Asset Management Strategy - Developing the Master Plan

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A Strategic Asset Management Plan

- Todays top performing organizations generally have a blue print for success.
- A key component of success is having a strategic asset management plan.
- As a asset manager it is strongly recommended that you take the time to understand the required steps of building a master plan with the right level of detail in order to elevate your role and your organization's value in your company.

Asset Performance Management in nine steps

1. Work with site leadership to develop set and communicate a high level strategic asset management policy and how to roll out across plant(s)/divisions/sites etc..

2. Assess your current state of maintenance and reliability practices to define the business drivers for change.

3. Create your business case, document the business benefits and return on investment to be achieved by proactively managing the organization for whole life asset management.

4. Identify how the impact of the improvement will be measured and monitored.

5. Define the scope, objectives, system and resource requirements, project accountabilities, timeline and critical success metrics for your asset management improvement plan.

6. Educate senior leadership through on change management and develop a portfolio of strategic initiatives to change the methods the organization uses to manage its asset base.

7. Communicate, engage and manage the entire organization in a change leadership effort to bring guiding and pragmatic change to the organization.

8. Continually re-assess the Business processes, practices and policies for sustainability and further improvement opportunities.

9. Measure the asset base for end of life retirement or refurbishment opportunities from functional requirements to protect the long term capabilities and stakeholders of the organization.

Strategic Asset Management…..Plan?

- Strategic – comes from the office of the general, command generalship…..is a high level plan to achieve one or more goals under conditions of uncertainty! (Wikipedia)
- So a strategy is in essence….a good plan.

Strategic Asset Management

- Strategic - A good plan
- Asset - Anything of Value
- Management - Is the function that coordinates the efforts of people to accomplish goals and objectives using available resources efficiently and effectively

Create a site Leadership Champion

- Work with site leadership to set high level asset management policy and how to roll out across divisions and sites.
- Best practice asset management requires a strong commitment.
  - You will need time and resources to sustain a program
  - A champion will sustain the message in the “C Suite”.

Executive Sponsorship

- Sponsor/lead: Is complex role in the sense that the person needs to have relationships with and responsibilities to the complete cross section of the organization.
  - Legitimate authority
    - Charismatic, Traditional and Legal (Max Weber)
  - An a enabler of the strategy
  - The provider of the keys to the bus.
  - Legitimizes the “Formal Asset Management Policy”.

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Formal Asset Management Policy

- Identify the vision and communicate it.
  - The vision is where the future state of the organization is communicated. *

    (*Uptime elements – executive Sponsorship)

- A key component of a successful and now compliant Organizations (PAS/ISO) is the formal vision in a guiding document.

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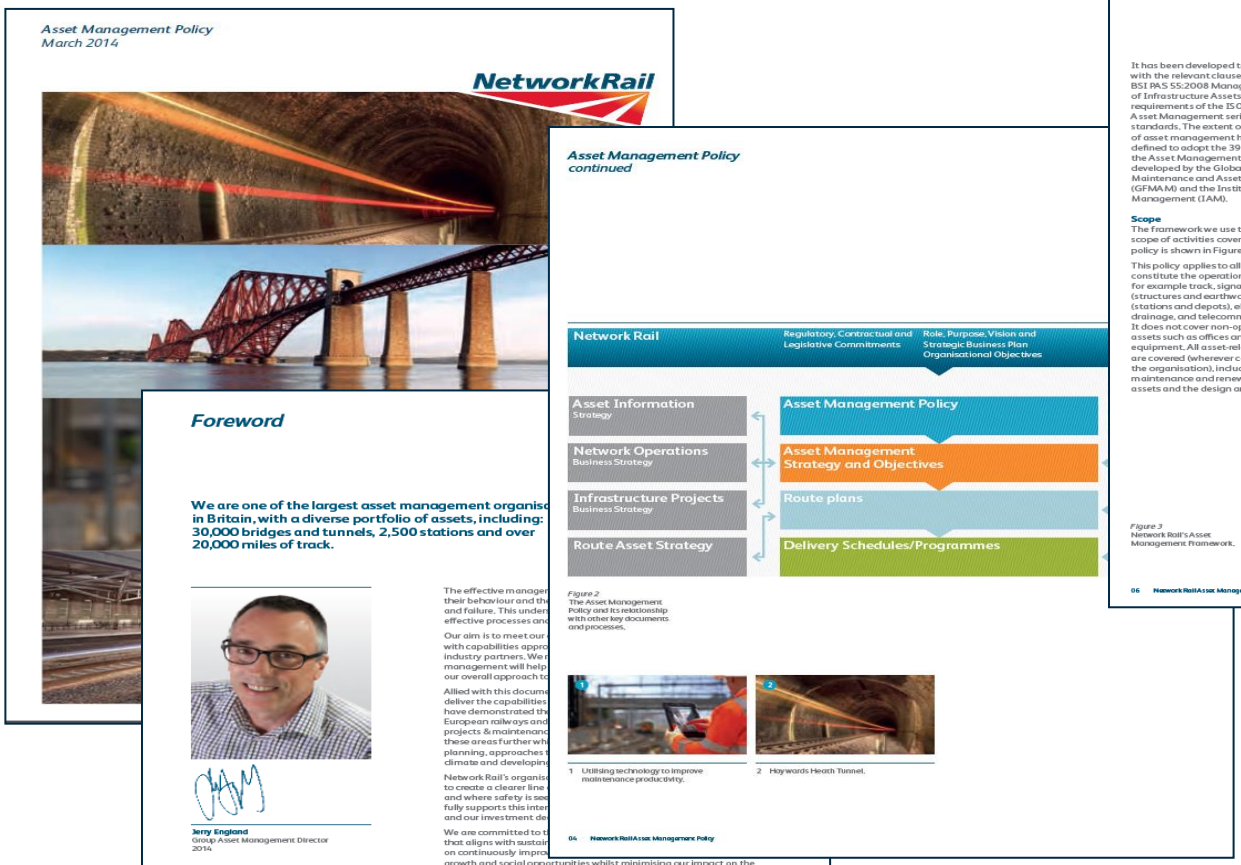
The Policy: …..must do's

- A policy is a defining prerequisite to the building of a Strategic Asset management Plan
- Asset management plan must be set at the appropriate level and in line with your company business planning cycle.
  - A correct asset management plan defines how your organization will choose to manage its assets.
  - A plan should include the systems, methods, resources and practices required to mitigate risk and consequences.
  - The policy should be revisited on a set continuum to ensure validity against changing business needs.
  - The policy must be endorsed by the organization Leadership.

Formal Policy: Guidance


Asset Management Policy
March 2014

NetworkRail

Foreword

We are one of the largest asset management organisc
in Britain, with a diverse portfolio of assets, including:
30,000 bridges and tunnels, 2,500 stations and over
20,000 miles of track.

Jerry England
Group Asset Management Director
2014

"Our aim is to meet our obligations in a manner that is demonstrably world class."

Asset Management Policy continued

Network Rail | Regulatory, Contractual and Legislative Commitments | Role, Purpose, Vision and Strategic Business Plan Organisational Objectives

Asset Information Strategy
Network Operations Business Strategy
Infrastructure Projects Business Strategy
Route Asset Strategy

Asset Management Policy
Asset Management Strategy and Objectives
Route plans
Delivery Schedules/Programmes

Figure 2
The Asset Management Policy and its relationship with other key documents and processes.

1 Utilising technology to improve maintenance productivity.
2 Haywards Heath Tunnel.

04 Network Rail Asset Management Policy

Good practice alignment

This document has been developed based on good practice guidance from internationally recognised sources.

It has been developed to comply with the relevant clauses of BSI PAS 55:2008 Management of Infrastructure Assets and the requirements of the ISO 55000 Asset Management series of standards. The extent of the discipline of asset management has been defined to adopt the 39 subjects within the Asset Management Landscape developed by the Global Forum for Maintenance and Asset Management (GFMAM) and the Institute of Asset Management (IAM).

Scope
The framework we use to define the scope of activities covered by this policy is shown in Figure 3 below.

This policy applies to all assets that constitute the operational railway, for example track, signalling, civils (structures and earthworks), buildings (stations and depots), electrical power, drainage, and telecommunications. It does not cover non-operational assets such as offices and IT equipment. All asset-related activities are covered (wherever carried out in the organisation), including inspection, maintenance and renewal of existing assets and the design and installation of new assets to enhance the capability of the network. The scope of asset management includes relevant operational activities including capacity planning, operational control and timetabling. The policy applies to all Network Rail personnel involved in asset management activities and all relevant suppliers of asset management services.

Corporate outputs are determined as part of the periodic review process. Specific asset condition, capability and reliability targets, funding and output measures are included in our Asset Management Strategy.

Network Rail is a patron of the IAM. Patrons work to develop and share good practice in the application of asset management.

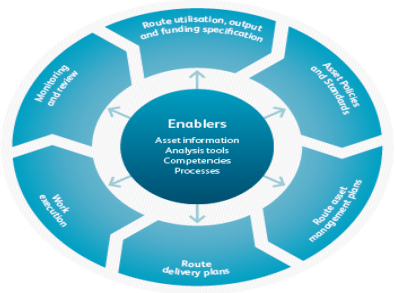


Figure 3
Network Rail's Asset Management Framework.

06 Network Rail Asset Management Policy

Publically available Asset management policy: Network Rail

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Asset Management Policy: Examples

- **Government/Municipality – City of Ottawa**
  - http://ottawa.ca/en/city-hall/your-city-government/policies-and-administrative-structure/comprehensive-asset-management
- **Oil and Gas – Chevron & Shell**
  - http://www.chevron.com/documents/pdf/OEMS_Overview.pdf?
  - http://www.shell.com/global/products-services/solutions-for-businesses/marine-products/hsse/management.html
- **Utilities:** Scottish Power
  - http://www.spenergywholesale.com/userfiles/file/RG-IMS-1002.pdf
- **Network Rail (attached)**
  - http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=23&cad=rja&uact=8&ved=0CDIQFjACOBQ&url=http%3A%2F%2Fwww.networkrail.co.uk%2Fpublications%2Fwhat-are-our-plans%2Fasset-management-policy.pdf&ei=uk5BVNTQMbC1sQTBsYGoBw&usg=AFQjCNFPNE-Bug6gimXm4W2_-RQKYvadRg&sig2=qj0NYldIZ5JiLZBWblqVnA
- **Water**
  - http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=45&cad=rja&uact=8&ved=0CDsQFjAEOCg&url=http%3A%2F%2Fwww.taswater.com.au%2FArticleDocuments%2F475%2FAsset%2520Management%2520Policy.PDF.aspx&ei=RFBBVJKUKu7hsAT34YLAAw&usg=AFQjCNFRFxPgjNkZKdwbXRWxzNWzJzhREQ&sig2=Rn7uF2olDdG77dLNSBDI4w
- **Utilities – Wales and West Utilities**
  - http://www.wwutilities.co.uk/Content/OurCompany/PDF/WW_A5_v5.1_20pp.pdf
- **Transportation: US Federal Department of Transit**
  - http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCIQFjAB&url=http%3A%2F%2Fwww.fhwa.dot.gov%2Fasset%2Fpubs%2Fhif13047.pdf&ei=llJBVNOOJIHnsASVj4K4Ag&usg=AFQjCNGLDYs0zE8rLstEWrTN3MTrJQu49Q&sig2=Dp-HeEvWcPnpGkyABsEwyA&bvm=bv.77648437,d.b2U
- **Guiding Associations: American Water Association**
  - http://www.awwa.org/about-us/policy-statements/policy-statement/articleid/188/asset-management.aspx
- **Education/academia – University of San Francisco.**
  - http://www.usfca.edu/its/about/policies/asset/

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2: Assess to define road ahead.

- Assess your current state of maintenance and reliability practices to define the business drivers for change.
  - Assess your current state of maintenance and reliability practices.
  - Where are you today do you need to be compared to best practice or compared to management expectations?
  - What are the potential tangible gains from improving the overall level of reliability prowess of your organization.

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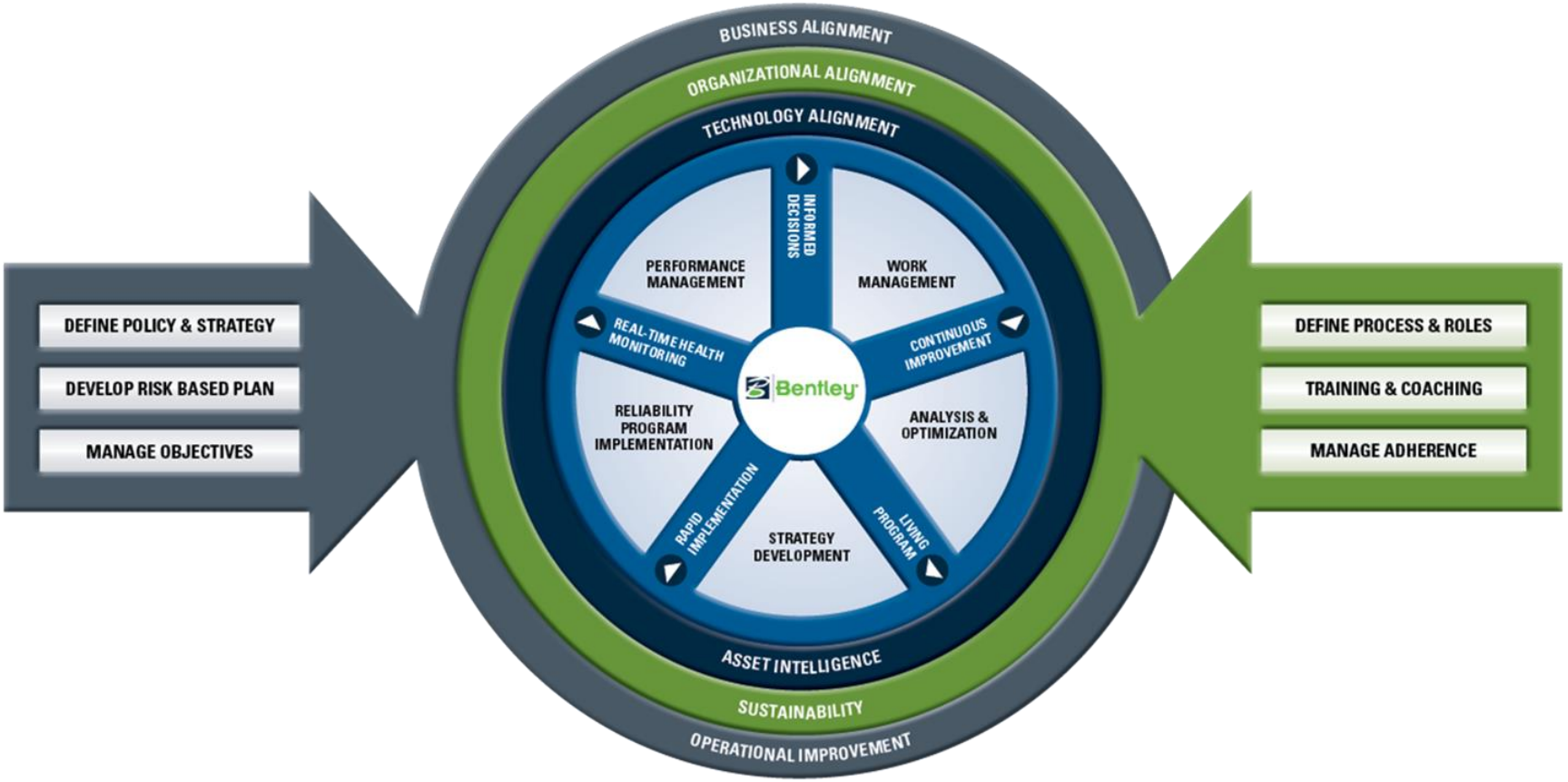
Asset Performance Management



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Asset Performance Management (APM) Process

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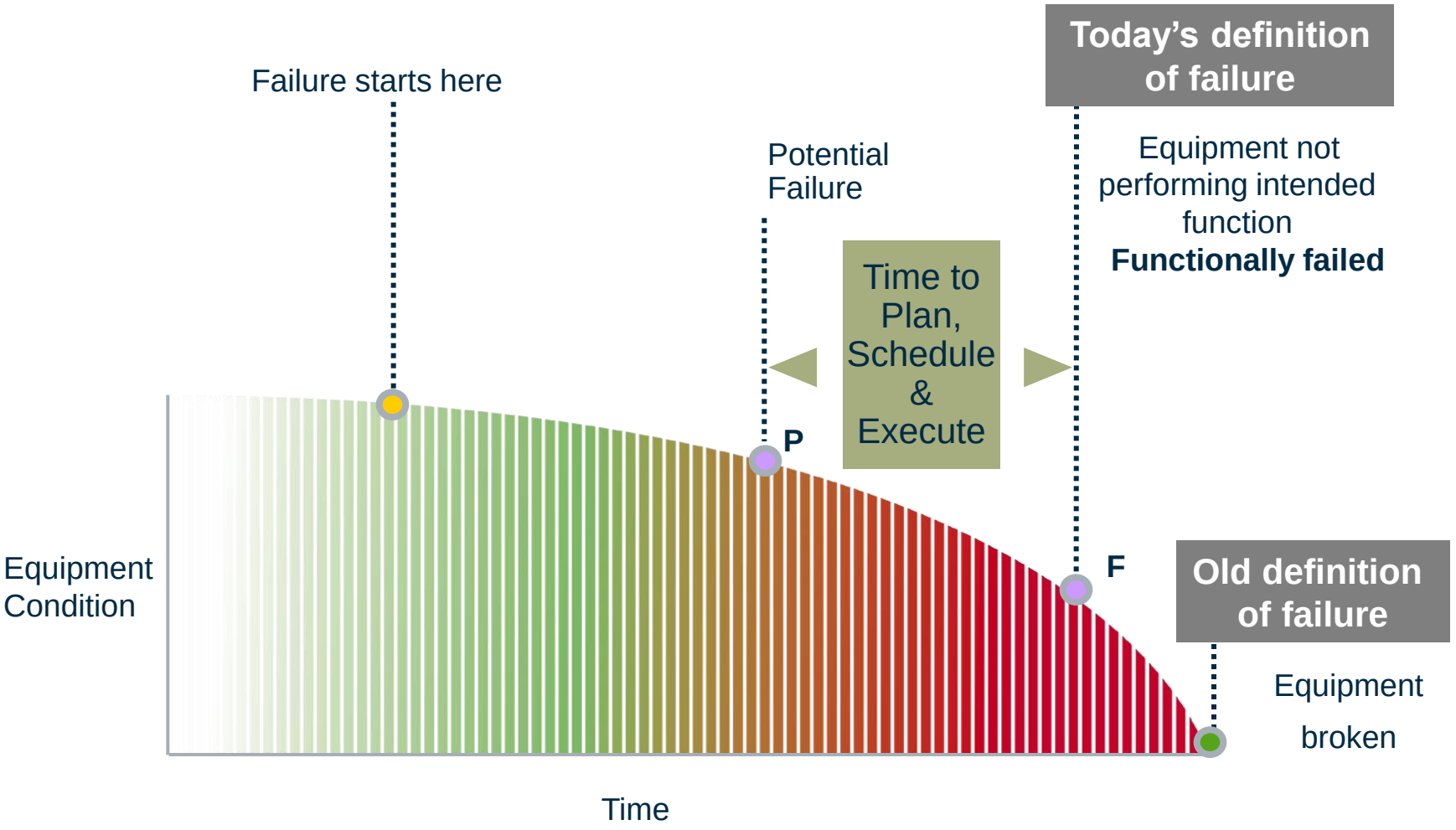
Condition Based Maintenance



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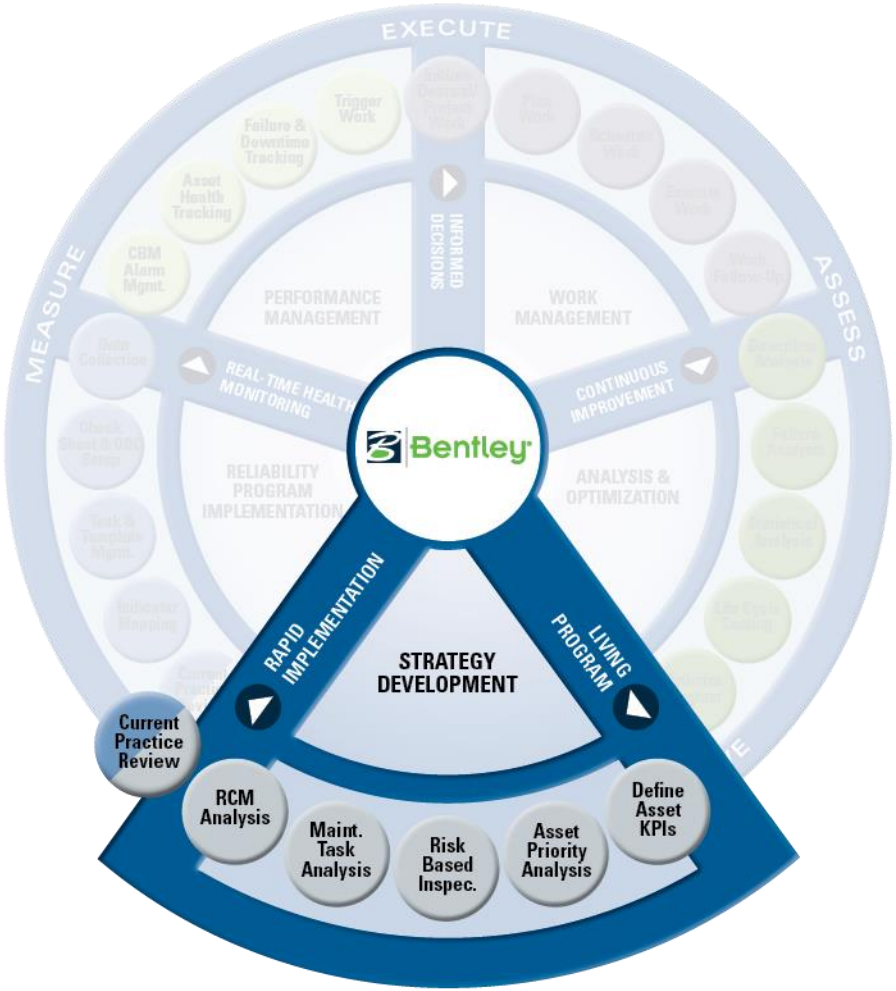
APM Strategy Development

- Develop asset level performance targets
- Identify business risk at the asset level
- Identify asset improvement candidates based on business prioritization
- Define action plans using:
  - RCM2 (F,FF,FM)
  - MTA (FM)
  - Current Practice Review (CPR)
  - Identify risk at the Failure Mode



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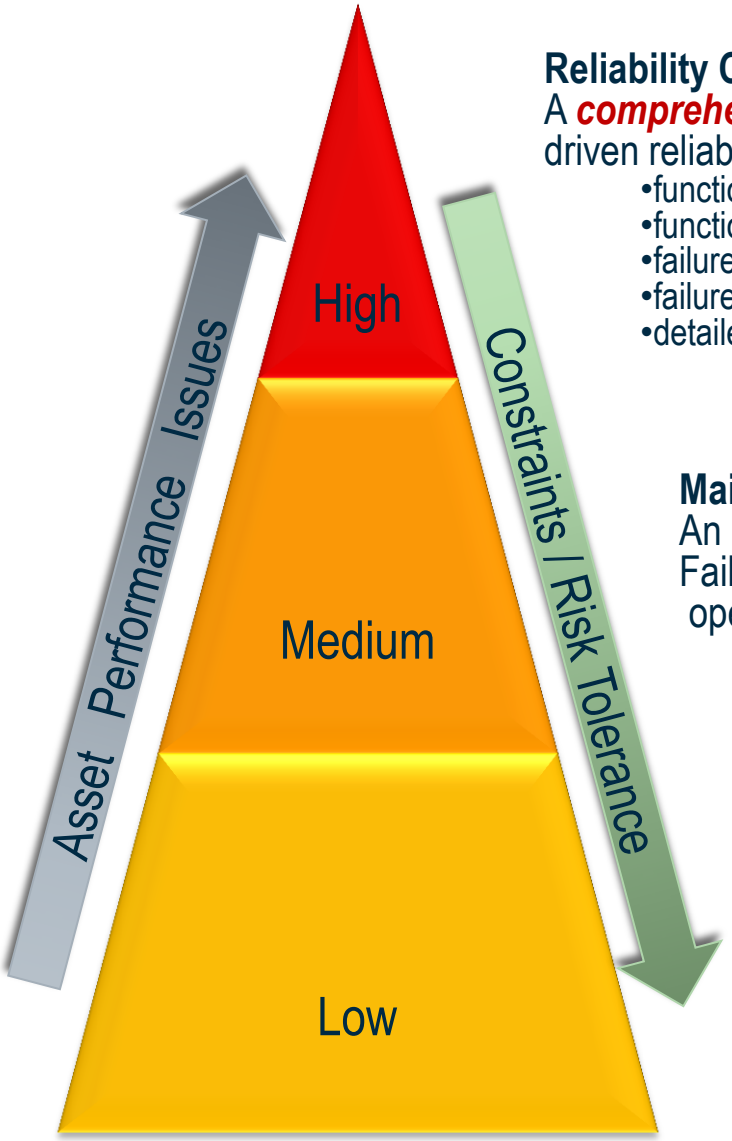
Strategy Selection based upon Business Risk/Constraints



Reliability Centered Maintenance (RCM2):
A ***comprehensive*** analysis practice used to identify and develop consequence driven reliability action plans:

- functions
- functional failures
- failure modes (causes) and effects
- failure mode risk/criticality (matrix)
- detailed consequence evaluation tools (RCM2 decision diagram)

Maintenance Task Analysis (MTA):
An ***intermediate*** analysis practice used to rapidly identify Failure Mode reliability action plans based upon existing operations and maintenance knowledge:

- failure modes (causes) and effects
- failure effects
- supported by templates and online content

Current Practice Review (CPR):
A ***baseline*** review practice used to identify CBM Action Plans enabled by APM indicators:

- valid paper based inspections and rounds
- valid Preventive Maintenance (PM) tasks
- valid Predictive Maintenance (PdM) routes
- operating and setup procedures

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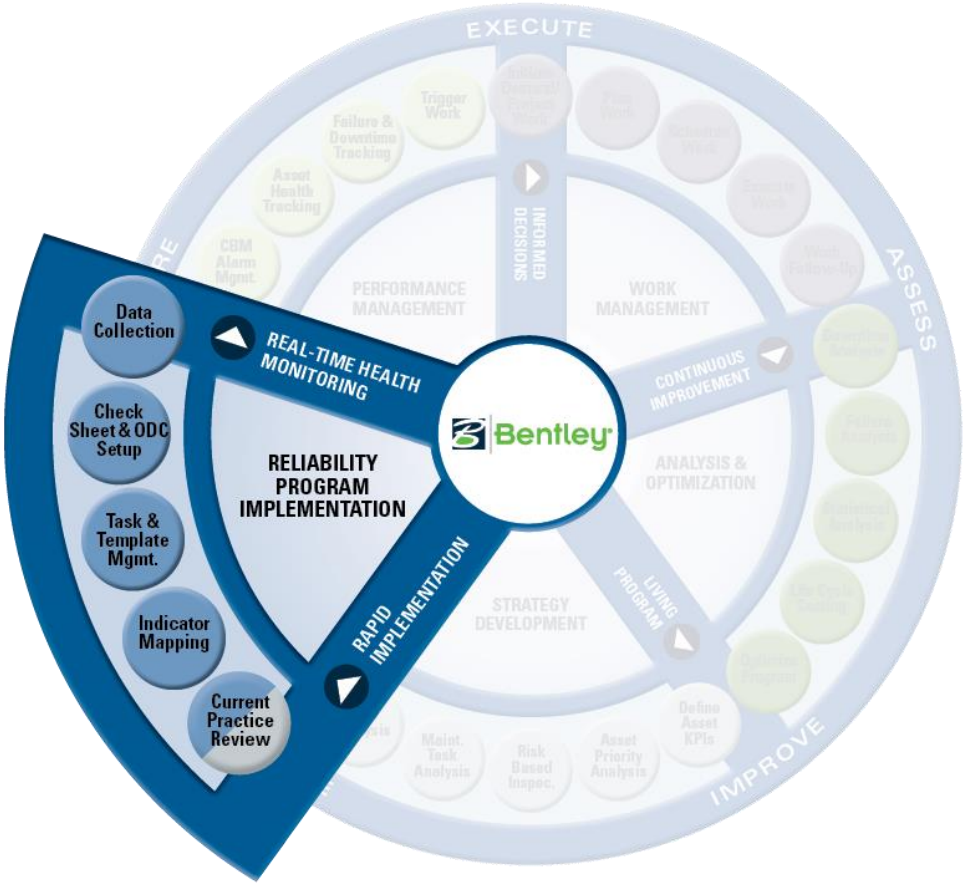
APM Reliability Program Implementation

- From action plans, define and implement:
  - condition based maintenance (CBM) checksheets/routes
  - failure finding tasks
  - preventive maintenance (PM) tasks and Jobs
  - Asset level improvement projects
- Collect, consolidate and online and handheld inspection indicators



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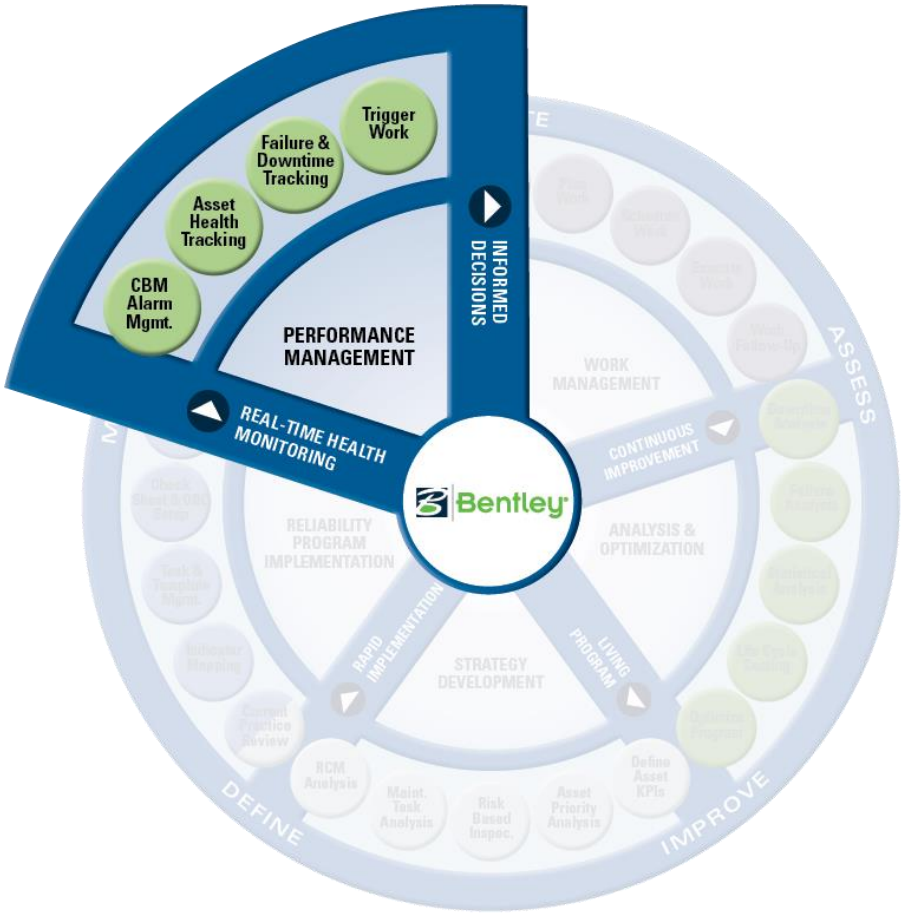
APM Performance Management

- Evaluate condition data against preset parameters to identify potential asset failures
- Identify asset health warnings and alarms
- Initiate corrective actions and preplanned tasks to mitigate asset health alerts
- Create potential failure records
- Identify Key Performance Indicators and track results



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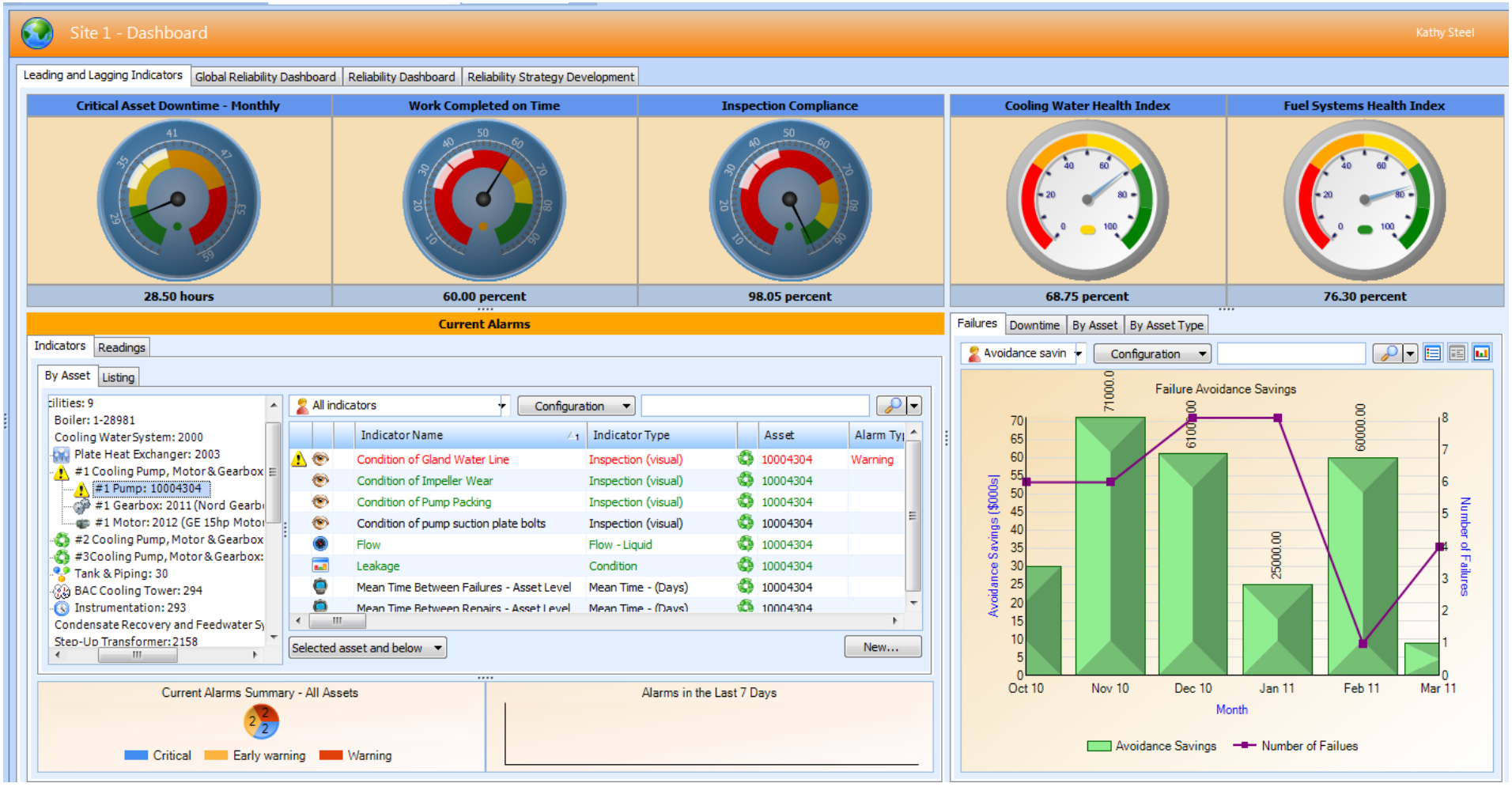
Living, Breathing Reliability Program



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Dynamic Management of CBM Alarms

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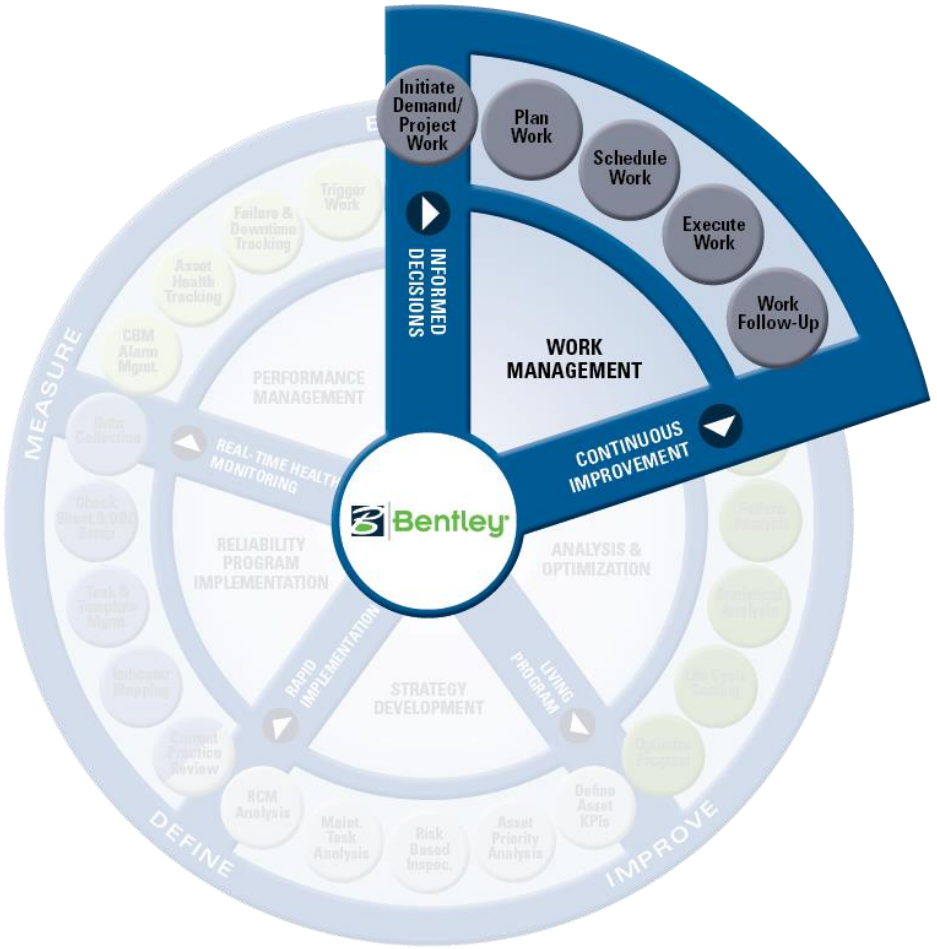
APM Work Management

- Clarify work instructions, resource and safety/environmental requirements
- Compile, validate and lock weekly work schedules
- Issue and manage daily and shift work schedules
- Assign work and manage execution
- Report work completion activity and reset asset alerts



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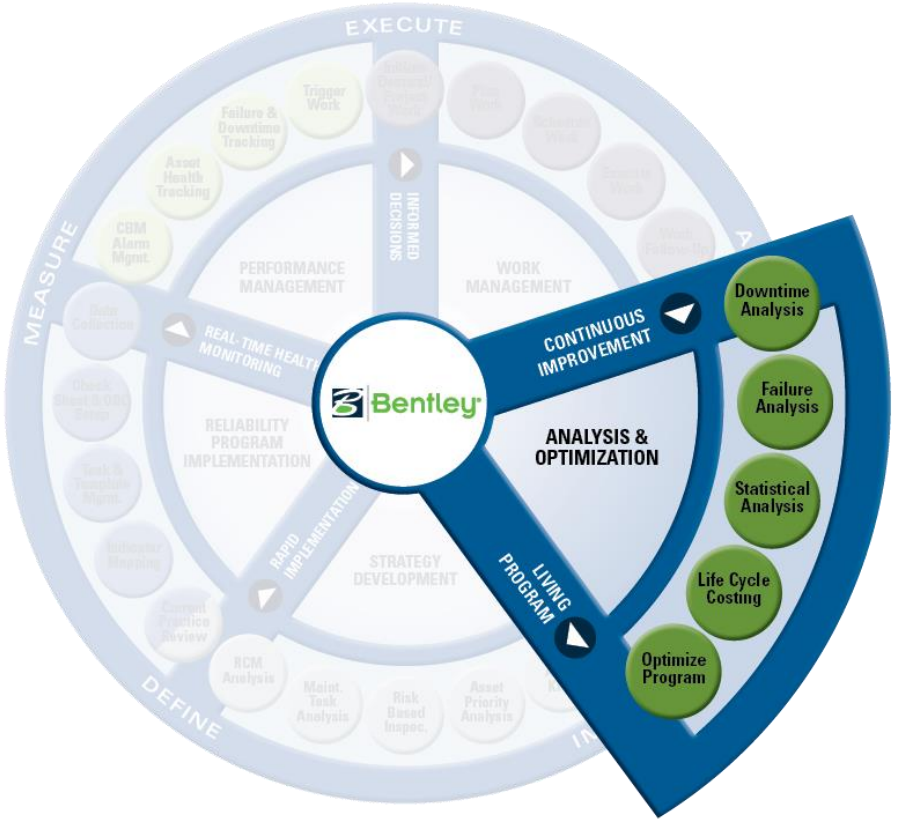
APM Analysis & Optimization

- Capture and consolidate historical work order data
- Failure and downtime analysis
- Weibull analysis
- Reliability strategy optimization
- Availability and reliability simulation (RBD)
- Identify asset life cycle cost recommendations
- Identify resource optimization opportunities
- RCA methodologies



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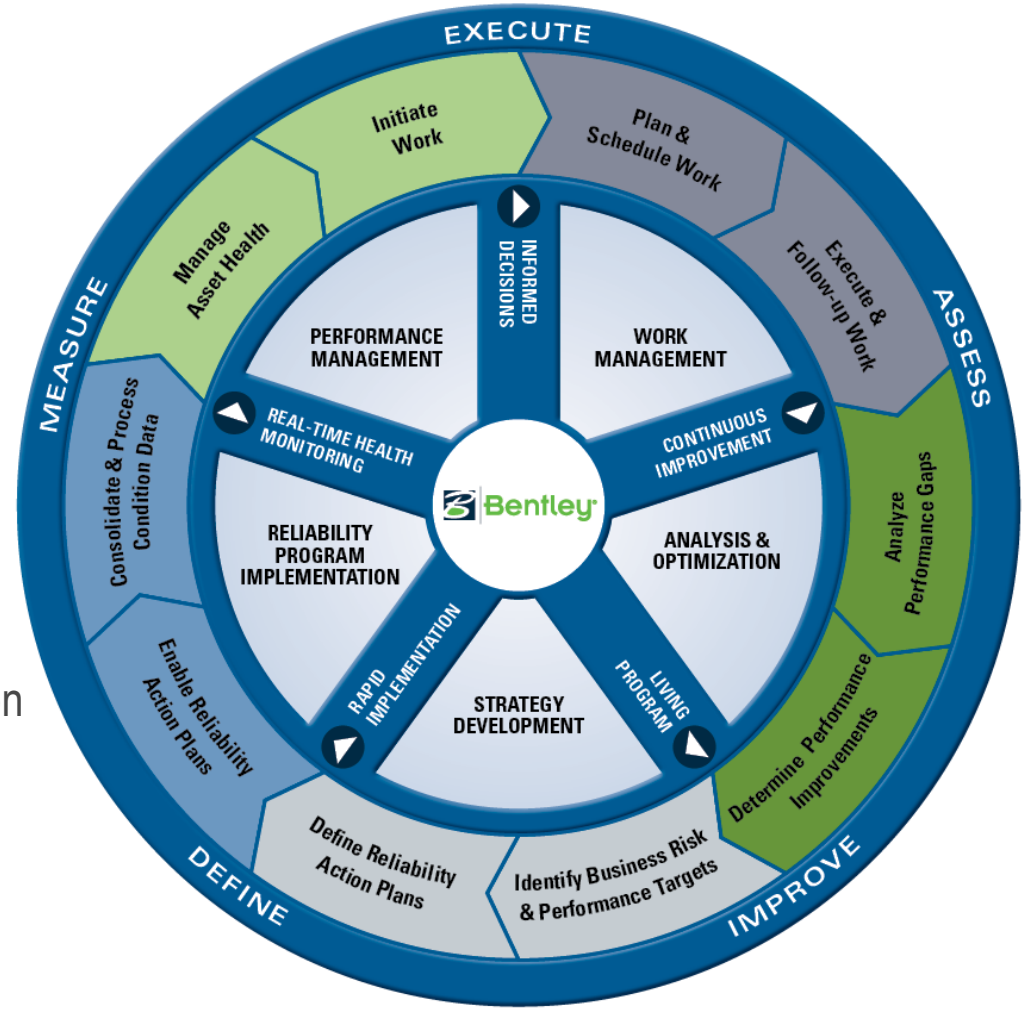
Asset Performance Management (APM) Process

Risk-based reliability centered approach to define "The Right Work at the Right Time"

- Real -time health monitoring
- Compliance reporting
- Rapid implementation and execution of strategy



- Informed decisions to manage work at the asset level
- Continuous improvement through analysis and optimization
- Managed as a 'Living Program' – not a project

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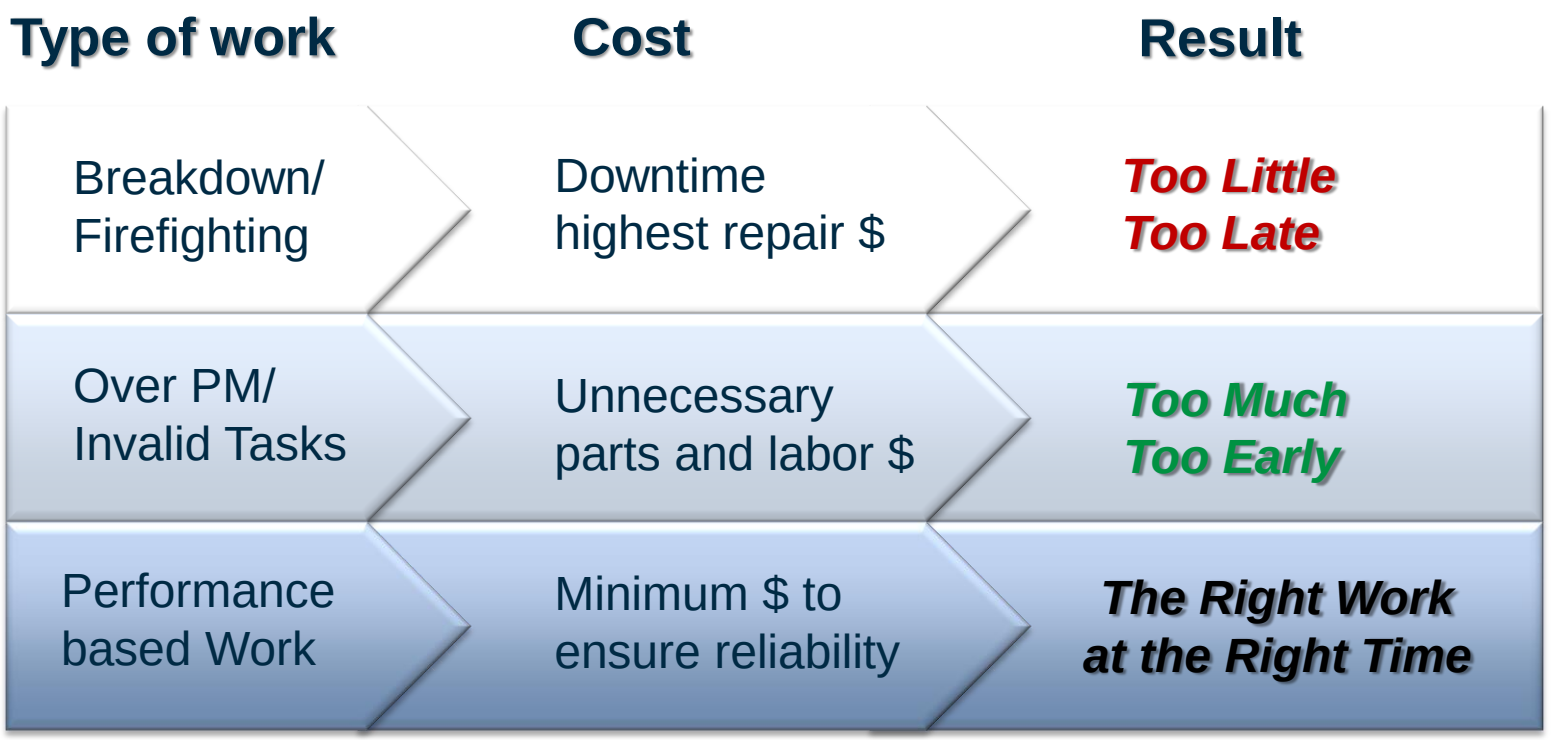
The Need for Strategy Development



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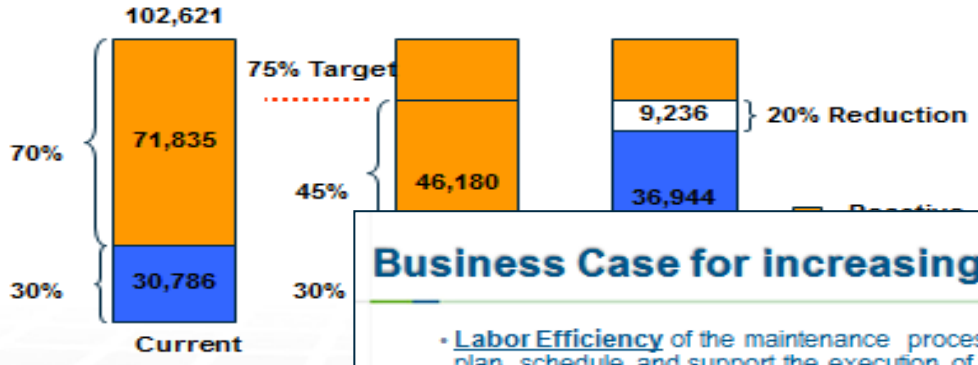
3: Create your Business Case

- A business case documents the business benefits and return on investment to be achieved by proactively managing assets.
  - For Capital Budgets, generally organizations what to understand the return for investment dollars.
  - Smart organizations demand that operations budgets warrant a similar approach.
  - Reliable organizations fund their own Asset management programs.
    - Hidden Plant – Hidden Capacity, Cost avoidance etc.

The Business Case

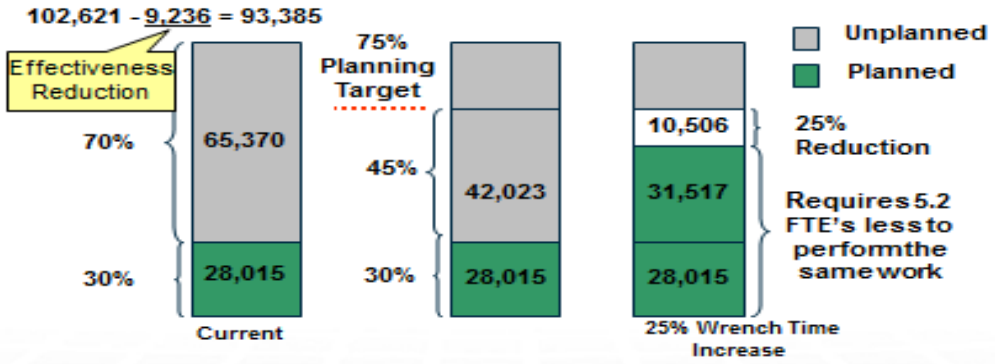
Business Case for increasing Maturity: Effectiveness

- **Labor Effectiveness** is a result of how pertinent the tasks are to maintaining the asset operating at the required level of performance. An effective maintenance program translates knowledge into actionable information and is comprised of activities that reduce the amount of firefighting needed to maintain the plant.



Business Case for increasing Maturity: Efficiency

- **Labor Efficiency** of the maintenance process is a result of how well we plan, schedule and support the execution of the maintenance activities. This can be related to the percentage of work planned and scheduled and the percentage of available time that is wrench time.



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The business case: Effectiveness targets

- The conversion of reactive hours to proactive hours reduces maintenance cost per unit produced
- Labor Effectiveness
  - We know that proactive labor is more effective than reactive work by approximately 20%
- Material Effectiveness
  - We know that proactive work is more effective than reactive work with respect to materials usage due to a reduction in collateral damage
  - This reduction is typically in the 50% range

Business case: Efficiency targets

- Example: Reliability Efficiency Scores
- We know that properly planned & scheduled work will increase labor efficiency of maintenance tasks by reducing delays associated with;
  - Waiting for parts
  - Waiting for instructions/job plans
  - Waiting for resources

- Improved planning and scheduling will improve wrench time by approximately 15-30% due to a reduction in these delays

Measure

- Identify how the impact of the Strategic Asset Management, improvement will be measured and monitored and what guiding standards will be used as a means to legitimize or define the direction/path.
- The SAM places the performance criteria at the heart of Asset Management
  - **A**sset **PERFORMANCE M**anagement

Measure to Manage: SAM/APM KPI's

- Key Performance Indicators.
  - Best practice systems should provide asset health indices as a means to quantify improvement measures.
  - Leading Organizations post live metrics in critical viewing locations.
    - Dashboards in CMMS systems.
    - Scrolling TV's, Andon Boards, interactive messages Boards, Intranet,
  - KPI's can offer communication help especially if an education program has preceded the release of the KPI's

Reliability business process defined to the activity level

- Roles assigned to each activity
- Each key element with process measures and clear targets

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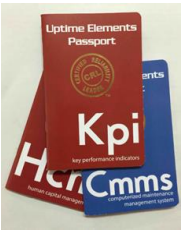
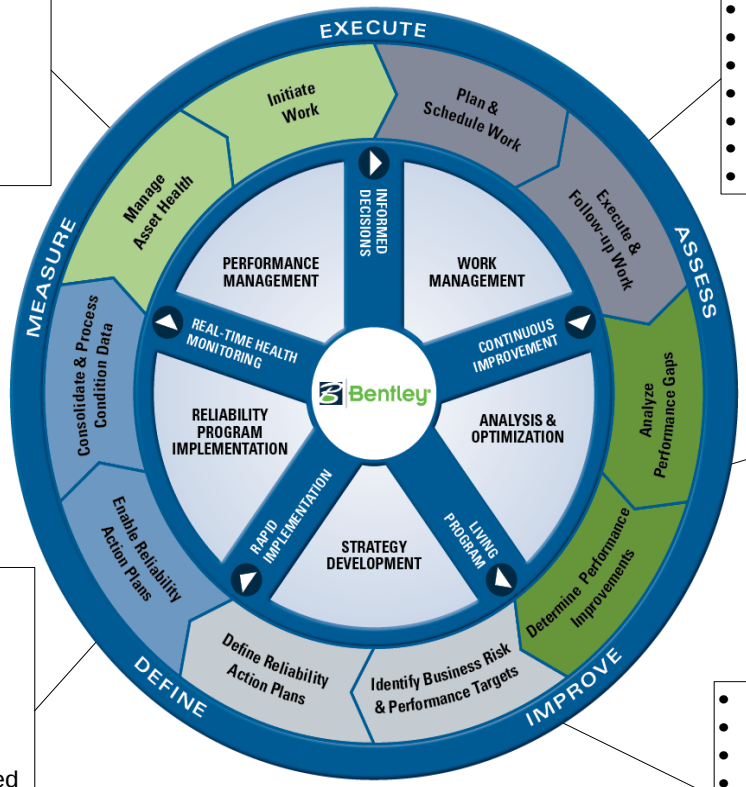
KPI Measurement and Reporting

leading and lagging



- % Alarms Acknowledged < 24 hrs
- Count of Missed Alarms
- Acknowledgement Type Breakdown
- % Work Generated from WID
- # of Failures
- # of Health indices in Alarm
- Production Loss Accounting
- Bad Actors by type



- PM Compliance
- % Work Planned
- Backlog Hours by Type / Trade
- Schedule Compliance
- % Work Scheduled
- % of Work Scheduled on Time
- Plan Accuracy (% Variance Est. vs Act.)
- Material Service Level

Defined per Customer:

- Downtime
- Throughput
- Quality
- Maintenance cost
- Safety
- Environmental
- OEE
- MTBF
- MTTR
- Cost of Functional Failures
- Cost of Total Failures
- Savings from Potential Failures
- Bad Actor RCA Analysis % Compliance

- % Action Plan Implemented
- % Implementation Hours
- Action Plans / Hour
- # of Indicators
- Indicators not on Failure Modes
- Indicators not on Routes
- % Compliance (at Indicator Level)
- Backlog Work from APM to be Planned
- # modifications / redesign
- # modifications / redesigns accepted

- % Assets Prioritized
- % Assets Analyzed (WID)
- Number of Failure Modes (FM)
- % Facilitation Hours
- Failure Modes / Facilitation Hrs
- % Action Plans by Type
- % Action Plans Audited
- % of Action Plans Validated Virtually

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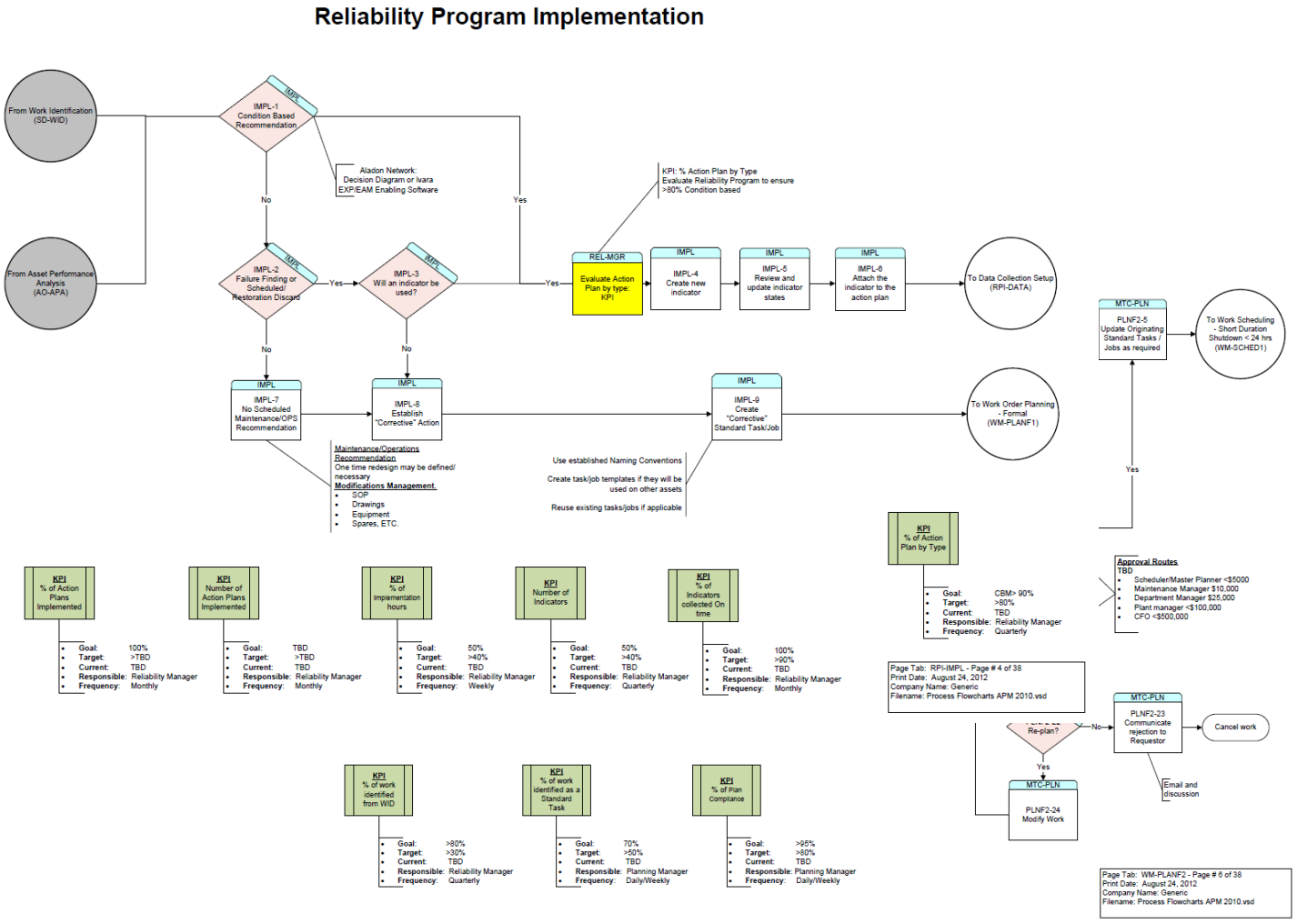
Leading Metrics: Driving accountability at the Business process activity level



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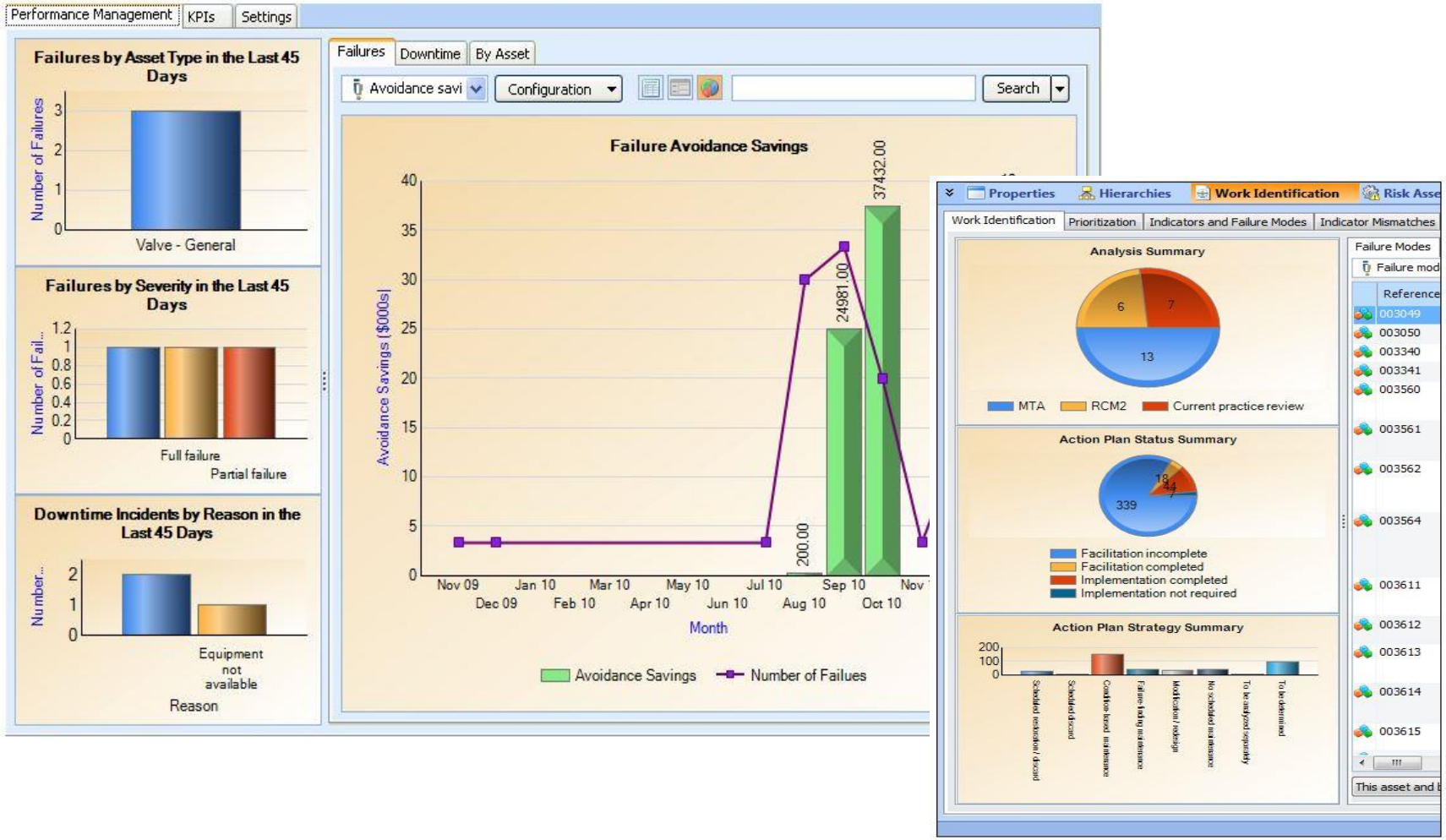
KPIs and Dashboards



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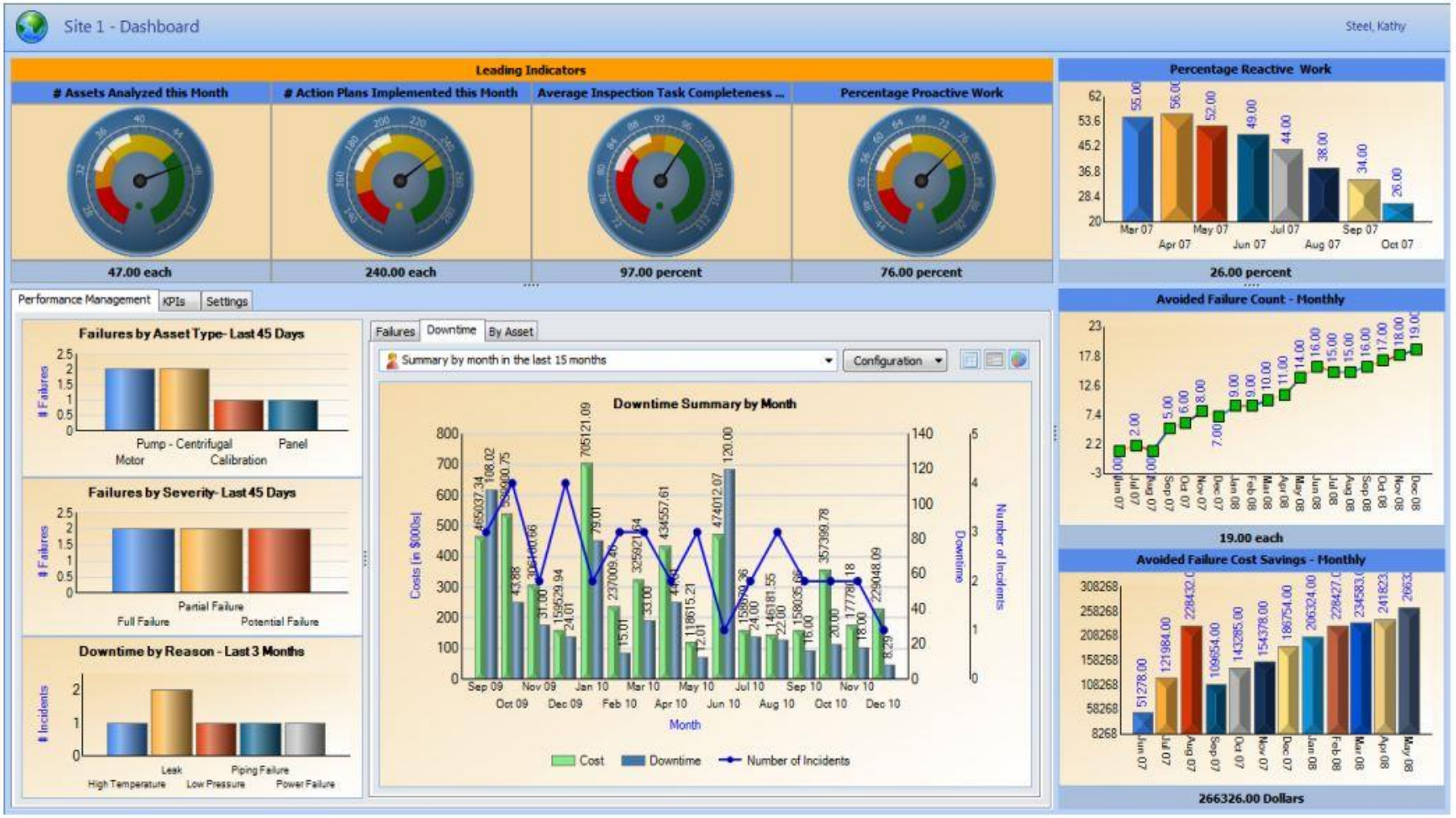
KPIs and Dashboards



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Success Factors: SAM/APM Process KPIs

Leaders review process details with people who report to them

- Identify the activities each role is responsible for performing
- Identify performance standards for the activity
- Set expectations for level of performance – including how it will be measured
- Provide individuals with regular feedback so they know how they are doing
- Ensure process KPIs are visible to those who can impact them
- Regular report/posting
- Role based and custom dashboards to display KPIs
- Create ownership

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Assessment

- In the research report on Asset management Practices Investments and Challenges (2014 – 2019), a CHM2Hill study on organizations and their assessment readiness found that:
  - 7% had conducted an Asset management assessment.
  - 22% were planning a baseline assessment in a years time.
  - 28% were planning a baseline assessment within 5 years time.
  - 43% had no plan at all.

"Only 55 participants (7%) indicated that they have already completed a gap assessment. One hundred and seventy three respondents (22%) are planning to implement it over the next 12 months and 222 (28%) are planning to implement it over the next one to five years. Many of the respondents (340 or 43%) indicated that they are not planning to implement the gap assessment. The majority of the participants (67%) conducted or are planning to conduct ISO55000 within five years. This indicates that more enterprises are interested in addressing the asset management gap assessment to improve on their processes and increase the reliability of their assets, which results in lower downtime and higher profits."

- CH2M Hill

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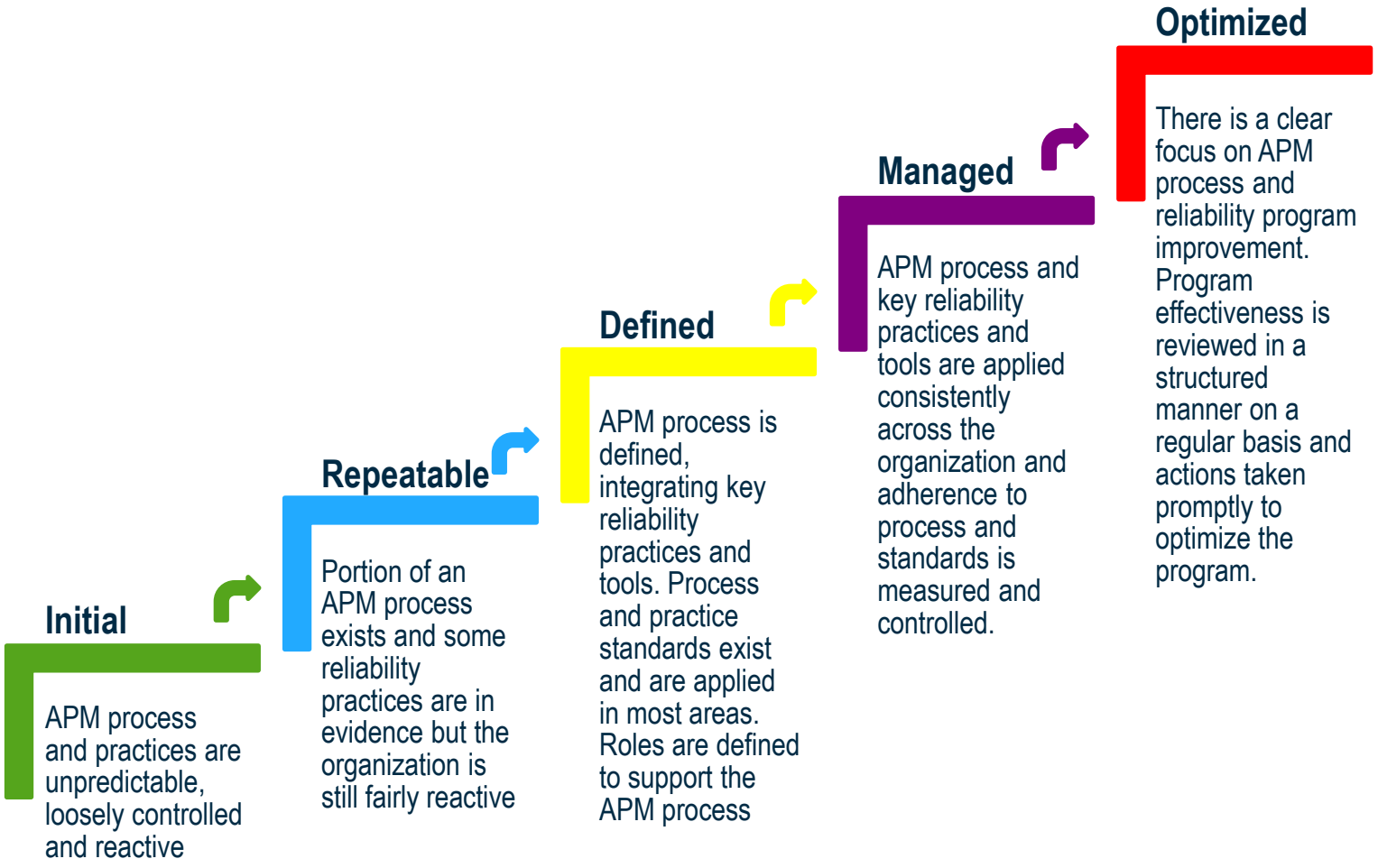
APM Maturity Model - Assessment



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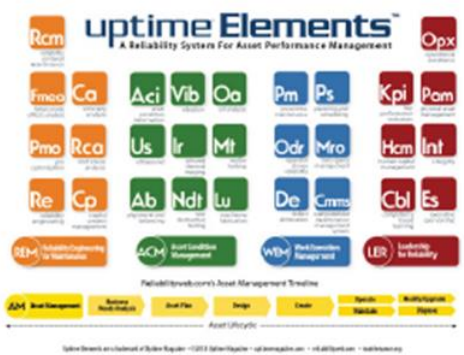
Reliability Maturity Benefit Assessment

- Business Alignment to Best practice for APM for Operational Improvement
  - High level program goals clearly linked to business goals
  - Asset performance targets based on business goals
- Organizational Alignment for Sustainability
  - People Practices and Process aligned for Asset Performance Management
- Enabling technologies
  - Digital, Federated and Scalable Whole Life Asset lifecycle Information Management
  - Analytics, Life Cycle Costing, Downtime tracking, Asset Optimization.. Etc..
  - Capex to Opex Information modeling
  - Management of Change for information Credibility
- Asset Management Process Standardization
- Asset performance Management Reliability Maturity Improvements
  - Implementation of Condition Based Maintenance
  - Increased Planning and Scheduling
  - Reduction of non-value added work
  - Eliminate the delta between proactive & reactive work
  - Improved efficiency via better planning & scheduling
    - Increase the amount of detailed job plans
- Improved Analysis techniques

Assessment: Benchmarking

- What does World Class look like and where on the journey are we today?

- The act of moving the goal post is a critical and strategic path for management.
- Placing "SMART" goalposts is fundamental to Cultural acceptance of the goals.

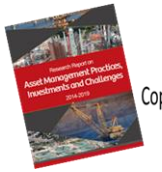


"Benchmarking is extremely important because it allows us to compare ourselves to others in our industry, or in general terms of overall operation. We all do some level of benchmarking that most people don't recognize. Metrics, measures, key performance indicators (KPIs) are all forms of benchmarking. Internally, they measure how individuals, departments, or the organization are performing against some high-water mark.

"Benchmarking can be likened to sports. Would we really watch sports if we didn't keep score? Would we really care to see people running up and down a court, field, baseball diamond, swim lanes, etc.? Every sports league has teams that make up divisions – North/South, American/National and Atlantic/Central – and within these divisions we have standings. Who's in first place and who's in last? We even reward the best performing teams with what's called playoffs. And after playoffs, we crown a champion.

"Think of benchmarking and the goal to be world class. What does world class mean? Is it being the best? Being great at everything? Nope! Being world class means being in the top quartile of your division. Benchmarking allows us to compare ourselves to the competition and constantly strive for continuous improvement. Organizations cannot allow themselves to become complacent. Once they do, they lose market share. If you don't believe this, look no further than Blockbuster and Redbox!"

- Nexus Global



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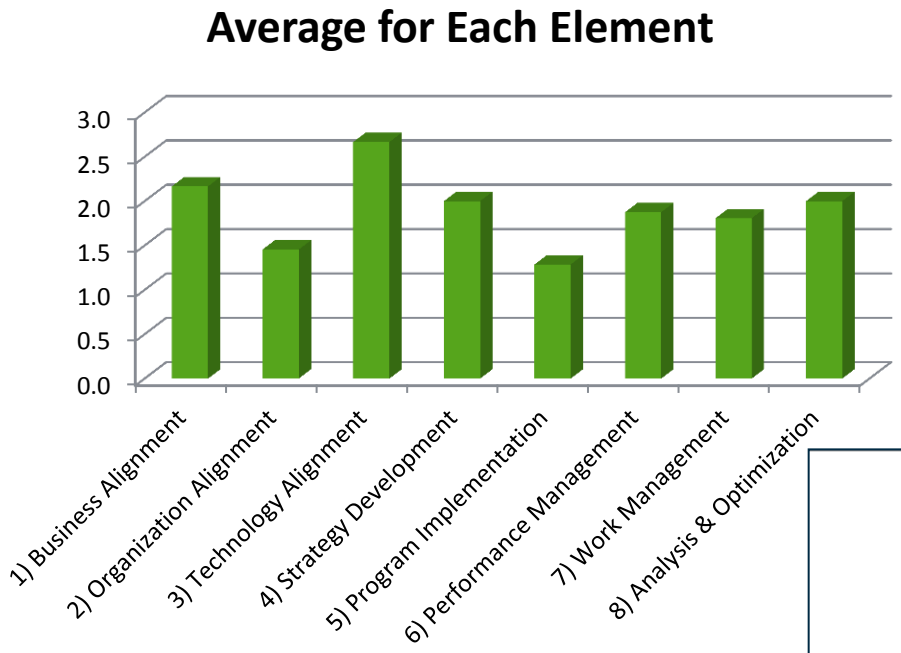
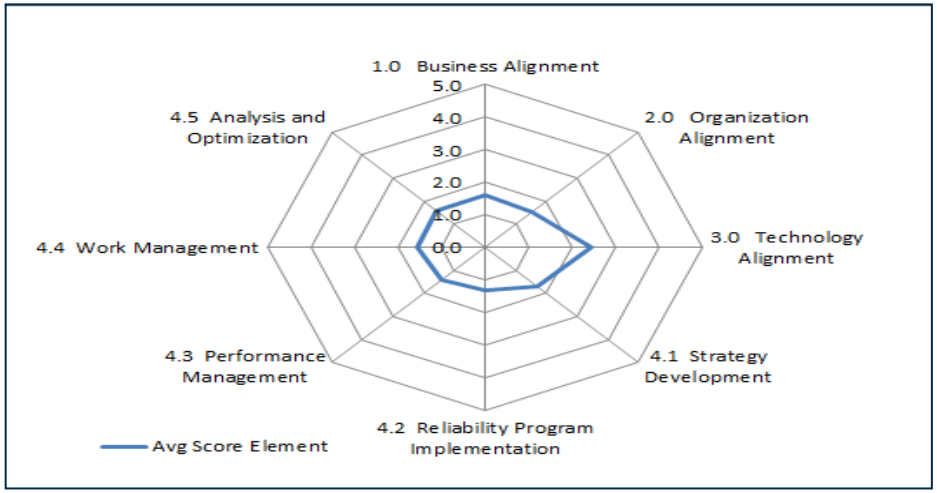
Assessment Baseline– Graph Segments





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Post Reliability Assessment: Result Tips

- Review results prior to presenting with the sponsor or SME for the analysis.
- Present the Reliability results first.
- Validate findings prior to building the business case for change.
- Be specific with recommendations based on opportunities identified in the questionnaire.
- Use World Class measures as reference points, i.e., your organization measured against World Class.
- Prepare for the so what…..Any set goals or defined goals must be SMART goals.
  - **S**pecific, **M**easureable, **A**ttainable **R**ealistic and **T**ime-bound.

Business Drivers

Define your Business Objectives:

What is not working today?

What are the consequences of doing nothing?

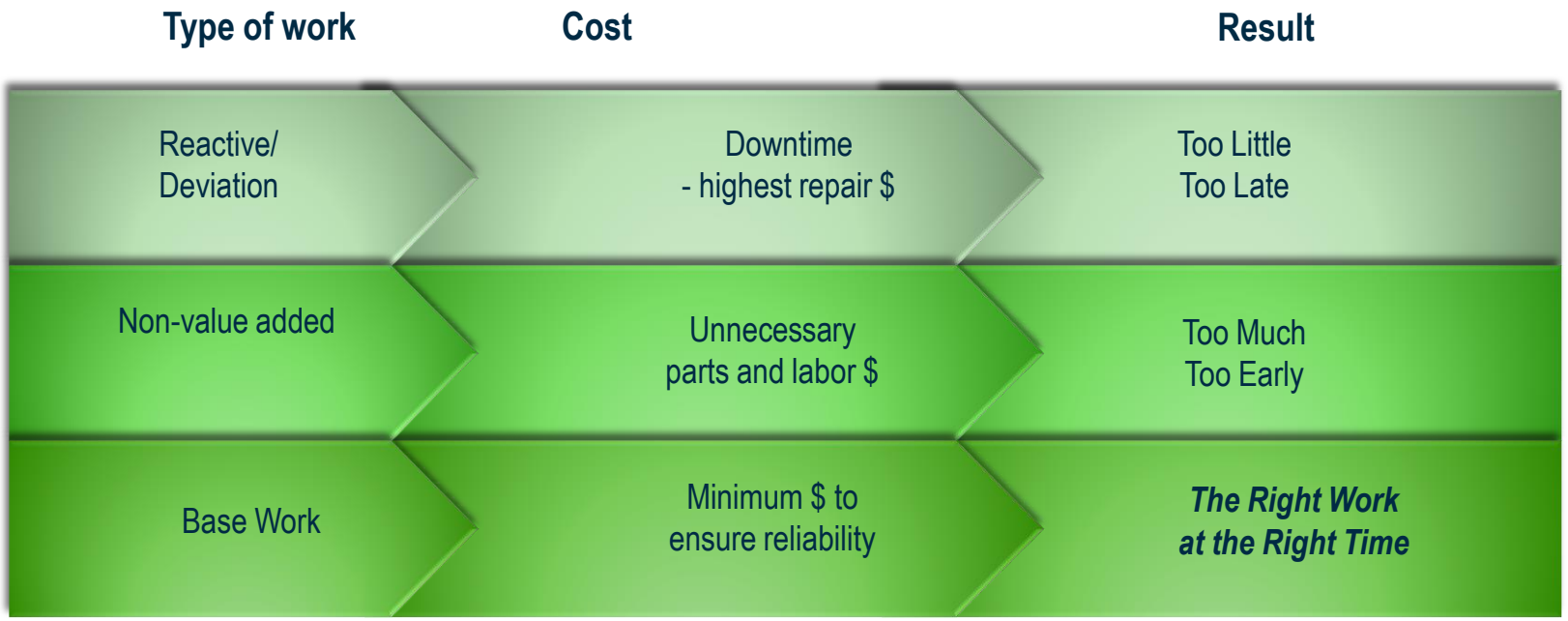
Why is the assessment needed?

What do we need to do in general?

What has been done so far?

Where are we headed as an Organization?

Business Drivers – Cost of Not Doing the Right Work



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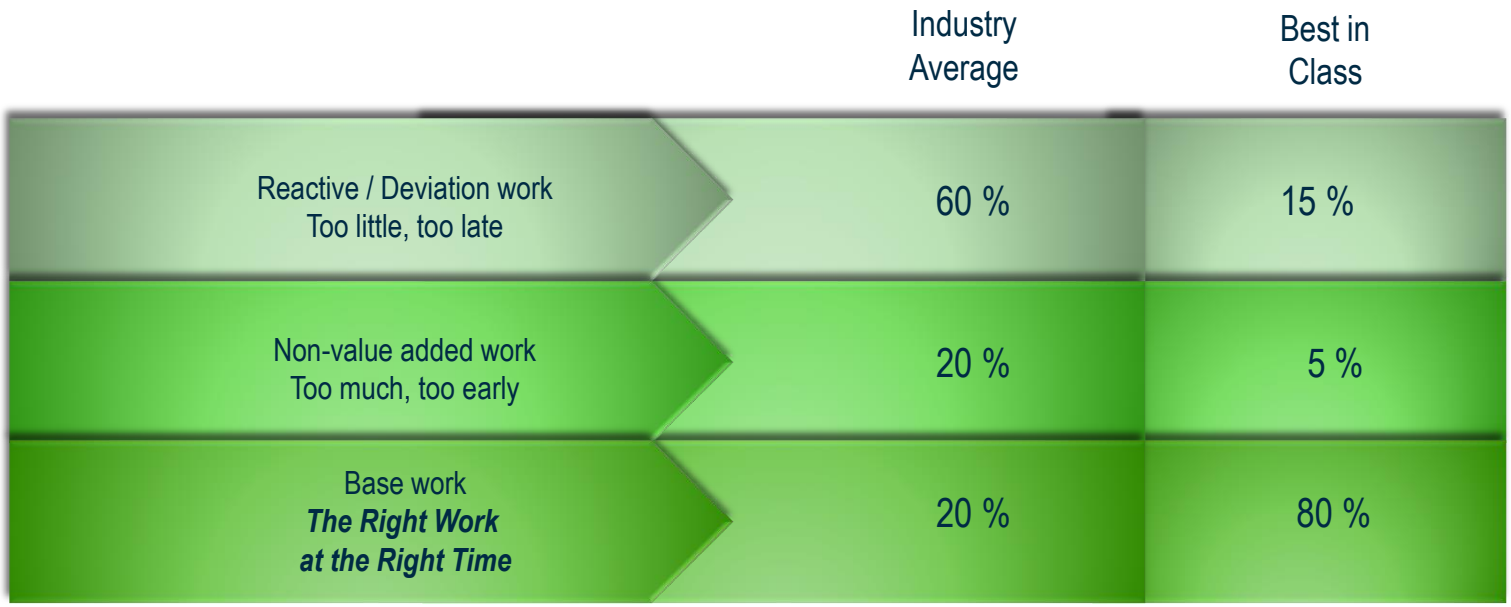
Business Drivers - Cost of Not Doing the Right Work

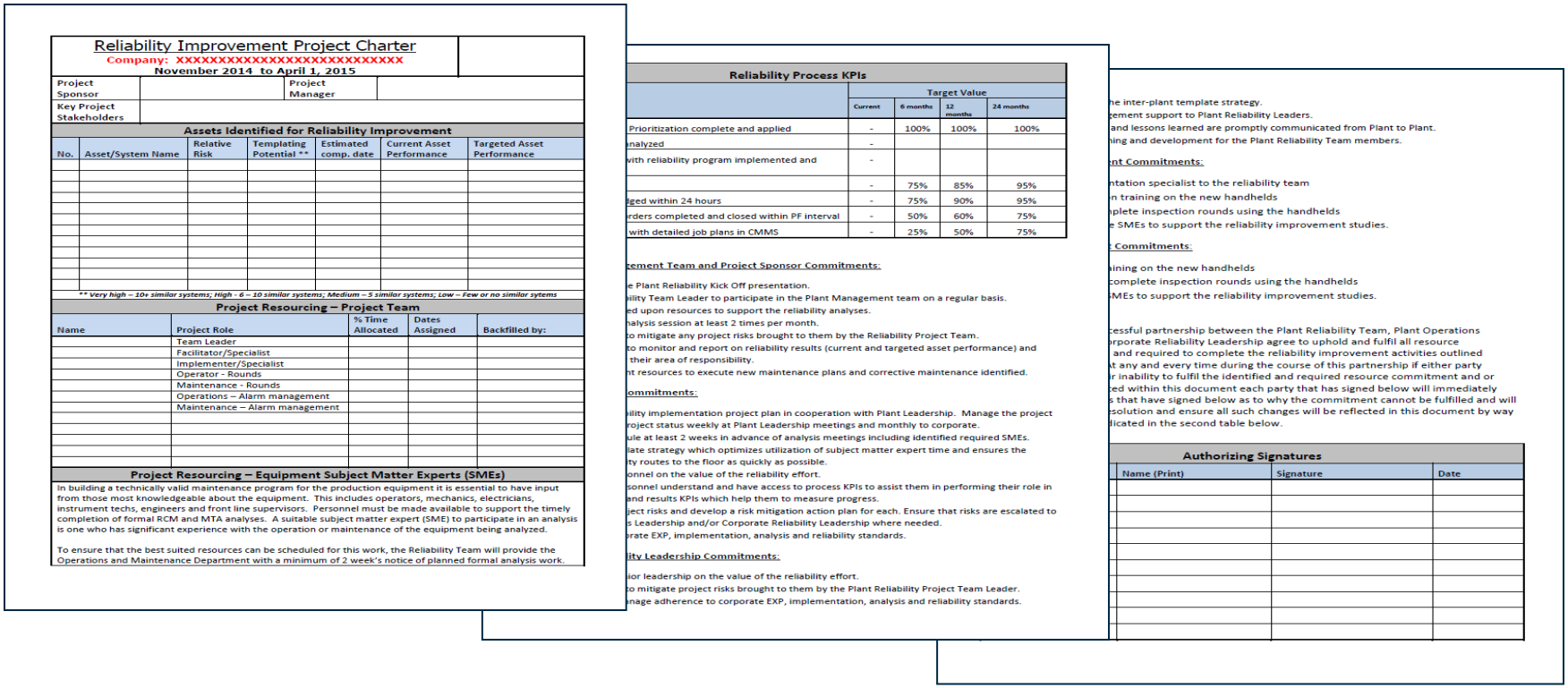


Reactive work takes longer and generally cost significantly more than correctly planned and scheduled work

5: Accountability Model

- The Accountability Model: Defines the scope, objectives, system and resource requirements, project accountabilities, timeline and critical success metrics for your asset management improvement plan.
- Built from the business case findings as well as the high-level business plan, senior leaders need to identify how they will measure the impact of the improvement efforts on the organization.
- Specific results-based and process-based KPIs should be identified, baseline measures established, targets for improvements established and agreed upon, and owners identification
- Communication Tool
  - Reliability Charter

Charter: Build and Publish



Reliability Improvement Project Charter

Company: XXXXXXXXXXXXXXXXXXXXXXXXXXXX

November 2014 to April 1, 2015

Project Sponsor		Project Manager	
Key Project Stakeholders			

Assets Identified for Reliability Improvement

No.	Asset/System Name	Relative Risk	Templating Potential **	Estimated comp. date	Current Asset Performance	Targeted Asset Performance

*** Very high – 10+ similar systems; High - 6 – 10 similar systems; Medium – 5 similar systems; Low – Few or no similar sytems*

Project Resourcing – Project Team

Name	Project Role	% Time Allocated	Dates Assigned	Backfilled by:
	Team Leader			
	Facilitator/Specialist			
	Implementer/Specialist			
	Operator - Rounds			
	Maintenance - Rounds			
	Operations – Alarm management			
	Maintenance – Alarm management			

Project Resourcing – Equipment Subject Matter Experts (SMEs)

In building a technically valid maintenance program for the production equipment it is essential to have input from those most knowledgeable about the equipment. This includes operators, mechanics, electricians, instrument techs, engineers and front line supervisors. Personnel must be made available to support the timely completion of formal RCM and MTA analyses. A suitable subject matter expert (SME) to participate in an analysis is one who has significant experience with the operation or maintenance of the equipment being analyzed.

To ensure that the best suited resources can be scheduled for this work, the Reliability Team will provide the Operations and Maintenance Department with a minimum of 2 week's notice of planned formal analysis work.

Reliability Process KPIs

	Target Value			
	Current	6 months	12 months	24 months
Prioritization complete and applied	-	100%	100%	100%
nalyzed	-			
vith reliability program implemented and	-			
	-	75%	85%	95%
lged within 24 hours	-	75%	90%	95%
rders completed and closed within PF interval	-	50%	60%	75%
with detailed job plans in CMMS	-	25%	50%	75%

cement Team and Project Sponsor Commitments:

e Plant Reliability Kick Off presentation.
ility Team Leader to participate in the Plant Management team on a regular basis.
ed upon resources to support the reliability analyses.
nalysis session at least 2 times per month.
o mitigate any project risks brought to them by the Reliability Project Team.
to monitor and report on reliability results (current and targeted asset performance) and
their area of responsibility.
nt resources to execute new maintenance plans and corrective maintenance identified.

ommitments:

ility implementation project plan in cooperation with Plant Leadership. Manage the project
roject status weekly at Plant Leadership meetings and monthly to corporate.
ule at least 2 weeks in advance of analysis meetings including identified required SMEs.
late strategy which optimizes utilization of subject matter expert time and ensures the
ty routes to the floor as quickly as possible.
onnel on the value of the reliability effort.
sonnel understand and have access to process KPIs to assist them in performing their role in
and results KPIs which help them to measure progress.
ject risks and develop a risk mitigation action plan for each. Ensure that risks are escalated to
s Leadership and/or Corporate Reliability Leadership where needed.
rate EXP, implementation, analysis and reliability standards.

ity Leadership Commitments:

ior leadership on the value of the reliability effort.
o mitigate project risks brought to them by the Plant Reliability Project Team Leader.
nage adherence to corporate EXP, implementation, analysis and reliability standards.

he inter-plant template strategy.
cement support to Plant Reliability Leaders.
and lessons learned are promptly communicated from Plant to Plant.
ing and development for the Plant Reliability Team members.

nt Commitments:

ntation specialist to the reliability team
n training on the new handhelds
plete inspection rounds using the handhelds
e SMEs to support the reliability improvement studies.

Commitments:

ining on the new handhelds
complete inspection rounds using the handhelds
MEs to support the reliability improvement studies.

cessful partnership between the Plant Reliability Team, Plant Operations
rporate Reliability Leadership agree to uphold and fulfil all resource
and required to complete the reliability improvement activities outlined
t any and every time during the course of this partnership if either party
r inability to fulfil the identified and required resource commitment and or
ed within this document each party that has signed below will immediately
s that have signed below as to why the commitment cannot be fulfilled and will
solution and ensure all such changes will be reflected in this document by way
dicated in the second table below.

Authorizing Signatures

Name (Print)	Signature	Date

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Publish “The Reliability Charter”

- The build and subsequent publication of a guiding document or “charter”, should be built to keep “the eyes on the prize”
- A charter should define the scope, objectives, resource requirements, project accountabilities, timeline and critical success metrics for your asset management improvement plan.
- A charter is a project and business change driver. In order for the document to be recognized as such it must be endorsed by the Asset management sponsor and all effected stakeholders.

Charter communication.

- Communicate and engage the entire organization in the change effort on a regular basis.
- Daily, weekly, monthly meetings should always highlight the status of the plan.
  - The use of key performance indicators are a strong way to continually communicate the efforts and status of the reliability charter.
- Steering committee should “hold to task” to the deliverables defined in the charter on a reoccurring fixed continuum.

6: Organizational Leadership Education

- Educate senior leadership through on modern asset performance management and develop a portfolio of strategic initiatives to change the methods the organization uses to manage its asset base.
- It is the responsibility of the maintenance department to be able to communicate in the language and with the reporting tools requirement by C level sponsors.
  - Education is requirement at all levels (Point 8).

Strong Leadership is Required

To drive ACCOUNTABILITY to the business process.

Strong Leadership is Required

- Performance Management
  - Set expectation and provide training/coaching and tools
  - Monitor process adherence & provide feedback
  - Ensure prompt corrective action is taken
  - Consistency is critical
  - Recognize/reward adherence to process and reliability successes
- Communicate
  - Regular updates of results
  - Communicate wins promptly & widely
- Lead by Example
  - Demonstrate active sponsorship of the reliability process
  - Participate in reliability process activities
  - Make proactive reliability a daily topic

Strategic Initiative: Digital APM

- Recently a Reliability Web study found that Only 19% believed that their Digital APM solution fully supported effective asset management.
- ISO55001 Asset Management System details that a holistic system of reference for Asset Management is a key component of effective decision making.

"It is no surprise that the responses are fairly evenly distributed among several key areas. It is essential for people at all levels to have accessible, high quality information to make **good decisions** that lead to better safety, efficiency and compliance. Bad decisions, which are the root cause of many asset failure incidents, are typically made by well-intentioned people, but based on poor information. Conversely, good decisions can make the difference when mitigating the consequence of failure. There's no question that well-informed decisions actually prevent incidents. Information management systems support human excellence in decision making. A central system should consolidate asset data and help make timely and accurate maintenance decisions.

"Managing assets requires a whole life value approach. As-built/as-maintained engineering information is needed to make informed decisions, as is an understanding of how that information relates to the original design and current regulatory obligations. When assets are modified or upgraded, engineering information must be kept up to date. Ideally, this includes:

- **Information federation** – Referencing and maintaining the relationships between relevant data that may reside in different systems.
- **Configuration management** – Managing the change process and ensuring the physical plant is aligned with the information asset at all times.
- **Information mobility** – Ensuring the right information in the appropriate format and level of precision can be accessed by the right people at the right time.
- **Immersive interfaces with 3D models** – Enabling information exchange and sharing of data. Using i-models (i.e., conveyors of architectural, engineering, construction and operations deliverables), not only 3D, but also 2D and 1D (i.e., data) information, is available within the asset management system.

"This approach aligns with ISO55000, as well as related National BIM Standards and PAS1192-3, which is the Publicly Available Specification for information management in the operational phase of assets using information modeling. The approach reduces the gap between an engineer's or manager's mental model of a plant, its performance and its representation in IT systems. This immersive environment facilitates a common platform for the various disciplines involved in asset management to collaborate effectively in streamlining processes, better supporting existing enterprise systems, providing consistency, and ultimately, improving performance and reducing risk.

"To ensure sustainability of assets, the management of assets then needs to span the whole life value. So integrating information management with asset management definitely should be a requirement to ensure better understanding of assets and their health, as well as to enable better decision making."

- Bentley Systems

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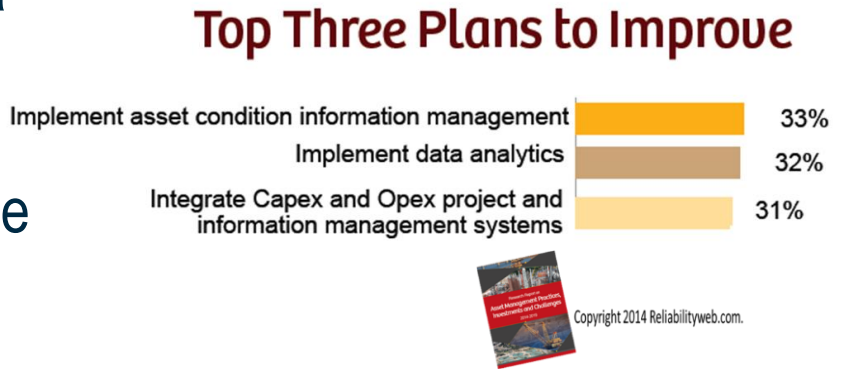
Strategic Initiative: Digital Immersive APM

- Information Federation – Reference data that may reside in different Systems
  - SAY NO to “Islands of Information”
- Configuration Management – manage the information to ensure the plant is being managed with the correct asset information at all times.



- Information Mobility – The right information in the appropriate format and level and precision can be accessible to the right people at the right time
  - 24/7/365.
- Immersive Interface with 3D models – enables the information exchange.
  - E.g., I-Models CAPEX to OPEX Bridge - RCDh

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Strategic Initiative: ISO 55000

- There will be a significant and steady increase in companies planning to either comply with the new ISO55000 series of standards or seek formal certification as a competitive advantage.
- Building and sustaining an asset management master plan will send you along way towards ISO55000 compliance
- To be realistic to achieve ISO 55001 compliance then a digital asset information framework is a requirement.
  - There is simply too much information to manage decisions without one.
  - There's no question that well-informed decisions actually prevent incidents.
  - Information management systems support human excellence in decision making.

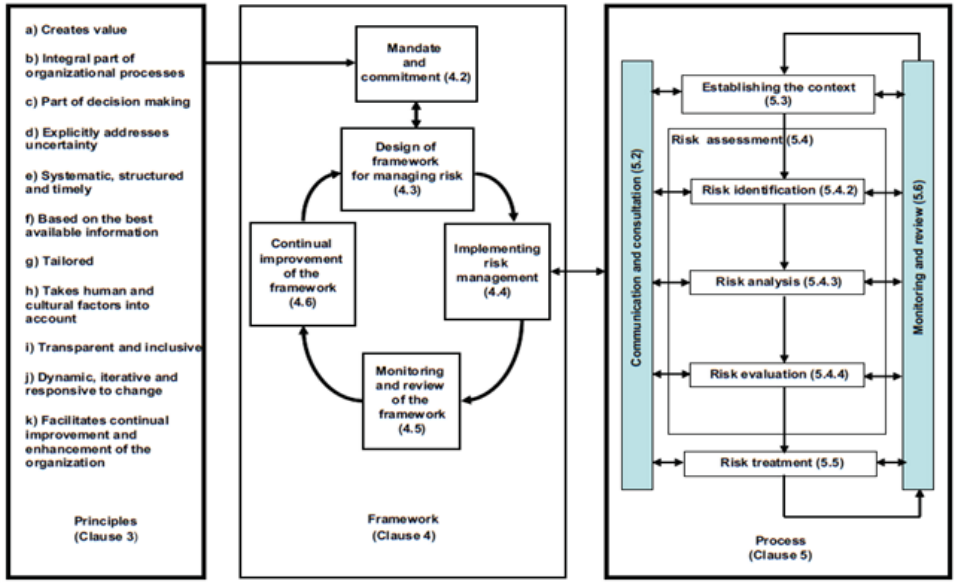
Strategic Initiative: ISO 31000

Risk = Consequence X Probability of the event /failure happening.

- All assets at minimum at the system level should prioritized for criticality based upon the risk of functional failure to the organization.
  - The 5 of assets prioritized is a key and leading indicator of the acceptance of Risk in an organization.
  - Additional strategies of SIS/SIL/SIF and HAZOP are strategies that identify Risk Mitigation strategies and should have a mechanism within the overall Asset Performance management system to quantify and to develop mitigation strategies against.
- Effective Risk Management is defined by ISO 31000 and this standard needs to be understood by organizations.
- A little over 1/3rd of Organizations surveyed in the Reliability Web 2014 noted that Risk management and Assessment are on their short term and long term radar.
  - Important Note: There is a common misconception that the ISO standards are a rebranding of asset management best practice.

ISO31000 Risk Management Framework

- Risk management creates value
- Risk must be:
  - Identified
  - Analyzed
  - Evaluated
  - Treated
- Must be considered as part of the decision making process
- Facilitates continual improvement



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Strategic Initiative: ISO 55000 Adoption

Rapid Adoption for ISO55000 Certification[1]

While adoption of an asset management based business strategy does not require certification, 33% of the study participants indicated they would pursue adoption over the next five years.

The trend indicates that there will be a significant and steady increase in organization planning to either comply with the new ISO55000 series of standards or seek formal certification as a competitive advantage.

- Terrence O'Hanlon

1. ISO/IEC TS 17021-5:2014 Conformity assessment -- Requirements for bodies providing audit and certification of management systems -- Part 5: Competence requirements for auditing and certification of asset management systems.

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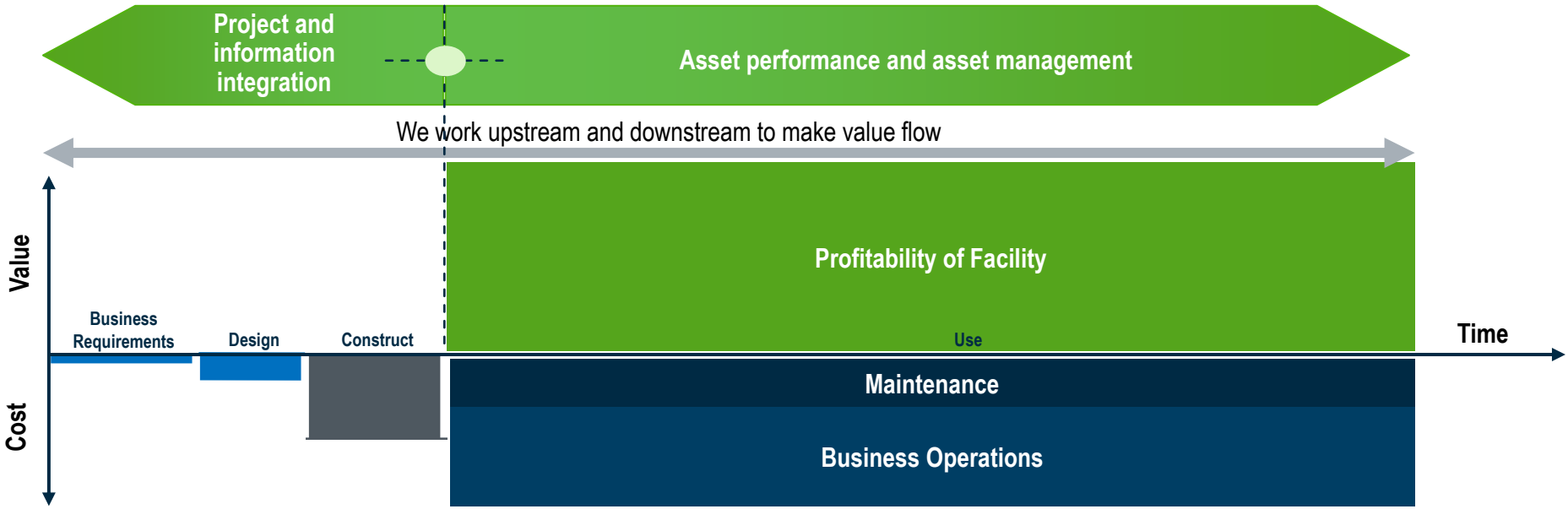
Strategic Initiative: Whole-Life Value



Adapted from DPR Consulting and Dr. Martin Fischer, CIFE IAB, 2011

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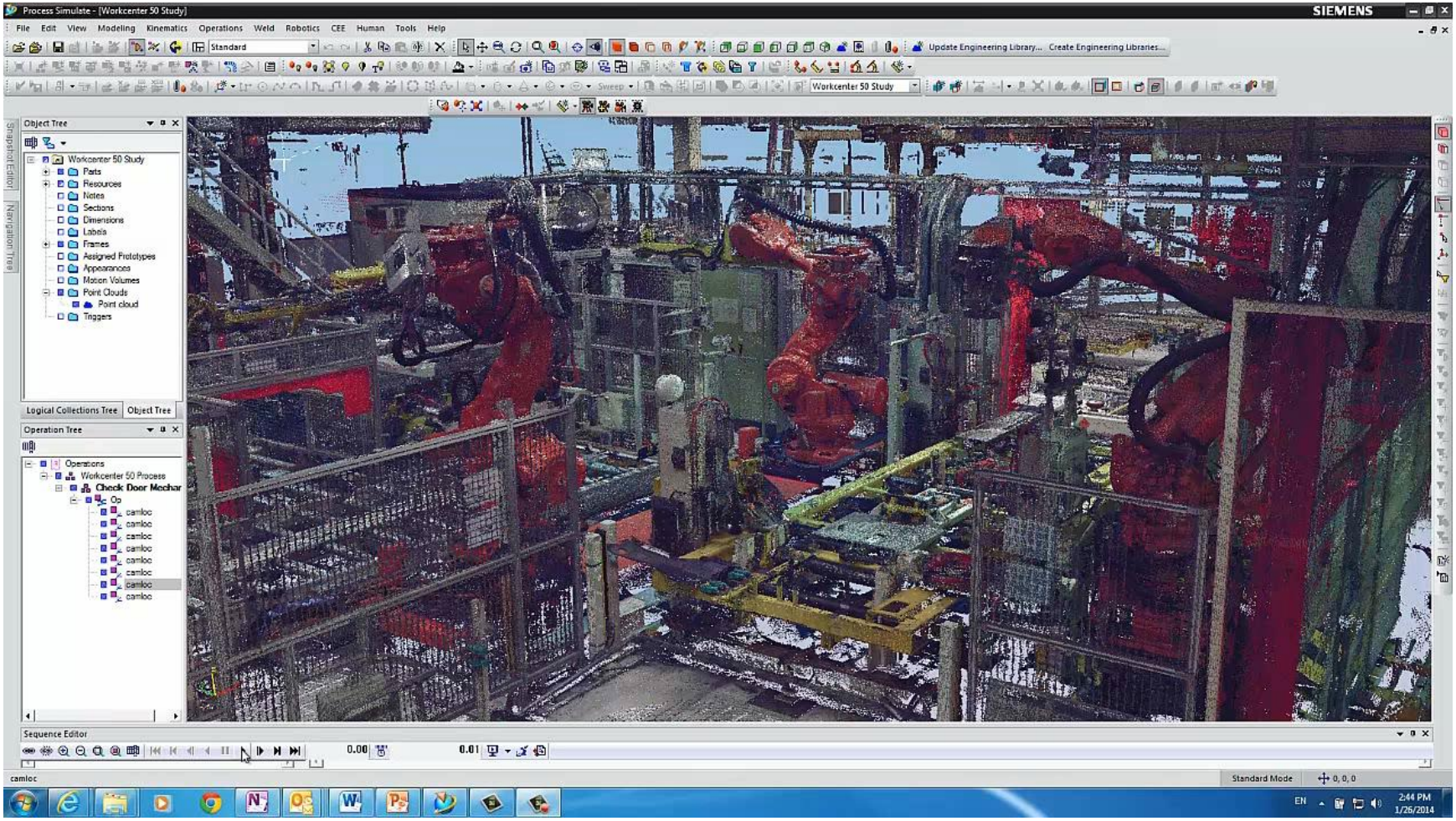
Immersive Operations



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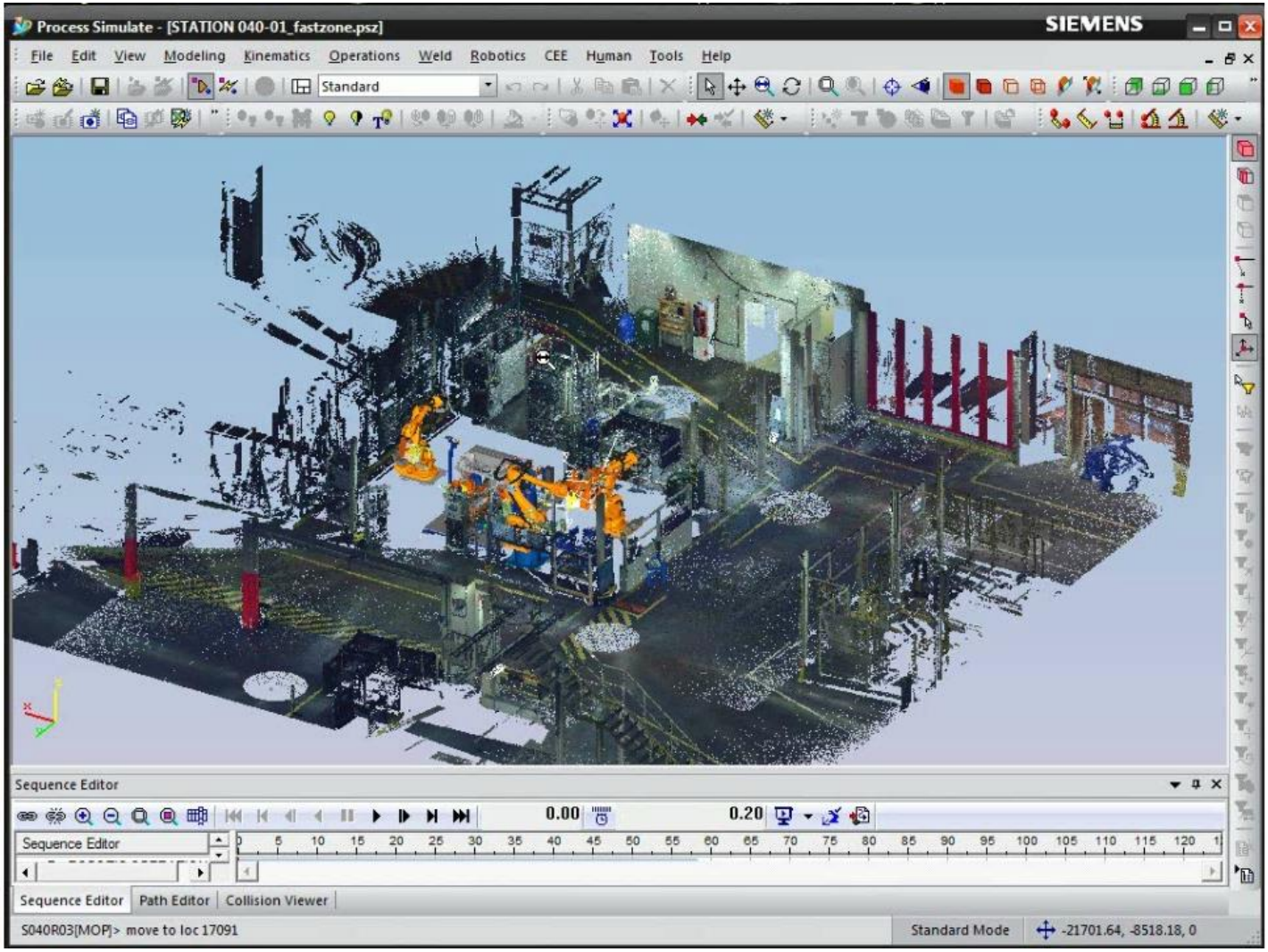

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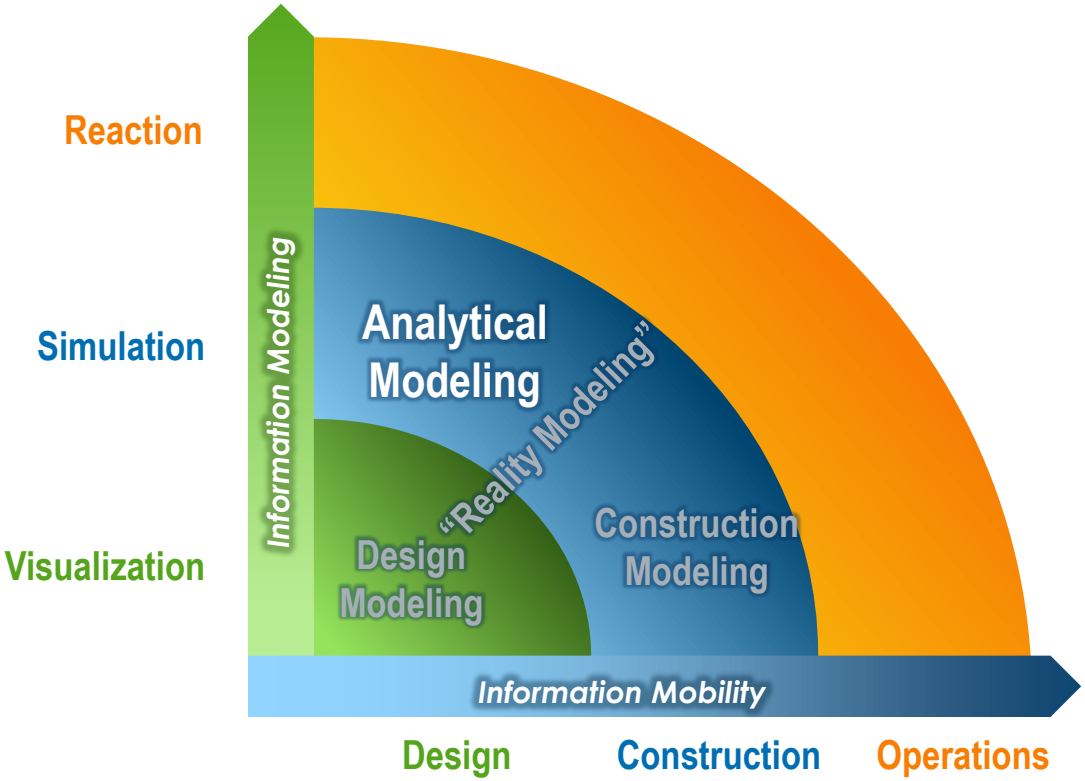
Advancing *Asset Performance…*



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Whole life: Value Engineering

DMAs	No. of houses	Pipe length (km)	Sweep-through (use device only) (man-hour)	Locate –Pinpoint (use model to locate leaks and device to pinpoint)					
				Hydrant test (man-hour)	modelling (man-hour)	Pinpoint (man-hour)	Total time (man-hour)	Leakage reduction (m3/h)	Leakage reduction (%)
15305	2861	50	114	0	15	15	30	6	30
15310	2899	21.7	85	0	7	9	16	5	29
2819	2257	27	77	0	12	16	28	14	39
2819	2257	27	77	21	19	18	58	16.2	44

Locate-pinpoint using model and devices is 4X more efficient than sweep-through by sounding for leaks (acoustic devices)

United Utilities
helping life flow smoothly

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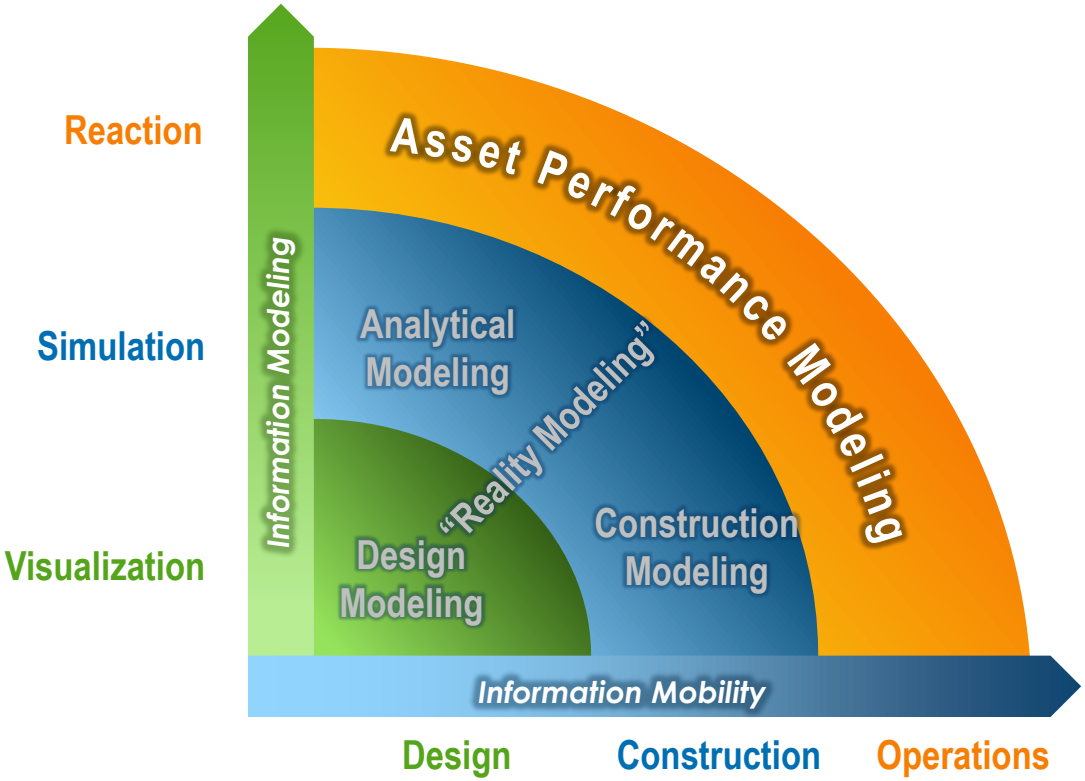
Advancing *Asset Performance…*

Asset Performance Modeling



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Asset Performance Modeling

APM: Digital Enabler

7

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Collect, maintain and retain the IP of an organization

- Communication:
  The right work at the right time to deliver the right information to understand the current health of the asset base
- Place the information at the user level.
- Access to Information is expected today, anywhere, everywhere.

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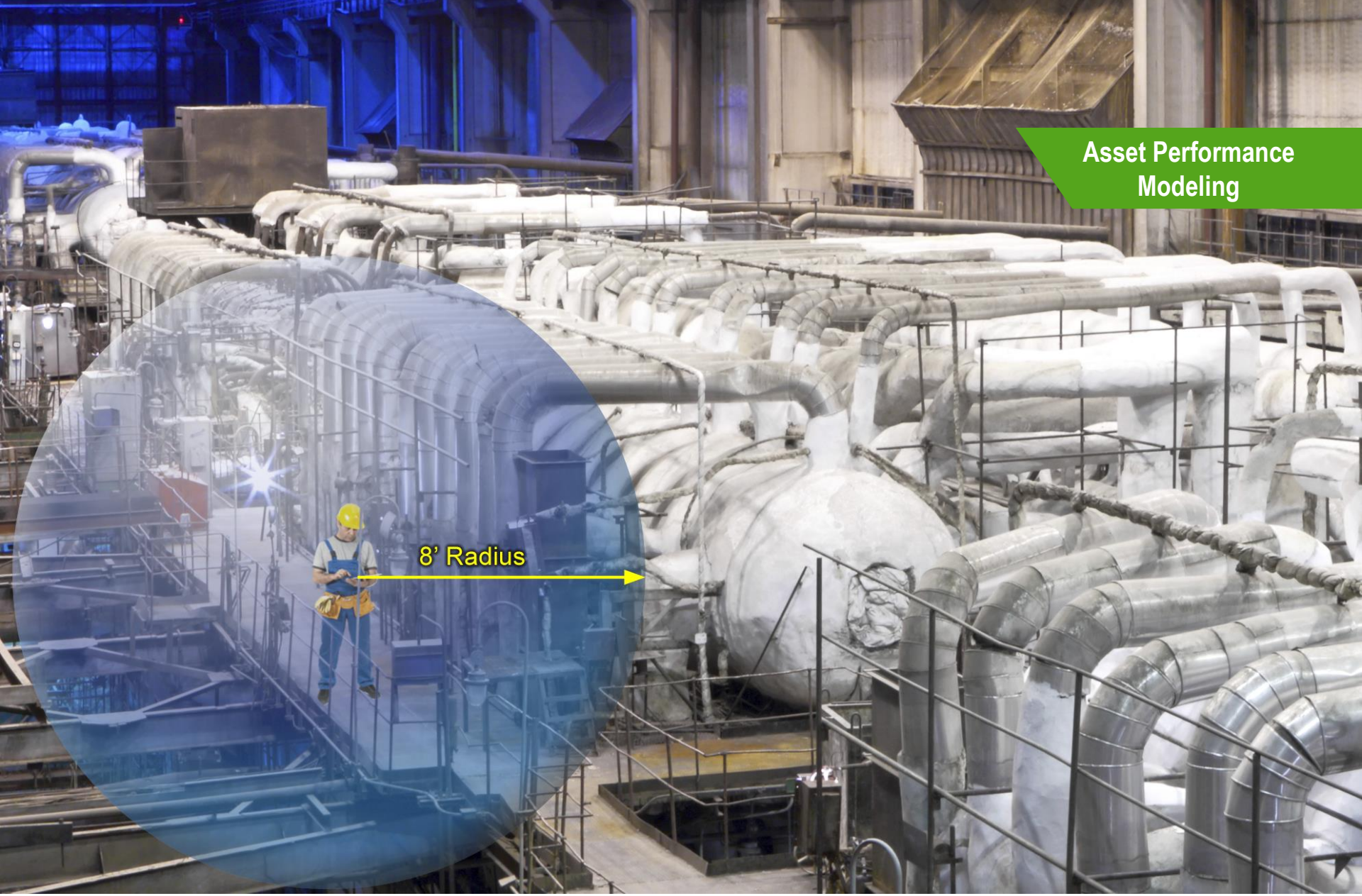

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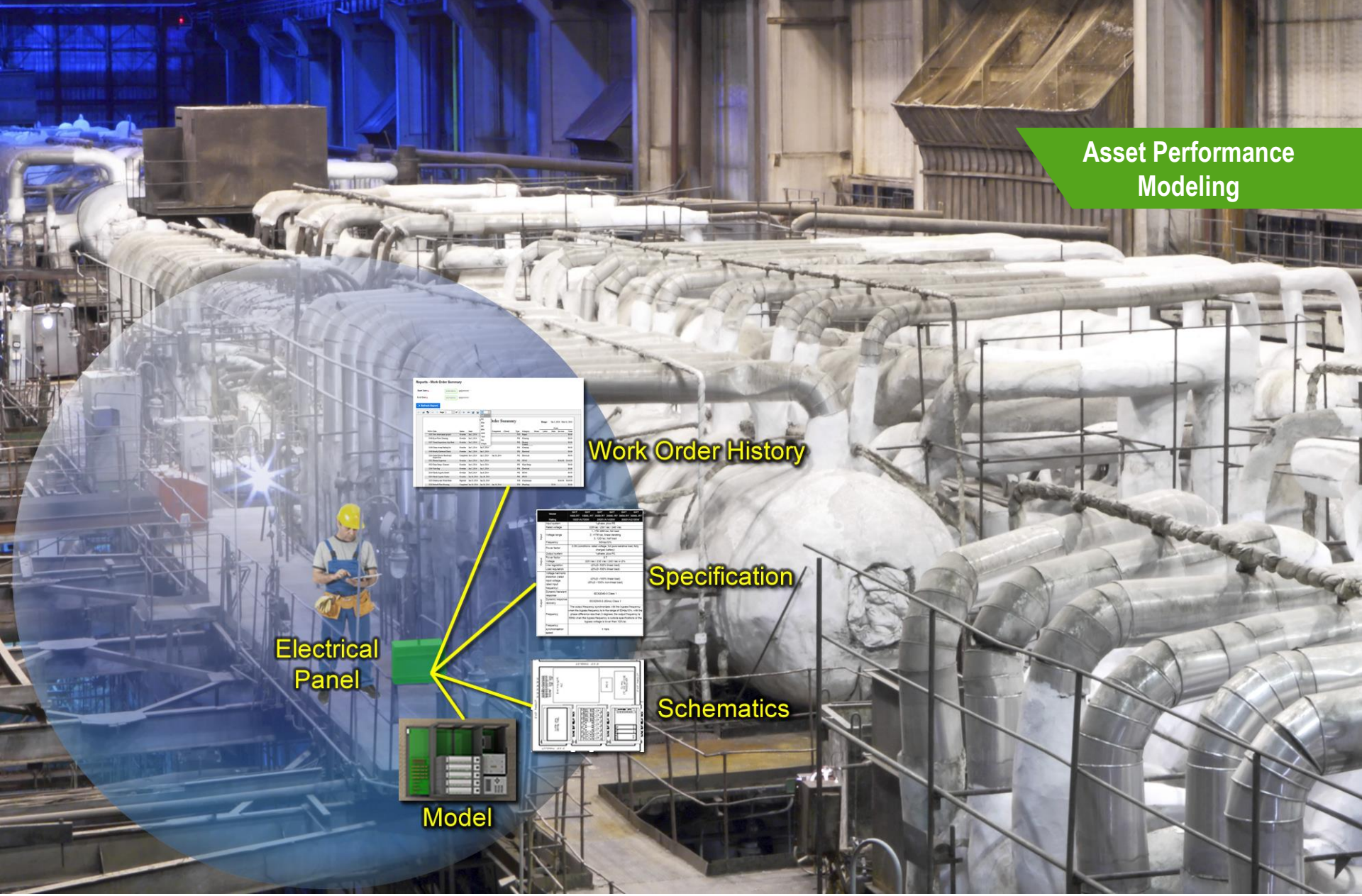
Bentley Sustaining Infrastructure

Asset Performance Modeling



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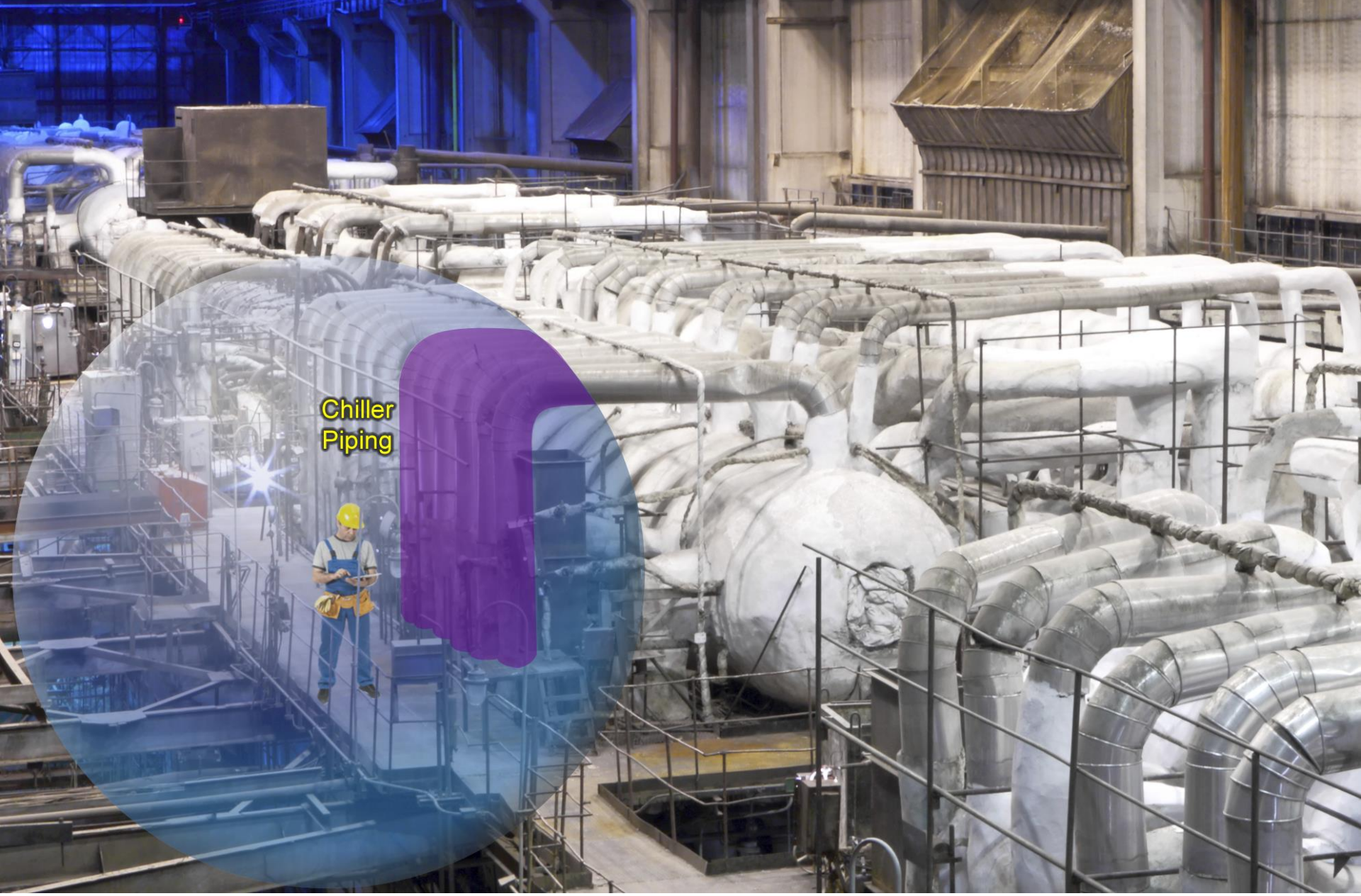
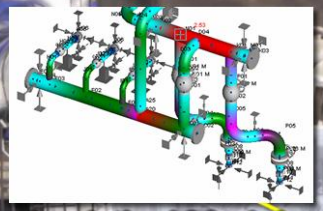
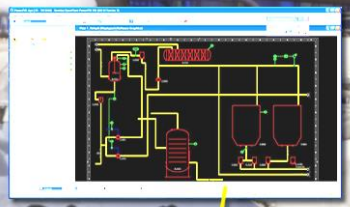


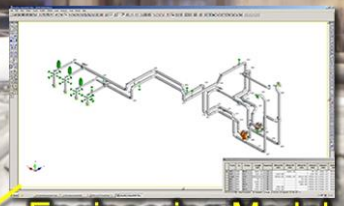
Asset Performance Modeling



Analytical Model



Schematics



Engineering Model

Inspection Form

Chiller Piping

Training Video

Failure Modes and Effects Analysis

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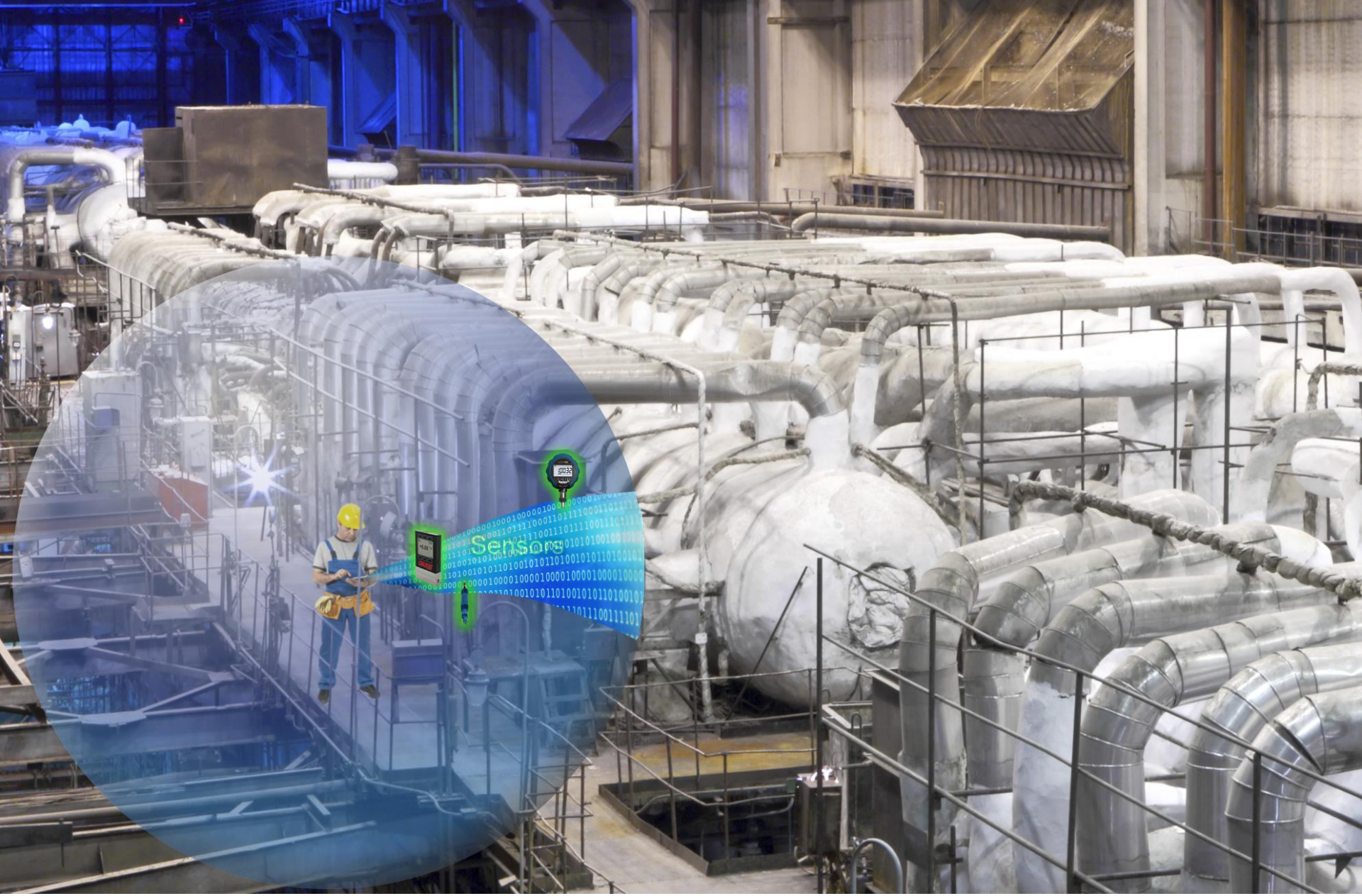

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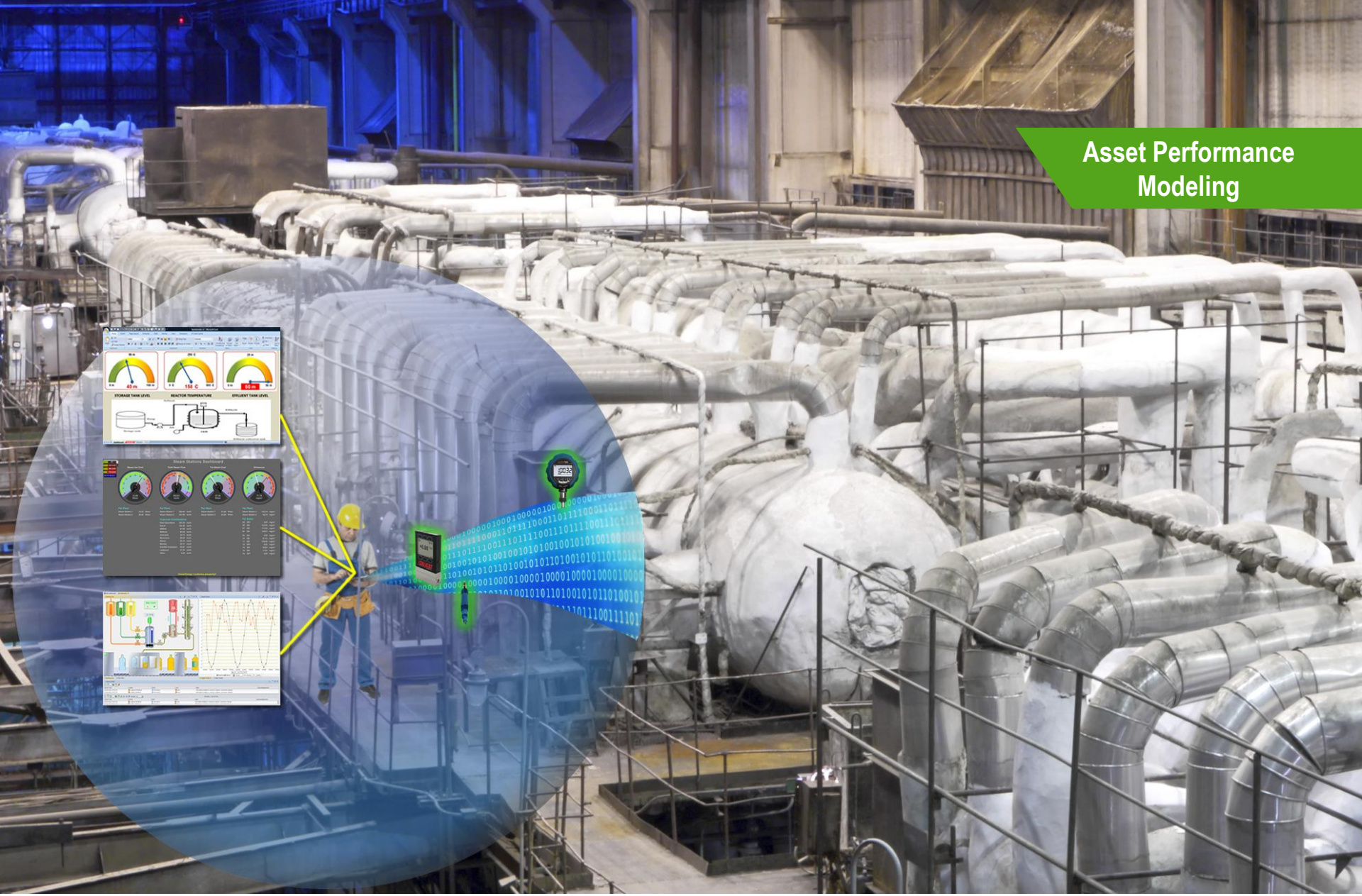

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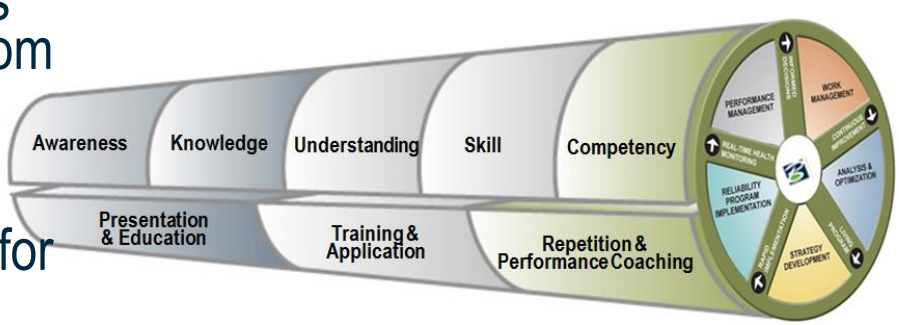
8: Cultural Change Management

- Communicate, engage and manage the entire organization in a change leadership effort to bring guiding and pragmatic change to the organization.
- It is an essential that organizational leadership has been preconditioned to the impending changes and is willing to endorse and commit to the strategic changes at the shop floor level.
- Change will be pushed from the lower ranks and pushed from above.
- Middle management will have the most to gain and the most to loose from a change initiative with the most to loose being front loaded.

Change Leadership Training

- Organizational Change Leadership Training – Asset management requires involvement and active sponsorship from all levels of the organization.
- Plan to educate senior leadership on change management, preparing them for the challenges they will face in leading and sustaining a proactive approach to asset management.



- In addition, plan to educate leadership on reliability centered maintenance so they can become well versed in the language of RCM and better equipped to ensure that physical assets make a positive contribution to the overall business strategy.

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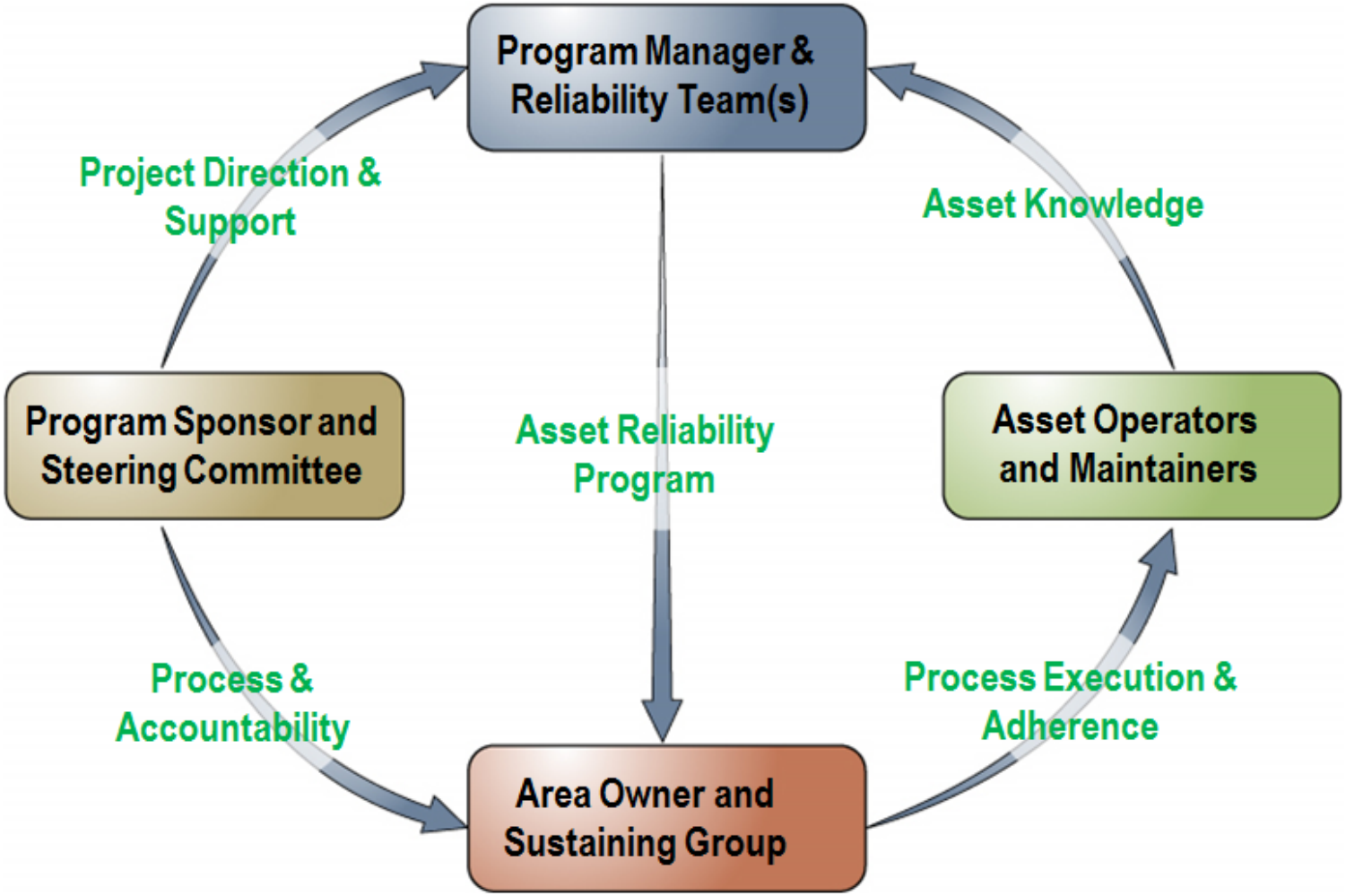
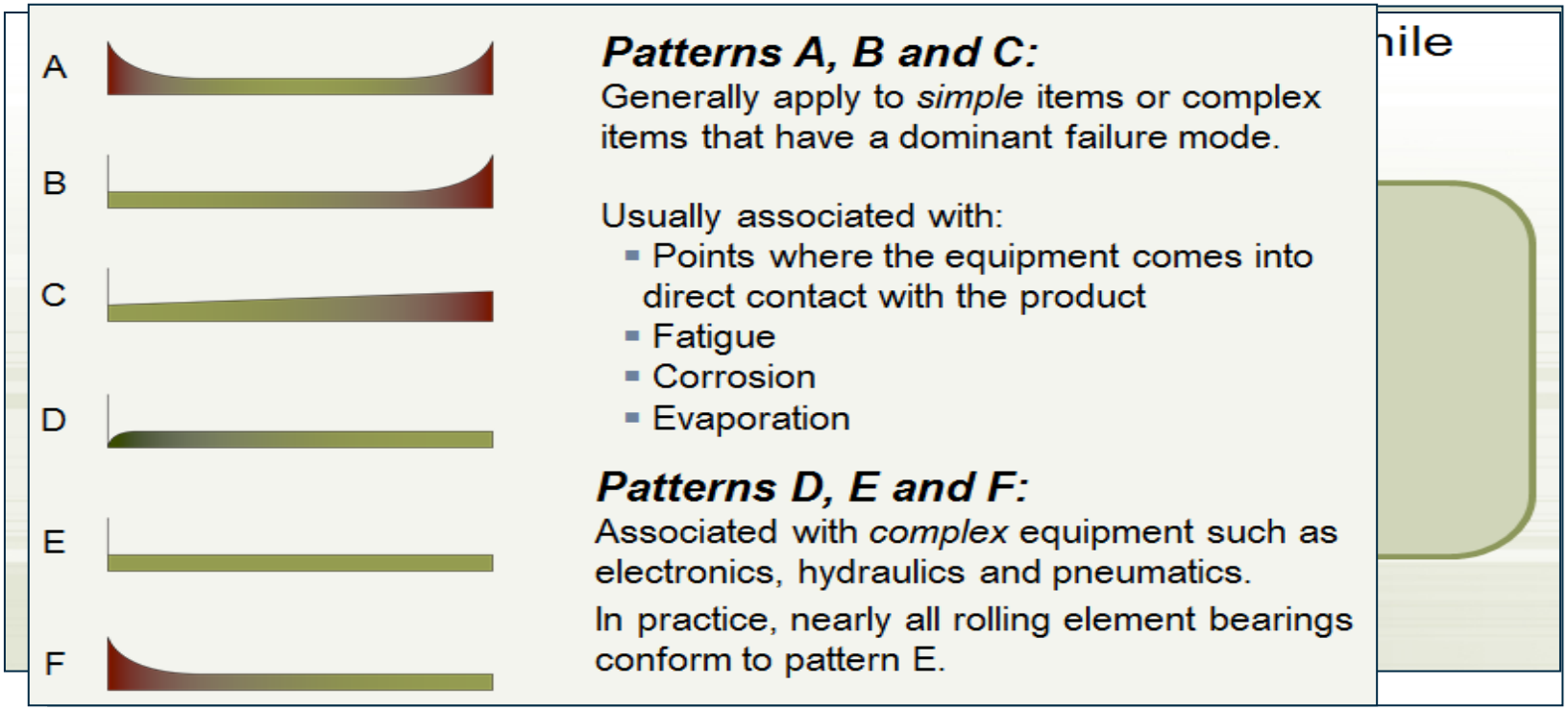
Change Management Organization

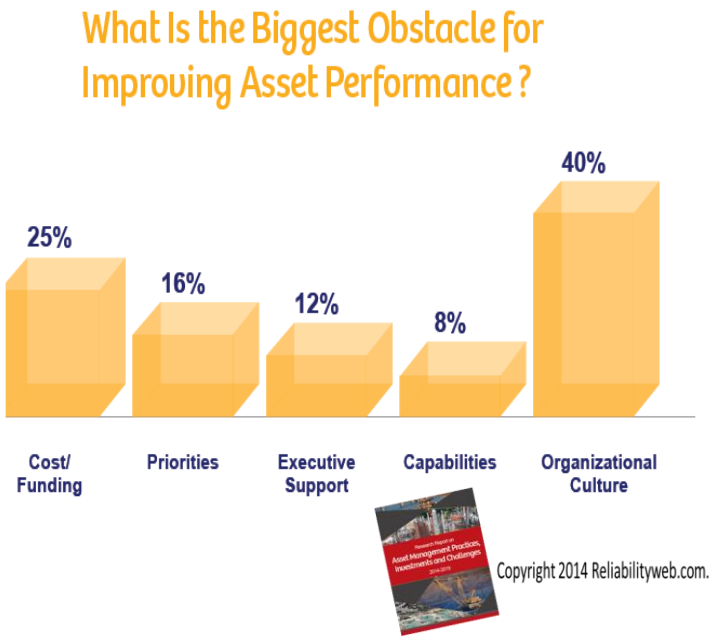


Educate to change the mindset



Cultural change: Biggest Hurdle

- "It's interesting, but, again, not surprising that most people think organizational culture is the biggest single obstacle to improving asset performance". *Bentley Systems*
- We know from experience that most people think organizational culture is impossible to change, but in our experience, changing from reactive to proactive is not impossible.
- **Reality**: It is difficult and multifaceted, but not impossible, provided organizations have the proper tools, training, KPIs and, most importantly, the leadership that will support and manage a new proactive process.



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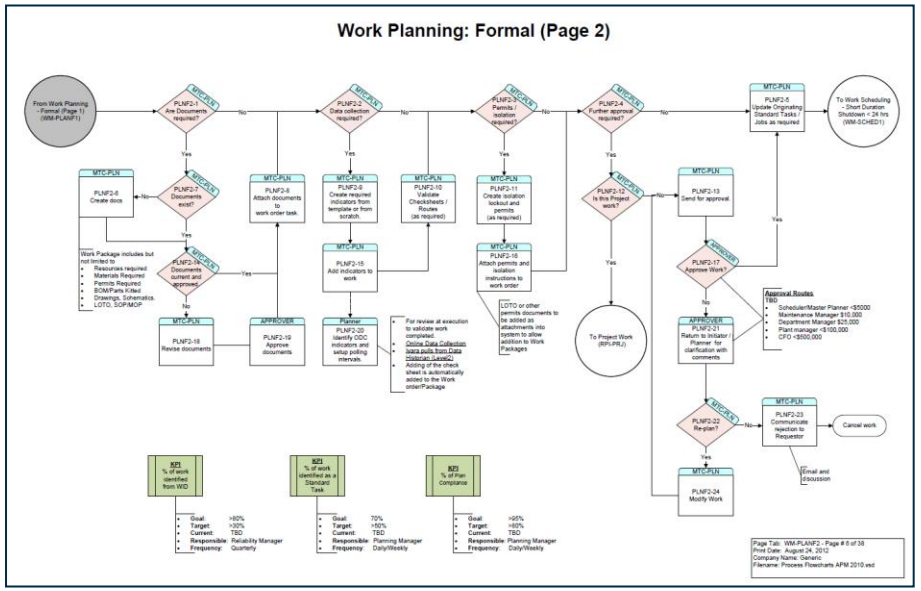
Change the day to day behaviors

- This requires addressing risk in the business planning process and incorporating data-driven process management that not only measures results, but also emphasizes process measures (e.g., leading indicators).

- "Expectations for a proactive approach to maintenance reliability need to be established and individuals must be held accountable for this approach.



- The business processes define the job description moving forward. They define the training requirements and define the level of accountability to the role. As a result team members become aware of their contribution level to task and to the overall SAM picture (WIFM). This is a critical change management tactic.

8

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9: The act of maintaining

- **Maintain** *(verb….meaning it is and therefore requires action):*

  1: cause or enable (a condition or state of affairs) to continue:

  2: provide with necessities for life or existence:

- Continually Measure: To understand the condition or state we must measure if the asset is still capable of its intended function (original or refurbished)

- If an organization is unable to maintain the function of the asset, then it may require replacement (Whole Life Asset Management).
  - Measure the asset base for end of life retirement or refurbishment opportunities from functional requirements **to protect the long term capabilities and stakeholders of the organization.**

Maintain

- To maintain: To cause or enable (a condition or state of affairs) to continue.
- By definition energy must be spent or placed into a system to maintain a system.
- The ability to maintain is a process of continually monitoring asset or process changes in state in order to provide the correct

Maintain vs. sustain

- Sustaining a relationship is much harder than Maintaining
- Maintaining implies short term interventions in order to correct changes in state.
  - The word ‘maintain’ is used in the sense of ‘carry on’ or ‘protect with care’ or ‘look after with care’ the sentences
- Sustainment takes much more energy to deliver
  - The Organization was able to sustain its best practices as they were ingrained into the organization, and energy continually spent to foster the culture.

Maintaining vs Sustaining.

- The act of Maintaining would incorporate the uses of predictive tools/sensors to Protect the functional state of the asset. They assist in the definition of state
- Computerized Maintenance Management Systems by definition are maintaining work management systems which often do not have sustaining strategies that drive the System. ……no silver bullet.
- Asset management Systems do not equal a CMMS. Far more effort, systems and solutions are required to sustain.
- As an example a sustaining effort would be the training or the people in order to set up the state change points on the asset, effectively read the predictive results in the software and react accordingly in a timely manner to the changes in state.

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10: Sustain

Lessons learned

…Industry was caught off guard.

…pulled the reigns on spending.

…Stopped training, and focused on reactive fixes not sustaining cultures, processes and strategies.

…Get the equipment, people performing in the act of maintaining for long term sustainment.

Whole Life Asset Management is not a project with a defined start and end date.

….requires foresight and the need to continually measure the strategy to baseline against best practice…….To sustain.

"When reviewing the top five responses to this question, it immediately drew attention to a common thread that can be traced back to the economic turn back in 2007/2008. When industry was caught off guard by the financial collapse, many, if not all, organizations pulled the reins back on spending. This included capital spending on equipment and we saw a marked increase in deferred maintenance activities. By doing so, the maintenance strategy fundamentally shifted to that of keep it running. The top three survey responses for asset management investments are asset reliability improvements, asset management training, and performance measures and metrics. This makes sense based on what we now know. Get the equipment back up to some level of asset health, train the people on how to maintain that level of health and put measures in place to track the health of the asset so early detection can take place and corrected at an optimal cost."

- Nexus Global

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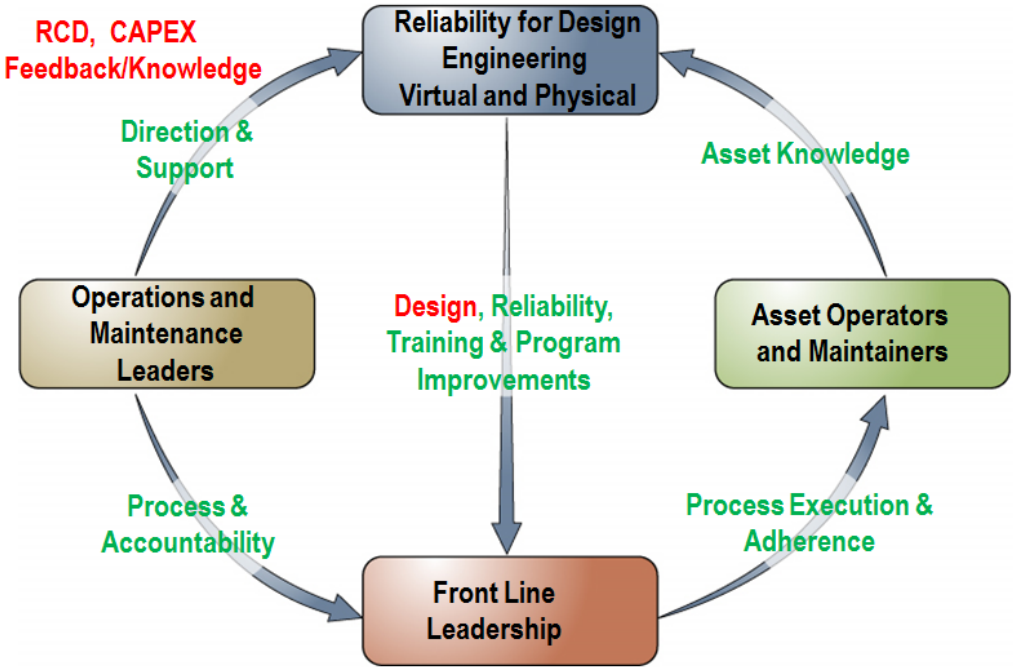
Sustaining Organization



- A sustaining organization understands that asset management is a cradle to grave initiative.
- It is a holistic cycle of continuance with all the required people, processes and enabling tools to ensure sustainability is designed into the organization.

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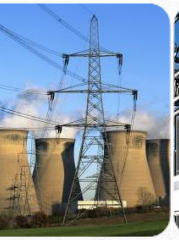
Sustaining people -IP

- Sustaining and Demographics - The technology solution.
- To sustain the asset management process and retain corporate Skills (IP) - knowledge based worker companies need to invest time and money in role based skills and coaching
  - The average US worker switches jobs/companies 4.4 years (US Bureau of Labor Statistics)
  - 91% of Millennials less than 3 years (US Bureau of Labor Statistics)
    - Just about the time they start to truly understand the process.
  - Sustaining the future truly lies in placing all the tools in the hands of the end user in simple formats so maintaining data can be collected, interventions can be achieved in a safe, environmentally sound manner to ensure sustain the profitability of the organization.

Sustain

- Continually re-assess the Business processes, practices and policies and for sustainability and further improvement opportunities.
- Sustainability Assessments – Plan for follow-up evaluations to measure adherence to the process and the impact the organization's improvement efforts have made on its maintenance reliability practices in the area(s) of implementation.
  - Organizations must re-assess on a continuum to ensure sustainability.
  - The minute the foot comes off the gas pedal, things can fail in a hurry
  - The market will provide enough "gas pedal" fluctuations alone without a maintaining organization taking their foot off.
- This is the only manner to sustain the triple bottom line - People, Profit and Planet.



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