

# Application Note

## Improving Oil & Gas Production



### Downhole Temperature Monitoring



Efficient reservoir and well management requires a good working knowledge of the environment around the wellbore and completion. In today's production operations, operators are putting an emphasis on use of downhole instrumentation that provides a clear picture of these conditions to help reduce uncertainty and accelerate operational decisions. They have found that improving the speed and accuracy of these instruments, as well as collecting data continuously over longer downhole intervals, makes a distinct improvement in their optimization process.

A distributed temperature sensing (DTS) system, is a real-time technology that enables operators and service companies to better visualize downhole conditions and the events that affect production efficiency. While it is well known that temperature data is extremely useful for characterizing and troubleshooting production operations, traditional tools for measuring wellbore temperature provide only limited information. For instance, a production logging tool will measure over the entire length of the well but only provides only short-term data. Permanently installed bottom-hole sensors provide long term monitoring but only measure at a single point in the well.

However, a DTS system with an optical fiber deployed in a cable with the completion can measure temperature over the entire length of the well, detecting conditions at thousands of points in the well. It also permanently monitors conditions over time, capturing critical events as they occur, while helping to eliminate the risk and cost of a well intervention for logging. The DTS can also be integrated with fiber optic point sensors for BHP/BHT single-point measurements, reducing the cost and need for multiple systems and cables in the wellbore.

#### Better Decisions from Better Data

- provides real-time temperature measurements for up to 40,000 discrete points along the length of a fiber optic probe, providing comprehensive thermal profiling
- high optical budgets and fast measurement times allow SensorTran units to be specified, configured, and tuned to optimize the balance between speed and temperature resolution
- improves the accuracy of reservoir models and helps eliminate uncertainty

▪ PRODUCTION MONITORING ▪ FLOW RATE MEASUREMENT ▪ WATER BREAKTHROUGH ▪ INJECTION BREAKTHROUGH ▪ FLOW BEHIND CASING ▪ LEAK DETECTION ▪



▪ GAS LIFT VALVE PERFORMANCE ▪ SAG-D PERFORMANCE ▪ INTER-WELL CONNECTIVITY ▪ CHEMICAL INJECTION MONITORING ▪ DEPTH CORRELATION ▪



SensorTran DTS systems can provide monitoring for a wide variety of applications. Following are some of the ways that operators and service companies use DTS data to visualize downhole conditions.

**Troubleshooting**

- Locate tubing and equipment leaks
- Detect flow behind casing
- Identify cross-flow between zones

**Optimize Production Over the Life of a Well**

- Identify water or gas breakthrough
- Provide enhanced understanding of zonal contributions or flow profiles
- Identify differential depletion in stacked reservoirs as early as possible

**Optimize Injection Wells**

- Establish injection profiles across multi-zone water flood completions

**Intelligent or Smart Completions Monitoring**

- Ensure downhole flow-control function or valve position in smart completions

**Monitor Steam Flood and SAG-D Efficiency**

- Verify steam chamber growth and placement
- Monitor observation wells for steam breakthrough into weaker formations

**Verify Effectiveness of Downhole Operations in Real Time**

- Confirm injection profiles
- Monitor cementing jobs; verify cement tops
- Verify gas-lift valve operation and injection points
- Determine fluid levels and operating temperature in electrical submersible pump (ESP) completions
- Identify potential flow assurance problems from hydrate, scale, or asphaltine build-up

**Improve Reservoir Stimulation and Remedial Operations**

- Observe fracture-height growth during fracturing treatments in real time
- Monitor multi-stage acid stimulation treatments



**SENSORTRAN**

Optical Conclusions

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