The WellWatcher Flux system extends permanent monitoring into the reservoir. It provides distributed temperature measurements and discrete pressure along the sandface of lower completions.

Case Study
Operator refines reservoir model & characterizes gas hydrate production

An operator planned the world’s first gas hydrate production well in the Japan Sea. It was a subsea deepwater development that consisted of one production well with two nearby observation wells cemented with the WellWatcher Flux system.

The system’s sandface monitoring captured the temperature change indicating a hydrate dissociation front. The front was dynamically changing during both the short-term production test and long-term reservoir stability period. The WellWatcher Flux system’s temperature data yielded valuable information for design and verification of reservoir simulators.

The temperature sensors were cemented behind casing and strategically installed across the entire wellbore, including the hydrate zone of interest.

The WellWatcher Flux system met all the requirements because of these features:
- Compact sensor size, spacing, and placement flexibility
- High-resolution digital temperature sensors
- Real-time sandface monitoring
- Reliability and low installation footprint

After successful installation, the monitoring system provided the critical information needed to refine the reservoir model, reducing field uncertainty.

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The WellWatcher Flux system is a digital permanent monitoring system that provides both pressure monitoring and distributed temperature sensing (DTS) along the sandface of subsea wells that are run in multiple stages.

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Temperature array of sensors (TAS)
The sensors on the TAS system feature high-resolution components that use platinum resistance devices to determine temperature. Laboratory and field testing has shown these devices have extremely low drift over many years of operation. Tight process control during manufacturing minimizes changes in drift from one sensor to the next—an important parameter for flow-profiling.

Inductive couplers
Coupler technology allows the WellWatcher Flux system to operate in multistage completions without requiring a direct electrical connection between stages. They are integrated into the overall completion and allow wireless bidirectional power and communications to be conveyed between downhole and surface. The technology is field-proven with more than 15 years of field experience and is not sensitive to debris or vibration.

Domain support
Our global domain organization can provide technical support from field design through installation and for life of the well. The domain team advises on system design and sensor placement to maximize the benefits of the data. Support is also available postinstallation for data processing and interpretation in real time to better understand the reservoir and optimize both well and field performance.

WellWatcher Flux system’s gauge station
The WellWatcher Flux system’s station houses two quartz pressure gauges—one tubing and one annulus—for discrete PT monitoring, but also acts as the link of communication and power between the TAS and the subsea interface card. Up to 60 TAS sensors can be powered by one WellWatcher Flux system station, which can be multidropped in a well—allowing for a total of 600 sensors, if needed.

Subsea interface card (IWIC-DA)
The proprietary wireless system’s management software provides a simple user interface to view all live and historic data. It enables the user to remotely manage all devices, adjust sampling rates, and set alarms. Customizable viewing options allow easy visual management of all devices in one simple-to-operate interface.

System Features
- Single wellhead penetration for simplified subsea architecture
- Ability to transmit power and telemetry wirelessly from lower to upper completion via inductive couplers
- Ability to independently work over upper completion while sensors left in lower completion
- Sandface monitoring for: Out-of-zone injection
  - Production or injection profiling
  - Production monitoring of:
    - GOR change
    - Gas/water breakthrough
    - Crossflow between zones
  - Alternative for production logging tools

Data analysis
The WellWatcher Flux system is compatible with major thermal modeling software packages, as well as proprietary real-time monitoring and interpretation software. Packages include Tecplot’s visual data platform, THERMO* thermal modeling and analysis DTS software, and custom software. WellWatcher Flux system monitoring software provides interpretation and recording and trending analysis, along with 2D and 3D plotting of the WellWatcher Flux system data and data from other monitoring systems.

WellWatcher Flux Multizonal reservoir monitoring system

Temperature array of sensors (TAS)

WellWatcher Flux system’s gauge station

Lower completion detail view

Temperature array of sensors (TAS)