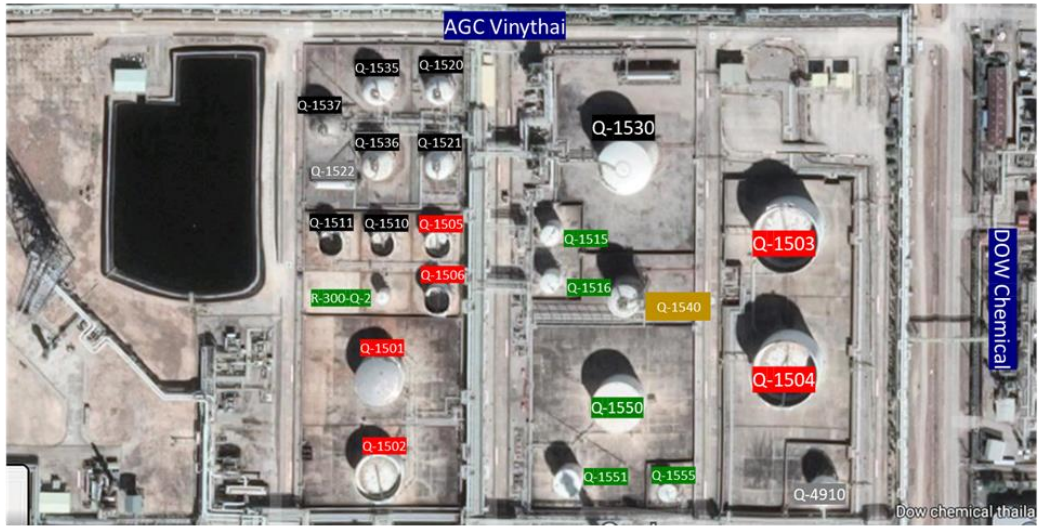
15th Chemical Process Safety Sharing (CPSS)

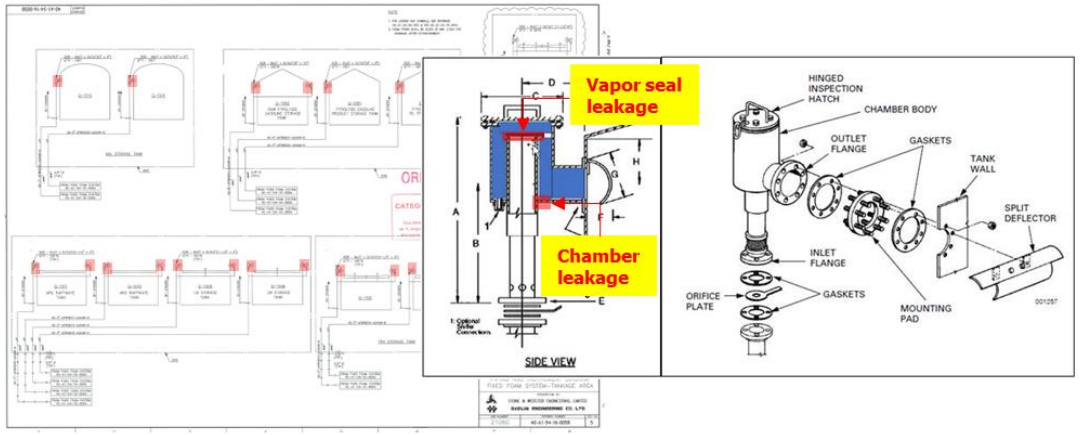
Topic: Aging Tank LOPC Prevention

Presenter Name: Siwanat Chairakwongsa
E-mail: Siwanat.c@pttgcgroup.com
Company : GC

Contents

GC Olefins2 Tank Area Background





Operational Risk Management Workflow

Operational Risk Management Workflow

- **Hazard Identification**
- Risk Analysis & Evaluation
- Risk Treatment
- Documentation Monitoring & Review
- Communication

Hazard Identification
- During an FRA (Facility Risk Assessment) of a chemical storage tank, hydrocarbon vapor backflow was detected entering the foam chamber of the fire protection system.
- Vapor continued through the foam system and drained via the line drain.
- Measurement showed 100% LEL at the drain—indicating a critical explosion risk.

Hydrocarbon-Specific Hazards
- Stored materials include Pyrolysis Gasoline, Mixed Heavy Oil, and Cracker Bottom—all highly volatile, flammable, and odorous.
- These compounds pose significant fire and explosion hazards and affect nearby communities through strong odors.

Vapor Cloud & Flashback Risk
- Accumulated vapors can form Vapor Clouds.
- With ignition sources, flashback may occur, leading to Full Surface Tank Fires—a high-severity fire scenario.

Equipment Age & Maintenance Issues
- The storage tank is over 30 years old, with signs of inadequate maintenance.
- Foam chamber equipment is deteriorated, increasing risks of vapor leakage and system failure.

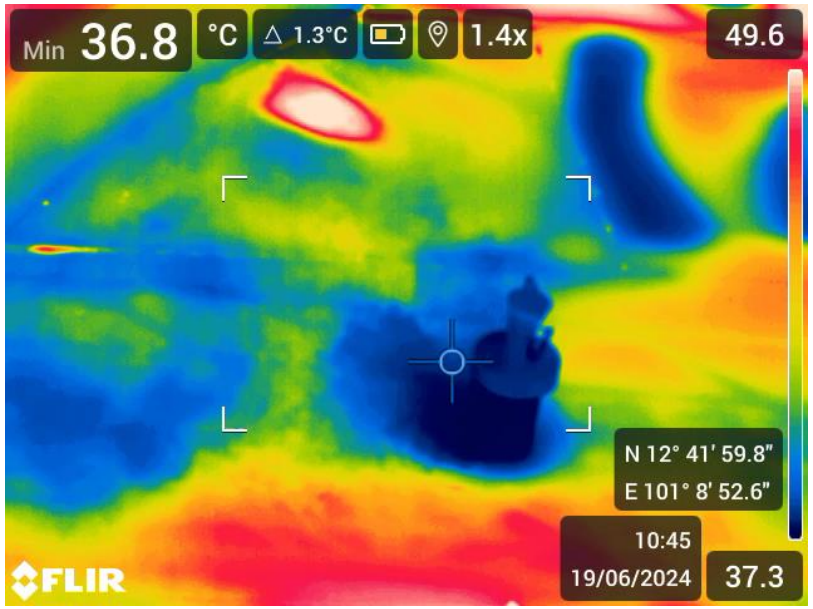
Operational Risk Management Workflow

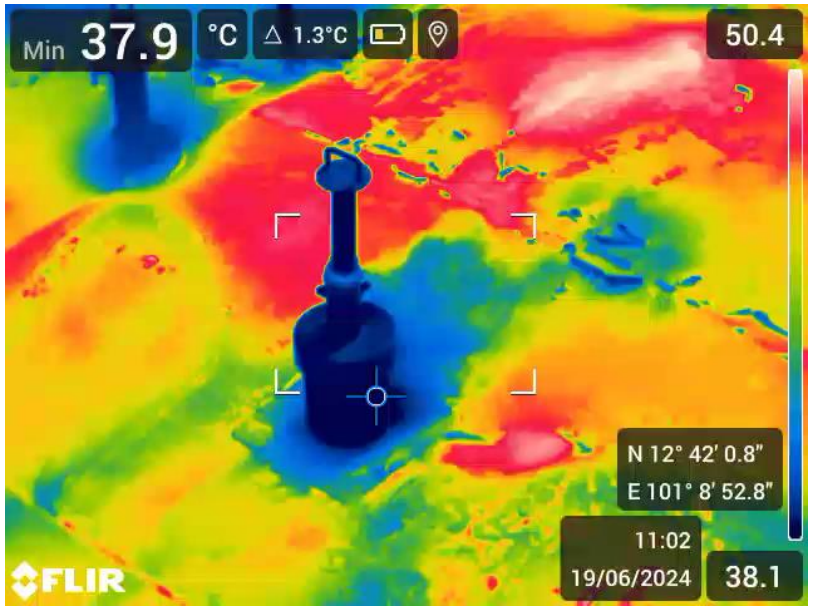
Operational Risk Management Workflow

- **Hazard Identification**
- Risk Analysis & Evaluation
- Risk Treatment
- Documentation Monitoring & Review
- Communication

Extended Inspection Findings: Foam Chambers and Top Tanks Involving VOC Storage

- VOC inspection equipment **(VOC Camera and Portable VOC Detectors)** was deployed to detect Hydrocarbon vapor leaks in the Tank Area.
- Findings:
  - **Detected Hydrocarbon Leakage at 100% LEL.**
  - **VOC concentrations exceeded 300 ppm at the Foam Chambers**
  - **Additional high VOC levels were detected at External Floating Roof Tanks**





Operational Risk Management Workflow

Operational Risk Management Workflow

- Hazard Identification
- **Risk Analysis & Evaluation**
- Risk Treatment
- Documentation Monitoring & Review
- Communication

Key Issues Identified

- **Aging Equipment:** Cone Roof, External Floating Roof, Vapor Seal, Rim Seal not properly maintained.
- **Foam Chamber:**
  - **Rubber Seal deterioration:** Hydrocarbon vapor backflow and leakage via foam drain.
  - **Corrosion at foam chamber nozzles.**
- **Top Tanks:**
  - **Roof Leg and Rim Seal degradation:** VOC emission risk.

Evaluated via RAM (Risk Assessment Matrix) under Process Hazard Analysis (PHA) is "High Severity".

8.2.1.3.1 *RAM* for Process Hazard Analysis (*PHA*)

	General Term (No.)	How often?	Hazard Severity Rating				
Likelihood	Frequent (5)	Has happened more than once per year in the Location	Low	Medium	High	Extreme	Extreme
	Likely (4)	Has happened at the Location or more than once per year in the PTTGC group	Low	Medium	High	High	Extreme
	Possible (3)	Possible to happen in the PTTGC group or more than once / year in the Industry	Low	Low	Medium	High	High
	Unlikely (2)	Possible to occur in the Industry (or has occured)	Very Low	Low	Low	Medium	Medium
	Improbable (1)	Unlikely to occur in the Industry (or has not occured)	Very Low	Very Low	Low	Low	Low
Consequence	Severity Number		(1)	(2)	(3)	(4)	(5)
	People (Safety, Health, Morale)		- No injury or First Aid case - No or very low health effect - No or Minimal morale impact	- Medical treatment or Restrict to work - Low health effect - Short-term morale impact	- Loss time injury - Medium health effect - Long-term morale impact	- Single fatality or Permanent total disabilities - High health effect - Protesters rally or official complaint	- More than one fatality - High health effect - Employees or Contractors strike
	Environment		No/Slight Effect	Minor Effect	Moderate Effect	Major Effect	Massive Effect
	Economic (Total Loss)	GPC (THB)	< 0.3 M	0.3 - < 3 M	3 - < 30 M	30 - < 300 M	≥ 300 M
		BU (THB)	< 0.1 M	0.1 - < 1 M	1 - < 10 M		≥ 100 M
		Small BU (THB)	< 0.01 M	0.01 - < 0.1 M	0.1 - <1 M		≥ 10 M
	Social (Community, Reputation, Customer, Law/Regulation)		- No or Slight impact to Community, Reputation and Customer - No fault or insignificant fault of complying with laws/articles of association.	- Minor impact with short term recovery - Local media - Verbal complaints - Partly comply with laws/articles of association.	- Moderate impact with long term recovery - Regional media - Official letter complaint - Non-compliance with laws/articles of association	- Major impact with national concern - National media - Customer less purchase - Violate the laws/ articles of association.	- Massive impact with international concern - International media - Customer stop purchase - Violate the laws/ articles of association, and/or subject to order to dissolve the company

Operational Risk Management Workflow

Operational Risk Management Workflow

- Hazard Identification
- Risk Analysis & Evaluation
- **Risk Treatment**
- Documentation Monitoring & Review
- Communication

Risk Treatment – Aging Tank LOPC Prevention

Corrective Actions (Completed/In Progress):
- Installed **drain line caps** to prevent hydrocarbon vapor accumulation.
- Conducted **VOC monitoring** using portable devices and alarm systems.
- Repaired and wrapped **leak points** on vapor seal and rundown line.
- Planned **Roof Leg replacement** on degraded tanks.

Preventive Actions:
- Implemented **daily fugitive VOC inspection** in critical areas.
- Launched a **PM plan** for foam systems and top tank components.
- Scheduled **VOC Camera surveys every 6 months**.
- Designed a new **Foam Chamber Bolt-Nut type** for easier maintenance and safer S/D work.

Future Direction:
- Currently testing **TVOCs Online Monitoring System** (PID type) for real-time hydrocarbon leak detection and control.

Operational Risk Management Workflow

Operational Risk Management Workflow

- Hazard Identification
- Risk Analysis & Evaluation
- Risk Treatment
- **Documentation Monitoring & Review**
- **Communication**

Monitoring & Review – Aging Tank LOPC Prevention

Risk Tracking and Documentation
- Risk case logged in ORM system: Hydrocarbon vapor backflow to foam chamber

Review Process
- Progress and actions are tracked in the OACT review platform, ensuring effective implementation of control measures.

Communication & Transparency
- **Risk status and mitigation progress are shared with stakeholders for:**
  - Alignment and accountability
  - Ongoing risk reduction and performance improvement

Thank you for your attention