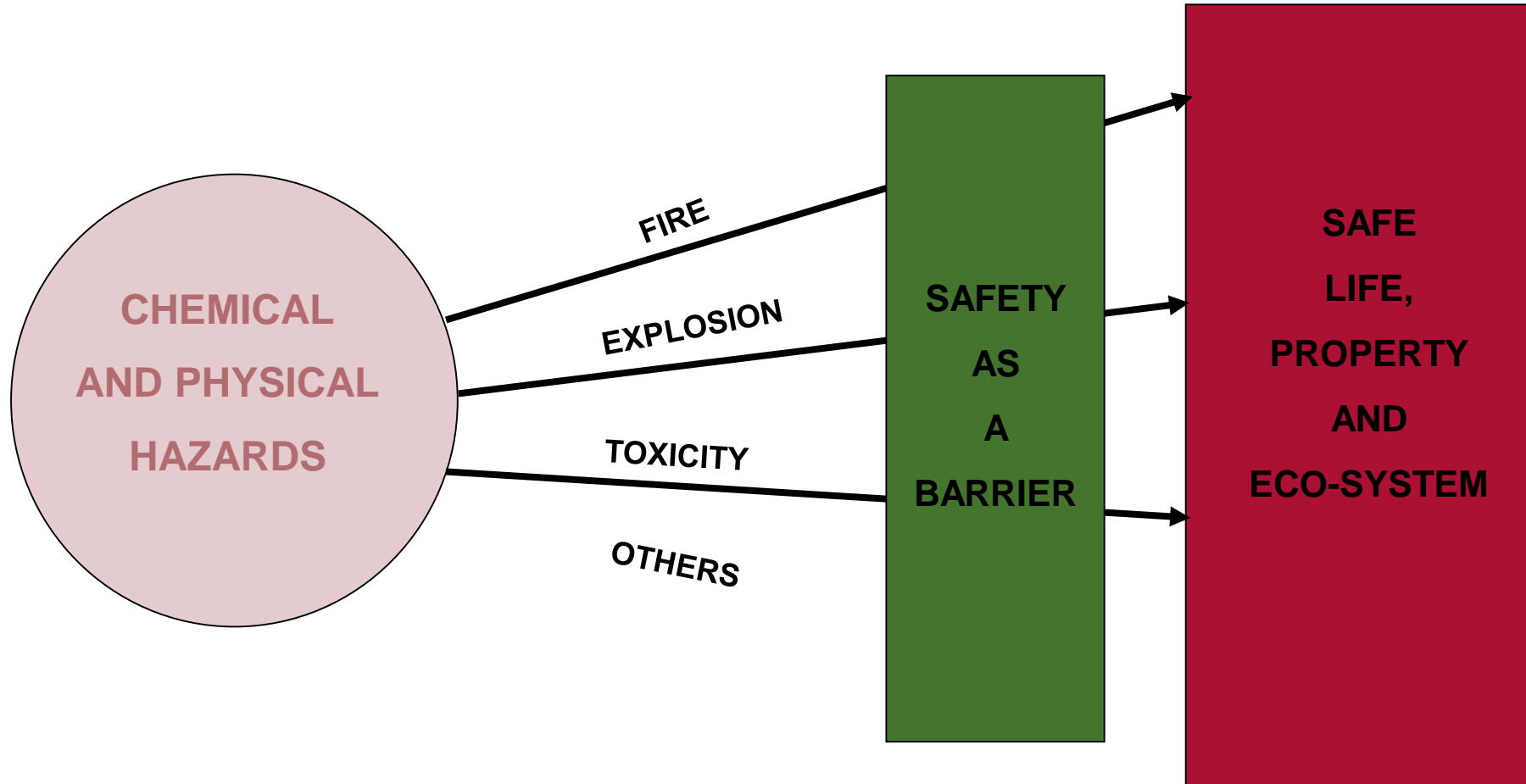




APPROACH TO PROCESS SAFETY DURING PROJECT LIFECYCLE



Why Do We Require Process Safety



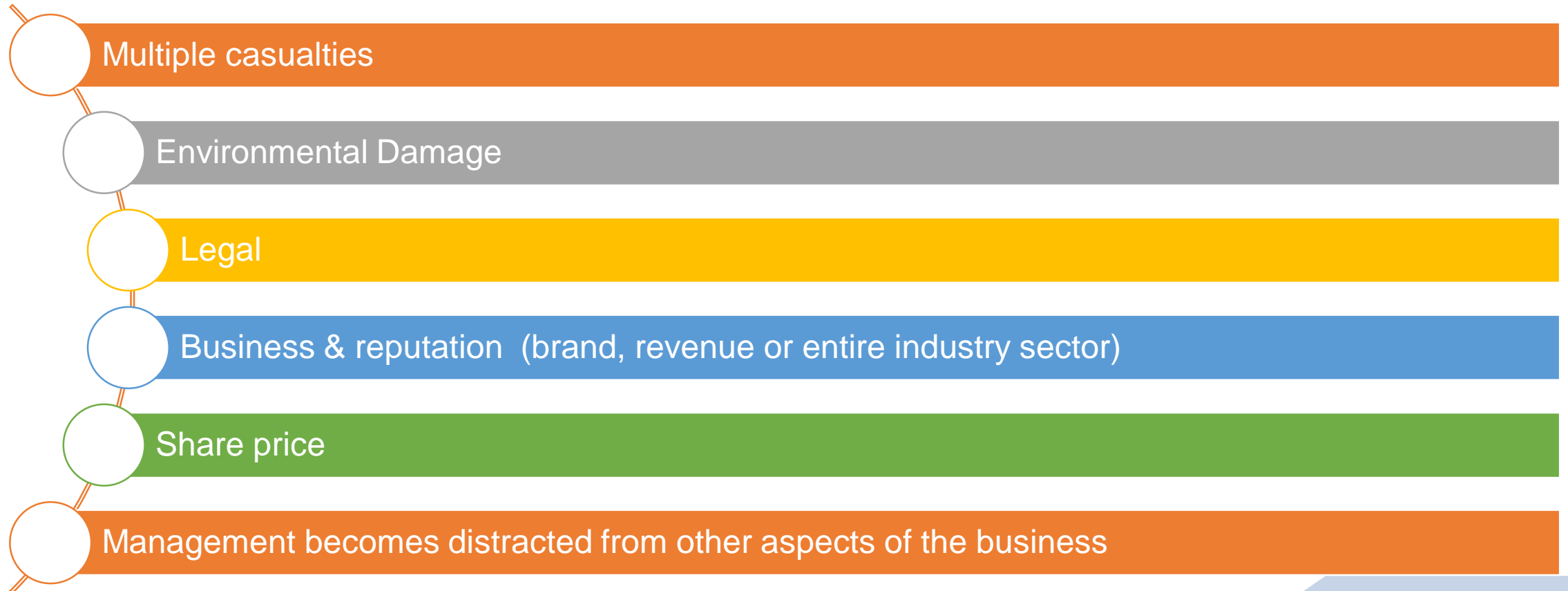
Why Do We Require Process Safety



SUBTRACT PROCESS SAFETY

Why Do We Require Process Safety

When Process Safety fails (such as: Seveso, Bhopal, Piper Alpha, Toulouse, Buncefield, Texas City, etc.) Consequences of one incident alone bear the potential to cause significant problems/losses:



Approach for Safety in Plant Design

Eliminate or minimize hazards rather than control hazards

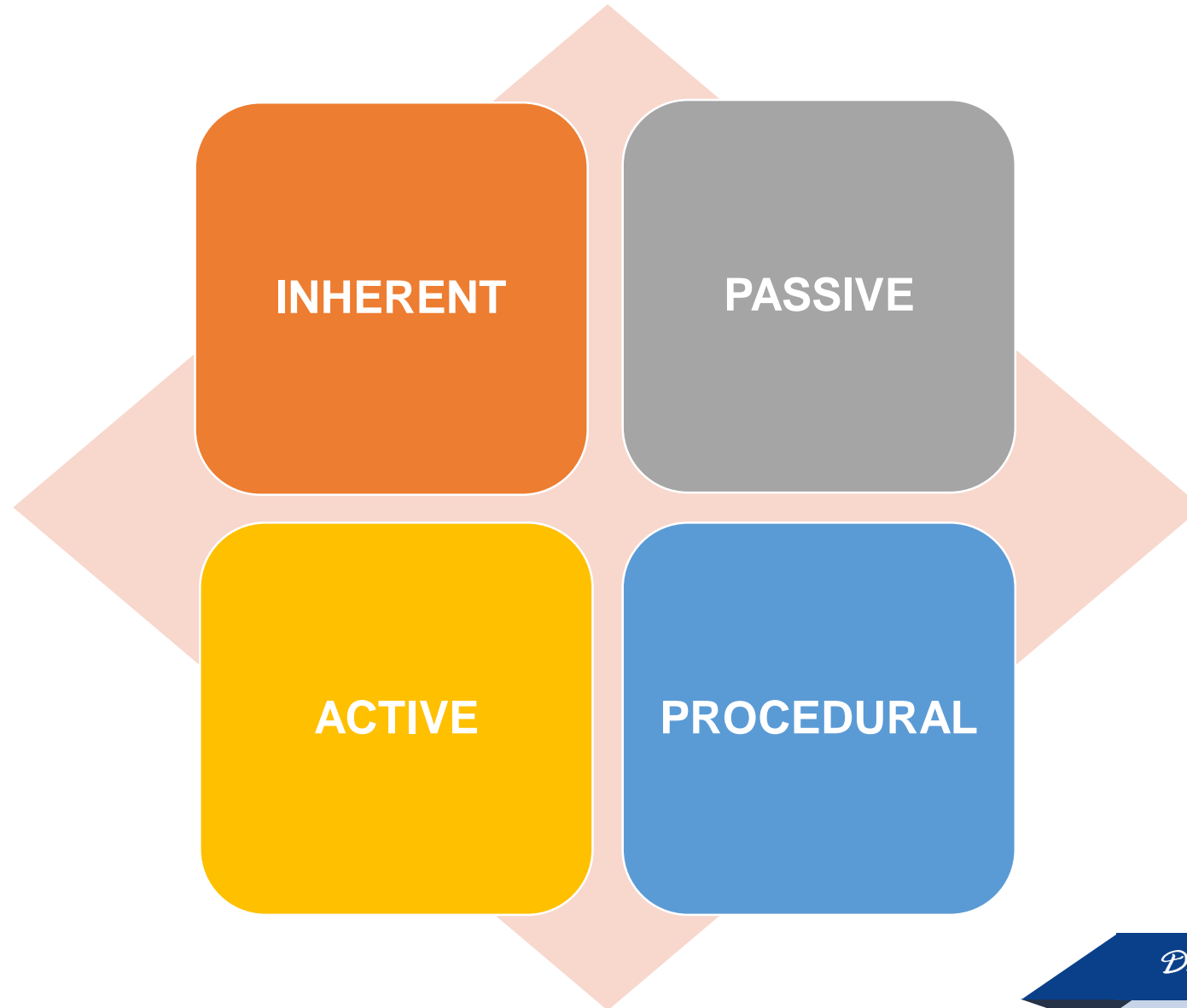
Don't wait for a major accident to identify need to improve major hazard management.

Need to learn lessons from accidents but don't rely on this approach

Manage risks via Foresight rather than Hindsight i.e. be proactive rather than reactive.

More a philosophy and way of thinking than a specific set of tools and methods applicable at all levels of design and operation from conceptual design to plant operations

Process Safety Strategies



Process Safety Strategies

INHERENT

- Minimize or eliminate the hazard by substitution.

PASSIVE

- Process or equipment design features

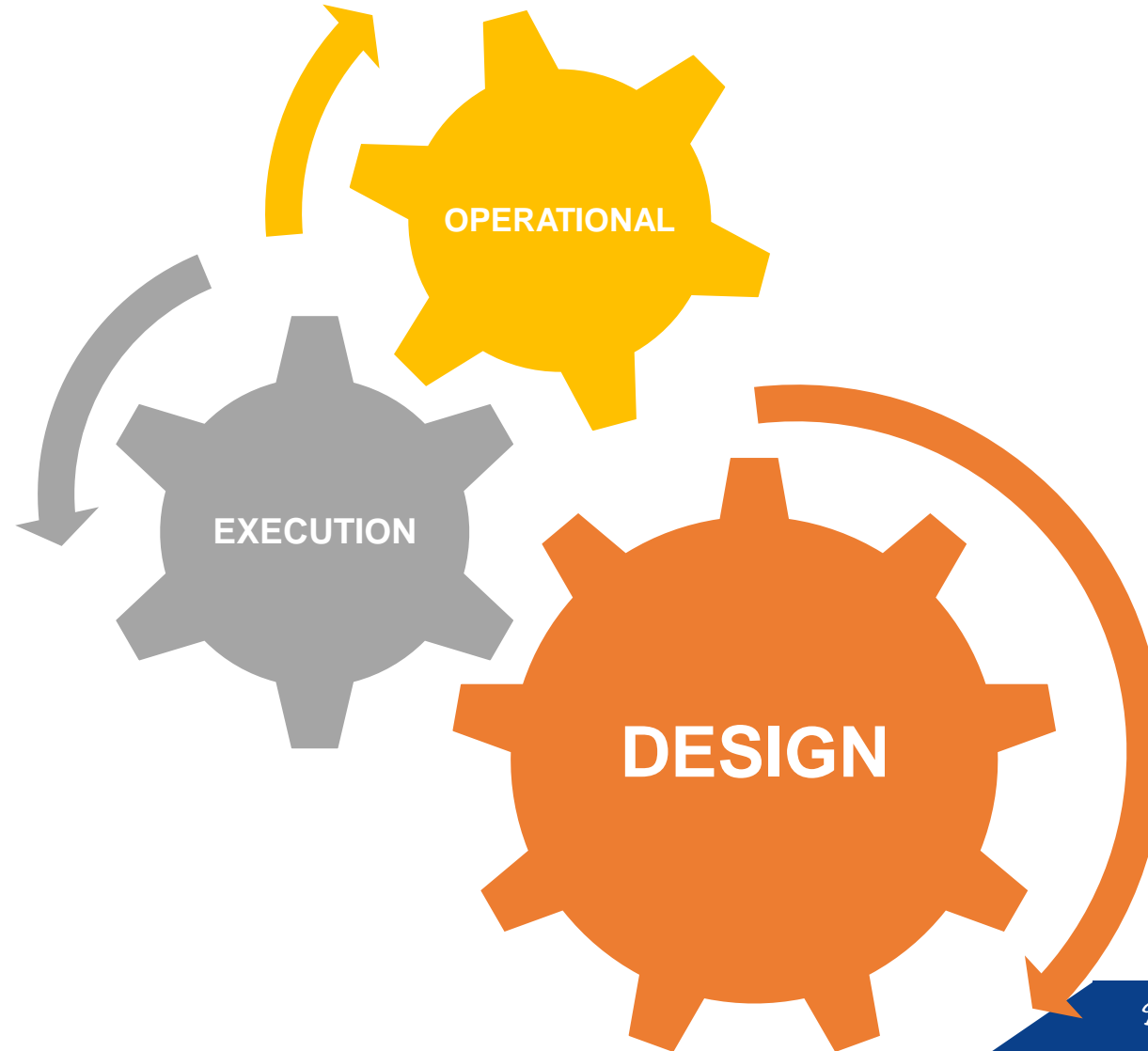
ACTIVE

- Controls and systems

PROCEDURAL

- Standard operating procedures, safety rules, emergency response procedures, training.

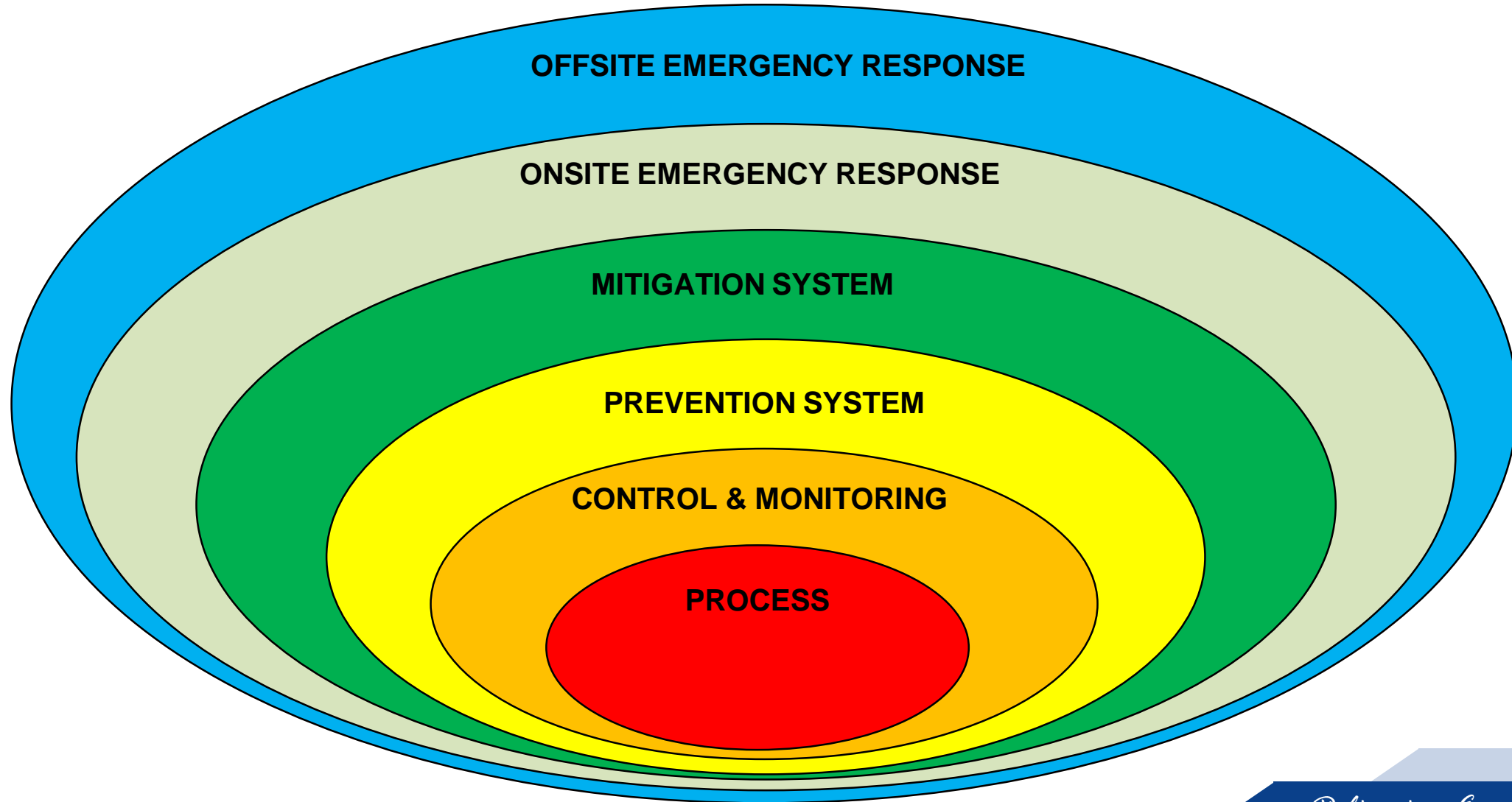
Process Safety at Various Phases



Process Safety In Design Phase

- Environment Impact Assessment , Environmental Baseline Survey
- HAZID, ENVID, HAZAN, What If analysis, FMEA
- HSE Reviews, viz 3D Model reviews, Plot Plan & Equipment layout review, F&G Mapping studies etc.
- HAZOP, SIL, QRA
- Fire Safety Assessment and Dispersion Analysis, Noise Study, EERA
- ALARP Study (As Low As Reasonably Practicable)
- Active and Passive Fire Protection System

Process Safety Philosophy



Process Safety Philosophy : Process Design

Selection of proper Material of Construction (MOC)

Selection of proper piping class, rating

Selection of proper design conditions (Pressure, Temperature)

Selection of hold up volume

Conformity to various codes/ standards

Adherence to Recognized and General Accepted Good Engineering Practices

Feed Back from previous jobs, Client, Engineering, Commissioning

Process Safety Philosophy : Layout

Separation of hazardous areas from non-hazardous areas

Safe separation distances as per codes and GEP

Keeping Toxic Chemicals handling unit / High Pressure units away from the Plant boundary

Adequate escape routes, safe access for operation and maintenance

Main ignition sources should be grouped and located upstream of prevailing wind.

Location of MCR, Fire Stations, Operator Cabins

Process Safety In Execution Phase

- System Design in accordance to various globally operational / accepted standards like API, ANSI, etc.
- SIMOPS - Simultaneous Operation study for Planning and coordination
- Project HSE Review (PHSER)
- Pre-startup safety review's (PSSR)
- Safety Audit's
- Following Procedures

Process Safety In Operational Phase



- Following Standard Operating Procedures (SOP's)



- Regular third party Safety Audit's



- Management of Change (MOC)



- Revisiting of PHA studies



- Training



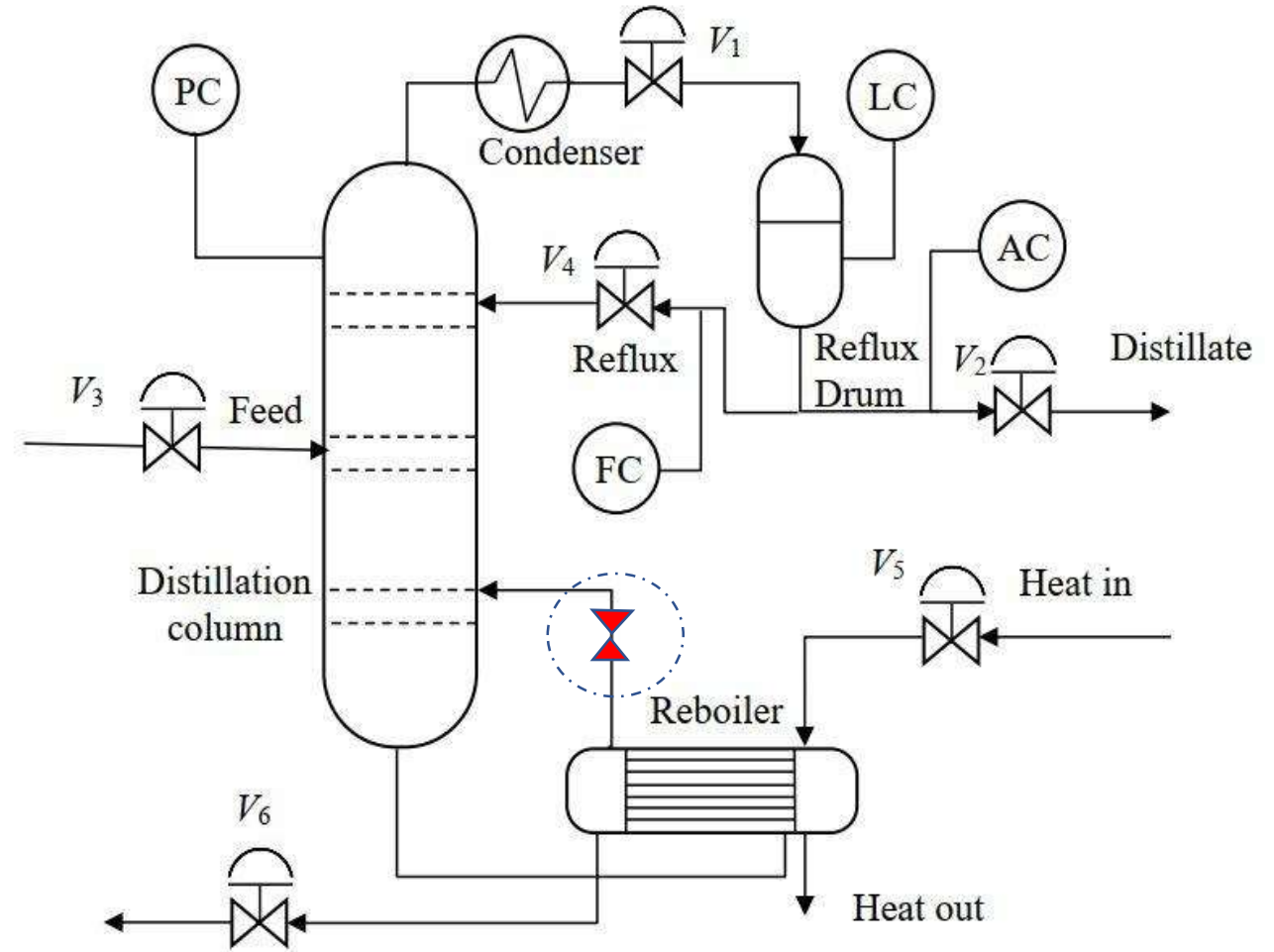
- Safety Permit System



- Up gradation based on newly developed technologies in control & automation

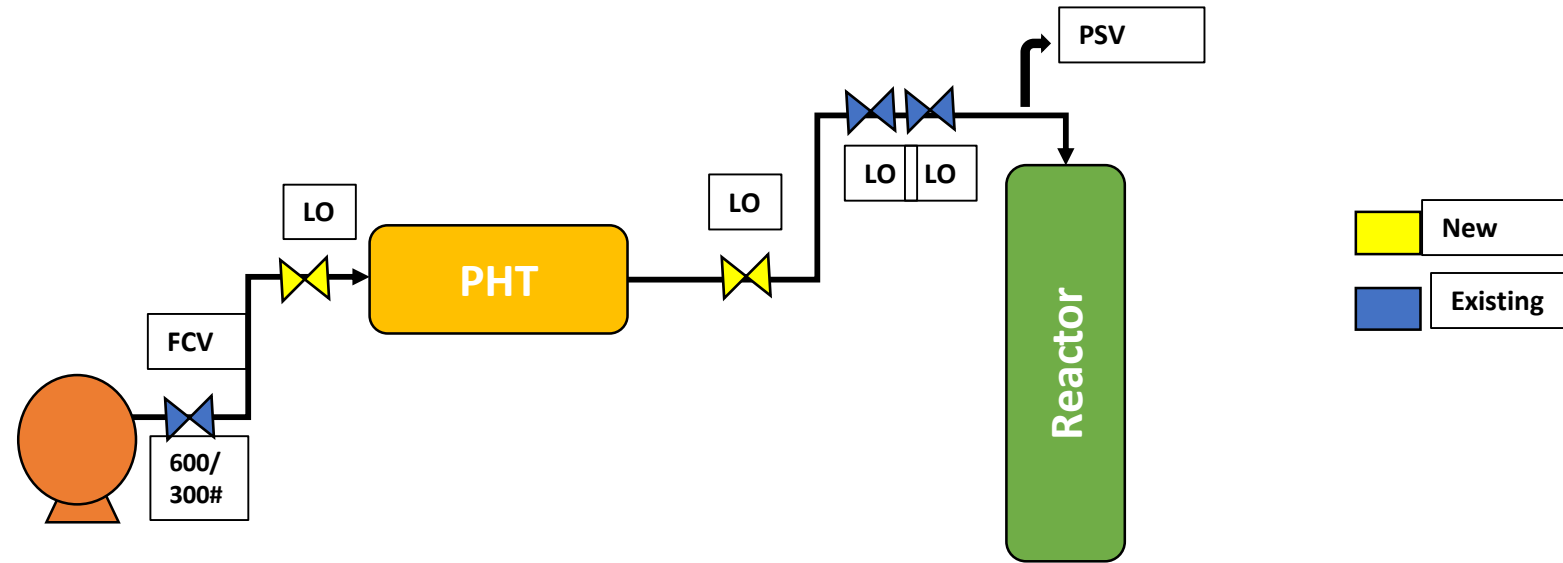
Process Safety- Case Study

- In a Cracker Recovery section a propylene rectifier operated with 4 reboilers.
- The return line of reboiler was 42" and was directly connected with the Column.
- Client provided isolation valve in the outlet of reboiler for ease of maintenance.
- With this arrangement the column PSV could be isolated during a start-up or mechanical issue with the valve and may lead to blocked in heating condition.
- This could overpressurize the reboiler leading to fire and safety hazard.
- During MOC approval, credit of LO was taken.



Process Safety- Case Study

- A HDS feed line to reactor passes through multiple Feed/effluent exchangers.
- Client introduced LO isolation valves for maintenance in the feed circuit.
- Pressure spec break was provided at upstream control valve.
- The reactor itself had locked open isolation valves.
- The PSV provided was located on top of the reactor for protection of reactor and system upstream.



- A total of 4 isolation valves with LO provision was available in feed line to reactor.

Process Safety- Area for Improvements

For LO valves; As per API, Administrative controls failure has to be considered and if the supply system pressure exceeds hydro test pressure of low pressure side then a suitable safeguard has to be provided.

Multiple SIL-3 loops are provided in design configuration for ensuring safety of plants, especially in revamps & new units as well. This always leave residual risk in plant if this loop is not maintained through out plant lifecycle.

Lack of Company specific Risk Acceptance Criteria leads to over design & under design of Process units by different Licensor / EPC.

Process Safety- Area for Improvements

Due to lack of above Cost Benefit Analysis (CBA) cannot be performed. Technical decisions are taken on qualitative basis.

Lack of Country specific Risk Acceptance Criteria leads non uniformity in QRA in industry.

Lack of Land use Planning Criteria leads to concurrent industrial & residential development.

Minimum standardization for Safety Study Chairman's is need of the hour.



THANK YOU