IntelliZone Compact
Modular multizonal management system
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The IntelliZone Compact* modular multizonal management system is a single unit that enables operators to maximize production control, reduce well costs, simplify well planning, and increase downhole control.

The IntelliZone Compact system provides pressure and temperature readings from each zone and seamless zonal isolation and control in multizone wells. Through either a local SCADA or remote connection, the system’s communication capabilities optimize reservoir drainage, facilitate well testing, and monitor changes in downhole conditions in real time.

**Multizone management**
Up to 15 IntelliZone Compact systems can be installed using only five control lines. The use of a software-controlled automatic power unit allows multiple zones to be managed simultaneously and in real time, greatly increasing well control and minimizing time-consuming and risky interventions.

**Compact design**
The integrated components of the IntelliZone Compact system are designed as a single assembly. Approximately 30 feet long, the length is comparable to that of a tubing joint but about half the length of traditional intelligent completions, making it simpler to handle and install.

**Fast deployment**
The IntelliZone Compact system is fully assembled and tested at the manufacturing facility and is delivered ready to be deployed downhole. This single-unit system streamlines planning, delivery, and onsite preparation, and it reduces rig time during installation. The ability to install more zones on fewer control lines further simplifies the deployment.

**Simple control**
With control logic programmed into the surface control system, valve operation is a simple two-click command with absolute valve position feedback after each actuation, greatly increasing well control and maximizing production.
IntelliZone Compact Components

Multiport packers

Field-proven hydraulically set packers available in two retrieval options: cut-to-release and straight pull-to release.

These packers allow for isolation between zones and up to $5 \times \frac{1}{4}$-in control lines to be passed through.

Flow control valves

The systems valves come in two options: on/off or multiposition.

A built-in collet-holding mechanism reduces operational risk by ensuring the valve position does not unintentionally change.

Dual PT gauges

The PT gauges provide measurements from both the annulus and the tubing in every zone, with up to three zones monitored on a single electric cable.
Intellitite connectors

With more than 4,000 installations and 100% survival, the Intellitite® electrical dry-mate connector removes leak paths and is available in fully welded or redundant configurations.

Position sensors

Sensors integrated into flow control valves identify flow control choke positions and report back to surface its current position through the gauge electrical line.

Multidrop modules

Fewer hydraulic control lines than with conventional intelligent completions reduce installation complexity and wellhead penetrations.
IntelliZone Compact
Components

Surface control system

When the valve position needs to be changed locally or remotely, the system automatically directs pressure sequences to the appropriate control lines for reliable valve operation.

WellBuilder software

The WellBuilder* completion system design software uses well data to simulate production scenarios, compare completion designs, explore their implications for production, and derive the optimal completion solution.

Operating software

Visualization and control software enables operators to easily manage well production with responsive control of downhole valves through two-click commands.
The IntelliZone Compact system and its components were designed and qualified at the Schlumberger Reservoir Completions Center in Houston. This 35,000-square-foot Schlumberger facility and its quality systems are certified to conform to ISO 9001 standards.

When an order is received, a system is configured to an operator’s particular specifications. Comprehensive testing and analysis of the system occurs at every stage of product development, from the initial test of each component to the final system-level qualification, ensuring the reliability and robustness of the entire system for the specified downhole conditions.
Optimize multizone production in marginal offshore oil field
An operator planned two wells in a marginal field offshore east Malaysia. The field consisted of multiple-dipping heterogeneous sandstone reservoirs with an unconsolidated formation. The multistacked reservoirs had a large gas cap with only marginal oil in place. Achieving maximum reservoir contact in this type of formation required horizontal wells.

Used IntelliZone Compact system to manage reservoir zones
After studying various well completion designs—including horizontal wells with passive versus active zonal control—Schlumberger recommended the IntelliZone Compact modular multizonal management system. This intelligent zonal flow control system would maximize reservoir drainage points and minimize overdepletion from the high-permeability, less productive zones, thereby enhancing reservoir performance and improving project economics.

The IntelliZone Compact system continuously monitors the flow from individual zones and enables adjustments to zonal contribution. This flow control function prevents or minimizes water/gas encroachment, and in this case, it would also help control both the aggressive gas cap expansion at the heel of the well and, as the field depleted, the aquifer’s coning up from the dipping well toe.

The modular, compact, integrated intelligent completion system is designed, assembled, and fully tested off site before shipment. Preconfiguring and pretesting accelerate final well commissioning at the rig site and, because there are fewer connecting joints and control line splices to make up on site, installation time and service quality incidents are significantly reduced.

Upfront engineering analysis ensures that the valve-opening sizes and positions are tailored to the range of reservoir and production characteristics for the target well. The final completion assembly integrates multiple components, including flow...
control valves, zonal isolation packers, permanent pressure and temperature sensors, and a mechanism that provides absolute feedback of valve choke position—all into one assembly.

**Produced more than 99% oil and saved USD 400,000 per well**

Because the system arrived at the wellsite ready assembled, the company experienced zero NPT before and during installation. Installation rig time was reduced to just 33% of the time required by conventional passive intelligent completions—8 hours per zone instead of the typical 24 hours per zone. The time saved was approximately 32 hours for each well, an equivalent of USD 400,000 per well. Seven months after the intelligent completions were installed, the two wells were producing more than 99% oil with a water cut of less than 1%.

Production from one of the two multizone wells completed with the IntelliZone Compact system was compared over a similar time period with the production of a conventionally completed offset horizontal well in the same reservoir layer. The well with the IntelliZone Compact system had a stable, high-net-oil production rate with almost no water cut.

The conventionally completed offset well, which used passive zonal control, had a fluctuating, lower production rate with steady water encroachment.
IntelliZone Compact Multizonal Management System Enables Seplat to Meet Regulations for Back Allocation

Develop marginal field economically and ensure back allocation of commingled production
Seplat Petroleum Development Company was developing a marginal onshore oil field in Nigeria’s Niger Delta, where the reserves are distributed over 14 stacked reservoirs. The marginal reserves and the field’s limited area made the project uneconomical unless the number of wells could be minimized. The goal, therefore, was to develop the field with fewer wells to reduce capex and opex. Due to the location’s poor accessibility and increased HSE risks, remote zonal monitoring was a necessity. In addition, Seplat had to meet local regulations requiring that back allocation be reported for individual reservoir zones.

Use IntelliZone Compact system to monitor and simultaneously control multiple zones
Schlumberger and Seplat considered the reservoir parameters, sand control measures, production targets, and governmental regulations for back allocation of jointly produced zones before deciding on the final completion choice for the well: the IntelliZone Compact modular multizonal management system. This single unit enables operators to optimize production control and commingling through remote downhole monitoring and control. For each zone, the system integrates variable-choke flow control valves, an optional pressure and temperature monitoring system with valve position sensing, an optional multidrop module, and a packer. The module allows more flow control valves to be actuated on fewer hydraulic control lines than with traditional flow control completions and to be controlled from the surface in real time without intervention.

IntelliZone Compact system components are designed, assembled, and fully tested off site before shipment. Because Schlumberger stocks all the components, delivery time is reduced from an average of 8 to 10 months for traditional systems to only 8 to 10 weeks.
The commingled testing results were used to evaluate the performance predicted by the original simulation model. No flow domination or crossflow was observed during static conditions. At the conclusion of the well test, a new calibrated simulation model was developed that was suitable for the new flow conditions. The difference between the measured and the estimated production was within 5%, confirming that the required daily production allocation could be performed from the updated simulation model. This model would remain valid as long as no significant changes occurred to fluid composition and gas/oil ratio.

**Improved reservoir management and met regulatory requirements**

Use of the IntelliZone Compact system resulted in several significant benefits for Seplat. Because of the system’s modularity, completion lead time was reduced and commissioning was accelerated. Installation in the three zones was completed within budget, without incident or NPT, and with less HSE exposure. The system’s remote monitoring and control of zonal production greatly improved reservoir management. Finally, the real-time flow measurements showed that zonal production met the regulatory requirements for joint production and back allocation from multiple zones.

![Production Rate for Single Zone Based on Valve Size and Choke Setting](image)

*Nodal analysis was used to evaluate the optimal flow control valve sizing for three reservoir layers, with the objective of determining the zonal production rates as a function of specific tubing head pressure for three valve sizes and a range of choke settings. The figure shows the production rates in one zone based on three valve sizes and choke settings.*