



ASSET INTEGRITY SERVICES

Asset Management

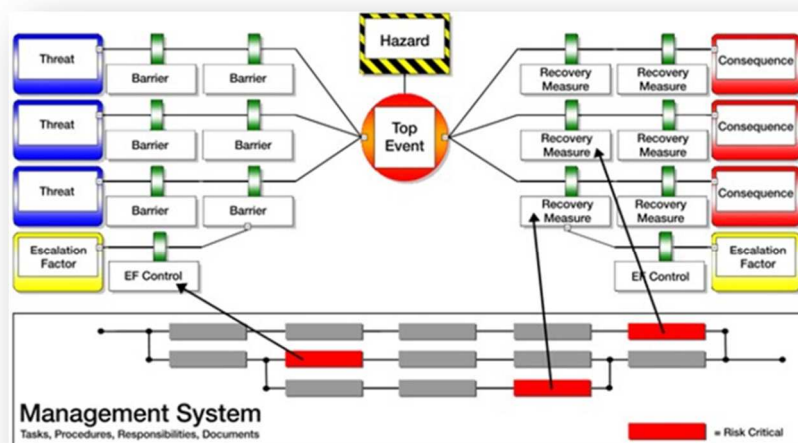
Crea provides technical assistance in developing **Asset Integrity** services. In all asset registers, there is the need to identify particular subset of objects, which have a particular importance for asset management.

Among these lists, we remind:

- ☀ **Safety Critical Equipment:** SCE will be identified and managed according to Company Specification and Performance Standards.

For optimal results, a *Major Accident Hazards (MAH)* is usually developed into *bow-tie models* to show the escalation, consequences and barriers, which are required to manage the hazards during plant operation.

It is adopted a standardized approach to SCE Analysis which facilitates SCE Build-up exposing *Functional Location Register* and allows the identification of *Barriers* to prevent or limit the consequences of a potential major incident.

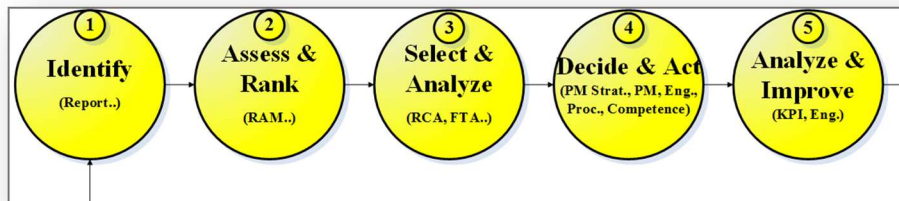


Barriers are organized by:

- Design features, as separation distances;
- Hardware, as pressure relief valve, fire detection system;
- Processes;
- Operational intervention tasks, as plant monitoring/shutdown.

- ✦ **Operational Reliability/Integrity Improvement Process:** *ORIP* is a formal, structured and continuous improvement process, which identifies, measures, ranks and analyses any issues, then it is decided the best actions to be performed. The process has five clearly defined stages:
 - Identify the opportunities
 - Assess and Rank Risks
 - Select and analyse Risks to determine the problem
 - Decide the best course of actions and acts
 - Analyse and improve process effectiveness.

ORIP output is a list of ranked and appropriate corrective actions (action plan) aimed at improving performance.



- ✦ **Cumulative Risk Analysis:** *CRA* is a process to assess the readiness for an entire plant in line with the HSE and Government Requirements with the goal, to establish if the overall plant risk level is tolerable to enable a safe production initialization.

Assessment uses **Design Conforming Certificates (DCC)**, which are assurance steps used to verify the physical and organizational readiness of facilities for the safe and conforming production initialization. A **DCC** document contains all the functional pre-requisites that have been specified as required for the agreed scope of work.

Each **Functional Pre-requisite** has a set of agreed acceptance criteria, so that any time the pre-requisite has not been completed and when the risk associated with Pre-requisite has been assessed as greater than **As Low As Reasonably Practicable (ALARP)**, a **Point of Attention (PoA)** is recorded against the Pre-requisite Acceptance Criteria in order to identify and apply a mitigation plan.

Such PoA's are used to establish the operational impact and degree of risk arising from outstanding PoA's prior to the production start-up so as to ensure that appropriate mitigation controls are in place and to demonstrate that these risks are ALARP.

NORMALIZED RISK RATING FOR HSE									
Estimated Plant Life 40		W. Frequency		Frequencies					Total
		Frequency (#/40y)		0.80%	3.00%	6.00%	30.10%	60.20%	100.10%
				1.0	4.0	8.0	40.0	80.0	133
				1/40y	2/20y	2/10y	5/5y	2/1y	
W.Score	Score	Scores		Rank	A	B	C	D	E
85.80%	10000.0	Multiple Fatalities		5	0.69%	2.57%	5.15%	25.83%	51.65%
8.60%	1000.0	Single Fatality		4	0.07%	0.26%	0.52%	2.59%	5.18%
4.30%	500.0	Major Injury		3	0.03%	0.13%	0.26%	1.29%	2.59%
0.90%	100.0	Minor Injury		2	0.01%	0.03%	0.05%	0.27%	0.54%
0.40%	50.0	Slight Injury		1	0.00%	0.01%	0.02%	0.12%	0.24%
0.00%	1.0	No injury		0	0.00%	0.00%	0.00%	0.00%	0.00%
100.00%	11651.0	Total							1.0

Risk Color Schedule		
Input Fields	GREEN <	0.0
Calculated Fields	<= YELLOW <=	0.054%
	= RED	0.480%

NORMALIZED RISK RATING FOR PRODUCTION									
Estimated Plant Life 40		W. Frequency		Frequencies					Total
		Frequency (#/40y)		0.80%	3.00%	6.00%	30.10%	60.20%	100.10%
				1.0	4.0	8.0	40.0	80.0	133
				1/40y	2/20y	2/10y	5/5y	2/1y	
W.Score	Score	Scores		Rank	A	B	C	D	E
61.60%	2220000.0	full outage of production (offshore) for 6 day		5	0.49%	1.85%	3.70%	18.54%	37.08%
20.50%	740000.0	full outage of production (offshore) for 2 day		4	0.16%	0.62%	1.23%	6.17%	12.34%
10.30%	370000.0	full outage of production (offshore) for 1 day		3	0.08%	0.31%	0.62%	3.10%	6.20%
5.10%	185000.0	2 train (offshore) for 1 day		2	0.04%	0.15%	0.31%	1.54%	3.07%
2.50%	90000.0	1 train (offshore) for 1 day		1	0.02%	0.08%	0.15%	0.75%	1.51%
0.00%	100.0	Failure of spared equipment		0	0.00%	0.00%	0.00%	0.00%	0.00%
100.00%	3605100.0	Total							1.0

- ✦ **Fire & Explosion Index (F&EI):** the scope is to facilitate the assessment of hazards of different process units using the well-known **Fire and Explosion Index**, which provides a standard approach for assessment of hazards due to facility design operation. The application of the F&EI involves a number of steps:
 - o **To Select** the process unit that would have the greatest impact on the magnitude of a potential fire or explosion
 - o **To Select** the most hazardous material present during operations and determine its material factor, which is a measure of potential energy release from fire or explosion produced by Combustion or chemical reaction
 - o **To Calculate** the Fire & Explosion Index, which is a measure of the degree of hazard associated with a particular process unit
 - o **To Calculate** the Loss Control Credit Factor to obtain a more probable and realistic risk assessment in terms of money at risk
 - o **To Analyse** the risk of equipment damage and other financial loss from a fire or explosion in a particular process unit.

The development of a standardized and complete Assets Integrity Master Data:

- ✦ **Facilitates** analysis of Process in terms of Risks and possible Improvements.
 - ✦ **Facilitates** development of documentation for government agencies.
 - ✦ **Supports** improvement of Maintenance Plans.
 - ✦ **Supports** improvement HSE situation.
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