**Manara** production and reservoir management system

Enables continuous, simultaneous, real-time control of multiple zones

- Reduces water production up to 80%
- Increases oil production up to 46%
- Obtains maximum flow rate of 5,000 bbl/d

**Where it is used**
- Single and multilateral wells requiring modular and scalable configurations for monitoring and control
- Horizontal wells with multiple laterals
- Extended-reach wells where long laterals are used to maximize production and recovery
- Maximum or extreme reservoir contact wells
- ESP-ready completions
- Openhole or cased hole wells
- Wells in remote, highly populated, or environmentally sensitive areas

**How it improves wells**
Manara production and reservoir management system is an intelligent completion system that enables operators to monitor and control multiple zones continuously, simultaneously, and in real time regardless of the length of the wellbore. Informed field development strategies for optimizing production and recovery can thus be devised and implemented.

**How it works**
**Zonal management without intervention**
An integrated monitoring and control station in each zone measures water cut, fluid flow rate, pressure, and temperature at the formation face to identify the amount of oil, water, and gas being produced in each zone. Gas fraction is identified using data analytics. Measurements are made before production from the zone commingles with the flow coming up from below.

This information enables operators to delay or prevent water and gas breakthrough using an infinitely adjustable flow control valve while hydrocarbon zones above and below the closed zone continue producing. Upstream placement of valve sensors enables transient analysis of the zone without affecting other zones, enhancing reservoir and production knowledge and optimizing drainage across the reservoir.

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Data and power transmission across multiple junctions
A single electric control line connects each station to the next and the entire system to the surface, minimizing connection points and splices, simplifying installation, and increasing reliability. Intellitite* downhole dual-seal dry-mate connectors eliminate potential leak paths, a common issue with monitoring systems.

Power and data are transmitted wirelessly across junctions via an inductive coupler. The couplers enable simultaneous monitoring and control of multiple zones across junctions.

Independent installation of completion stages
The inductive coupler connects between the lower and upper completion. Eliminating the control line across the junction enables the lower completion to be run in on drillpipe. The pipe can be pushed, pulled, and rotated to overcome friction and reach target depth in extended-reach wells without fear of damaging control lines, removing any restrictions on the length of the wellbore. Subsequently, the upper completion is installed, and the coupler establishes electrical connection between the two.

Infinite flow control options with absolute position sensing
The electric flow control valve provides continuously variable flow control. An absolute position sensor embedded in the valve sends real-time feedback about the choke’s position. The operator can observe zonal fluctuations as they occur and make immediate flow adjustments based on recommendations from production optimization software.

The valve reacts instantly to surface commands. Measurements made by the Manara system enable the operator to dial in a target production rate for each zone instead of cycling a valve to predetermined choke settings.

Decision making without guesswork
The high-resolution, high-frequency data reach the surface before the fluid arrives. A surface controller integrates these data seamlessly into an operator’s existing SCADA and business systems.

WellWatcher Advisor* real-time intelligent completion software filters, analyzes, and translates the data into useful, actionable information via multiple workflows for optimizing production and recovery at the level of a single zone, a single well, or the entire field. Optimal flow control valve settings for each zone and well can be identified against a set of optimization constraints (e.g., minimum water cut, production above the bubblepoint) entered by the operator. The software can be connected to real-time data sources, such as process information (PI) servers, or to remote production operations centers.

A common user interface presents notifications and alarms, feedback on malfunctioning equipment, field views that capture trends over time, workflows with real-time control, and optimization.

Simplified upper completion workovers
The inductive coupler enables completion stages to be disconnected and reconnected multiple times. The debris-tolerant stab-in mechanism facilitates changeout of the upper completion tubing, replacement of an ESP, and other remedial operations without having to remove or compromise the integrity of the lower completion.

Targeted firmware and software enhancements
The station’s electronics enable firmware enhancements. Updated software can be downloaded to single sensors, single stations, or multiple stations.

Support for data interpretation
Through its status updates, comprehensive workflows, and continuously updated reservoir models, the Manara system provides visualizations downhole and across the reservoir in real time, enabling faster, more effective decisions.

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