

SPECIAL ISSUE ARTICLE

Development of pre-startup safety review implementation tool for safe operation in process plant

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Abstract

A pre-startup safety review (PSSR) is a formal review of a chemical manufacturing process to verify that critical areas of the affected process have been assessed and addressed before using the process. It can be a new process or after modification to an existing process or operating conditions. There is concern about full implementation compliance, including designing the PSSR program, preparing the process to perform PSSR, following PSSR action items, and approving the PSSR report. This study aims to develop a PSSR Implementation Tool (PSSR-IT) via the Microsoft Excel platform. At the end of the self-assessment process, the end users were provided with the value of the percentage of compliance with PSSR requirements and a thorough review process prior to the start-up activities. A safety experts' content validation index (CVI) was performed to ensure the tool's content was valid and sufficient for the PSSR process, followed by a case study. Feedback from process safety engineers and PSSR leaders as end users has been collected through the System Usability Scale (SUS). A total of 227 questions have been listed under 10 disciplines, including general info, operation, engineering, operational, process safety, health safety and environment (HSE), action log, final walk down, and approval that cover all essential aspects of review process prior to the start-up activities with CVI value of 0.98, $k = 0.67$. SUS findings demonstrated that all industrial experts and end users believe the tool is suitable and reliable, with a score >85%. Utilizing the PSSR tool will help the industries promote and improve the process safety program at the workplace.

KEYWORDS

pre-startup safety review, process safety management, PSSR implementation tool

1 | INTRODUCTION

Process safety accidents like those that happened in the Bhopal tragedy in December 1984, which caused 2260 fatalities, and the Texas City Refinery explosion involved 15 fatalities (March 2005) and become bad examples of implementing process safety management (PSM) are considered significant tragedies that have transformed the process industry landscape and have resulted in vast changes in regulations and development of standards and safety management systems.¹ As a result of this major accident, Chapter 29, Section 1910.119, titled Process Safety Management of Highly Hazardous Chemicals (HHC), has been gazetted

by U.S. Occupational Safety and Health Administration (OSHA) under PSM requirements in the Code of Federal Regulations (CFR).² PSM has been introduced to minimize or prevent the consequences of catastrophic releases of toxic, reactive, or flammable chemicals.³ A systematic approach to managing the PSM process and activities shall be established to ensure full implementation of the PSM work process. The process requires the program to ensure continuity when personnel change and include quality assurance such as steps to plan, implement, check, and correct the PSM implementation program.⁴

PSM implementation degrees vary within plant facilities due to insufficient systematic mechanisms for industries to comply with PSM