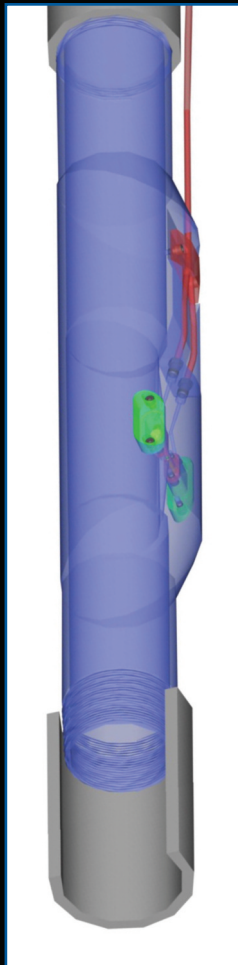




**Other Products**



# PetroMax™

APS Technology's PetroMax System\* is a fiber-optic sensor for completion systems that provides real-time monitoring of downhole fluid composition. This key enabling technology for advanced completions provides the operator continuous oil, water and gas concentrations from multiple downhole locations without interrupting production.

Well performance data is traditionally obtained through surface-based measurements, wireline operations or well isolation. These methods, if initiated at all, involve high risk or cost and often the data obtained is not of sufficient quality. By applying photonics to hydrocarbon production control, PetroMax can continuously provide quality performance data with a reliable, permanent, non-intrusive sensor. Potential uses include:

- Providing real-time information on gas and water breakthrough.
- Tracking long-term production performance (e.g., increasing water cut).
- Monitoring multiple pay zones with multiple sensors, allowing model validation or corrective action.

## Measurement

PetroMax distinguishes among chemicals passing the downhole sensor through their unique near-infrared absorption spectra. The method directly measures the composition of the downhole fluid, rather than inferring it through its physical state or other properties.

The sensor operation begins with a source lamp at the surface. Near-infrared light travels down an optical fiber to the sensor and passes through a portion of the production fluid. Light that is not absorbed returns to the surface and is analyzed and presented in real time.

## Performance Specifications

- > Full range of oil, water and gas concentrations (0 to 100%).
- > Full-range accuracy of 5%.
- > Measurement is not influenced by fluid flow rate or other variables that influence multiphase properties.
- > Since PetroMax normalizes the returning spectra, intensity variations caused by the light source, fiber bending, bubble scattering, etc., do not influence the measurement. The shape of the spectra, not the intensity, differentiates among oil, water and gas.

\* U.S. Patents 6,507,401 B1 and 6,707,556 B1



**Headquarters ♦ Wallingford ♦ USA**

7 Laser Lane, Wallingford, CT 06492 USA  
Phone: 860-613-4450 ♦ Fax: 203-284-7428  
contact@aps-tech.com

**Houston ♦ USA**

15415 International Plaza Dr., Suite #150  
Houston, TX 77032 USA  
Phone: 281-847-3700 ♦ Fax: 832-230-2899

Rev. 120418-vB

Specifications subject to change without notice.

© APS Technology, Inc. 2012

# PetroMax™

## Design Features

The design of PetroMax has focused on ruggedness, long-term survivability and ease of integration into completion systems and other sensor systems.

- > Minimal downhole presence provides non-intrusive design (full bore access).
- > Temperature and pressure survivability: 392°F (200°C) and 20,000 psi (1379 bar).
- > Operating life greater than 5 years; potentially as long as the well's life.
- > All active components (electronic and optical) are housed at the surface, reducing (and even enabling) maintenance; no downhole electronics.
- > Multiple downhole sensors can be integrated to a single surface system to provide redundancy, multiple well monitoring or multi-leg measurements on a single well.
- > Installed fiber is suitable for other fiber optic measurements (e.g., distributed temperature and pressure available through other suppliers).

## Technical Measurement Information

- > PetroMax uses standard communications-grade multimode fiber (50/125, 62.5/125 um) for communication to and from surface.
- > The chemicals that can be measured by PetroMax (i.e. have a unique IR absorption spectrum) are numerous. If the chemical of interest contains hydrogen bonded to carbon, nitrogen, oxygen or sulfur, then it is very likely that it can be observed by PetroMax.
- > Chemometric analytical techniques are used to differentiate between the various spectra: partial least squares (PLS), principal components regression (PCR), SIMCA.
- > The accuracy of PetroMax depends on a random fluid sample's passing the sensing element. In highly stratified flows (e.g., long horizontal wells), multiple sensors (top and bottom of production string) or fluid randomizers may be required.

## Status

The PetroMax system has completed all laboratory tests and a field prototype has been designed. The technology is available for acquisition, including both the hardware and rights to the patents.

