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A Sand Management System for Mature Offshore Production Facilities

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Abstract

ExxonMobil subsidiary Esso Australia Pty Ltd has implemented a Sand Management System to minimise the impact of sand to its operations in the Bass Strait. Some of these facilities have been in operation for more than 30 years and no downhole sand control was installed during original drilling completions. Over time, with increased water production, sand production has become more problematic.

This paper examines the strategies used to minimise the impact of sand production on facilities including the impact of corrosion and erosion on downhole, offshore topsides and pipeline infrastructure. The Sand Management System defines a management structure, with assigned responsibilities to ensure that guidelines are followed and continuous improvement opportunities are enacted. The system includes operational instructions for flowing wells, monitoring sand production, and installing retrofit sand control where required.

Introduction

Hydrocarbon production from Bass Strait facilities shown in Figure 1 started in 1968 on behalf of the Gippsland Basin Joint Venture (GBJV), comprising Esso Australia Resources Pty Ltd as operator and BHP Billiton Petroleum (Bass Strait) Pty Ltd. No downhole sand control has been installed in any of the approximate 200 wells. The majority of wells contain conventional cased-and-perforated completions producing from high (multi-Darcy) permeability reservoirs with strong aquifer support. Most reservoirs have seen very little pressure depletion (less than ~ 200 psi), and the strong water drive coupled with high sweep efficiency enables wells to be economically produced at high water cuts. The offshore oil platforms have 3 phase separation systems with water handling facilities, which are designed to treat produced formation water (with any entrained sand) prior to overboard disposal. The gas platform facilities typically include 2 phase separation for water removal. The export wet gas streams are dosed with monoethylene glycol for hydrate inhibition prior to being sent by pipeline for onshore processing and separation of remaining natural gas liquids.

Over time, sand production in produced fluids has become more problematic. Establishing a multi disciplinary team with members from downhole, surface facilities, corrosion mitigation and production operations backgrounds was key to ensuring that all areas were adequately assessed. This team is internally referred to as the Sand Management Team (SMT) and was formed to assess the impact and develop strategies for mitigation of the effects of sand production on the operation.

Sand production typically results from either shear failure of the rock matrix caused by pressure depletion or by tensile failure of individual sand grains "plucked" from the rock matrix under the influence of fluid flow through the rock matrix. Shear failure is not a dominant failure mechanism in Bass Strait due to the strong water drive pressure support present in the reservoirs.