

The Application of a Hybrid Lean Six Sigma Approach for the Improvement and Sustainability of Safety and Health (SH) for Workers and Customers at Petroleum Stations

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Abstract

Occupational safety and health (OSH) is a major concern for any workplace including petroleum stations where extra care and precautions should be always in place due to the hazardous nature of operations there. Any issues related to OSH can lead to very bad outcomes, both from a human and ethical points of view (which is the most important) and also from a financial side as accidents are very expensive in terms of both direct and indirect costs. Thus, it is very important to make sure that both workers and customers are safe all the time. The Lean Six Sigma methodology including the Define, Measure, Analyze, Improve, and Control approach can be used to improve these operations and reduce the inefficiencies and errors which can have a significant impact on the operations in petroleum stations. Another important aspect is the sustainability and monitoring of these operations to ensure that improvements are being sustained and that things are consistently under control. In this paper, a hybrid lean six sigma approach is applied where the hazard analysis (both preliminary and detailed) tools will be implemented within the lean six sigma methodology. In the Define phase, project charter, SIPOC (Suppliers, Inputs, Process, Output, and Customers) diagram and critical to quality characteristics (CTQs) are presented followed by the data collection part where data was collected from several petroleum stations in Kuwait. The data includes the records of unsafe acts and unsafe conditions at these petroleum stations. In the analyze phase, the hazard and risk analysis techniques are applied including preliminary hazard analysis (PHA), and detailed hazard analysis (DHA), specifically the human error analysis (HEA), fault tree analysis (FTA), risk analysis (RA) and the failure mode and effects analysis (FMEA). In the Improve and control phases, suggestions for improvement and sustainability of these improvements are presented including the use of 5S method and the real time monitoring of operations which can be very critical in quickly detecting any safety related issues. Such monitoring system should primarily be able to track the number and patterns of both the accidents and incidents including near misses. An effective tool that can be used to do that is the control charts, specifically the attribute control charts to monitor any patterns which should immediately trigger actions by the petroleum stations.

Keywords

Occupational safety and health (OSH), Six Sigma methodology, Preliminary hazard analysis (PHA), Detailed hazard analysis (DHA)