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## **Activating the Barrier Guardian: Moving from 'Calculative' to 'Proactive' Safety Culture in Major Hazard Facilities**

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### **ABSTRACT**

For Major Hazard Facilities (MHF), high levels of automation and rigorous regulatory frameworks can inadvertently foster a "compliance trap." At Vopak Australia, while safety statistics remained stable and major risks were theoretically controlled via the Safety Case with practical engineering controls, an internal review identified a critical gap: workforce "auto-pilot" mode. Despite documented Bow-Tie processes and emergency response mechanisms, there was an underlying unease regarding workforce activation—specifically, how frontline personnel would react to the failure of an independent barrier during an abnormal situation.

To address this, Vopak Australia embarked on a journey to climb the Hudson Safety Culture Ladder, moving from a "Calculative" (systems-driven) mindset to a "Proactive" (people-driven) one. The strategy centered on operationalizing "Barrier Thinking" by extracting Bow-Tie diagrams from technical documents and embedding them into the daily operational DNA. Vopak focused on bringing the left-hand side of the Bow-Tie into real-world, day-to-day scenarios, ensuring operators understand how preventative controls actively prevent the loss of control that leads to a major incident.

The core of this transformation was a shift in field engagement and overall risk appetite. Rather than traditional compliance-based auditing, site inspections were redesigned to focus on a singular, critical inquiry: "Which specific barrier could fail during this activity?" This approach forced a move away from generic safety observations toward high-fidelity risk discussions. Regardless of the type of event or incident, investigations pivoted to focus purely on the "failed barrier." Furthermore, Vopak Australia integrated a Bow-Tie framework into its Integrated Management System (IMS), creating specific KPIs for each barrier. These KPIs act as leading indicators, verifying that Safety Management System (SMS) elements are actively working at the field level. This represents a paradigm shift from a document-based SMS to one with effective, real-life implications.

The impact of this cultural pivot has been quantifiable and significant over the last 24 months. For example:

- Contractor Safety: Total contractor-related incidents on site have decreased by 50%.
- Operational Oversight: Active site inspection coverage for high-risk activities surged from an initial 50% to 95%.

- Risk Literacy: By integrating barrier thinking into incident investigations, preventative maintenance, and project development, the workforce has transitioned from passive followers of procedures to active "barrier guardians."

The results demonstrate that when the workforce understands the why behind the barrier, risk appetite decreases and situational awareness increases. This presentation provides a practical roadmap for MHF operators to move beyond "paper safety" and achieve genuine cultural maturity by making invisible barriers the focal point of every workday.

#### **KEY WORDS**

Safety Culture Ladder, Barrier Management, Bow-Tie Methodology, Contractor Safety, Workforce Activation, Major Hazard Facilities (MHF)

#### **BIOGRAPHY**

Avishek Biswas is the National SHEQ Manager at Vopak Terminals Australia, where he serves as a core member of the Management Team driving national safety strategy and governance. A Bachelor of Chemical Engineering with over 10 years of experience, Avishek is a specialist in Major Hazard Facility (MHF) compliance and Process Safety Management. Beyond the energy sector, he has a proven track record of driving cultural transformation in the manufacturing and gas industries by leveraging data-driven system improvements, most recently leading Vopak Australia's transition.

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