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**SONAR-Based Wellhead Surveillance for Gas Condensate Fields**

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**Abstract**

Production optimization and reservoir management rely in part on periodic surveillance of produced oil, gas and water flow rates of individual gas condensate wells. Flow measurement at the wellhead has proven to be challenging due to a number of factors. Conventional (gravity-based) Test Separators (CTS) and in-line Multi-Phase Flow Meters (MPFM) are intrusive and may be costly to mobilize, not to mention the associated HSE related risks. For fields where access and logistics pose a challenge, the deployment of either CTS or MPFM packages may require a significant amount of time. In some cases, the required well test frequency may not be reached with the available equipment or due to the increased number of wells in production.

This paper describes a convenient and cost-effective approach to production surveillance of gas condensate wells using the non-intrusive SONAR-based Surveillance system. The system integrates the clamp-on sonar flow meter (SONAR) with a PVT and multiphase flow engine to calculate the properties of the produced fluids, and the individual phase flow rates. The SONAR is a multiphase-tolerant volumetric flow device that provides the bulk flow rate of the fluid stream within the flow line. The PVT engine calculates the individual phase properties of the produced fluids, at the pressure and temperature conditions measured where the SONAR is clamped-on. The measured flow rate is then interpreted in terms of oil, gas and water rates at both the actual and standard conditions.

Examples of field performance of SONAR-based system for three-phase production surveillance of gas condensate wells are presented. The test results show that the SONAR-based system represents a reliable, safe and cost-effective solution for recurring production surveillance where reservoir conditions are relatively stable over time.