Schlumberger

Surface Well Test Solutions Ensure Deliverability of a Giant Offshore Gas Field

Production ExPRESS solutions efficiently clean up, test, treat, and control high-flow-rate gas condensate wells at up to 100 MMscf/d in complex conditions

Production ExPRESS* rapid production response solutions efficiently prepare completed wells for production, ensuring deliverability of natural gas and bringing additional gas resources from the field to European markets for the first time.

Enable efficient cleanup and high-quality well testing

An operator wanted to develop production from a giant offshore field in the Caspian Sea comprising gas-producing wells with complex subsea network pipelines and high flow rates of more than 100 MMscf/d (14.7-psi and 60-degF standard conditions). Near-freezing seabed temperatures significantly increased the potential for hydrate formation, which was identified early on as a main HSE risk to personnel and operations. Also, the production facility could not handle the high flow rate of unconditioned fluids, so the gas needed to be ready for production in the required condition. The wells needed efficient cleanup and accurate testing to ensure maximum productivity was achieved.

Deploy custom solution using surface well test equipment and domain expertise

Schlumberger designed and manufactured a fit-for-purpose solution to enable reliable well cleanup and testing of the completed wells before bringing them to production. Together with the operator, Schlumberger engineered a modular temporary facility to high industrial standards and developed new advanced technologies specific for the project while adhering to the operator's process safety requirements.

Schlumberger provided extensive technical support through reservoir modeling, flow assurance, and surface facility process engineering. Included in the Production ExPRESS solutions portfolio, fluid preconditioning ensured the facility could handle complex flow specifications of up to 15,000 psi and subzero temperatures. Because efficient fluid separation and flaring of associated condensate was necessary, the EverGreen* minimal environmental impact well effluent burner was used, adhering to strict environmental standards required by the sensitive offshore area.

Because the semisubmersible rig had limited deck space, a new steam-heat exchanger with double the heating capacity and reduced footprint was specifically designed for the operator. And to increase safety and reliability, an IEC 61508 SIL 2-certified electrical emergency shutdown system with a faster response was manufactured to integrate with the subsea shutdown system. Additionally, a customized data acquisition system was designed with a production facility setup. The comprehensive solution with advanced safety features increased operations control and process efficiency.

Ensure well deliverability

The novel design implemented for the project was unlike previous conventional arrangements, keeping flowback parameters within the required operational envelope to maximize reservoir productivity while ensuring a reliable operation.

The steam-heat exchanger was a critical element, reducing the required deck space by 7.5 times and cutting both capex and opex by almost 3 times. This made the system leaner by reducing the amount of piping required, improving process safety.

The solution enabled the operator to efficiently test, treat, and control high-flow-rate gas condensate wells at complex conditions, assess the wells' performance, better characterize the reservoir, and determine the extent of field prospectivity. Because of this, the operator achieved its primary objective to clean up the completed wells in preparation for production, ensuring deliverability of natural gas and bringing additional gas resources from this field to European markets for the first time.

Compact, customized solution using advanced well test equipment.

Case study: Ensuring deliverability of a giant offshore gas field, Caspian Sea

> **"We would like to recognize the meticulous planning, reliable engineering, and safe execution that took place by you and your respective teams. The outcome in delivering such a complex high-rate subsea gas well safely and effectively is a testament to the focus, dedication, and integrated teamwork you all undertook during the various system integration tests, planning events, rig upgrades, associated preparations, as well as the actual job itself. It is also a testament to the cross-disciplinary and intercompany teamwork to be able to deliver such an exemplary standard in all areas of performance, no matter how we wish to measure it. Therefore, we would like to say thank you and firmly believe that your continued safe teamwork, support, focus, and professional enthusiasm will serve to extend the achievement to other wells in the field."**
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> Completions engineering manager, well operations manager, and subsea wells manager

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