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Tahiti Project Subsea System Design/Qualification

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Abstract

The Tahiti Project was Chevron's first high pressure subsea development. This paper describes some of the design challenges and key lessons learned from the execution of the subsea equipment delivery Contract and installation program. This paper will provide an overview of the subsea system and discuss lessons learned with respect to equipment qualification, and specific issues regarding thermal insulation, material compatibility and long term wet storage.

Introduction

The design requirements of the Tahiti subsea facilities, whilst not dependent on the qualification of new or 'enabling' technology did depend on extending or 'enhancing' the limits of existing technology.

This paper briefly describes some of the key design requirements, the approach to determine the then current level of equipment qualification relative to these design requirements; the qualification process and the subsequent lessons learned.

In order to meet the cool down times required to mitigate the formation of hydrates, the subsea trees, well jumpers and manifolds are insulated with a pour in place glass syntactic polyurethane (GSPU) foam. The first subsea production tree installed had to be retrieved due to problems caused by the insulation system. This paper will describe the approach taken with respect to the design and analysis of the insulation system; the root cause of the failure and the valuable lessons learned.

Correct material selection in the subsea environment is critical; this paper will describe the approach taken to ensure material compatibility with respect to produced and operating fluids and the environment. It will also describe the problems associated with long term wet storage of the subsea equipment on the seabed and the methods used to counter these problems.

The authors recognize that whilst high pressure subsea facilities are becoming commonplace, particularly in the GOM, this report will provide valuable lessons learned that will benefit engineers responsible for designing and delivering subsea facilities that are required to perform under increasingly demanding operating conditions and environments.

Subsea Overview

The Tahiti subsea facilities consist of an eight well production drill center in the south and a six well production drill center in the north of the field. There is a single well, mid-flowline tie-in midway between the north drill center and the host facility. The drill centers are approximately 3 miles from the host facility and are each served by 2 x 9 inch nominal OD production flowlines and 1 x 6 inch nominal OD test flowline, each drill center is served by two electro-hydraulic steel tube umbilicals. Figure 1 illustrates the field layout.

Each manifold has 2 x 9.625 inch nominal OD production headers and 1 x 6.625 inch nominal OD test header; all headers are rated to 12,900 psi operating pressure. Round trip pigging of the production and test flowlines is achieved via removable pigging loops and a 'Y' spool. The 'Y' spool allows the smaller test pig to drop into the larger production header where it will be swept back to the host using a production flowline pig. The manifold configuration enables production from any well to be directed into any header.