

Echometer Digital Well Analyzer

- ACOUSTIC LIQUID LEVEL INSTRUMENT
- PRESSURE TRANSIENT TESTER
- DYNAMOMETER
- MOTOR POWER/CURRENT ANALYSIS
- PLUNGER LIFT ANALYSIS



THE WELL ANALYZER IS A PORTABLE COMPUTERIZED INSTRUMENT FOR OBTAINING A COMPLETE WELL ANALYSIS

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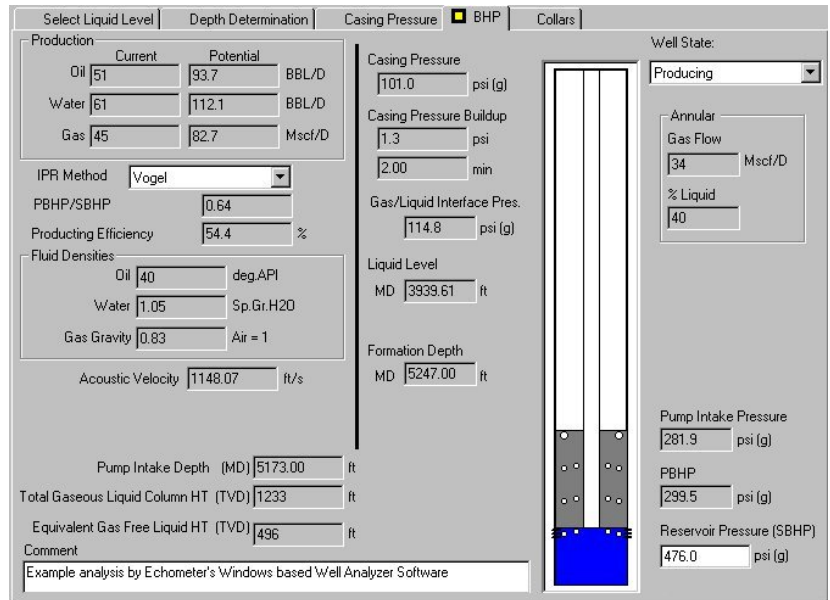
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Echometer Well Analyzer

The Well Analyzer is an integrated artificial lift data acquisition and diagnostic system that allows an operator to maximize oil and gas production and minimize operating expense. Well productivity, reservoir pressure, overall efficiency, equipment loading and well performance are derived from the combination of measurements of surface pressure, acoustic liquid level, dynamometer, power and pressure transient response. This portable system is based on a precision analog to digital converter controlled by a notebook computer with Windows-based application. The Well Analyzer acquires, stores, processes, displays and manages the data at the well site to give an immediate analysis of the well's operating condition.

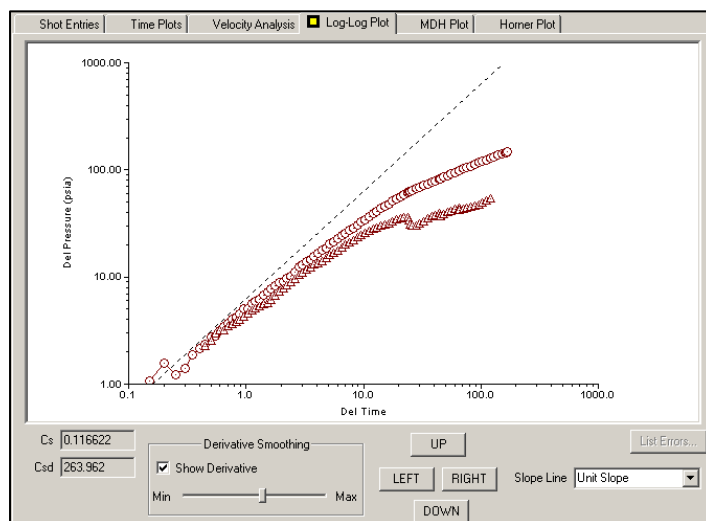
Acoustic Liquid Level Tests

The Echometer Well Analyzer is used in conjunction with a gas gun/microphone assembly to determine the liquid level depth in a well. Normally, the liquid level depth is determined in the casing annulus, but also, the liquid level depth can be measured inside tubing in gas wells. An acoustic pulse is generated at the surface of the well. The acoustic pulse travels through the gas and is reflected by changes in area including tubing collars and the liquid level. The software automatically processes this acoustic data to determine liquid level depth. Concurrent with the acoustic liquid level depth measurement, an initial and two-minute build-up casing pressure tests are performed. The casing pressure



build-up measurement allows calculation of the casing annulus gas flow rate and the gradient of the gaseous liquid column if free gas is bubbling up through the liquid. Software calculates the producing bottomhole pressure, maximum production rates, pump intake pressure, casing annulus gas flow rate and other parameters. This single-shot acoustic liquid level depth test is displayed as shown so the operator can visualize and understand the performance of the well.

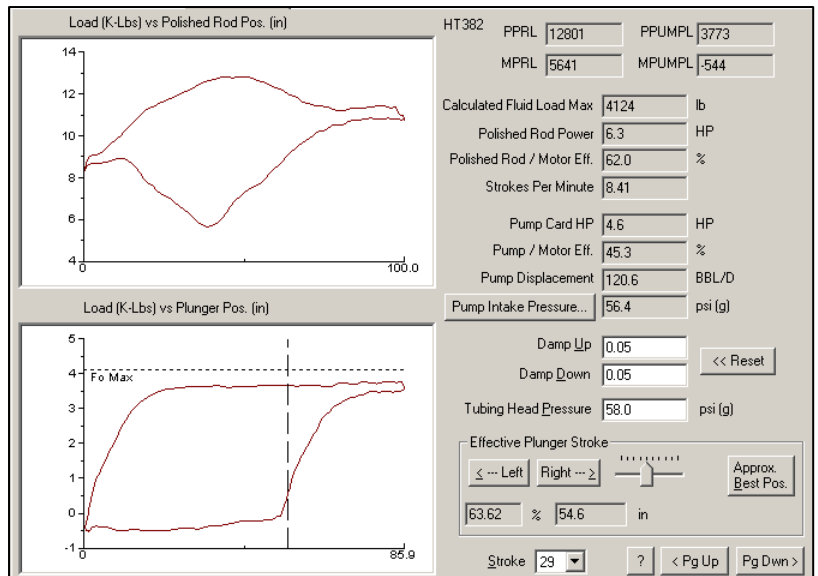
Pressure Transient Tester



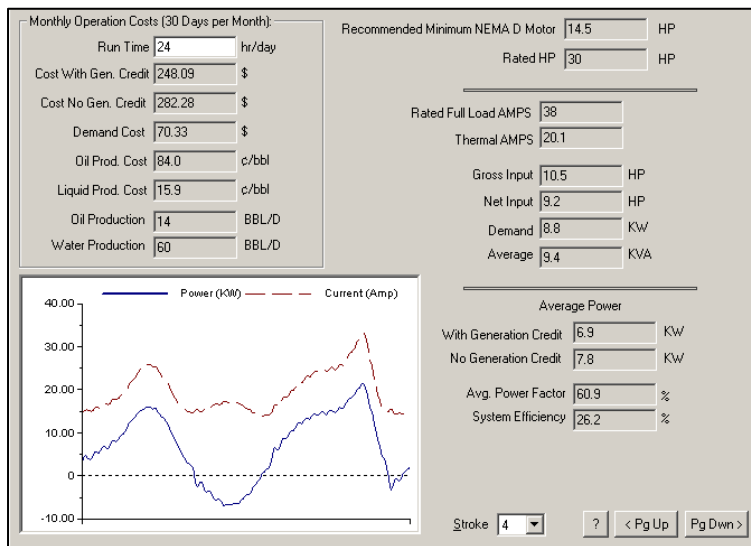
The Well Analyzer can be used with special software to obtain pressure buildup data. The operator programs the Well Analyzer to acquire data at a specified rate in either shots per hour or shots per log time cycle. Advanced analog to digital converters, precision pressure sensors and reliable remote fire gas guns allow acquisition of accurate data, which is used to calculate bottomhole pressures. Numerous diagnostic and analysis plots are available including casing pressure vs. time, liquid level vs. time, bottomhole pressure vs. time, log-log with derivative, Horner plot and MDH plot. Real time viewing of the data insures that the wells are returned to production as soon as the test objectives have been reached.

Dynamometer Tests

A dynamometer analysis allows an operator to determine the loadings and performance of a beam pump system. Rod loadings, beam loadings, gear box loadings, pump performance and downhole gas separator performance can be determined. An easy-to-install compact polished rod transducer is attached to the polished rod below the carrier bar in a few seconds. The polished rod transducer offers safe and easy acquisition of load and position data with sufficient accuracy for most analysis. A quantitative horseshoe load cell that is installed between the carrier bar and the polished rod clamp allows the acquisition of load with precise accuracy. An accelerometer within the transducers provides a reliable technique to determine polished rod position. With both dynamometers, a surface dynamometer card and a downhole pump card are calculated and displayed. Traveling valve and standing valve tests can be performed. When using a horseshoe transducer, a permissible load diagram and torque analysis are available. A motor current sensor allows acquisition of motor current data with the dynamometer data for balancing and motor size and motor performance analysis.



Motor Power Analysis



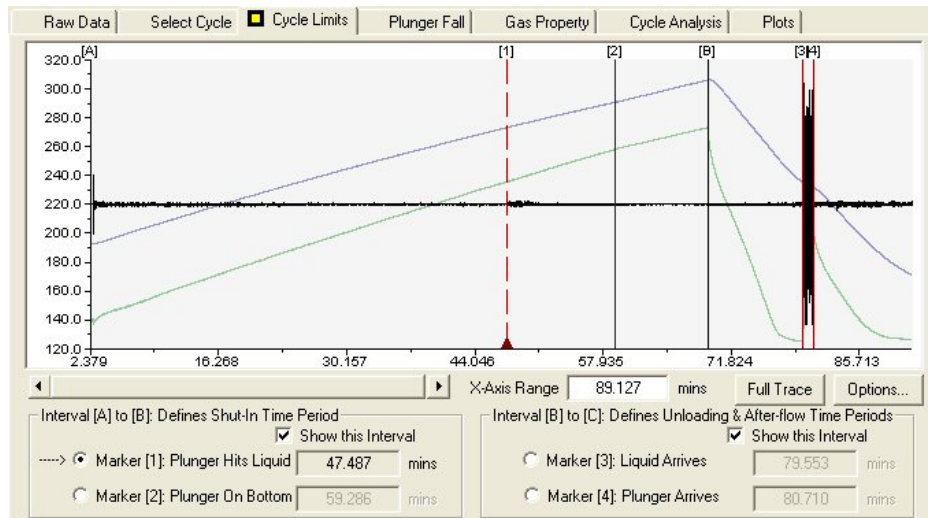
costs and expressed as \$/bbl.

A motor power/current sensor measures both power and current. The test is performed either as a stand alone test or simultaneously with dynamometer data acquisition. The power and current data is processed to determine electrical costs, overall electrical efficiency, gear box torque, power factor, motor loading and other electrical parameters. The minimum size motor is recommended. To balance a well, the operator simply inputs the weight of the counter-weights to be moved and the program calculates the distance that the counter-weights should be moved. Electrical cost of operating the pumping system is calculated in terms of consumption and demand

Plunger Lift Analysis

The Well Analyzer is used during the plunger lift cycle to continually acquire acoustic signals generated as the plunger travels in the tubing, plus acquire pressure signals from the tubing and casing. Key events such as plunger arrival at the liquid level in the tubing and plunger arrival at the bottom of the tubing are identified. The operator ensures that the plunger reaches the bottom of the tubing by the end of the shut-in time period and determines the proper shut-in time for the plunger lift installation. Oil and gas production of a plunger lift installation can be maximized

by determining the position and velocity of the plunger throughout the cycle and calculating gas and liquid flow rates into and out of the wellbore as a function of the measured pressures.



Gas Gun / Microphone Assemblies

The Echometer Well Analyzer can be used with a variety of gas guns/microphone assemblies. The gas gun generates an acoustic pulse which travels down the casing annulus gas and is reflected by collars and the liquid level. The reflected acoustic pulse is converted into an electrical signal by the gas gun microphone. A remote fire gas gun is normally supplied with the Well Analyzer and is necessary for unattended pressure transient data acquisition. A manual fire 1,500 PSI compact gas gun can be operated in the explosion or implosion mode. High pressure gas from the well can be released into the compact gas gun to create the initial pulse so that an external gas supply is not required. 5,000 and 15,000 PSI gas guns are available for high-pressure applications. Precision pressure transducers with a wide range of pressure ratings are available for use with the various gas guns. See www.echometer.com.

Data Management

A complete well analysis is performed from the acquired data stored on the Well Analyzer laptop in conjunction with the well database. Graphical and text reports are generated and printed. The software can be freely downloaded from the web and installed on other computers as necessary.

CSA Certification

CSA Certification, Certificate No. 1705541 for use in Class 1, Division 1, Groups A, B, C, & D, is available at additional cost for some of the sensors. The Well Analyzer can be modified for intrinsically safe service with the sensor located in hazardous areas. Please request a special quote if certification is desired. See www.echometer.com.

Seminars and Technical Papers

Training seminars discuss the use of the Well Analyzer to optimize a well's performance. Numerous technical papers are available on the acoustic, dynamometer and motor power/current analysis. A list of seminars and of technical papers will be sent upon request. This information can be downloaded at www.echometer.com.

Specifications and Dimensions

The Well Analyzer is a state-of-the-art instrument using sigma-delta analog to digital converters, precision sensors, shielded cables and user-friendly Windows software. The total weight of the complete Well Analyzer system is 75 lbs. (35 Kg). The complete Well Analyzer system is shipped in two packages having approximate dimensions of 20" x 20" x 20" each. The instrument is compact, rugged and designed to be used in hot, cold, humid and dry conditions. Additional information about dimensions and weights can be supplied depending upon the particular options desired.

Performance Guarantee

Money back if any current competitive instrument can match the performance of the Well Analyzer on a variety of difficult wells.

Instrument Guarantee

The Well Analyzer is guaranteed for a period of one year. The guarantee covers defects in material and workmanship and is limited to replacement of parts and materials.

USA PATENTS 4,408,676 4,637,463 4,793,178 4,932,253 5,117,399 5,200,894 5,285,388 5,406,482
5,464,058 5,589,633 and others pending. Canada Patent 2,037,277