PROCESS SAFETY MANAGEMENT ; FROM THE BOARDROOM TO THE FIELD – THE WELL ENGINEERING PERSPECTIVE

A Presentation by AKUKWE, NICHOLAS ONYEKA @ the ASSE NIGERIA CHAPTER PDC 2016.

onyeekaachukwu@yahoo.com
onyeekaachukwu@gmail.com
PRESENTATION OUTLINE

• 1. OVERVIEW OF THE PROCESS SAFETY AND PERSONAL SAFETY MANAGEMENT.

• 2. BASIC UNDERSTANDING OF WELL ENGINEERING OPERATIONS.

• 3. WHAT PROCESS SAFETY MEANS IN WELL ENGINEERING OPERATIONS.

• 4. IMPLEMENTATION OF PROCESS SAFETY MANAGEMENT IN WELL ENGINEERING – FROM THE BOARDROOM TO THE FIELD.

• 5. SUSTAINING THE PROCESS SAFETY JOURNEY IN WELLS.
OBJECTIVES

• 1. TO PROVIDE A BASIC UNDERSTANDING OF PROCESS SAFETY AND PERSONAL SAFETY IMPLEMENTATION.

• 2. TO USE WELL ENGINEERING PROCESS SAFETY MANAGEMENT TO FURTHER ENLIGHTEN ON PRACTICAL PROCESS SAFETY MANAGEMENT IN OIL AND GAS INDUSTRY.

• 3. TO SHOW THE SYNERGY BETWEEN THE BOARDROOM (LEADERS) AND THE FIELD (COLD FACE) IN PROCESS SAFETY MANAGEMENT IN WELL ENGINEERING OPERATIONS.
WHY PROCESS SAFETY?

1988 Piper Alpha
167 fatalities

2005 Buncefield

2005 Thunder Horse

2005 Texas City

11 fatalities

2010 Macondo
OVERVIEW

• Safety Management Systems, falls into two major categories;

• 1. Those designed to protect the personal safety of personnel.

• 2. Those focused on process safety, or ensuring the safety and integrity of the operations and assets.

• Safety; – Safety is the absence of danger to physical harm to people, equipment, structures and materials.

• Personal Safety Management; – This is management of hazards that can give rise to injury or harm to persons.

• Process Safety Management; – This is the management of hazards that can give rise to major accidents involving the release of potentially dangerous materials, such as hydrocarbon and energy /explosion.
PERSONAL SAFETY INCIDENTS

• Personal Safety Incidents are incidents that could cause harm or injury to personnel.

• It could lead to Fatality(s) or Permanent Total Disabilities.

• It usually affect only a few persons and the cost implication is limited.

• It can be a slightly significant or High Potential rating with RAM4+P.
WELLS PROCESS SAFETY INCIDENTS (WPSI)

• These are incidents relating to well control and loss of well integrity during design, construction, operating, maintenance and abandonment.

• It includes all other unplanned and uncontrolled release of produced liquid or gas from assets or facilities operated by Well Engineering.

• It is usually Significant and High Potential RAM 5A/5B.

• It could lead to catastrophic events with multiple fatalities and huge cost implications.
CATEGORIES DEFINITIONS

• 1. **Significant** - When there is loss of primary well control during well operations, and secondary well containment arrangements fail to control well, leading to release of hazardous substance to the external environment, having a RAM 4+ ACTUAL consequences.

  • Example;
  • BP Macondo; where loss of primary well control leading to release of gas at surface and subsequent explosion and fatalities.

• 2. **High Potential** - When there is loss of primary well control during well operations, and secondary well containment arrangement fail to control well, leading to release of hazardous substance to the external environment, having a RAM 4+ POTENTIAL consequences.

  • Example;
  • A well control incident where an isolation valve opened whilst well was underbalanced leading to reservoir fluid on surface. Well successfully shut-in.
3. **Single Barrier Failure (SBF)** - This is when a single barrier fails to fulfil its function during well operations; however, alternative barriers provide containment.

   - **Examples** –
     - a) When there is an influx (Kick).
     - b) When Well BOP test fails, but fluid column remain intact and provides primary barrier.

4. **Other Incidents** - These are when process related systems or behaviours exceptions are observed, however, barriers remain intact.

   - **Examples** –
     - a) Flow Control devices are discovered to be inoperable.
     - b) Well BOP test frequency reduced without appropriate authorisation.
     - c) Inappropriate repairs performed on well control equipment.
EXAMPLES OF PERSONAL SAFETY INCIDENTS

- Helicopter door open in flight (27.09.14)
- Broken port side door railing
- Dropped Object (04.10.14)
- Basket with coflex hose
- MV Anaiah – Man overboard while mooring (11.07.14)
- Electrical Fire in the Laundry (13.07.14)
- Dropped grating (24.09.14)
- MVI- Heavy MV Rollover (26.09.14)
EXAMPLES OF PROCESS SAFETY INCIDENTS

- **Mumbai North Platform fire**
  - 27 July 2005
  - Mumbai, India
  - 22 fatalities
  - Caused from vessel collision
  - Damage cost: over USD200 million

- **Deep water Horizon disaster**
  - 20 April 2010
  - Gulf of Mexico, USA
  - 11 fatalities
  - Caused from well blowout
  - Damage cost: over USD60 billion (est.)

- **Amuay Refinery explosion**
  - 25 August 2012
  - Amuay, Venezuela
  - 48 fatalities
  - Caused by gas leak
  - Damage cost: undisclosed
OVERVIEW

• The Oil and Gas industry enjoys a commendable track record in reliability and safety. That explains why the frequency of process safety incidents are low, compared with personal safety incidents.

• However, there is no reason to be complacent, as we can learn from various major hazard accidents across the industry which regretfully resulted in fatalities, asset damage and environmental impact.
OVERVIEW

• Reliability in Process Safety is therefore imperative as it underpins not just the safety of people and assets, but also credibility with stakeholders, licence to operate and external reputation.

• Good Process Safety performance for E & P operators requires good reliability, because it translates into more production and less operating cost
OVERVIEW

• Well Engineering operations is similarly vulnerable to Process Safety incidents if hazards are not properly managed (e.g. Piper Alpha fire, Macondo blow out, and most recently the Oil Rig Platform fire in the Caspian Sea, etc

• In Well Engineering, Process Safety Management is a journey towards ‘Our Wells are safe and we know it’. That journey never ends; it is our way of working.
WHAT ARE THE POTENTIAL IMPACTS OF PROCESS SAFETY INCIDENTS?

- Cost of doing business goes up
- Environmental and ecosystem damage
- Economic and communities impact
- Stakeholder relationships
- Regulatory changes, calls for enhanced OSR
- Liabilities and insurance premiums
- Competitive landscape
- Low industry reputation and trust
- JV and suppliers tension
- Litigations and difficulty to get employees

Let's not forget: This Is A Process Safety Rooted Incident

11 Fatalities
5 mln bbls
$50-100 bln

Environmental and ecosystem damage
Economic and communities impact
Stakeholder relationships
Litigations and difficulty to get employees
JV and suppliers tension
Competitive landscape
Low industry reputation and trust

Reuter's
Russia suggests oil firm levy for pollution fund

Obama v BP
The damage beyond the spill

The Economist
UNDERSTANDING WELL ENGINEERING OPERATIONS

• Well Engineering operations involve many high risk activities which make it vulnerable to major incidents if the hazards are not properly managed.

• Root causes for some of these major accidents are complex in nature. They are related to a series of interlinked failures in mechanical, human judgement, engineering design, operational implementation and team interfaces.

• To avoid such incidents, we must translate learning into effective barriers, aimed at reducing risk to acceptable levels.
UNDERSTANDING WELL ENGINEERING OPERATIONS

• What is Well Engineering? –

• Well Engineering can be defined as “The efficient use of energy and equipment, to construct and maintain a conduit, which explores or exploits some underground objectives - Hydrocarbons.

• Well Engineering Operations comprises basically of Well Drilling, Well Completion and Well Intervention operations.
WHAT PROCESS SAFETY MEANS IN WELL ENGINEERING OPERATIONS

• ‘Process Safety in Well Engineering’ is simply about keeping the Hydrocarbons in THE PIPE, THE WELL OR THE RESERVIOR, where we have control over it.
WHAT PROCESS SAFETY MEANS IN WELL ENGINEERING OPERATIONS

• Keeping the Wells safe (i.e. hydrocarbons in the well, pipe, and reservoir) involve Barriers which could be Equipment, People or/and Procedures.

• Think Smarter + Work Smarter = Keep the Wells Safe.
Process Safety Risks are managed with Barriers— it is about

“Creating and Maintaining Effective Barriers”

Barriers must be healthy and effective to avoid incidents (“Swiss cheese”)

It’s all about Barriers and …… Barriers Thinking!
“SWISS CHEESE MODEL” : A VISUAL WAY

When barriers fail, undesirable consequences may occur!

“Barrier thinking” includes addressing small holes at each level. This keeps a series of small holes from lining up and leading to an incident.

Active Barriers for each stage of the programmed works-scope must be explicitly identified and verified.
WELLS PROCESS SAFETY MANAGEMENT

• WELL Process Safety is managed through;

• 1. Well Design Standard.

• 2. Established ‘Operating Envelopes’ not to be exceeded.


• 4. Safety Cases that amongst other things describe how the hazards are identified and assessed and how barriers are established to control and prevent these hazards.

• 5. An effective Management Of Change (MOC) Process.
REAMS AND ACTIONS FOR WELLS PROCESS SAFETY MANAGEMENT

• In 2013, an international E & P company operating in Nigeria in support of her vision Goal Zero Aspirations, introduced a Control Framework for Process Safety Management in their Well Engineering Operations called – THINK PROCESS SAFETY.

• This framework addresses Well Engineering Process Safety Management explicitly and has a clear line of sight between: Risk assessment; Well Design and construction; Operation, maintenance and inspection; and Leadership integrity.

• This framework has helped the organization to record over 3yrs LTI free days in Wells operations in Nigeria since its roll out and still counting; a practice worth replicating.
THINK PROCESS SAFETY

• Think Process Safety has 10 Elements.

• These 10 elements are developed to improve understanding of Wells Process Safety and enable all stakeholders to focus on key Process checks and actions required to keep the wells safe.

• These elements are expected to guide the Day –To-Day actions to take to keep the wells safe, for both leaders and field staff.

• They are expected to help staff maintain vigilance on Process Safety risks and mitigations to keep the wells safe.

• They are 10 Critical elements to keep our wells safe.
As a Leader (Boardroom) You Need To;

• 1. Set an expectation that all office based planning includes detailed rig-ups and risk assessment to achieve ALARP, plus contingency planning.

• 2. Review all rig-up drawings and risk assessments.

• 3. Own the ‘Management of Change’ process and make sure it is used.

At the Frontline (Field) You Need To;

• 1. Critically review office based risk assessment.

• 2. Carry out task specific, onsite risk assessments before the work starts.

• 3. Identify and communicate any changes to plans to your supervisor – use the ‘Management of Change’ process when appropriate.
A comprehensive risk assessment is the first stage in ensuring that we have reduced risks to “as low as reasonably practicable” (ALARP).

Getting this wrong means you don’t know what you’re facing, which means you can’t control it. It is the Nucleus.

So getting it right **FIRST TIME** is critical.

The “4-What” risk assessments questions work regardless of the stage of the project:

- a. When deciding the drilling fluid weight in the design phase / during well construction operations, e.g., correctly measuring the mud density.

- b. During completion in deciding tools to run, and well fluid properties.

- c. During intervention when choosing the appropriate Pressure Control Equipment to use.
THE `4 WHAT`S OF RISK ASSESSMENT

• Risk Assessment in its essence is about the “4 WHATs”.
• We need to ask this 4 what's questions and answer appropriately.

• 1. What could go wrong ...and how bad could it get?
• 2. What could cause it to go wrong
• 3. What can I do to prevent it from going wrong?
• 4. What should I do if it does go wrong?
WHAT COULD GO WRONG (and how bad could it get)?

• This first question addresses the identification of hazards known in the Bow-Tie as “Top Event” (something we do no want to happen) and the possible consequences.

• In terms of well operations, a top event would be any instance we fail to keep the hydrocarbons inside the pipe, the well or in the reservoir.

• Examples:
  • 1. Release of Gas at surface.
  • 2. Blowout.

• ......and how bad could it get?

• Potential for multiple fatalities;

• Potential for fire and explosions leading to fatality/significant asset loss/significant environmental impact.
WHAT COULD GO WRONG (and how bad could it get)?

• We rate risks on Risk Assessment Matrix (RAM) to understand how severe the risk may be, and from this we determine the effort required to ensure it is properly managed.

• Most Wells Process Safety Risks are rated either RAM **RED** or **YELLOW** - 5A/5B.

• For this reason they deserve very careful attention.
WHAT COULD CAUSE IT TO GO WRONG?

- This second question seeks to identify threats.
- **A threat is a scenario where, if nothing is done, the situation will very likely lead to top event.**

- Example;
  - 1. Not filling up the hole (well) correctly during tripping.
  - 2. Drilling unprepared into shallow gas.

- Defining credible threats at all levels in the design, planning and execution stages is essential to creating as complete as possible understanding of risks and how these could materialize.

- Especially in the case of release of hydrocarbons, we need to sure that all credible scenarios are assessed so that so that the right barriers are put in place to manage them.
WHAT CAN I DO TO PREVENT IT FROM GOING WRONG?

• Addressing this third question helps to define the barriers needed to prevent the threat leading to top event as well as identifying the barrier owners, i.e. the people ultimately responsible for ensuring barriers will be effective when they are needed.

• For instance:

• When tripping, ensure the trip tank is properly lined up and monitored and the driller is aware of the requirement to shut in the well in case of a suspected kick.

• Ensure maintenance, calibration, and inspection of safety critical equipment are conducted as and when required and by qualified person, etc
WHAT SHOULD I DO IF IT DOES GO WRONG?

- The final questions is about barriers that reduce the potential consequences in case a top event does occurs: i.e. the mitigation or recovery measures needed.

- Examples:
  
  1. The competence of the driller is known to meet the required standard;
  
  2. Ensuring that the correct size of Full Opening Safety Valve (FOSV) and appropriate cross-over's are available on the work basket/rig floor for the pipe in hole.
  
  3. Ensuring relevant personnel's in well control situation are competent and, also through regular drills are aware and familiar with what to do mitigate escalation factors.
RISK ASSESSMENT SUMMARY

• The examples used to illustrate the “4-WHATs” have shown they can (and should be asked at any stage of the well delivery process).

• They are just as useful before a job as the basis of Pre-Job Safety Meeting/ Tool Box Talk as they are in identifying Major Accident Hazards (MAH) in the design phase.

• Well Control incidents can escalate into serious events because of failures in identifying / assessing risks correctly. This has the potential to occur at any stage of well delivery process (from initial design through to day-to-day operations).

• Information gathered from asking the “4 WHATs” is often visualized in the form of a bow-tie diagram.

• Because, Process Safety incidents has more serious consequences for people, asset, environment and reputation; it is therefore critical that we learn how to do adequate risk assessment and take actions to strengthen barriers on both sides of the bow-tie.
BOW TIE FOR PROCESS SAFETY RISK ASSESSMENT

What could cause it to go wrong?

THREAT

Barriers

What could go wrong?

HAZARD

Recovery Measures

What should I do if it does go wrong?

TOP EVENT

...and how bad could it be?

CONSEQUENCES

What can I do to prevent it from going wrong?
ELEMENT 2- BARRIERS- (Know Your Physical Well Barriers and Confirm They Are Tested)

As a Leader (Boardroom) You Need To;
• 1. Set expectation that barriers are defined for every operation in well construction, intervention and abandonment.
• 2. Review the status of barriers during site walk-rounds.
• 3. Be prepared to ask probing questions about barriers and challenge any hesitant answers.

At the Frontline (Field) You Need To;
• 1. Know who is responsible for maintaining a wells barrier- is it you?
• 2. When an operation changes, always reconfirm the barriers.
• 3. Discuss all changes in status of barriers with your supervisor.
**BARRIER EXPECTATIONS**

- Barriers characteristics include;
  - 1. Must reduce probability of release of hazard to do harm.
  - 2. Must work at least 90% of the time.
  - 3. Have weaknesses.

- To work, a barrier itself must be able to;
  - 1. Stop the threat from releasing the top event.
  - 2. Mitigate or reduce consequence of the top event.
  - 3. Must be independent.
  - 4. Effective (Big, Strong, Fast, Reliable).
  - 5. Auditable.
EXAMPLES OF SOME WELL HARDWARE BARRIERS

• During well construction/completion the primary barrier is the Drilling Fluid (Mud/Brine).
• Blow-Out Preventers (BOP) – internal and external
• Casing Strength.
• Casing Shoe Track strength
• Cement.
• Well Head.
• Pressure Control Equipment (PCE).
• Full Opening Safety Valve (FOSV).
• Gas/Fire detection systems.
• Surface and sub-surface valves.
• Hazardous Area Classification Layout.
• Fire Fighting Equipment and accessories
• Use of appropriately rated equipment.
• Choke Manifold.
• Well Design, etc, etc.....
EXAMPLES OF SOME WELLS SOFT BARRIES

• Competence and certification for barrier owners – Mud Engr., Mud loggers, Geologist, Driller, etc.
• Standard and procedures (monitoring mud properties, well control, approved tripping practice, maintaining full hole, Pressure test, Drilling Well On Paper (DWOP), etc.
• Logging – surveys, cement log.
• Pre-Job safety meetings and pre-tour meetings, PTW.
• Emergency Response plans,
• Inspection/ maintenance/ QAQC,
• Supervision, Designated Storage areas, Mud type selection, MSDS, etc.
WELLS PROCESS SAFETY MANAGEMENT IS ALL ABOUT BARRIERS ........AND BARRIER THINKING

When barriers fail, undesirable consequences may occur!
BARRIER OWNERSHIP AND BARRIER VALIDITY

• The suitability and effectiveness of our well control barriers depends on competent identification, design and operation by ourselves: we provide the critical “human element” to barrier success. All persons tasked with barrier design, specification, purchase, construction, and operation, need to recognize and own their barriers. It is people (us) that make barriers work.

• There are several examples of well control incidents resulting from failures in barrier validity and/or ownership.

• Barrier ownership or/and validity can be assured by “operationalizing ” the bow-tie barriers

   ( i.e. making them work)
BARRIER VALIDITY

• What does a barrier need for it to be valid. We will look at three aspects:

• 1. **The barrier must be effective**;

• An effective barrier prevents an undesired outcome when that barrier is correctly designed and functions as intended.
• To do this, the barrier must be;

• **BIG ENOUGH**
• **FAST ENOUGH**
• **STRONG ENOUGH**

• With this we mean that when the barrier is correctly deployed, it will prevent an undesired event from happening.

• For instance: the hydrostatic pressure of a mud/brine column is greater than the pore pressure, thereby keeping the hydrocarbons in the formation.
BARRIER VALIDITY

• 2. The barrier must be independent;

• This means the barrier must be independent of the initiating event (ie. of the threat) and the barrier has to be independent of any other barrier that is considered valid for the same condition.

• Barriers cannot be considered independent from one another if there is a common cause failure.

• For example, if the high level alarm and the high-high level alarm on a trip tank are on the same transmitter, they are NOT independent of each other.
3. The barrier must be auditable;

An auditable barrier means the barrier can be evaluated to verify that it will operate correctly when it is activated.

Simple examples of barrier auditing are inspection and/or testing.

The importance of barrier audits was recently demonstrated when a pressure test showed the barrier (Annular BOP) was leaking after a stripping operation. The rubber element was changed as a result of the test.
BARRIER OWNERSHIP

• The ownership of any single barrier can often be with more than one person.

• In most of these cases the barrier will only function as intended when all the individual owners perform their respective task(s) correctly.

• To illustrate this we have split up the ownership of the following barrier example, a mud/brine column, into 3 critical parts.
BARRIER OWNERSHIP

• **1. Design the barrier**;

• Barrier ownership already starts when a barrier is designed.

• The correct mud/brine weight must be selected.

• The Well Engineer calculates the correct weight and selects the appropriate specifications, this is partly based on the subsurface work on the Pore Pressure and Fracture Gradient by the Geologist.

• Service Companies and the Production Chemist develop the mud/brine and a Mud/Brine Engineer on site prepares it.

• Everyone involved in the design of a barrier play a big role in barrier ownership.
BARRIER OWNERSHIP

2. Operate the barrier;

- The Driller operates the mud/brine column for the well by looking at pit levels and monitoring the well behaviour.

- A Mud Logger and/or Shaker Hand also monitors and is expected to communicate with the Driller.

- An important part of operating a barrier is deciding what to do with information.

- Both the Tool pusher and/or Client Representative (Company Man) need to set clear expectations across all team members of what, when and how information must be collected and communicated.

- Correct and timely interpretation of changing conditions is critical to the operation of many barriers.

- Failure to recognize or correctly interpret changing well information has occurred on a number of occasions leading to incorrect operation of the fluid column as a barrier.
BARRIER OWNERSHIP

• 3. Maintain the barrier;

• Finally a barrier needs to be maintained.

• For our mud/brine example, its properties must be monitored and when necessary treated to ensure these remain within specification.

• Testing by the Mud/Brine Engineer, and provision of this data to the Tool pusher and Client Representative (Company Man) is vital to ensuring timely and proper adjustment of the fluid column properties so that it provides the barrier properties intended.

• An out of calibration mud balance can cause the barrier (Mud/Brine) to be insufficient illustrating 2 failures:
   The mud balance as a critical instrument, and the fluid column as a result.

• If this goes un-noticed for long duration, a serious incident could result.

• Both these examples show that also indirect tools related to a barrier must be maintained properly.
BARRIER OWNERSHIP

- Competent barrier management requires that each barrier owner understands the validity of their barrier and has the skill to execute their part of ownership.

- That skill is developed by applying knowledge in day to day operational execution, including also through required drills.

- It is the duty of each Barrier Owner to ensure they operate and maintain their barrier as designed at all times when required.

- Every barrier owner is expected to know their roles, know the barriers, keep them healthy, and prove it.
ELEMENT 3- LOST BARRIERS – (If A Barrier Is Lost, Immediately Stop And Fix It.)

As a Leader (Boardroom), You Need To;
• 1. Make it clear that everyone must comply with the minimum two (2) independent barrier policy.

• 2. Provide the time and resources that people need to either put barriers in place or repair them

At the Frontline (Field) You Need To;
• 1. When barriers are not clear; STOP and confirm before you proceed.

• 2. Always check there two wells barriers in place.

• 3. Report all lost barriers , including leaks and spills to your supervisor.
EXAMPLES OF LOST BARRIER SCENARIOS

• 1. Leaks from Stuffing boxes in wireline / Coil Tubing.

• 2. Leaks from stripper of grease injection heads in wireline / Coil Tubing.

• 3. Leaking BOP’s.

• 4. Hole not taking the right fluid volume for displacements during tripping.

• 5. Abnormal increase/ decrease in the trip tank, etc.
LOST BARRIERS EXPECTATIONS

1. Have procedures agreed and communicated for monitoring the well and conducting flow checks.

2. Communicate what steps to be taken in lost barrier scenario to make the well safe during pre-job safety meeting.

3. Establish good communication between the various parties on location that monitor and maintain barriers (e.g. mud loggers, mud engineer, MPD engineers, real-time logging).

4. Have clear responsibilities for well control if other services may affect the ability to close-in the well (e.g. wire line logging).

5. Make it clear who does what.

6. Conduct regular drills to test personnel, equipment, and well barriers management scenarios.
ELEMENT 4 – WELL CONTROL – (Know Your Well Control Equipment And Confirm It Is Certified And Tested.)

As a Leader (Boardroom), You Need To;

• 1. Regularly review the status of critical well control equipment in your assurance tracking tool/ software.

• 2. Make sure the re-certification of critical well control equipment is captured in preventive maintenance programmes.

At the Frontline (Field), You Need To;

• 1. Make sure the status of well control equipment is in the well assurance tracking tool / software.

• 2. Maintain the proper line-up of well control equipment.

• 3. Confirm shear capability and discuss the running of any non-shearables with your supervisor.
WELL CONTROL

• Many well control incidents indicate failure to ensure that the teams responsible for managing the well barriers have the right level of competence.

• Strong and weak signals are either not recognized and therefore not responded to, or response times to deviations from predicted well behaviour have been too slow.
WELL CONTROL

• Questions are not being asked to confirm understanding of changed situations, and/or operational deviations are accepted resulting in escalation that could have been avoided.

• There have been instances of incorrect responses which either aggravated the situation or well recovery, and cases of incorrect or damaged equipment being used due to failure to recognize, check or test beforehand.
WELL CONTROL

• It is important that we utilize the opportunity and obligation to learn from previous incidents but too often we fail to do this.

• For the sites, getting the basics right is critical: always maintain two independent barriers, have assured competent persons in critical roles, apply MoC when necessary, and use the correct equipment (fully functional and tested as required).

• When it comes to well control incidents, asking questions in case of doubt or to confirm understanding is a strength that needs to be displayed by all involved.
WELL CONTROL EXPECTATIONS

• 1. COMPETENCE;

• a. Continuously test for and assure competence for all team members in critical barrier roles. It is essential that each team member be competent in their field of expertise. This competence must be assured NOT assumed.

• b. Develop approved review process to assure team member competence for all barrier ownership roles, covering both day and night sifts.

• c. Conduct regular drills to test personnel, equipment, and well barrier management scenarios.

• d. When planning a critical or specialized activity, take steps to assure that the persons approved as competent to undertake the activity will actually be present.

• e. Have a process in place, to address changes to your team (including across Shifts and crew changes).
2. **COMMUNICATION**; handovers; language barriers

a. Ensure communication protocols are in place and test these before you need to apply in a real situation.

b. Please pay particular attention to communications within multi-cultural teams (often from different companies), especially when members move into work environments they are not familiar with, and especially when these circumstances include unfamiliar technology deployment or working on technically difficult well projects (e.g. HPHT; MPD).

c. Ensure that data (including handovers) and instructions, especially regarding well control, will be complete and clearly understood first-time-every-time.

d. Conduct tests before critical operations to assure that there are no language barriers between key personnel.

e. Ensure that your communications testing is representative of a real potential scenario (e.g. overcomes barriers such as multiple languages; high noise environments; other).
WELL CONTROL EXPECTATIONS

• 3. **PLANNING;** Contingency/Emergency preparations and application of MoC.

• a. Ensure planning meets all known requirements including mitigation of known risks, and address the requirement to STOP (and undertake MoC steps) as necessary.

• b. Have roles and responsibilities for mitigation of emergencies defined, allocated and communicated to the appropriate persons.

• c. Ensure contingency planning consider situation complexity: where multiple contractors and/or service providers are involved in a given operation, clarity as to who is responsible when, and for what, can be a critical factor in avoiding an incident.

• d. Test your team communication interfaces and prove they are effective.

• e. MOC is mandatory in specified circumstances: ensure your team knows what these circumstances are.

• f. Ensure that the need to stop and apply the MOC process is recognised by your team.
WELL CONTROL EXPECTATIONS

4. **EQUIPMENT;** OEM and other checks; Walk-the-Line (and test your barrier deployment).

a. Be certain that your equipment is fit for purpose, properly set up, will be operated by competent persons, and assure that it will work as required when required.

b. Have procedures are in place to ensure an operation does not commence before a complete ‘Walk-the-Line’ has been undertaken.

c. Verify and ensure that equipment is correct and meet required (OEM) standards.

d. Ensure that ‘Walk-the-Line’ is always executed by a competent person.

e. Ensure accurate and up-to-date P&IDs are always available.
ELEMENT 5-SUBSURFACE UNCERTAINTIES- (Know and Communicate Subsurface Uncertainties.)

As a Leader (Boardroom), You Need To;
• 1. Confirm that a Technical Authority has endorsed well operations plans, including Pore Pressure Predictions.
• 2. Encourage and demonstrate an integrated approach to managing subsurface uncertainties.
• 3. Understand the full implication of worst case scenarios.

As the Frontline (Field), You Need To;
• 1. Know the expected formation strength and subsurface pressures.
• 2. Double check the fluid weight against the expected formation pressure.
• 3. Contribute to well control or kick drills, and also learn from them.
SUBSURFACE UNCERTAINTIES EXPECTATIONS

Key Controls for Subsurface Predicted Related Wells Process Safety Incidents Include;

1. Effective communication and collaboration between multiple disciplines (i.e. Subsurface, Exploration, Wells) to integrate confirmed PPP and all the identified potential geo-hazards in the drilling program.

2. Communicate all the subsurface risks to the well-site team during DWOP or pre-spud meeting to raise awareness and precautions.

3. Close monitoring of real time data by competent persons

4. Immediate communication with site team at early signs of data deviating from the drilling program.

5. Know and apply the MOC procedure in case of changes, however small. Ensure the whole team understands their obligation to report and/or stop if there are doubts.
ELEMENT 6- WALK THE LINE – (Walk The Line On Temporary Rig-Ups and Confirm Set-Up = Layout Drawing.)

As a Leader (Boardroom), You Need To;

1. Set an expectation that for all temporary rig-ups, detailed layout drawings must be done.

2. Make it clear that Senior Supervisors must walk the lines.


As the Frontline (Field), You Need To;

1. Tell your supervisor about any difference between the actual and planned rig-up.

2. Get your supervisor’s approval for any changes to plan.

3. Use the Management of Change process when appropriate.
WALK THE LINE EXPECTATIONS

1. Ensure the person who walks the line to check rig up against the P&ID, is competent and can read the P&ID, and indeed check orientation of equipment (e.g. Choke Manifolds, NRV’s, Trip Tank, etc).

2. Have a pre-start up procedure to verify correct rig up and functioning of all equipment in a rig up.

3. Verify that the P&ID used in the field are the latest approved one and are linked to the procedures used.

4. Key personnel must be familiar with a management of change procedure and how do you determine if it is needed to deviate from the procedure or P&ID.
WALK THE LINE EXPECTATIONS

• 5. Ensure that you follow the right sequence of the program (e.g., walk the line prior to testing).

• 6. Ensure only approved 1502” unions are used and Go-No-Go ring available to verify.

• 7. Ensure that there is no mix up of equipment either with respect to pressure rating or suitability.

• 8. Ensure that High Pressure temporary pipe-work is not subject to pressure (including test pressure) prior to all required restraints being in place.

• 9. Keep people out of harm’s way (Line of Fire) when High Pressure temporary pipe-work is under pressure.
**ELEMENT 7 – STANDARDS AND PROCEDURES (Follow Standards And Procedures Or Get Approval To Deviate)**

**As a Leader (Boardroom), You Need To:**

- 1. Know the standards, external and internal regulations, and provide easy access to them for relevant persons.
- 2. Put in place bridging documents with contractors.
- 3. Assign appropriate Technical Authority Levels

**As the Frontline (Field), You Need To:**

- 1. Know and comply with all standards, external and internal regulations.
- 2. Apply the bridging documents that connect contractors' safety systems to confirm applicable standards.
- 3. Always get the required sign-off if a task or action will not comply with the standards.
STANDARDS AND PROCEDURES EXPECTATIONS

• 1. Site Supervisor to ensure that all required controls are in place before the work starts.

• 2. Ensure that specific operational preparations are included in the work permit on site.

• 3. Conduct a Management of Change (MOC) and follow the procedures.

• 4. Ensure the right Technical Authority for the work activity approve changes in the work plan.

• 5. Ensure compliance with the Life saving Rules.

• 6. Ensure approval and precautions are in place during maintenance and repair activities of safety critical equipment.

• 7. Ensure the latest service manuals and operating procedures are available for the equipment in service.
ELEMENT 8-TRAINED PEOPLE-(Confirm All People Are Trained And Competent For The Task.)

As a Leader (Boardroom), You Need To;
• 1. Regularly review the training needs of your teams.

• 2. Identify suitable training programmes and make time for training.

• 3. Communicate formal competency requirements, particularly for HSE-critical tasks.

As the Frontline (Field), You Need To;
• 1. Keep your training up-to-date.

• 2. Act as a buddy and share your learning's with less experienced colleagues.

• 3. Test and show competence during drills.
TRAINED PEOPLE EXPECTATIONS

• 1. Have an assurance process that verifies the training and competency requirements for contractor personnel identified before commencing operations on each location and ensure compliance.

• 2. Conduct regular drills to test personnel competence, familiarity with equipment & well barriers, and well control management scenarios. And assure that drills cover all crews including other relevant 3rd party service personnel.

• 3. Review relevant learning from previous local or external incidents ahead of critical or routine operations.

• 4. Regularly check the training compliance records of new personnel arriving on site to perform a job.
ELEMENT 9-EMERGENCY RESPONSE- (Test Your Emergency Responses And Conduct Regular Drills.)

As a Leader(Boardroom), You Need To;
• 1. Make sure fully documented emergency response contingency plans are in place.
• 2. Be fully confident that the emergency response roles are clear to the parties.
• 3. Regularly test emergency responses with all those likely to be impacted.

As the Frontline(Field), You Need To;
• 1. Know what your role will be in an emergency response.
• 2. Know the site alarm signals and muster points.
• 3. Take part in all regular drills, and record them if that is your role.
EMERGENCY RESPONSE EXPECTATIONS

• 1. We must maintain vigilance in planning and execution for repetitive high risk activities.

• 2. Well control preparedness should be tested and assessed for (high risk) wells, e.g. competence and experience for personnel involved relevant to the operations at hand.

• 3. Establish prior to commencing critical operations that all agreed precautions are in place, e.g. kill pumps hooked up & tested, enhanced kick detection operational, etc.

• 4. Determine who initiates drills and how are they adopted as realistic scenarios to test all relevant people and equipment.

• 5. Assess the existing rig equipment set-up for compatibility to conduct possible alternative well control activities, e.g. rig up of pressurised lubricators or hydraulic work-over unit.
ELEMENT 10-REPORT/LEARN – (Report Wells Process Safety Incidents, Investigate, Share and Learn.)

As a Leader(Boardroom), You Need To;
• 1. Encourage open and honest reporting; welcome bad news.
• 2. Provide the resources to adequately follow up and investigate incidents.
• 3. Take part in close-out of incidents findings.

As the Frontline(Field), You Need to;
• 1. Report ALL Wells process safety incidents; including leaks.
• 2. Be alert to and share process safety event learning's that apply to your own operations.
• 3. Know what you must do to avoid a repeat of an incident that happened somewhere else.
REPORT AND LEARN EXPECTATIONS

1. Ensure regular inspections happen on location to confirm that equipment are in full working order or that relevant procedures are being adhered to.

2. Have a reporting process that ensures that any defects, irregularities or concerns are reported promptly.

3. When deficiencies are observed, determine the root cause and address it.

4. Ensure that feedback from these observations are shared with all relevant people on location (e.g. night/day shift, temporary site staff such as service contractors, even people on leave).

5. Plan to review relevant learning from previous local or external incidents ahead of similar critical or routine operations.

6. Ensure that learning experienced during an activity are captured for future similar operations (e.g. update of procedures, safe working/method statements).

7. Alerts should be reviewed with only one question in mind......Could this also happen on your location, why not? And take action accordingly.
CONCLUSION

• To create strong Process Safety Management in an asset is a journey. The journey starts very often with having a reactive culture where structure and compliance to PSM are largely absent.

• This journey then needs to continue with sustaining and improving further the PSM performance towards proactive and generative levels (“this should be the way we do business in this industry”).

• Experience from other journeys, show that performance can drop when not ensuring proper attention.

• Causes can be related to change of leadership, change of direction / new priority settings in company, poor ownership of PSM processes, lack of training, lack of reviews, all potentially setting the operation back on the PSM journey.
CONCLUSION

• However, to sustain this journey of Process Safety, we require CHRONIC UNEASE.

• Chronic Unease is a mindset that supports our journey towards Goal Zero – No Leaks, No Harm, No Major Incidents in our operation.

• It is a preoccupation with the weak signals of potential failure.

• A state of chronic unease is achieved when leaders at all levels have created a culture where they are made aware of weak signals, and make effective and timely challenges and interventions on risk assessments and decision making.

• Process Safety for us in Well Engineering is not about WHAT we do, it is about WHY we do what we do........
• To put into Wells context;

• “CHRONIC UNEASE FOR ME MEANS CHANGING OUR MINDSET FROM ‘OUR WELLS ARE SAFE AND WE KNOW IT’ TO AN ASSUMPTION THAT OUR WELLS ARE UNSAFE UNLESS WE HAVE PROOF THAT THEY ARE SAFE”

   - PETER SHARPE (EVP - WELLS, SPDC)

IN WELL ENGINEERING, SAFETY IS NOT ONLY OUR NUMBER ONE PRIORITY AND VALUE, IT IS A FUNDAMENTAL REFLECTION OF OUR PERFORMANCE...AND HOW WE DO BUSINESS.
ACKNOWLEDGEMENTS

1. Think Process Safety In Shell Publications.

2. WELLS PT Monthly Bulletins on Process Safety.

THANK YOU FOR YOUR TIME.

QUESTIONS