NEXA PSM engage

2019

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NEXA Process Safety Engineers

ASSET INTEGRITY MANAGEMENT

What is Asset Integrity Management (AIM) ?

Asset Integrity Management is the means of ensuring that the people, systems, processes and resources that deliver integrity are in place, in use and will perform when required over the whole lifecycle of the asset.

In this context, an asset is a process or facility that is involved in the use, storage, manufacturing, handling or transport of chemicals, or the equipment comprising such a process or facility. Examples of assets include; process and auxiliary tanks, vessels and piping systems including their internal components; control systems; safety systems; buildings and other structures; and transport containers.

AIM programs vary **according to industry, regulatory requirements and plant culture.** Normally effective AIM programs :

- Include activities to ensure that assets are designed, procured, fabricated, installed, operated, inspected, tested and maintained in a manner appropriate for its intended application.
- Prioritize Assets to help optimally allocate financial, staffing, storage space and other resources.
- Minimize unplanned maintenance.
- Help plant staff recognize when equipment deficiencies occur and include controls to help ensure that equipment deficiencies do not lead to serious process incidents.
- Incorporate applicable codes, standards and other recognized and generally accepted good engineering practice (RAGAGEP).
- Help ensure that personnel assigned to perform AIM activities are appropriately trained and have access to appropriate procedures for these activities.
- Maintain service documentation and other records to enable consistent performance of AIM activities and to provide accurate asset information to other users, including other process safety and risk management elements.
- Customer Satisfaction during site visits & minimize insurance costs.

WHAT ASSETS ARE INCLUDED?

Mainly two major parts:

1. Properly designing and installing the facility's assets **before startup**.
2. Maintaining the ongoing integrity of the assets over a **lifetime of facility operation**.

The question for this task can be rephrased as "What facility assets do we need to maintain, and to what degree of rigor?" "With limited resources, and sometimes needing to deal with unforeseen circumstances, we may not be able to always keep up with every scheduled maintenance task. How do we manage this situation?" These questions have been answered, implicitly or explicitly, in many ways by doing: **Breakdown Maintenance, Compliance Maintenance, Risk-Based Maintenance, Prioritized Maintenance** and **Comprehensive Maintenance of All Assets.**

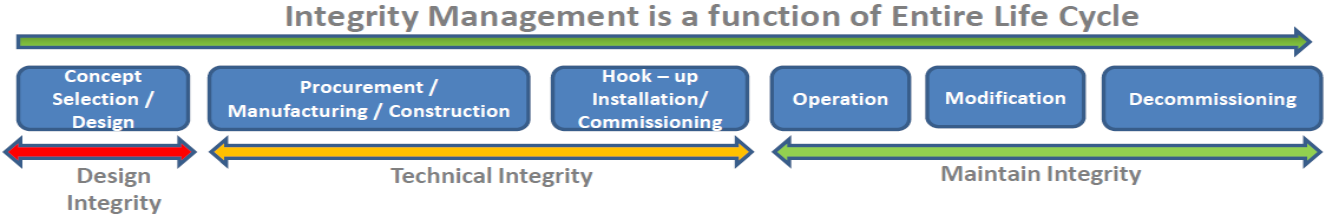
AIM LIFE CYCLE

There are three phases of integrity management

1.Design Integrity

2.Technical Integrity

3.Maintain Integrity



RELATIONSHIP TO RAGAGEP :

Codes, standards, and practices, which are sometimes termed "recognized and generally accepted good engineering practice" (RAGAGEP), are an important resource for an AIM program. RAGAGEP stems from the selection and application of appropriate engineering, operating, and maintenance knowledge when designing, operating, and maintaining process facilities with the purpose of ensuring safety and preventing process safety incidents.

FAILURE MODES AND MECHANISMS :

AIM program should cover key concepts and terminology related to the kinds of asset failures that an AIM program seeks to prevent, as well as what tools are available to identify and analyze potential failures. **Most damage mechanisms, Degradation mechanisms, Failures and Failure effects can be anticipated on the basis of prior experience with the same or similar assets.** They can be systematically analyzed for their likelihood of occurrence as well as the severity of their effects. Systematic approaches are commonly used that aid the identifying of failure modes and mechanisms. Like Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis (FTA) and Event Tree Analysis (ETA).

ASSET SELECTION :

Critical Assets : The malfunction or failure of which could (or is likely to) cause , contribute or fail to prevent or mitigate a major business impact or a major safety, environmental or security incident. Safety Critical equipment/element can be identified by

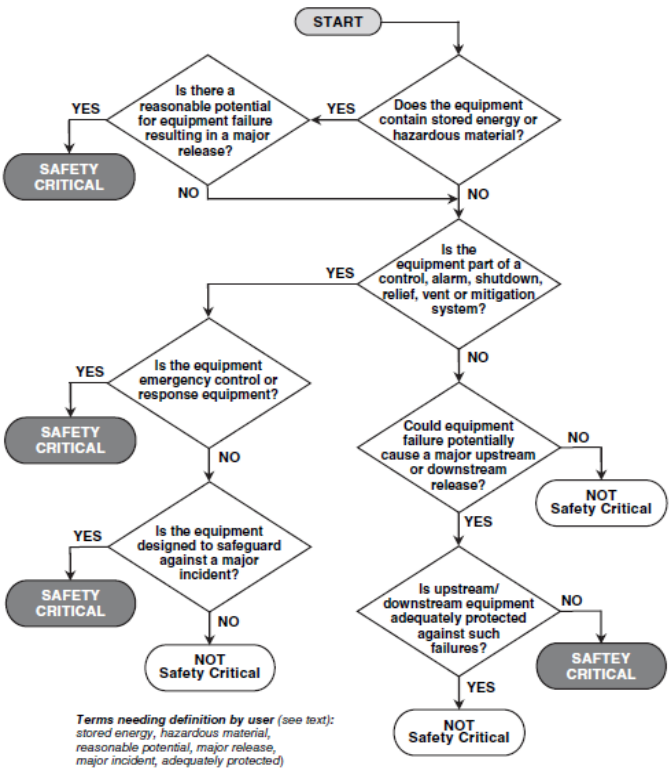
- **Consequence-based asset selection**
- **Risk-based asset selection**
- **Prescriptive asset selection**

INSPECTION, TESTING AND PREVENTIVE MAINTENANCE:

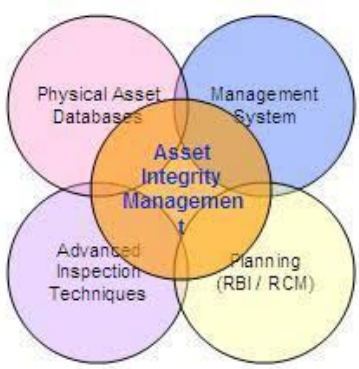
AIM program focus should be on developing and implementing an inspection, testing and preventive maintenance (ITPM) program after AIM defining. After Determining Types of ITPM Tasks' desired approach or approaches for managing each failure, the team can then determine the types of tasks needed. In general, the tasks fall into the following three categories:

1. **Inspection tasks**, which detect the onset of a failure condition (e.g., vessel wall crack) and/or assess the asset condition (e.g., vessel wall thickness).
2. **Testing tasks,** including predictive maintenance tasks, which assess the condition of the equipment (e.g., drift in an instrument, vibration of a pump) and/or detect hidden failures (e.g., functional test of a shutdown system).
3. **Preventive maintenance (PM) tasks**, which help prevent premature failure of assets by (1) promoting inherent asset reliability (e.g., lubricating a pump) or (2) restoring the asset reliability by replacing the entire item or selected components or parts (e.g., rebuilding of a compressor before its functionality is lost).

AIM is important for Risk Management activities, Assets Reliability, Establishing Performance Measurement System, Learning lessons from Equipment Failures, Process Safety Incidents and Near Misses to enhance future installations, Reduce damage to Corporate Reputation.

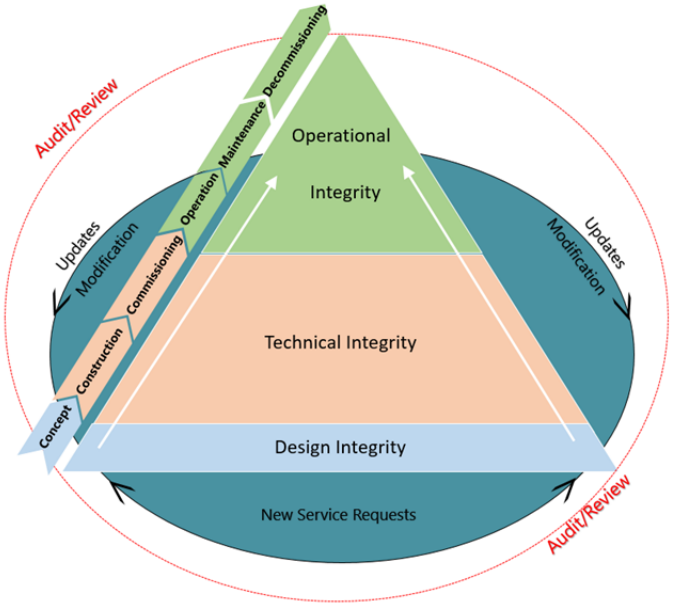


Risk-based determination of safety-critical equipment

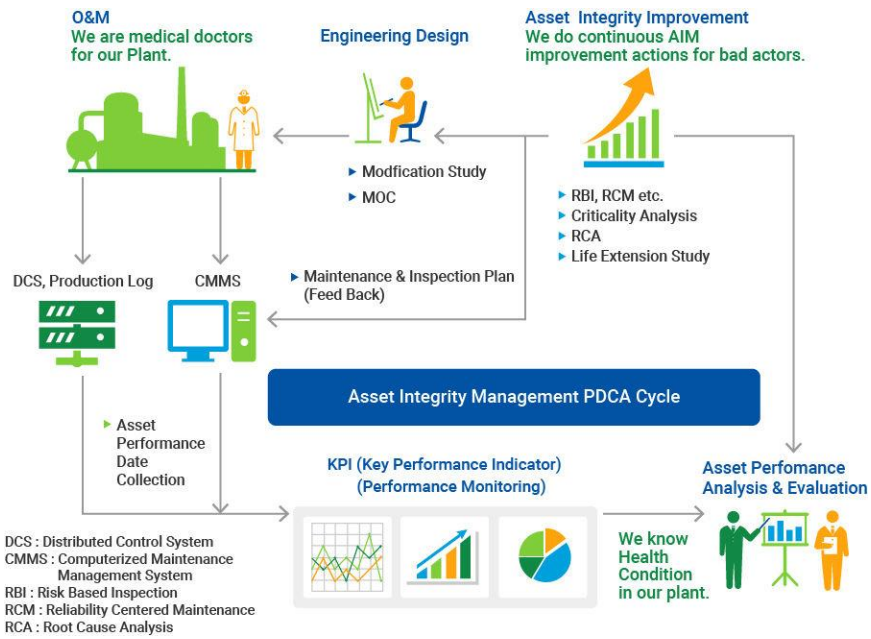


EXAMPLE OF ASSETS TO BE COVERED :

1. **Rotary or Reciprocating Assets :** Primarily involving hazardous materials and failure can cause catastrophic process incident.
2. **Instrumentation & specific Control loops**
3. **Utilities and Support system**
4. **Process required Secondary utilities**
5. **Fired Equipment**
6. **Mitigation systems**
7. **Third Party Assets / Vendor Packages**
8. **Transportation Assets**
9. **Pressure Vessels**
10. **Important Piping**
11. **Pressure / Vacuum Relief systems or devices**
12. **Critical Vents & Drains control valves**
13. **Fire & Chemical release mitigation systems**
14. **Systems with Stored Energy Hazards**
15. **Emergency Shutdown (ESD) systems**
16. **Flare system**
17. **Vessels involving Polymer formation in monomer**
18. **Process Motor failure**
19. **Building Ventilation systems / HVAC / FAU / Process ventilation / Local Exhaust Ventilation**
20. **Equipment involving Freezing of water or other chemicals in process**
21. **Important pipe supports / pipe racks**
22. **Fire & Gas Detectors / Portable detectors**
23. **Emergency response equipments**
24. **Cranes & other lifting equipment**
25. **Inerting systems**
26. **Electrical grounding & bonding system**
27. **Test equipments**
28. **Structural & Support facility**



Asset Integrity Management (AIM)



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