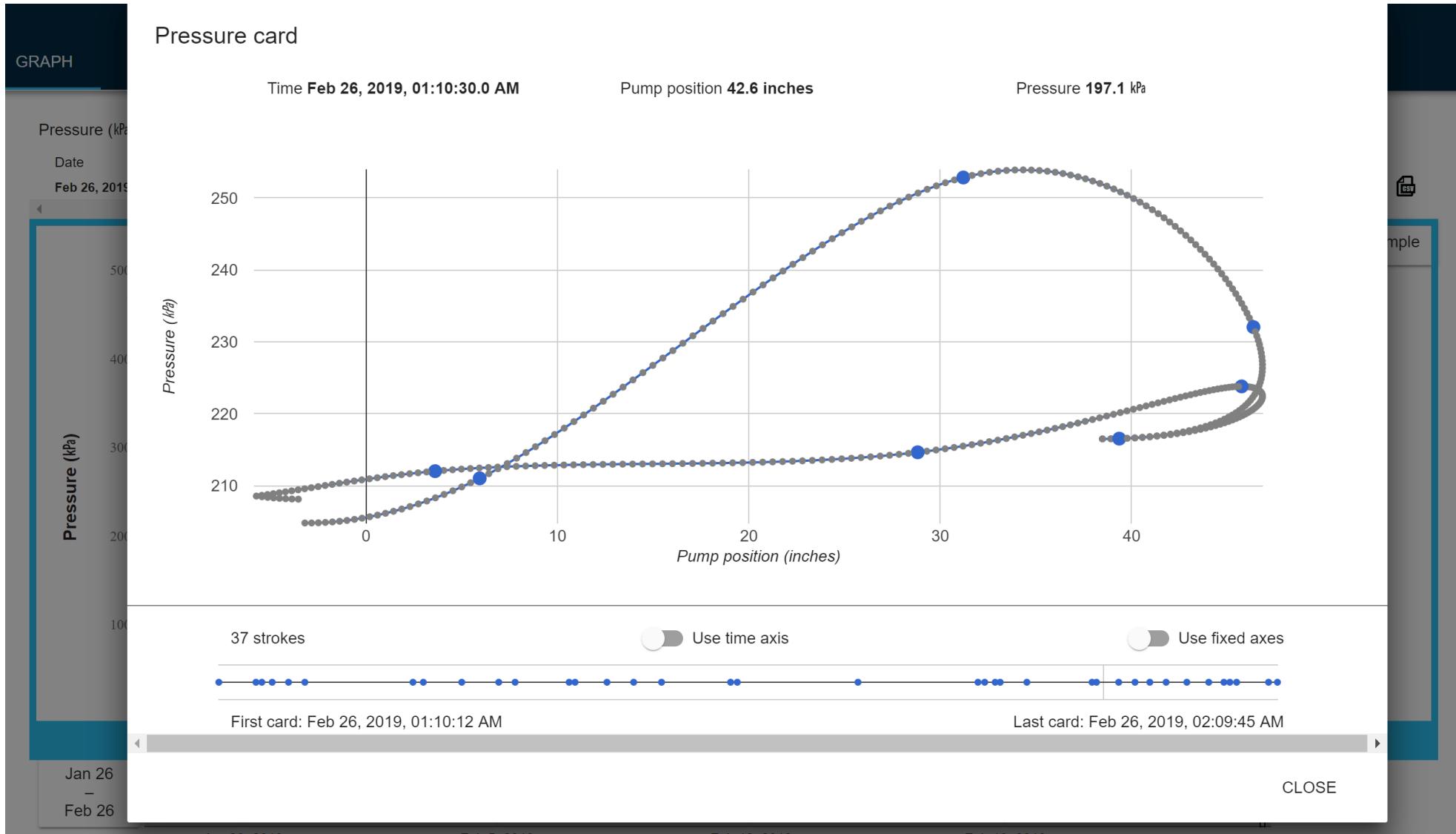
ILLUMASS TOOLS – DRILL DOWN TO PER SECOND



PUMP CARDS



PUMP CARD TOOLS





2.5% Leak

Rate of Change Alarm Test

1 Hour

10 Minute

1 Minute

1 Second

8:00AM - 9:00AM, 2.5% leak



1		
8:05:57	679.6667	-0.33333
8:05:58	679.6667	-4
8:05:59	671.6667	-0.66667
8:06:00	678.3333	4
8:06:01	679.6667	0

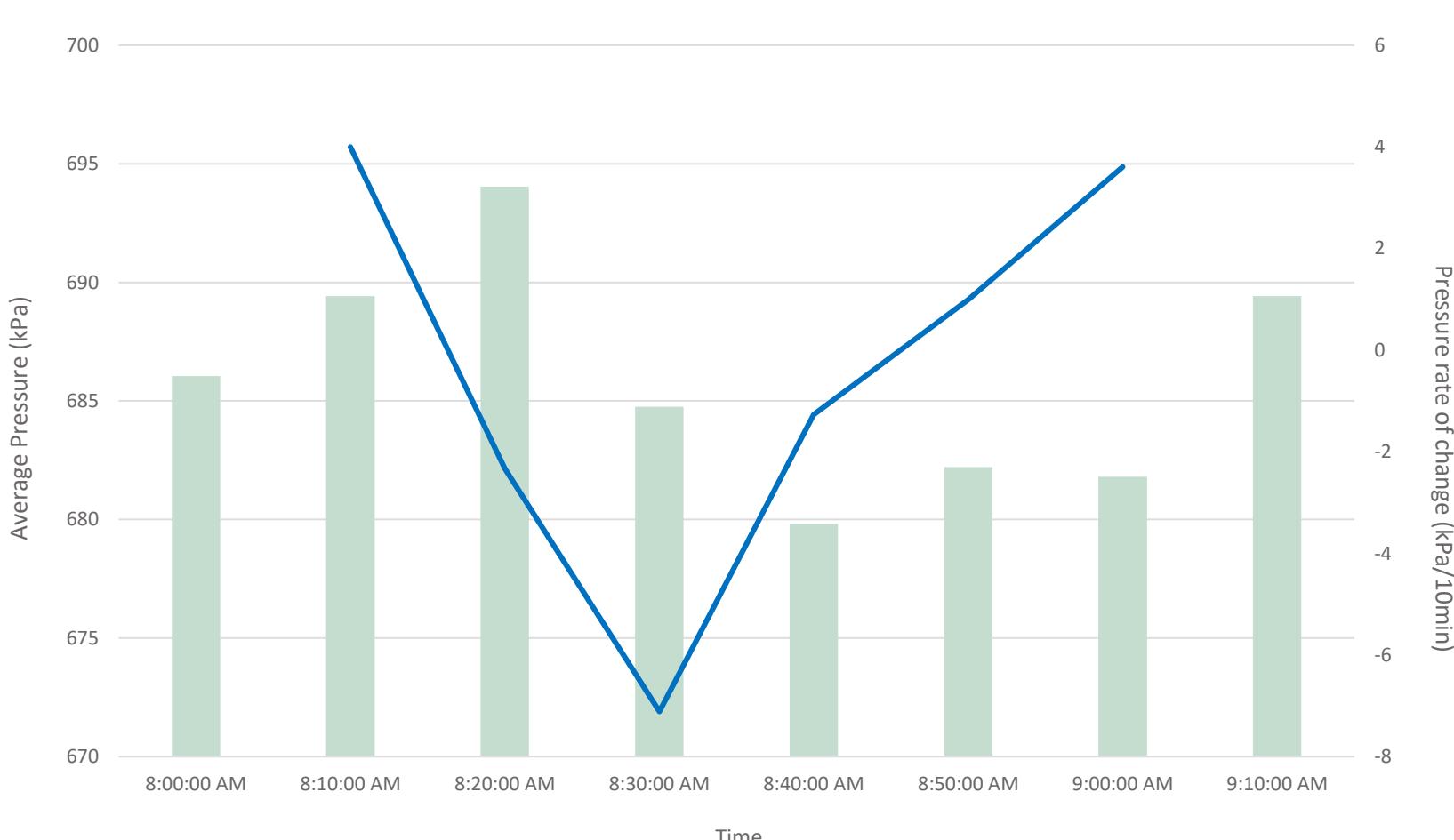
2		
8:14:57	690	-0.16667
8:14:58	689.3333	-17.16667
8:14:59	655.6667	-4.66667
8:15:00	680	13.5
8:15:01	682.6667	1.833333

3		
8:37:58	687.6667	0
8:37:59	687.3333	-3.16667
8:38:00	681.3333	-5
8:38:01	677.3333	-1.5
8:38:02	678.3333	0.833333

4		
8:56:58	680.6667	0.166667
8:56:59	680.6667	-3
8:57:00	674.6667	-3
8:57:01	674.6667	0.833333
8:57:02	676.3333	0.833333



10min RoC, 2.5% leak



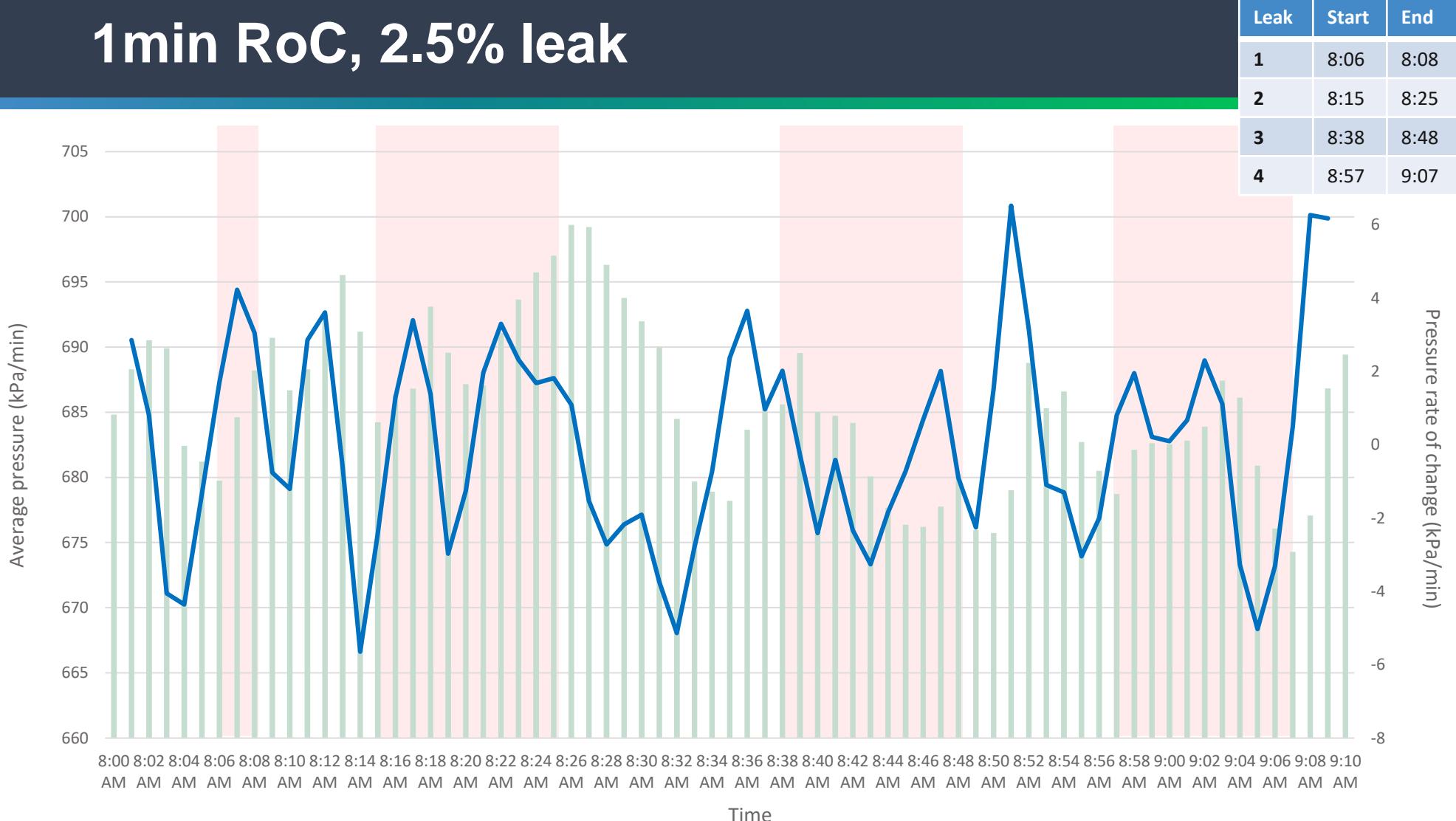
Avg PRESS	Max	694.0394444
	Min	679.8161111
	Mean	685.9363194
	SD	4.777300437

RoC	Max	3.997222222
	Min	-7.111666667
	Mean	-0.35375
	SD	4.166979543



1min RoC, 2.5% leak

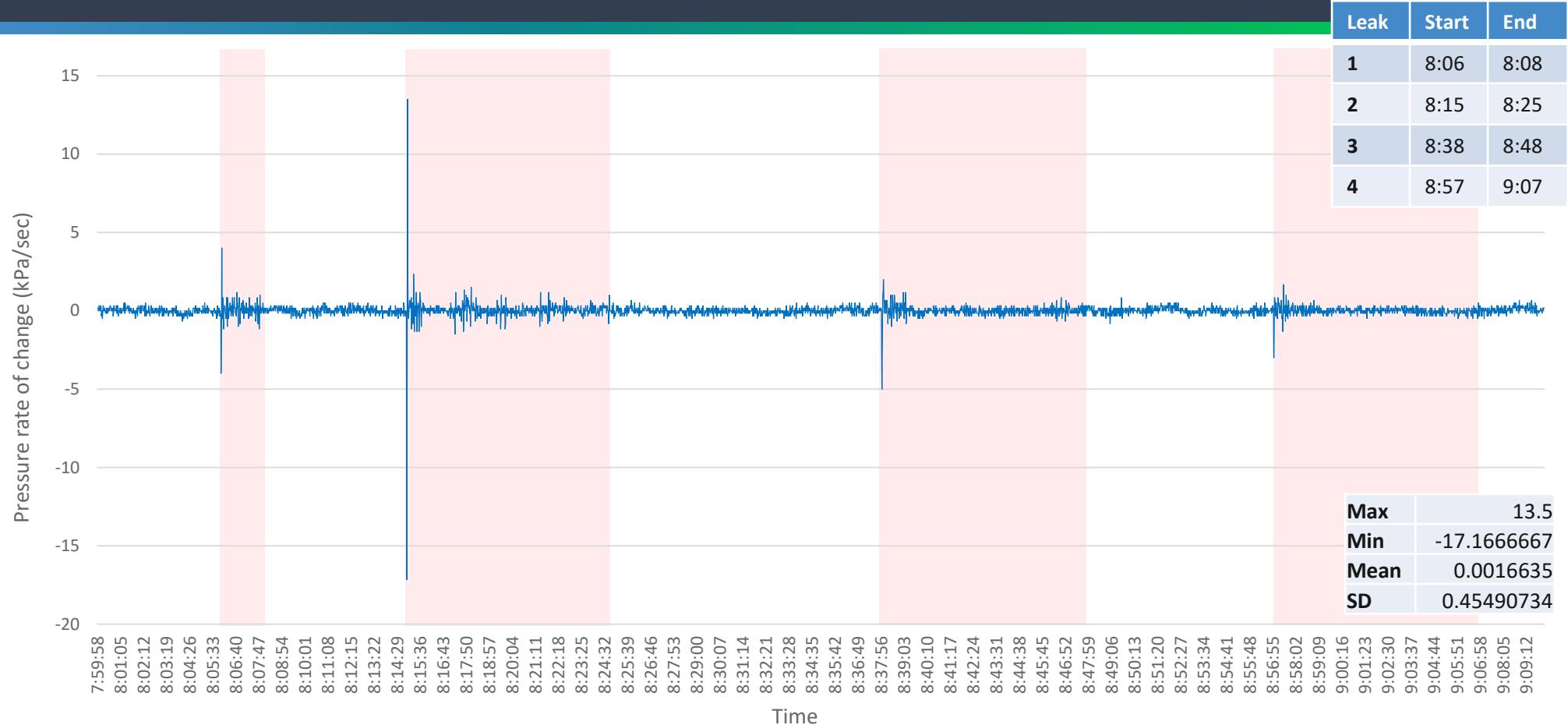
Leak	Start	End
1	8:06	8:08
2	8:15	8:25
3	8:38	8:48
4	8:57	9:07



Avg Press	
Max	699.372222
Min	674.283333
Mean	685.458179
SD	6.02923311



1sec RoC, 2.5% leak



1		
8:05:57	679.6667	-0.33333
8:05:58	679.6667	-4
8:05:59	671.6667	-0.66667
8:06:00	678.3333	4
8:06:01	679.6667	0

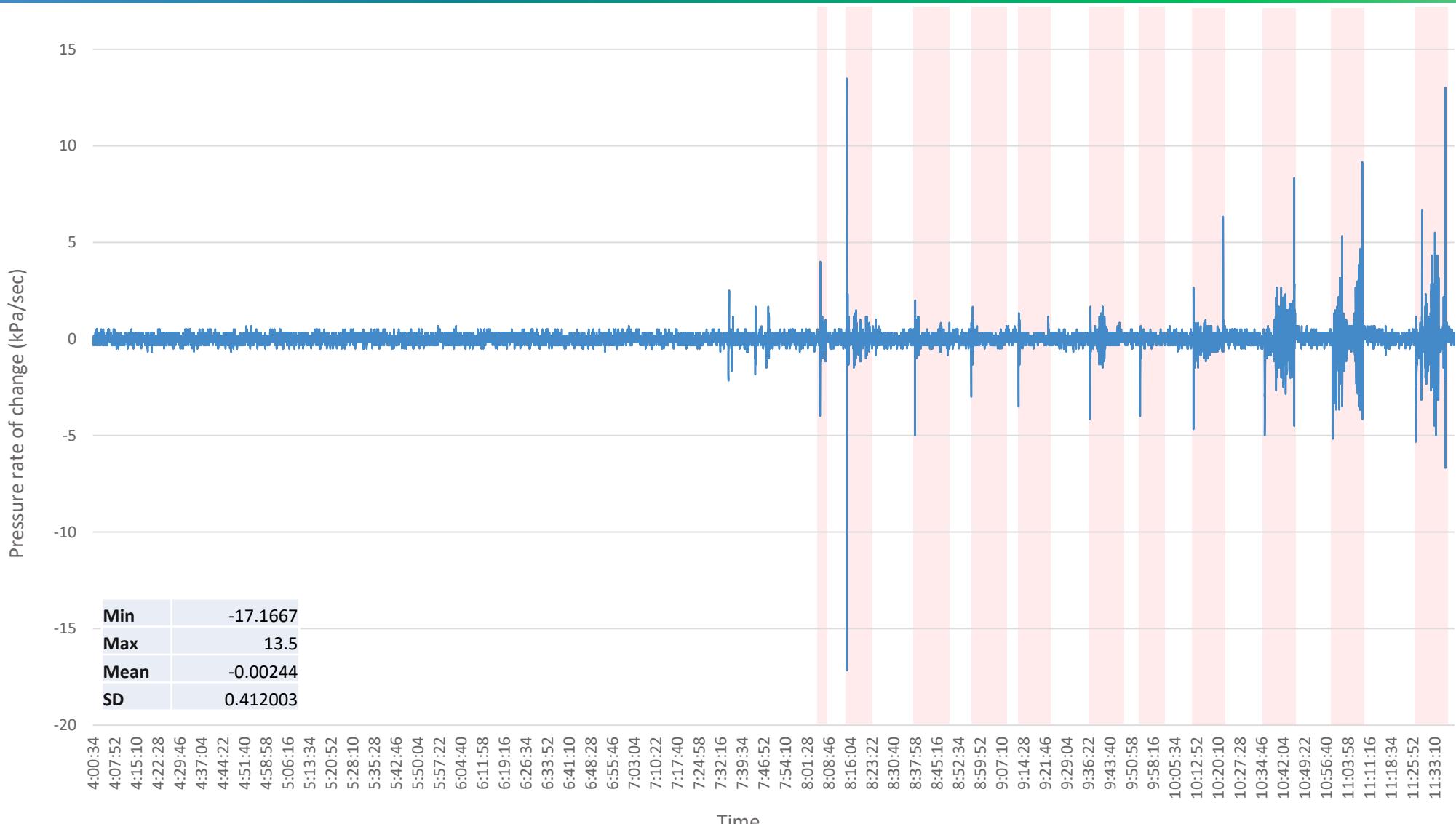
2		
8:14:57	690	-0.16667
8:14:58	689.3333	-17.1667
8:14:59	655.6667	-4.66667
8:15:00	680	13.5
8:15:01	682.6667	1.833333

3		
8:37:58	687.6667	0
8:37:59	687.3333	-3.16667
8:38:00	681.3333	-5
8:38:01	677.3333	-1.5
8:38:02	678.3333	0.833333

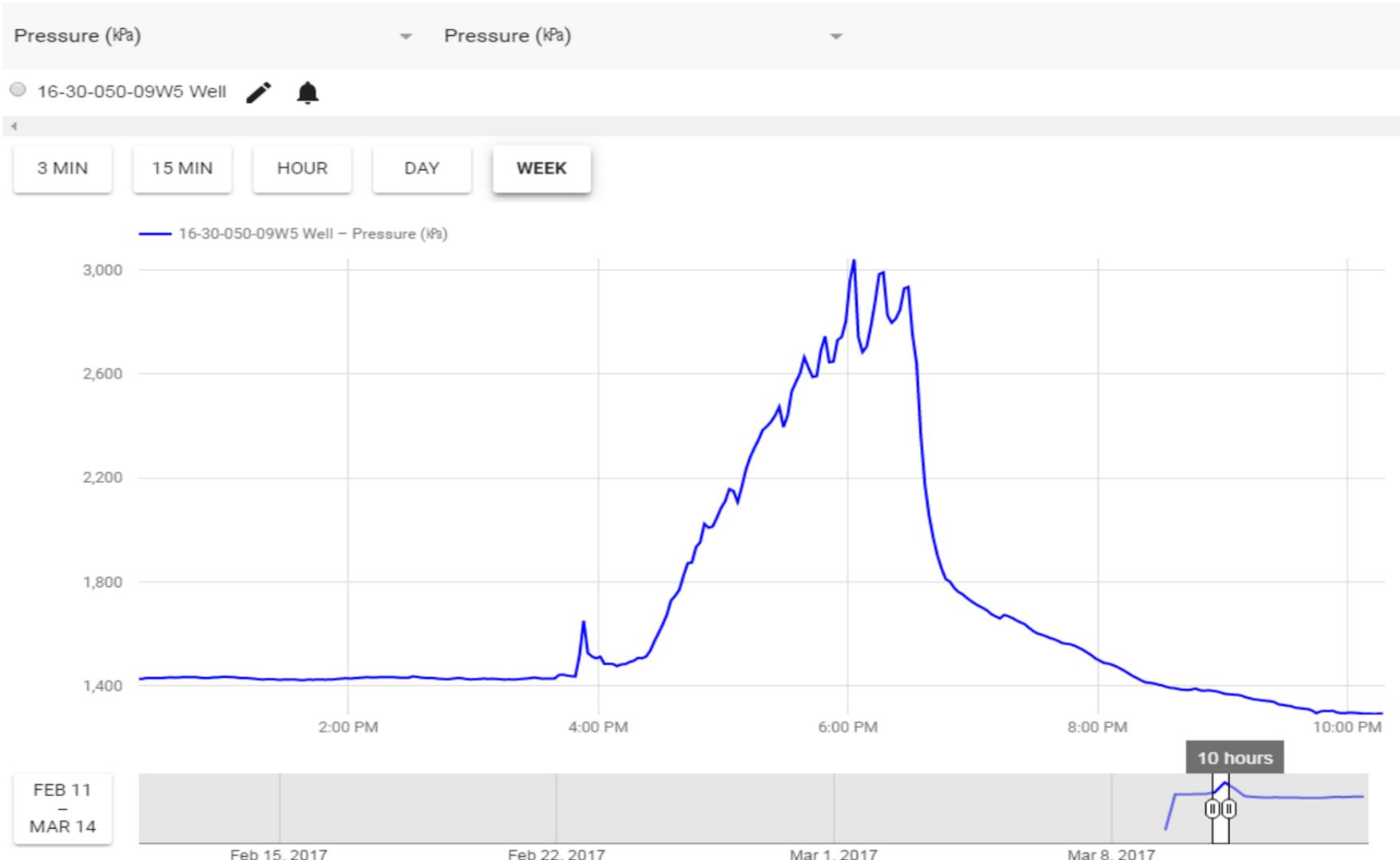
4		
8:56:58	680.6667	0.166667
8:56:59	680.6667	-3
8:57:00	674.6667	-3
8:57:01	674.6667	0.833333
8:57:02	676.3333	0.833333



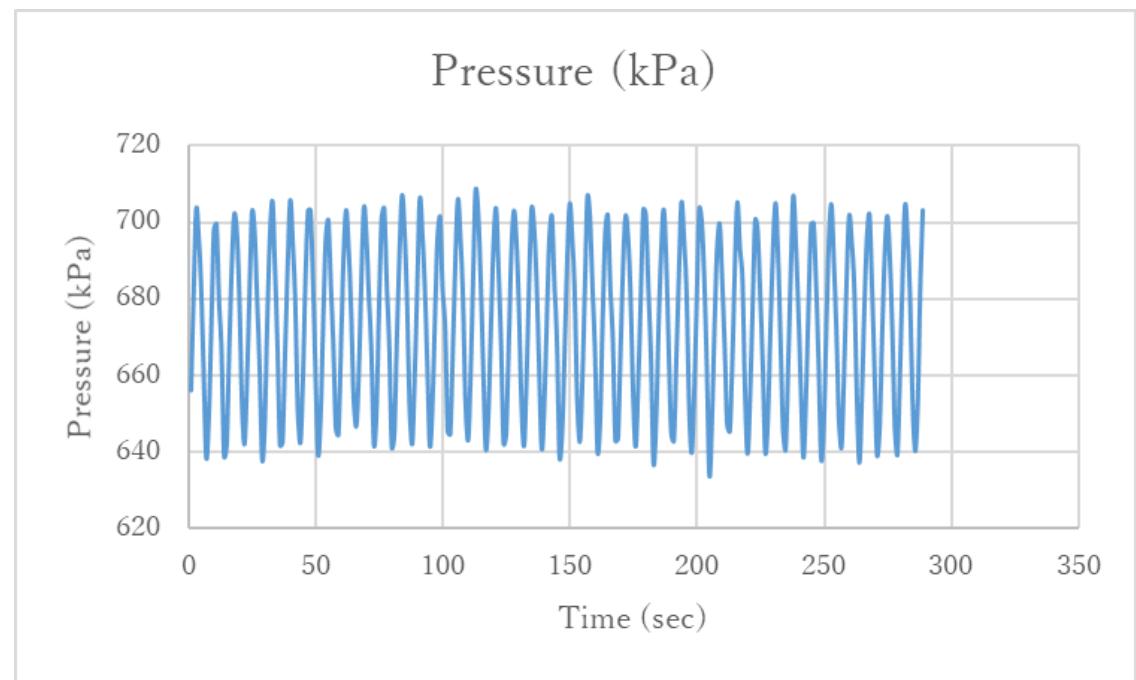
1sec RoC, 4:00AM-11:40AM



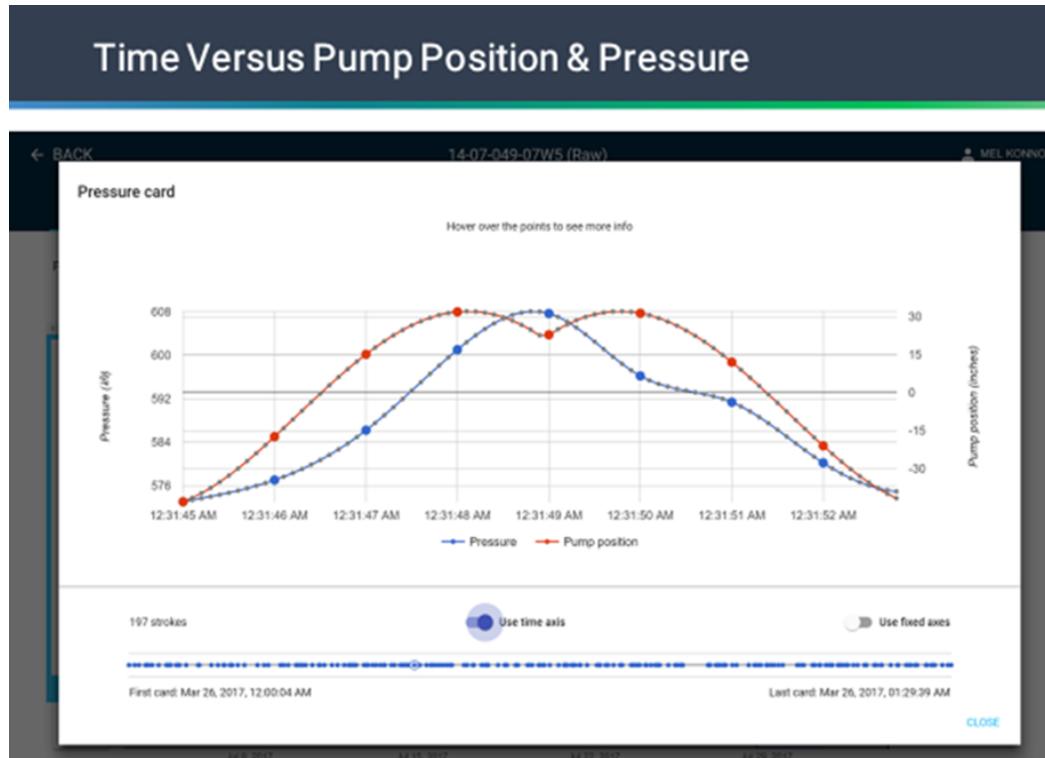
PRESSURE WAVE - PIGGING



Tubing Pressure vs. Time



Pressure Cycle Analysis: Just The Beginning



Critical Information

- Pressure travels at approx. 1000 m/sec. in oil. Tubing Pressure = discharge pressure of the downhole pump.
- Complete pressure cycle contains both valve moments.
- PumpJack position matches with pressure cycle

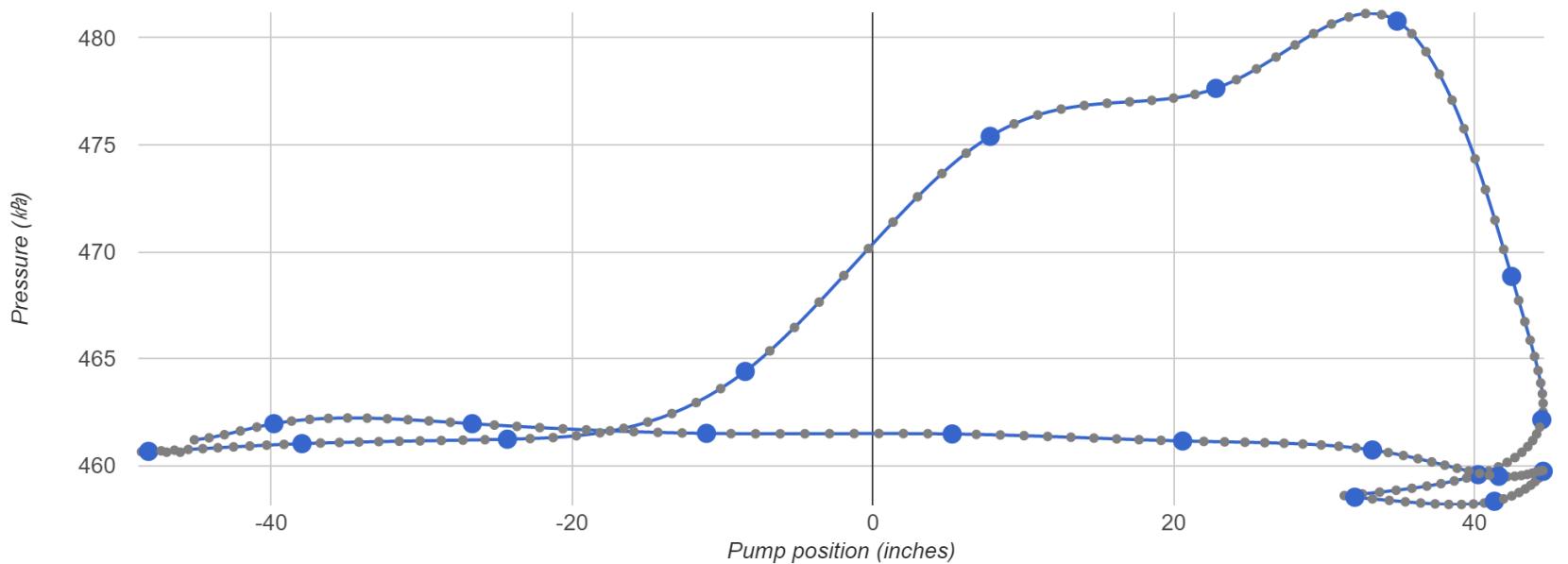
Typical Pump Curves Pressure vs Position

Pressure card

Time **Feb 20, 2019, 10:04:48.9 AM**

Pump position **-9.4 inches** (Inferred)

Pressure **461.5 kPa** (Inferred)



1 strokes

Use time axis

Use fixed axes

First card: Feb 20, 2019, 10:04:31 AM

Last card: Feb 20, 2019, 10:04:31 AM



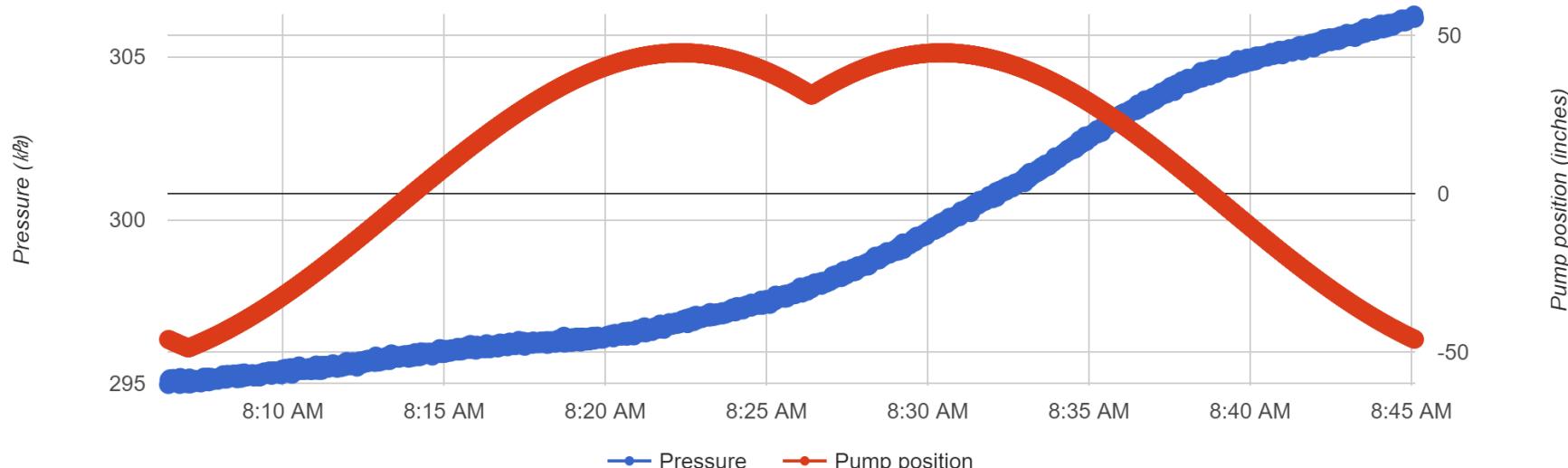
Pressure and Pump Position (Over Time)

Pressure card

Time **Feb 14, 2019, 08:13:58.7 AM**

Pump position **-0.3 inches** (Inferred)

Pressure **295.8 kPa** (Inferred)



1 strokes



Use time axis



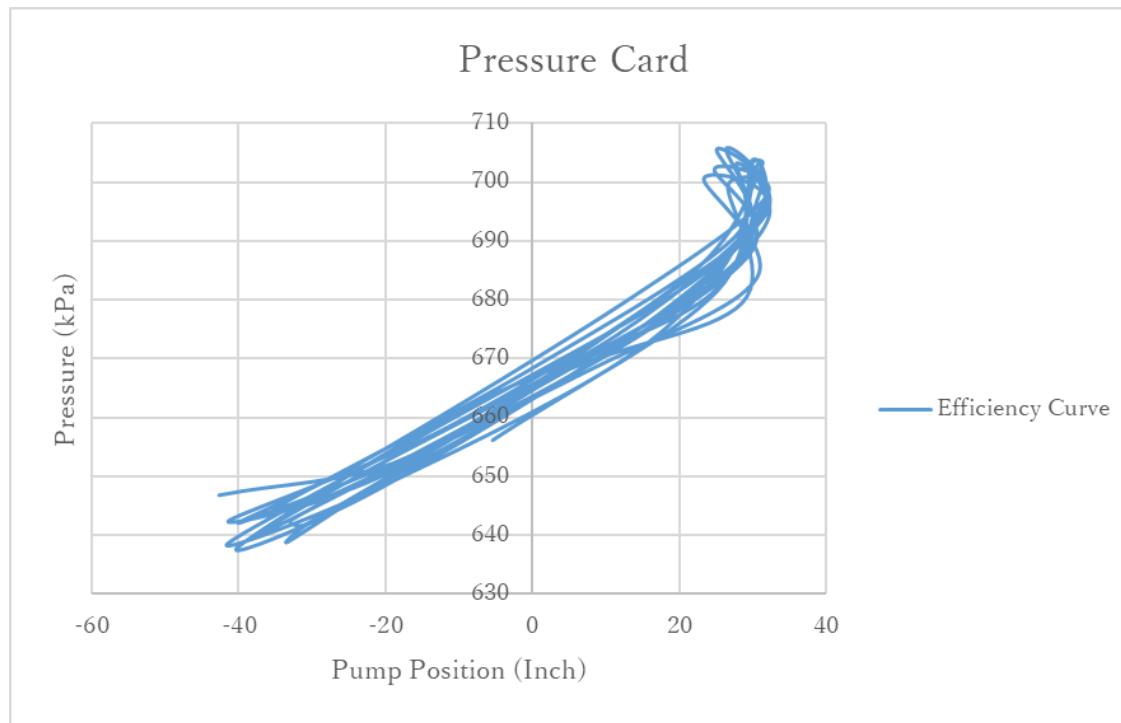
Use fixed axes

First card: Feb 14, 2019, 08:06:26 AM

Last card: Feb 14, 2019, 08:06:26 AM

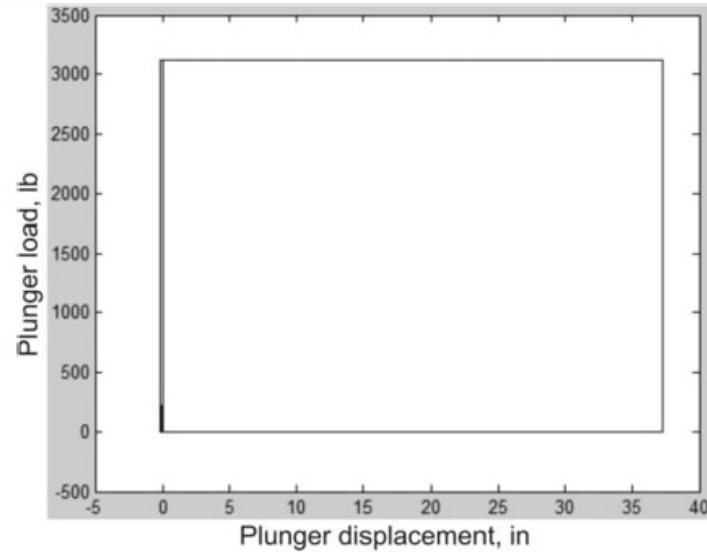


Pressure Card of Downhole Pump

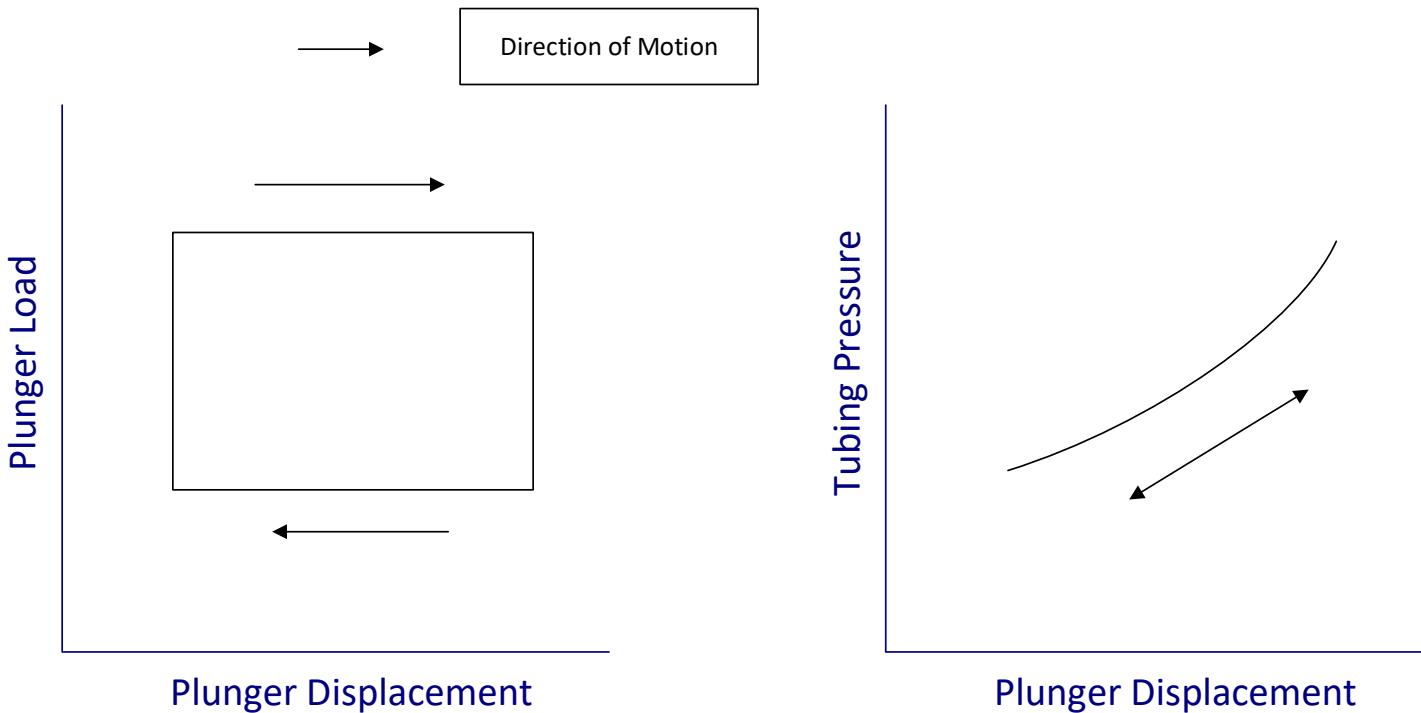


Complete Pressure Cycle (From Start to Finish)

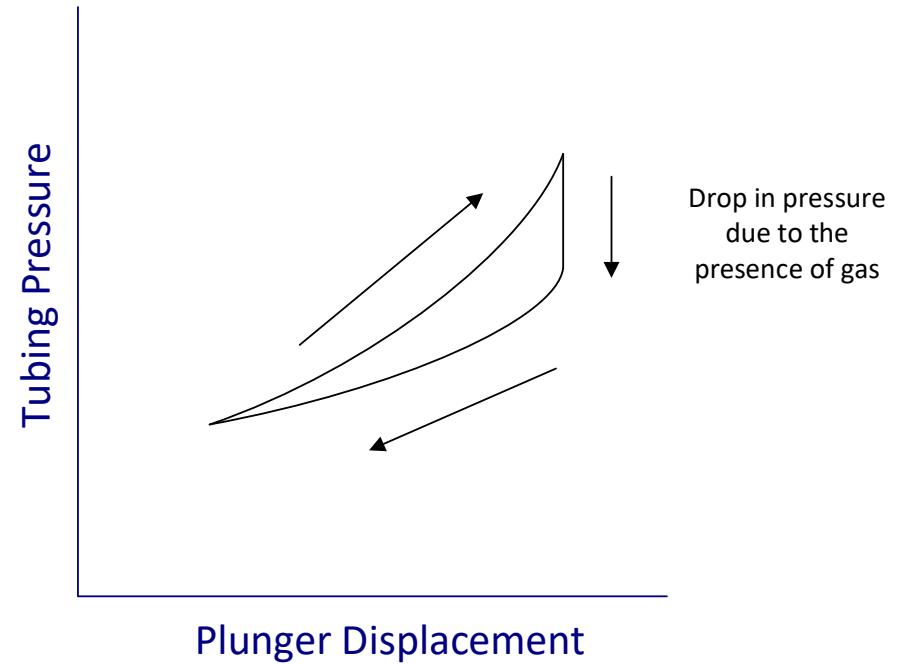
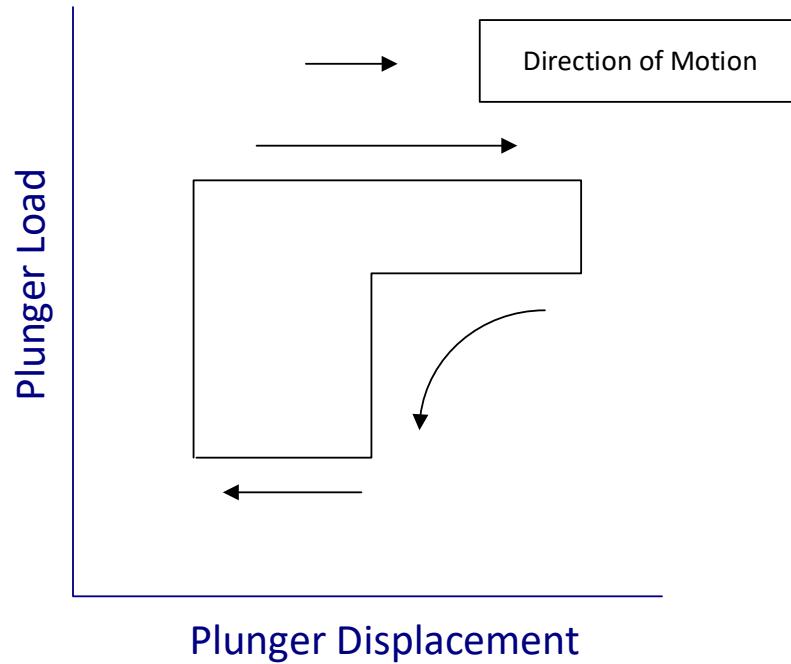
Downhole Card – Theoretical Perfection



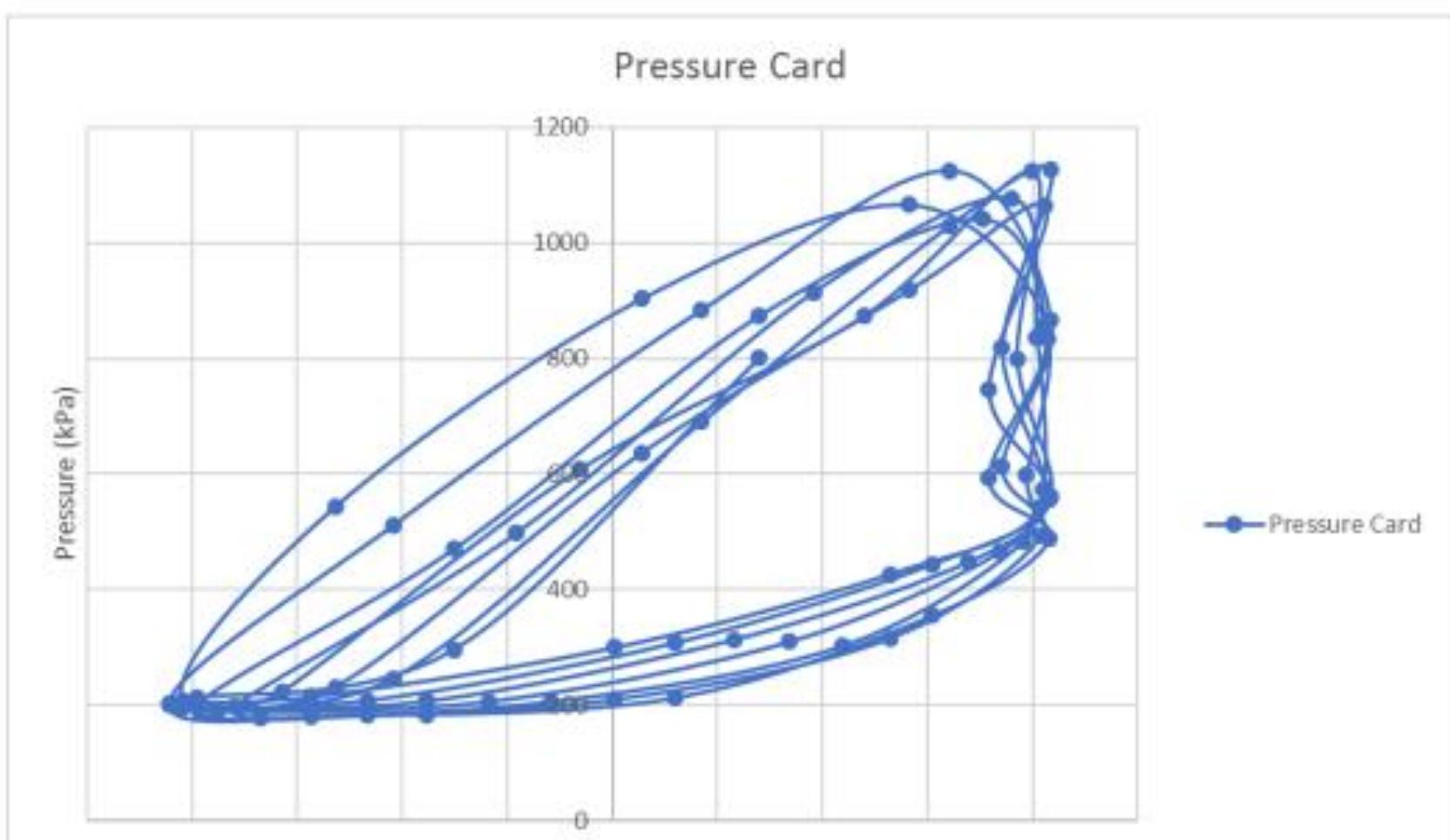
Comparison – Normal Operation



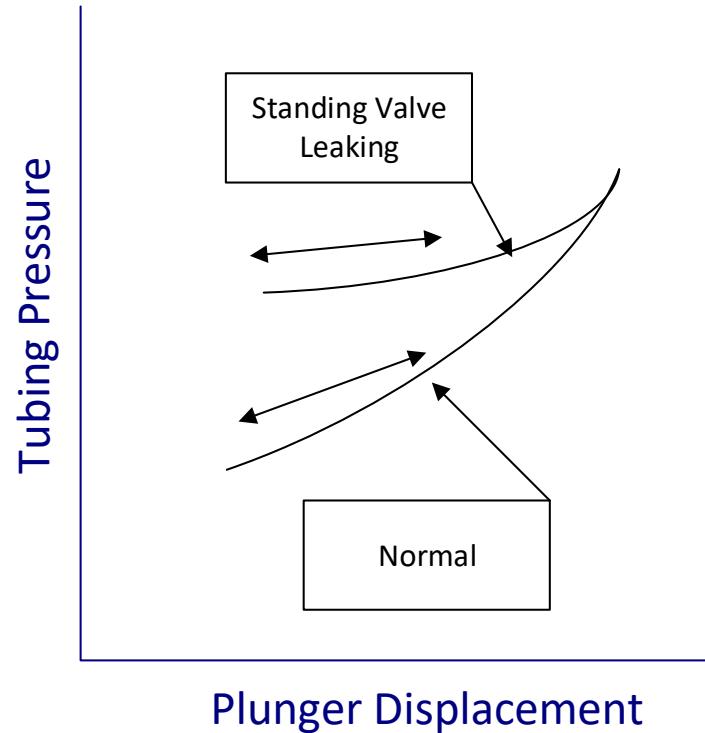
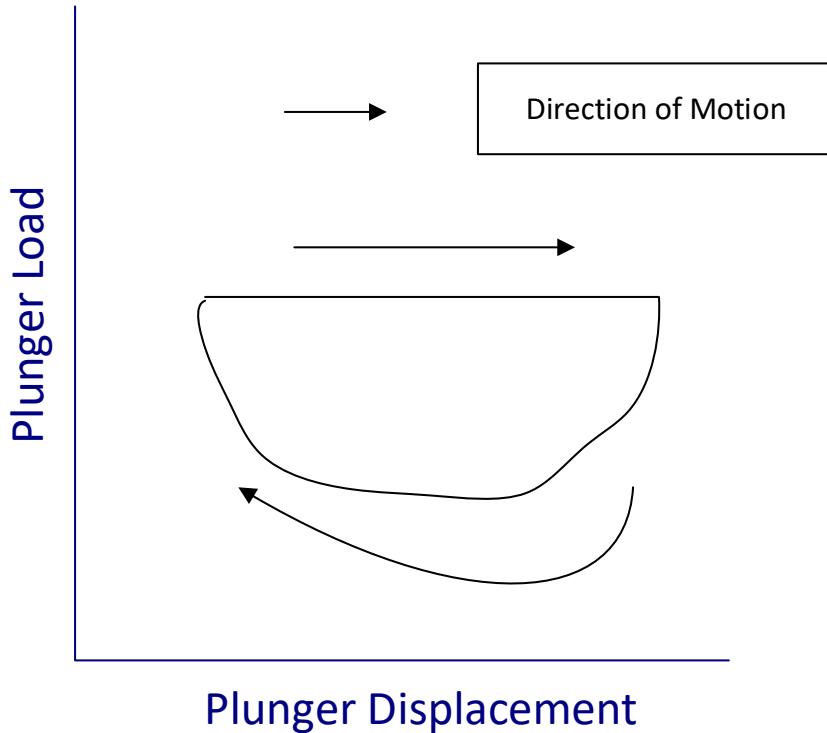
Fluid Pounding – Presence of Gas in Chamber



Large Pressure Loss During Down Cycle



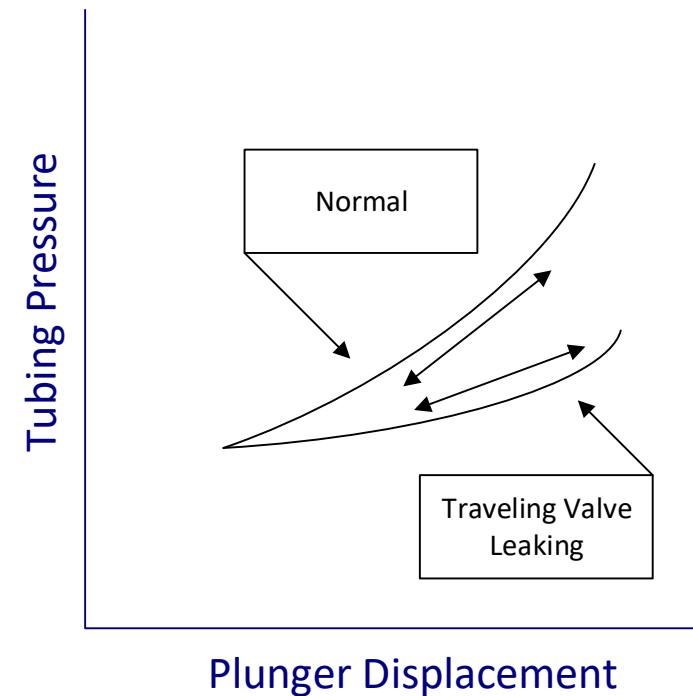
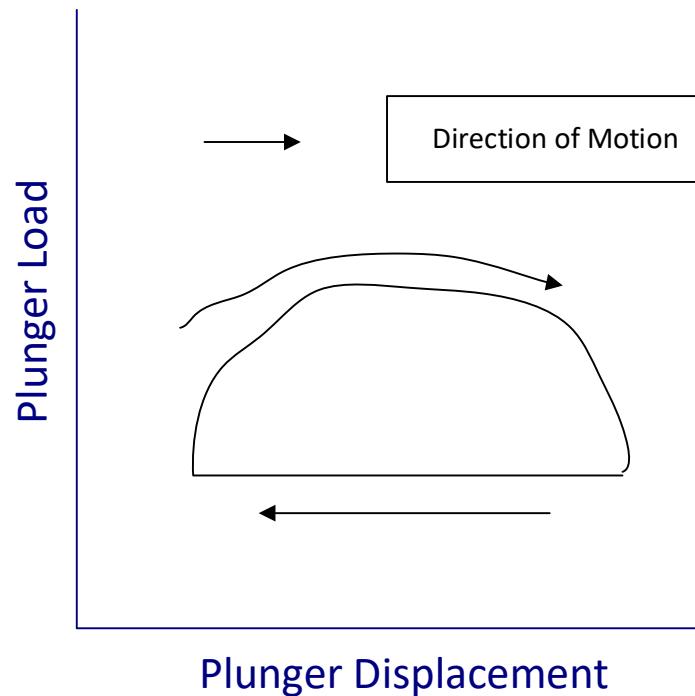
Comparison – Leaking Standing Valve



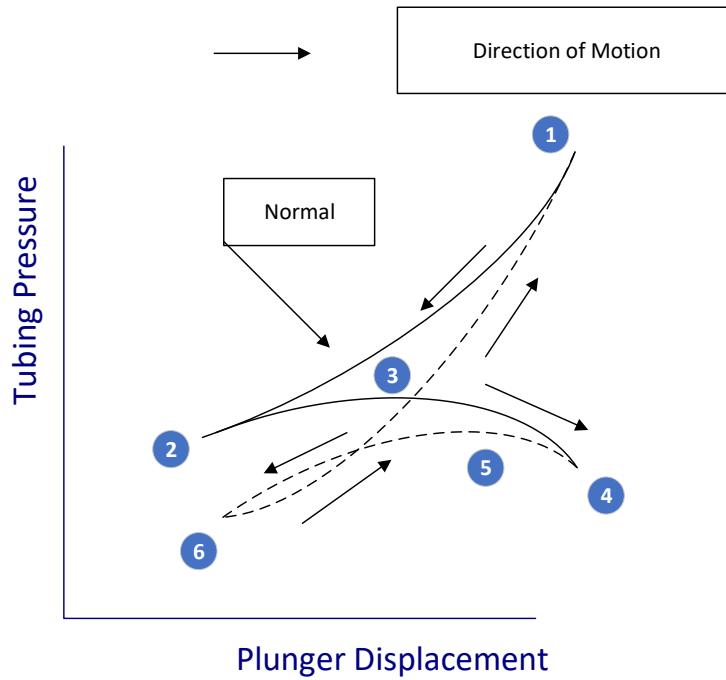
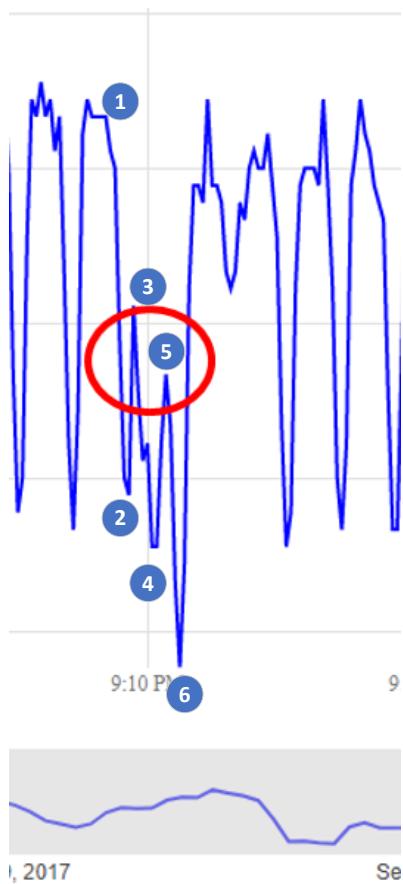
Standing Valve Leak



Comparison – Leaking Traveling Valve



Both Valves are Malfunctioning



GOAL = SIMPLE INTUITIVE OPERATIONS TOOLS



RED – Fillage less than 50 %

YELLOW – Fillage less than 80%

GREEN – Fillage is better than 80%



TOKU



End

T1000 STANDALONE MONITORING

