

FROM VISION TO ACTION

A COMPREHENSIVE RELIABILITY ROADMAP TO ENHANCE ASSET PERFORMANCE

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AGENDA

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RELIABILITY

What is Reliability ?

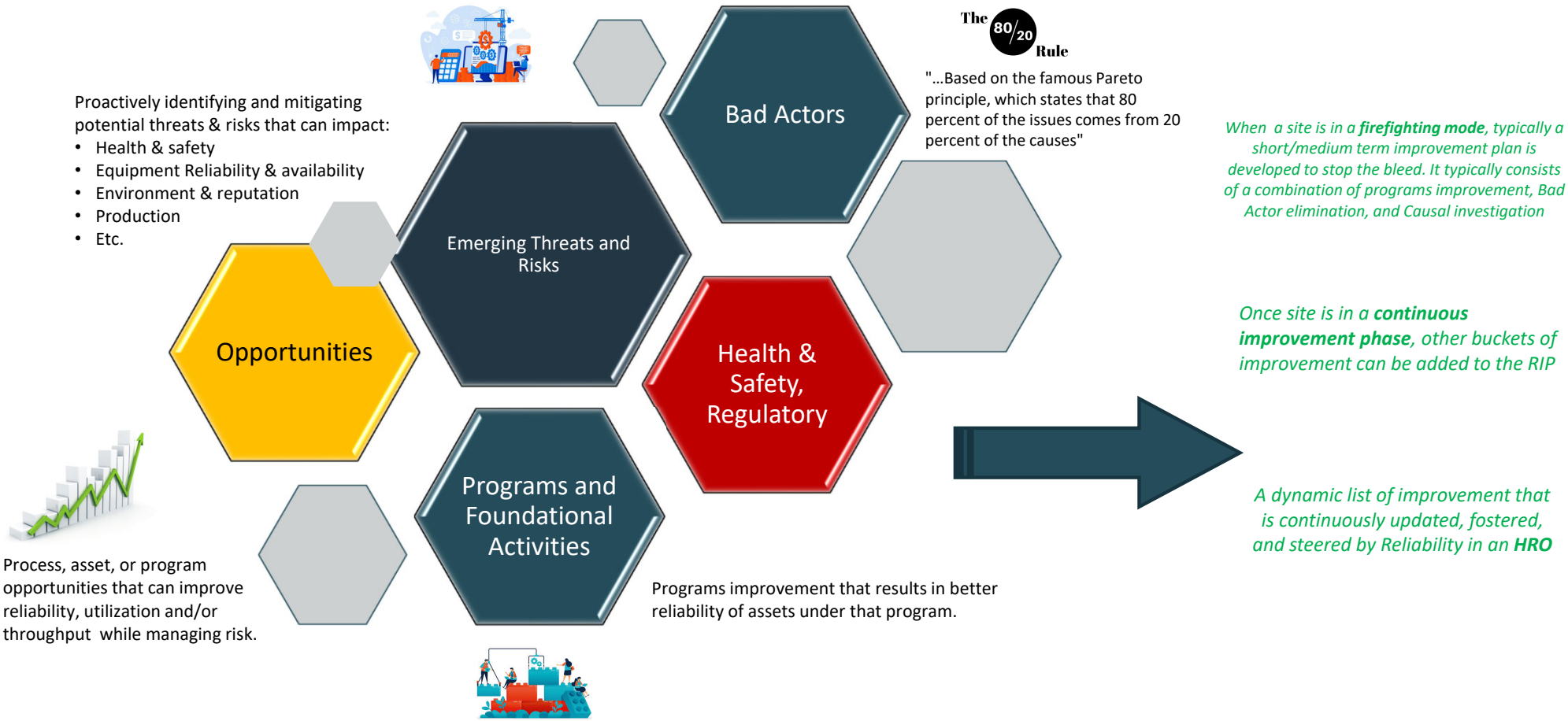
"The ability of an asset to perform its required function under specified conditions for a specified period of time."

Source: British Standards Institute - BS 4778-3.1:1991 & PAS 55

What is Reliability for any High Reliability Organization (HRO)?

"The ability of an organization to consistently and effectively manage complex, high-risk operations while minimizing errors and maintaining safety and performance standards."

HIGH RELIABILITY ORGANIZATION (HRO)



THREE KEY THEMES FOR A RELIABILITY ROADMAP

Back to Basics

Focus on building a strong foundation for reliability by addressing essential elements:

- 1 **Alignment & Engagement**
 - Ensure cross-functional collaboration and secure leadership buy-in.
 - Foster a shared vision of reliability across all departments.
- 2 **Reliability Standard(s)**
 - Develop, implement, and standardize reliability guidelines and procedures.
 - Align practices with industry benchmarks and regulatory requirements
- 3 **Reliability Process**
 - Establish structured processes for reliability planning, monitoring, and evaluation aligning standards
 - Integrate reliability into operational workflows to minimize risks.
- 4 **Reliability Competency**
 - Invest in training and upskilling (using 70/20/10 model) employees to build reliability expertise
 - Create a competency framework to track skill development.

Continuous Improvement

Emphasize iterative enhancements to drive incremental gains in reliability:

- 5 **Benchmarking**
 - Compare current reliability performance against industry leaders or best practices (e.g. Solomon studies, SMRP)
 - Use data-driven insights to identify improvement opportunities.
- 6 **Bad Actor Management**
 - Develop systematic process to identify and eliminate recurring failures or chronic reliability issues
 - Use root cause analysis (RCA) to address systemic problems.
 - Implement learnings across enterprise to prevent similar problem.
- 7 **Change Management**
 - Implement structured change management processes to support reliability initiatives.
 - Ensure organization-wide alignment during transitions
- 8 **Technical Authority & Reliability Governance**
 - Establish clear governance structures to oversee reliability practices.
 - Empower technical leaders to drive accountability and compliance.

Transformational

Leverage advanced technologies and strategies to achieve breakthrough reliability performance:

- 9 **Reliability Digitalization**
 - Develop reliability digitalization strategy to improve safety, increase availability and optimize cost performance
 - Align strategy with peers / industry and align with corporate goals.
 - Implement in waves
- 10 **APM – Asset Strategy**
 - Develop risk-based asset (maintenance strategies) to optimize asset lifecycle values.
 - Use criticality analysis status in prioritizing asset strategy development.
 - Use ISO 14224 based library to accelerate
- 11 **APM-Predictive Maintenance**
 - Utilize predictive analytics (e.g., machine learning, AI algorithm) to forecast and prevent potential failures on most critical assets (0.2 to 2%)
- 12 **APM-Asset Health**
 - Integrate operator rounds, corrective & reactive works, time series, predictive analytics, all other reliability recommendations / data to monitor and manage the health of critical assets.
- 13 **APM-Asset Integrity**
 - Ensure asset safety and compliance by adopting integrity management prog.
 - Use risk based inspection (RBI) to achieve financial optimization
- 14 **Advanced Technologies & Analytics**
 - Leverage cutting-edge tools like artificial intelligence, advanced inspection, maintenance technologies and achieve world-class reliability.

RELIABILITY ROADMAP : JOURNEY TO WORLD CLASS

OPERATIONAL EXCELLENCE

Year 1 Foundation

- Executive sponsor & stakeholder engagement / alignment
- Define Reliability Standards & Strategies
- Define reliability competency requirement
- Define reliability digitalization strategy
- Define reliability technical authority

Year 1~2 Plan for Improvement

Conduct assessment and benchmarking to create a reliability strategy (Gap Closure plan)

- Implement reliability standards
- Implement reliability processes
- Implement bad actor management (e.g., root cause analysis or failure elimination)
- Implement reliability competency management
- Define digitalization roadmaps for reliability
- Pilot Asset Performance Management (APM), including Mechanical Integrity, Asset Strategy, Predictive Maintenance, and Asset Health
- Establish reliability governance
- Define a change management plan

Year 2~4 Drive for Improvement

- Broaden the rollout of reliability standards
- Broaden the rollout of reliability processes
- Broaden the rollout of Asset Performance Management (APM)
- Enhance reliability competency
- Conduct reliability audits
- Implement reliability analytics
- Launch phase II of the reliability digitalization rollout
- Establish knowledge-sharing initiatives (e.g., Community of Practice)

Year 4 + World Class

Successfully implemented across enterprise

- Reliability standards
- Reliability process
- Reliability analytics to drive continuous improvement
- APM
- Reliability digitalization program

Organization that has with

- High confidence & verified trust in data across reliability platform
- Focus on economic and operational optimization
- Advanced inspection / maintenance technologies
- Competent & motivated transformed workforces take ownership, adopt changes and self drive for excellence
- Top talent with industry recognized subject matter experts
- Reliability is built into design, focus on full life cycle cost

Back to Basics

Continuous Improvement

Transformational

1

ALIGNMENT & ENGAGEMENT

Description



Align with corporate goals

- Aligning reliability with corporate goals is essential for ensuring that an organization's efforts in reliability management contribute directly to its overall success and strategic objectives.
- Reliable assets reduce downtime, increase production, and minimize costs, which aligns with corporate objectives such as revenue growth, cost efficiency & profitability.
- Reliability leads to consistent product quality and service delivery, aligning with goals of customer retention and brand recognition.
- Preventing failures and ensuring safety align with corporate goals "best & safest place to work".

Executive sponsor

- Senior executives ensure that reliability improvement aligns with the organization's broader objectives.
- Their influence helps prioritize reliability initiatives over competing projects, securing funding and mobilizing talents.
- High level advocacy required implementing enterprise-wide reliability standards.
- Employees are more likely to embrace reliability practices when they see leadership's commitment.
- Senior leaders act as visible advocates for driving organizational and cultural changes required for reliability improvement.

Engage stakeholders

- Reliability is a cross-functional effort. Engaging stakeholders fosters a sense of ownership, increasing their commitment to the initiative.
- Stakeholders bring diverse expertise, such as insights into operational challenges, technical knowledge. Utilizing their expertise and buy-in accelerate reliability improvement journey.
- Engaging stakeholders ensures better communication, they act as change ambassador.

Roles & responsibilities

- Reliability improvement is every bodies responsibilities - not just reliability department. Defining clear roles and responsibilities is essential for the success of reliability improvement initiatives because it establishes accountability, ensures efficient collaboration, and minimizes confusion among all stakeholders.

Description

Develop
reliability
standards

- Clearly outline the purpose and objectives of the standard, - e.g., achieving zero safety or environmental incidents due to unreliable assets, attaining 98% availability, ensuring 80% proactive maintenance, and reducing maintenance costs by 30% within five years.
- Specify the scope of the standard – e.g., all types of equipment across enterprise. Additional regulatory, and relevant codes will apply on safety critical and pressure equipment .
- Define the roles, responsibilities, and minimum requirements for reliability standards, ensuring comprehensive coverage but not limited to the specified items below
 - information requirements to safely operate & cost effectively maintain assets (e.g., asset / engineering documents, process information, master data etc.)
 - Asset Criticality Ranking
 - Asset Strategy Development methodologies – e.g., as RCM, FMEA, ISO 14224 based libraries / templates, RBI, regulations/ code requirements etc.)
 - Asset Strategy Implementation approaches - e.g., RTF (Run-to-Failure), Operator Rounds, Preventive Maintenance (regular, outage, turnaround), Condition Monitoring, Predictive Maintenance, Spares Strategies, Preservation Strategies, one-time changes (design, process, documentation) etc.
 - Asset Integrity - Pressure Equipment Integrity Program (PEIP) : Define a comprehensive program designed to ensure the safe operation, reliability, and compliance of pressure equipment regulations, industry standards and codes (e.g. ASME, API, NBIC etc.) for boilers, pressure vessels, heat exchangers, and piping systems. Defines inspection, maintenance, repair and data collection requirements- e.g., Thickness / Condition Monitoring, Schedule Inspections, Risk Based Inspection (RBI), Non-Destructive Testing (NDT), Pressure Testing, Fitness for Service Assessment, Emergency Plans for responding leaks, rupture or other failures and their investigations process.
 - Define a Process Safety Equipment Standard to prevent explosions, fire, or toxic release by ensuring integrity & compliance to regulations / codes (e.g., OSHA, EPA, API, ISO, IEC, NFPA etc.) . Develop comprehensive asset strategies (maintenance, inspection, testing, repair, calibration strategies etc.)
 - Clearly define work selection criteria and approval process for asset strategy / asset integrity / reliability recommendation works planning, scheduling and execution
 - Define continuous improvement process – such as Failure Elimination (Bad Actor Management), Optimize Asset / Maintenance strategies, prioritizing reliability related design changes

Implement
standards

- Clearly define reliability standards rollout plans across enterprise – e.g., criticality analysis completed by first year, all critical A and B type assets shall have approved asset strategy by second year.
- Clearly define key performance metrics and specifies acceptable thresholds or targets of these metrics - values such as availability, reliability (MTBF, MTTR etc.), % assets with criticality & approved asset / maintenance strategies.

Compliance
to standards

- Provides guidelines for demonstrating compliance with the standard.
- Specifies procedures for conducting internal or external audits to ensure compliance is verified

RELIABILITY BUSINESS PROCESSES

RELIABILITY COMPETENCY

3

Business
Process
Development

Description

- Define structured sequence of activities or tasks performed to achieve a compliance to reliability standards .
- All activities or tasks required must specify clear purpose, logical sequence, input & outputs, roles & responsibilities, applicable rules & standards to ensure repeatability, consistency.
- All tasks must be trackable and monitored.

Business
Process
Implementati
on

- Clearly define reliability process rollout plan
- Outlines how to demonstrate adherence /compliance to the process would be measured – such as process is followed in developing criticality, asset strategies, RCAs etc.

4

Reliability
Competency
Program
Development

- Systematically identify the skills, knowledge, behaviors and abilities required by individuals and teams to effectively ensure the reliability of assets, systems, and processes. Examples of few roles below
 - Technicians, analysts, engineers (junior, intermediate, senior, SME), leaders (all levels)
- Assess current competencies.
- Perform competency mapping to each roles (e.g. skills, knowledge, behaviors and abilities and their level of proficiency required)
- Develop competency programs to breeze the competency gaps
 - 70 % (learn through experience – on the job), 20% (learn through others), 10% (learn through training)
- Define monitoring program – track progress, integrate with HR programs, regularly review and refine to adopt to evolving needs.

Reliability
Competency
Program
Rollout

- Launch the program with a small group to test its effectiveness and gather feedback.
- Scale the program across enterprise, ensuring consistent communication and accessibility.
- Monitor and support programs, measure success, refine & improve as needed and finally sustain the program



BACK TO BASICS ROADMAP

	Year 1	Year 2	Year 3	Year 4	Year 5
Alignment & Engagement <ul style="list-style-type: none"> Align reliability with corporate goals Assign executive sponsor Engage statehooders at all levels Clarify roles & responsibilities 	1 3 months 3 months				Ongoing
	6 months				
Reliability Standards <ul style="list-style-type: none"> Define reliability policy, purpose, minimum requirements and performance expectations Define information requirements Asset criticality assessment Define asset strategy programs Implement asset strategy programs Define pressure equipment integrity program (PEIP) Implement PEIP Define a process safety equipment program Implement process safety equipment program Define work execution process w.r.t. reliability Define continuous improvement process Implement standards Compliance to standards / audits 	2 6 months 6 months 12 months 6 months 6 months 6 months 6 months 6 months 6 months	10 % Assets 30 % RBI Assets scope	20 % Assets 100 % RBI Assets scope	30 % Assets 40 % Assets	50 % Assets Other 50% RTF Ongoing Ongoing Ongoing
	6 months				
	6 months				
	6 months				
	6 months				
	6 months				
	6 months				
	6 months				
	6 months				
	6 months				
Reliability Process <ul style="list-style-type: none"> Standardize & simplify business processes to align with reliability standard(s) / procedures. Implement new process across enterprise. 	3 6 months 12 months				
Reliability Competency <ul style="list-style-type: none"> Develop programs to enhance skills, knowledge, behaviors and abilities required to improve reliability Rollout program, and monitor, evaluate, refine & improve 	4 9 months				Ongoing

Back to Basics

Continuous Improvement

Transformational

BENCHMARKING

BAD ACTOR MANAGEMENT

5

Benchmarking - Perform

Description

- Identify the purpose of benchmarking - e.g., refinery availability first quartile (Solomon studies) or competitors or full compliance with regulations (ASME, NFPA, OSHA etc. or reliability & maintenance best practices and performance first quartile (SMRP)
- Finalize benchmarking scope
- Perform benchmarking.

Benchmarking – Gap Closure Plan

- Analyze benchmarking gaps.
- Develop gap closure plans.
- Align with other reliability activities e.g., adjust paces - some activities might accelerate, some activities slowdown etc.

6

Bad Actor Management

The term "bad actor" in asset management and reliability engineering is widely recognized. It refers to the process of identifying, addressing, and resolving recurring equipment failures, inefficiencies, or issues that negatively affect operational performance, safety, and costs. However, it is not uncommon for different leaders or departments within the same organization to maintain varying lists of bad actors. These lists often shift based on the "flavor of the day," leading to misaligned priorities and significant effort being wasted on addressing low- to medium-priority problems. To succeed

- Define standard and a systematic process to identify bad actors, determine root cause, implement corrective & preventive actions (bad actor management).
- Ensure data collection is trustworthy
- Ensure robust process to identify root cause, developing effective corrective , preventive actions and documenting all lessons learned.
- Ensure prioritization of bad actor projects / initiatives best on values (e.g., regulation, health, safety, environment and/or economic.
- Ensure right governance to identify, monitor, evaluate, refine bad actor program to get maximum values from these 'low hanging fruits.
- To prevent failure to similar assets, process or systems, learnings must be implemented enterprise- wide

CHANGE MANAGEMENT

TECHNICAL AUTHORITY & GOVERNANCE

Description



7

Change Management

Change Management plays a critical role in achieving and sustaining reliability improvement initiatives. Reliability improvement often involves introducing new processes, technologies, systems, or cultural shifts, which can face resistance or fail without proper management. Change management ensures these transitions are smooth, effective, and aligned with organizational goals.

- Define a structured process for leading people through change to achieve a desired reliability outcome (e.g. ADKAR, Kotter's 8 Step Process, Lewin's Change Management Model etc.). Key steps are
 - Define the change
 - Change impact assessment
 - Develop Plan (e.g., communication plan, training & support plan, define success criteria etc.)
 - Implement the change
 - Reinforce the change (measure results, gather feedbacks, celebrate success, institutionalize the change)
- Benefits of an effective change management are
 - Faster adoption of new practices.
 - Higher employee engagement and satisfaction.
 - Better alignment between reliability improvements and operational objectives.
 - Sustained reliability gains over time.

8

Technical Authority

Technical Authority is critical for reliability improvement because it provides expert guidance, oversight, and decision-making to ensure that reliability initiatives are technically sound, aligned with organizational objectives, and implemented effectively.

- Define, socialize and implement technical decision-making authority across enterprise.
 - Clearly define the decision-making powers of the TA in areas like equipment design, equipment operation (including right to intervene operations with clearly pre-set criteria), asset strategy management, and failure investigations etc.
 - Establish clear protocols for when and how technical decisions are escalated.
 - Empower Autonomy: Allow the TA to make critical technical decisions without unnecessary bureaucratic delays.

Reliability Governance

- Define reliability governance structure, their roles responsibilities, decision making process. Including established cadence how this would be executed
 - Executive Sponsor: Set the vision, strategic direction, and priorities. Approve budgets and allocate resources. Also acts as champions.
 - Steering Committee: Provide oversight, coordination, and strategic guidance. Ensure cross-functional collaboration and alignment.
 - Technical Authority: Serve as the subject matter expert. Develop and enforce technical decisions, standards, guidelines, best practices.
 - Reliability Team: Lead the execution of reliability initiatives. Act as a central point.
 - Maintenance & Ops. Teams: Provide supports and provide real-time insights and feedback on equipment performance.

CONTINUOUS IMPROVEMENT ROADMAP

	Year 1	Year 2	Year 3	Year 4	Year 5
<p>Benchmarking</p> <ul style="list-style-type: none"> Finalize benchmarking scope Perform benchmarking. Develop gap closure plans. Align with other reliability activities e.g., adjust paces; some activities might accelerate, some activities slowdown etc. 	<p>3 months</p> <p>3 months</p> <p>2 months</p>				Ongoing
<p>Bad Actor Management</p> <ul style="list-style-type: none"> Define a systematic process to identify bad actors, determine root cause, implement corrective & preventive actions Implement bad actor management. 	<p>3 months</p>				Ongoing
<p>Change Management</p> <ul style="list-style-type: none"> Develop a structured change management program for leading people through change Implement Change Management Program 	<p>6 months</p>				Ongoing
<p>Technical Authority</p> <ul style="list-style-type: none"> Define, socialize technical decision-making authority Implement Governance Implement technical authority 	<p>3 months</p>				Ongoing
<p>Reliability Governance</p> <ul style="list-style-type: none"> Define reliability governance structure, their roles responsibilities, decision making process Implement governance 	<p>3 months</p>				Ongoing

Back to Basics
Continuous Improvement
Transformational

Description

Reliability Digitalization

Digital transformation is a process in which companies implement technologies across their businesses to drive fundamental changes. Transformational in Operations, Maintenance & Reliability program can enable employees to improve personal and process safety, increase reliability and optimize cost performance. Digital transformation is now absolute necessary to stay relevant in today's advanced technological world. We must align digital strategy with peers / industry and align with corporate goals to stay competitive

Key Focus Areas

- **Asset Information Management** : Standardize & digitize asset information content by providing simplified process, tools & technology to access accurate updated information promptly that user can trust and make faster decision.
- **Asset Performance Management (APM)**: APM seeks to strengthen reliability culture. The focus is on empowering people to drive greater value from assets by providing processes, tools to perform reliability activities. The goal is to improve asset reliability, minimize downtime, and decrease maintenance costs.
- **Connected Worker**: Connected Worker enable field workers with digital tools that they require to access the information they need, where they need it, and the ability to share information from the field with others in real-time.
- **Production Optimization**: The Production Optimization utilizes digital capabilities and analytics that maximize production performance.

Execution Philosophy

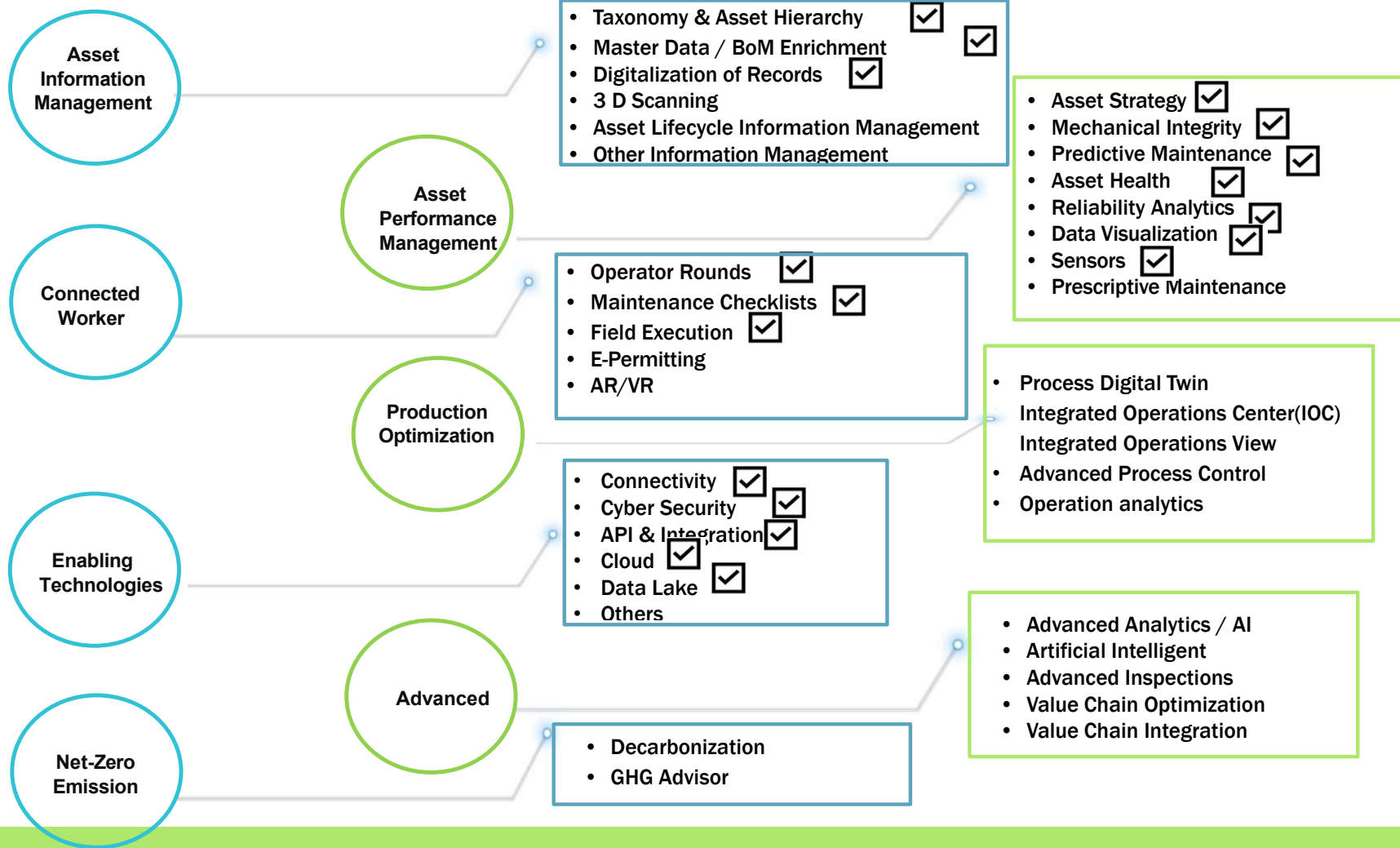
- Business Process: Simplify and standardize business process to meet reliability standards and goals.
- Tool: Choose right tool. Configured the tool aligning business process. Integrate with ERP (SAP, Maximo etc.), Operational Technology (e.g. OSI PI) and other data as appropriate
- Data: Clean data before migration. When creating new content - use industry template (e.g., ISO 14224 based Asset Strategy/ FMEA templates)
- People: A comprehensive change management & competency program to transform the workforce to meet the needs of the future.
- Pilot → Evaluate → Scale :Focus on a high-impact area or critical asset for initial implementation. Refine based on pilot results and expand to other assets.

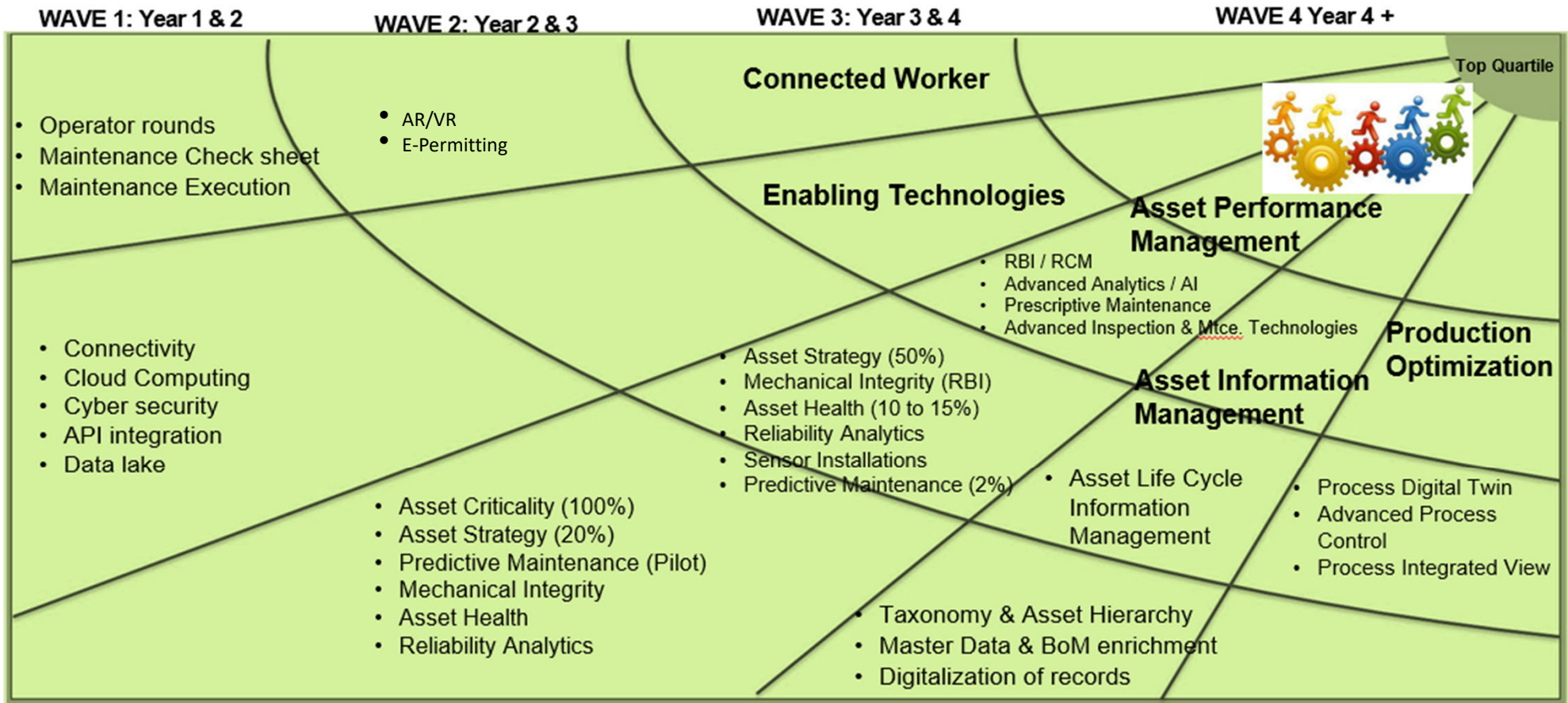
Implement in Waves

- Implements in waves to increase adoption and less interruption with operations.

Note: Additional info in next two slides.

RELIABILITY DIGITALIZATION

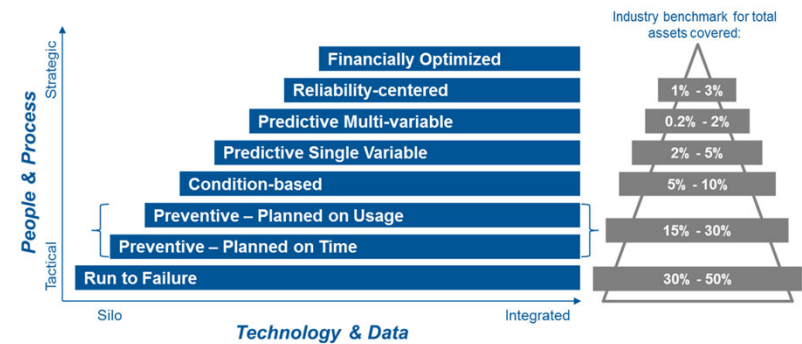




Description

Asset Strategy is a structured plan that defines how assets should be managed throughout their lifecycle to achieve organizational goals, including operational availability, cost-efficiency, reliability, and risk management. Asset strategy practices enable origination's goal to move from reactive to proactive maintenance. >>

- Define standard for asset strategy development & implementation. Clearly specify performance expectation – e.g., all 'A' & 'B' critical assets shall have asset strategy in two years and all assets by 5 years including all Run-to-Failure assets.
- Specify asset strategy KPIs (e.g., % assets with asset strategy, % asset strategy actions implementation, effectiveness of asset strategy etc.)
- Provide guidelines on development methodology (e.g. which methodology to use)
 - RCM (recommended for most critical assets and for a mature rel. organization)
 - FMEA (Failure Mode Effect Analysis)
 - Asset Strategy Library (based on ISO 14224, recommended as accelerator)
 - SIS – Safety Instrumentation System
 - Regulations / Codes / Industry standards (e.g., NFPA, OSHA, ASMI, API etc.)
- Define risk thresholds for implementing strategy actions : simulate all recommended actions on cost, risks vs. business goals.
- Develop guidelines on strategy optimization to minimize inspection / maintenance / repair related downtime



APM Asset Strategy Development

Asset Strategy Acceleration

- To accelerate asset strategy development, it is recommended to use standard strategy templates based on ISO 14224.
- 'Master Template' concept also enhances change management / sustainment. If a template is used for thousands assets, changes made in a temple applies to all thousands' assets

Asset Strategy Implementation

Asset Strategy output recommendations / actions could be any combinations of any activities listed below

- Operator driven reliability (operator rounds) → integrate with operator rounds tool
- Preventive maintenance (regular, outages or turnaround) → can push into ERP (SAP or Maximo) if APM application is bi-directionally integrated with ERP tool
- Condition monitors → condition monitoring tools
- Predictive maintenance → predictive maintenance tool
- One-time changes (design, process, documentation, training program etc.)
- Spare strategies
- Run-to- failure (no maintenance / inspection actions, however, consider spares as required.)

11

APM - Predictive Maintenance

Description

Predictive Maintenance (PdM) is one of the proactive maintenance strategies that uses machine learning advanced analytics algorithm to predict equipment failures and avoid catastrophic losses on mission critical assets. This provides sufficient time to analyze & diagnose accurately and determine the best course of actions of potential failure.

- Define predictive maintenance procedure to evaluate organization readiness for predictive maintenance
 - Instrumentation and/or sensor data coverages to feed real time data
 - IT infrastructure to process huge amount of multi variable data and identify patterns using AI/ML
 - IT policy , cyber security requirements if data needs to be streaming to Predictive Model technology vendor's cloud
- Begin with a pilot program to test the approach. Evaluate the results, make refinements as necessary, and then scale the deployment based on lessons learned.
- Optimize asset strategies by eliminating duplicate maintenance activities, such as tasks already covered in operator rounds, preventive maintenance (PM), inspections, or testing, once the predictive modeling program is stable.
- It is recommended to limit the scope of multi-variable predictive maintenance to 0.2%–2% of the overall asset base to ensure focus and feasibility.

12

APM – Asset Health

Asset Health refers to the evaluation and monitoring of an asset's condition and performance to determine its current operational state, risks, and remaining useful life. By effectively assessing asset health, organizations can prioritize maintenance activities, enhance reliability, and optimize overall asset performance.

- To streamline the process, it is recommended to integrate health data from multiple platforms or tools into a unified system for better accessibility and analysis.
- The types of data required for establishing asset health should be clearly defined, including but not limited to:
 - Operator rounds
 - Corrective and reactive maintenance activities
 - Condition monitoring time-series data
 - Predictive analytics
 - Reliability recommendations and other relevant data sources
- Provide clear guidelines on setting up an asset health index, such as assigning weightage to various data sources, and specify the scope of health monitoring. For example, focus on 10–15% of critical assets for asset health program.

13

APM Asset integrity

Description

- Define 'Pressure Equipment Integrity Program (PEIP)' program to demonstrate compliance to standard
 - Create a detailed & complete inventory of all pressure equipment (e.g. boilers, pressure vessels, piping)
 - Classify equipment based on criticality, operating conditions, and risk.
 - Perform corrosion studies
 - Develop inspection / maintenance strategies to mitigate risks (e.g., damaged mechanism, failure modes)
- Define condition-based inspection program- thickness monitoring
 - Consider wireless thickness monitoring for selected services
- Define risk-based inspection (RBI) program to achieve financial optimization.
- Integrate inspection strategy with other APM programs such as maintenance strategy, asset health to optimize maintenance / inspection execution

14

Advance Inspection / Maintenance Technologies

- Evaluate and develop advanced technologies for inspection and/or maintenance to reduce risks, improve safety and optimize cost. Few examples
 - On-stream tank floor robotic crawler
 - Rapid heat exchanger tubular inspection
 - Tank / sludge cleaning robotic cleaner
 - Online thickness monitoring
 - Radiographic testing
 - Utilizes magnetic fields to detect corrosion, pitting, and material loss in ferromagnetic components like pipelines and storage tanks.
 - Eddy Current Testing (ECT) for detecting cracks and corrosion in conductive materials, especially tubes in heat exchangers.
 - Advanced visual inspection using robot and drones Inspection using drone
 - Advanced leak detection techniques etc.

Advanced Analytics

- Explore opportunities to use advanced analytics like AI to further improve reliability and optimize maintenance & inspection. Few examples
 - Prescriptive maintenance – provide actionable recommendations on what, when and how to perform maintenance.
 - Automated inspection – AI-powered drones and robots perform inspect hard-to-reach areas based on data
 - Fault Diagnosis – identify root causes of complex failures
 - Optimize maintenance execution analyzing variables such as trade, spare, material, cost, selling price of the commodity etc.
 - Spare optimization

TRANSFORMATIONAL

9

Reliability Digitalization

- Assess reliability digitalization reequipments and current state
- Identify improvement opportunities
- Secure executives' approval to standup digitalization program
- Standup digitalization programs / teams
- Executions in waves – pilot, evaluate, refine, scale

10

APM Asset Strategy

- Define asset strategy standards, process & programs
- Select APM asset strategy tool, configure aligning business process and intergrade with EAM/ERP (SAP/ Maximo), OT
- Pilot
- Scale rollout

11

APM Predictive Maintenance (PdM)

- Define predictive management standards & programs
- Select Predictive Maintenance tool, connect with OT system
- Pilot
- Scale predictive maintenance rollout
- Install & integrate data from sensor to increase PdM coverage

12

APM Asset Health

- Define asset health standards, process & program
- Setup asset health indicators / index on critical assets

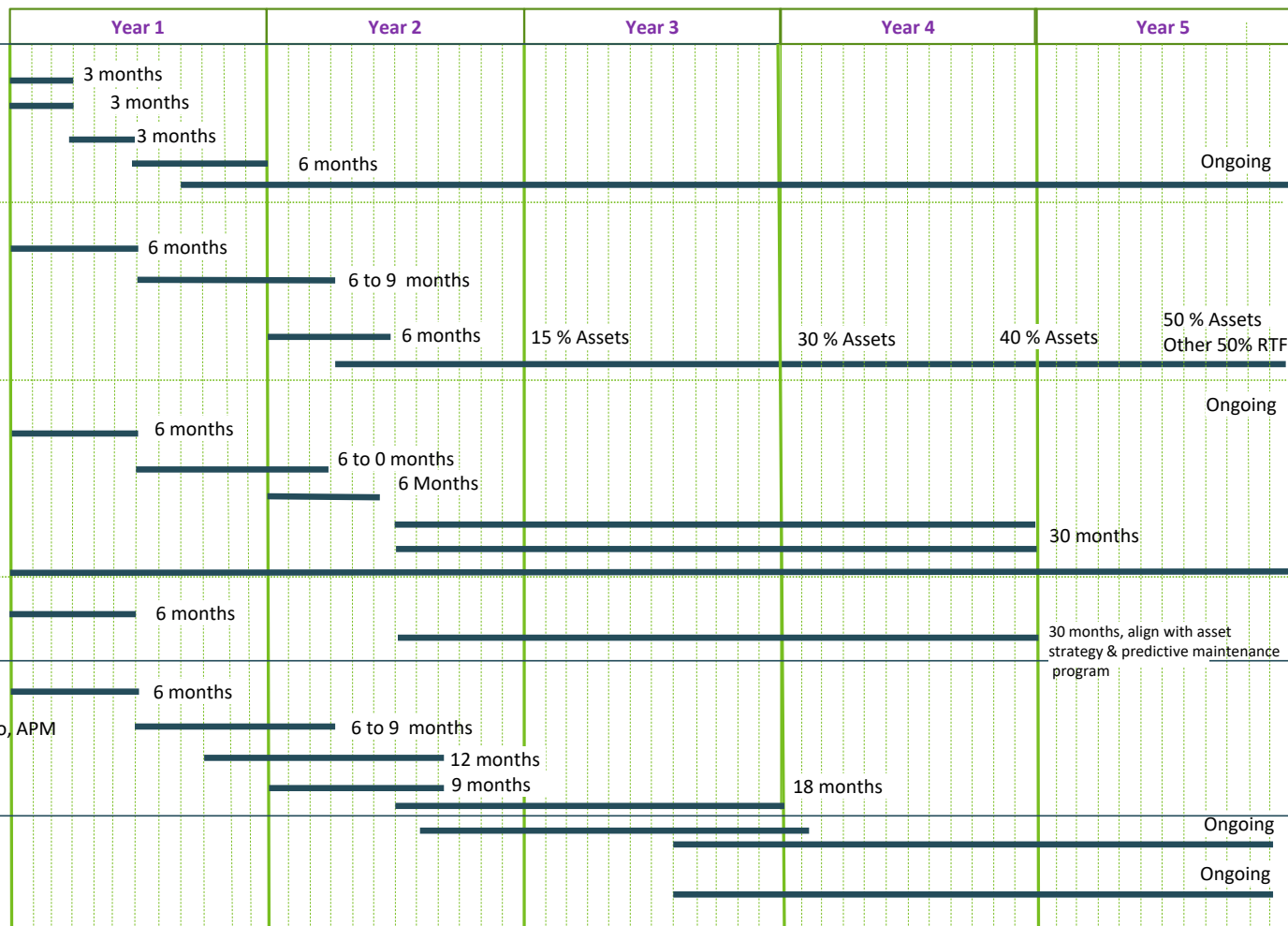
Asset Integrity

- Define PEIP Program
- Select asset integrity tool, configure, integrate with SAP/ Maximo, APM
- Develop inspection program
- Develop condition-based program – thickness monitoring
- Develop RBI program

14

Advanced Technologies & Analytics

- Explore advanced analytics opportunities, pilot, rollout
- Explore advanced inspection & maintenance opportunities, pilot, rollout



ABOUT GLOBAL ASSET CARE

Project & Program Management

- Program Management / PMO
- Roadmap
- Project development
- Project Execution / Deployment
- Sustainment

1

Digital Projects Experience

- Asset Information Management
- Connected Worker
- Asset Performance Management
 - Asset Strategy
 - Predictive Maintenance
 - Mechanical Integrity
 - Asset Health
 - Advanced Analytics

2

Asset Performance Management

- Business Process Simplification & Standardization.
- Technology selection
- Integration with SAP/ Maximo and Operation Technologies
- Data Management
- People
- Change Management
- Adoption

3

6

Digital Transformation

- Program / portfolio Management
- Gap Assessment
- Requirement Assessment
- Digitalization Roadmap
- Benefits Models
- Sustainment

5

Mechanical Integrity Program

- Pressure Equipment Integrity Program
- Thickness Monitoring
- RBI Programs
- Migrate Mechanical Integrity programs into any APM application.

4

Reliability Improvement

- Gap Assessment, Gap Closure Plan
- Develop reliability process, standards, guidelines
- Asset Criticality Assessment
- Asset Strategy Development
- Asset Strategy Implementation
- Predictive Maintenance Model Development
- Library: Asset Strategy, Maintenance Procedures and Maintenance Check Sheet

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