Echometer “How To” Guide

TAM Using a Wireless Power Probe Sensor with a Dynamometer Acquisition Test

by

Echometer Company

Reference: How-To’s: http://echometer.com/Support/HowTos/tabid/94/Default.aspx

MOTOR POWER SURVEYS ANSWER THE FOLLOWING QUESTIONS:

1. What is the overall electrical efficiency of the pumping system?
2. Is the surface electrical efficiency less than 80%?
3. Is the overall electrical efficiency above 50%?
4. What is the power consumption, $/month, $/BBL, and power demand, KW?
5. What is the motor current? Does the motor overheat?
6. Does the motor generate electricity at some time during the stroke? Is credit allowed for generation?
7. Is the gearbox overloaded?
8. Is the pumping unit properly balanced?
9. Required movement of counterweights to balance unit?
10. What are transmission line losses in relation to power consumption ?

Portable Wireless Power Probes with Cable Harness

TWO CURRENT SENSORS

THREE VOLTAGE SENSORS

Cable harness used on wells that are not outfitted with a permanently installed Fixed Power Adapter.

POWER MEASUREMENT EQUIPMENT

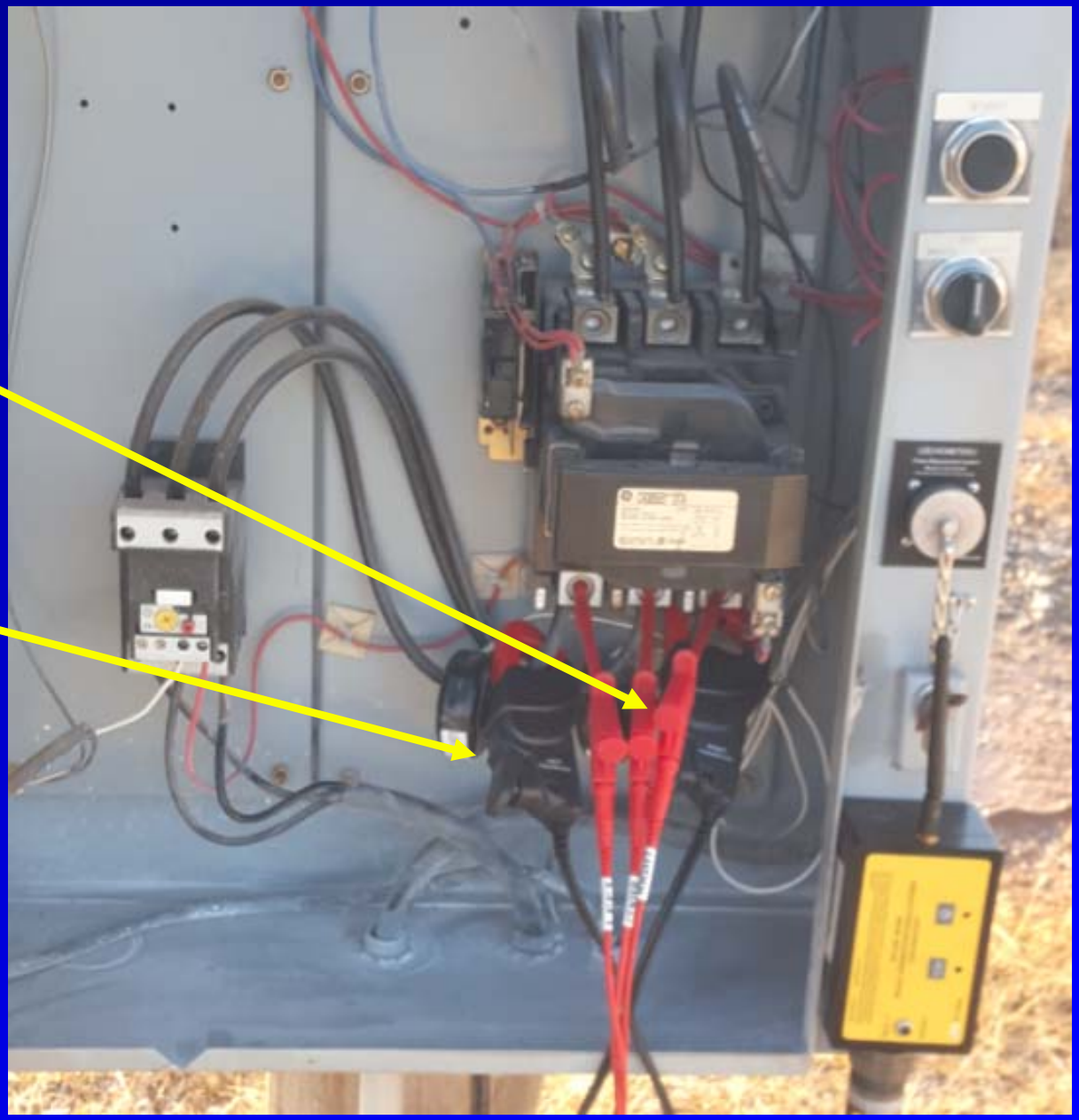
THREE

VOLTAGE

SENSORS

TWO CURRENT

SENSORS



Limit Use of Power Probe Installation Where Maximums NOT EXCEEDED

MAXIMUM VOLTAGE does NOT EXCEED *750 Volts AC*

MAXIMUM CURRENT does NOT EXCEED *300 Amps*

If used in installations where these MAXIMUM ratings are exceeded it is possible to overload the transducer and to cause permanent damage to the transducer and possibly create a health hazard.

USE !!! CAUTION !!! DURING POWER MEASUREMENT

These measurements should *NOT BE PERFORMED*:

1. IF the operator is not in proper condition to operate safely.
2. IF wet or moist conditions prevail around the well and/or electrical power enclosure.
3. IF the operator has not been properly trained or educated.
4. IF the operator has not read and understood the Electrical Measurements section of the operating manual.

Electrical Safety

1. Most power measurement devices require the operator to open the electrical control panel to install sensors.
2. The operator is exposed to DANGEROUS HIGH VOLTAGE electricity.
3. The cabled portable power transducers installation procedure is safe when the operator exercises precaution and follows the recommended procedures in the attachment of the voltage and current sensors and uses proper safety equipment.
4. Permanently installed WIRELESS connector for power/volts/current sensors eliminates risk of contact with electrical components inside control panel.

Following table shows that a very small amount of electrical current passing through the body is hazardous:

CURRENT IN MILLIAMPERES	PHYSICAL EFFECT
2 ma AC or 10 ma DC	Threshold of a sensation: a strong tingling.
10 ma AC or 60 ma DC	Let go current, above which one freezes due to muscular contraction.
100 ma AC or 500 ma DC	DEATH due to heart fibrillation and paralysis of breathing.

To increase safety of working conditions YOU should report ALL SHOCKS and defective equipment. A SHOCK means that SOMETHING IS WRONG. The slightest shock when operating an electrical device might, in another situation, result in instant death if part of the body made only slightly better contact with the ground or a grounded metallic object.

WHAT IS ACQUIRED FROM THE WIRELESS POWER PROBE?

1. RMS (thermal) motor current
2. Average (real) motor current
3. kW during a pump stroke cycle
4. Volts during a pump stroke cycle

Stop the Pumping Unit carefully, near the bottom of the stroke.

For safety purposes when stopping the pumping unit to attach the Power Probes, the operator should disconnect the power and set the break.

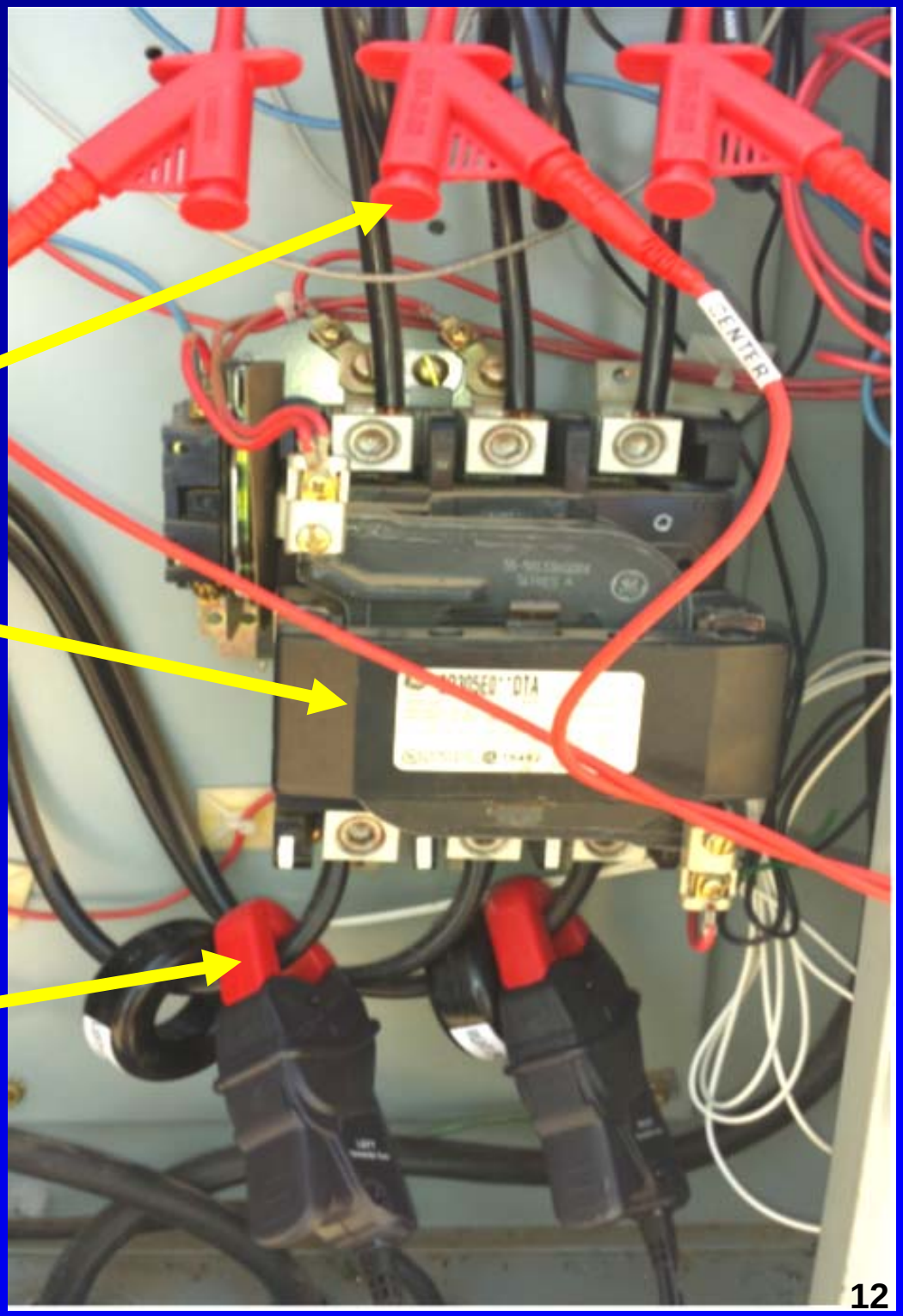
Disconnect Power When Connecting Power Probes

1. Turn off the power to the pumping unit and set brake.
2. Check Panel with Volt meter to confirm safe to touch.
3. Disconnect main power switch
4. Open switch box carefully.
5. Visually inspect for clues to possible electrical faults.

Note: If you have any question concerning safety, stop with the test and have a qualified electrician repair the problem.

Wireless Power Probe Installation

1. Open switch box door and install the voltage probes between the fuses and the relay switch.
2. When the voltage probes are above the relay switch, the lease line voltage can be monitored while stopped during the traveling and standing valve tests.
3. The portable current transducers can be above or below the relay switch.



Connect Current Transducers

1. Attach **LEFT** current transducer around left wire, downstream of the main power switch .

2. Attach **RIGHT** current transducer around right wire.

3. Insure side labeled "**towards line**" is actually facing towards the power supply line. The black side of the current transducer should be facing toward the motor.

4. Insure the jaws are **<u>completely closed</u>** and the respective wires are centered within and perpendicular to the jaws.

Connect Voltage Sensing Leads

1. Attach three voltage sensing leads to the corresponding phase terminals.

2. Each voltage lead is labeled “RIGHT", "CENTER" or “LEFT".

3. Make connections to the appropriate terminal and on the side of the power switch connected to the motor.

Wireless Power Transmitter with Portable Sensors

1. Attach Portable transmitter/receiver with voltage and current sensors attached to a convenient place on the panel by magnetic tape.

2. Line of sight with base station is desired.

Safe Internally Mounted Power Sensors

Safe measurements can be obtained quickly using the Fixed Power Adapter where current and voltage sensors are permanently mounted internally with an external connection on the control panel.

Technicians are not required to open electrical box thus do not need licensing or special authorization.

Power data can be acquired more frequently with dynamometer and acoustic data when the process is quick and easy.

Externally Connected Portable Wireless Power/Current/Volt Transmitter Plugged into External Connector on Control Panel.

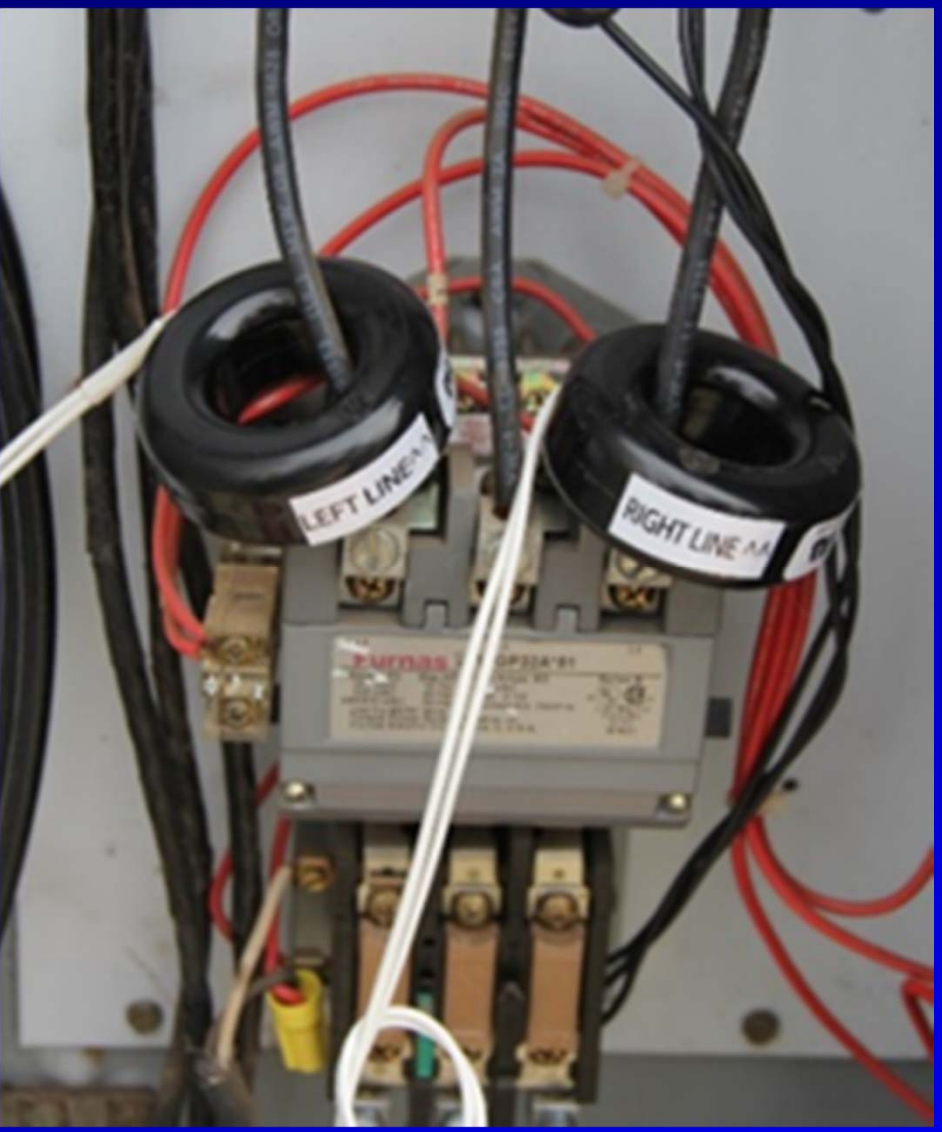
Wireless Transceiver antenna should be line of sight with base station connected to laptop

Safe Internal Permanent Fixed Power Adapter

Requires: mounting two current transformers around power wires and attaching three voltage sensing leads to electrical lines and installing safe external connector in control panel.

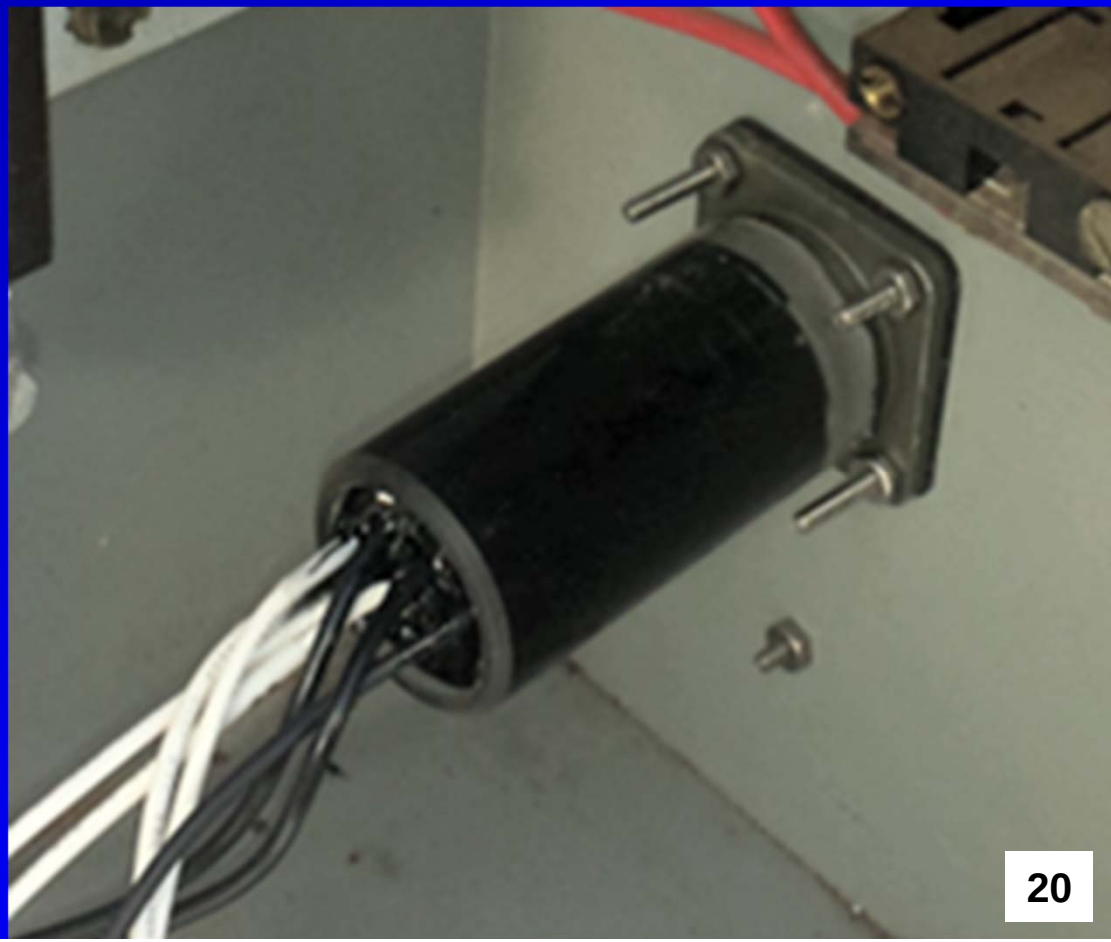
Instructions for installation of the Internal current sensors and external connector are supplied with a mounting kit

Permanent Current Sensors



Connector Feed-through

Millivolt current output to external connector pins.Current to ground limited to 0.72 mA for 480 V



External Connector with watertight cover

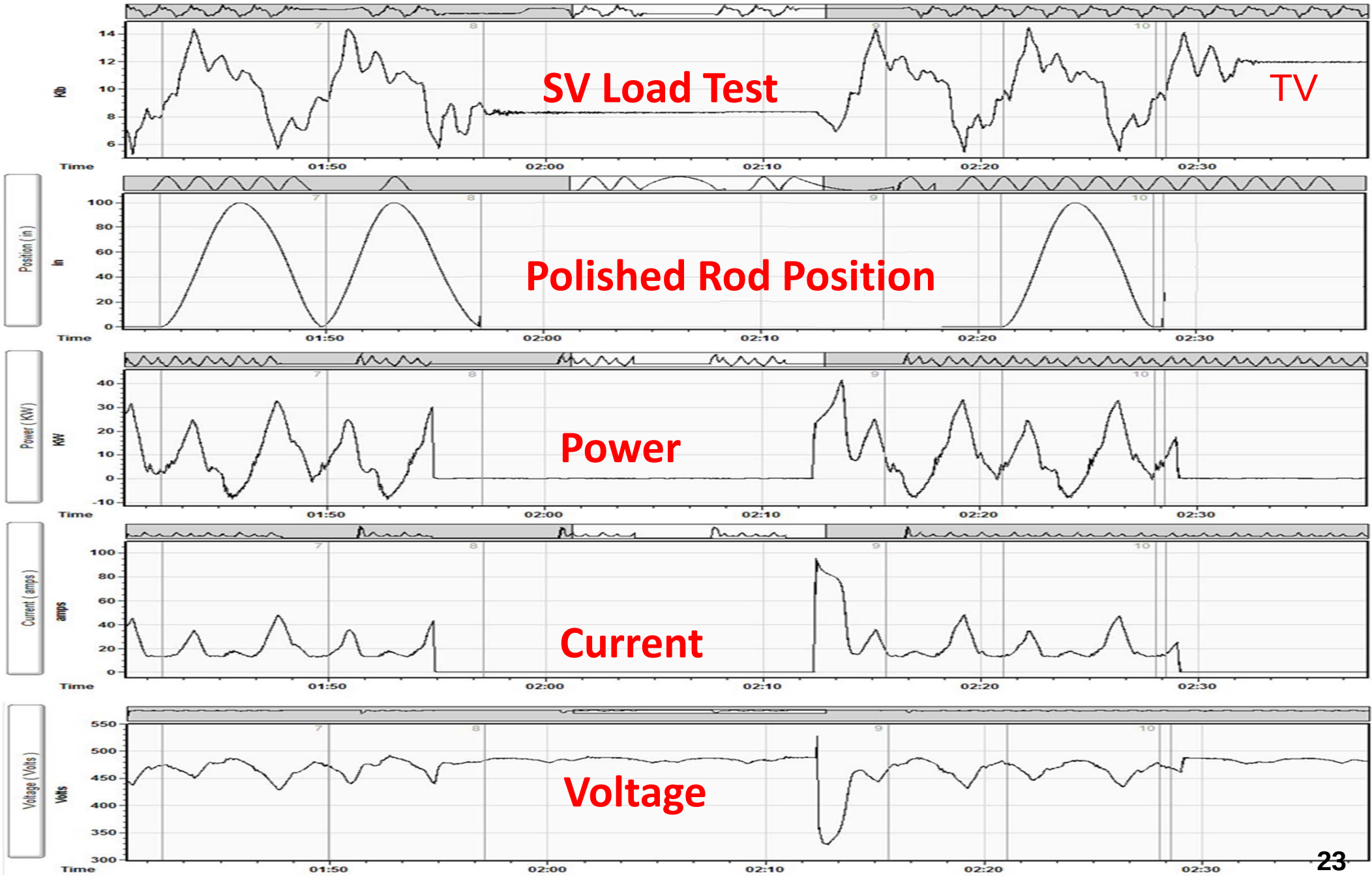
Wireless Power Transmitter

Wireless Power Transmitter may be connected while pumping unit is operating.

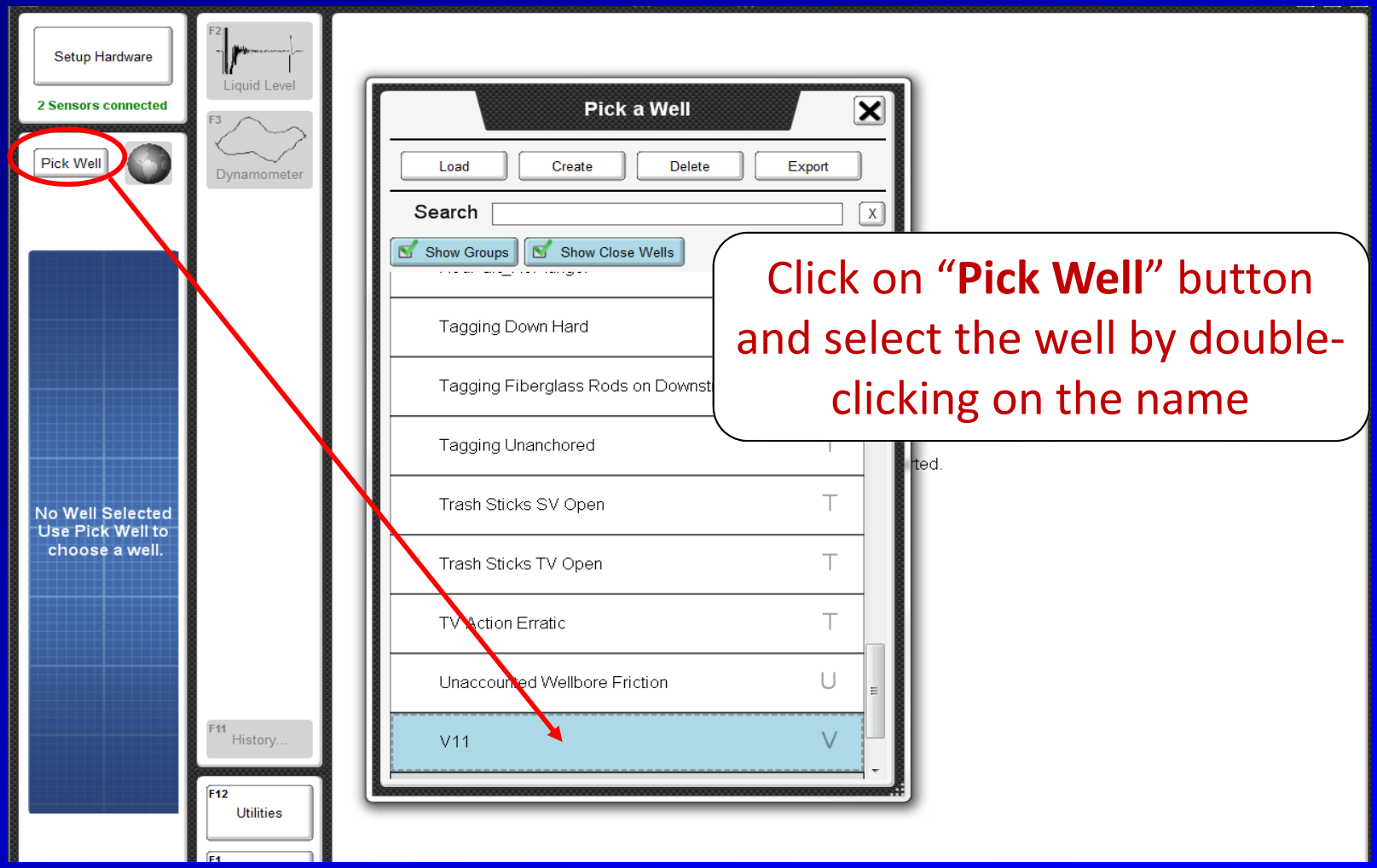
Wireless Power Transmitter is powered by depressing the ON button, then data transmission is indicated by a flashing ACQ light.

Generally power, current and voltage are acquired simultaneously with dynamometer data.

Simultaneous Acquisition of Polished Rod Load, Polished Rod Position from Acceleration, Motor Power, Current and Voltage.

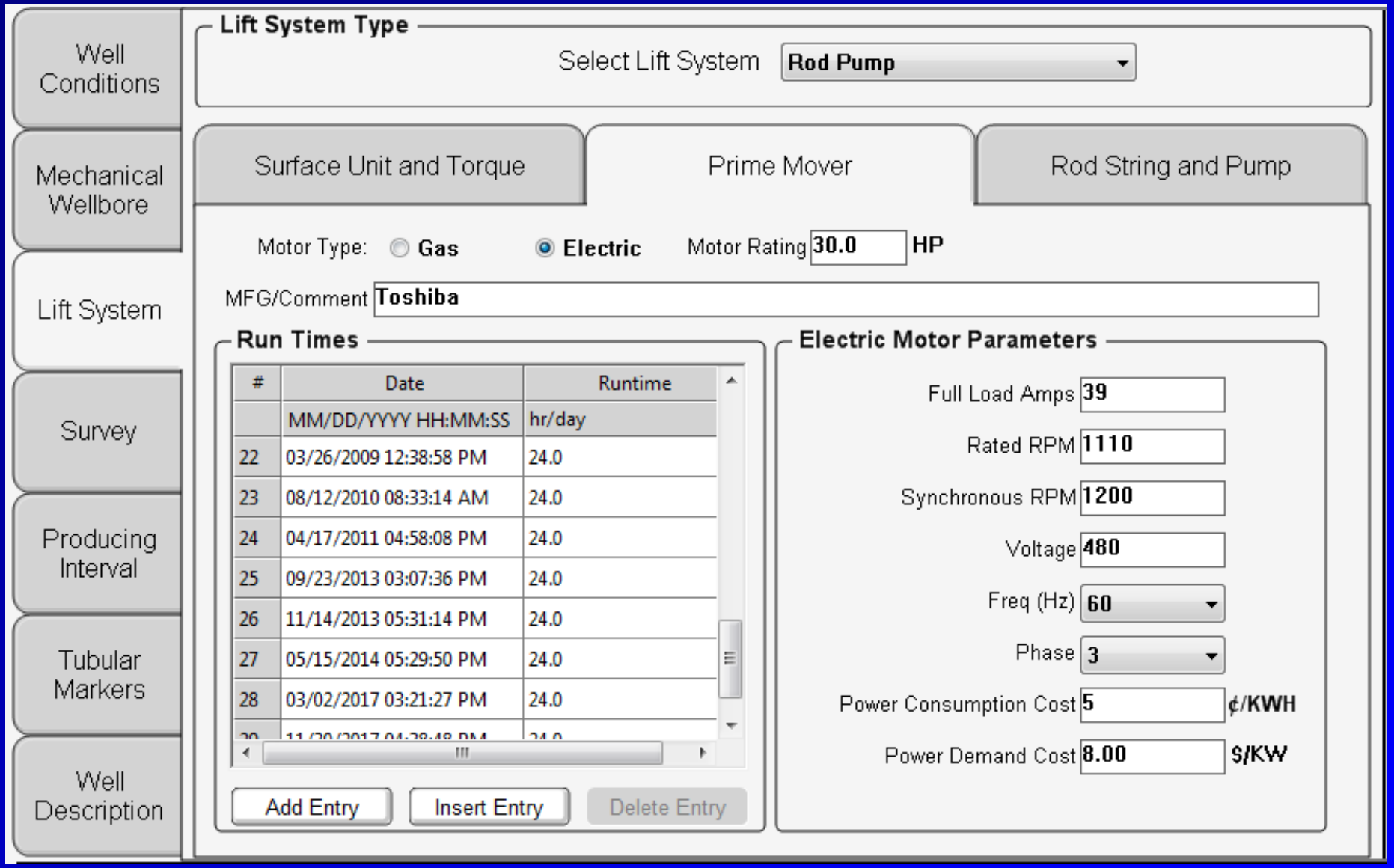


1 Pick Well



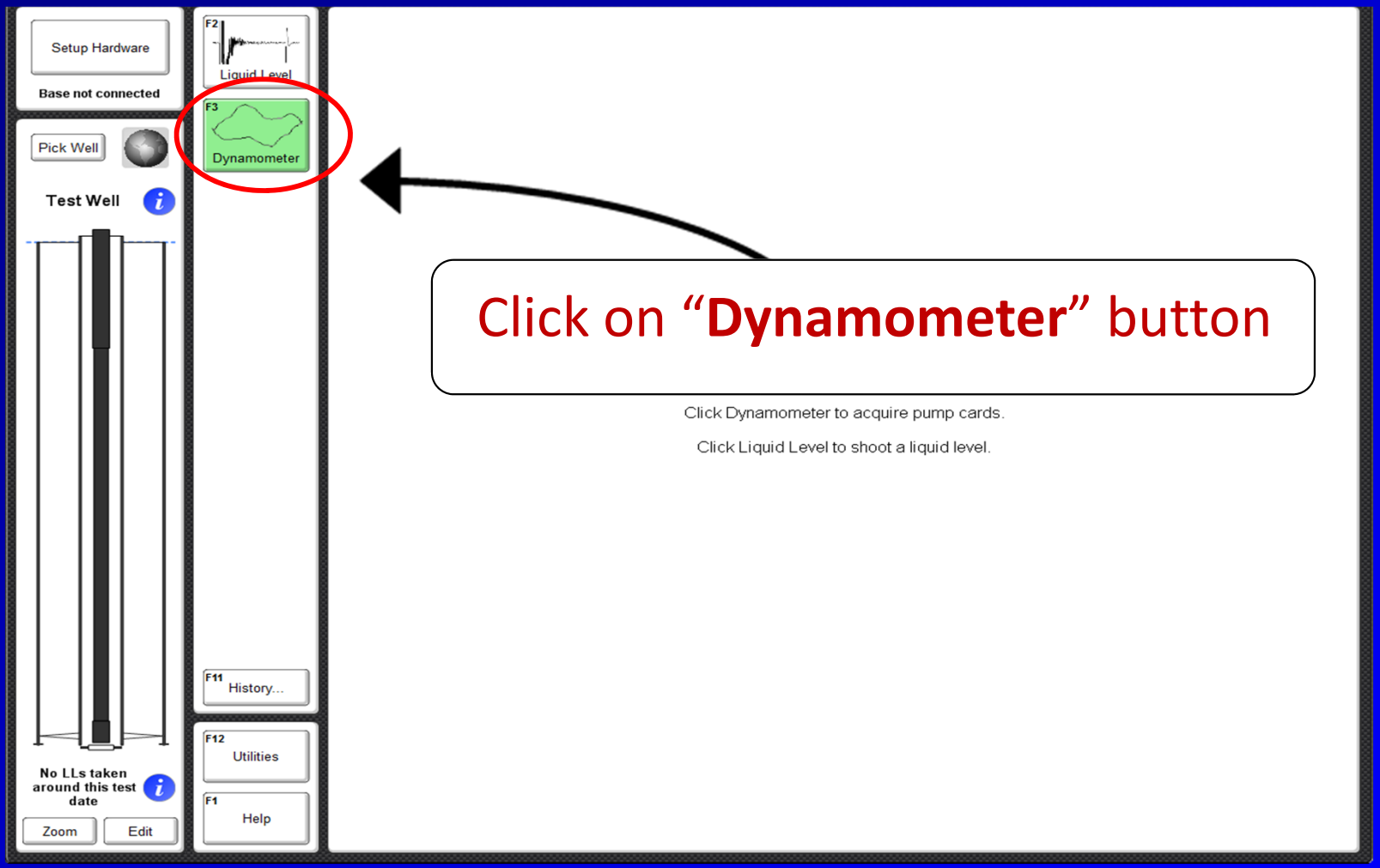
Click on "**Pick Well**" button and select the well by double-clicking on the name

Select Wellbore Tab to Verify Data



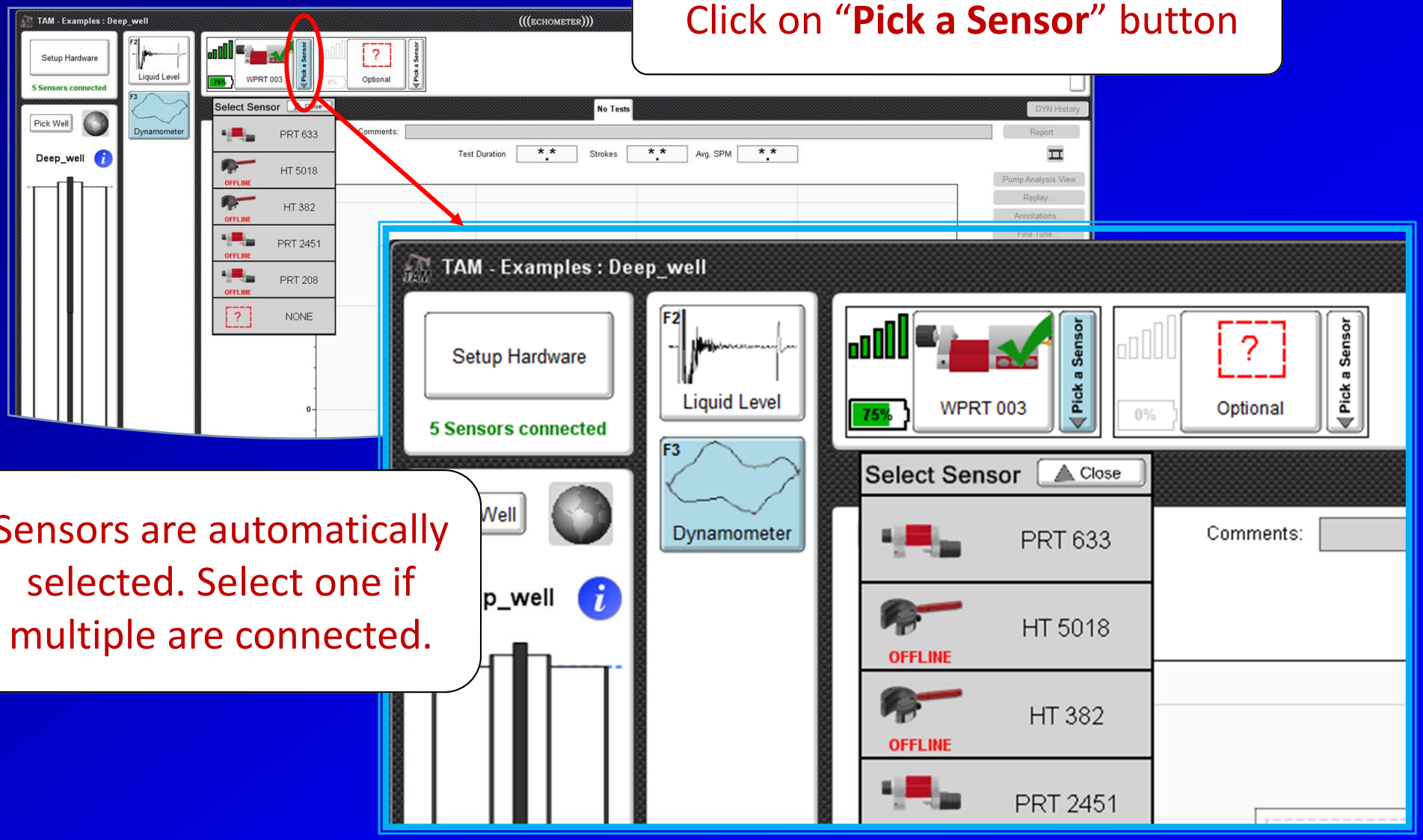
1. From the Lift System select the Prime Mover Tab and verify the **Electric Motor Parameters** and **Prime Mover** are correct for the well.
2. Be sure to enter **pump depth, fluid gravities,** and **production rates.**

2 Select Dynamometer



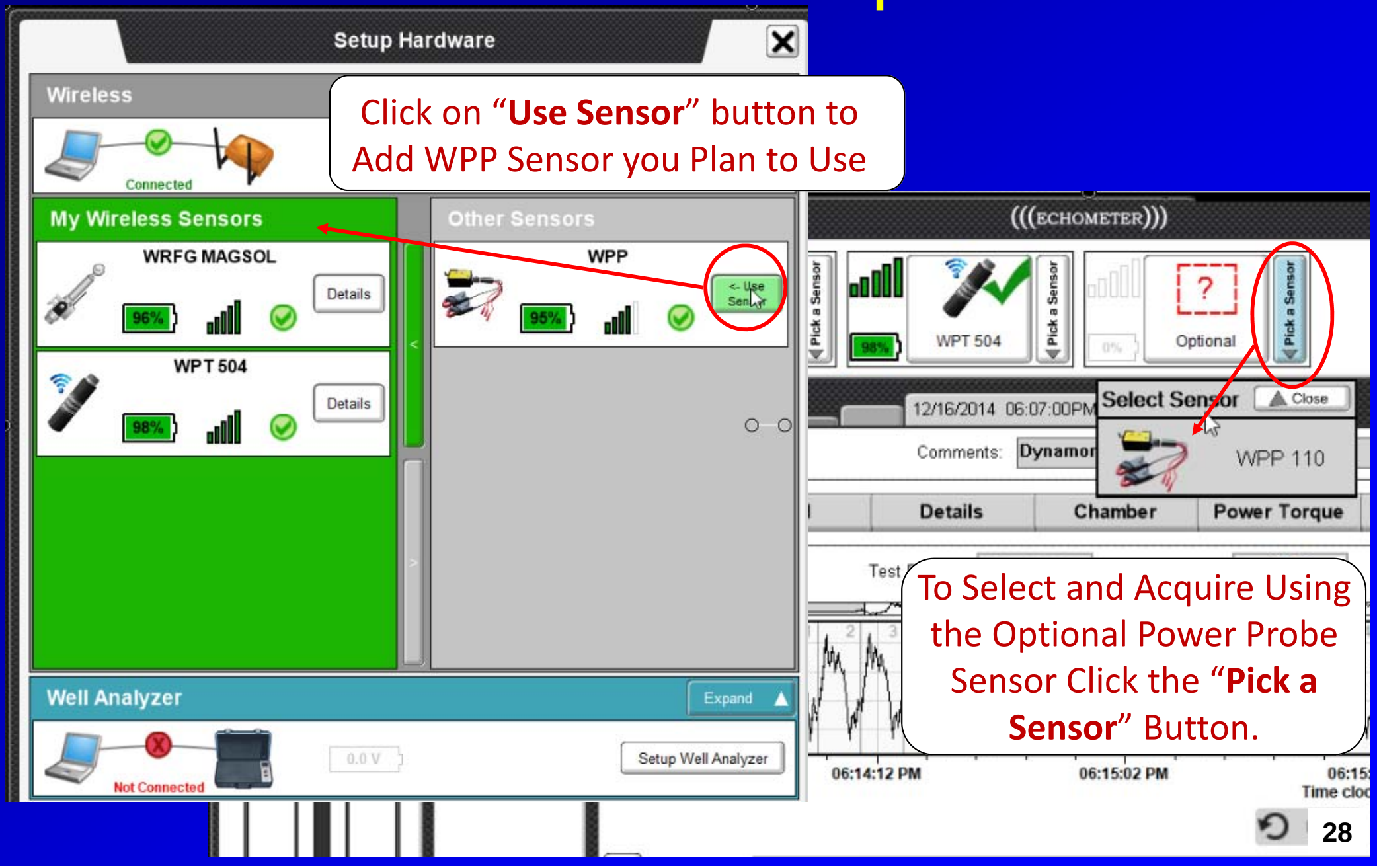
3 Pick Sensor

Click on "**Pick a Sensor**" button



Sensors are automatically selected. Select one if multiple are connected.

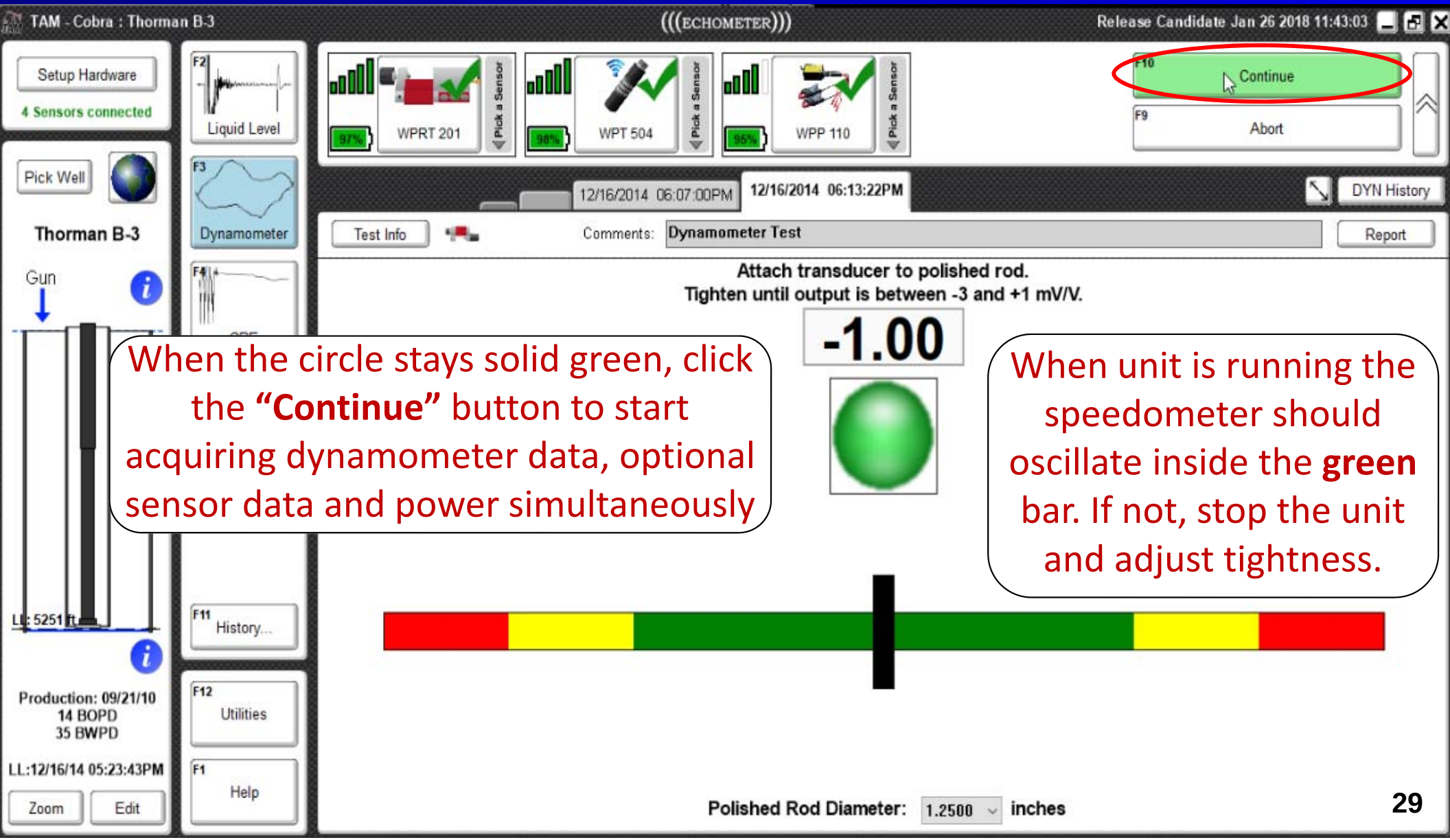
3a Select My Wireless Power Probe Sensor for Acquisition



Click on "**Use Sensor**" button to Add WPP Sensor you Plan to Use

To Select and Acquire Using the Optional Power Probe Sensor Click the "**Pick a Sensor**" Button.

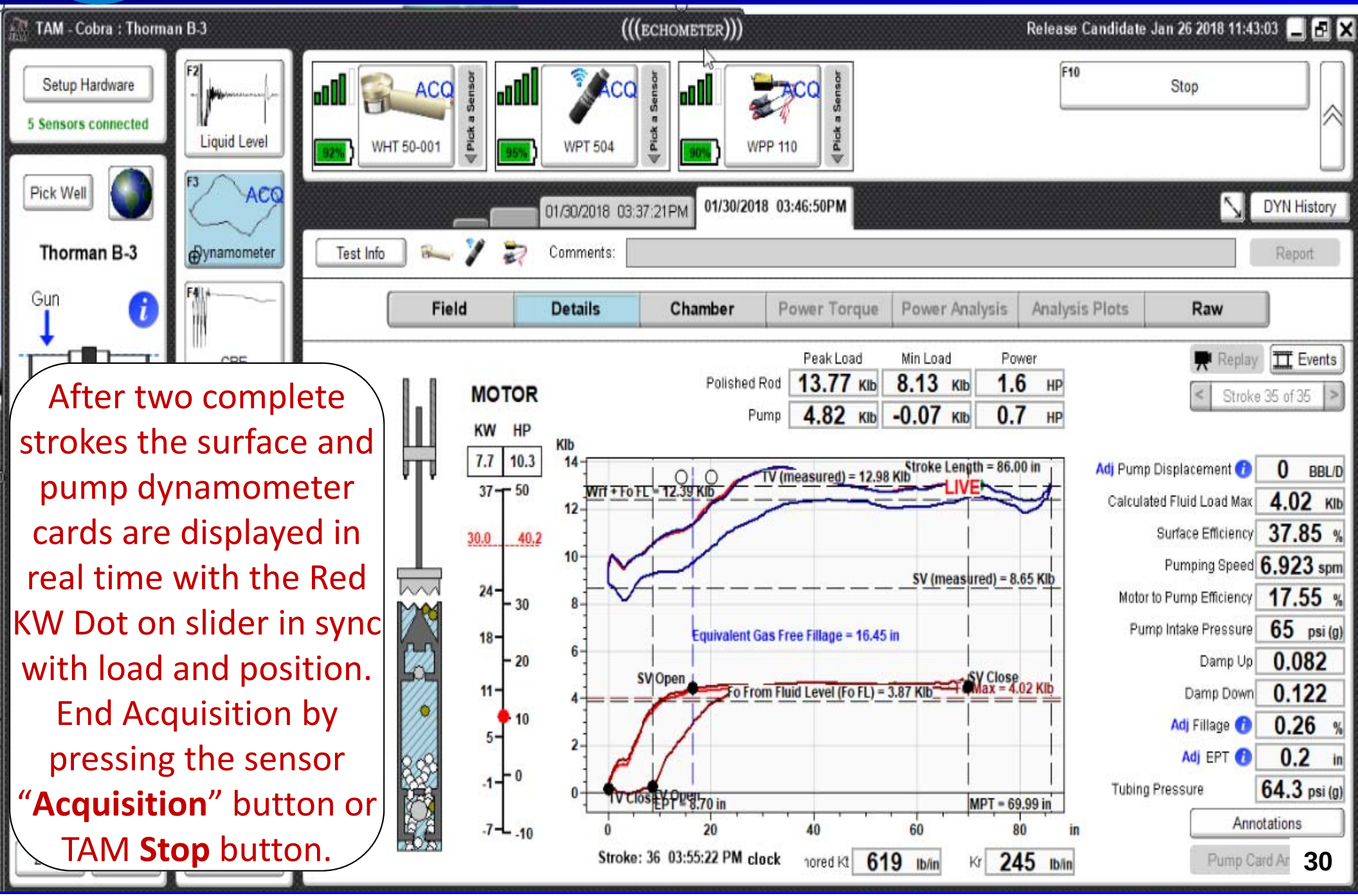
4 Verify Installation & Start Acquisition at Laptop



When the circle stays solid green, click the **"Continue"** button to start acquiring dynamometer data, optional sensor data and power simultaneously

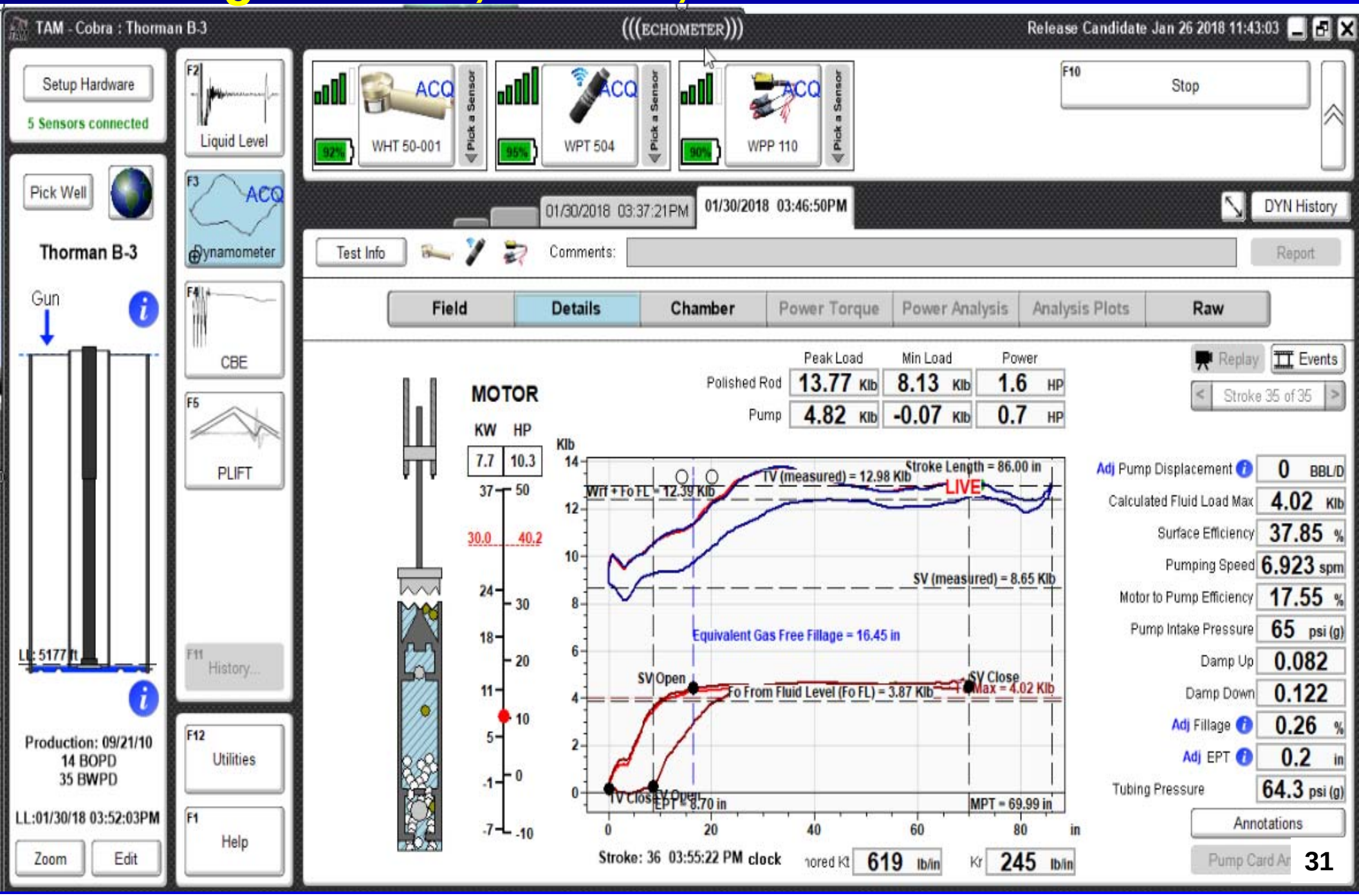
When unit is running the speedometer should oscillate inside the **green** bar. If not, stop the unit and adjust tightness.

5 See Results in Real-Time

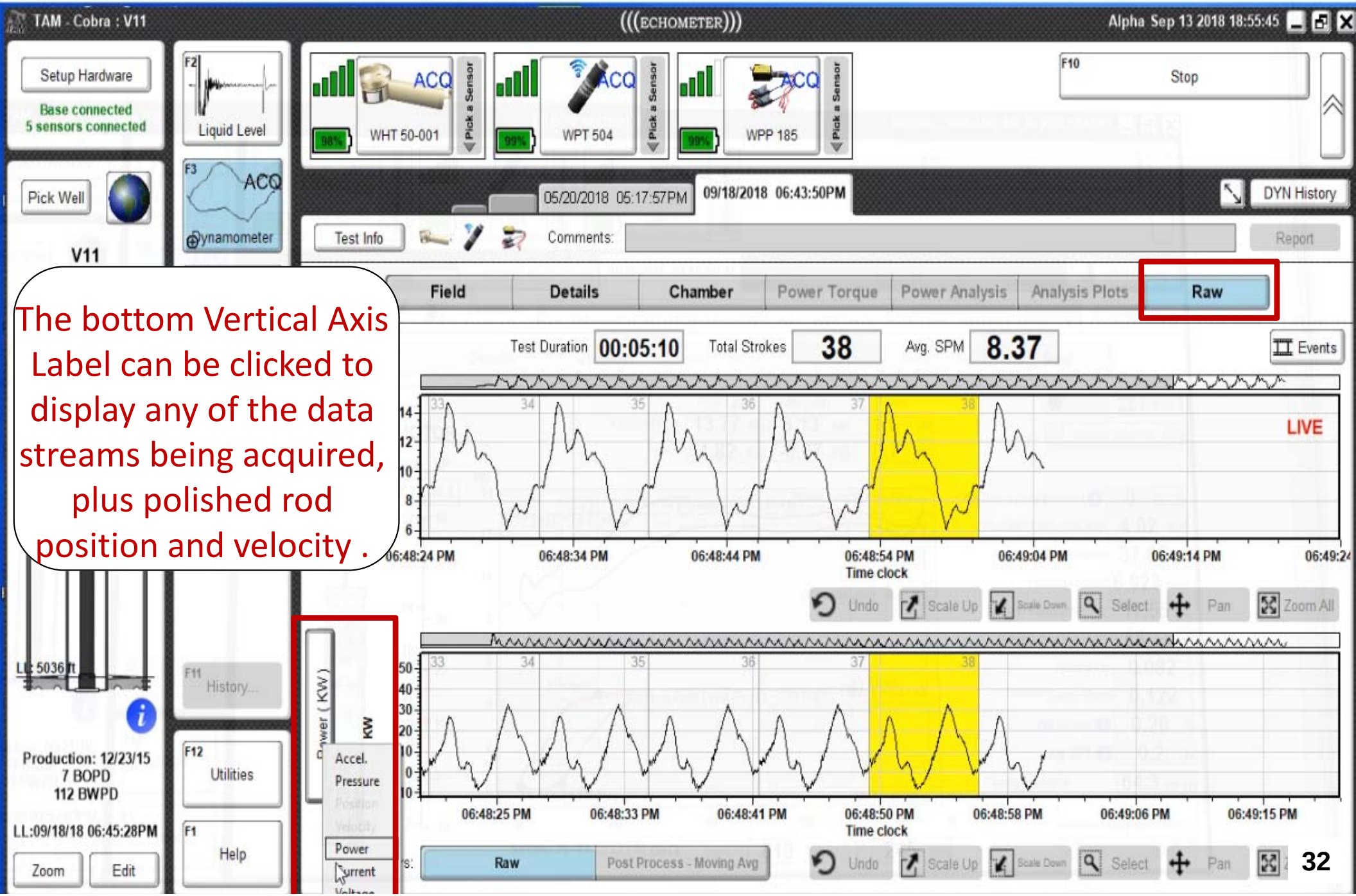


After two complete strokes the surface and pump dynamometer cards are displayed in real time with the Red KW Dot on slider in sync with load and position. End Acquisition by pressing the sensor "**Acquisition**" button or TAM **Stop** button.

View Real Time Data During the Acquisition by Clicking on Field, Details, Chamber or Raw Button

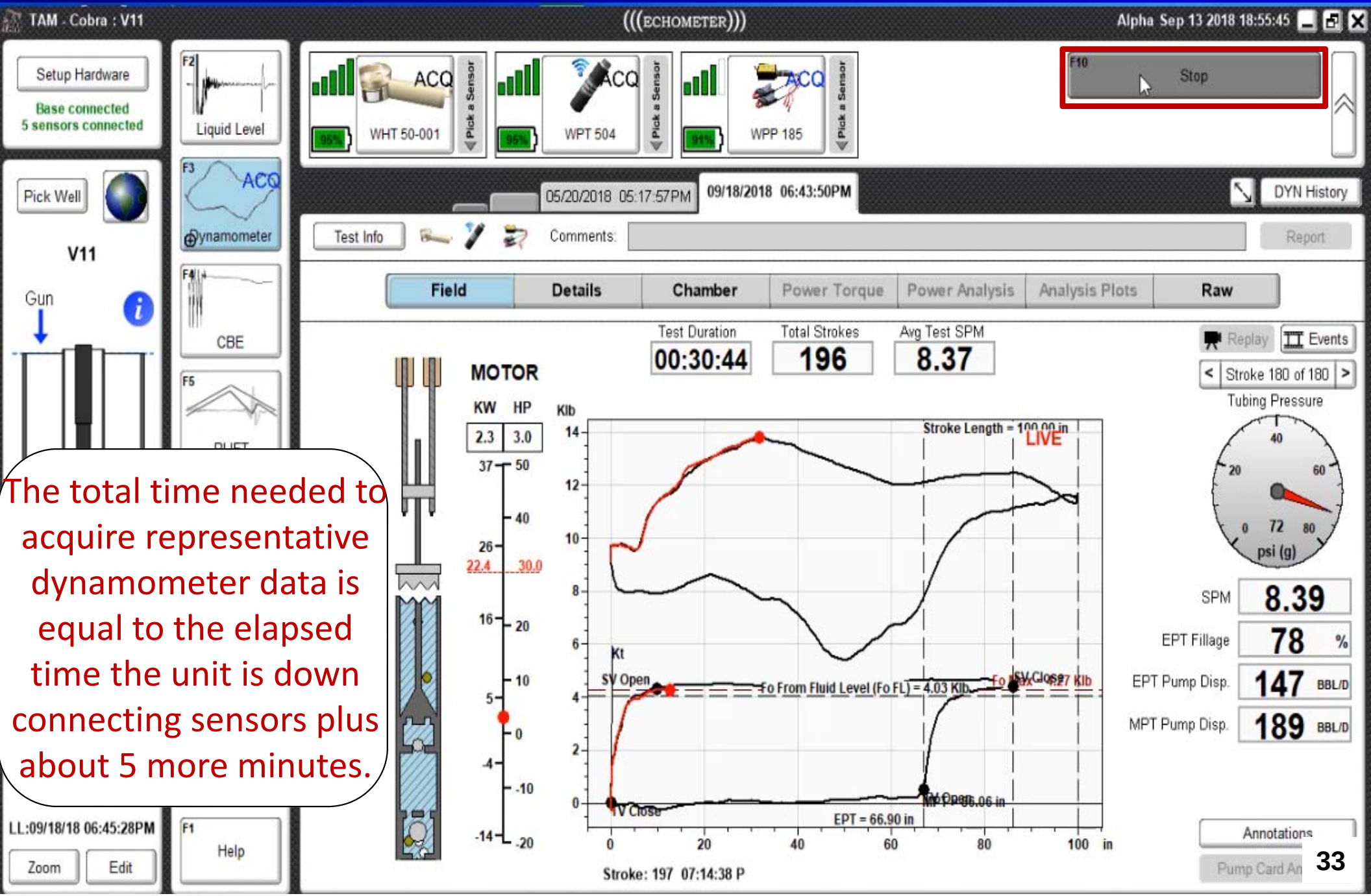


To Display Data VS Time Click Raw



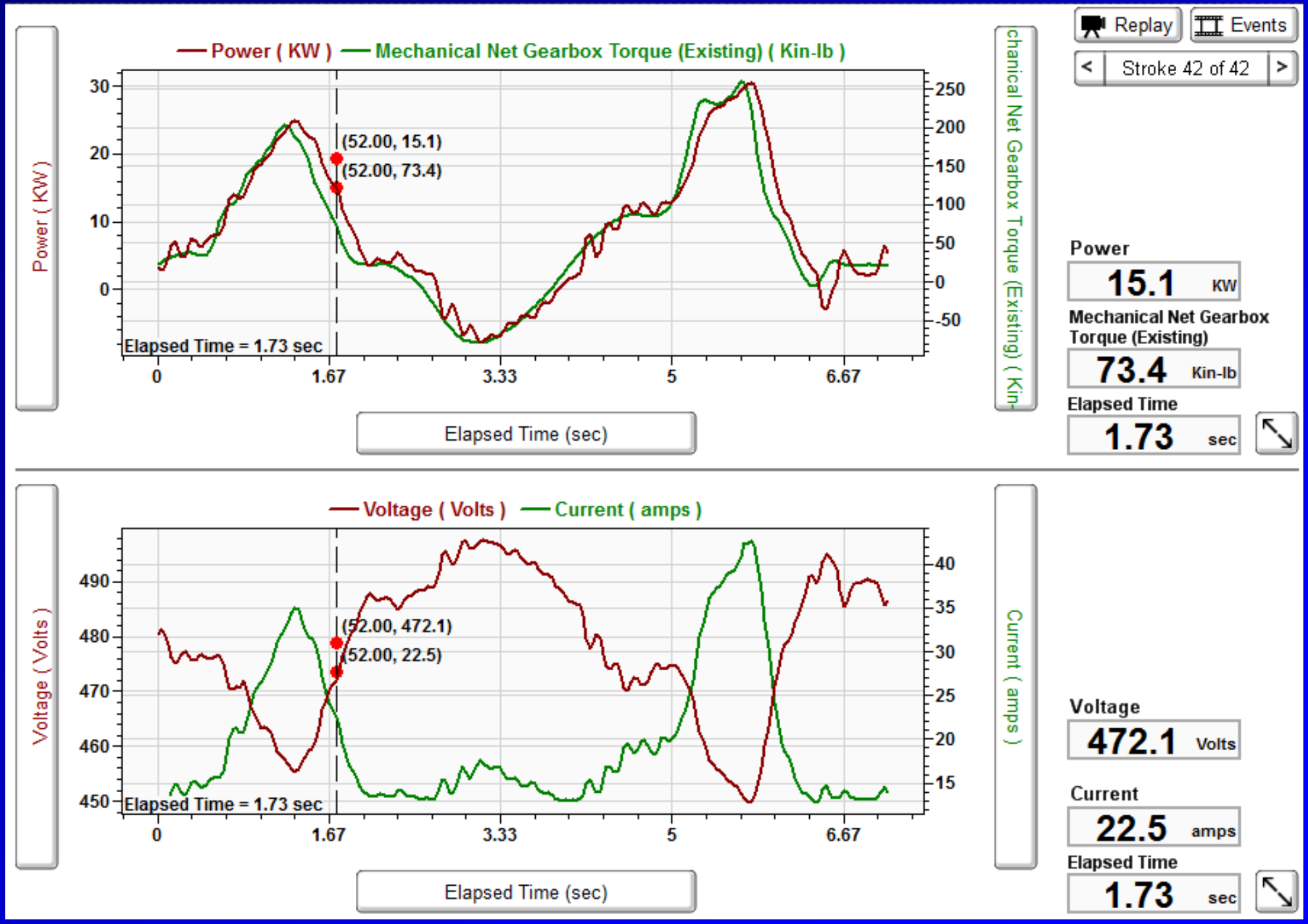
The bottom Vertical Axis Label can be clicked to display any of the data streams being acquired, plus polished rod position and velocity .

Click **Stop** Button to End Acquisition After Acquiring Sufficient Data Representative of Well Conditions

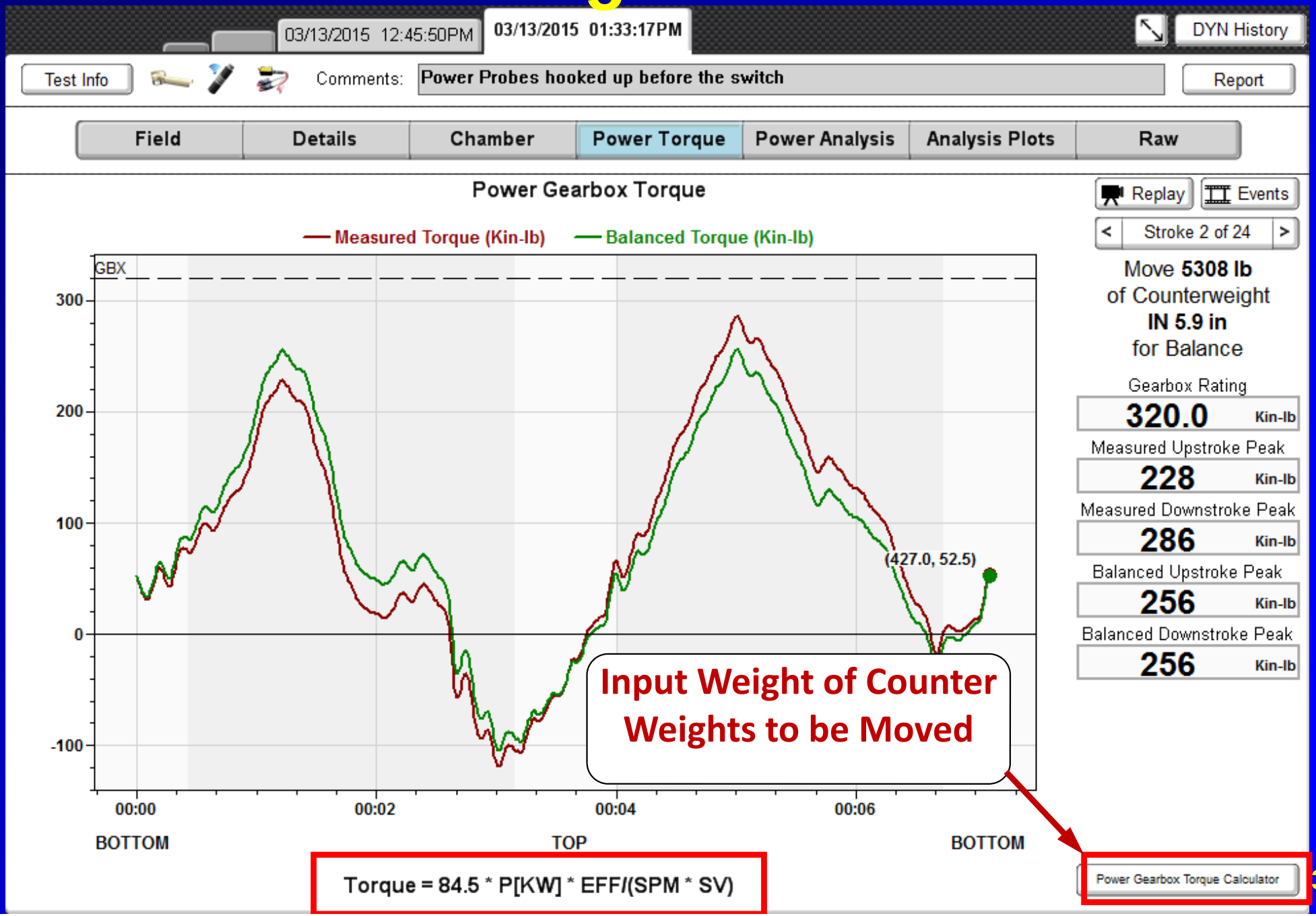


The total time needed to acquire representative dynamometer data is equal to the elapsed time the unit is down connecting sensors plus about 5 more minutes.

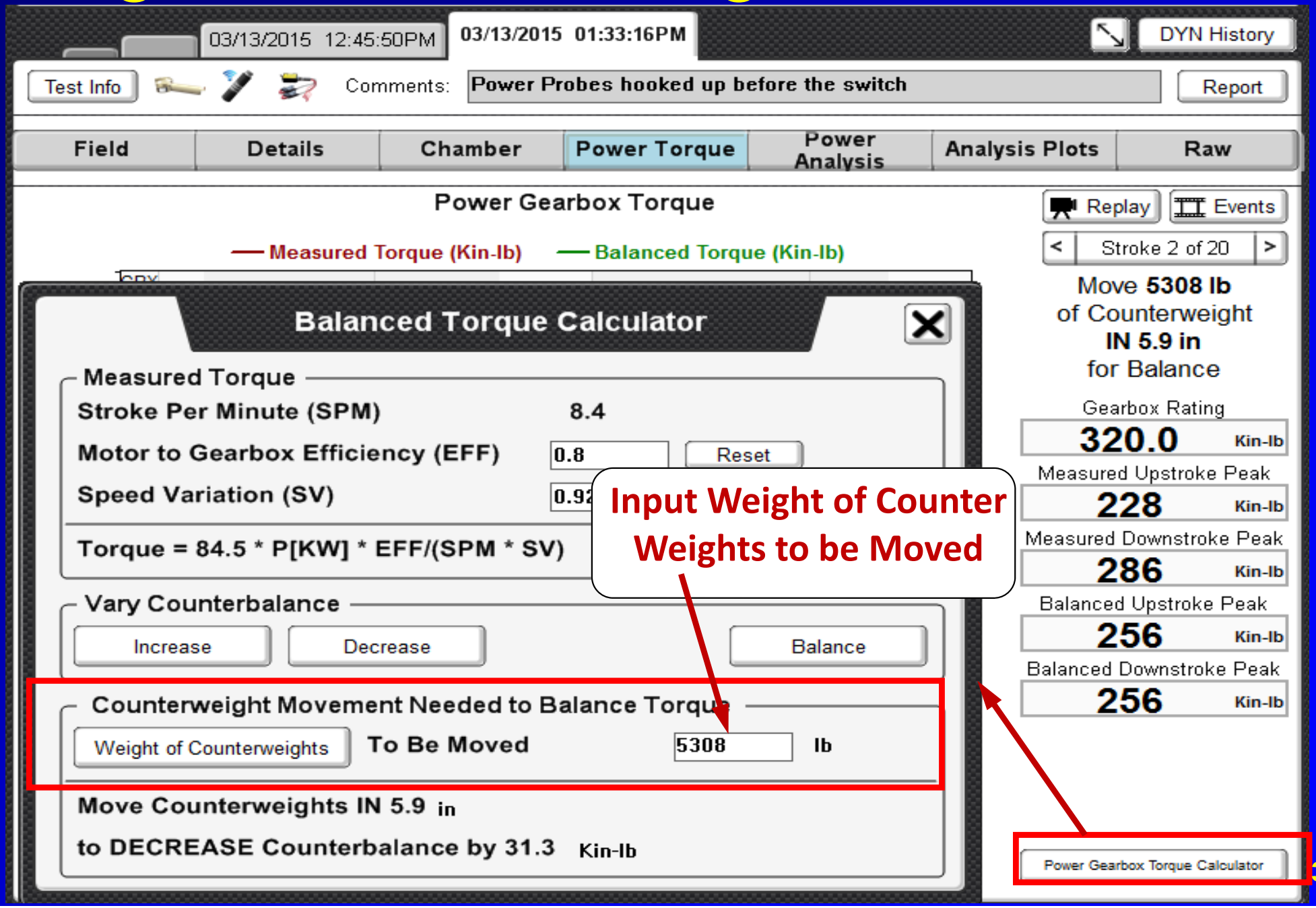
Use **Analysis Plots** to View Data by Stroke



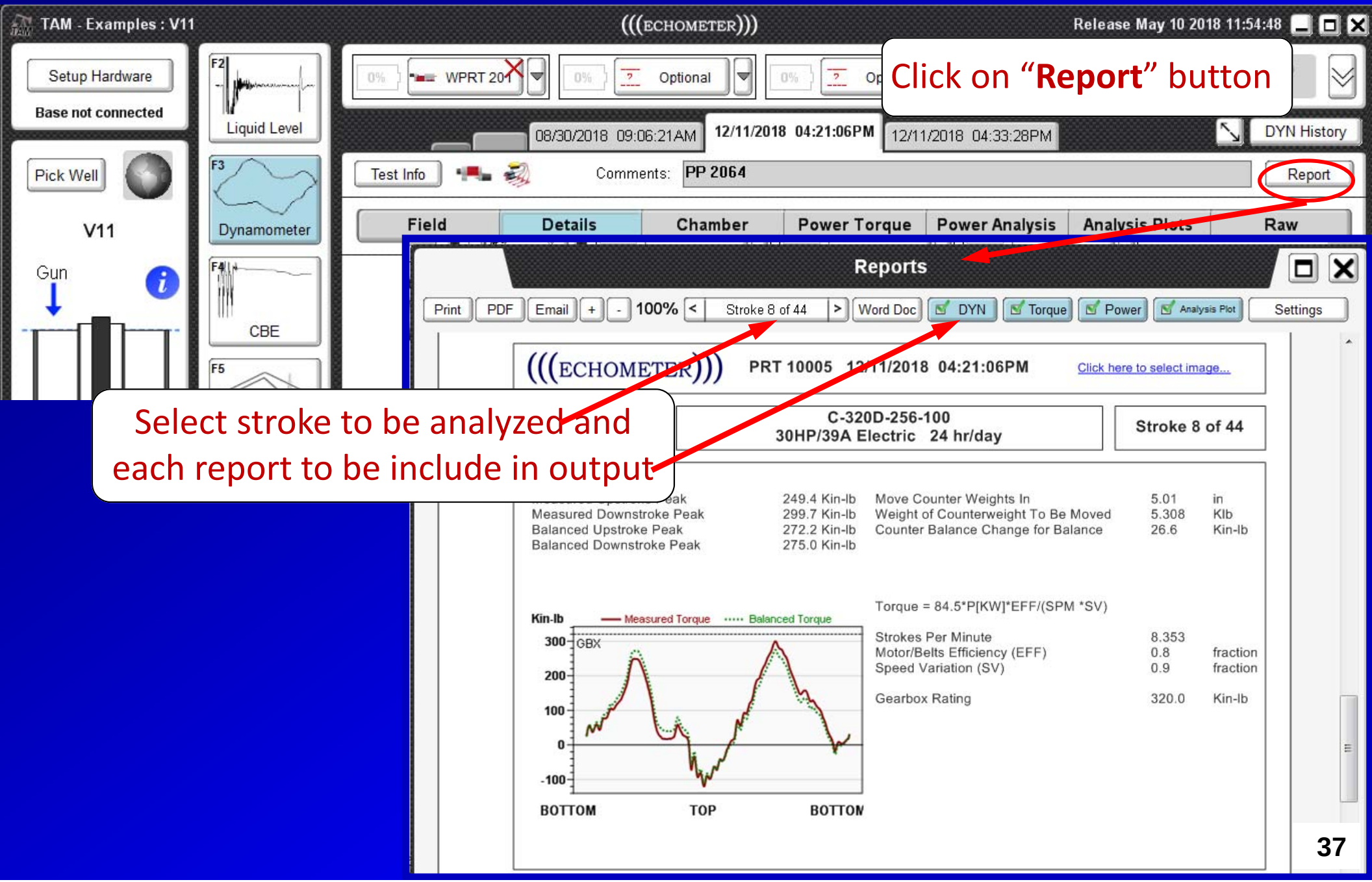
What is the Torque Loading and Movement of Weights to Balance Unit?



On Balanced Torque Calculator Input Weight of Counterweights to be moved.



6 View, Print, E-mail Report



Motor Power and Electrical Analysis

Power Analysis

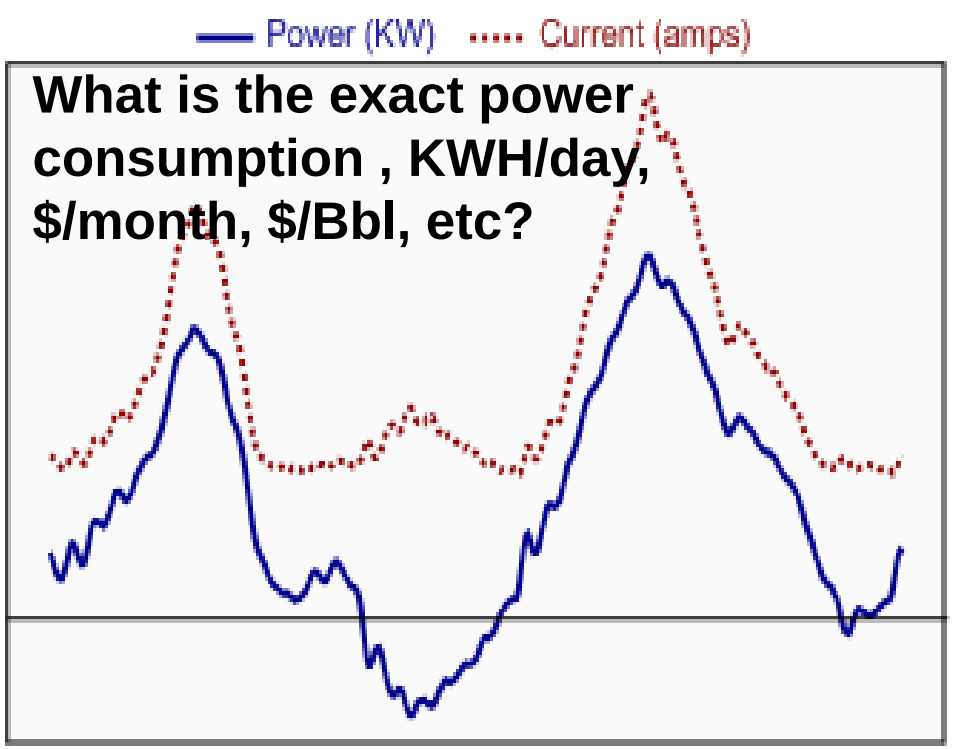
Monthly Operation Costs (30 Days/Month)		
Run Time	24.0	hr/day
Cost With Gen. Credit	358.04	$
Cost No Gen. Credit	387.52	$
Demand Cost	92.67	$
Oil Production Cost	228.7	¢/bbl
Liquid Production Cost	15.0	¢/bbl
Oil Production	7	BBL/D
Water Production	100	BBL/D

Cost $

What is the power use during a pump stroke?

Recommended Min NEMA D Motor	19.8	HP
Rated HP	30.0	HP
Rated Full Load AMPS	39	
Thermal AMPS	23.4	
Gross Input	14.4	HP
Net Input	13.3	HP
Demand	11.6	KW
Average	10.3	KVA
Average Power		
With Generation Credit	9.9	KW
No Generation Credit	10.8	KW
Average Power Factor	76.3	%
System Efficiency	56.9	%

Power



What is the exact power consumption , KWH/day, $/month, $/Bbl, etc?

System Efficiency

What is total system efficiency?

Electrical cost is one of the highest expenses in operating a well.

1. The power measurement system is designed to give instantaneous power values within 5% of actual values.
2. Through use of the power probe the Artificial Lift Technician will become proficient at reducing electrical cost.

The End