

"21st Century Pathway to Process Safety: From Dependent Systems to Digital Independence"

Case Study of PSM Framework

Rajesh Garg, CCPS Certified, Process Safety Professional

Process Safety Management (PSM) is a vital framework designed to prevent the release of hazardous chemicals and mitigate risks associated with process industries. The roots of PSM can be traced to numerous major industrial disasters that occurred in the 20th century, including the Bhopal gas tragedy in 1984 and the Flixborough explosion in 1974. These catastrophic incidents highlighted the need for stricter safety regulations, leading to the development of formalized safety management systems. Over time, the PSM framework, particularly as outlined by OSHA and CCPS, has evolved to encompass various elements aimed at enhancing safety and operational reliability in industries that handle hazardous materials.

Despite these advancements, Process industries continue to encounter significant challenges in implementing PSM effectively at the grassroots level. Key challenges include managing the vast amount of technical documentation required for plants, ensuring the availability of updated information to end users like operations teams, addressing delays in the Management of Change (MOC) processes, and handling manual workflows for Pre-Startup Safety Reviews (PSSR), Process Hazard Analyses (PHA), Audits, and Safety investigations. Additionally, tracking and updating safety procedures, and ensuring that recommendations from audits and investigations are effectively implemented, often remain prone to errors.

In response to these challenges, strategic initiative has been taken to digitize entire set of PSM elements, in line with OSHA and CCPS guidelines. This paper explains detail journey in transforming PSM processes through digitalization, covering all aspects from fostering a proactive process safety culture to improving emergency response systems. The paper explores the digital tools and systems developed under each PSM element, including the integration of these tools with advanced data analytics platforms. By enabling real-time monitoring of process safety performance indicators, MHF has significantly improved the efficiency, accuracy, and overall health of its PSM framework across its operating facilities. This abstract highlights the success of MHF's digital PSM initiatives, providing a blueprint for other organizations in the industrial sector looking to enhance their process safety practices through digital innovation and underscores the importance of embracing technology as a key component of process safety in the 21st century.

Keywords: Digitalization, *PSM, Management of Change (MOC), Process Hazard Analysis (PHA), Pre Start up Safety Review(PSSR), PSM Chatgpt, IBMS (Interlock Bypass Management System, SOPCV (SOP Compliance Verification), PROMT (Process Management Tool), PSM Power BI Dashboard, D PSI (Digital Process Safety Information Sheet), D SOP CL (Digital SOP Checklist), D PMT (Digital Process Mock Tagging), LMS (Learning Management System), AMS (Audit Management System), CCRM (Chemical Chemical Reactive Matrix), TDMS(Technical document Management System).*

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