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UTILIZING RFM AND CONDITION MONITORING TO ENHANCING PROCESS SAFETY

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ABSTRACT

This paper discuses how aligning Technical Integrity Standards with RFM can enhance Process Safety, and elaborates on predictive methods to safeguard assets, beginning with monitoring equipment performance and measuring their variables e.g. vibration, thermography, emission, releases, corrosion rate, damage mechanism, NORM, and noise, to establishing proper measures to control the exceedance of these variables.

Keywords: technical integrity, asset integrity, process safety, safety critical elements.

INTRODUCTION

Hydrocarbon Operations are hazardous in nature, whereby potential or likelihood of leaks causing damage to life, property, environment and/or Operators' reputation vary depending on the Technical Integrity (TI) measures—taken to ensure that assets are being designed, operated, inspected and maintained in a way such that under normal operations, the said risks are tolerable and have been controlled and contained to be "As Low As Reasonably Practicable (ALARP)".

Since the TI measures (whatever comprehensive) cannot grant the achievement of the "Zero Incident" goal, major hydrocarbon operators are prepared with Emergency Response Plans that address initial response and communications leading to the containment of the incidents' effects (e.g. H2S release, Hydrocarbon/Chemical Spill, Fire and Explosion, Radioactivity) and to safeguarding of lives, the environment, and assets.

TECHNICAL INTEGRITY

By definition, Technical Integrity of an asset is achieved when, under specified operating conditions, the risk of failure that endangers the safety of personnel, the environment, asset value, or Company reputation is tolerable and has been controlled or contained to be ALARP.

Technical Integrity (as practiced by major operator and advised by global regulatory bodies) depends on controlling the escalation of emergency events and associated consequences at ALARP level, by forming a successive set of Integrity Barriers, where each barrier contains a number of Safety Critical Elements (SCEs). For each SCE, a series of TI Standards for each equipment type were defined as measures to contain the risk of failure.

ASSET INTEGRITY AND PROCESS SAFETY (AI-PS)

Asset Integrity and Process Safety (AI-PS) of hydrocarbon facilities are intrinsically linked and together they constitute Technical Integrity, where Asset Integrity is the process of establishing Technical Integrity, by understanding and evaluating key risks early at the design stage, selecting protection, defining controls to containing risks of failure at an as low as reasonably practicable limit, and executing the design for safety and environmental integrity.

Process Safety is the efforts of safeguarding Asset Integrity through, verifying that appropriate assurance measures are in place to oversee operating assets within design standards, and structuring robust controls to manage risks. This can ideally be achieved by forming a set of Safety Barriers (each of which comprises a predefined set of Safety Critical Elements (SCE)) to control the escalation of events at the unlikely emergency situations.

Since AI-PS goal is the fitness of the assets throughout their lifecycle (from design to decommissioning), aligning Technical Integrity Measures with an efficient and cost effective Maintenance Program (ideally preemptive) is a must.

Risk-Focused Maintenance (RFM) is the process of maintaining equipment predictively. It is a disciplined approach that follows a logic structure to measure equipment performance against predefined set of operating envelops and minimum acceptance criteria to ensure sustainability of design standards (throughout equipment lifecycle) at low cost, while preserving safety.

RESULTS AND CONCLUSIONS

Technical Integrity Framework comprises Asset Integrity and Process Safety assurance methodologies were presented along with an RFM and associated Condition Monitoring system. Combining these elements together (in a proper way) can help proactive assurance of asset integrity and process safety, furthermore, reduce total maintenance costs, increase profitability, and set the position of the organization (in terms of management, leadership and accountability) on the industry ladder.

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