The Isolation Technology of Oil and Gas Pipeline in China

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ABSTRACT

The oil and gas pipeline transportation has been developed rapidly in China in recent years. As a result, more and more scheduled and emergent pipeline repair works are required. All the construction works should be conducted when the oil & gas pipeline is under operation, thus the isolation technology is needed to block and seal the oil and gas pipelines in order to finish the follow-up operation. The isolation technology is introduced in this paper in China, including hot taps and line stops and the intelligent plug system. The technical problems and challenges are analyzed according to the development status of them in China. Finally, the possible solutions are discussed in detail.

KEY WORDS: oil and gas pipeline; isolation; hot taps and line stops; intelligent plug system.

INTRODUCTION

For oil and gas pipelines, it is necessary to carry out planned repairing and retrofitting during daily oil & gas delivery to ensure safety production and minimize economic loss. In addition, when any accident occurs, it is necessary to make urgent repair, e.g., urgent hot on-line repair, repair of failed pipe sections, addition of devices, and retrofitting for sub delivery, etc. All the construction works should be conducted when the oil & gas pipeline is under operation, that is, it is necessary to carry out isolation technology. Currently, the hot taps and line stops and the intelligent plug system are used for oil and gas pipelines in the world.

HOT TAPS AND LINE STOPS

The technology of hot taps and line stops is currently widely used in oil and gas pipeline maintenance in China. The existing block device is generally comprised with plugging machine, Plugging Head and Sandwich Valve (Figure 1). Firstly, the hot tapping machine makes hole on the oil and gas pipeline; secondly, the block device is installed on the hole of the pipeline and the plugging head is into the pipeline to block and seal the pipeline; then the follow-up of construction work can be completed. Finally, the plugging head is hoisted from the pipeline and the block device is removed from the pipeline after the construction work is completed. The technology of hot tap and line stops is widely used in the scope of onshore and offshore oil and gas pipelines maintenance since it was invented. Quite a number of scientific research study the block module for many years and made some achievements, however, there are still some technical problems in China.

Fig 1. The block device: 1-plugging machine 2- Sandwich Valve 3- Plugging Head 4-pipeline

The sealing problems of sandwich valve and plugging head are challenges. This kind of technical problems belongs to the scope of high-pressure static sealing technology (Li, 2003). The larger bore of the pipeline, the larger span between fasten bolts, the results is that the sealing becomes failure between upper/down plates and the gate of sandwich valve under the pressure of the pipeline. The plugging head is the key component to plug the pipeline, the weight of main frame, bending arm and plugging head will be large enough to spoil the sealing between plugging head and the inner wall of pipeline (Yu et al., 2006). In another word, large-bore pipeline and high pressure transportation will bring some new technical challenges on sealing. Researchers have to explore or introduce advanced design method to evaluate the sealing performance (Han et al., 2003).

The plugging head is the most important component for the equipments of isolation, and it is the key tool to isolate the flow in pipeline. Therefore, researchers should pay more attention on the theoretical research of it. It seems not complicated work to design a plugging head.