PROCESS SAFETY – BARRIER MANAGEMENT

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Our assets are Safe and ... we know it
**WHAT IS A BARRIER?**

**Barriers** are measures that reduce the probability of releasing a hazard, and reducing the consequence of a released hazard.

**Barriers** can be hardware, human intervention, or a combination.

**Two types of Barriers…**

**Control Barriers**-
Reduce likelihood (pro-active/ preventative) e.g. High Pressure alarm/ operator response; Automatic high pressure interlock; Pressure relief valve.

**Recovery Barriers**-
Mitigate consequences (re-active), e.g. Gas detection alarm/ operator response; automatic sprinkler system, emergency response.
**Bow-Tie approach to manage safety**

- **Bow tie**: It is a graphical representation of threats & potential consequences relating to a hazard, and the barriers.

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**Hazard**

- Threat 1
- Threat 2
- Threat 3

**Top Event**

**Controls**

**Recovery Measures**

**Consequence 1**

**Consequence 2**

**Consequence 3**

**HSSE Critical Activities**

**List of HSSE Critical Equipment**

**HSSE Critical Processes**

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### Example - Lion at the Zoo

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Threat</th>
<th>Control Barriers</th>
<th>Top Event</th>
<th>Recovery Measures</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lion</td>
<td>Human Error; Improper cage design etc.</td>
<td>Materials of Const.; Zoo Keeper Rounds etc.</td>
<td>Loss of Control; Lion gets out</td>
<td>Zoo Emergency Response Plan</td>
<td>Injuries, Fatalities</td>
</tr>
</tbody>
</table>

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HAZARD - Road Transportation

Threats - driver impairment/distraction, tire failure, mechanical failure, wrong vehicle, etc.

- Vehicle Mechanical Failure
- Design
- Instruments/warning Devices
- Loss of Control
- Safety Equipment (airbag, ABS, seatbelts)
- Collision/Injury

- Instrument/wiring failure
- Vehicle not adequately maintained
- Not available or not used
- State Inspection
- Driver inspections
- Preventive Maintenance
- Rules and Regulations
- State Inspection
- Manufacturer’s Requirements
- Training
Examples of Control and Recovery Barriers
Can you think of other potential Barriers?
These two barriers together make one independent and valid barrier

These three barriers together make one independent and valid barrier
BARRIER VALIDITY CRITERIA

■ Effective
  ▪ Strong Enough/ Fast Enough and Big enough
  ▪ Active barriers have to have a sensor, Logic and Actuator

■ Independent
  ▪ Not dependent on any other barrier
  ▪ Not having a common sensor or logic in common with another barrier
  ▪ Not related to the threat

■ Auditable
  ▪ Being maintained / inspected (CA and responsible party) to “guarantee” the PFD taken into account
  ▪ Have a PFD <= 0.1 (barrier counting)
PERSONAL SAFETY VS PROCESS SAFETY

The Lion – Personal Safety

- Hunts in groups
- Is often visible (audible etc)
- Commonly seen in its own environment
- Is a killer
- Can never be fully tamed
- Can never be left unguarded
- Needs constant vigilance

The Tiger – Process Safety

- Hunts alone
- Is secretive and hard to detect
- Not commonly seen
- Is a killer
- Can never be fully tamed
- Can never be left unguarded
- Needs constant vigilance
RAISING PROCESS SAFETY EMPHASIS AND PERFORMANCE

Goal Zero

Personal Safety

Process Safety
PERFORMANCE STEP CHANGE NEEDED

Goal Zero

Commit
Act
Care

Goal Zero

Comply
Intervene
Respect

Personal Safety

Everyone on the Pitch

Process Safety

Increased Focus and Urgency

Design Integrity
Technical Integrity
Integrity Leadership
Operating Integrity

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Leadership  Action - Be mindful of HSSE risks

Demonstrate wariness/ chronic unease

Know the main hazards in an operation – if you don’t - ask

Engage with those doing the work – “what could go wrong, and what controls are in place to prevent it?”

Welcome bad news – “what do you not want to tell me” - and react appropriately

Watch traffic light reporting – challenge the greens and support the reds
Let us get Barrier thinking to be part of the way we do our work everyday to ensure we prevent major process safety incidents in our business.

Yes

Our assets are safe and ... we know it
Thank you for Active listening!