



LIVE Monitoring Service

Fit For Purpose, Decision-Ready Answers

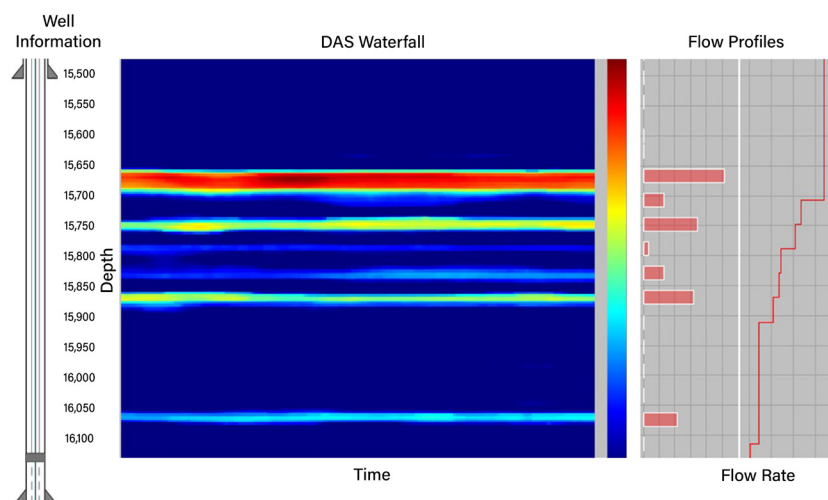
Operators need the right data in order to make critical completion and production decisions

The current process for downhole data interpretation requires the acquisition of the data, followed by an extended period of time for delivery of the raw data, processing, visualization, and report creation.

This offsite process typically takes weeks to deliver actionable results, costing time and money, while creating an expanded environmental footprint.

To help Operators get to where they want to be, faster and more cost-effectively, the OptaSense LIVE Monitoring™ solution delivers real-time data acquisition that provides the information needed to make critical completion and production decisions where it matters most -- at the wellsite.

The OptaSense LIVE Monitoring solution eliminates the post-acquisition timeframe by delivering fully processed, fit-for-purpose answer products during the data acquisition process, compiled into a simplified standard report available immediately. In addition to the readily transmittable downhole visualization file delivered by LIVE Monitoring, a full dataset is recorded for advanced analysis and reporting if necessary.



Fiber-optic technology provides real-time solutions for Operators directly at the wellsite

The OptaSense LIVE Monitoring solution works by converting a standard fiber optic cable into a network of virtual sensors capable of detecting changes in pressure, temperature, stress and acoustic signals along the length of the fiber, at the speed of light.

Positioned within this network is the OptaSense Interrogator Unit (IU), a highly stable laser that pulses light 10,000 times a second down the fiber optic cable. Our IU processes and records changes in the backscattered light, which indicate a function of strain on the fiber, at speeds exceeding 100 meters per second.

The position and amplitude of strain sites are determined and visualized in real time using our proprietary software—providing continuous insight to optimize the decision making process for our customers.

A new approach to acquiring and analyzing data

Industry Process

- ▼ Crew completes job
- ▼ Crew returns to facility post project **3 days**
- ▼ Data loaded, quality controlled, process initiated **7 days**
- ▼ Data processed, first visualization of flow contribution **10 days**
- ▼ Information completed and developed into customer deliverable report **2 days**

TOTAL TIME POST ACQUISITION
22 days

OptaSense LIVE Monitoring Process

- ▼ Crew completes job
- ▼ LIVE Monitoring product delivered **0 days**

TOTAL TIME POST ACQUISITION
ZERO days

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OptaSense LIVE Monitoring Services

Production Profiling

OptaSense LIVE Monitoring Production Profiling service delivers the data necessary to maximize your asset value by improving operating efficiency, optimizing your completion design and lowering development costs.

Through OptaSense LIVE Monitoring, a rapid assessment across the entire production interval is delivered, allowing you to instantaneously assess flow contribution and locations.

The key to production optimization is gaining a complete understanding of flow patterns through reservoir monitoring and data analysis. Unlike other conventional production monitoring methods, Production Profiling through the LIVE Monitoring solution lets you visualize inflow and axial flow along the entire wellbore, in real time, at the perforation level, for the life of the asset.

By using an optical fiber clamped to the casing or production tubing, the Production Profiling service offers non-intrusive data acquisition for continuous logging and on-demand surveys, without interrupting production, at a significantly lower cost compared to conventional production logging.

Injection Profiling

OptaSense LIVE Monitoring Injection Profiling service provides a comprehensive analysis of inflow and axial flow conditions. OptaSense has the most diverse industry expertise, through which we created highly developed algorithms to visualize inflow with reliable and repeatable results. In addition to LIVE Injection Profiling contribution for perforation clusters, sleeves, zonal contributions or injection intervals, OptaSense LIVE Monitoring provides the decision ready, critical information our customers rely upon for wellsite decision.

Leak Detection

OptaSense LIVE Monitoring Leak Detection service provides a rapid leak detection solution with an immediate assessment of anomalous conditions within the conduit (well, pipeline, etc.).

Leak detection is a vital part of optimizing the production flow, preventing possible crossflow and contamination from and into the non-targeted reservoir, identifying detrimental pressure spikes in the annuli and quickly identifying the severity of undesired flow paths that could lead to environmental disasters. Having fiber-optic data from along the whole well up

to the surface provides the required knowledge to act quickly and decisively when necessary. Fiber-optic leak detection allows the ability to identify a leak through multiple strings of pipe. Efficiency is improved by assessing the entire wellbore simultaneously and operational time is reduced by more than 50% over electrical measurements.

Crosswell Strain Monitoring

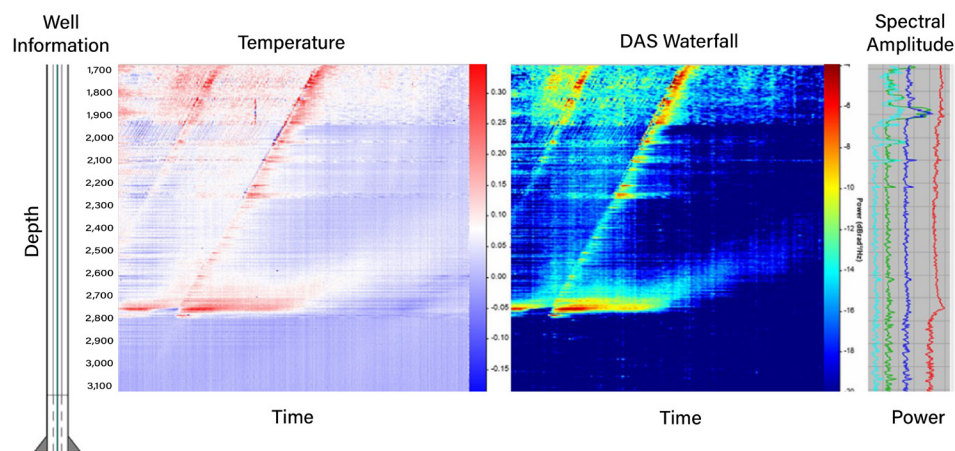
The LIVE Monitoring Crosswell Strain Monitoring service measures the dynamic stress and strain changes within a rock formation from hydraulic fracturing stimulation providing live visualization of critical frac hit diagnostics.

From our low frequency distributed strain measurements, we can tell exactly how and where a fracture is propagating, uncovering key principles of a fracture's orientation, length, growth rate and distribution. Fracture events communication locations and time can be captured from dynamic strain between the monitor well and treatment wells. Results are analyzed to evaluate the prescribed stimulation design, well positioning, fracture diagnostics and identifying geological controls and features.

Confident decisions can be made for optimized well spacing by evaluating how strain variations to the fracture program impact fracture driven interactions. With the ability to identify dominant fracture paths and fracture network in the reservoir, our clients are able to access parent-child well interactions. With this unique data set, subsequent wells can be better designed to target the intended treatment zone. OptaSense also delivers advanced analysis of the performance impact of various completion and stimulation techniques on quantitative reservoir dynamic strain level induced by fracturing treatment. This unique strain data enables detailed reservoir analysis to optimize completion and well spacing design.

Microseismic Monitoring

OptaSense LIVE Monitoring Microseismic Monitoring service provides a unique solution for active microseismic monitoring. Our fiber-optic interrogators allow for high fidelity microseismic monitoring in



Simplified, decision ready interpretation provided LIVE at the wellsite.

individual or multiple wells and can be deployed outside casing as permanent installations or inside wells from retrievable fibers.

Fiber-recorded microseismic is evenly sampled over the full length of a monitoring horizontal. This even and wide aperture sampling allows for a greater level of accuracy in microseismic monitoring source locations. Additionally, this even sampling results in little array bias and allows for a more representative distribution of events from toe to heel.

OptaSense's real-time solution provides event locations and magnitude estimates autonomously to illuminate the fracture initiation and development. Results are visualized in real-time with optional pumping data, strain data, and temperature measurements.

Induced Seismicity Event Detection

OptaSense fiber-optic monitoring services include surveillance of processes surrounding injector wells. Both in existing oil fields or as part of carbon capture storage and utilization, the monitoring of injector wells is a critical aspect as they could trigger induced seismic events.

OptaSense's real time LIVE Monitoring Induced Seismicity Event Detection service has been

deployed to assess injection processes as well as caprock integrity. Our high sensitivity systems have surpassed the performance and detection thresholds of conventional seismic networks while providing 24/7 surveillance at a fraction of the cost. Real-time assessment of induced seismic events provides operators with a critical tool to assess operational aspects of their assets.

Hydraulic Fracture Monitoring

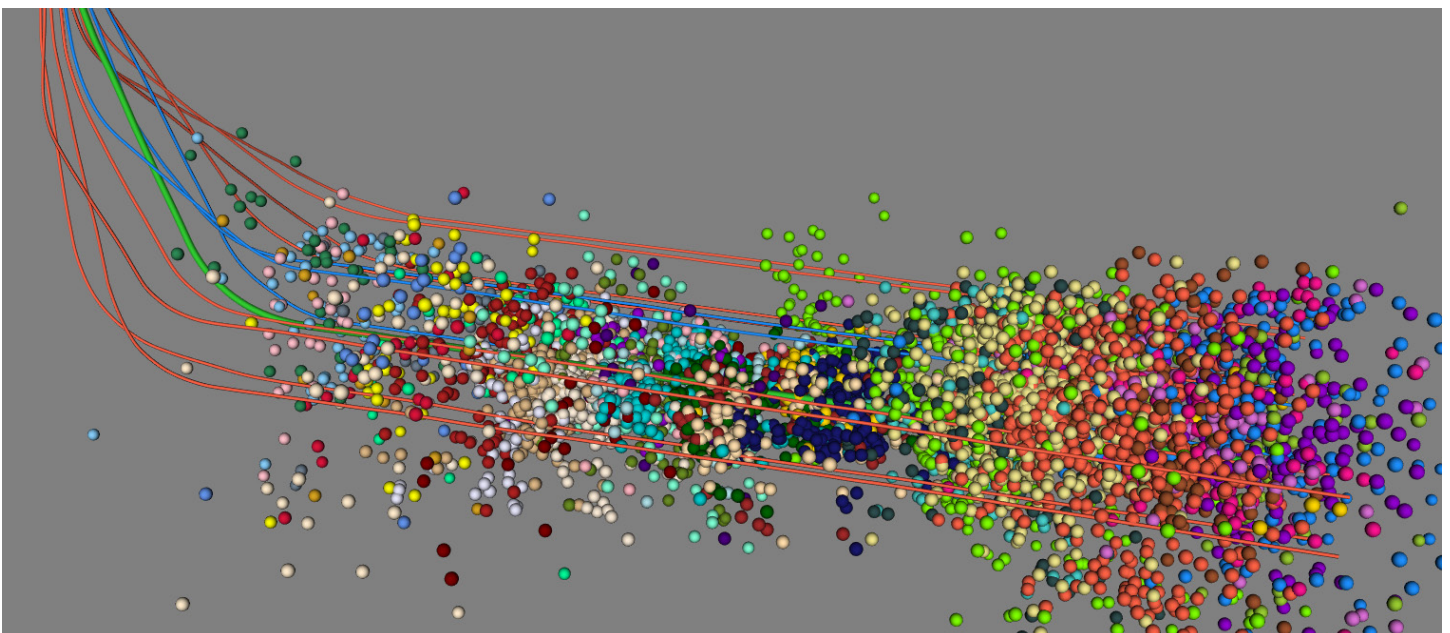
OptaSense LIVE Monitoring Hydraulic Fracture Monitoring service utilizes advanced Distributed Acoustic Sensing and Distributed Temperature Sensing technology to help you confirm successful completion operations, determine fluid and proppant distribution and monitor cross well communications in real time, at the perforation level, by acquiring continuous acoustic and temperature measurements along the length of your well.

This service also allows you to measure well interference, such as strain and temperature, on multi-well pads when one or more wells are instrumented with a fiber-optic cable. As a result, the data can provide valuable information on future well placement, perforation designs and reservoir development.

Visualization of real-time distributed strain, temperature and acoustic data provides Operators with the information needed to optimize fracture treatments, evaluate diversion strategies, and identify cross well communication events. In addition, this novel sensing combination can offer real-time insights into:

- Perforation cluster efficiency and distribution of fluid and proppant
- Effectiveness of flow diversion
- Well integrity issues
- Initial flowback and well cleanout
- Long term production and reservoir performance

On-demand completion data not only provides the insight you need to optimize fracture programs, additionally, it also allows you to mitigate operational issues in order to save completion dollars. For instance, to mitigate losses associated with mechanical failures, the OptaSense LIVE Monitoring Hydraulic Fracture Monitoring service monitors all operations in real time, such as confirming perforations, plug setting, ball drops and sleeve actuation. It identifies unwanted inter-stage communication in treatment wells, as well as unwanted hydraulic connectivity in offset wells. Frac monitoring also enables the immediate detection and location of well integrity issues.



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