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Testing Gas Condensate Wells in Northern Siberia with Multiphase Flowmeters

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Abstract

A number of tests were performed in Yamburggazdobycha Gazprom's fields in Northern Siberia area to evaluate the performance of multiphase flowmeters in gas-condensate reservoir applications. The remoteness of the operation and the roughness of winter weather conditions combined with the complexity of the fluid compositions create unique challenges to the successful acquisition of well test data.

The paper discusses the challenges and potential benefits of deployment in line multiphase flowmeters in the difficult operating environment of Northern Siberia.

The reduced logistics and the ability to monitor in real time the true evolution of the gas and condensate wells provide an in-depth view of the actual well performance.

The evolution of the real dynamics of the wells stabilization after a change of choke can be observed and monitored accurately with the in-line Venturi – Dual Energy gamma ray multiphase flowmeter. The importance of the hydrate detection and mitigation processes is essential in the performance of successful tests in the Siberian gas well environment.

The paper details the methodology of the comparison of the well test rates of gas and condensate against traditional means of measurement presently deployed in Siberia. It is based on a rigorous mass balance approach, which enables to consider properly the mass transfer effects when comparing flowrates at different measurements conditions of pressure and temperature.

The presence of hydrates despite the extremely low water content of the effluent is detected by the multiphase flowmeter, which therefore provides also confirmation of the hydrate build up curve.

The challenges to collect representative samples of condensate and gas to ensure proper set-up of the multiphase flowmeter and thus the correct computation of gas and condensate rates are presented, and a number of solutions are described. A discussion of the validity of samples for full reservoir fluid characterization provides insights on the benefits and limitation of sampling in multiphase flow combined with proper conditioning of the samples. The paper further elaborates on the comparison of the fluid composition between traditional surface sampling methods and multiphase testing methods.

The utilization of the dynamic information obtained from the multiphase flowmeter to complement the understanding of the reservoir performance is discussed.

Introduction

Recent advances in the wet gas multiphase well testing have recently enabled the measurement in the field of reliable rates of gas, condensate and water in gas, and condensate wells. The need for inline measurement has been made more acute in the last few years to tackle the following issues:

- Mitigation of the carry over in gas line out of conventional separator
- Increasing need for high resolution of GCR measurements to determine changes in fluid properties on choke changes
- Higher repeatability measurements to confirm slow trends
- Circumventing hydrate formation issues downstream of surface production chokes plugging up controls in separators
- Remote unmanned operations
- Lowering of risk associated with well testing in gas well operations through elimination of active control systems and reduction of the volumes of pressurized hydrocarbons contained in the testing systems
- Permanent monitoring requirements

More of these requirements for wet gas well testing have already been presented in Theuveny et al [1]. The basics of the gas well testing with dual energy gamma – venturi multiphase flowmeters have been shown by Pinguet et al [2], Hopman et al [3] and Guiese et al [8].

The recent trend in the overall deployment of multiphase flowmeter has shown a significant interest in the in-line