Pioneer Petrotech Services Inc. (ppg







Permanent Dovvnhole Monitoring Systems

www.pioneerps.com

Overview of Permanent Monitoring Systems

PPS27 permanent downhole monitoring systems have multiple levels of gauges and surface data acquisition units (SDAU) to choose from. This equipment can be used for diverse applications from low pressure CBM wells to extremely corrosive wells with high concentration carbon dioxide [CO₂] and/ or hydrogen sulphide [H₂S].

PPS can also provide all the accessories necessary for intelligent well completions. This includes gauge carriers, downhole cable, cable protectors, cable head and wellhead outlets.

Premium, Elite & LPLT Series

Customers can choose from single to multi-drop permanent gauge completions with an option of gauge reading tubing pressure or annulus pressure. All of PPS's state-of-the-art downhole tools incorporate industry leading sensors, innovative electronic components, and an electron beam welded housing design.

There are different SDAU configurations to choose

from, including *SmartWatcher Touch* which provides instant data trending and charting or *SmartWatcher II* which makes it possible to connect up to four wells—with a maximum of four gauges per well—and therefore a total of 16 gauges communicating to the surface unit.

Analog Series

The PPS27 Analog Series is specifically designed for permanent low pressure, low temperature monitoring and remediation monitoring. Using 4-20mA output and integrated cable head, this option can provide high quality data at low cost, with easy installation and no need for additional surface monitoring equipment. Overall the design is based on the Premium Series of peizo gauges, but modified to provide a reliable and effective alternative for applications below 3,000 psi and 110°C.

ESPLink Monitoring & Control

The PPS electric submersible pump monitoring system can measure pressure, temperature, pump

System Applications

- Production optimization
- Injection monitoring
- CO₂ injection monitoring
- Observation well monitoring
- Pump system monitoring
- · Well testing without additional equipment
- Intelligent completions
- Pressure build-up surveys without additional equipment
- High pressure and high temperature monitoring

motor operating parameters, and vibration on the x, y and z axes. One of the key advantages of the PPS equipment is the high level of accuracy and resolution provided for all measurements.

Having the ability to control the pump is essential to maintaining optimum pump lifting efficiency. Using ESPLink operators can monitor intake and discharge pressure, as well as set parameters for the minimum and normal dynamic fluid level, and the critical and normal motor temperature. When these values are entered into the monitoring system, commands will be sent to the Variable Frequency Drive (VFD) to either stop or restart the pump when these specific levels are reached.

PCPLink Monitoring & Control

The PCPLink system provides real time downhole pressure measurements and the full vibration spectrum of three axes simultaneously creating a snapshot of whether machinery is operating within optimum parameters. The *SmartWatcher Touch* surface unit was specifically designed to provide a convenient interface for viewing real time numeric data or graphical representations of the data.

By using vibration as a leading indicator of equipment health, operators can recognize issues and plan preventative maintenance thereby protecting and increasing pump longevity. As well pressure data can prompt operators to vary the pump speed, maximizing pump efficiency and production, all while maintaining bottom-hole pressure.



Diagram of PPS27 Permanent Downhole Monitoring



SmartWatcher

PPS SmartWatcher is available in multiple configurations for downhole data interfacing, processing and logging. This system has a modular structure that connects to multiple gauges with a single cable (maximum four downhole gauges) and supports Modbus/RTU communication. The modular structure allows for maximum flexibility with unit expansion for different applications, enhanced reliability in harsh environments, independent mobility for unit improvement, upgrades and certification, and convenience for production and unit maintenance.

SmartWatcher II

This is the most advanced SDAU that PPS offers, because it is able to have up to four wells communicating to it. Each well can have a maximum of four gauges connected for a total of 16 gauges communicating with SmartWatcher II unit. Other features include internal memory, an SD card, Modbus/Push data port via RS485 or RS232, AC & DC power entries, and solar station availability. The electronics are enclosed in a NEMA-4 box with a large viewing window so that data reading and system status can be monitored without opening the door. The unit is compatible with PPS's online remote monitoring.

SmartWatcher Touch

SmartWatcher Touch can display two channels of pressure, one channel of temperature and three axes of vibration. The data channels are displayed on a touch screen which provides a convenient interface for viewing real time numeric data or graphical representations of the data. The samples that are displayed are simultaneously saved to text files which can later be extracted to a standard USB memory drive.



Specifications

Elite Series

Quartz Gauges

Sensor Pressure Ranges*–psi Temperature Range*–°C Service Quartz 10K | 16K | 25K 150 | 177 | 204 H₂S / CO₂ Services

* Additional pressure and temperature ranges available upon request

Premium Series

SOI Gauges

Sensor	SOI
Pressure Ranges*–psi	10K 20K
Temperature Range*–°C	20 to 125
Vibration Sensor**	MEMS Accelerometer
Service	H_2S / CO_2 Services upon request
* Additional pressure and temperature ranges available upon request	

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Premium Series

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Sensor	Piezo
Pressure Ranges*–psi	6K 10K
Temperature Range*–°C	20 to 125
Vibration Sensor**	MEMS Accelerometer
Service	H_2S / CO_2 Services upon request
* Additional pressure and temperature ranges available upon request	

** Vibration sensor is optional for 6K gauges only

LPLT Series Quartz Gauges

Sensor
Pressure Ranges–psi
Temperature Range–°C
Service

Quartz $5K \mid 10K$ 20 to 130 H₂S / CO₂ Services upon request

Analog Series Silicon Sapphire Gauges

Sensor Type Pressure Range–psi Temperature Range–°C Silicon-Sapphire 0 to 3K psi 20 to 110



Analyze drawdown and buildup pressure transients to enhance production

Increase asset management by enabling a deeper understanding of reservoir performance and optimization

Acquire pressure and temperature information without requiring well intervention

Optimize artificial lift and extend the run life of Electric Submersible and Progressive Cavity pumps by using vibration measurements to monitor pump integrity

Specifications

SmartWatcher

Downhole Gauge Support Communication Baud Rate Interface Power Supply Operating temperature Safety Maximum 4 gauges Modbus/RTU protocol 1200, 2400, 4800, 9600 (default), 19200, 38400 bps RS485/RS232 (15kV ESD Protection) +12VDC(40mA), +24VDC(25mA) or 9-28VDC or Solar Power Station Optional -40°C to +70°C Class I Division 2

SmartWatcher II

Downhole Gauge Support Communication Baud Rate Interface Power Supply Operating temperature Safety

Maximum 16 gauges Modbus/RTU protocol 1200, 2400, 4800, 9600 (default), 19200, 38400 57600 or 115200 bps RS485/RS232 (15kV ESD Protection) 85-264VAC, 50-60Hz (±10%), 40W 9-32VDC or Solar Power Station Optional -40°C to 85°C (continuous use) Class I Division 2

SmartWatcher Touch

Downhole Gauge Support Communication Baud Rate Interface Power Supply Operating temperature Safety

Maximum 4 gauges Modbus/RTU protocol 1200, 2400, 4800, 9600 (default), 19200, 38400 57600 or 115200 bps RS485/RS232 (15kV ESD Protection) 85-264VAC, 50-60Hz(±10%), 30W 9-32VDC or Solar Power Station Optional -40°C to 65°C (continuous use) Class I Division 2



Smart Gauges and Simple Software





Pioneer Petrotech Services Inc.

#1, 1431–40 Avenue NE Calgary, Alberta, Canada, T2E 8N6 Tel: 1–403–282–7669 Fax: 1–403–282–0509 Toll Free in Canada & US: 1–888–PP–GAUGE (774–2843) Email: sales@pioneerps.com

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