Pressure Test Tubing for Leak

Joseph Norman, FORTY A&M LLC
http://www.fluidlevels.com/

Lynn Rowlan and Tony Podio
Echometer Company
1. When a Hole-In-Tubing, HIT, is suspected then a recommended practice is to confirm the HIT by pressure testing the tubing with a water truck.

2. If no fluid is produced to the surface, then the tubing pressure test is done by shutting down the well (usually on the downstroke) and pumping clean treated water into the tubing.

3. Tubing is usually pressured up to 500 psi(g) and the pressure is held for a period of time.

4. If hole is present the tubing pressure will quickly leak off.

5. Collar leak can take 10 minutes or longer to leak off.

6. If fluid is produced to surface, then the typical procedure to pressure test the tubing is performed by using the sucker rod pump to increase surface pressure by pumping against a closed surface flow line valve.
When to Run a Pressure Test

1. Troubleshooting Sucker Rod Lifted Well because Production Rate has Dropped Off OR Less Than Expected.
2. Verify Tubing Holds Pressure and Casing Check Valve Operates Properly After a Work-Over on a Well
3. Standard Practice to Perform Test During a Scheduled Dynamometer Test Acquisition.
4. As an additional Test Following a Traveling/Standing Valve Test
5. TV Test Indicates a Leaky Pump, Verify Tubing is Holding Pressure
How Pressure Test Data Acquired

1. Test is primarily performed during wireless acquisition of dynamometer (WPRT or WHT).
2. Simultaneously pressure is acquired with wireless pressure sensor (WPT) connected to the tubing at the pumping-tee or at the flowline fluid sampling valve.

Wireless Pressure Sensor

Wireless Remote Fire Gas Gun
Well 997 Dynamometer Data Shows Liquid Filled Pump Displacement Matches Production Rate

<table>
<thead>
<tr>
<th></th>
<th>Peak Load</th>
<th>Min Load</th>
<th>Power</th>
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</thead>
<tbody>
<tr>
<td>Polished Rod Pump</td>
<td>24.14 Klb</td>
<td>11.60 Klb</td>
<td>11.6 HP</td>
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<tr>
<td></td>
<td>7.54 Klb</td>
<td>-0.11 Klb</td>
<td>9.7 HP</td>
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- **Adj Pump Displacement**: 128 BBL/D
- **Calculated Fluid Load Max**: 7.47 Klb
- **Surface Efficiency**: ---- %
- **Pumping Speed**: 6.510 spm
- **Motor to Pump Efficiency**: ---- %
- **Pump Intake Pressure**: 267 psi (g)
- **Damp Up**: 0.141
- **Damp Down**: 0.141
- **Adj Fillage**: 83.94 %
- **Adj EPT**: 74.8 in
- **WPT Tubing Pressure**: 133.0 psi (g)

- **Unanchored Kt**: 490 lb/in
- **Kr**: 117 lb/in
Pressure Test as Part of SV/TV Test

Tubing Appears to be Holding Pressure

@ 3:20 ran one stroke, then pulled brake

Pulled brake at #12

# Pump Up
Strokes = 3

@ 4:50 opened tubing

Shut in tubing at stroke #8
Well A1 Run Time is 50% and Fluid Level is High and Pump is Full of Liquid
Tubing Pressure Leaks Off from 580 to 530 Psi in 10 Min. of Elapsed Time – NO Hole in Tubing

Tubing Quickly Pressures Up When Only Liquid in Pump and Tubing

Tubing Pressure Leaks Off from 580 to 530 Psi During 10 Minutes of Time Possible Slow Tubing Collar Leak
Well 7 Strokes 25-32 ~ Pump is Full of Liquid
Tubing Pressures Up Quickly and Very Slow Leak Off May Indicate a Minor Tubing Collar Leak

Tubing Pressure Leaks Off from 325 to 270 Psi During 11 Minutes of Time

Repeating Pressure Wave is Seen Between Pressure Sensor and SN when Pump is Stopped and Tubing is Filled With Liquid.

Pump S/N 7977 ft, Acoustic Velocity of Propagation of the Wave would be: 7977 x 2/3.75 = 4254 ft/sec which is a Typical Acoustic Velocity for Water

3.75 Sec. Repeating Pressure Wave Echo
Well 3053 Surface Pressure Increases as High Pressure Gas Rises up Tubing After Pumping Stops

Tubing Pressures Up Slowly When Gas and Liquid Discharged into Tubing

Shut in at stroke #79

Pulled brake at #115

Opened tubing at 21:00

Gas Interference Pump Card

Gas Discharged @ 3801 Psi PDP

Fo From Fluid Level (Fo FL) = 5.72 Klb

Fo Max = 6.66 Klb

EPT = 127.76 in

MPT = 154.42 in
269 BPD Adjusted Pump Displacement Shut-in @ Stroke #10 - NO Pressure Increase NO Production

Full Pump Can Indicate a HIT
Likely Hole in Tubing Near Surface, Lifting Liquid to Surface Since Pump Card Height near FoMax

Shut-in @ Stroke #10; Tubing Pressures Does Not Increase During 93 Full Pump Strokes ~ 268 BPD Leaves Pump, None to Surface
Leaky Standing Valve with Very High Fluid Level, Pressure Increases at Bottom of Down Stroke

SHUT IN TUBING TEST
STROKE #130-133
Check If Valve Between Flowline and Casing is Holding to Prevent Liquid Recirculating Out the Tubing Back Down the Casing

1. Perform at the end of the Tubing Pressure Test

2. Tubing pressure increased above flow line pressure by shutting valve V1 until desired test pressure reached.

3. Tubing is not leaking or leak not very significant.

4. Closing the valve to the flow line (V2) and opening Valve V1

5. Monitor pressure:
   a. If pressure holds then check valve is OK
   b. If pressure drops significantly, then the Casing Check Valve has a problem

To Perform Casing Check Valve Test
Should have valve (V2) Downstream from Tee Junction of Tubing and Casing Lines
Specific Well Setup to Pressure Test Tubing and Then Pressure Test Casing Check Valve

Valve V1

Valve V2

Wireless Pressure Sensor

Casing Check
Closed Valve V1 & V2

Stopped Pumping

Tubing OK

Casing Check Valve OK

Verify that Casing Pressure is Less that Line Pressure When V1 Open and V2 Closed

Opened Valve V1 with Valve V2 closed to Test Casing Check Valve
Well 3022 ~ 145 BPD Discharged From Pump Tubing Valve Closed with NO Pressure Buildup
1. tubing pressure test can be used to identify a hole-in-tubing.
2. pressure data acquired in conjunction with a dynamometer card provides enhanced troubleshooting capability.
3. when the pump is liquid filled, then tubing pressure can increase in a few strokes (determine # of pump up strokes)
4. if hole is present the tubing pressure will quickly leak off or not build-up.
5. if gas is in the pump, then tubing pressure will slowly increase and will continue to increase after pumping stops.
6. tubing pressure increase appears to be related to the plunger velocity, well depth, and liquid acoustic velocity.
7. important to pressure test tubing, casing check valve, and tubing back pressure valves.
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