

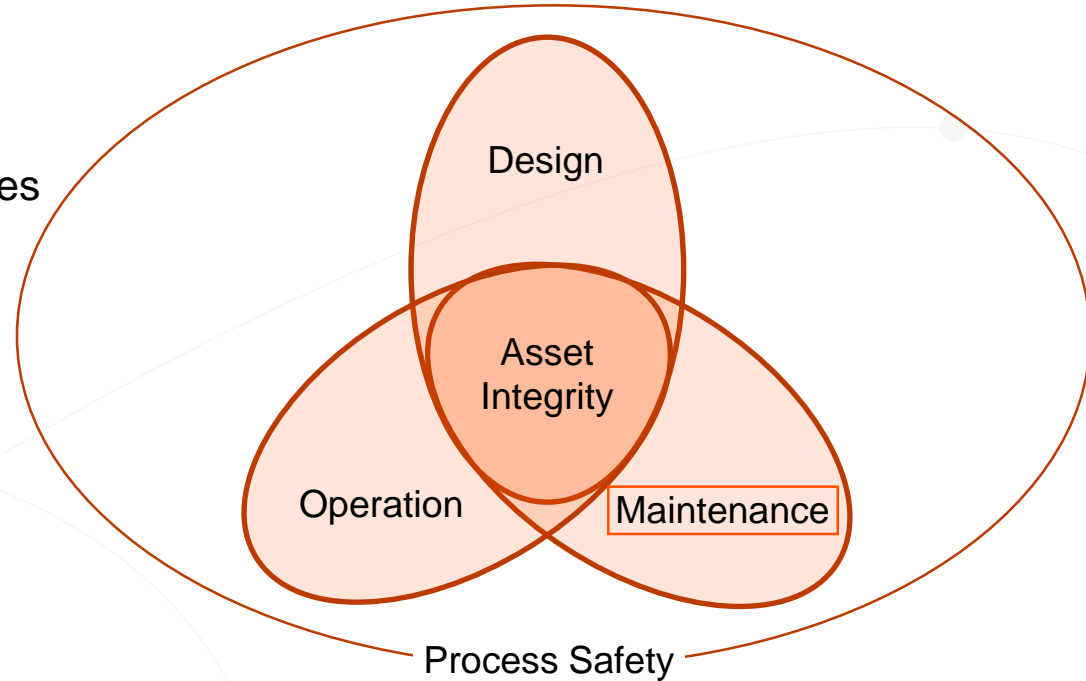


# PSM & Asset Integrity (Precision) Maintenance

Toine Cremers

Nouryon

- Process safety focuses on preventing fires, explosions and accidental chemical releases in chemical process facilities or other facilities dealing with hazardous materials such as refineries, and oil and gas (onshore and offshore) production installations.
- Process safety programs focus on design and engineering of facilities, **maintenance of equipment**, effective alarms, effective control points, procedures and training.



# Process Safety Blind Spots: **EXPOSED!**

Improving safety for organizations involve more than technological solutions; understanding processes and plant interactions are equally important. Oftentimes, "blind spots" are recognized as a significant contributor to a major accident. Here are the top process safety blind spots every engineer/manager should be aware of:



## Blind Spot #1 The Project Execution Woe

Today's typical large-scale engineering projects have major teams that interact with many organizations. As such, thousands of documents are created; information is communicated through many different media and quality check process is constantly challenged. Undetected errors can occur if the data exchange protocols are not well defined or managed.



## Blind Spot #2 The Safety Assessment Hitch

The Safety Assessment Hitch  
Safety assessments such as hazard and operability studies (HAZOPS) identify hazards and quantify their respective risk. A hidden deficiency in this process can result in risks that are underestimated so that the applied Independent Protection Layers (IPLs) are inadequate. A hazard can be missed or incorrectly assessed if the team is missing key technical, operating or maintenance expertise.



## Blind Spot #3 The Technology Squeeze

New technology and new designs often create unforeseen "challenges". When the industry embraced open systems, the Microsoft® Operating System became a standard component in many control systems. The unforeseen risk was an ongoing urgency to install frequent software "patches" to correct security holes and software stability problems. This and similar blind-spots can degrade the system.



## Blind Spot #4 The Human Factor

A well-designed system, organization or procedure integrates humans into processes where they are known to perform well, and it avoids or minimizes activities that humans are known to perform less reliably. If this is not the case, the expected error rate will be higher, and the resulting errors may be overt, hidden or unforeseen. Human error in any type of process or activity increases when humans are under tasked, over tasked or placed under stress.



## Blind Spot #5 The Organization Drag

High-performance organizations of the type needed to manage high-integrity safety systems are not at a natural state; the laws of entropy apply. Organizations undergo continuous change, whether desired or not. The organization affects the other listed modes in positive and negative ways, which means it contributes to blind spots. A seemingly subtle change in priorities, staffing, training, etc. can significantly affect process safety as it interacts with other listed modes.



## Blind Spot #6 The Operations and Maintenance Flaw

Operating modes may exist that are "below the radar" and, therefore, not assessed from a safety and risk perspective. On the maintenance side, off-the-books repairs and undocumented software changes may be implemented in response to a problem that occurs during an unscheduled event holiday weekend maintenance callout.



## Blind Spot #7 The Risk Acceptance Creep

Individual risk tolerances can shift when the person is faced with an immediate decision on whether to proceed (e.g., maintain production) or revert to a known safe state (e.g., shutdown). Risk acceptance appears to increase or perhaps, risk denial occurs.



## Blind Spot #8 The Accident Investigations Dilemma

Past theory and practices for accident investigations took an approach that often cited "operator error" as the root cause. The new theory, which takes a much wider view, will often trace the root cause to a management failure or a failure of system in which humans function. Those applying the old approach are not aware of where the true weakness in their systems exists, so similar accidents may recur.



## Blind Spot #9 The Management and Leadership Puzzle

By words, actions and examples, management and safety leaders demonstrate their expectations. Subordinates interpret this message and bias their actions and attitudes accordingly. Given the challenges of communications in large and complex organizations, a few misunderstood words or an ambiguous or conflicting message may degrade the process safety attitude of employees.

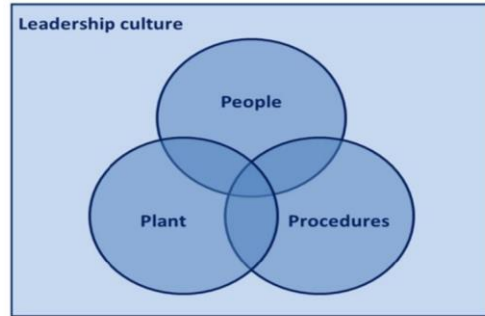


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Non-routine Maintenance activities

# Nouryon PSM Framework & Maintenance



PSM Building blocks	
Plant	7 Process safety information / Substance register
	8 Process safety information/ Process technology information
	9 Process safety information/ Asset register
	10 Major hazard and catastrophic scenarios
	11 Maintenance and inspection plan and procedures

**Maintenance Reliability Management:**  
“do right things”

Criticality Review  
Define Asset Tactics  
Implement  
Review Asset Tactics

PSM Building blocks	
People	1 Leadership, management commitment and operational discipline
	2 Organization
	3 Competence matrix for critical roles
	4 Training matrix for critical activities
	5 Employee involvement and engagement
	6 Contractor management

PSM Building blocks	
Procedures	12 Risk matrix
	13 Management of change
	14 Hazard studies
	15 Pre-startup safety review
	16 Investigation of incidents
	17 PSM audits (corporate, specialist, compliance and internal)
	18 Stake holder outreach
	19 Safe work practices
	20 Operating procedures
	21 Emergency response planning

**Asset Maintenance Management:**  
“do things right”

Safe  
On time  
First Time Right

**Precision Maintenance**

“do things right instead of over and over again”

# Precision Maintenance

“Do things right instead of over and over again”

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## **Precision:**

- 1.The state or quality of being precise; exactness;
- 2.The ability of a measurement to be consistently reproduced;

## **Maintenance:**

- 1.The act of maintaining or the state of being maintained;
- 2.The work of keeping something in proper condition;

## **These two definitions combined:**

“The act of maintaining in a consistently reproducible manner.”

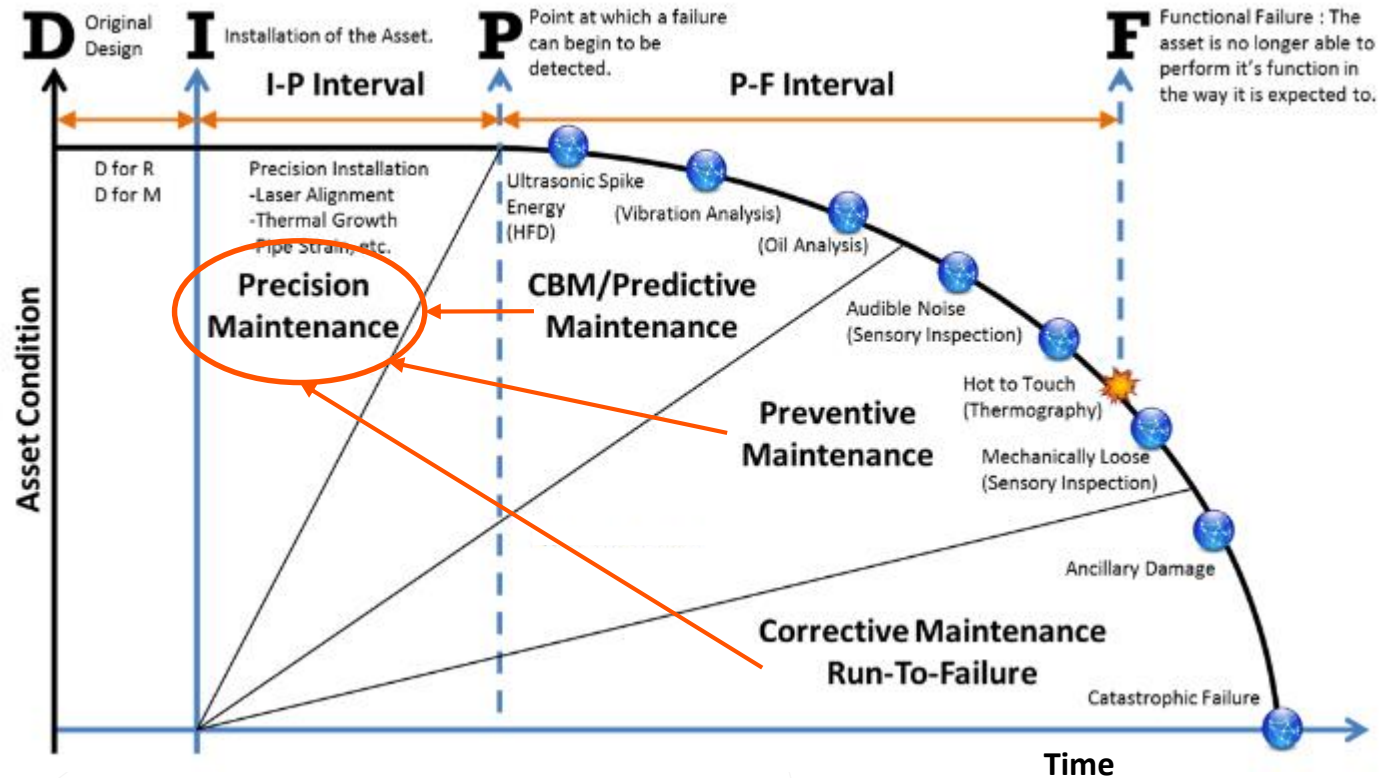
This means that the maintenance performed, is done the same way, and delivers the same outcomes regardless of who performs the activity.

## **Typical Precision Subjects:**

- Measure (equipment)
- (Laser) alignment
- Thermal growth
- Flange Integrity Management
- Torque
- Pipe strain
- Corrosion under insulation
- ...

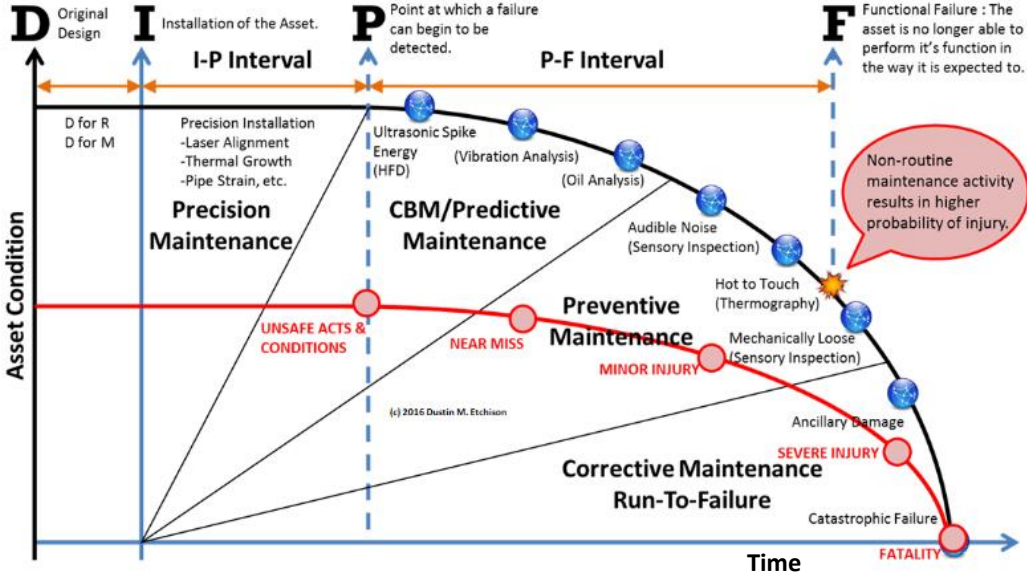
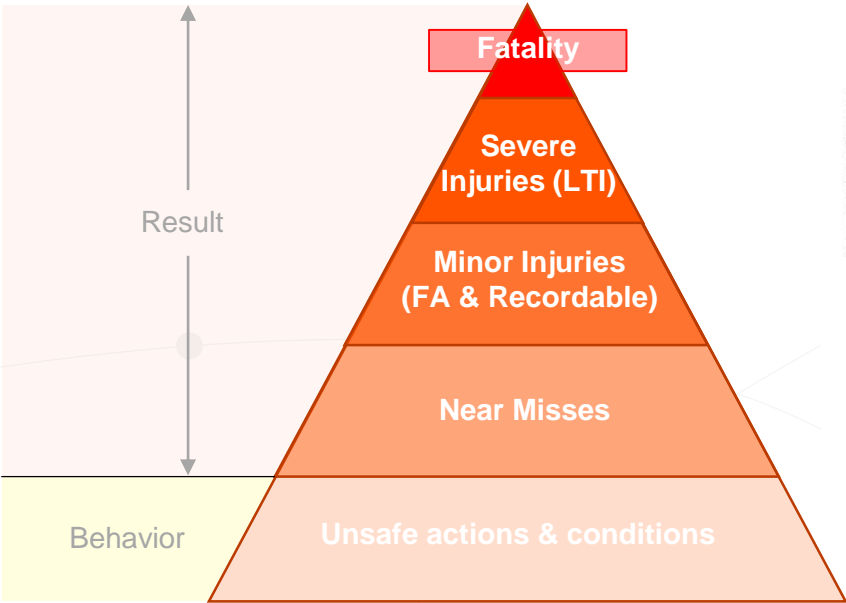


# Asset Failure Curve

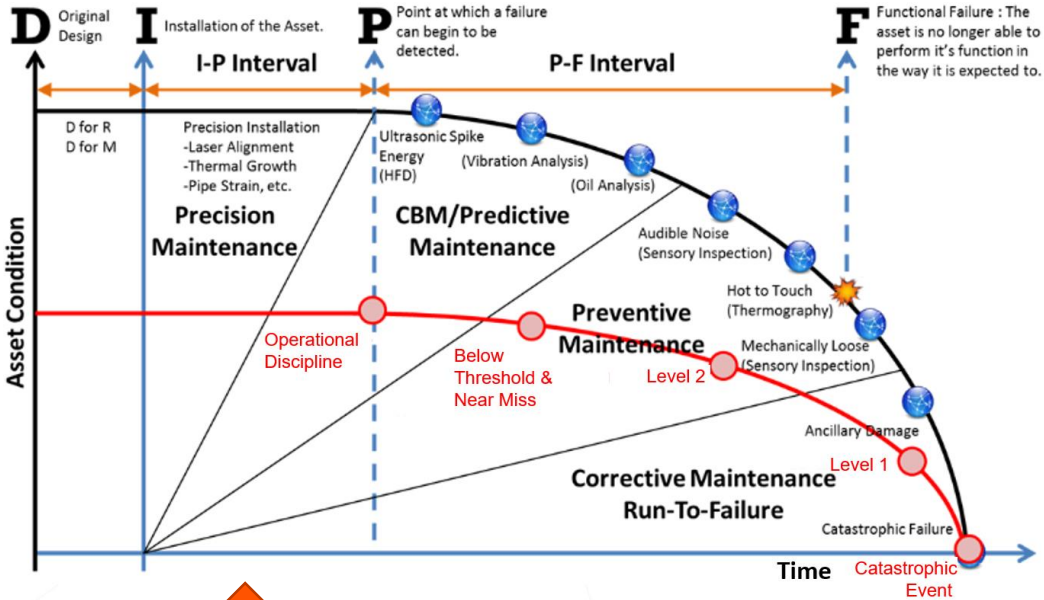
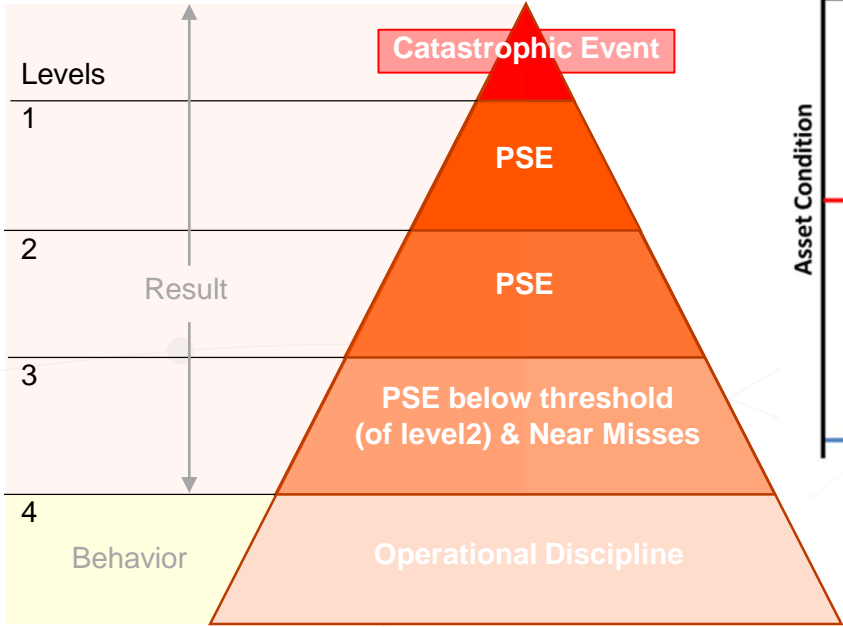




# People Safety Triangle



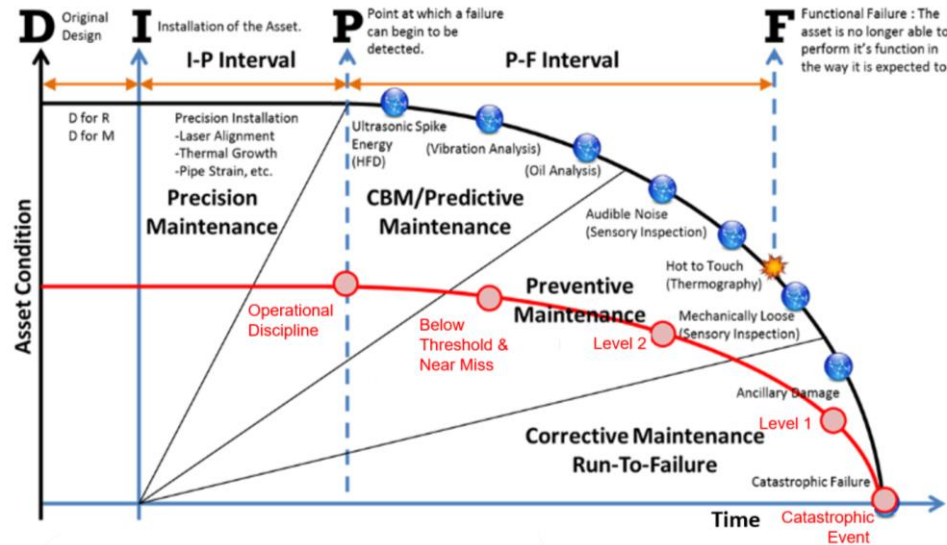
# Process Safety Pyramid





# So what does this show us?

- The probability of a Process Safety Event is significantly increased with non-routine Maintenance activity resulting from equipment failures.
- Connecting the importance of Process Safety to the importance of Equipment Reliability and (Precision) Maintenance is critical in driving a Process Safety Event-free culture.



- How have you (or your organization) connected Equipment Reliability to Process Safety?
- Do you have data proving this?
- What methods are in place to continue to push the limits of Equipment Reliability while improving Process Safety hand-in-hand?

The background is a solid orange color. Two thin, white, curved lines sweep across the frame. One line starts from the left edge, curves upwards and to the right, ending near the top right. The other line starts from the bottom left, curves upwards and to the right, crossing the first line. A small blue dot is located on the upper white curve on the left side. A small green dot is located on the lower white curve on the right side.

**Thank You**

**Nouryon**