PROCESS SAFETY INITIATIVE OF NIGERIA

Q3 2026 NEWSLETTER QUARTERLY

JULY – SEPTEMBER 2026

SAFER TODAY, STRONGER TOMORROW

Turning Lessons into Action, Building a Safer Nigeria



COVER STORY

Process Safety Intelligence: WHAT NIGERIA'S 20-MONTH INCIDENT RECORD IS TELLING US

From road tanker disasters to pipeline ruptures, LPG risks and industrial incidents—our 20-month review shows one clear truth: weak barriers cost lives.

Our path forward: Stronger barriers. Smarter systems. Safer communities.

Together, we can do better.

Page 2

ALSO INSIDE THIS ISSUE

THE 7TH CCPS–DNV JOINT WEBINAR

Record turnout, deep engagement and global reach for Process Safety in Africa.

Page 13

BASE++ INITIATIVES

Building a proactive safety culture on the NLNG Train 7 Project.

Page 15

HUMAN FACTORS ENGINEERING

Designing systems and workplaces to support safe human performance.

Page 20

Q3 PROCESS SAFETY INDUSTRY NEWS

Key developments and updates from Nigeria and around the world.

Page 23

Q4 EVENTS PREVIEW

Conferences, webinars and training opportunities you should not miss.

Page 24



Engr. Mamoud Abubakar, FNSChE

Process Safety Intelligence: WHAT NIGERIA'S 20-MONTH INCIDENT RECORD IS TELLING US

The recurring national signal is loss of containment across petroleum transport, pipelines, and smaller high-hazard facilities—not one isolated refinery catastrophe.

A structured review of public records from January 2025 to Mid-Aug 2026 identified 23 material Nigerian incidents and examined three international incidents for locally relevant lessons. The review assessed asset integrity, legacy infrastructure, petroleum logistics, CNG/LPG growth, non-routine operations, toxic hazards, emergency readiness, governance, and the translation of lessons into action.

The selected events involved more than 200 reported fatalities. However, this also includes process safety incidents in road transport, mining, and defence manufacturing. This is not a national process-safety statistic. It is not derived from an investigation-grade public database; the review is a documented sample—not a census. Because this information comes from media and public reports, it may be incomplete or miss casualties. It is not an official or legal finding and is not a substitute for competent, site-specific advice. Any reported causes are only theories until confirmed by an official investigation.

The evidence points to one decisive intervention: strengthen the barrier chain linking asset condition, operations, logistics, land use, public behaviour, emergency access and incident learning. **Disasters occur when weak barriers align.**

Leaders should scrutinise high-potential and Tier 1/Tier 2 events, identify the weakest safety-critical barriers, verify offsite emergency readiness and ensure corrective actions reach evidence-based closure. Through PSIN and CCPS collaboration, Nigeria can build shared metrics, stronger competence and trusted national learning.

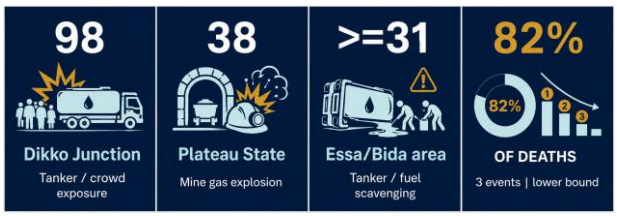
Nigeria's incident signal: concentrated harm

Based on public-record events, January 2025 to Mid-Aug 2026

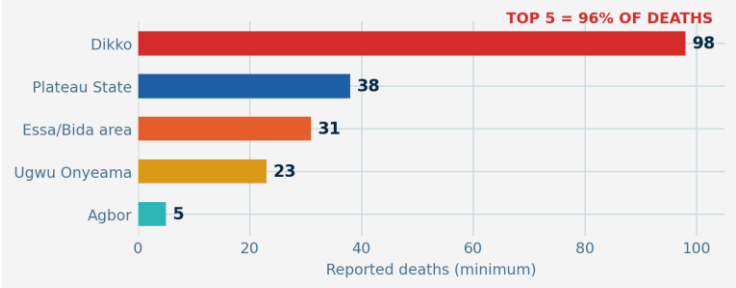
Reported Minimums



Severity Concentration

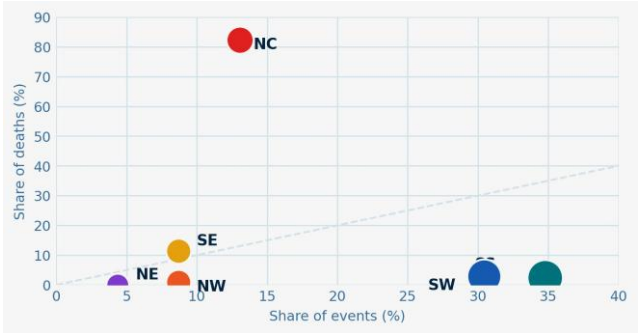


Severity Fatal-Event Pareto



Geography: frequency is not severity

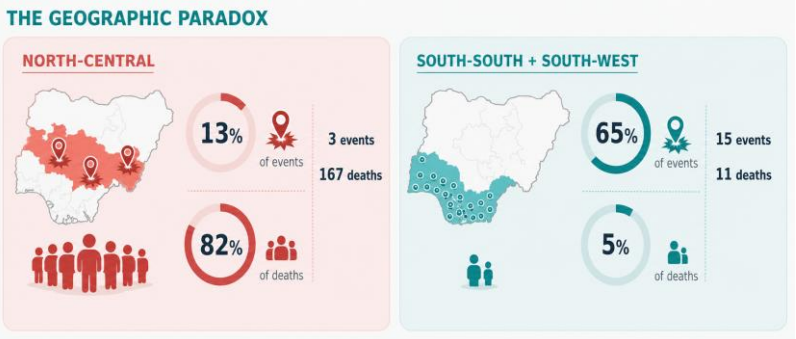
Event share versus lower-bound fatality share across six geopolitical zones



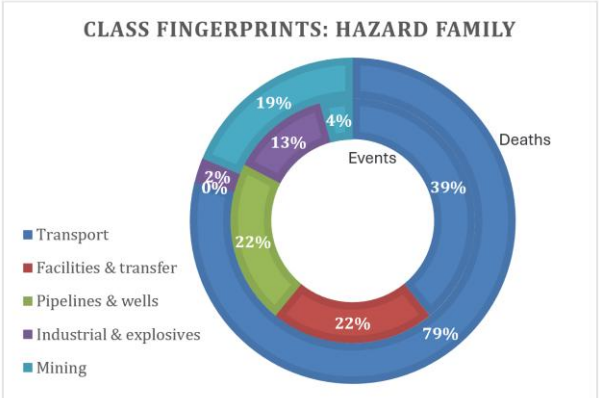
INCIDENT CLASS
Transport is the mass casualty engine

79%	90%
DEATHS FROM TRANSPORT	MINIMUM INJURIES FROM TRANSPORT

THE GEOGRAPHIC PARADOX



CLASS FINGERPRINTS: HAZARD FAMILY



Learning must outlive the news cycle—and translate into safer operations!

EVENT CATEGORIES AGGREGATION

01 Dikko and Essa: When a Tanker Rollover Becomes a Mass-Casualty Event

02 Beyond "Road Safety": Managing the Petroleum Tanker as a Process-Safety System

03 Pipelines: Integrity, Isolation and the Right-of-Way Are One Risk System

04 When Community Access Becomes a Critical Safety Control

05 Fatal Chemistry, Energetic Materials and the Cost of Thin Public Learning

06 LPG and CNG Growth: The Urban Interface Must Not Be an Afterthought

07 From New Rules to Better Barriers: Turning 2025–2026 Developments into Practice

08 Putra Heights: Pipeline Integrity Begins in the Ground

09 Opening Equipment and Starting Up: Where Familiar Plants Become Unfamiliar

10 From Port Storage to Ammonia Clouds: High-Hazard Learning Beyond the Fence Line

11 Metrics, Regulatory Change and AI: Keep Risk Evidence at the Centre

12 An Action Agenda for PSIN and Nigerian Practitioners

1.0 Dikko and Essa: When a Tanker Rollover Becomes a Mass-Casualty Event

Fuel scavenging amplified the consequences, but it does not explain the full multi-barrier failure.

CASE LEARNING

At Dikko Junction along the Abuja-Kaduna Expressway on 18 January 2025, a petrol tanker crash was followed by attempted product transfer and ignition; the widely reported toll reached 98 deaths and 69 injuries *[NEMA, 2025a; Associated Press, 2025c; Channels TV, 2025b]*. **On 21 October 2025 near Essa/Bida, Niger State, another overturned petrol tanker exploded while people gathered around the spill, killing at least 31** *[Associated Press, 2025b]*.

The initiating road event, hazardous recovery activity, ignition control, crowd entry, and emergency exclusion all belong to a single prevent–control–mitigate chain.

1.1 What the public record supports

Reports on the Dikko incident described a generator being used during product transfer. Spilled petrol, a potential ignition source, and a large exposed crowd created the conditions for catastrophic escalation. Later reports on Essa showed the same basic consequence pattern: rollover, accessible product, crowd entry and ignition.

Public reports do not provide investigation-grade findings on vehicle condition, driver factors, road geometry, transfer controls, command timing or the effectiveness of public warnings. Those are questions for competent investigation—not facts to be assumed.

1.2 The barrier chain

- **Prevent**: tanker roadworthiness, stability, speed, route and bridge suitability, journey management and driver competence.
- **Control**: trained emergency transfer teams, suitable equipment, bonding and earthing, ignition-source exclusion, spill containment and stop-work authority.
- **Mitigate**: rapid traffic closure, defensible exclusion zones, local-language warnings, foam and water capability, burn and mass-casualty plans and disciplined incident command.
- **Learn**: preserve evidence, reconcile fatalities and injuries, publish causal findings and verify corrective-action closure.

1.3 Public behaviour is part of consequence modelling

A model that assumes orderly evacuation may be technically neat and operationally false. In areas where spilled fuel has economic value, consequence assessment must anticipate crowd convergence, phone filming, informal recovery and delayed compliance with exclusion orders.

This is not an argument for blaming victims. It is an argument for designing emergency controls around observable human and socioeconomic conditions.

1.4 What regulators and depot operators can do now

- The regulator should establish a coordinated emergency response plan with the support of PSIN and other professional bodies, involving all stakeholders -tanker drivers, transport owners, safety agencies, depot operators, emergency agencies, etc.
- Make release-to-load conditional on verified mechanical condition, capacity, route suitability and emergency equipment.
- Pre-authorise competent recovery contractors and prohibit improvised powered transfer equipment.
- Share tanker identity, destination/route plan/timing, product and quantity with response agencies before departure, and activate alert immediately after a crash.
- Drill police, fire, NEMA/state agencies, operators and communities on immediate exclusion and ignition control.

2.0 Beyond "Road Safety": Managing the Petroleum Tanker as a Process-Safety System

Repeated rollovers, brake or loss-of-control reports, offloading fires and urban exposure show why tanker risk cannot be managed by driver behaviour alone.

SYSTEM ASSURANCE

From Agbor and Enugu to Otedola Bridge, Lagos–Ibadan and Iyana-Isolo, Nigeria's incident record shows a recurring mobile loss-of-containment problem *[Vanguard News, 2025; Channels TV, 2025a; NEMA, 2025c; Channels TV, 2025f; Channels TV, 2025g; Channels TV, 2025e]*. **Filling-station events in Jigawa and Adamawa add the transfer interface** *[NEMA, 2025b; Channels TV, 2025d]*: **the journey does not end when the tanker reaches the gate.**

A tanker's safety case should connect depot loading, vehicle integrity, route risk, driver competence, transfer controls, telemetry and roadside emergency command.

2.1 The mobile major hazard

Bulk fuel combines large inventory, road kinetic energy, vulnerable containment and constantly changing public exposure. A rollover can create a spreading flammable pool or vapour cloud within seconds. On elevated roads and congested corridors, fire can also damage buildings, utilities and evacuation routes.

The control boundary therefore spans multiple organisations: depot, marketer, carrier, driver, vehicle inspector, road authority, police, fire service and emergency management. Who is coordinating them?

2.2 A practical release-to-load standard

- Confirm vehicle identity, authorised capacity, compartment condition, tyres, brakes, suspension, valves and emergency shut-off arrangements.
- Verify driver licence, product competence, hours, fitness, journey plan and route restrictions.
- Check placarding, documentation, extinguishers, spill control, communication and recovery contacts.
- Use telemetry to trigger intervention for speed, harsh braking, route deviation, fatigue exposure and unauthorised stops.
- Refuse loading when evidence is missing; do not let commercial urgency override the gate.

2.3 Capacity limits need performance evidence

NMDPRA barred tankers above 60,000 litres from loading from March 2025 and planned to tighten it to a 45,000-litre limit by Q4 2025 [BusinessDay, 2025], but there is no evidence of implementation. Capacity reduction can reduce inventory per event, but it may also increase trips or shift work toward older vehicles if implementation is poorly controlled.

FRSC reported that tanker- and trailer-related fatalities fell by 61.29% and its crash severity index declined by 15.53% in 2025, attributing the improvement to the Safe-to-Load Programme [FRSC, 2026]. However, the release did not provide the underlying counts, comparison baseline, or severity-index calculation; the figures should therefore be treated as agency-reported outcomes pending detailed validation.

2.4 Assurance questions

- What percentage of loads failed the gate, and why?
- Which routes exceed tolerable rollover or public-exposure risk?
- How quickly can the operator provide product data and a competent technical representative?
- Do drills include crowd entry, vapour migration and a crash without immediate ignition?

If the tanker is contracted, which barriers remain demonstrably owned by the product company and depot?

3.0 Pipelines: Integrity, Isolation and the Right-of-Way Are One Risk System

The Rivers cluster, ELPS breach, Obololi leak and Owaza explosion underline the need to test both failure prevention and consequence control.

ASSET INTEGRITY

Publicly reported pipeline events during the review window included an underwater leak at Obololi *[Premium Times, 2025a]*, **an explosion and fire on the Trans Niger Pipeline at Bodo** *[ICIR, 2025]*, **an Escravos–Lagos Pipeline System breach** *[NNPC, 2025]* **and an Owaza OML 11 pipeline explosion that damaged homes and farms** *[BusinessDay, 2026]*.

Even when deliberate interference is suspected, operators still need effective integrity, detection, segmentation, isolation and community-protection barriers.

3.1 Do not use "sabotage" as a closure code

Intentional damage and process-safety barrier performance answer different questions. Security evidence may explain initiation; it does not show whether pressure trends were recognised, valves isolated quickly, inventory was limited, or communities were warned.

A technically credible investigation should test competing hypotheses with supervisory control and data acquisition (SCADA) and pressure data, patrol records, corrosion history, cathodic protection, in-line inspection, geotechnical conditions, third-party activity and physical evidence from the failure.

3.2 A wider integrity envelope

- **Material degradation:** corrosion, cracking, erosion, defects and ageing equipment.
- **Ground and support:** washout, settlement, soft soil, slope movement and water crossings.
- **External interference:** excavation, theft, encroachment, construction and vehicle loading.
- **Detection and isolation:** alarm quality, leak recognition, valve spacing, closure time and trapped inventory.
- **Offsite consequence:** housing, farms, schools, waterways, ignition sources, access and emergency warning.

3.3 The March 2025 Rivers information problem

The Bodo pipeline fire, a separately confirmed short-duration Port Harcourt Refinery fire [Channels TV, 2025c], and an unconfirmed Soku-area report circulated within days of one another [Dada, 2025]. Public reporting mixed verified events, operator statements, advocacy claims, and political speculation.

That cluster demonstrates why a national learning system needs unique event identifiers, operator and asset verification, confidence grades, and a rule that hypotheses remain labelled as hypotheses.

3.4 Executive/Investigators' evidence to request

- Top integrity threats by segment and evidence that inspection coverage matches those threats.
- Worst-case isolation inventory and actual valve closure performance.
- Repeat leak locations, deferred repairs and temporary controls.
- Encroachment and community-access dependencies included in drills and safety cases.

Your integrity team should be able to show how a leak becomes an alarm, an isolation decision, a public warning, and a verified safe condition!

4.0 When Community Access Becomes a Critical Safety Control

The Kpean/Yorla Well 14 incident shows that stakeholder relationships can directly determine how long hazardous inventory remains uncontrolled.

LEGACY ASSETS

An explosion, fire, and spill occurred at the old Kpean/Yorla Well 14 in Ogoniland in August 2025. NOSDRA later stated that the denial of access delayed repairs and that a secondary spill followed the Joint Investigation Visit [NOSDRA, 2025].

If access can prevent source isolation or repair, it belongs in major-accident hazard analysis, performance standards and emergency exercises—not only in a stakeholder plan.

4.1 Legacy does not mean low hazard

Idle, old or divested wells can retain pressure, hydrocarbons and uncertain mechanical condition. Ownership records may be fragmented, original design information incomplete, and emergency responsibility contested. These are warning signs for stronger—not weaker—governance.

A national legacy-asset register should identify location, ownership, well status, barrier condition, inspection history, credible release scenarios, access route and the party authorised to mobilise source control.

4.2 Access as a performance standard

- Define the maximum tolerable time to reach and isolate the source.
- Identify community, security, terrain and seasonal constraints that could defeat that time.
- Maintain pre-agreed protocols for emergency entry, evidence preservation and community observation.
- Exercise the protocol with operators, regulators, community representatives and responders.
- Track access readiness as a leading indicator and escalate deterioration before an incident.

You consult the community only when there is an incident. They should be fully integrated into your emergency response plan with clear responsibilities, and review with them at defined intervals.

4.3 One incident command structure

Source control, temporary containment, air and water monitoring, public communication, remediation and compensation interfaces should not operate as disconnected workstreams. A unified command structure reduces contradictory messages and makes priorities visible.

Transparency is especially important where historical distrust exists. Communities need clear information on hazards and monitoring; technical teams need safe access; investigators need protected evidence. Those needs can be negotiated before an emergency.

4.4 Assurance actions

- Reconcile all idle, suspended, abandoned and divested assets against field reality.
- Assign named emergency owners and pre-qualified well-control capability.
- Include secondary releases and failed temporary containment in drills.
- Verify that divestment does not leave gaps in records, liability or response authority.

Determine which critical emergency actions at your site depend on permission, cooperation, or access outside the operator's direct control

5.0 Fatal Chemistry, Energetic Materials and the Cost of Thin Public Learning

Terra Acqua, DICON, Quantum Steels and the Plateau mine show why process-safety competence must extend across Nigerian high-hazard industry.

BEYOND OIL AND GAS

Three workers died in the Terra Acqua chemical explosion in Ota in June 2025 *[Premium Times, 2025b]*. **A DICON factory explosion in Kaduna killed two and injured four; management attributed it to expired energetic materials** *[The Guardian, 2025a]*. **A machine blast injured seven at Quantum Steels** *[The Guardian, 2025b]*, **while a reported gas explosion in a Plateau lead mine killed 38 in February 2026** *[Africanews, 2026]*.

PPE and worker behaviour cannot substitute for understanding reaction hazards, operating limits, relief, containment, ventilation, material ageing and competent supervision.

5.1 The unanswered technical questions

For the Terra Acqua event, the public record located for the original report did not establish the chemical identity, reaction pathway, quantities, contamination potential, batch conditions, relief basis or ignition mechanism. Family allegations also raised questions about casual labour, training and protection, but these were not investigation findings *[Premium Times, 2025b]*.

The correct response is neither to dismiss the allegations nor repeat them as fact. It is to commission a multidisciplinary investigation and publish enough technical learning to prevent recurrence.

Withholding incident investigation findings to avoid litigation or public criticism weakens industry learning and may allow failures to recur. A carefully defined regulatory framework could encourage responsible disclosure through appropriate legal and confidentiality safeguards, subject to applicable law and due process. Such protections should not extend to negligence, willful misconduct, regulatory breaches or failure to implement required corrective actions.

5.2 Four high-hazard control domains

- **Chemical reaction safety:** calorimetry, incompatibility, contamination, scale-up, cooling failure and emergency quench.
- **Energetic materials:** shelf life, surveillance, segregation, quantity-distance, ignition control and safe disposal.
- **Industrial machinery**: stored energy, guarding, pressure, maintenance condition and safe operating envelope.
- **Mining atmospheres**: ventilation, methane or toxic gas detection, ignition control, rescue capability and governance of informal operations.

5.3 Precarious labour is a barrier issue

Where casual, contract or informal workers perform hazardous tasks, competence must be demonstrated at task level. Induction attendance is not evidence that a worker can recognise a runaway reaction, verify isolation, interpret an alarm or stop an unsafe batch or task.

Supervision, language, fatigue, production pressure and the authority to stop work belong in the causal analysis alongside hardware.

5.4 The publication standard Nigeria needs

- State verified facts and evidence with confidence.
- Describe the hazardous mechanism and failed barriers without prejudicing legal process.
- Identify systemic causes, corrective actions, owners and due dates.
- Publish closure evidence and lessons applicable beyond the affected company.

A technically competent reader should be able to learn enough from your last serious incident summary to prevent the same mechanism elsewhere

6.0 LPG and CNG Growth: The Urban Interface Must Not Be an Afterthought

A gas tanker collision in Lagos and a filling-station explosion in Calabar on the same day illustrate the expanding number of high-hazard interfaces near the public.

EMERGING DISTRIBUTED HAZARD

On 21 March 2026, a gas tanker–tipper collision and explosion on the Lekki–Epe corridor resulted in reported fatalities, property damage, and disruption to the electrical supply *[Channels TV, 2026b]*. **On the same day, a gas filling station explosion in Calabar South injured residents and affected nearby property** *[Channels TV, 2026a]*.

LPG and CNG mean liquefied petroleum gas and compressed natural gas, respectively; both can form flammable clouds following a release.

Gas adoption must be matched by consequence-based siting, verified equipment safeguards, competent operators, effective emergency isolation and trained municipal responders.

6.1 Distributed sites, distributed exposure

Unlike a large remote facility, retail and mobility gas infrastructure sits beside roads, shops and housing. Rapid sector growth can outpace inspection, maintenance competence, land-use control and fire-service familiarity.

Each site should be assessed for realistic release direction, vapour accumulation, traffic impact, nearby ignition sources, building occupancy and responder access—not only compliance with a nominal distance.

6.2 Critical controls at the interface

- Impact protection for vessels, dispensers, pipework and unloading positions.
- Emergency shutdown, excess-flow devices, hose breakaways and remote isolation.
- Gas detection, ventilation, earthing/bonding and ignition-source control.
- Verified competency for transfer, cylinder handling, inspection and emergency actions.
- Management of change when a petrol site adds LPG, CNG or other gas service.

6.3 Responder competence changes outcomes

LPG vapour clouds, jet fires, vessel heating, boiling-liquid expanding-vapour explosions (BLEVEs) and cylinder projectiles require scenario-specific decisions. Water application, evacuation direction and approach routes should be based on product behaviour and available detection—not improvised at the scene.

Site operators should provide responders with inventories, isolation points, drawings and joint drills before commissioning.

6.4 A commissioning gate for growth

- Independent verification that safeguards are installed, functional and accessible.
- Proof of competent staffing across all shifts.
- Emergency exercise with public agencies and neighbouring occupancies.
- Management system for inspection, alarm testing, hoses, breakaways and relief devices.
- Revalidation after traffic, construction or land-use changes.

Operators must be competent to predict the direction and extent of a full-bore gas release during peak traffic and clearly identify who is authorized to isolate the source.

7.0 From New Rules to Better Barriers: Turning 2025–2026 Developments into Practice

Nigeria's regulatory consolidation and PSIN's stronger international links create an opportunity—if organisations convert participation and compliance into field evidence.

NIGERIA DEVELOPMENTS

During the review period, the Process Safety Initiative of Nigeria (PSIN) joined the Center for Chemical Process Safety (CCPS) and supported Africa-focused learning activities. The Nigerian Upstream Petroleum Regulatory Commission (NUPRC) and Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) published or listed important regulatory frameworks, while tanker-capacity restrictions and methane measurement guidance added new operational expectations.

The value of a regulation, membership or webinar should be measured by changed safeguards, verified competence and reduced exposure—not by publication or attendance alone.

7.1 PSIN's expanded platform

PSIN's admission to CCPS provides access to a global body of knowledge and a network of practitioners. Its role in the CCPS–DNV Process Safety in Africa webinar and its national programmes strengthen its convening position *[PSIN (n.d.-b); PSIN, 2025; PSIN (n.d.-a); PSIN (n.d.-c)]*. PSIN joined CCPS-DNV as an institutional partner to organize the 6th and 7th editions of the annual African webinar series in April 2025 and June 2026, respectively.

The strategic opportunity is to move from events to a learning cycle: participate, apply on-site, peer-review the application, publish anonymised results, and track wider adoption.

7.2 Regulatory framework

NUPRC's Upstream Petroleum Safety Regulations 2024 provide safety-case and risk-based inspection guidance [NUPRC (n.d.-a)], and NMDPRA Operations Regulations 2025 consolidated operations rulebooks for refineries, pipelines, depots, LPG facilities, trucking and retailing [NMDPRA (n.d.)]. From March 2025, tankers above 60,000 L were barred from loading, which was later further tightened to 45,000 L [BusinessDay, 2025].

7.3 Regulation-to-evidence crosswalk

- **Legal duty:** identify the exact requirement and accountable entity.
- **Performance standard:** define what the safeguard must achieve and under which conditions.
- **Assurance evidence:** inspection, test, drill, audit, or operating data showing current health.
- **Regulatory question:** make the evidence inspectable and comparable across sites.
- **Learning loop:** use incidents and near misses to revise the standard and assurance frequency.

7.4 Three developments to test carefully

The tanker-capacity restriction should be evaluated for actual risk per kilometre, not only litres per vehicle. The Safe-to-Load improvement claim should be supported with definitions and denominators. Methane measurement should be integrated with loss-of-containment detection and repair governance, so climate and major-accident data reinforce one another. [*BusinessDay, 2025; FRSC, 2025; NUPRC (n.d.-b)*]

Safety-case and risk-based inspection frameworks should also demonstrate how ageing assets, legacy wells, community access and offsite populations are managed—not merely catalogue hazards.

7.5 PSIN's practical next move

- Publish a Nigerian incident taxonomy and evidence-grading protocol.
- Create practitioner crosswalks for major NUPRC and NMDPRA requirements.
- Convene regulator–industry peer reviews of barrier performance standards.
- Measure whether training changes field decisions and critical-control health.

8.0 Putra Heights: Pipeline Integrity Begins in the Ground

Malaysia's 2025 gas pipeline fire is a sharp reminder that material integrity, soil support and land development must be managed together. [Associated Press, 2025a; BERNAMA, 2025; PETRONAS, 2025]

GLOBAL LESSON | LOCAL APPLICATION

The Petronas gas pipeline explosion in Putra Heights, Malaysia, on 1 April 2025 injured 145 people and damaged homes and vehicles. Reports on the investigation attributed the failure to inadequate support associated with soft and moist ground; PETRONAS established an independent task force *[Associated Press, 2025a; BERNAMA, 2025; PETRONAS, 2025].*

Pipeline integrity programmes must treat geotechnical change as a live degradation mechanism and connect it to isolation inventory, emergency zones and land-use surveillance.

8.1 Why this matters in Nigeria

Nigerian pipelines cross wetlands, flood-prone terrain, river systems, eroding slopes and fast-changing settlements. A line can meet material specifications yet fail when support conditions change, loads concentrate or nearby development alters drainage and access. A conventional corrosion-led programme may therefore miss the controlling threat.

8.2 Add geohazards to the integrity loop

- Map soil, groundwater, flood, erosion, settlement, slope and water-crossing threats by segment.
- Define monitoring triggers and inspection intervals for changing ground conditions.
- Integrate satellite, survey, patrol and maintenance observations into one threat picture.
- Periodically reassess strain and support after construction, flooding or drainage changes.
- Escalate anomalies using risk, not ownership boundaries between civil and integrity teams.

8.3 Model the inventory after rupture

Consequences depend on more than failure size. Valve spacing, detection time, decision delay, closure time, and continued decompression determine the released inventory. A high-pressure gas line can continue feeding a fire after isolation commands are issued.

Emergency planning should use credible closure performance and population data, then test public warnings and evacuation routes under traffic and communication constraints.

8.4 Assurance questions

- Which pipeline segments have geotechnical threats with no current performance standard?
- What data would trigger shutdown or immediate excavation?
- How is new development inside the consequence zone detected and managed?
- Do drills use the maximum credible isolation inventory rather than a convenient release size?

If the soil beneath a critical pipeline changed gradually, which indicator would reveal the loss of support before containment failed?

9.0 Opening Equipment and Starting Up: Where Familiar Plants Become Unfamiliar

The Martinez refinery fire and Marathon Renewables investigation show why isolation, line-up and safe operating limits require independent verification.

NON-ROUTINE OPERATIONS

Two separate Martinez-area incidents are relevant. On 1 February 2025, opening process equipment for planned maintenance at Martinez Refining Company caused a hydrocarbon release, fire, injuries and community health measures [Contra Costa County Fire Protection District. (n.d.); JEM Advisors, 2025; Bay Area, 2025]**. Separately, in November 2023, a fired-heater tube ruptured during start-up at Marathon Martinez Renewables, releasing renewable diesel and hydrogen and causing a major fire. The CSB's March 2025 report attributed the rupture to misaligned valves that diverted process flow and blocked burner-air inlets that caused afterburning and tube overheating** *[CSB, 2025a].*

Planned work is not low risk. Residual inventory, wrong line-up, low flow, burner operation, and worker location can align rapidly during maintenance and start-up.

9.1 Why non-routine work defeats familiarity

Normal indications may be unavailable, equipment states change, and several teams interact under schedule pressure. Operators may rely on drawings, tags, or verbal confirmation that do not reflect the physical condition.

The risk rises when hazardous material remains trapped behind a valve, drains are ineffective, blinds are absent, or start-up proceeds outside validated safe operating limits.

9.2 Positive isolation is an engineered state

- Identify every energy and inventory source, including bypasses, dead legs and pressure migration.
- Use positive isolation where consequence warrants it; do not confuse a closed valve with zero energy.
- Drain, vent, purge and test at the point of opening under representative conditions.
- Independently verify physical line-up and isolation before breaking containment.
- Position workers outside credible release paths and define a stop condition for any discrepancy.

9.3 Start-up needs safe operating limits

The Marathon case highlighted the interaction of flow, valves, heater firing, worker proximity and oversight. Alternative or lower-carbon feedstocks do not remove core pressure, temperature, fuel and hydrogen hazards.

Start-up procedures should state limits, consequence of deviation, operator response and the evidence required to

continue. Alarms must lead to decisions; they are not substitutes for a safe line-up.

9.4 A national learning campaign

- Select recent local line-opening, isolation and start-up near misses for anonymised review.
- Observe field execution, not only permit paperwork.
- Audit residual-inventory verification and worker positioning.
- Track repeat deviations, overrides and overdue corrective actions at leadership level.

Before the next line opening, what physical evidence—not signatures—will prove the equipment is free of hazardous inventory?

10.0 From Port Storage to Ammonia Clouds: High-Hazard Learning Beyond the Fence Line

Global events in ports, fluorochemical processing and food refrigeration carry immediate lessons for Nigerian logistics parks, chemical users and cold-chain operators.

TOXIC AND LOGISTICS HAZARDS

The April 2025 Shahid Rajaee Port explosion in Iran killed at least 57 people and injured more than 1,000 *[Kolivand, 2025]***. US CSB reports on repeated hydrogen fluoride releases at Honeywell Geismar and an ammonia release at Cuisine Solutions show how toxic inventory, relief discharge, and emergency preparedness can fail in very different sectors** *[CSB, 2025b; CSB, 2025c].*

Chemical identity, compatibility, segregation, safe relief disposal, remote isolation and offsite emergency action are core process-safety duties wherever hazardous inventory is stored or used.

10.1 Port and logistics controls

Public accounts of the Shahid Rajaee event implicated hazardous-goods storage, segregation and safety compliance, while the precise chemical identity remained contested [Kolivand, 2025]. That uncertainty is itself a lesson: emergency responders need accurate declarations before an incident.

Nigerian ports and inland logistics parks should test declaration quality, compatibility segregation, dwell time, fire monitoring, access, blast separation, and the ability to isolate or move exposed inventories.

10.2 Repeated toxic releases demand systemic action

The CSB examined three catastrophic hydrogen fluoride release events at Honeywell Geismar over less than three years [CSB, 2025b]. Recurrence shifts the question from isolated equipment defects to governance: how hazards are recognised across events, how actions are prioritised and whether repairs address systemic causes.

For HF, chlorine, ammonia and similar inventories, material compatibility, flanges and gaskets, detection, remote isolation, refuge, escape and community warning require integrated assurance.

10.3 Relief discharge is not automatically safe

At Cuisine Solutions, an ammonia pressure-relief discharge formed a toxic cloud [CSB, 2025c]. Relief protects equipment from overpressure; it does not guarantee that discharged material reaches a safe location.

Cold-chain and food facilities should evaluate discharge height and direction, occupied areas, weather, detection, alarms, muster logic, and evacuation. Their hazard may be smaller than a refinery's, but their proximity to workers and communities can be greater.

10.4 Immediate actions

- Reconcile declared chemical inventories against physical stock and safety data.
- Review segregation and escalation paths for fire-exposed containers.
- Model toxic relief discharges and test alarms under realistic weather.
- Escalate repeat events and impaired toxic-gas safeguards to senior leadership.

Where does each relief device discharge—and what would a person downwind experience under the worst credible weather?

11.0 Metrics, Regulatory Change and AI: Keep Risk Evidence at the Centre

Global developments in performance data, CO_2 pipeline rules, risk-management policy and process-safety analytics point to a common need: stable, transparent governance.

FUTURE-READY GOVERNANCE

International Association of Oil & Gas Producers (IOGP)'s process-safety event datasets, proposed US carbon dioxide (CO_2) pipeline requirements, changes to US Risk Management Program policy, and the growing focus on big data and AI all affect how practitioners define, measure, and govern major-accident risk *[IAOGP, 2025; IAOGP, 2026; PHMSA, 2025; USEPA, 2026; AIChE,2025b; AIChE,2025a].*

Use consistent definitions and engineering evidence across regulatory cycles; technology should strengthen human decisions, not hide weak data or unclear accountability.

11.1 Metrics need definitions and denominators

IOGP publishes Tier 1 and Tier 2 process-safety event data normalised by work hours and segmented by activity, consequence and material [IAOGP, 2025; IAOGP, 206]. Voluntary participation and portfolio differences mean comparisons require care.

Nigeria needs a common baseline that separates personal safety from process safety and includes high-potential events, demands on safety systems, overdue inspections and impaired safeguards.

11.2 CO2 pipelines are not ordinary gas lines

US proposals highlighted emergency planning zones, dispersion modelling, fracture control and broader lifecycle coverage. Nigerian carbon capture plans should address impurities, dense-phase decompression, terrain-following clouds, asphyxiation, fracture propagation and responder detection before projects reach commissioning. [PHMSA, 2025]

Early standards reduce the risk of importing equipment without importing the required competence and emergency capability.

11.3 Risk controls should survive policy cycles

US EPA reconsideration of its 2024 Risk Management Program rule illustrates that regulatory requirements can expand and contract [USEPA, 2026]. Companies remain responsible for risk-based safeguards where credible consequences justify them.

Independent audits, root-cause quality, safer-technology reviews and community preparedness should not disappear simply because a rule changes.

11.4 Govern AI as management of change

- Define the decision the model supports and the human accountable for it.
- Test data completeness, bias, drift, false alarms and missed-event consequences.
- Protect process and safety-system data from cyber compromise.
- Validate recommendations against engineering limits and field conditions.
- Retain an auditable trail of model, data, override and final decision.

Which leading indicator would reveal weakening barriers months before your next Tier 1 event?

12.0 An Action Agenda for PSIN and Nigerian Process Safety Practitioners

The next step is a national learning and assurance system that produces common definitions, rapid learning products, competent investigators and visible closure.

FROM LEARNING TO EXECUTION

Nigeria's incident record and recent professional developments support a practical sequence: establish governance, publish rapid learning, pilot a national portal, strengthen tanker barriers, build investigation competence and address emerging-energy hazards.

Success should be defined by field application and verified control health—not the number of events held or documents issued.

12.1 Establish the learning architecture

- Approve incident scope, severity bands, evidence grades, confidentiality rules and a causal taxonomy.
- Form a steering group spanning regulators, operators, academia, emergency services and labour.
- Publish rapid alerts on tanker emergency transfer, positive isolation/opening equipment and LPG siting/emergency shutdown.
- Agree how anonymised learning will be reviewed, corrected and released.

12.2 Test national systems

- Pilot collection of Tier 1, Tier 2 and high-potential events without company league tables.
- Publish quarterly trends with definitions, denominators and confidence limitations.
- Develop a tanker barrier standard covering release-to-load, route risk, telemetry and roadside command.
- Begin common investigator training in evidence preservation, barrier analysis and human/organisational factors.

12.3 Demonstrate capability

- Run peer reviews of safety-case demonstrations for ageing assets, geohazards, legacy wells and community access.
- Issue practice notes for ammonia, CNG, LNG, and battery energy storage.
- Create first-responder modules and exercise them with actual local agencies, community organisations and leaders, etc.
- Publish a State of Process Safety in Nigeria report with action closure and research priorities.

12.4 Practitioner assurance checklist

- **Leadership**: Are major-accident risks and repeat events visible separately from total recordable incident rate (TRIR) and lost-time injury (LTI) metrics?
- **Assets**: Does every safety-critical element have a performance standard, owner and assurance test?
- **Operations**: Are start-up, shutdown, line opening and temporary operations specifically assessed?
- **Transport**: Can a depot prove vehicle, driver, route and emergency readiness before loading?
- **Community**: Do consequence models include actual populations, traffic and behaviour?
- **Emerging energy**: Has management of change addressed different dispersion, toxicity, ignition and response behaviour?

Engr. Mamoud Abubakar is a chemical engineer, sustainability, and ESG specialist.

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Process Safety in Africa: The 7th CCPS–DNV Joint Webinar with PSIN as the Institutional Partner

10 June 2026 | Platform: Zoom



1. A landmark turnout with deep engagement

The 7th CCPS–DNV webinar drew a large, genuinely global, and highly attentive audience of process-safety professionals, concentrated where the programme was aimed: Africa's energy sector. Attendance and engagement figures, summarised below, confirm both the reach and the relevance of the programme.

2. Attendance and Geographic Reach

2.1 Global Audience, Anchored in Africa

Of the 592 attendees, 452 (76%) joined from across the African continent, a bullseye for a programme built around Process Safety in Africa. The remaining quarter spanned the Middle East, the Americas, Europe and Asia-Pacific. Reach also extended to small delegations from Trinidad, Madagascar, Eswatini, Brunei and beyond.

Metric	Result	Interpretation
Unique attendees	592	All distinct registrants present
Countries represented	57	Truly worldwide reach
Organizations	317	Operators, regulators and academia
Person-hours watched	1,230	Total live attention time
Median watch time	122 mins	Half of attendees stayed longer than this
Stayed 120+ minutes	50%	Sustained, high engagement

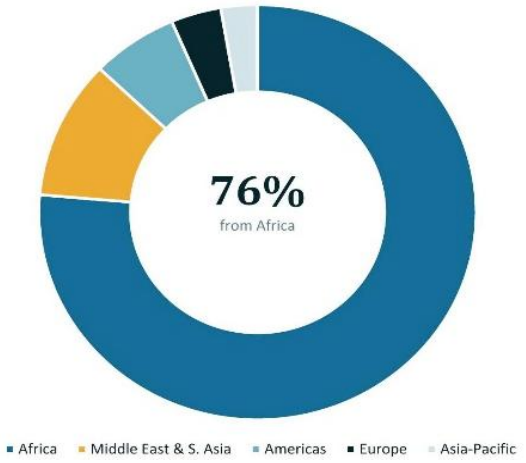


Figure 1: Share of attendees by world region.

Region	Attendees	Share of Total
Africa	452	76%
Middle East & South Asia	64	11%
Americas	38	6%
Europe	22	4%
Asia-Pacific	16	3%
Total	592	100%

2.2 Country Breakdown: Nigeria Leads; Ten Countries Dominate

Nigeria alone accounted for 300 attendees, 51% of the entire audience. The next nine countries by attendance are shown in Fig 2.

What this tells us

West Africa's oil-and-gas hub drove turnout; there was strong North and Southern Africa presence (Egypt, South Africa, Algeria, Morocco); and notable non-African interest came from India, the United States, and the Gulf.

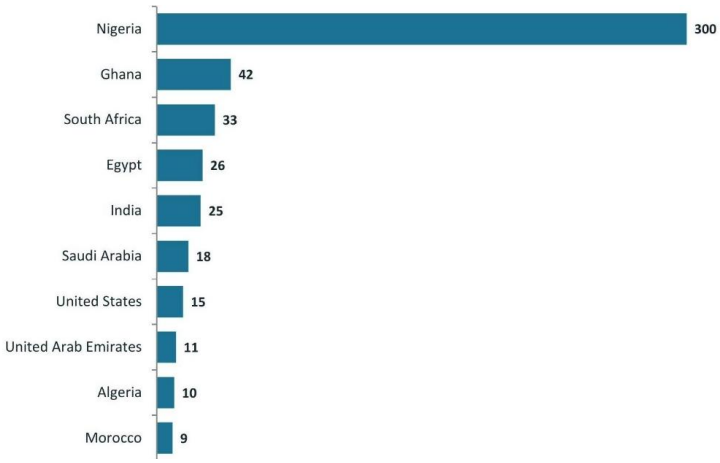


Figure 2: Top ten countries by attendee count

3. Audience Profile

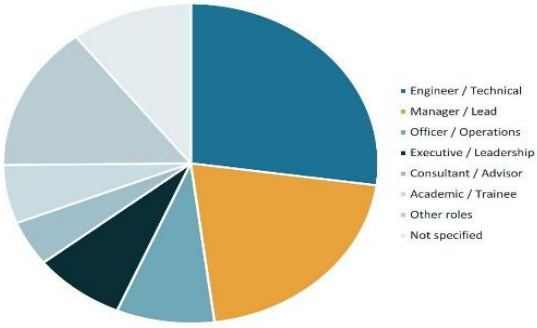


Figure 3: Attendees by professional role.

The webinar attracted a senior, safety-focused professional audience. Thirty-six percent of attendees (212 individuals) hold Safety, HSE or Risk roles, and carry process-safety responsibility directly in their job title, confirming a tightly targeted, on-topic audience.

Note: *The remaining attendees were distributed across Consultant/Advisor, Academic/Trainee, Other roles, and Not Specified categories (individual counts not broken out in the source attendance data).*

4. Organizations and Sectors

Participation spanned 317 organizations. National oil companies anchored attendance, alongside global majors, regulators and universities, a cross-section of the entire process-safety ecosystem.

Sector	Notable Participation
National oil companies	NNPC Group and NEPL alone fielded approximately 100 attendees, the single largest contingent.
Global energy majors	SABIC, NLNG, Sasol, ADNOC, TotalEnergies, Sonatrach, Aradel, Seplat and more.
Regulators & authorities	NUPRC and national petroleum regulators attended in numbers.
Academia & consultancies	Universities (KNUST, BIUST) and independent risk consultancies represented.

5. Engagement and Attention

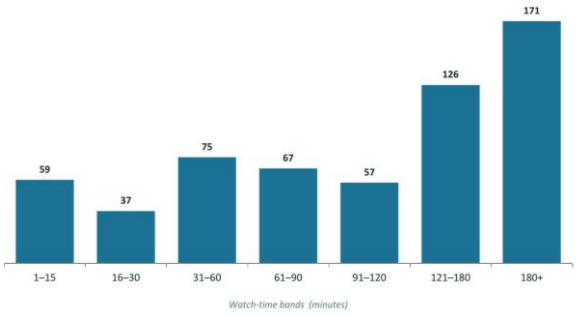


Figure 4: Distribution of attendees by watch-time band.

Most attendees stayed for the full programme. Watch-time skews heavily toward the long end: the largest single group stayed beyond three hours, and only one in ten dropped off in the first 15 minutes (Fig 4).

6. The Programme and Speakers

Practitioners from South Africa, Egypt, Nigeria and Ghana shared management-of-change, incident-lessons, asset-integrity and functional-safety expertise across seven 20-minute talks. The closing technical block focused on keeping ageing assets safe and on the emerging intersection of cybersecurity and functional safety.

Speaker	Role & Organization	Country	Topic
Jill Peters	Risk Mgmt & Process Safety Advisor, Capital Projects — Astron Energy	South Africa	Management of Change
Ahmed El Sonbaty	Process Safety Engineer — Helwan Fertilizer Co. (HFC)	Egypt	Lessons learned: hydrogen flange fire in an ammonia-plant methanator unit
Dr. Gogomary Oyet	Major Energy Marketers' Association of Nigeria (MEMAN)	Nigeria	Process safety & asset integrity in storage and retail facilities
Chika Obani	Renaissance Africa	Nigeria	Practical asset-integrity management & life extension of ageing oil & gas facilities
Dauda A. Rahman	Project Manager & Lead, FEED Team B — NNPC E&P Ltd (NEPL)	Nigeria	Managing ageing assets in NEPL upstream operations
Stephen Davor	Health & Safety Superintendent — Genser Energy	Ghana	Managing ageing assets in power & gas operations: a process-safety perspective
Stephan Marais	Lead — DNV	South Africa	The cyber gap in functional safety

7. Key Takeaways

Takeaway	What the Numbers Show
On-target reach	592 attendees from 57 countries, 76% from Africa — the audience matched the programme's African focus precisely.
Exceptional engagement	A median 122-minute watch time and 50% staying past two hours signal content that genuinely held the room.
Right people, right roles	36% in explicit safety/HSE roles, led by engineers, managers and a strong executive layer.
Momentum to build on	NOC, major-operator and regulator participation creates a ready audience for follow-up sessions and deeper formats.

The Base++ Initiatives

Building a Proactive Safety Culture on the NLNG Train 7 Project

Engr. Edith Opuada Hart | Adapted from NSChE HSE Sectorial Group Technical Meeting Series | 27 June 2026.

Base++ is presented as the behavioural and cultural layer that sits above conventional HSE systems on the NLNG Train 7 Project. Its purpose is to convert procedures, standards and controls into everyday ownership: stronger relationships, better speak-up culture, visible barriers and short-cycle risk awareness at the frontline.

Why Base++?

Every organization operates through a combination of values, beliefs, attitudes and systems. On a large construction project, those foundations must support more than productivity and schedule performance: they must also produce behavioural safety and operational excellence. The Train 7 presentation identifies subcontractor management and inherent safety culture among the project's major HSSE & SP risks, reflecting the scale and diversity of the expected local workforce and the potential for inconsistent safety practices.

The central problem statement is that conventional safety systems, while necessary, do not automatically create an incident- and injury-free workplace. Experience from earlier train projects is presented as evidence that human factors, behavioural drivers, psychological safety and team engagement must be addressed deliberately. Base++ is therefore positioned as a flexible framework for building commitment, trust, ownership and proactive intervention across company personnel and contractors.

From Base to Base+ to Base++

The presentation describes three layers of safety practice. "Base" refers to the conventional HSE management-system elements used on earlier projects—procedures and processes for managing health, safety and environmental risks. "Base+" adds stronger frontline standards and expectations, including Life-Saving Rules, construction-site safety standards and a Culture of Care. "Base++" is the continuous-improvement layer: people actively searching for risk, speaking up and influencing one another toward safer behaviour.

"Base++ is "US (You and I)" building a continuous-improvement culture and actively searching and speaking up about potential risks."

Six objectives that define the culture

The Base++ objectives combine relationship-building with operational discipline. They aim to make safe work a shared commitment rather than a compliance exercise.

- Strengthen relationships among company employees, EPC contractors, and subcontractors through joint activities, regular meetings, and shared goals.
- Build commitment by cultivating trust and openness across teams.
- Develop an ownership spirit in which people focus on solving problems rather than assigning blame.
- Create a "Get It Right the First Time" mindset through co-created positive safety practices.
- Move from compliance to commitment, so safety and quality are driven by conviction rather than minimum regulatory requirements.
- Communicate and embed a Zero Injury Roadmap that is understood across the workforce.



Figure 1. The six Base++ objectives presented for the Train 7 safety-culture programme.

A flexible menu of interventions

Base++ is not described as a fixed catalogue. Projects are expected to select and prioritize interventions that best influence behaviour in their operating context. The broader set shown in Fig.3 includes Top 4 Threat Barriers, HSSE & SP quick reminders, Family Size Units, Post Job Debriefs, No Wahala Take 5, the Blue Zone and tailored HSSE onboarding. Reward and recognition may also be emphasized where it reinforces desired behaviour.

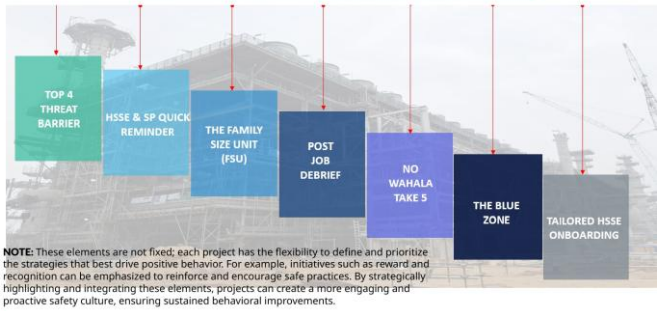


Figure 2. Base++ elements are presented as a flexible portfolio rather than a one-size-fits-all programme.

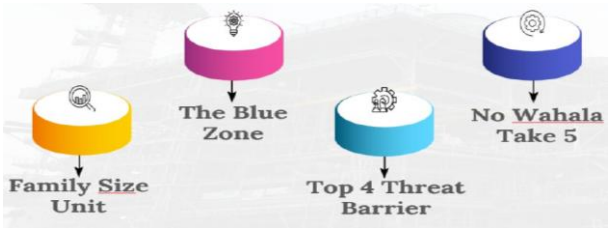


Figure 3. The four Base++ initiatives selected for detailed implementation and discussion.

For the Train 7 discussion, four initiatives receive particular attention: the Family Size Unit, the Blue Zone, Top 4 Threat Barriers and No Wahala Take 5.

1. Family Size Unit: relationships as a safety control

The Family Size Unit (FSU) is built on the proposition that strong work relationships improve both performance and safety. The presentation links the FSU to four ideas: relationship and team bonding; peer-to-peer intervention and influencing; the creation of an acceptable barrier-thinking culture; and a Culture of Care in which people instinctively act to protect themselves and others.

The benefits are described at three levels. At organizational level, the FSU can support accident-cost avoidance, basic risk-factor management, safety performance, speak-up culture and care. At team level, it can improve morale, effectiveness, interface quality and peer intervention. At individual level, it can strengthen belonging, barrier ownership, situational awareness, learning and psychological safety.



Figure 4. Why the Family Size Unit is used and the expected benefits at organizational, team and individual levels.

Implementation challenges are also acknowledged. These include the dynamic nature of project activities, weak speak-up culture within some groups, fear of challenging established norms, insufficient visibility of project leadership, and irregular workforce mobilization and demobilization. The reported learnings stress that interpersonal relationships improve morale and productivity; workers may hesitate to raise concerns when trust is weak; recognition strengthens belonging; visible, approachable leadership increases confidence; and structured communication reduces uncertainty during changing conditions.

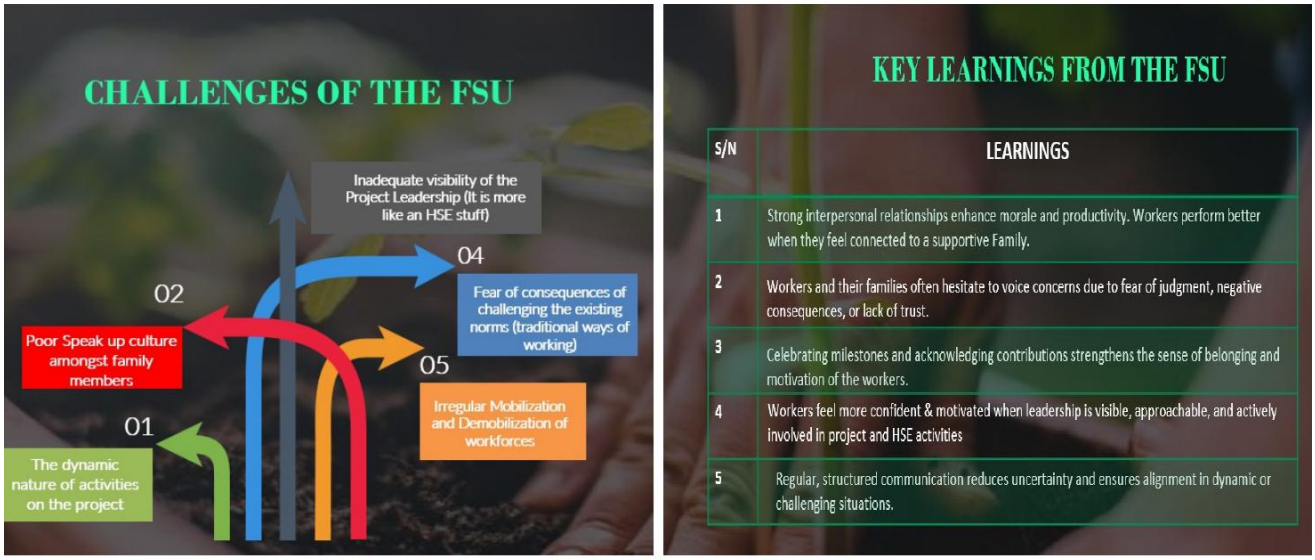


Figure 5. FSU implementation challenges and key learnings recorded in the presentation.

2. The Blue Zone: making hazards visible

The Blue Zone is a visual engagement point for frontline workers. Its purpose is to provide a one-stop location for worksite information: the activities being performed, the hazards and threats associated with those activities, the required control measures, top events and possible consequences. The presentation emphasizes pictorial representation so that critical risk information is easy to access and discuss.

The expected benefits include improving morale through recognition of positive safety behaviour, raising awareness of the barriers needed to manage threats, communicating Life-Saving Rules and other key HSE information, encouraging ownership, supporting continuous improvement, and orienting first-time visitors to site activities and risks.

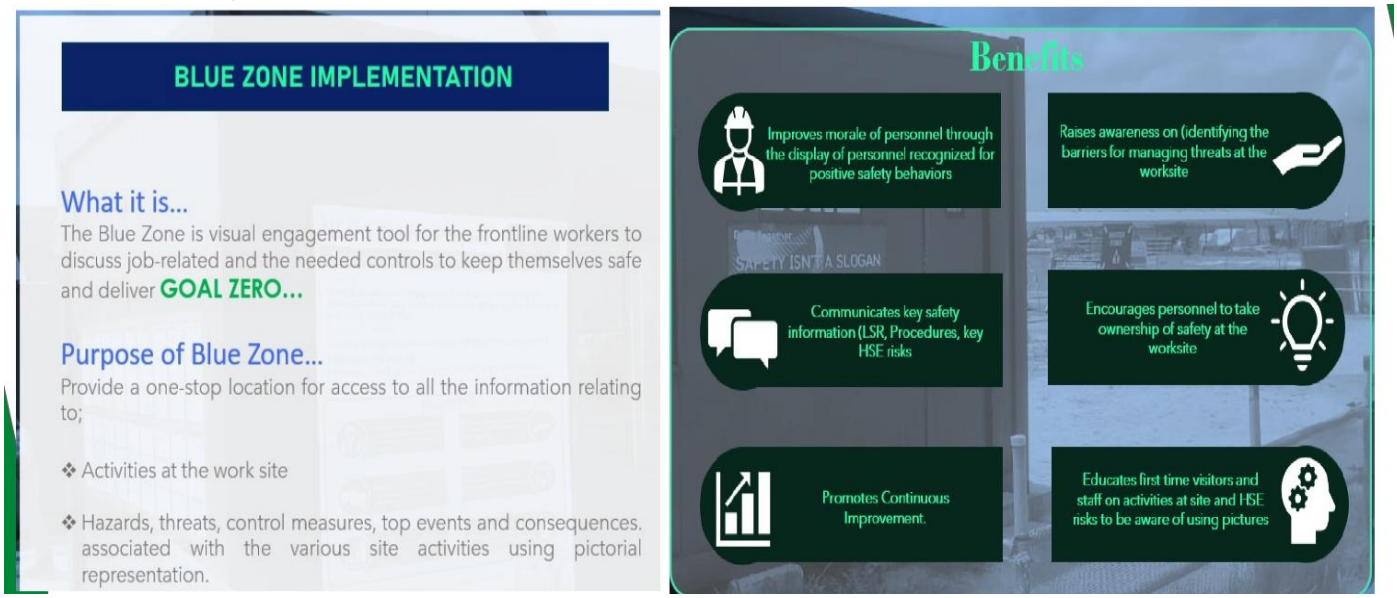


Figure 6. Blue Zone purpose and benefits as presented to the HSE Sectorial Group.

3. Top 4 Threat Barriers: focus the conversation on controls

The Top 4 Threat Barrier approach is a practical form of barrier management at work-location level. The presentation defines a threat as something that can release a hazard and affect people or assets, and a barrier as a measure put in place to prevent that threat from releasing the hazard. The logic is deliberately simple: identify what can cause harm; identify what could trigger the hazardous event; then identify the barriers that prevent or control that pathway.

The Top 4 Threat Barrier board concentrates attention on the most important threats at a specific work location and the controls relied upon to manage them. Identification is linked to work planning, permit-holder interface, job hazard analysis, the Hazards and Effects Register, toolbox discussions and active site supervision. The key result areas include threat awareness, barrier integrity and reliability, operational compliance and safety culture, and incident prevention and mitigation through feedback and learning.

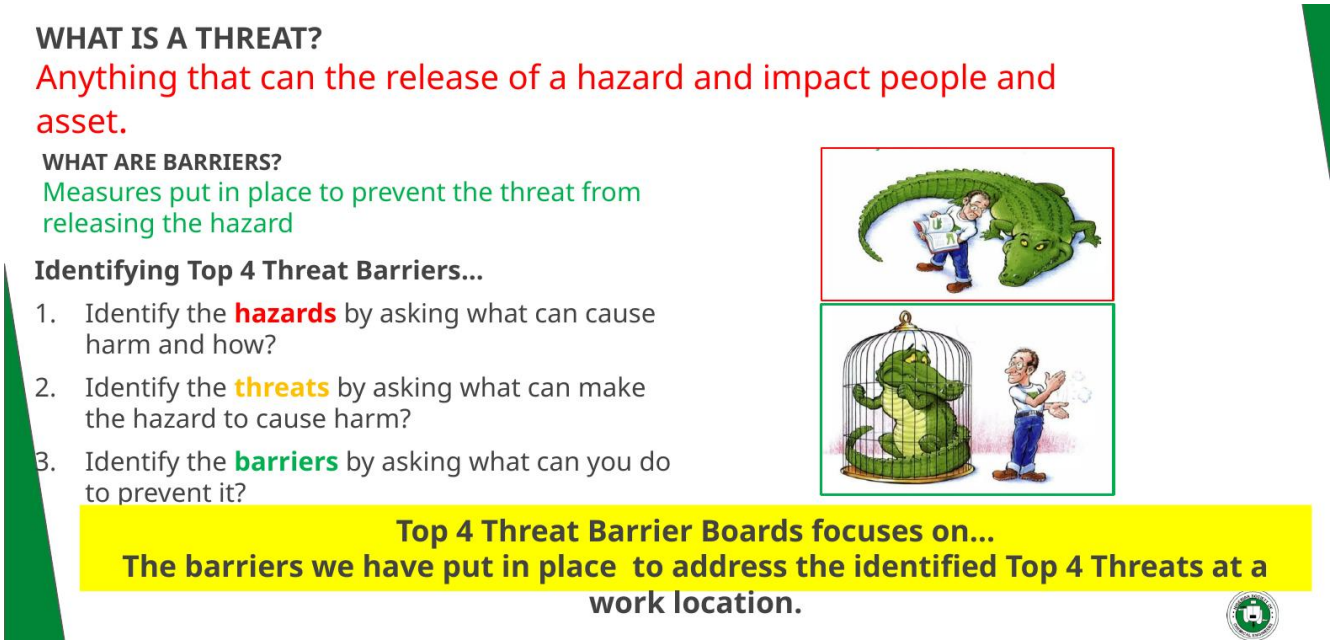


Figure 7. The presentation uses simple hazard-and-barrier imagery to reinforce the distinction between a threat and the control that contains it.

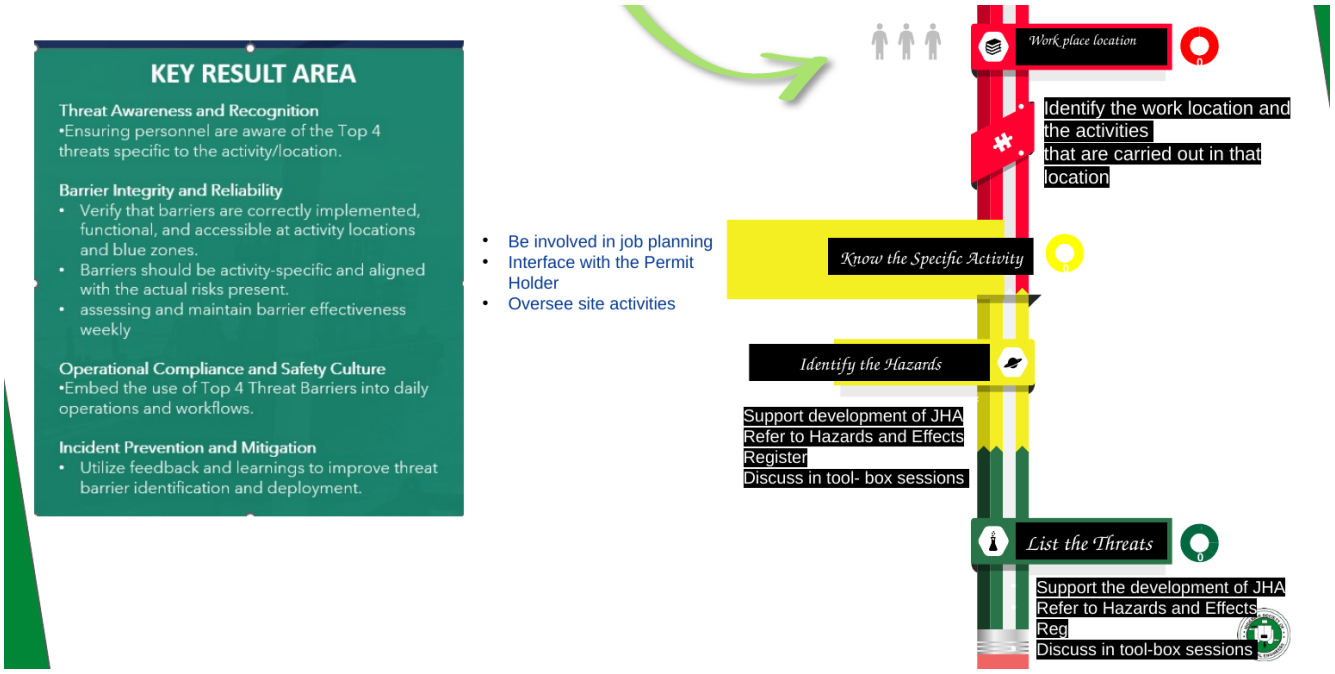


Figure 8. Workflow and key result areas for identifying and managing the Top 4 Threat Barriers.

4. No Wahala Take 5: a short pause for dynamic risk

No Wahala Take 5 is presented as a quick, field-level risk-awareness practice: step back approximately five paces and invest five minutes at the job site. It asks workers to observe the work area and surroundings, mentally step through the task, consider what else is happening, identify possible changes and new hazards, and reflect after the job on whether their work created additional hazards.

The presentation is equally clear about what Take 5 is not. It is not a one-size-fits-all tool and does not replace a structured risk assessment or the normal Job Hazard Analysis. Its value lies in complementing those formal processes by creating a disciplined moment of situational awareness immediately before and during execution.



Figure 9. "No Wahala Take 5" combines a short field pause with observation, mental rehearsal and change awareness.

What Base++ changes

Taken together, the four initiatives operate at different but complementary layers of the safety system. The FSU targets relationships and psychological safety; the Blue Zone makes risk and control information visible; Top 4 Threat Barriers sharpens barrier awareness at the point of work; and No Wahala Take 5 addresses the dynamic conditions that can change after formal planning is complete. Their common purpose is to strengthen ownership and intervention rather than relying on passive rule-following.

The presentation therefore reframes safety culture as an operational capability. Leadership visibility, trust, peer intervention, barrier thinking, visual communication, continuous learning and short-cycle hazard review are treated as mechanisms that help convert management systems into behaviour at the workface.

Conclusion

Base++ is presented as a deliberate attempt to move the Train 7 Project beyond compliance and toward an incident- and injury-free culture. Its distinctive contribution is the emphasis on human factors: how people relate to one another, whether they feel safe to speak up, whether they understand and own critical barriers, and whether they can recognize changing risk in real time.

The long-term test is not only the project's safety statistics, but whether the workforce leaves behind a stronger culture of care, operational discipline and collective responsibility. In that sense, Base++ is less a campaign than a set of habits designed to make safe behaviour visible, repeatable and socially reinforced.

Editorial basis: *This article was developed from the presentation "The Base++ Initiatives" by Engr. Edith Opuada Hart on 27th June 2026 during the NSChE HSESG monthly technical meetings. Incident descriptions, timelines, quantitative figures, and technical recommendations are presented as reported in the source presentation and were not independently verified for this editorial conversion.*

Human Factors Engineering in Process Safety, Health and Safety

Designing systems and workplaces to support safe human performance

Engr. Sir Osondu Opara, FNSChE, FNSE | Adapted from NSChE HSE Sectorial Group Technical Meeting Series | 26 July 2026



Human Factors Engineering (HFE) starts from a simple premise: safe and efficient performance is more likely when systems, equipment, tasks, and workplaces are designed around human abilities and limitations—not when people are expected to compensate for poor design.

Figure 1. The presentation links human factors directly to process-safety performance and the prevention of loss-of-primary-containment events.

Human Factors Engineering: putting people into the design

Human Factors Engineering (HFE) is the science of designing systems, equipment and workplaces to match human physical, cognitive and sensory capabilities. Its purpose is practical: reduce the likelihood of human error by creating work environments that support safe, reliable and efficient performance.

In this perspective, human performance is not treated as something separate from engineering. The design of controls, the complexity of tasks, the clarity of feedback, workstation ergonomics and environmental conditions all influence how people understand situations, make decisions and carry out work. HFE therefore places the human–system interface inside the safety-management conversation.

Five practical principles of HFE

The presentation highlights five design principles that translate HFE from theory into everyday engineering and workplace decisions:

HFE principle	Practical application
Design for human capabilities	Match equipment and tasks to physical, cognitive and sensory abilities. Controls, for example, should be accessible and practical to operate.
Keep it simple	Avoid unnecessary complexity that can create confusion, increase workload and make errors more likely.
Provide clear feedback	Ensure users can immediately understand the result or status of an action—for example, whether equipment is running or stopped.
Consider physical ergonomics	Design workstations and tasks to reduce strain, fatigue and injury; adjustable chairs and workstations are simple examples.
Optimize environmental conditions	Provide appropriate lighting, temperature and noise conditions so that the work environment supports attention, comfort and effective performance.

Why HFE matters in process safety

The presentation defines process safety as the prevention of Loss of Primary Containment (LOPC) in order to protect people, the environment and company assets. When containment is lost, the potential consequences include fire, explosion, toxic chemical release and other major industrial accidents.

Human factors influence the conditions under which these events are prevented, detected, controlled or escalated. The presentation identifies six areas in particular:

- Decision-making — how people interpret information and select actions under operating conditions.
- Communication — how critical information is transferred between individuals, teams and shifts.
- Situational awareness — whether people recognize what is happening and how conditions are changing.
- Fatigue management — whether work patterns and recovery support alert, dependable performance.
- Workload — whether task demand remains manageable and attention can be directed to what matters most.
- Competence and training — whether personnel have the knowledge and practice required to perform safely.

Viewed together, these factors show why process-safety assurance cannot depend only on hardware integrity and written procedures. The system must also be designed so that people can understand, operate and respond effectively within it.

HFE in occupational health and workplace safety

The same principles extend beyond major-hazard prevention. The presentation links HFE with improved employee health, mental well-being, job satisfaction and reduced fatigue, as well as better teamwork and emergency response. This makes HFE relevant to both process safety and day-to-day occupational health and safety.

The common thread is work design. When tools, tasks, information, physical environments and team interfaces are better aligned with human capabilities, workers are more likely to sustain attention, communicate effectively and complete tasks without unnecessary physical or mental strain.

Risk-reduction strategies: make human performance manageable

The presentation recommends a practical set of organizational measures for reducing human-factor risk. These measures reinforce one another and are strongest when integrated into normal management and operational routines:

- Conduct Human Factors Risk Assessments to identify where system design or working conditions may increase the likelihood of error.
- Improve training programmes so that competence is built and maintained for the work people are expected to perform.
- Develop clear operating procedures that are understandable, usable and aligned with the task.
- Encourage reporting of near misses so that weak signals and recurring problems can be learned from before they contribute to a serious event.
- Promote teamwork and effective communication across the workforce.
- Manage fatigue as an operational risk, not simply as an individual responsibility.
- Improve supervision so that expectations, support and field oversight are consistently available.

Common causes of human error

Human error rarely occurs in a vacuum. The presentation identifies recurring conditions that can make errors more likely and increase the probability of accidents and incidents. These include poor communication, inadequate training, time pressure, distractions, lack of supervision, poor workplace design, fatigue and stress.

Poor communication	Inadequate training
Time pressure	Distractions
Lack of supervision	Poor workplace design
Fatigue	Stress

Case study: BP Texas City Refinery Explosion (2005)

The presentation uses the 2005 BP Texas City refinery explosion as a case study for examining the human dimensions of major-accident risk. Within the source presentation, the emphasis is not on reconstructing the full technical investigation; it is on the human-factor conditions that should inform safety leadership and system design.

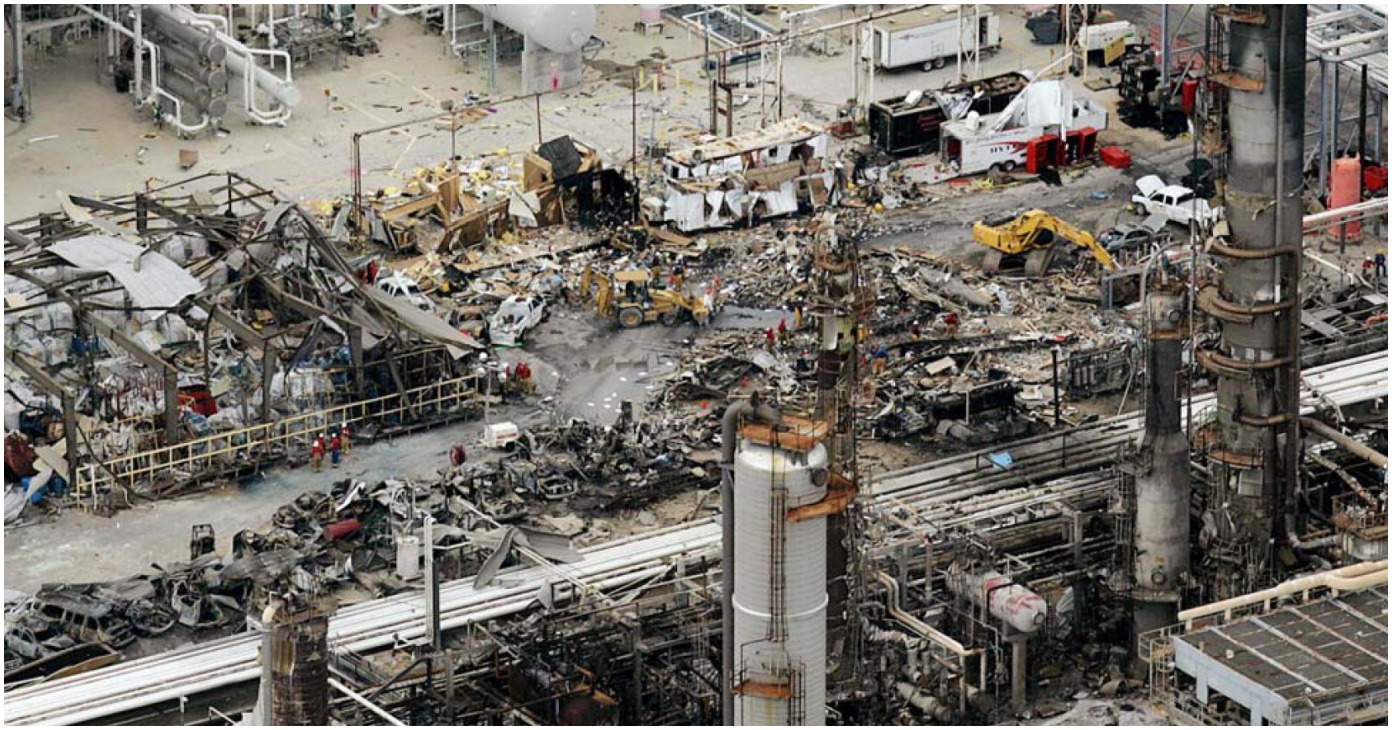


Figure 2. Aftermath of the 23 March 2005 BP Texas City refinery explosion, showing extensive damage around the isomerisation unit and temporary trailer area. Source: U.S. Chemical Safety and Hazard Investigation Board, 2007 (https://www.csb.gov/assets/1/20/csbfinalreportbp.pdf).

Systemic human-factor failures identified by the CSB

- Weak process-safety leadership and safety culture.
- Cost and production pressures that degraded safeguards.
- Inadequate procedures, training and supervision.
- Excessive working hours and operator fatigue.
- Poor siting of occupied trailers near hazardous process equipment.
- Deficient corporate oversight, learning and accountability.

The lesson is not simply that workers failed to follow procedures. Management systems did not adequately anticipate human limitations, maintain safeguards or provide the conditions required for a safe start-up. Effective human-factors engineering therefore requires usable procedures, competent staffing, fatigue management, effective supervision, safe facility siting and leadership assurance that critical controls remain effective. [CSB: https://www.csb.gov/assets/1/20/csbfinalreportbp.pdf]

The associated lessons are equally direct: stronger safety leadership, better operator training, improved process-safety management, and deliberate integration of human factors. The broader message is that human performance should be designed for and managed as part of the process-safety system—not treated as an afterthought once a procedure has been written or equipment has been installed.

Benefits—and the implementation challenge

When effectively applied, HFE can strengthen both safety and organizational performance. The presentation identifies the following benefits and practical challenges:

Potential benefits	Implementation challenges
Fewer accidents	Resistance to change
Improved safety performance	Cost of implementation
Better employee health	Limited awareness
Higher productivity	Inadequate management commitment
Lower operational costs	Lack of continuous training
Regulatory compliance	
Increased organizational reliability	

The challenge, therefore, is not simply to acknowledge that human factors matter. Organizations must convert that recognition into better design choices, stronger supervision, usable procedures, effective training, fatigue management and a culture in which people can communicate and report concerns. Without sustained management commitment and continuous learning, HFE can remain a concept rather than an operational control.

Conclusion: design systems that support people

Human Factors Engineering is essential to improving process safety, occupational health, and workplace safety. By aligning systems and work environments with human abilities and limitations, organizations can reduce accidents, protect workers, improve operational efficiency and support long-term sustainability.

The central message of the presentation is particularly important for high-hazard operations: good safety design should support people rather than expect people to overcome or manage poor system design. That principle shifts attention from blaming individuals after an error to asking whether equipment, procedures, workload, communication, training and the work environment have been engineered to make safe performance achievable and repeatable.

HFE is not an "extra" layer on top of safety. It is the discipline of making sure that the people who operate, maintain and respond to systems are considered in the way those systems are designed and managed.

Editorial note: *This article has been adapted for publication from the NSChE HSE Sectorial Group presentation "Human Factors Engineering (HFE) in Process Safety, Health and Safety" by Engr. Sir Osondu Opara, FNSChE, FNSE on 26 July 2026. Incident descriptions, timelines, quantitative figures, and technical recommendations are presented as reported in the source presentation and were not independently verified for this editorial conversion.*



REGISTRATION

CADRE	Standard Rate N	20% Discount before 31st Aug. N	On Site Registration N
Students	15,000	12,000	25,000
Graduate/Associate/Affillate Member	25,000	20,000	25,000
Corporate Member	40,000	32,000	50,000
Fellow	60,000	48,000	70,000
Excursion/Spouse Program	25,000	20,000	33,000
Non-Member (Nigeria)	50,000	40,000	60,000
Foreign Delegates	$200	$160	$300
Foreign Non-Delegates	$250	$200	$300
Exhibitors	250,000	N/A	N/A

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B. Golf Kitty @ Python Golf Club, PHC, Beside Conference Venue. Time 9.00am.

C. Welcome Reception @ DR. OBI WALI INT'L CONFERENCE CENTER Port Harcourt Time: 6.00pm

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PROCESS SAFETY WATCH: Recent Key Developments

Across the selected developments, the strongest recurring signal is … major risk concentrates during restart, shutdown, maintenance, transfer, decommissioning and other non-routine operations. The recurring weaknesses are equally familiar—ageing equipment, informal procedures, inadequate hazard review, poor atmospheric monitoring and uncertain investigation evidence.

NIGERIA DEVELOPMENTS

01 REGULATORS MOVE TO CLOSE RADIATION-SAFETY GAPS

On 7 June, NUPRC and the Nigerian Nuclear Regulatory Authority (NNRA) announced collaboration on radiological safety in upstream operations. Priorities include information sharing, radiological impact assessments, NORM management, training and a single regulatory interface. The development is especially relevant to well logging, industrial radiography and nucleonic gauging.

Key takeaway: Regulatory efficiency must never dilute technical accountability. Every radioactive source needs traceable ownership from receipt to final disposal

Source: https://nnra.gov.ng/nnra/post-nnra_seeks_stronger_regulatory_collaboration_with_nuprc_to_enhance_safety_and_compliance_in_oil_and_gas_sector

02 MUSHIN EXPLOSION CLASSIFIED AS MECHANICAL FAILURE

Following the 22 June explosion in Mushin, Lagos, police technical investigators reportedly found no evidence of explosives or sabotage. The event was classified as the catastrophic failure of an external pressurised mechanical component, causing glass damage and minor injury.

Key takeaway: Stored mechanical energy deserves the same disciplined containment, inspection and exclusion-zone controls as hazardous chemicals.

Source: https://www.vanguardngr.com/2026/06/mushin-blast-caused-by-mechanical-failure-not-bomb-cp-fatai

03 AZUZUAMA SPILL EXPOSES AN INVESTIGATION-CONFIDENCE GAP

On 27 June 2026, an oil spill occurred on Oando's 4-inch Azuzuama-1 flowline in Bayelsa State. Oando attributed the rupture to induced corrosion from suspected third-party interference; community representatives cited equipment failure and natural corrosion and questioned the inspection process. Repairs were completed on 19 July, with remediation continuing. Until the signed JIV report is available, the cause should remain disputed, and the supporting evidence transparently preserved.

Key takeaway: A Joint Investigation Visit must produce defensible evidence—not merely a conclusion. Instrument validity, photographs, samples, chain of custody, and dissenting observations should be preserved.

Source: https://www.premiumtimesng.com/news/top-news/898866-oando-blames-bayelsa-community-oil-spill-on-sabotage-intensifies-cleanup.html

https://naturenews.africa/oando-bayelsa-community-clash-over-cause-of-oil-spill

04 BONO ENERGY TERMINAL FIRE CONTAINED BEFORE ESCALATION

On 3 July 2026, fire engulfed a five-million-litre AGO storage tank at Bono Energy Terminal, Ibru Jetty Complex, Olodi Apapa, Lagos. State firefighters and neighbouring emergency teams extinguished it by 13:54, preventing spread to adjoining tanks and infrastructure. No casualties were recorded; the cause remained under investigation.

Key takeaway: Successful containment does not replace prevention. Verify detection, suppression, drainage, isolation, emergency access, and exposure from adjoining facilities.

Source: https://punchng.com/lagos-probes-fuel-storage-tank-fire

05 OWERRI TANKER RESPONSE DEMONSTRATES SECONDARY-EVENT PREVENTION

On 10 July, a diesel tanker and minibus crashed in Owerri. NEMA coordinated rescue, scene control and safe product transloading with multiple agencies. The operation concluded after the tanker was secured and traffic restored.

Key takeaway: Recovery is itself a hazardous operation. Transloading requires ignition control, grounding, traffic exclusion, spill containment and a named incident commander.

Source: https://nema.gov.ng/nema-coordinates-emergency-response-to-tanker-accident-in-owerri

GLOBAL LESSONS WITH NIGERIAN RELEVANCE

06 RAS LAFFAN RESTART EXPLOSION: 13 DEAD, 66 INJURED

On 21 June, an explosion and fire occurred at Qatar's Barzan gas facility while operations were being restarted after an extended shutdown. Thirteen workers died, and 66 were injured. QatarEnergy described it as an operational accident; the full investigation remained underway.

Key takeaway: Restart is not a return to normal—it is a new operating state. Readiness reviews must verify equipment condition, isolation status, control functionality, staffing, and deviations accumulated during shutdown.

Source: https://apnews.com/article/b8a36eea8889899b2fa499c5e247a08f

07 SEVESO AT 50: MAJOR-HAZARD REGULATION MUST EVOLVE

On 10 July, the European Commission marked 50 years since the Seveso disaster. The present framework covers approximately 11,000 industrial sites and is being challenged by climate hazards, cybersecurity, digitalisation and energy-transition technologies.

Key takeaway: Future-ready regulation must integrate process safety, land-use planning, emergency preparedness and emerging hazards—not regulate them in separate silos.

Source: https://environment.ec.europa.eu/news/eu-maintains-commitment-strengthening-industrial-safety-2026-07-10_en

08 BIO-LAB REPORT: Protection System Became the Initiator

The CSB's 21 July final report into the massive September 29, 2024, chemical fire and toxic gas release at the KIK Consumer Products Bio-Lab Plant 12 warehouse in Conyers, Georgia, found that water from a corroded sprinkler contacted reactive pool-treatment chemicals, initiating decomposition, fires, and toxic releases. Nearly 14 million pounds of chemicals were stored—more than twice the quantity previously indicated to local authorities. About 17,000 people were evacuated and 90,000 advised to shelter in place.

Punchline: A safeguard that is chemically incompatible with the hazard can become the initiating event.

Source: https://www.csb.gov/csb-releases-bio-lab-conyers-final-investigation-report

09 U.S. STEEL REPORT CONNECTS INFORMAL WORK, AGEING EQUIPMENT AND SITING

The CSB's 10 August report on the fatal August 11, 2025, explosion at the U.S. Steel Clairton Coke Works facility in Clairton, Pennsylvania, concluded that an informal pressurised-water cleaning practice contributed to catastrophic failure of a cast-iron gas valve more than 70 years old. The explosion killed two people, injured 11 and caused an estimated US$52.5 million in damage. Occupied buildings were located directly above hazardous gas piping.

> **Punchline:** "We have always done it this way" is not a procedure—and occupied-building location is a process-safety barrier.

Source: https://www.csb.gov/us-chemical-safety-board-issues-final-report-on-august-2025-fatal-coke-oven-gas-explosion-at-us-steel-clairton-coke-works

10 DECOMMISSIONING CHEMICAL TRANSFER GENERATES FATAL H_2S

A CSB update issued on 13 August described an April decommissioning incident in which incompatible chemicals were transferred into a wastewater tank, releasing highly toxic hydrogen sulfide gas at the Ames Goldsmith Corporation's Catalyst Refiners, Inc. (Catalyst Refiners) facility in Institute, West Virginia. Two workers died, and four were seriously injured. Investigators identified the absence of a written disposal procedure, personal gas monitors and suitable respiratory protection.

> **Punchline:** Shutdown reduces production—not hazard. Residual chemicals, undocumented inventories and improvised disposal can create new reaction pathways.

SOURCE: https://www.csb.gov/us-chemical-safety-board-issues-update-on-investigation-of-fatal-april-2026-hydrogen-sulfide-release-at-catalyst-refiners-facility-in-west-virginia

PROCESS SAFETY WATCH: *Conferences, Training & Webinars*

Verified professional-development calendar | Sep 2026 – Jun 2027

From flagship congresses to focused online learning, these opportunities support stronger technical competence, shared incident learning and future-ready process-safety leadership. *Organiser dates, fees and delivery arrangements should be reconfirmed before registration or travel.*

Conferences and major events

DATE	EVENT / VENUE	PRINCIPAL FOCUS	PRINT LINK
9 Sep 2026	**11th CCPS Canadian Regional Meeting** Calgary, Canada	Regional collaboration, incident learning and risk-based process safety.	aiche.org/ccps/conferences-events
15–16 Sep 2026	**Global Conference on Process Safety and Big Data** Frankfurt, Germany	Data, analytics and digital technology for stronger process-safety decisions.	aiche.org/ccps/conferences-events
30 Sep–2 Oct 2026	**11th Latin American Congress on Process Safety** Lima, Peru	Major-hazard management, operational experience and regional good practice.	aiche.org/ccps/conferences-events
4–5 Oct 2026	**13th International HSSE & Loss Prevention Professional Development Conference** Kuwait	HSSE leadership, loss prevention and professional capability.	aiche.org/ccps/conferences-events
20–22 Oct 2026	**Mary Kay O'Connor Safety & Risk Conference** Houston, USA	Process safety, risk management and responsible integration of artificial intelligence.	psc.tamu.edu/symposia
28–29 Oct 2026	**9th Global Summit on Process Safety** Qingdao, China	Global case learning, process-safety technology and leadership.	aiche.org/ccps/conferences-events
17–19 Nov 2026	**Hazards 36** Manchester, UK	Leadership, evolving hazards, digitalisation, climate risk and the energy transition.	icheme.org/training-events
2 Dec 2026	**International Process Safety Day** Online	Global incident learning and renewed attention to catastrophic-risk prevention.	aiche.org/ccps/conferences-events
21–25 Mar 2027	**AIChE Spring Meeting & 23rd Global Congress on Process Safety** Oklahoma City, USA	Flagship multidisciplinary forum for process-safety research, practice and leadership.	aiche.org/conferences

Scheduled training and live webinars

DATE / STATUS	EVENT / VENUE	PRINCIPAL FOCUS	PRINT LINK
15–29 Sep 2026	**Fundamentals of Process Safety** Online • five modules	32 CPD hours covering hazard identification, asset integrity, human factors, management of change and emergency response.	icheme.org/training-events
21 & 23 Sep 2026	**Safety Instrumented Functions** Online	Practical grounding in SIL, LOPA and the IEC 61508/61511 safety lifecycle; 12 CPD hours.	icheme.org/training-events
23 Sep 2026 16:00–17:00 WAT	**From Control of Work to Connected Operations** Live webinar	Critical controls, permits, operational risk and integrated control-of-work systems.	ili.aiche.org/academy
7 Oct 2026 19:00–20:00 WAT	**Agentic AI in the Process Manufacturing Industry** Live webinar	AI applications balanced against safety, cybersecurity, governance and human oversight.	ili.aiche.org/academy
Multiple cohorts	**CCPS Process Safety Boot Camp** Classroom and virtual	Intensive four-day introduction to risk-based process safety; confirm current cohort dates with AIChE Academy.	ili.aiche.org/academy/courses/ch900

Flexible and on-demand development

DATE / STATUS	EVENT / VENUE	PRINCIPAL FOCUS	PRINT LINK
On demand	**CCPS Process Safety Fundamentals Certificate** Self-paced	Twenty-four courses spanning hazards, risk, applications and the four pillars of risk-based process safety.	ili.aiche.org/academy/courses/elp900
On demand	**SAChE Practical Process Safety 1** Self-paced	Operational discipline and fundamentals for younger professionals and engineers entering high-hazard operations.	ili.aiche.org/academy/courses/ela985
On demand	**Risk-Based Process Safety Decision-Making for All Engineers**	Hazard analysis, safeguards, ethical judgment and emerging AI considerations.	ili.aiche.org/academy/courses/ela401v01
On demand	**The Link Between Process Safety and Process Intensification** Webinar	Designing smaller, safer and more efficient process systems.	ili.aiche.org/academy
On demand	**CHEF and RAST Risk-Analysis Tools** Webinar	Practical screening and simplified quantitative risk-analysis methods.	ili.aiche.org/academy

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