In the past reservoir development and management have been guided by data gathered during short logging and testing periods before the start of production. Additional information was gathered, if considered necessary, months or years later, using well intervention methods that threatened loss of production and presented logistical problems.

One way to avoid the costs and inconvenience associated with this late-stage data gathering is to install permanent monitoring systems that will record well data and transmit them to surface, without affecting production, throughout the lifetime of the well.

Permanent systems for downhole pressure and temperature monitoring were introduced more than 20 years ago. These early installations consisted of a pressure/temperature gauge inside a side pocket mandrel that had to be retrieved by slick line to recover the data.

Modern systems use state-of-the-art downhole pressure/temperature sensors designed for permanent installation. These can be used to monitor tubing and/or annulus pressure as well as downhole diphasic liquid flow in a venturi flowmeter configuration. Various recording devices may be used at the wellhead to record and transmit the relevant data.

The WellWatcher wellsite production monitoring and communications equipment integrates downhole permanent sensors, surface sensors, surface controls, a remote terminal unit (RTU), remote control (via radio, telephone line, leased line, private network, etc.) and application software to control well safety and optimize production and recovery. Data sensors may be downloaded to a Finder* database for long-term management.

WellWatcher installations allow the operator to monitor wells and reservoirs remotely, in real time, from offices hundreds or thousands of kilometres from the wellsite. This allows production, maintenance and field management to be optimized throughout the life of the reservoir from early exploration drilling to secondary recovery projects.

The superior sensors and reliability of WellWatcher systems are backed by responsive engineering from Wireline & Testing Product Development Centres worldwide.
Suitable sensors

The minimum WellWatcher configuration is a downhole gauge measuring tubing pressure/temperature. More gauges may be added (up to three attached to a single cable) to measure annulus pressure or downhole flow in a venturi flowmeter arrangement. The following permanent sensors are available:

PressureWatch* Quartz is a new-generation downhole pressure and temperature measurement sonde. To ensure excellent measurement stability and long life, the sonde incorporates hermetically sealed quartz resonator crystals, Schlumberger electronics and new mechanical sealing technology.

PressureWatch Sapphire* is a new-generation slim downhole pressure and temperature measurement sonde. The small (3/4-inch) diameter of the sonde means it can be installed in smaller gauge mandrels, providing more flexibility in completion design.

PressureWatch Twin Sapphire features twin Sapphire sensors and has a small (1-inch) diameter to provide greater flexibility in completion design. The gauge was developed to measure both annulus pressure and tubing pressure, but can be ported in other configurations.

FloWatcher* is a downhole flowmeter that measures pressure, temperature, flowrate and fluid density. It is used to optimize production, make production diagnostics and identify potential problems with production rates, valves, etc.

PumpWatcher* is a downhole monitoring tool for wells pumped with electrical submersible pumps. It measures pressure and temperature at the pump intake and transmits data along the pump power cable. The pressure measurement is achieved with a high-precision quartz sensor.

Flexible acquisition systems

Several acquisition systems may be used at surface to acquire the data and provide a link to the client’s office.

The autonomous surface unit regular (ASU-RA) is a complete acquisition and communication system designed to interface with all Schlumberger gauges via a personal computer (PC) through a client network. It can handle up to 48 gauges and is primarily intended for multiwell operations, for example, on offshore platforms. The ASU-RA is available in various packages, including a blast-proof version.

The autonomous surface unit compact (ASU-CR) is a 100% SCADA (Supervisory Control and Data Acquisition) compatible system that can handle up to three downhole pressure/temperature gauges and a wide range of surface sensors. It is also capable of operating various well controls such as choke, subsurface safety valve, master and wing valves. Several options may be added, such as modem, radio and solar panel.

The autonomous surface unit light (ASU-LR) is a compact, light and cost-effective unit capable of interfacing with up to three downhole gauges. It has no transmission or well control capability. Data may be retrieved using a laptop and an infra-red link.

WellWatcher consolidates all downhole and surface data, combining it with powerful interpretation software for a range of solutions.