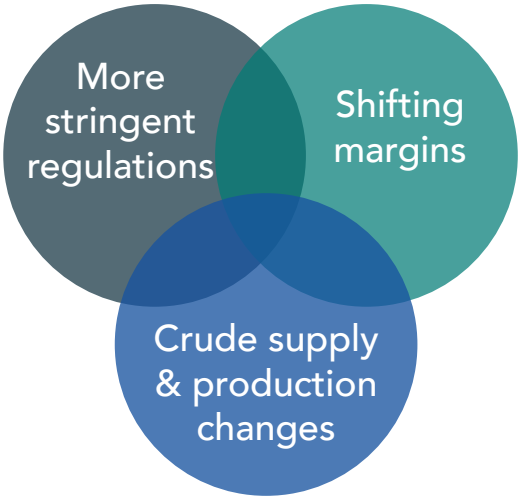
REIMAGINING RESILIENCE WITH INTEROPERABLE, DATA-DRIVEN OPERATIONS

A Process Safety Management Case Study

Global, integrated oil companies today are facing three major challenges:



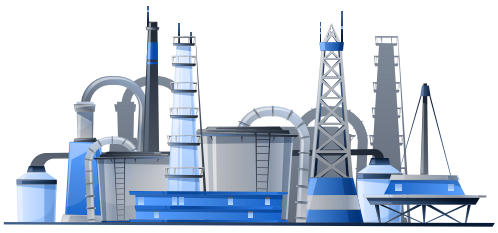
Each one of those challenges directly impacts:

- Maintenance & plant reliability
- Frontline labor productivity
- Safe operations
- Working capital management
- Capital projects and large scale turnarounds
- Shareholder value

Under pressure, organizations are without the tools to properly manage major challenges.

> **93%** of companies say their very existence is jeopardized by operating models that can't keep pace. **- Accenture**

An example:



Asset Profile

Type: Oil & Gas Refinery | Capacity: 270,000 BPD
NCI: 11.8 | Age: 56

KEY CHALLENGES:

- Recently acquired
- Upgrades & installation of special equipment has boosted ability to process difficult crudes into gasolines & distillates
- High utilization
- Shifting margins from oil price downturn

Reliant on **multiple** systems to manage operations:

HSE policies

Inspection and audit

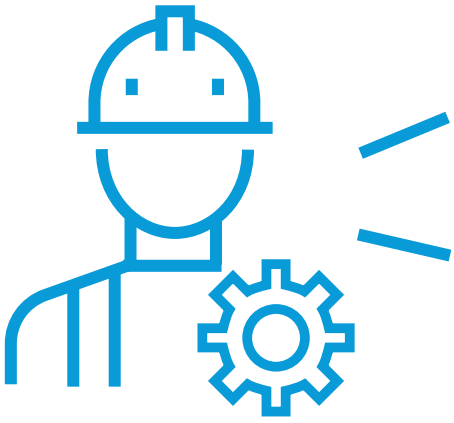
Risk assessments

"Paper on glass" permits

Communication from multiple personnel

Safety-critical Maintenance

Safety-critical Equipment Status

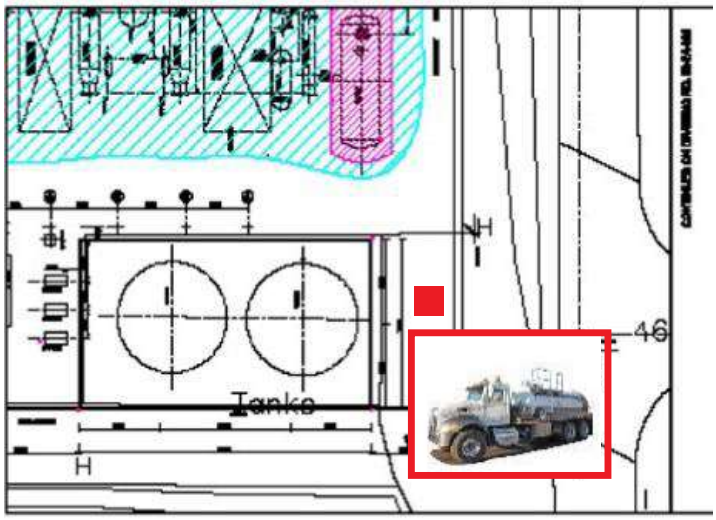


What is the current Process Safety Risk on my plant?

What safety critical work should I prioritize?

What permits are safe to issue today?

Frontline view:



One permit
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- use of the vacuum tanker
- operation within a bunded tank area
- use of hoses
- use of a vehicle within an operational unit
- cleaning activity
- general plant hazards
- electrical isolation not required

Management system shortfalls:

Unclear operating procedures

Lacking permit system

Reliant on multiple systems to manage operations

Inadequate control of contractors

Neglect for procedural gas test requirement

Dated process hazard analysis (PHA)

Incomplete task risk assessment

Insufficient training & competence

Unsatisfactory application of lessons learned from previous incidents

Consequences:

(4) Fatalities and
(1) serious injury

- Loss of Containment
- Explosion

Specific Root Causes:

- Lack of knowledge
- Inadequate risk review
- No safe system of work
- Downgrade to hazardous area classification

No Longer Black Swan Events for Petrochemicals & Refining Operators?

75%

of largest loss events over the last 2 years are contributions of down-stream refining and petrochemical operators (a 15.3% increase over previous years).

> 30 years

65% of loss in plants older than 30 years is the result of critical mechanical integrity failures, with maintenance & inspection failures as the primary cause.

$28bn/€23.8bn

combined loss from largest refining and petrochemical events over the last 20 years.

MARSH

With needed focus on operational risk and process safety management.

only **49%** say there is a high degree of consistency in risk assessment and control processes

only **51%** say companies maintain a high degree of quality in investigations & management

72%

of senior leaders believe oil price downturn has a moderate or significant effect on process safety risk exposure

The New Excellence Framework

	Operational Excellence	Capital Projects Excellence	Asset Optimization
Organization	Operating Model		
	Organizational Effectiveness		
Regulatory	Operating Model		
	Organizational Effectiveness		
Digitalization	Operations & Maintenance		
	Supply Chain		

Digital Resilience - **The use of innovative technology to reimagine organizational, regulatory and digital models to maintain or optimize safe operations, capital projects and assets during unexpected business shocks.**

Value of Operational + System (IT/OT) Transparency

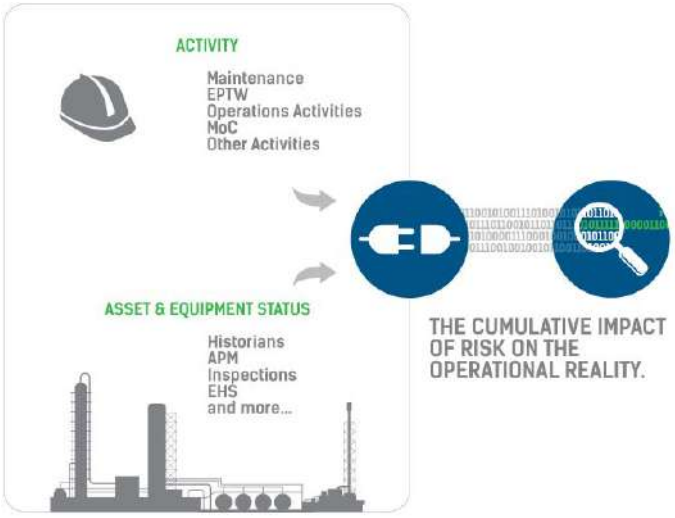
Keep people and assets safe	Reduce and manage costs	Ensure continuous performance improvement
Improve overall asset management and business performance	Implement reliable maintenance programs	
Dynamically increase efficiency at the frontline	Ensure compliance and control	

Digital Components Needed to Support Operational Safety and Resilience

- Safe work standards & policies in practice
- Competence management systems
- Process modification and MoC
- Contractor management
- Safety-critical communication
- Lessons learned
- Schedule prioritization & dynamic management
- Performance Indicators
- Emergency response plan information

Agile, interoperable operating models to support Process Safety & Risk management

1 Management System Integration

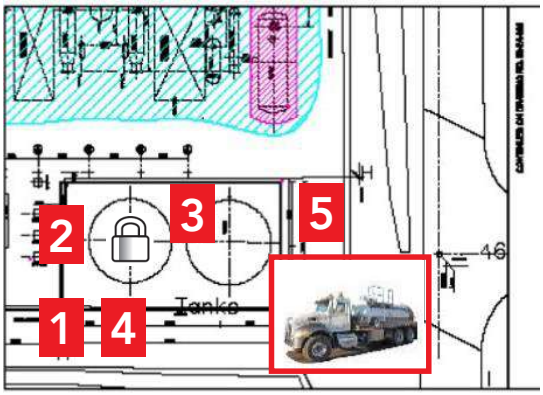


2 Comprehensive View of the Operational Reality & Actionable, Data-Driven Insights

- Live permit status
- Active isolations
- Geographical view of work and nearby risks
- Work conflict indicators
- Live activities
- In-progress MoCs
- Approved work orders
- Incident data
- Risk advisories
- Lessons learned
- Risk register
- Risk assessments for each job
- Operations logbook to support safe shift handover
- Conduct and record gas tests while in the field
- Cumulative risk impact of all activity and all asset/equipment status, providing insight to MAH exposure (e.g. fires and explosions)

3 Central, role-specific dashboards that display needed data for interoperable management enterprisewide

An example: Frontline View



All Tasks/Permits with Risk Assessments:

1
- Cold work - "connect flushing line hoses"
- Drain/Flush/Purge Ops tasks record in shift log
- Gas test and record results (if ok to proceed)

2
- Mechanically Isolate

3
- Cold work – remove manways

4
- CSE IDLH – Enter Part Of Body For Vacuum Hoses placement
- Gas test and record results (if ok to proceed)

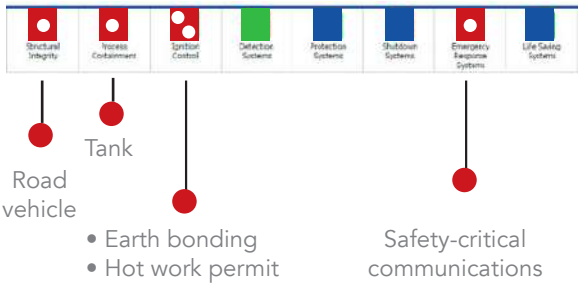
5
- Hot Work - use of the vacuum tanker to remove sludge

Identify hazards and control for each job

Process Safety view:

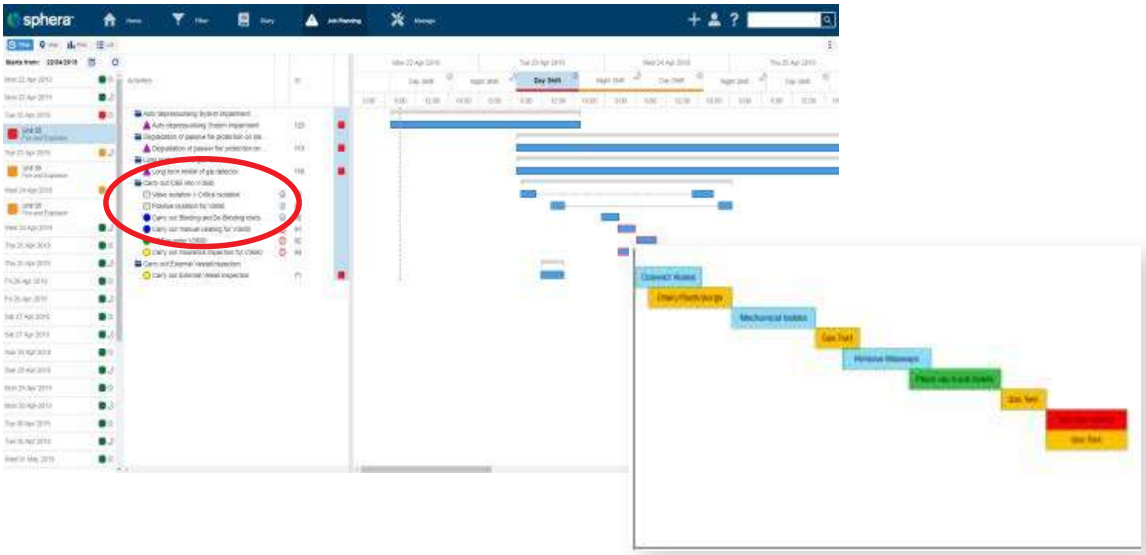
- Navigate shift-to-shift to see changes in process safety barrier health
- Click to reveal details of equipment health, status and deviations
- See the real-time health of the impacted areas

Potential exposure to Fire and Explosion



Aligned to corporate or IOGP barriers/safety critical elements

Work prioritization and scheduling view:



- Navigate shift-to-shift to changes in process safety barrier health
- Understand what is contributing to risk
- Understand the level of risk
- See SIMOPS and conflict detection between jobs

How mature is your process safety management?

Let us help by providing an assessment and maturity enhancement design