Process Safety Management

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Making our world more productive

What is Process Safety?

A definition by Reynold Training Services

You can further check @ https://youtu.be/i1pKYhFQJvM

Disasters in Industry

Flixborough 1974	What went wrong:- • Modifications made without proper risk assessment • Operating practices were modified	**Fatality** ~ 28	
Bhopal 1984	What went wrong:- • The storage refrigeration system was down • The high temperature alarm was disabled • Scrubbing system was not available	**Fatality** > 3000	
Bintulu 1997	What went wrong:- • Hydrocarbon contamination in Re-bolier • Low purge of liquid Oxygen	**Fatality** Lucky !!!	
BP Texas 2005	What went wrong:- • Level transmitter malfunctioned • Operating practices were not followed • Location of temporary trailers very close to vent stack	**Fatality** ~ 15	
Henan 2019	What went wrong:- • Leakage in cold box leading to O2 enrichment in insulation • Operation continued despite of leakage & crack on cold box • Operating procedure not followed	**Fatality** ~ 15	

Root Cause & Learnings

Flixborough 1974	Root Cause:- • No Engineering Management of Change • Operating practices were not followed
Bhopal 1984	Root Cause:- • Lack of Engineering Management of Change • Ineffective Emergency Preparedness and Community Notification • Inadequate Mechanical Integrity and Maintenance
Bintulu 1997	Root Cause:- • Ineffective Employee training • Lack of Hazard Awareness
BP Texas 2005	Root Cause:- • Lack of Engineering Management of Change • Inadequate Mechanical Integrity and Maintenance • Inadequate incident/near miss investigation process
Henan 2019	Root Cause:- • Inadequate Hazard Awareness • Not following operating procedures

Learning

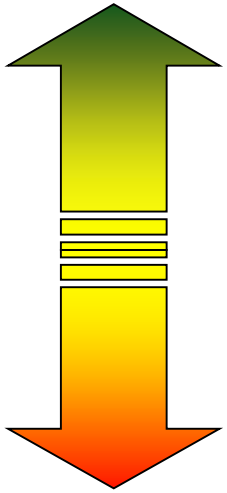
- **Awareness & Evaluation of Hazards and Risks involved in day to day operations.**
- **Review and Document Design and Operational Procedure changes.**
- **Competency development, Training & Assessment.**
- **Develop & adherence to Maintenance schedules**
- **Develop & adhere to Standard Operating Procedures.**
- **Develop Emergency Prepardness**

Risk Reduction

- Risk Reduction is the art of applying controls to reduce risk
  - No “Risk Control” is completely fail safe unless the hazard can be eliminated
  - Process controls must be selected according to their effectiveness
  - Generally, more than one ***layer of protection*** should be applied, particularly for major hazards or where the risk is high

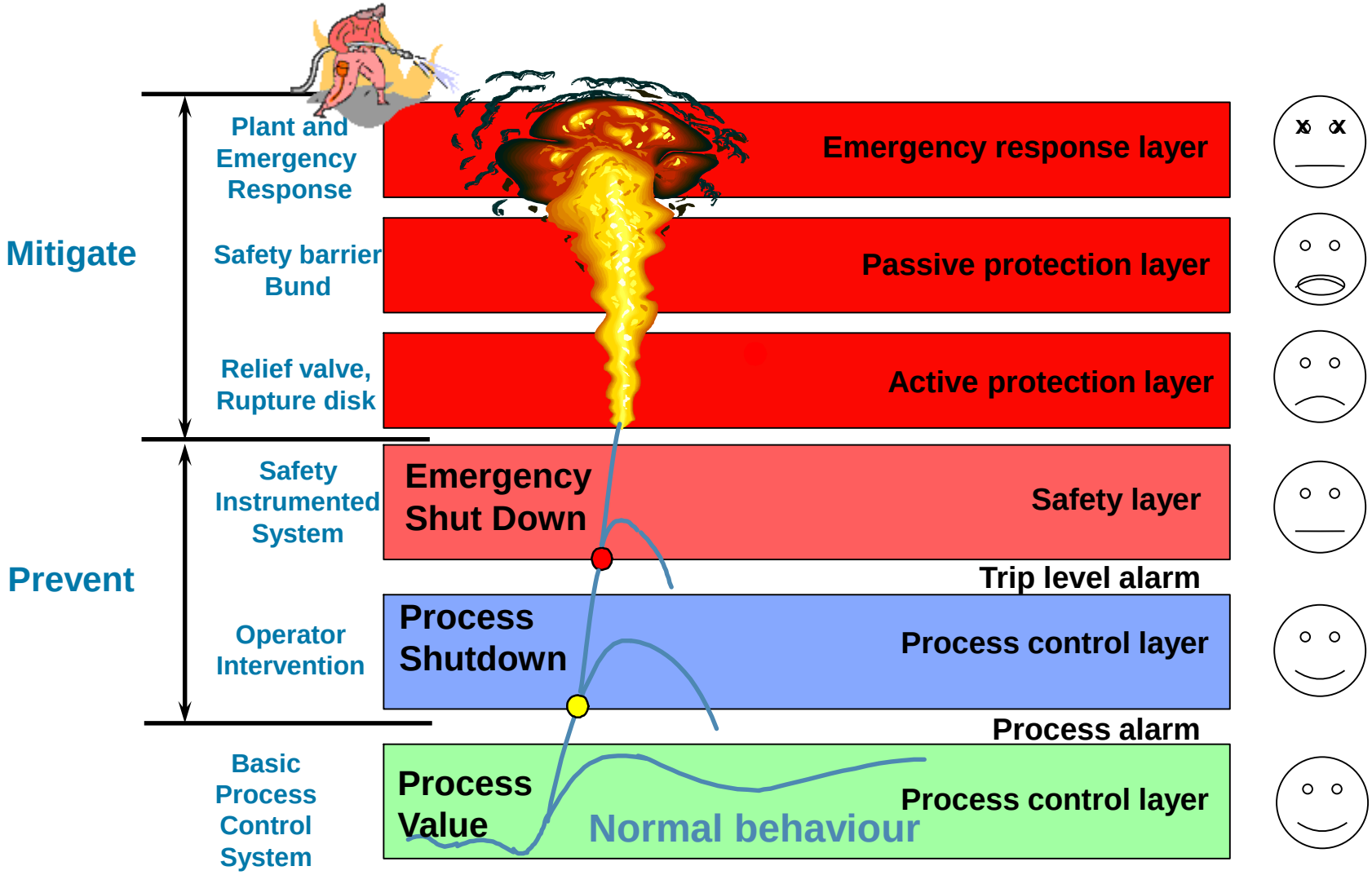
- Control Hierarchy
  - Eliminate the hazard
  - Substitution or inventory reduction
  - Engineering controls
    (safety valves, process trips, interlocks, etc)
  - Isolation of the hazard
    (blast shields, barriers, insulation, etc)
  - Procedural or administrative controls
    (work instructions, training, signs, etc)
  - Personal Protective Equipment
  - Accept the risk

More Effective



Least Effective

Control of process hazards -"*Layers of Protection*"

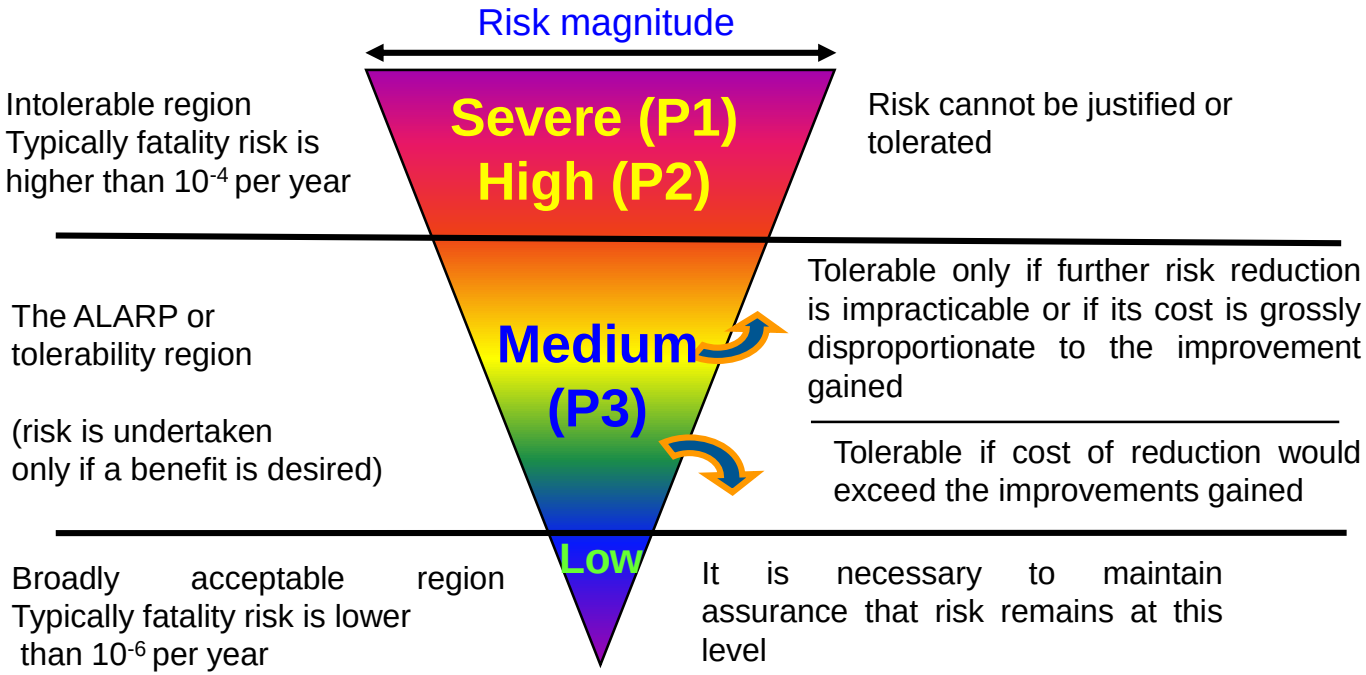


What is an acceptable level of Risk?

Organisations have a legal & moral responsibility to reduce risks

'As Low As Reasonably Practical' (ALARP)

ALARP boundaries for individual risks: Typical values.



This principle applies to Design, Operation & Maintenance activities

Process Safety Management system Elements

- Wake up call for industry to improve Process Safety
- Many systematic, organizational and technological failures identified which still remains as the underlying causes for the major incidents

1. Organisation and Personnel (Competency, Awareness, Culture & Practise)
2. Process and Material Information (Threshold Quantities, Data sheets etc.)
3. Hazard Identification and Evaluation (Process Hazard Analysis, HAZOP, Risk Assessments)
4. Operational Control (Robust Procedures, Procedure Check & Compliance)
5. Safe Systems of Work (PPE, Risk Identification, Work Permit)
6. Mechanical Integrity and Reliability (Inspection, Maintenance, Re-validation, Calibration)
7. Competency development (Training & Assessment)
8. Engineering Management of Change (Risk Assessment & Documentation)
9. Pre Start-Up Safety Reviews (Look for hidden Hazards in changed situations)
10. Emergency Planning and Response (Define Emergency Situations, DO's & DON'Ts in emergency)
11. Incident Handling (RCA, Tools and techniques, Communication - Lessons from Loss)
12. Process Safety Performance (Define Process Safety KPIs – Reporting Targets)

Finally, Audit – Checks & Balances

Ways to learn???????

- Learning from accidents ???

  : Pain / Fatalities / Injuries / Failures/Business Impact

- Learning from incidents ???

  : Injuries / Cost / Failures / Business Impact

- Learning from others' incidents

  : Free Learning for us, may not be for "others"

- Learning from near misses

  : Free Learning for us, may not be for "others"

The most important way to learn is from "Sharing"

Best Practices across industries.

Many lives can be saved……

Stay Safe; Act Safe; Keep Safe – Make our world more productive

Thank you