PCP Fluid Level Estimate Setup   5/23/2023

Overview

806792 PCP software contains a Well ID feature for in-situ characterization of the pump, and a simulation mode for simulating drive, motor, pump, fluid, and reservoir. The Well ID routine is initiated at the drive. Alternately, the **well id auto** option allows it to run automatically once per day (at a preset time). The Well ID routine will accelerate the motor to maximum speed, dwell, decelerate to a slow reverse speed, dwell, and resume normal operation (at which time the Well ID is complete).

The reverse direction portion of the Well ID is used to calibrate the fluid level. As a safety precaution, if the motor torque drops below the **well id abort torque** parameter at any time during the test, the Well ID will abort and the motor will resume normal forward operation, thereby protecting the rod from unwinding in the event of a stuck pump. Prohibiting the reverse portion of the test is permitted, but will necessitate subsequent manual fluid level calibration by other means such as a "fluid shot"; if subsequent manual fluid level calibration is not conducted, the level estimate will be resolved by way of **pump rated lift** and **pump torq at rated lift** setup parameters.

It is recommended that the fluid level be manually calibrated after running Well ID by entering the known fluid level into the **fluid level calibrate** parameter. The associated correction factor will be maintained, even after another Well ID has been executed. There is a 20 second delay after setting the **fluid level calibrate** parameter before any action is taken – wait 20 seconds after fluid calibration before monitoring fluid level! To clear the fluid level calibration correction factor, set the **well id clear all** parameter to ENABLE prior to running Well ID.

If enabled, the **well id auto** option will automatically run the Well ID at a preset time each day, allowing the system to automatically adapt to changing pump conditions such as swelling or wear.

Resulting Well ID data is logged in the event history (Well ID event) upon completion of each Well ID, allowing the user to track trends in the pump.

Fluid Over Pump Estimate Setup Checklist:

1. Enter pump data the PUMP Menu, particularly the **pump base speed** and **pump base flow** parameters. <u>These parameters must be accurate for correct fluid level estimate. See following section on Pump Data</u>
2. Set **pump rated lift** and **pump torq at rated lift** (on Pump Menu). These values can be found on a "pump evaluation report." See below.
3. Set **tubing fluid density** and **casing fluid density**.
4. Run the pump until fluid is flowing in the tank. It is required that the entire tubing and production line be full and flowing.
5. Run Well ID. If desired, chart the following signals:
    a. PCP Rod Torque Monitor
    b. PCP Rod Speed Monitor
    c. PCP Well ID Table Torque
    d. PCP Well ID Table Speed
6. After Well ID, if desired, chart the following signals:
    e. PCP Rod Torque Monitor
    f. PCP Rod Speed Monitor
    g. PCP Well ID Table Torque
    h. Fluid Level Monitor
7. Allow **fluid level monitor** readout to stabilize. This may take approximately 30 seconds.
8. Calibrate fluid level by entering the correct <u>fluid level from surface</u> into the **calibrate fluid level** parameter.

The parameters **pump base flow**, **pump base torque**, **tubing fluid density**¸and **casing fluid density** must be properly set to achieve correct fluid level measurements corresponding to different physical fluid levels.

Entering Pump Data

Example pump data with corresponding Unico setup parameters are shown below:

Pump ID: 30 N 095-102-2330355-2-2029736-2

Field Store:	Weston-Colorado	Movex:
Well ID:		Movex CO:
Tested At:	Willis	
Tested By:	Lance Brady	
Date:	Sep 26, 2005	
Test Time:	4:17 pm	

Specifications

Pump Model:	30 N 095
Stator Serial Number	2330355-2
Rotor Serial Number:	2029736-2
Elastomer:	102
Lift Capacity:	3000 feet
Tag Bar Type:	2 3/8" * 7"
Stator OD:	3.5 inches

Volumetric Efficiency (chart, Feet of Lift vs %)

Dimensions

	Rotor	Stator
Overall Length:	147 "	147.5 "
Top Thread:	7/8"	2.875 "
Bottom Thread:	NA	2.875 "
Major Diameter:	0.000 "	
Minor Diameter:	0.000 "	
Rotor Model:	2 Under Size Special	
Rotor Coating:	Chrome, Single Plate	
Substrates	Alloy Steel	
Pin Type:	Male	

Torque Chart (Feet of Lift)

Performance

Efficiency @ Rated Lift:	57.00%
PET Efficiency	84.00%
Torque @ Rated Lift:	155 ft-lb
Production:	171 BPD; 27.25 m³/day
Test Speed:	300 RPM
Fluid Temperature:	107°F(Water); 42°C(Water)
Air Temperature	78°F; 26°C
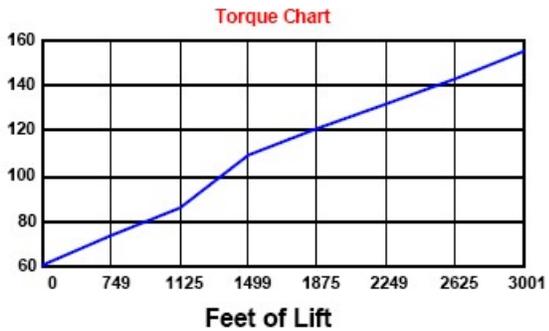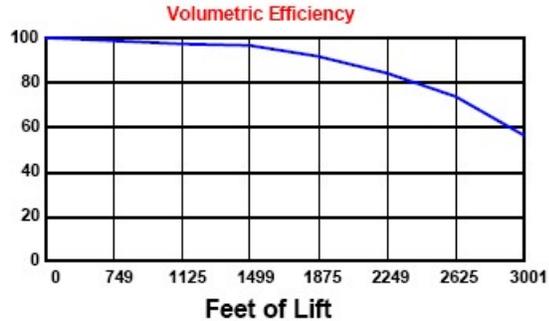
Notes: (NEW Stator & Used Rotor). 9.5" from end of Elast.
to top of tag pin.

Feet	FlowG/min	Flowm³/day	Efficiency	Torque ft lbs	Torque Nm
0	8.80	47.97	100	61.00	82.70
749	8.70	47.42	99	74.00	100.33
1125	8.60	46.88	98	86.00	116.60
1499	8.50	46.33	97	109.00	147.78
1875	8.10	44.15	92	121.00	164.05
2249	7.40	40.34	84	132.00	178.97
2625	6.50	35.43	74	143.00	193.88
3001	5.00	27.25	57	155.00	210.15

pump base speed   = 300 RPM

pump base flow   = 8.8 gal/min (from table, at starting head)
pump mid point flow   = 8.5 gal/min (from table, at a middle point head)
pump end point flow   = 5 gal/min (from table, at end point)
pump base head   = 0 (from table, at starting head)
pump mid point head = 1499 feet (from table, at a middle point head)
pump end point head   = 3001 feet (from table, at end point)

pump base power   = Not used
pump mid point eff   = Not used
pump end point eff   = Not used
pump rated lift   = 3000 feet (Lift Capacity)
pump torq at rated lift = 155 ft-lbs (Torque @ Rated Lift)

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Running Well ID

⚠️

Fluid must be to the surface (flow must exist in the flowline) during the Well ID Test!

If the Well ID aborts, the fluid level algorithm will not function properly!

If "WELL ID REQD" message is displayed in the fluid level monitor field, a parameter has changed that requires the Well ID to be performed. **The fluid level estimate will be wrong!**

If a fluid level calibration had been previously performed (using the **fluid level calibrate** parameter), and it is desired to clear the old fluid level offset, set **well id clear all** to ENABLE prior to running the Well ID. This is recommended under most circumstances.

To run Well ID, set **Well ID enable** parameter to ENABLE. The motor will accelerate to **pump max vel** speed, dwell for **well id dwell time**, decelerate to **pump min speed**, dwell for **well id dwell time**, accelerate to **pump rev speed** (forward), dwell for **well id dwell time**, decelerate to **pump rev speed** (reverse), dwell for **well id dwell time**, and accelerate back to normal run speed (at which time the Well ID is complete). Fluid must be to the surface (flow in production flowline) during the Well ID test.

If the Well ID completes successfully, the message WI DONE will appear in the **well id state** display (WELL ID Menu). If the Well ID aborts because the torque dropped below the **well id abort torque** parameter, the message WI ABORT will appear in the **well id state** display. If the Well ID aborts, the pump characterization will not be correct.

If "WELL ID REQD" message is displayed in the fluid level monitor field, a parameter has changed that requires the Well ID to be performed. **The fluid level estimate will be wrong!**

Example Well ID:
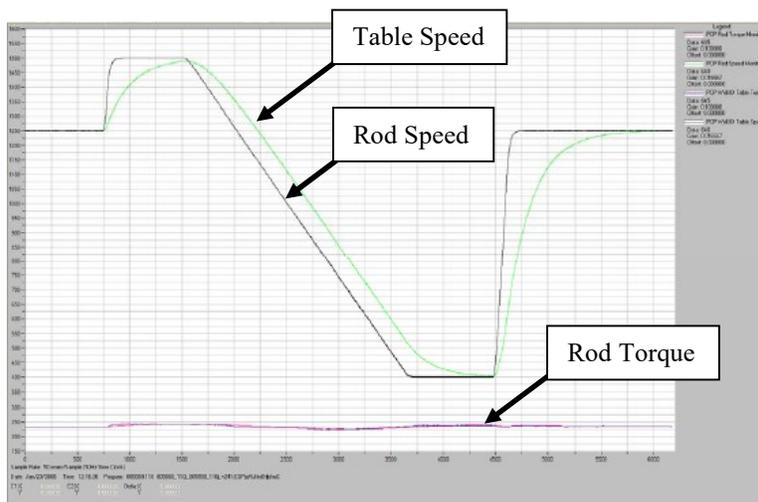
Calibrating Fluid Level

⚠️ The motor must be on and running at a constant speed, and fluid must be to the surface (flow must exist in the flowline) when calibrating fluid level!

The fluid level estimate will update 20 seconds after fluid level calibration.

If the Well ID was prohibited from running reverse or the fluid density is incorrect, the fluid level will need to be calibrated*. To calibrate the fluid level, set the **fluid level calibrate** parameter to the known fluid level from surface. After 20 seconds, the fluid level estimate will be updated to reflect the calibration. The motor must be on and running at a constant speed, and fluid flow must be to the surface during the fluid level calibration. The fluid level offset derived from this fluid level calibration process is maintained, even if another Well ID is performed. To clear this offset, set **well id clear all** to ENABLE prior to running a Well ID.

*Note: If the Well ID was prohibited from running reverse and a subsequent manual fluid level calibration is not conducted, the level estimate will be resolved by way of **pump rated lift** and **pump torq at rated lift** setup parameters (bench test data). (These parameters must be entered prior to the Well ID.)

keywords
806792
PCP
Progressive cavity
FOP
Fluid over pump
Well ID

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