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Optimizing Production in Offshore Scenarios by In Situ Generated Nitrogen

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Abstract

This paper contains a summary of the lessons learned in 4 years of experience with using Nitrogen generated on project site for as solutions for several different types of operation for optimizing field productivity in offshore and remote location scenarios. Nitrogen is used in many applications in field drilling and production operations such as:

- Inductions operations immediately after drilling or well intervention.
- As a means of lifting for well testing.
- Sand clean up after a fracturing operations.
- Removal of solids such as paraffin or hydrates.
- Commissioning of valves, pipelines, vessels, production facilities and FPSOs.
- Drilling wells in underbalance condition.

All these practices have become cost effective solutions not just to accelerate the processes, but also to provide safe, high efficiency and low logistical requirements operations. The application in offshore scenarios is now becoming essential because effective solutions in such high cost operations can have a major impact on the economics of the projects.

This paper will include some examples of typical and some special activities showing comparisons with conventional solutions in order to help decision makers to find out when the use of membrane non cryogenic Nitrogen is the best choice and when a conventional solution is more suitable.

Nitrogen generated in place is just a physical separation by membranes which can be used worldwide with no limitations on climate, geography or accessibility to the location. It is interesting then to share these experiences with other project managers who may think about the solution but don't have parameters available to identify when any given application is appropriate.

Introduction

The use of non-cryogenic Nitrogen was introduced in the petroleum industry some 40 years ago. It has always been well recognized that in situ generation is advantageous where logistics issues make it difficult to keep the Nitrogen supply all time it is required for the project. Once determined the maximum SCFM of Nitrogen required has been determined, the NPU - Nitrogen Production Unit (NPU) is chosen and the project has a guarantee of the continuity of its supply with no time limit. Several projects require Nitrogen supply for months, which makes the use of Cryogenic supply problematical even if it is readily available. This kind of project demands Nitrogen generated in situ, not only to avoid logistic issues and high costs, but also from a safety point of view due to the necessity of keeping a stable and continuous supply of Nitrogen at all times.

While the in situ system of generating Nitrogen started gaining acceptance, satisfied customers wanted to make it applicable for more scenarios and operational personnel gained experience in maintenance and control of the NPUs. At the same time engineering personnel were able to generate compact units which are very easy to mob/demob and very quick to rig up/ rig down. These facts made the Nitrogen generated by membranes more and more economic, arriving to the point that nowadays, the use of non-cryogenic Nitrogen is no longer limited to those projects which require high volumes of Nitrogen.

Discussion

For all cases which will be described in this paper, both onshore and offshore scenarios are being considered. As the main concern of offshore cases is foot print or area occupied, the main difference between offshore and onshore NPU design is the layout and the mob/demob system. NPUs designed for Offshore are composed of compact modules which have the ability to be rigged up either stacked one upon the other or side by side. Each offshore module is shorter than or equivalent to one 10 feet container. Depending on the footprint area available on the platform and the limit of weight per square foot, the arrangement is done to install the NPU in horizontal or vertical rig up. Meanwhile, for onshore cases, the NPUs are usually provided with on a trailer to make mob-demo a more economical process. Onshore NPUs are bigger than offshore, typically being the equivalent of one 20' container. The onshore NPUs normally have a higher SCFM capacity as a result.