Technical Integrity in a Full Scale Qualification and Test Facility for Offshore Equipment

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ABSTRACT

Technical integrity of a full scale test facility for compressors, separators, valves, flow meters, etc. is a key factor in achieving on plan and budget project development safely. The methodology for successful technical integrity of such a test facility, compared to the technical integrity of a process plant, is outlined. This implies, coordination between technical disciplines and highly qualified personnel and also custom Life Cycle Information (LCI) strategy. When such large scale test facility is integrated in a process plant the technical requirements are even stricter and need to comply both with offshore requirements and onshore process plant requirements. The novelty of the tested technologies, and sometimes the lack of appropriate mature standards, makes it challenging to ensure safe technical integrity solutions for such test facilities. Continuously changing projects, and short time commissioning and decommissioning of equipment, increases the complexity of the test facility and the associated risks. Sound risk assessments, quantitative as well as qualitative assessments, are performed for understanding the integrity limits and their risk contribution. Realistic offshore conditions are the driver to develop innovative cost effective approaches to full scale testing. Examples of such tests are outlined herein, i.e. testing of a submerged 11 MW subsea compressor module weighing 350 metric tons, meant to work on the subsea bed.

KEY WORDS: Subsea; Wet gas compression; Compressors; Test; Technology Qualification; Industrial Scale.

INTRODUCTION

The key to sustainability and effective operations for the oil and gas industry is represented by continuous technical innovation and process optimization. This key is crucial especially during challenging times for the oil industry. But, the process from one idea to development of new technologies, testing and finally production and implementation is often long and expensive. Thus, having a lean and effective technological development and testing is a valuable advantage. Operating a standalone full scale testing facility, for both small and large process equipment (both for onshore, offshore and subsea applications), in many cases may be an expensive investment that can represent a barrier for technological development. However, it is a way to have lower than expected testing and operational costs, than initially foreseen for a standalone full scale testing facility. The solution is to have the testing facility integrated in a large process plant, and thus to take the opportunity of using the available resources in this process plant (Fig. 1). Such resources are utilities, standards and norms, management system, and most important, the technical competencies and technical integrity.

Fig. 1 K-Lab as an integrated part of Karsto process plant

In the following paragraphs the process plant, the testing facility and the technical interactions and collaboration between them are described.

Karsto process plant is a large industrial platform where rich gas, and light oil (condensate) is processed. The raw gas and liquids are coming from the North Sea and are refined in the plant to meet the client’s specifications.

The test facility short name is “K-Lab”, and it is a versatile testing and technology qualification (TQ) facility for the oil and gas industry. K-Lab includes two test loops and a pipeline pigging testing facility. The test loops are designed for full scale testing of various equipment such as multiphase flow meters, valves, compressors, pumps, etc. Karsto