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Evaluation of Low-Dose Hydrate Inhibitors (LDHI) for a Long-Distance Subsea Tieback in Ultradeep Water

A. Singh, SPE, Total E&P USA Inc., and P. Glenat, SPE, and J.-L. Peytavy, Total S.A.

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Abstract

The Canyon Express transportation system consists of two 12-inch flow lines running parallel from Camden Hills through Aconcagua and Kings Peak to Canyon Station Platform. The three subsea fields are in 6200 to 7250 ft. of water depth. Canyon Express is one of the longest subsea tiebacks in the Gulf of Mexico.

Production from the fields is predominantly methane gas with some condensate and formation water. The chosen hydrate mitigation strategy is continuous injection and regeneration of methanol (MeOH) for flow assurance. The Low-Dose Hydrate Inhibitor's (LDHI) were investigated because of increasing water production in the mid life of the Canyon Express production system. Both Anti-Agglomerants (AA's) and Kinetic Hydrate Inhibitors (KHI's) were evaluated for severity of operating conditions at Canyon Express.

This paper presents the step evaluation process including the engineering and laboratory studies which were performed for evaluation of LDHI's. It highlights LDHI limitations and presents the field operational changes which both resulted in the non-implementation of this technology.

Introduction

With the deep and ultra-deepwater thrust in the oil and gas industry, long-distance subsea tiebacks are becoming a preferred field development option. At high pressures and low ambient temperatures, the multiphase fluid is in the hydrate region close to the wellhead requiring continuous injection of thermodynamic inhibitors. Severe operating conditions require high injection volumes of thermodynamic inhibitors to be outside of the hydrate regions resulting in high OPEX and challenging operability.

LDHI's for long distance subsea tiebacks will be an optimal field development option resulting in lower treatment rates, pumping costs, and logistic costs. Risk associated with hydrate mitigation will result in comprehensive step evaluation of Low-Dose Hydrate Inhibitors for a long distance subsea tieback in ultra-deep water.

Major operational drivers for transitioning from thermodynamic inhibitors to LDHI's for the Canyon Express System were identified.

Canyon Express System

The Canyon Express transportation system consists of two 12-inch flowlines running parallel from Camden Hills (Marathon Oil Company operated) through Aconcagua (Total operated) and Kings Peak (ATP operated) to a host platform (Canyon Station) located approximately forty miles north of the northernmost Kings Peak well. Production from the fields is predominantly gas with condensate and produced water. The wells are tied together via a "daisy-chain" arrangement. The Canyon Express field and liquid management have been described in previous papers[1,2]. Refer to attached Canyon Express schematic, Figure A-1.

During the period of this evaluation there were four producing wells on the easterly flow line and four producing wells on the westerly flow line. The two flow lines are loop connected at the ends and are isolated from one another via a subsea isolation valve located just upstream of MC305-1.

Each flowline is designed for multi-phase operation with a nominal capacity of 250 MMSCFD gas flow for an arrival pressure of 2,000 psig at the host platform. The host platform is equipped with topsides facilities designed to separate the liquids from the gas in the multiphase flow. Each of the wells is connected to the main flowline by a 6-inch jumper that extends from the subsea tree to the flowline sled. Each jumper is equipped with a wet gas flowmeter to measure the gas and liquid flow from each well.