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Plant integrity and reliability are the keys to improving profitability

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Abstract

The technical integrity of a plant means that, under specified operational conditions, the risk of failure is as low as reasonably possible, or A.L.A.R.P. This definition does not precisely tell us what is technical integrity, nor how it can be achieved and maintained. The obvious questions are: How can technical integrity be achieved and maintained, and at what cost? This presentation offers some answers to these questions through a review of the strategy and the management systems developed and implemented in Shell to achieve, maintain, and demonstrate the technical integrity of our plants. Integrity and reliability are neither activities nor names of departments in an organizational chart, but rather continuous processes that involve various management and technical levels in the company. A robust quality system is needed to ensure that the optimum strategies are developed and executed. Examples of the application of these processes and their supporting systems demonstrate that the integrity and reliability of oil and gas production, transportation, and refining plants is a critical factor to ensure their profitability. The elements that form the basis of these systems, and their integration into the plant management, are analyzed. These topics should be of interest to people interested in improving both the safety and the performance of their plants.

Introduction

This presentation focuses on the technical and mechanical integrity, and the reliability, of hydrocarbon processing plants, although the elements and conclusions that will be presented are equally valid for other industrial plants and for oil and gas production and transportation facilities. Mechanical integrity is just one of the components of process safety management, albeit one of its most critical. Clearly, the safety of a process cannot be higher than that of the equipment that contains it. Mechanical integrity is also a key element, but not the only one, to improve the performance, reliability, and profitability of plants, since plants that cannot operate due to failures or product leaks will not generate profits. Many studies have shown that loss of mechanical integrity, which results in leaks, environmental contamination, health and safety incidents, or even catastrophic failures, is the main cause of economic underperformance and loss of human life in the oil and gas industry¹.

The A.L.A.R.P. concept ("as low as reasonably possible") was developed to evaluate the inherent risk of an activity. It means that the possible modes of equipment failure, such as corrosion, fracture, fatigue, embrittlement, erosion, etc., have been evaluated, and the mechanisms and procedures to reduce or mitigate the impact of these failures have been implemented. The risks include economic, environmental, health and safety aspects. Technical and mechanical integrity programmes typically focus on establishing and maintaining risks at an ALARP level.

The information that will be presented can be used to improve the effectiveness of mechanical integrity programmes. The intent is to describe a programme to achieve excellence in asset integrity management (AIM), and not simply to comply with regulations and other government requirements. In our experience, plants that only focus on meeting these regulations and not in achieving excellence in AIM will not achieve the benefits, in terms of economic performance, personal safety and environmental sustainability, that can be obtained from achieving excellence in AIM.

Excellence in AIM does not translate to "expensive". In fact, it can be demonstrated that maintaining asset integrity pays for itself in reducing the number of leaks with a consequent reduction in loss or deferred production, increase in the on-stream availability of the assets, increase in the safety and environmental performance, optimization in the utilization of limited resources, etc.

Maintaining the mechanical integrity of a hydrocarbon processing plant is no secret. It means, simply, to execute the actions required, and to do so consistently, effectively, and continuously, regardless of other priorities that could interfere with their execution, such as achieving or cost reduction targets. It is crucial to maintain the focus on mechanical integrity and not allow distractions by other priorities.