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Artificial Intelligence: A Sharp Tool for Process Safety, not a Blunt Instrument

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ABSTRACT

Artificial intelligence (AI) is increasingly being discussed in the context of process safety, often framed around automation, efficiency gains, or the replacement of existing human activities. In practice, many early applications have resulted in limited value, inconsistent outputs, or what practitioners increasingly describe as "AI mush" - plausible-sounding text that adds little insight and can undermine confidence in investigation outcomes.

This paper takes a different position. Rather than using AI to automate simple, repetitive human tasks, it focuses on applying AI to areas where humans are demonstrably inconsistent, slow, or unlikely to engage deeply at scale. The intent is not to replace established process safety methods, but to extend the process safety toolkit by using AI to perform tasks that humans typically do poorly or not at all.

The paper provides a current overview of how AI is being applied in process safety today, with particular emphasis on incident reporting, investigation, and organisational learning. It explores practical applications including: improving the quality of initial incident reports; recreating clearer incident titles and metadata; consistent classification of incident severity and categories; and supporting the early sense-making phase when large volumes of incident data must be reviewed.

A significant focus is placed on where AI can assist investigations and where it should not be used. The paper draws clear boundaries around causal analysis, judgement, and accountability, demonstrating how rules, constraints, and retrieval-augmented approaches can be used to deliberately limit AI behaviour and avoid unsubstantiated conclusions. Practical examples are provided showing how AI can support evidence handling, timeline construction, report drafting, and quality assurance without intruding into human-led investigation methods.

The presentation is deliberately hands-on. Using readily available tools such as Copilot agents, it includes live demonstrations and practical techniques that participants can apply immediately in their own organisations. These examples are vendor-agnostic and focus on configuration, prompting, and governance rather than software promotion.

Finally, the paper looks ahead to where AI in process safety is likely to develop next, highlighting emerging opportunities for improved learning at scale while reinforcing the need for disciplined, transparent, and evidence-based use. Attendees will leave with a clearer understanding of how to use AI purposefully, safely, and without diluting the rigour of process safety practice.

KEY WORDS

Process safety toolkit; Hands-on demonstration; Artificial intelligence; Future of process safety; Incident investigation; Incident reporting; Organisational learning; AI governance; Retrieval-augmented generation;

BIOGRAPHY

Simon has over 30 years' experience in risk management and process safety across the oil and gas, chemical, mining, transport, and utilities sectors, following an early career as an offshore Production Engineer with BP Exploration. He is an experienced ICAM incident investigator and HSE auditor, with specialist expertise in quantitative risk assessment, project risk management, training, and facilitation. Simon was among the first IChemE-registered Professional Process Safety Engineers in Australia. He also volunteers with Scouts Victoria as State Commissioner for Risk and Safety and will serve as Director of Risk when 10,000 youth attend the 2028 Australian Jamboree.

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