



17th Chemical Process Safety Sharing (CPSS)

DIY Smart Bow-Tie Barrier Health Monitoring for Enhancing PSM



[1] MARISA PALANOR
marisa.p@pttgcgroup.com
Company : GC



[2] ATCHARA PANTHASRI
atchara.p@pttgcgroup.com





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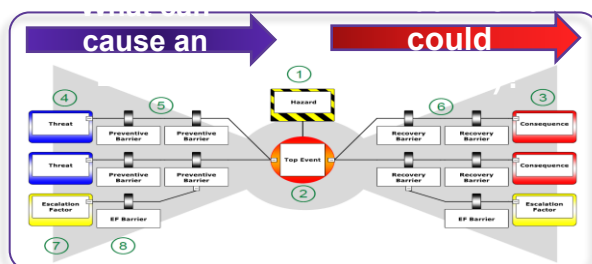
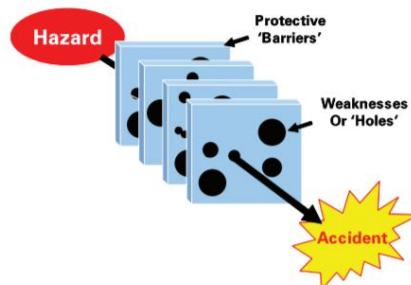
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June 11th, 2026, Pattaya, Thailand



Smart Bowtie Barrier Health Check Process

The objective of MAEs Identification is to systematically identify all hazards or hazardous events which can potentially lead **major accident either directly** or through escalation of events based on life cycle operation of a facility

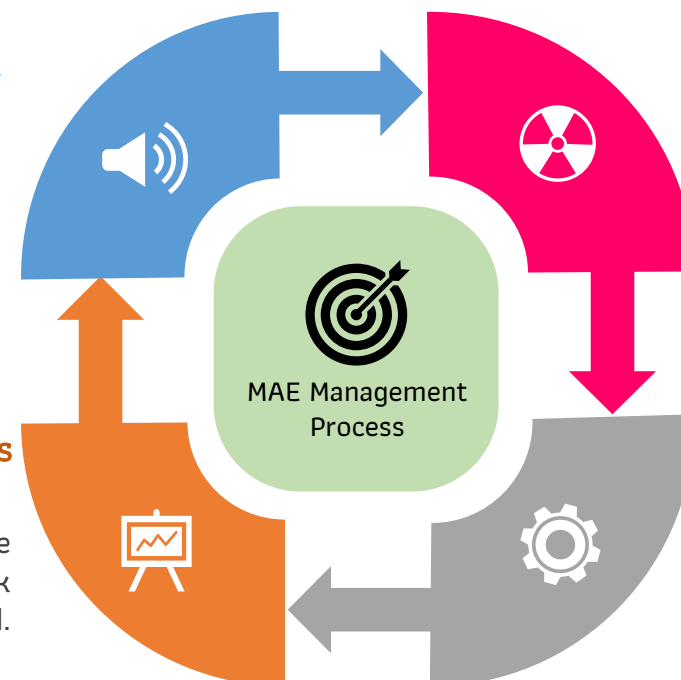


4. Barrier Management & Risk Communication

Findings and risk reduction will be reported and linked into 'ORM Workflow'.

3. Barrier Validation & Audits

Functional and Site Compliance Validations for barrier health check will be performed.



1. MAE Identification

MAEs will be identified by using a severity based.

2. Develop Bow-Tie Models

A brainstorming workshop will be applied for constructing a Bow-Tie Diagram.



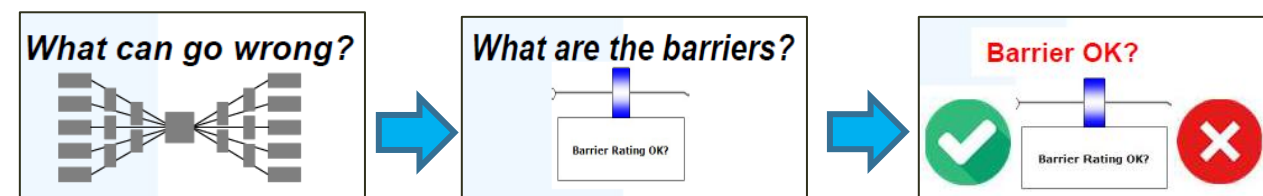
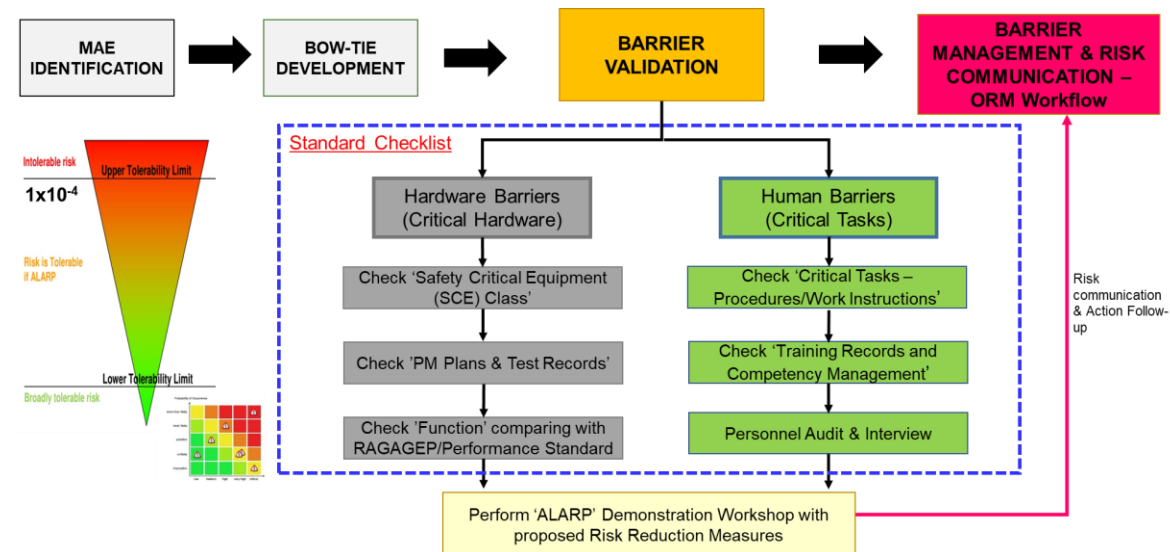
Smart Bowtie Barrier Health Check Process

Bowtie Barrier Health check & Validation

For operations phase, Intent of Barrier Validation is to provide assurance that “the risks of a Major Accident Event is tolerable and ALARP”.

At the **business unit level**, we are required to:

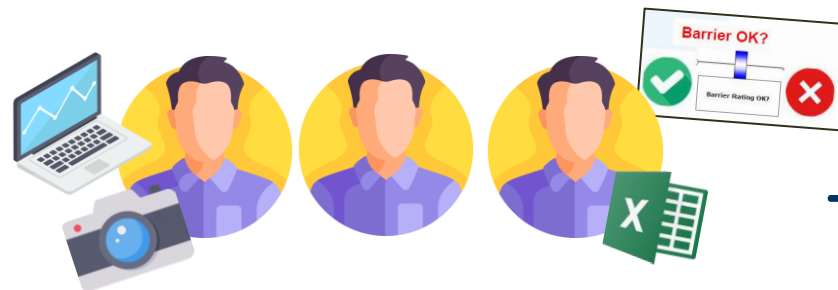
1. Understand the level of risk;
2. Implement effective controls to manage the risk to an acceptable level; and
3. Monitor and assure the controls.





Smart Bowtie Barrier Health Check Process

Work process for Existing Bow Tie Barrier Health Check



Shift Managers manually create reports on the 15th of each month

Operators capture field conditions via camera, then upload images to laptops and consolidate them into 8 Excel reports stored on a shared drive

Engineers manually review and consolidate files to generate monthly summary reports

Delays in approval and verification

Complex process involving multiple steps and devices

Fragmented and scattered information

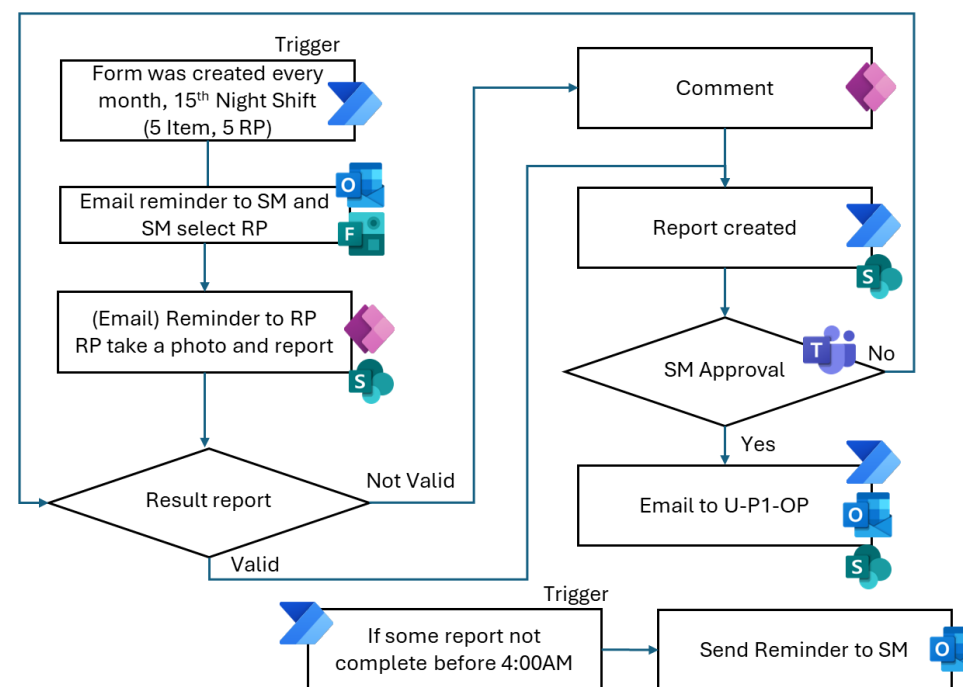
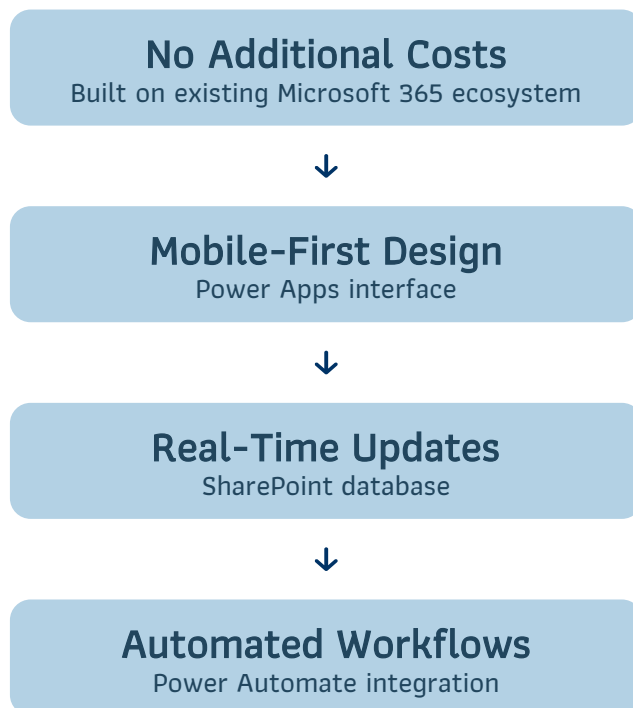
Limited visibility of barrier status



Smart Bowtie Barrier Health Check Process

Solution Overview – Smart Bow Tie Platform

Microsoft 365 Platform





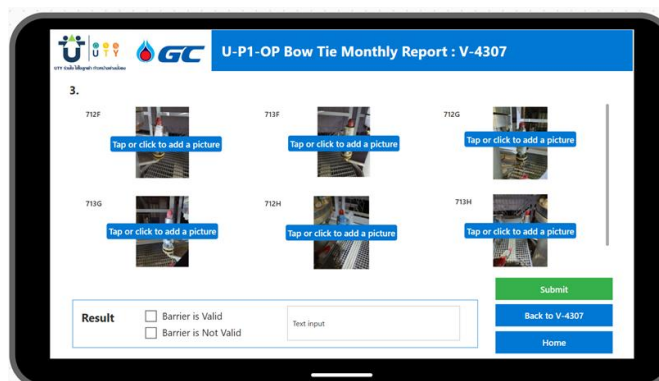
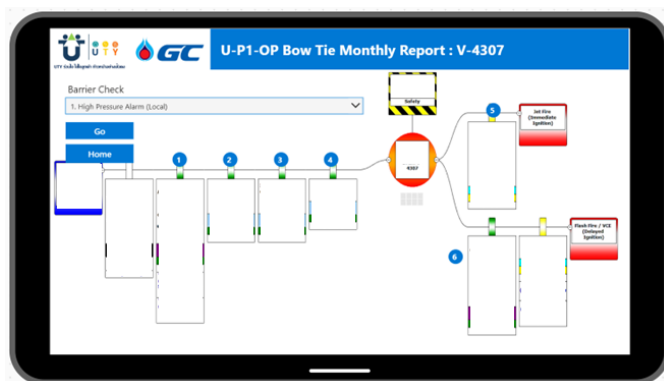
Smart Bowtie Barrier Health Check Process

Hands-on Application Prototype



Key Feature

- ✓ A hands-on mobile application enables operators to verify barrier conditions onsite with just a few taps on a tablet
- ✓ All barrier check records are automatically stored in SharePoint as an online database



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Smart Bowtie Barrier Health Check Process

Achievement

DO LESS

Reduce non-value-added work

- 90% reduction in report preparation time
- FTE reduction = 53 h/year
- Eliminate manual consolidation and fragmented data

DO NOW

Enable faster decisions

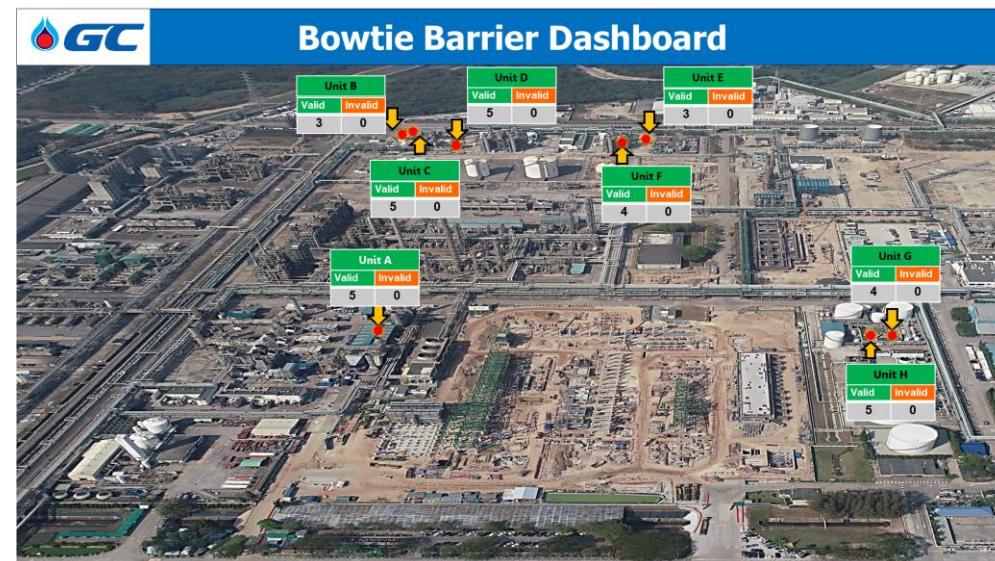
- Ensure the bow-tie barriers Health Checked every month
- Linkage between daily operational activities and risk controls [to be Risk Sensor]
- Quicker, data-driven decision-making

DO MORE

Drive proactive safety performance

- Interactive Bow-tie barrier dashboard
- Corrective action tracking system

PSM is transformed from a manual compliance requirement into a performance-driven system that enables faster decisions and more reliable operations.





Smart Bowtie Barrier Health Check Process

Key Takeaway

Simple digital tools, combined with multidisciplinary collaboration, can transform Process Safety Management [PSM] from a compliance-driven function into a performance-driven system.

In this way, PSM is no longer just a requirement to meet, but PMS is a capability that actively drives safer and more reliable operations.



Thank you for your attention

