Pursuing Reliability Certifications in Healthcare

FORUM RELIABILITY

ASQ CERTIFIED Reliability Engineer

SMRP | CMRP
Certified Maintenance & Reliability Professional

CERTIFIED RELIABILITY LEADER® CRL

CRL BLACK BELT Certified Reliability Leader®

FORUM RELIABILITY

CALIFORNIA SOCIETY FOR HEALTHCARE ENGINEERING, INC. BETTER PATIENT CARE THROUGH PROGRESSIVE ENGINEERING KNOWLEDGE

Introductions – Devin Hugie

- **FASHE (2018)**
- **CHFM, CHC, CHSP-FSM, CHEP, CLSS-HC, CEPSS-HC, Six Sigma Green Belt, CRL**
- **Education**: BSBM & MHA, California Coast University
- **Volunteerism**: ASHE, CSHE, NFPA, IAHSS
- **Veteran**: US Army
- **Experience**: Exec. Dir. Support Services, CHOC, Orange CA Dir. Fac. & Support Serv., Providence, Torrance & San Pedro CA
- **Personal**: Product of Southern California relocated to Indiana. Married to the best woman on the planet and raising four great kids. Two adult children and two grandsons.

Introductions – Jim Carrel

- **Certified Reliability Leader (2015) – Black Belt (2021)**
- **Category III Vibration Analyst (2005)**
- **Education**: BTh, The Way College of Emporia
- **Volunteerism**: ASHE – Author and Reviewer, ASHE Reliability-Centered Maintenance Guide, HFM Magazine
  AMP – CRL Domain Mastery Belt and Black Belt Programs, Author and Contributor
- **Veteran**: US Navy Nuclear Power Program
- **Experience**: ~50 years in Reliability & Physical Asset Management
- **Personal**: Married for 39 years, lived everywhere and settled in Texas. Three adult children, two grandchildren.

Who Are We? – Forum Reliability

Vision: Reliability into Every Company

Mission: Weave reliability into the fabric of every company's culture through collaboration to help them improve safety, profitability, and responsibility.

Values:

Passion	Courage	Empathy
Acumen	Ownership	

Who Are We? – Forum Reliability

- ReliabilityWeb.com Reliability Partner
  - Certified Reliability Leaders (CRL)
  - Two CRL-Black Belts (almost 3)
- ASHE
  - State & National Leadership & Advocacy
  - Frequent Authors & Presenters
- Stewards of Classical Reliability-Centered Maintenance (RCM) Methodology
  - Only Classical RCM Champion in Healthcare
  - 5 Uptime Awards
  - Recognized by Anthony “Mac” Smith

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RELIABILITY

Healthcare's History of Asset Reliability

Why Certification?

Why Certification?

- Demonstrate healthcare-specific expertise
- Increase professional credibility and recognition
- Support career advancement
- Strengthen regulatory and code compliance knowledge
- Improve patient and staff safety
- Create consistency across teams
- Invest in professional development and advancement

Why Reliability Certification?

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Why Reliability Certification?

- Validate reliability engineering expertise across the product/system life cycle
- Strengthen credibility with an accredited, third-party certification
- Build capability in core reliability methods employers expect
- Improve safety, risk, and compliance outcomes
- Differentiate yourself for roles that require decision-making responsibility
- Accelerate professional growth through structured preparation

Why Reliability Certification?

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Certified Maintenance & Reliability Professional

- Validate reliability expertise
- Gain a recognized third-party credential
- Reduce downtime and repeat failures
- Improve safety and risk management
- Support lifecycle cost decisions
- Create a common standard across teams
- Strengthen you career profile
- Build confidence and identify gaps

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Why Reliability Certification?

- Validate reliability leadership (not just technical know-how)
- Speak a common language across stakeholders
- Build holistic mastery across the Uptime Elements™ knowledge domains
- Drive operational excellence and organizational objectives
- Strengthen credibility with a global standard
- Accelerate your career path in maintenance, reliability, and asset management

Common Reasons for Certification

- Validate expertise and leadership
- Professional credibility and recognition
- Supports career advancement
- Improve safety for all
- Standardize on successful practices and terminology
- Professional development
- Align practices with corporate objectives

Certified Maintenance & Reliability Professional

1. Business Management
2. Manufacturing Process Reliability
3. Equipment Reliability
4. Organization & Leadership
5. Work Management

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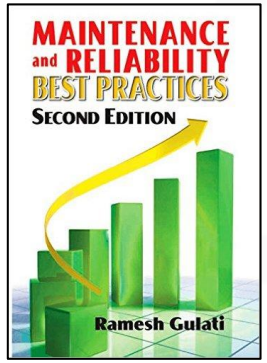
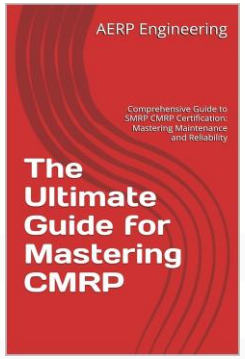
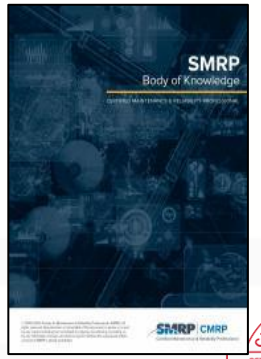
Certified Maintenance & Reliability Professional

SMRP | CMRP

Certified Maintenance & Reliability Professional







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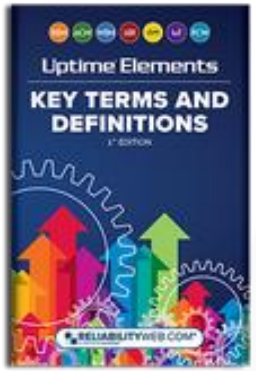
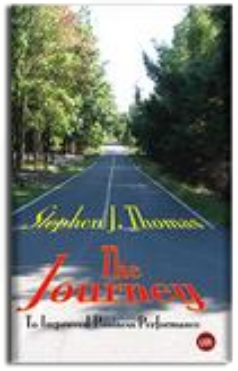
Certified Reliability Leader

- Reliability Engineering for Maintenance
- Asset Condition Management
- Work Execution Management
- Leadership for Reliability
- Asset Management

Certified Reliability Leader





The Uptime Elements™

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Uptime® Elements

Technical Activities

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- **Ca** criticality analysis
- **Rsd** reliability strategy development
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- **Cp** capital project management
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ACM Asset Condition Management

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WEM Work Execution Management

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LER Leadership for Reliability

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Business Processes

AM Asset Management

- **Sp** strategy and plans
- **Cr** corporate responsibility
- **Samp** strategic asset management plan
- **Ri** risk management
- **Ak** asset knowledge
- **Alm** asset lifecycle management
- **Dm** decision making
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A Reliability Framework and Asset Management System™

10 RIGHTS OF ASSET LIFECYCLE MANAGEMENT

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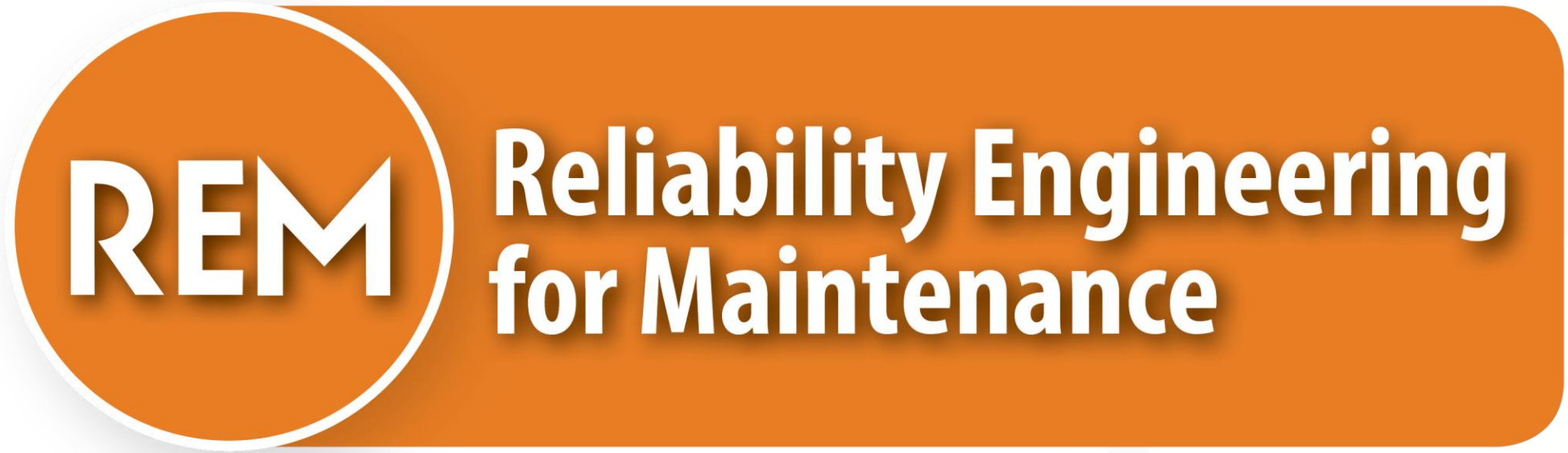
The Uptime Elements™



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The Uptime Elements™

Area Served		Risk (NFPA 99-2012)		Age	
10	OR/Cath Labs/Labs/Sterile Processing/Pharmacy	10	Category 1	10	75-100%+ Asset Life
10	Patient Care	7	Category 2	7	Reconditioning Overdue
7	Common Area	5	Category 3	5	Median
5	Equipment Support	2	Category 4	2	Refurbished
2	Material Storage			1	Newly Commissioned
O&M Cost		**Equipment History**		**Redundancy**	
10	OEM Support Required	10	High Failure Rate	10	Zero Redundancy (N+0)
7	Outsourced Repairs	8	High Incident Rate	7	Seasonal Redundancy
5	Outsourced Maintenance	3	Few Incidents	5	N+1 Redundancy
3	Self-Performed	1	PM Activities Only	2	N+2 Redundancy
0	Run-to-Failure	0	No History	1	Seldom in Service

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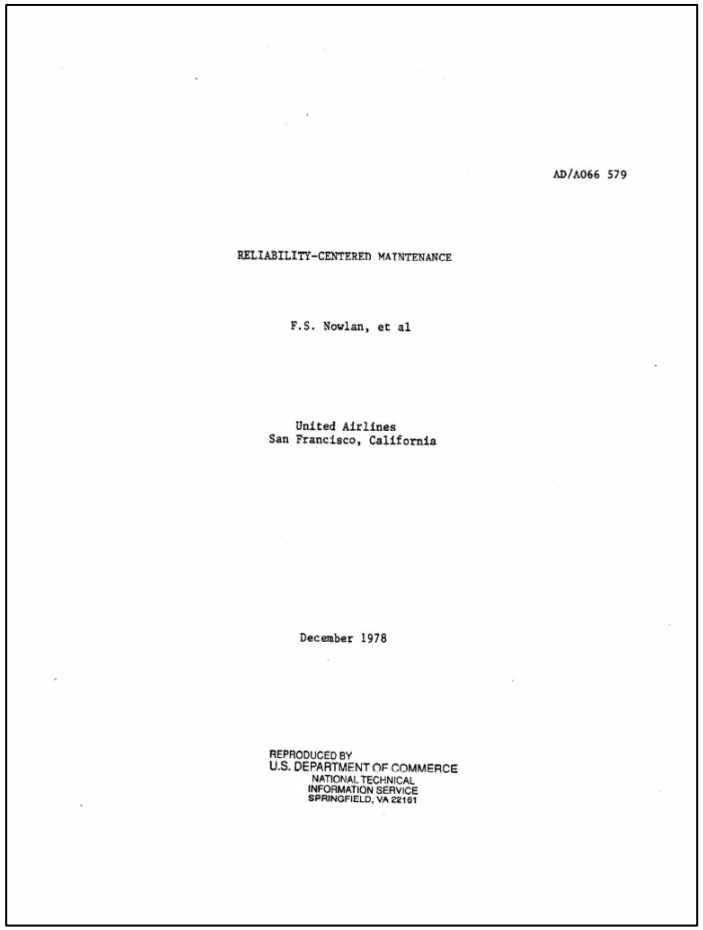
The Uptime Elements™

What Is Reliability-Centered Maintenance?



AD/A066 579

RELIABILITY-CENTERED MAINTENANCE

F.S. Nowlan, et al

United Airlines
San Francisco, California

December 1978

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

"The development of this program is towards the control of reliability through an analysis of the factors that affect reliability and provide a system of actions to improve low reliability levels when they exist."

F. Stanley Nowlan & Howard F. Heap, *Reliability-Centered Maintenance*, 1978, p.4

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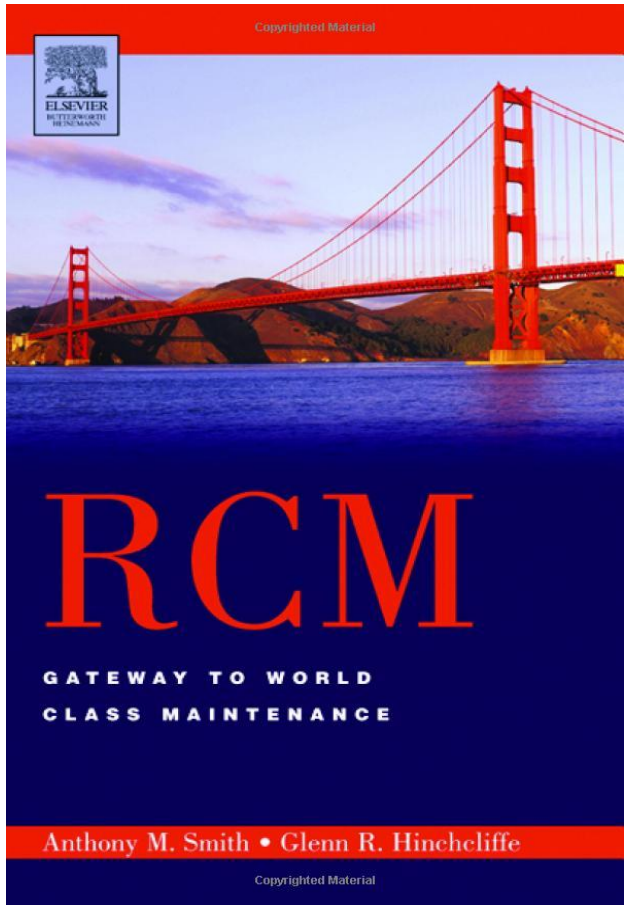
BETTER PATIENT CARE THROUGH PROGRESSIVE ENGINEERING KNOWLEDGE

What Is Reliability-Centered Maintenance?

"Reliability-centered Maintenance: a process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its present operating context."

John Moubray, *Reliability-Centered Maintenance*, 2nd Edition, 1997

What Is Reliability-Centered Maintenance?



"In summary, then, the RCM methodology is completely described in four unique features:

1. Preserve functions.
2. Identify failure modes that can defeat the functions.
3. Prioritize function need (via failure modes).
4. Select applicable and effective PM (planned maintenance) tasks for the high priority failure modes."

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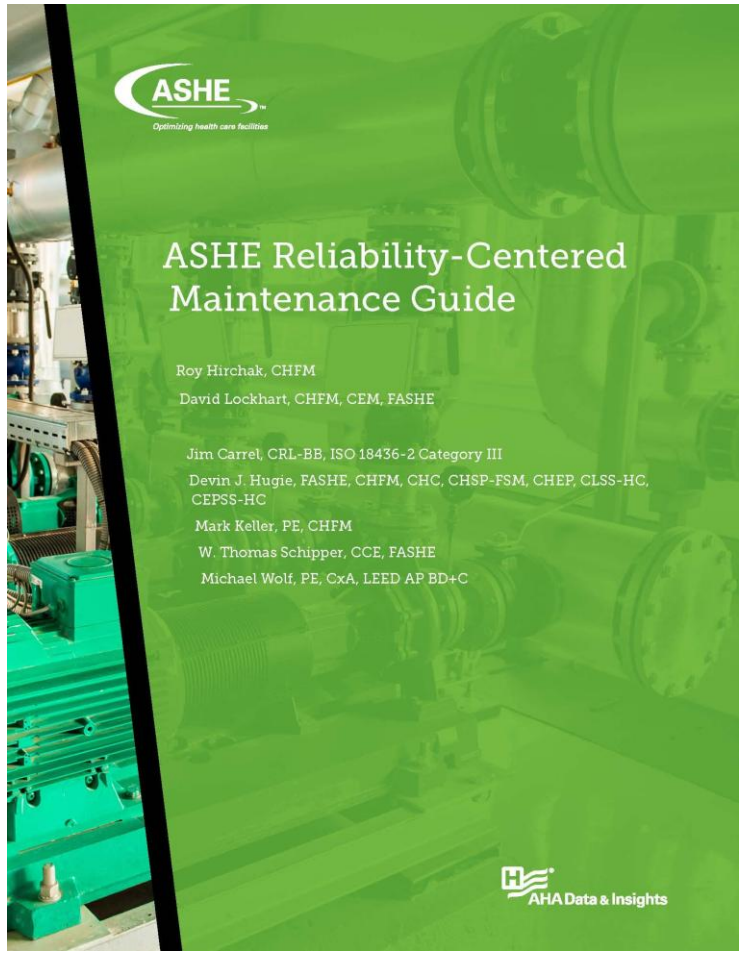
What Is Reliability-Centered Maintenance?

"Reliability-Centered Maintenance (RCM) determines the applicable and effective maintenance for each failure given the operational context of the equipment being assessed. The [analysis] technique can be described as a process to help people determine the best policies for managing the functions of physical assets and for managing the consequences of their failures."

Victor Borges, www.dnv.com, 2023

What Is Reliability-Centered Maintenance?



"RCM is a decision-making process that analyzes the structures, systems, and assets (SSA), defines its true design function…, and determines the risk and/or criticality of the SSA to the organization and the operation of the facility."

ASHE Reliability-Centered Maintenance Guide, 2022

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NFPA 70B 8.1.3

A.8.1.3* “Reliability-centered maintenance shall be permitted,” *A.8.1.3

*Reliability-centered maintenance should not jeopardize the objective of **8.1.1**. Reliability-centered maintenance is an umbrella strategy and decision-making process that analyzes systems and assets, defines their design function, and determines their risk and/or criticality to the organization and operation of the facility. Through a risk analysis process focused on the system and asset failure modes and their potential consequences, RCM aims to optimize the maintenance strategy to apply the most effective maintenance approach for each system and asset reliability, minimizes downtime, and optimizes maintenance costs for the organization. For additional information on reliability-centered maintenance, see NFPA 70B, Annex I.*

RCM: The Seven Basic Questions

1. What are the functions and associated performance standards of the asset in its present operating context?
2. In what ways does it fail to fulfill its functions?
3. What causes each functional failure?
4. What happens when each failure occurs?
5. In what ways does each failure matter?
6. What can be done to [mitigate] or prevent each failure?
7. What should be done if a suitable proactive task cannot be found?

(Reliability-centered Maintenance II, 2nd Edition, John Moubray, 1992. p.7)

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What About Compliance?

The Joint Commission

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BETTER PATIENT CARE THROUGH PROGRESSIVE ENGINEERING KNOWLEDGE

Definitions

The Joint Commission

“**Utility Systems**

Building systems that provide support to the environment of care, including electrical distribution and emergency power; vertical and horizontal transport; heating, ventilating, and air conditioning (HVAC); plumbing, boiler, and steam; piped gases; vacuum systems; and communications systems, including data exchange systems.”

CAMH Glossary (January 2024)

RCM & Regulatory Compliance

The Joint Commission

“**Maintenance**

There are five types of maintenance – predictive, metered, corrective, interval-based, and reliability-centered.”

CAMH Glossary (January 2024)

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Authority Having Jurisdiction

The Joint Commission

"Equipment subject to federal or state law or Medicare Conditions of Participation in which inspecting, testing, and maintaining be in accordance with manufacturers' recommendations, or otherwise establishes more stringent maintenance requirements."

CAMH, EC.02.05.01 EP6 (January 2024)

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Deviations from OEM Guidelines

The Joint Commission

"New operating components with insufficient maintenance history to support the use of alternative maintenance strategies."

CAMH, EC.02.05.01 EP6 (January 2024)

- Records provided by the hospital's contractors
- Information made public by nationally recognized sources
- Records of the hospital's experience over time

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Why Reliability?

- Set a goal for ZERO UNPANNED DOWNTIME
- Patient and staff safety
- More controllable financials
- Operationalize former capital projects
- Manage the complete asset lifecycle
- Align asset performance with organizational goals
- Regulatory compliance
- Human capital management
- Risk management

What is Reliability?

An environment or condition in which assets and systems do what they have been designed and installed to do, when they are needed to do it, and in the manner required.

The History of Maintenance Strategies

<1940's	1960's	1970's	1980's	NOW
Reactive	Preventive	ACM	RCM	Precision

Reactive (Breakdown) Maintenance

Unexpected repairs are performed when equipment has already broken.

Activity focused on restoring broken equipment to its design operating context.

Symptoms of a Reactive Maintenance strategy:

- Unusually loud noises
- Lots of yelling
- Even more running around
- Then everything gets quiet

Interruptions, overtime, high cost

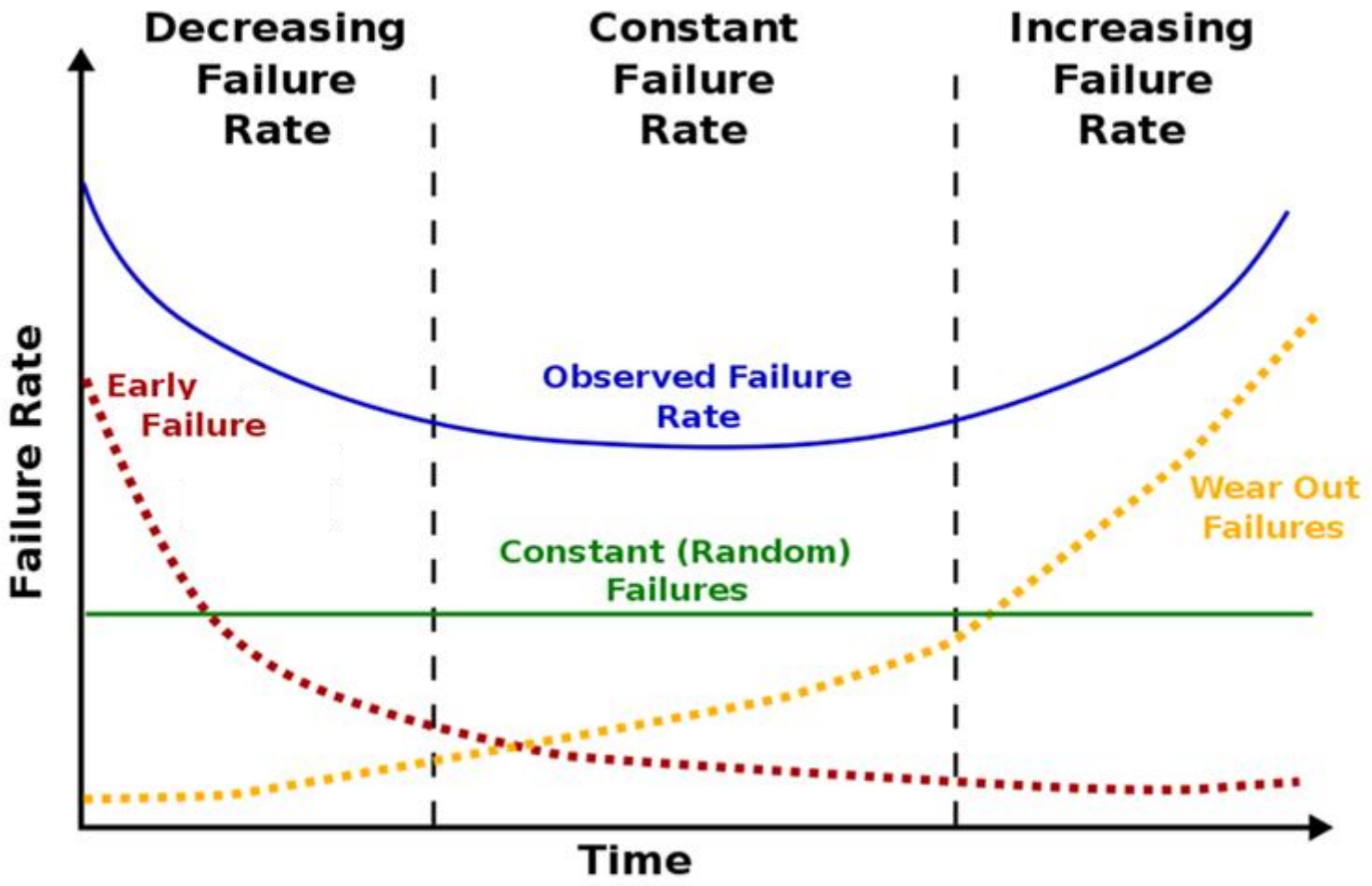
Preventive Maintenance

Preventive Maintenance is the planned maintenance of plant infrastructure and equipment with the goal of improving equipment life by preventing excess depreciation and impairment.

This maintenance includes, but is not limited to, adjustments, cleaning, lubrication, repairs, replacements, and the extension of equipment life.

Continue functioning in the designed operating context.

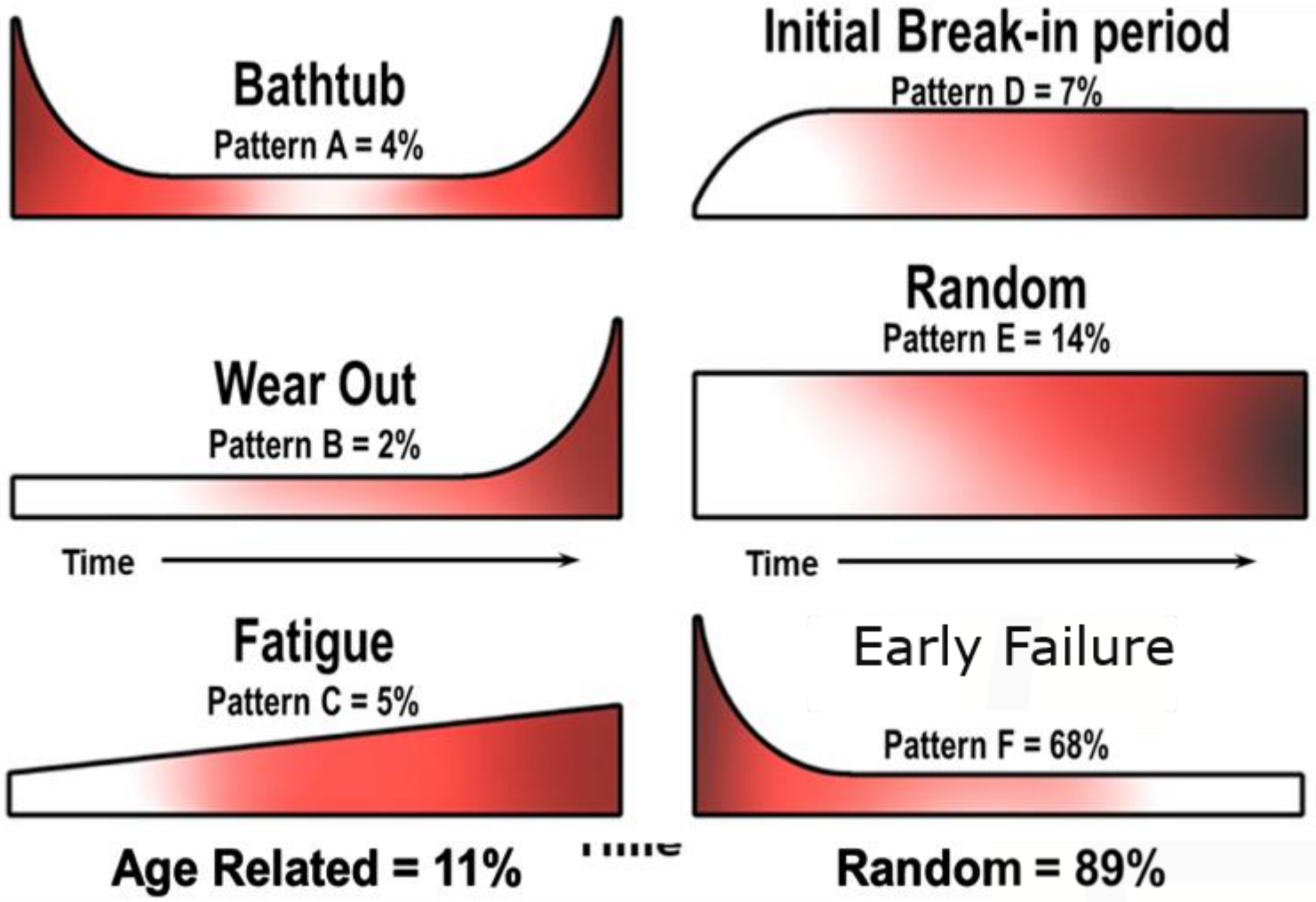
Determining Asset Life



Preventive Maintenance

Inspections or actions performed on a time- or machine runtime-based schedule that identify, protect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling the degradation to an acceptable level.

Maintenance and Failure Prevention



Reliability-Centered Maintenance, F. Stanley Nowlan and Howard F. Heap, 1978

⟩⟩⟩ Preventive (Time-Directed) Maintenance

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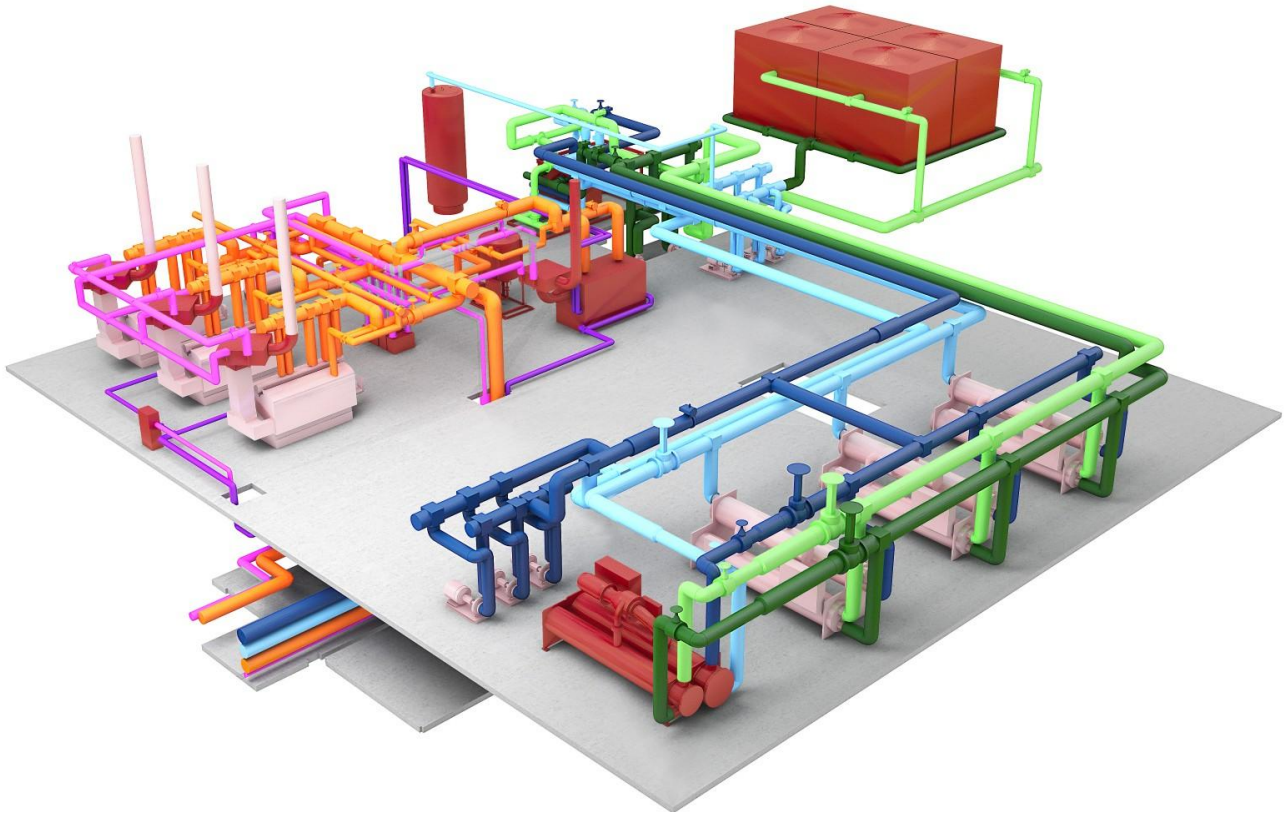
Preventive Maintenance Flaws



<u>Mean Time Between Failures</u>
(MTBF)

The predicted elapsed time between inherent failures of a system during operation.

PM intervals are calculated at ~70% of MTBF for the component to be maintained.

Preventive Maintenance Flaws

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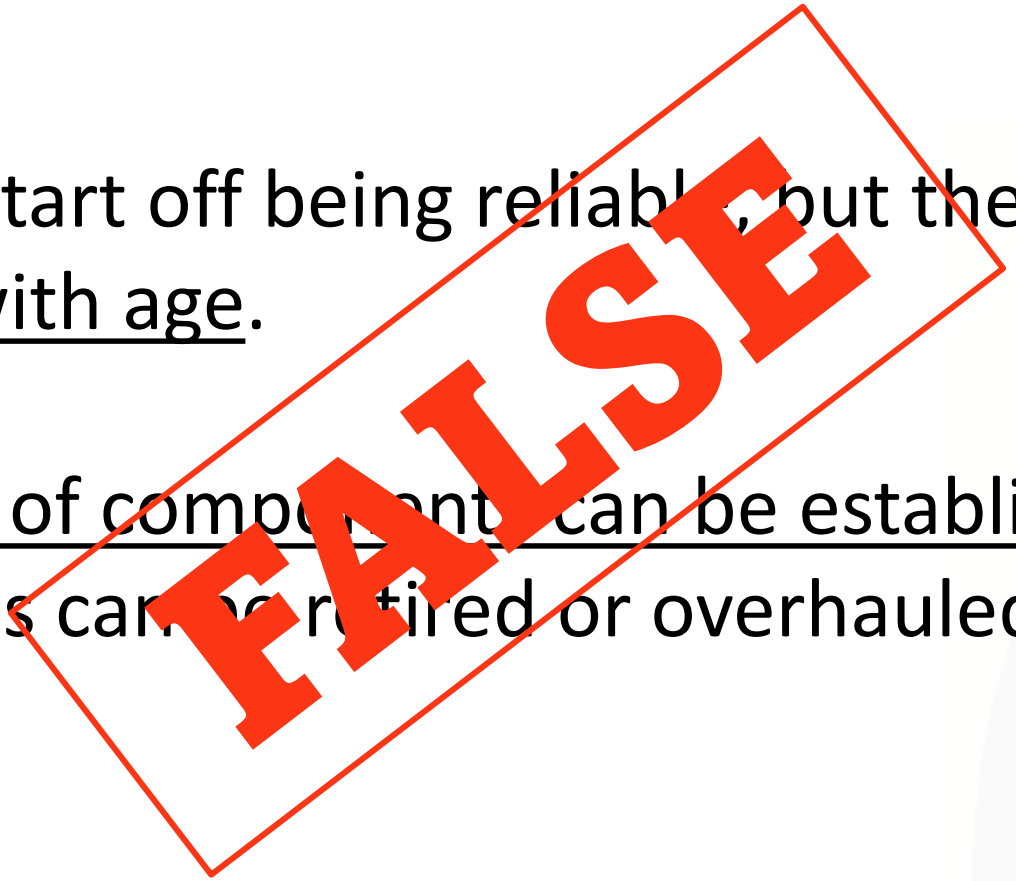
Maintenance Strategy Assumptions

Components start off being reliable, but their reliability deteriorates with age.

The useful life of components can be established statistically, so components can be retired or overhauled before they fail.



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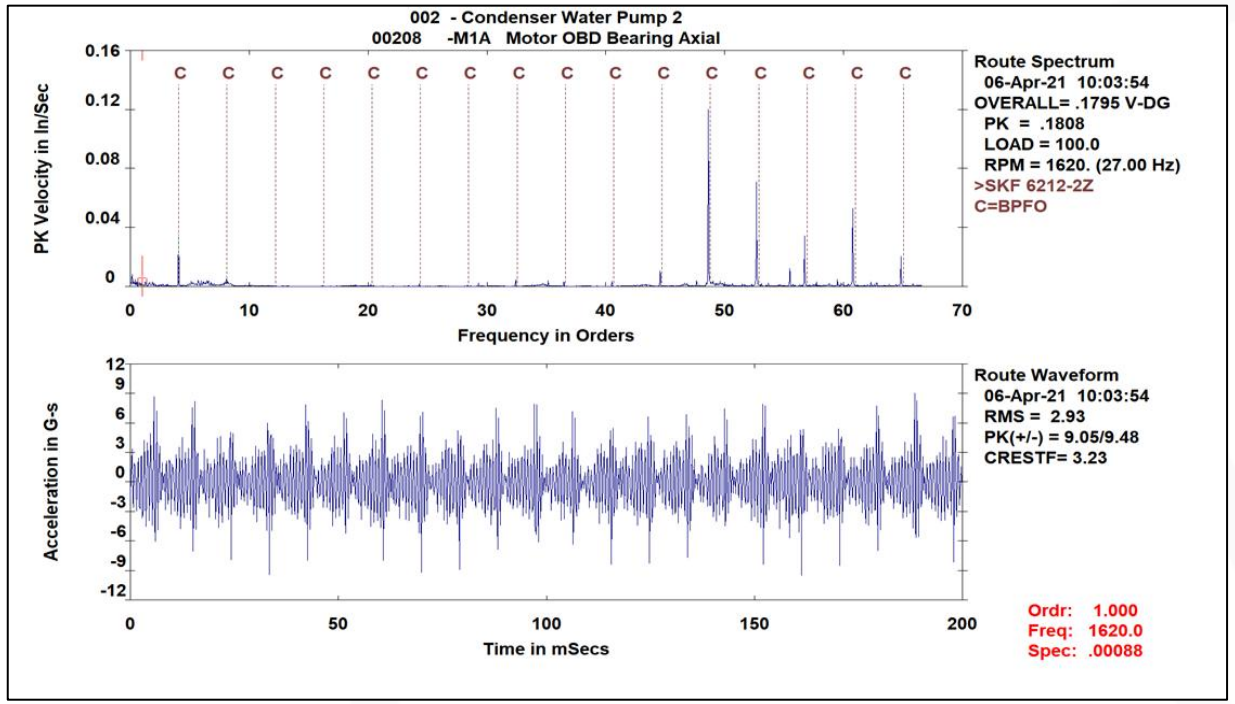
PRISMA HEALTH

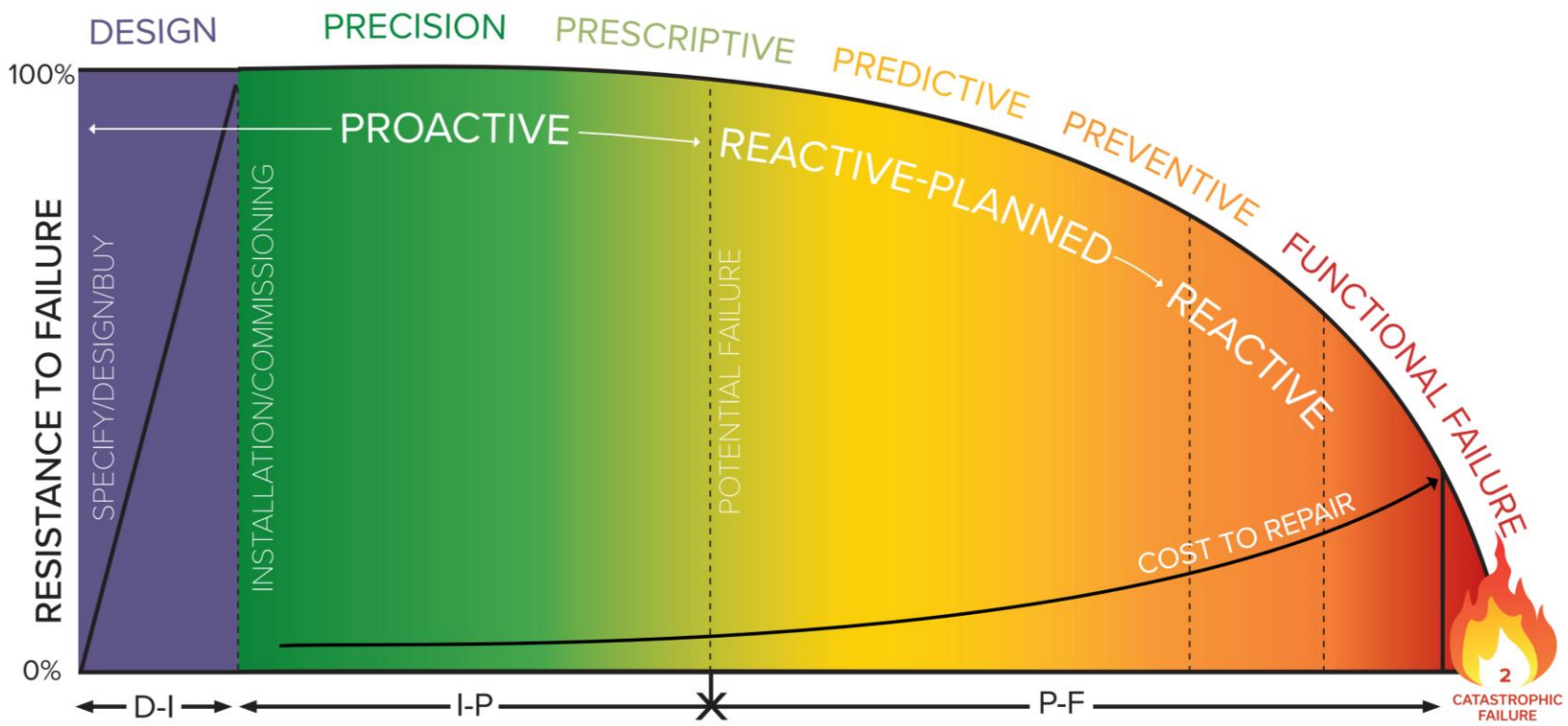
Asset Condition Management

Measurements that detect the onset of system or component degradation (lower functional state), thereby allowing casual stressors to be eliminated or controlled prior to any significant deterioration in the component physical state.

Results indicate current and future functional capability.



Adapted PF Curve (Reliability Spectrum)



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Uptime® Elements

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Leadership

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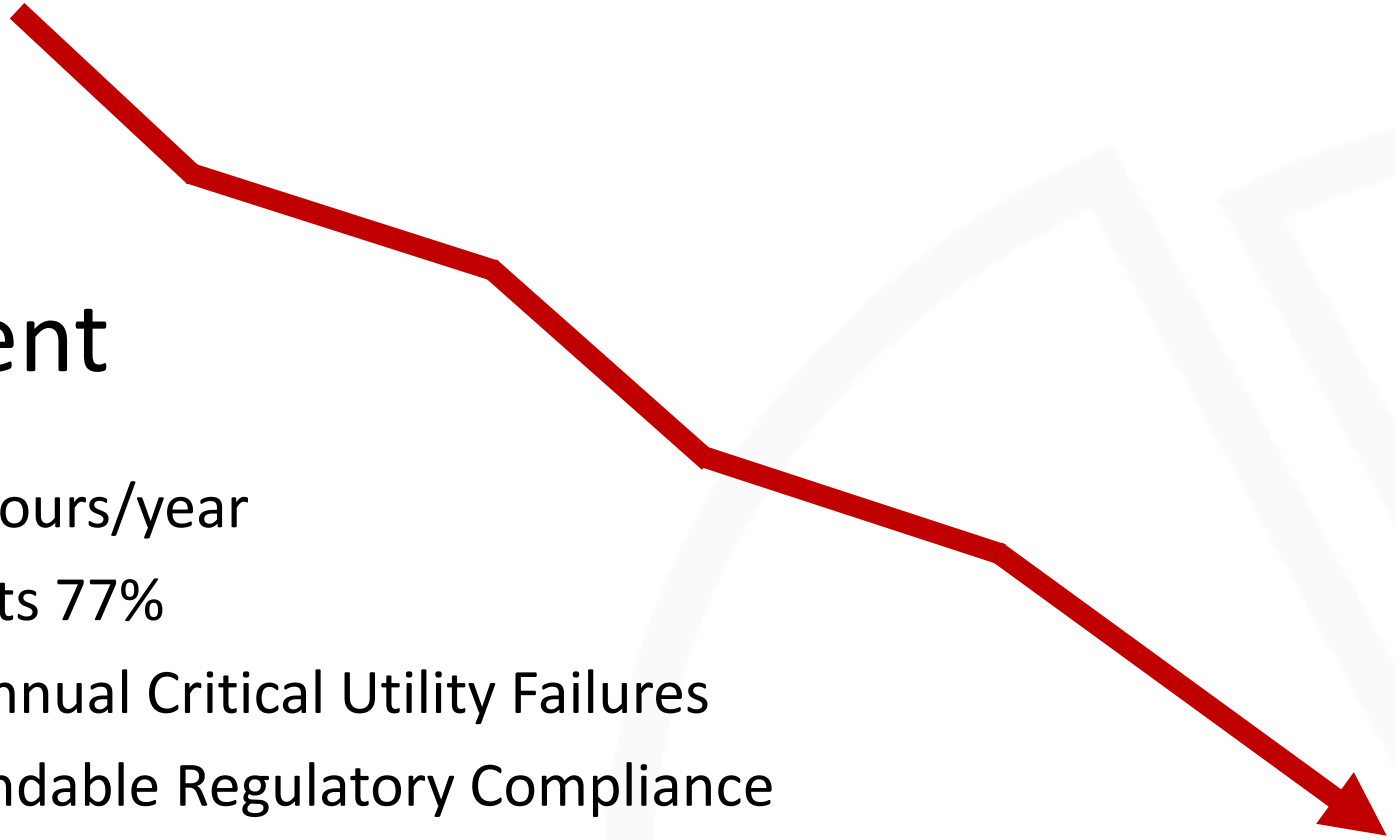
Returns on Investments (Money and Time)



Return on Investment

- Repurposed 24% total man-hours/year
- Reduced Outsourced PM Costs 77%
- Eliminated 78% of Average Annual Critical Utility Failures
- 100% Documented and Defendable Regulatory Compliance

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BETTER PATIENT CARE THROUGH PROGRESSIVE ENGINEERING KNOWLEDGE

Just What the Doctor Ordered

AEM Written Justification Criteria

The Joint Commission

- How the equipment is used.
- Likely consequences of equipment failure
- Available redundancy
- Incident history of identical or similar equipment
- Maintenance requirements

CAMH, EC.02.05.01 EP7 (January 2024)

AEM Record Keeping

The Joint Commission

"The hospital identifies operating components of utility systems on its inventory that are included in an alternative equipment maintenance program."

CAMH, EC.02.05.01 EP8 (January 2024)

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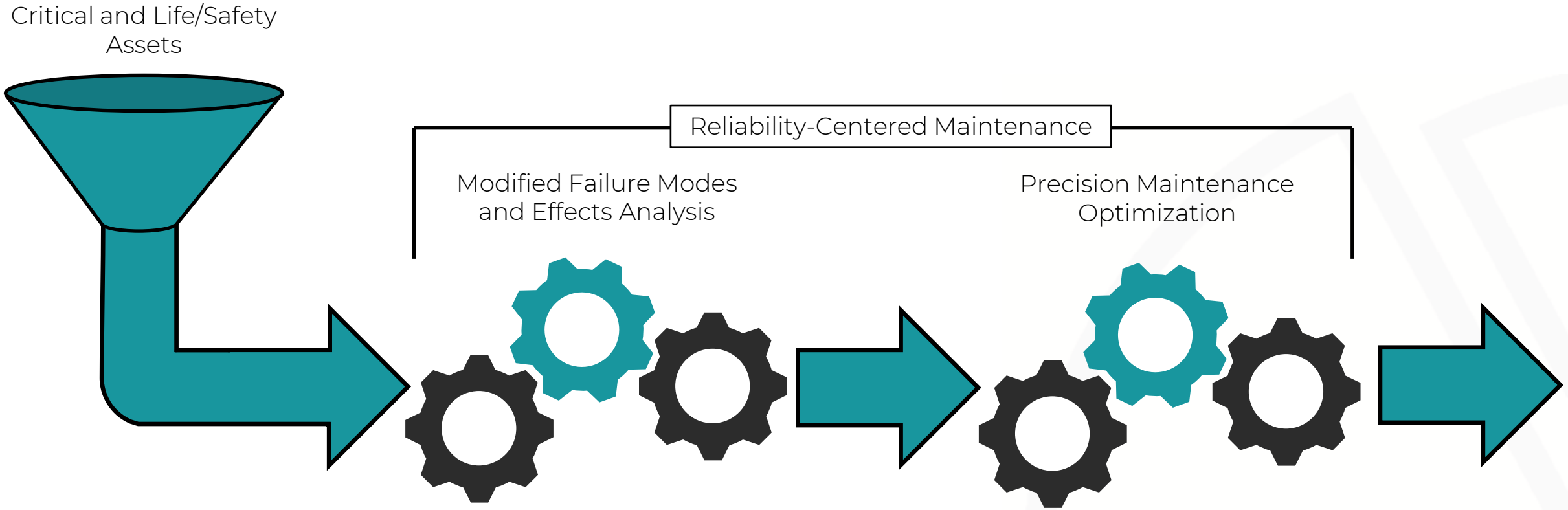
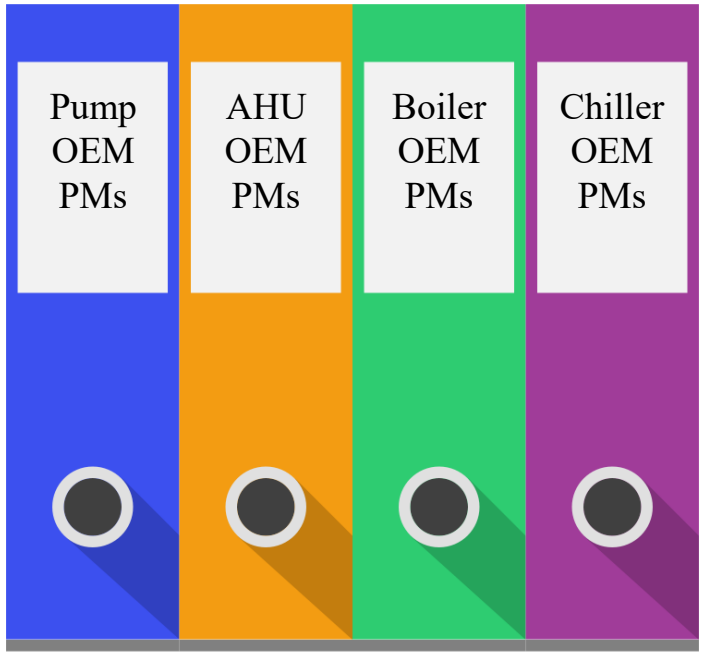
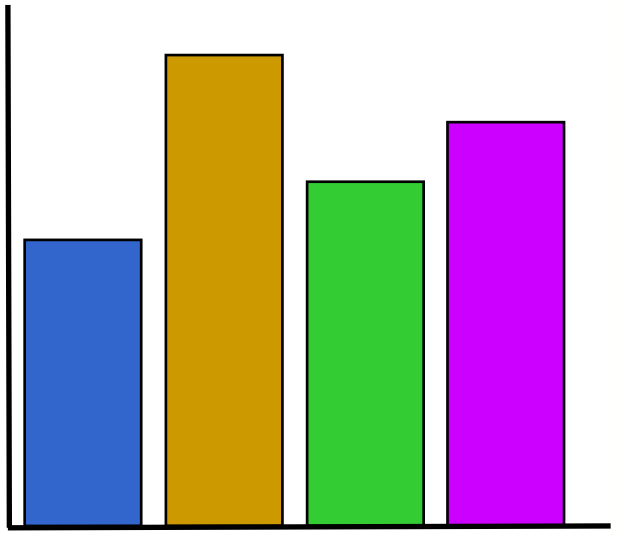
Smart Crafting the AEM



AEM Documents of Authority



Original Equipment Manufacturer Preventive Maintenance Guidelines

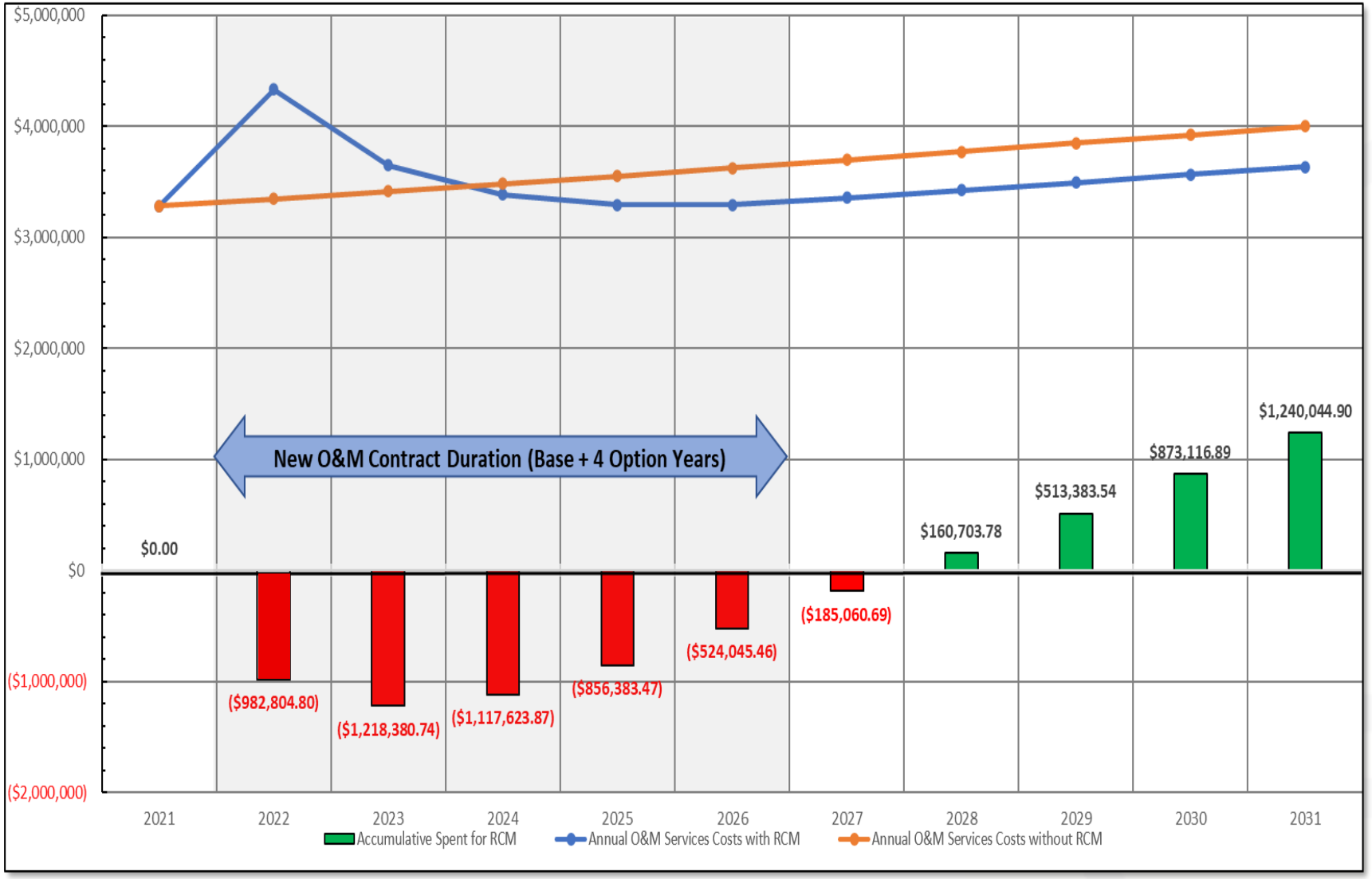


Reliability-Centered Maintenance Analyses

Alternative Equipment Maintenance Risk Assessments

The Uptime Elements™

The Uptime Elements™



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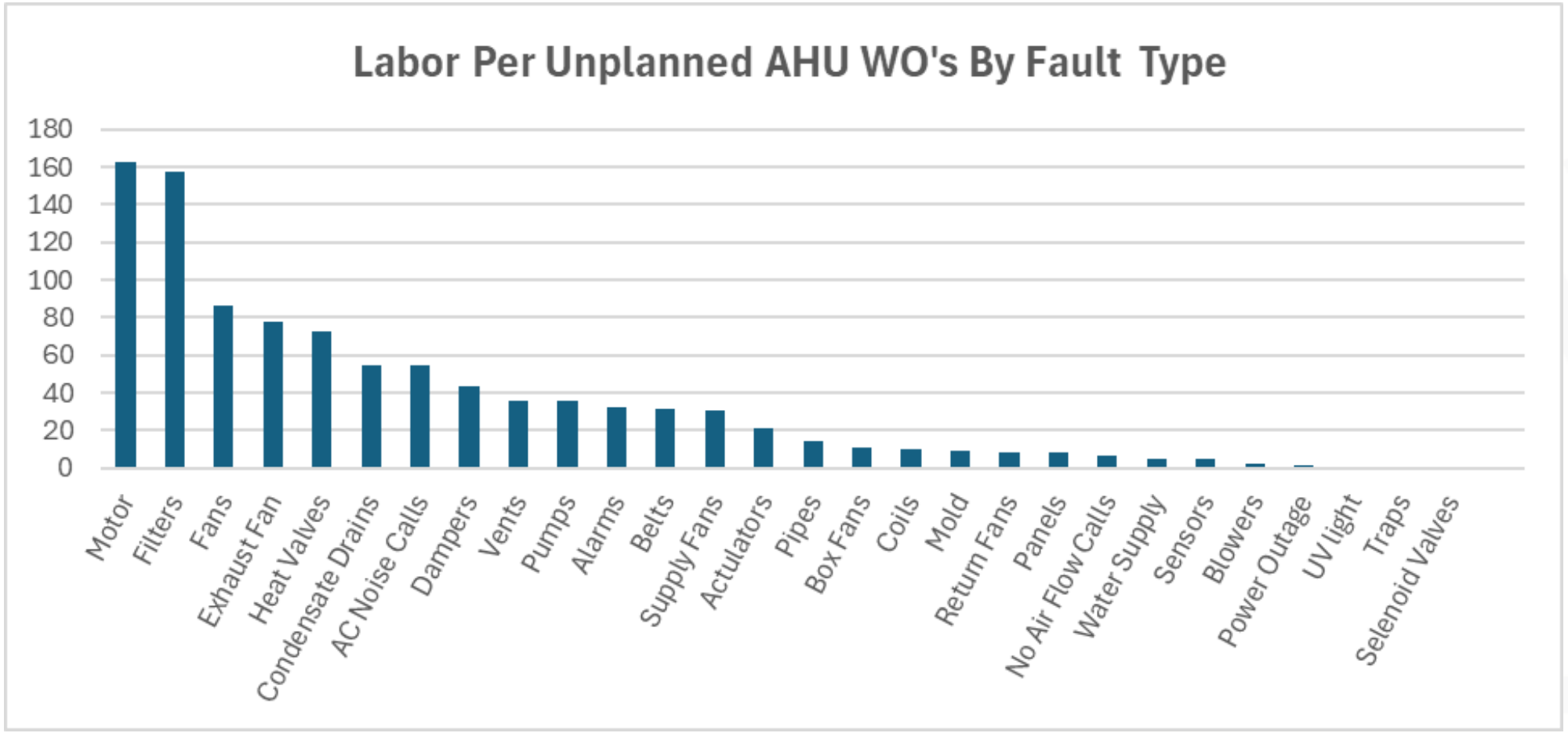
The Uptime Elements™



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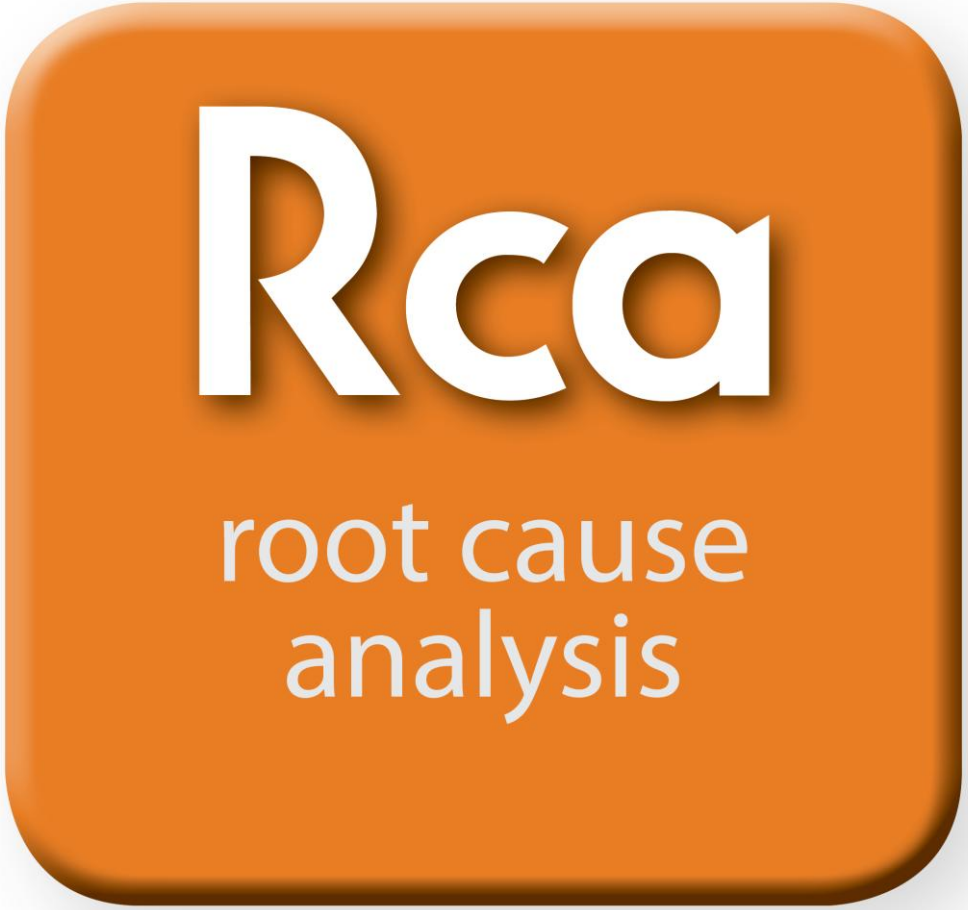

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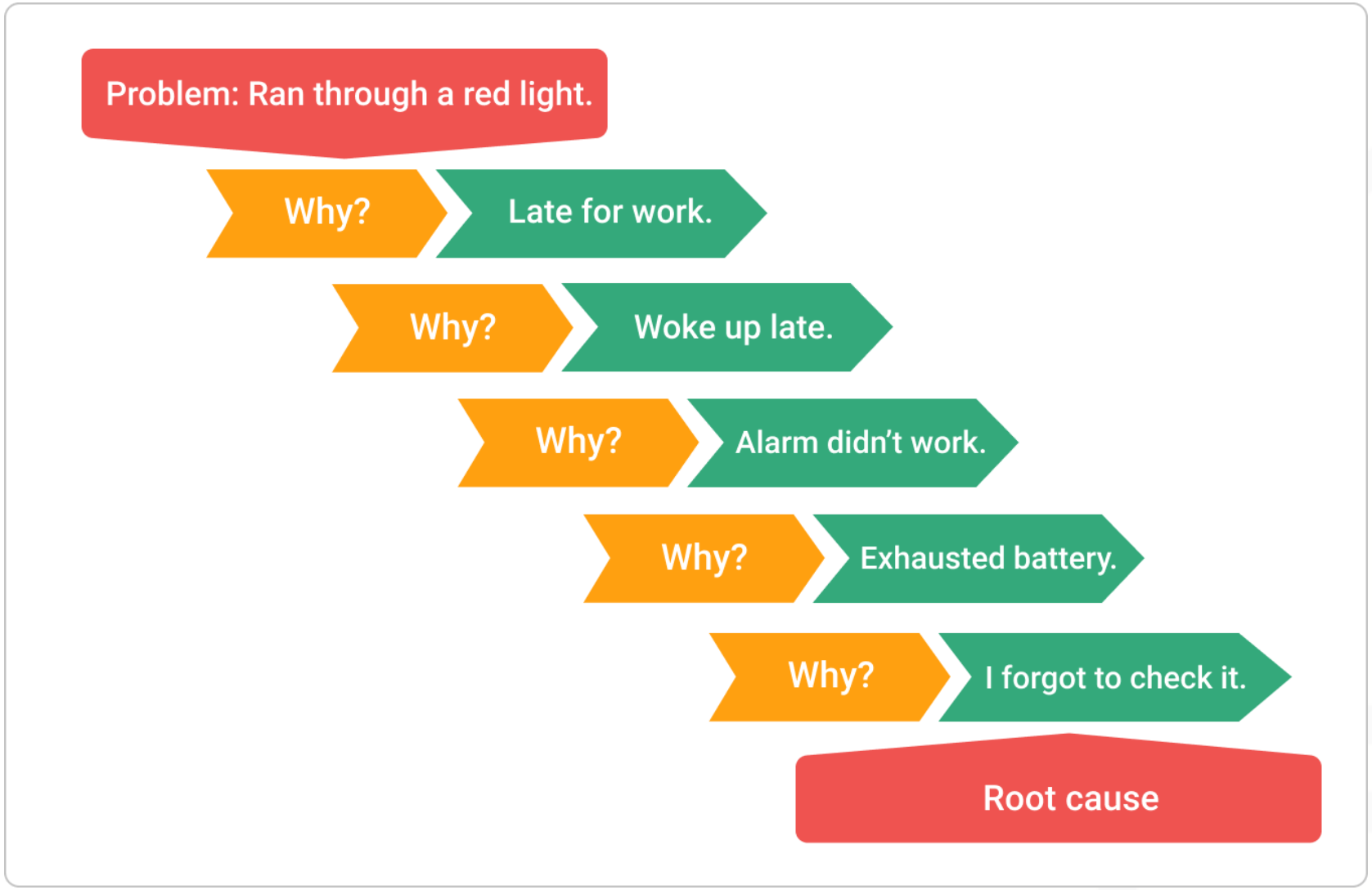

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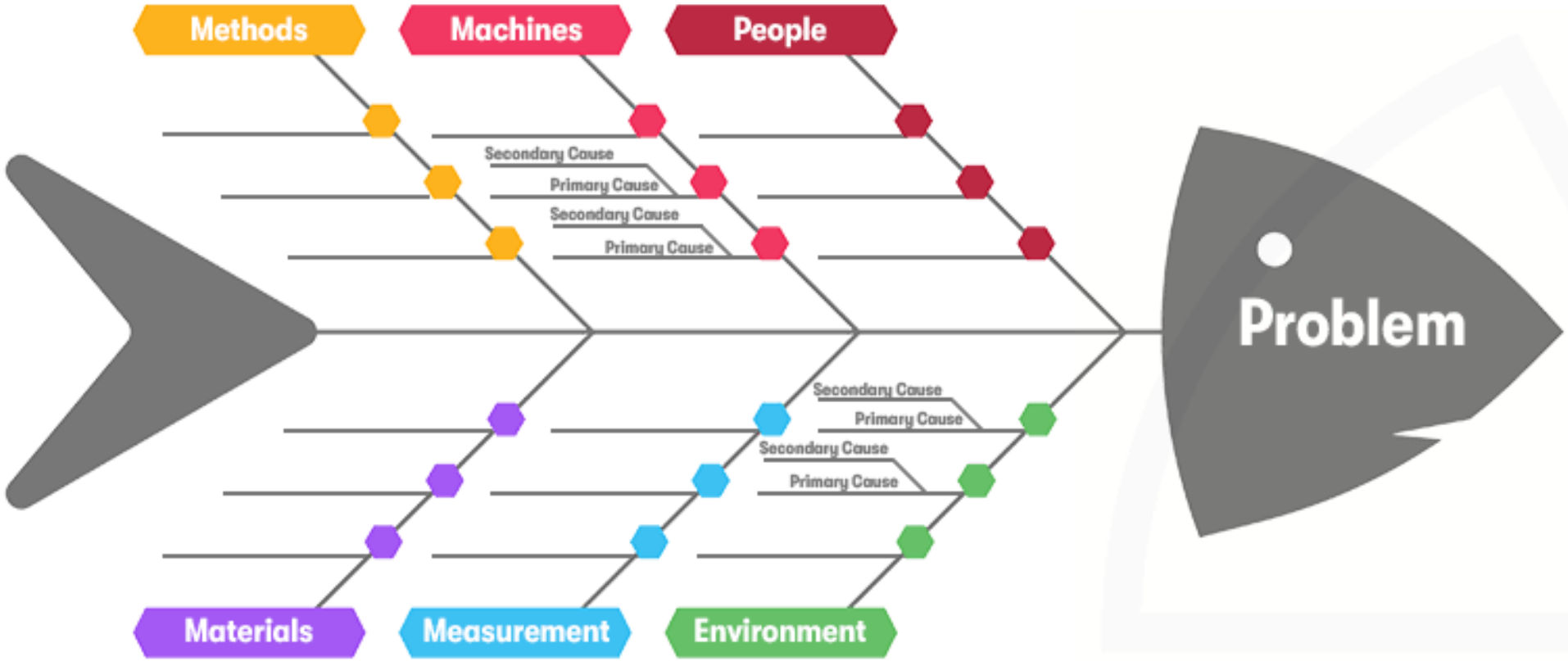

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Steps in the Process	Failure Mode	Failure Causes	Failure Effects	Likelihood of Occurrence (1-10)	Likelihood of Detection (1-10)	Severity (1-10)	Risk Priority Number (RPN)	Actions to Reduce Occurrence of Failure
Orders are written for any new medications	The first dose may be given prior to pharmacist review of the orders	Medication ordered may be available and easily accessed in the dispensing machine	Patient may receive incorrect medication, incorrect dose, or a dose via incorrect route	6	5	1	30	Assign clinical pharmacists to patient care units so that all medication orders can be reviewed as they occur.
Orders are written to discontinue a medication or change the existing order	The first dose may be given prior to pharmacist review of the orders	All doses needed for a 24-hour period are delivered to the drawer. Drawer is not changed until next routine delivery. 24-hour supply of refrigerated medications is delivered. Multi-dose vials may be kept in the patient-specific drawer. Medications are available in dispensing machine	Patients may receive medications that have been discontinued or the incorrect dose of a medication that has been changed	10	5	5	250	Schedule pick-ups of discontinued medications, including refrigerated medications, twice per day. Use dispensing machine screen to verify all information regarding current and discontinued medications prior to each administration.
Orders are written for a non-standard dose of a medication	Nursing staff may prepare an incorrect dose when manipulating the medication	Staff prepare the dose using medications from the dispensing machine and manipulate them to get the dose ordered	Patient may receive an incorrect dose	3	5	4	60	Prepare all non-standard doses in the pharmacy and dispense each as a patient-specific unit dose.

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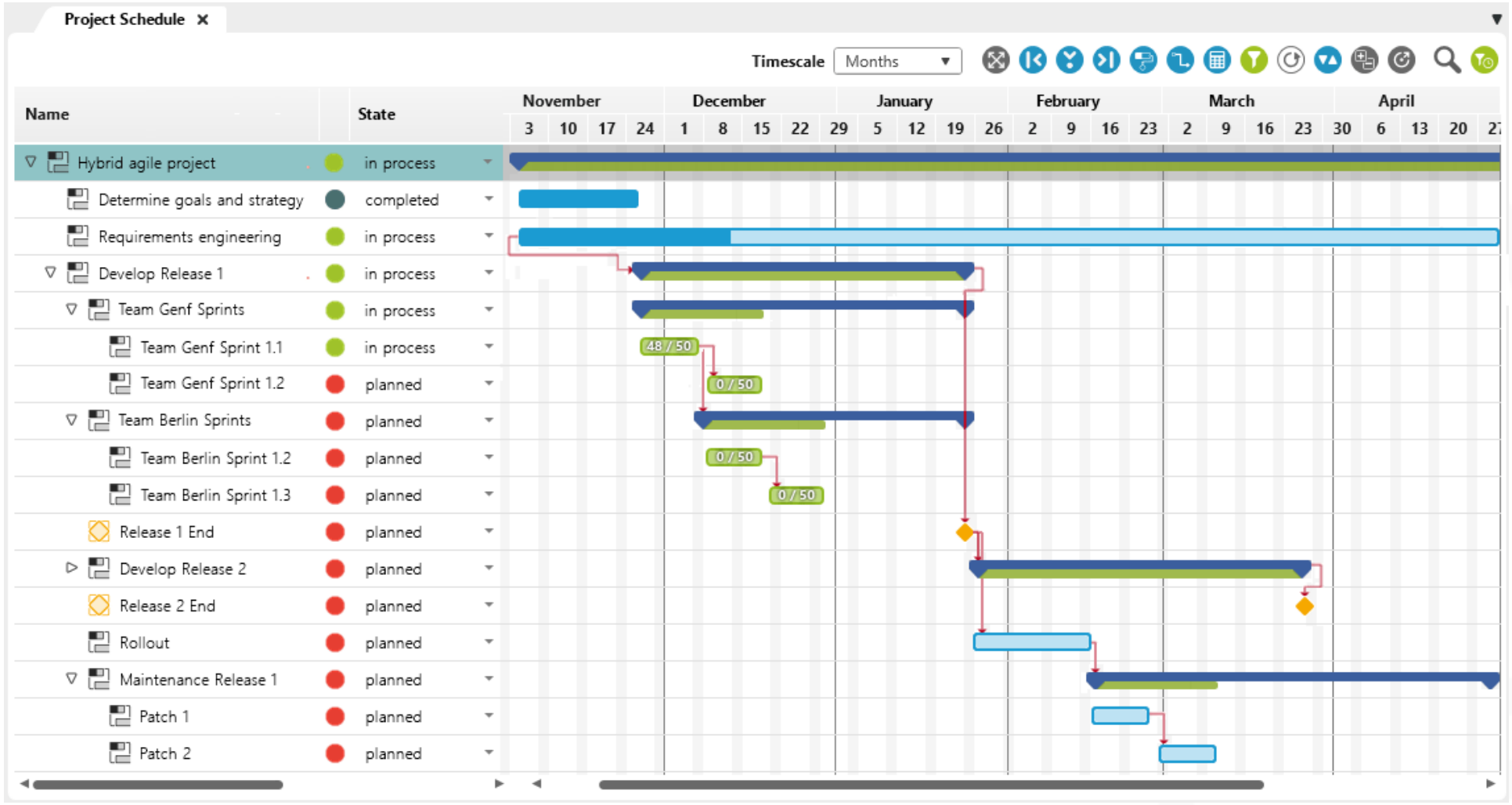

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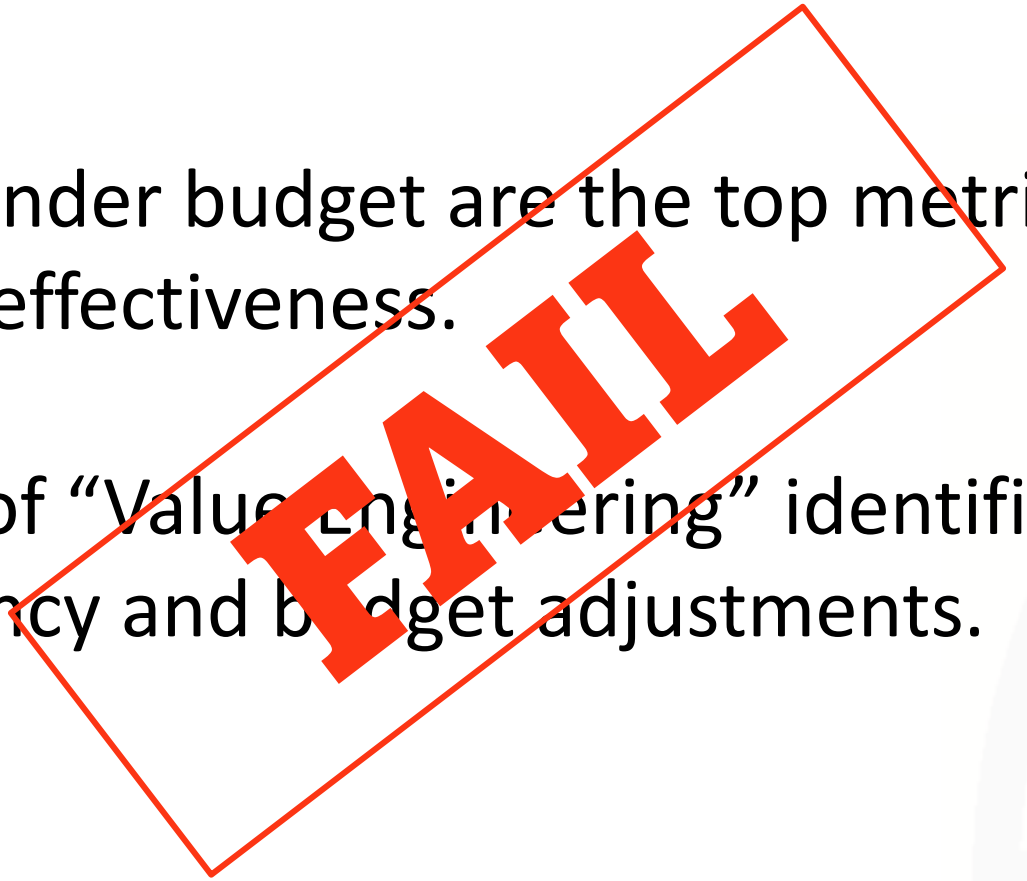
On time and under budget are the top metrics for project management effectiveness.

The principal of “Value Engineering” identifies candidates for project efficiency and budget adjustments.



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Systems or physical asset are verified against business requirements and contractual obligations before being officially taken over.

It ensures the asset is fit for purpose, functions as intended, and meets the quality standards required by the end-user or client

Acceptance Testing Is

- Acceptance Testing Specification (Pre-Con)
- Condition Discovery
- Fault/Defect Identification
- Root Cause Analysis
- Objective, Rules-Based

Acceptance Testing Isn't

- Subjective, 'Gut Feel", or an Opinion
- Does not 'target' contractors, suppliers, or OEMs
- Does not cover for faulty operations
- Only negative

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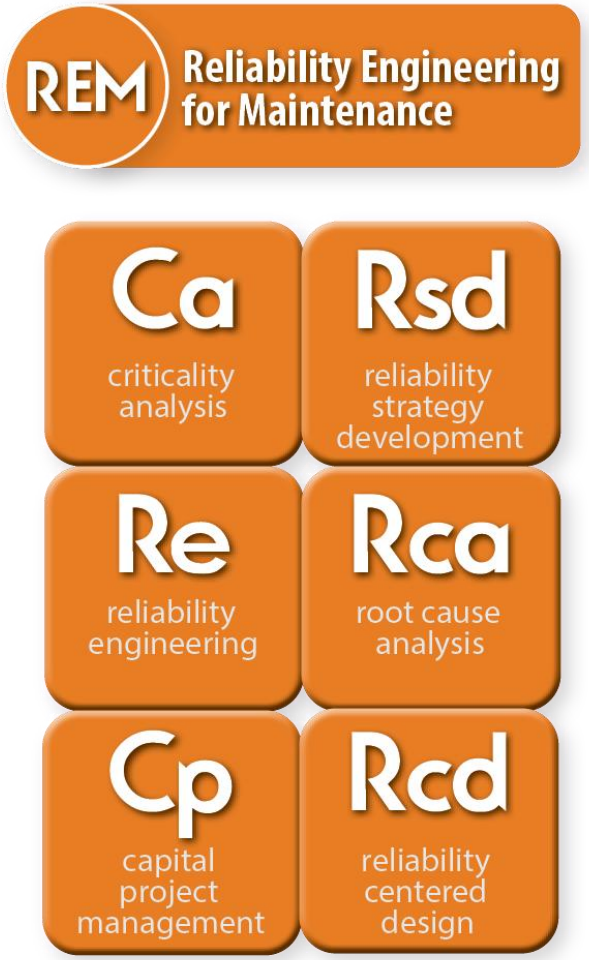

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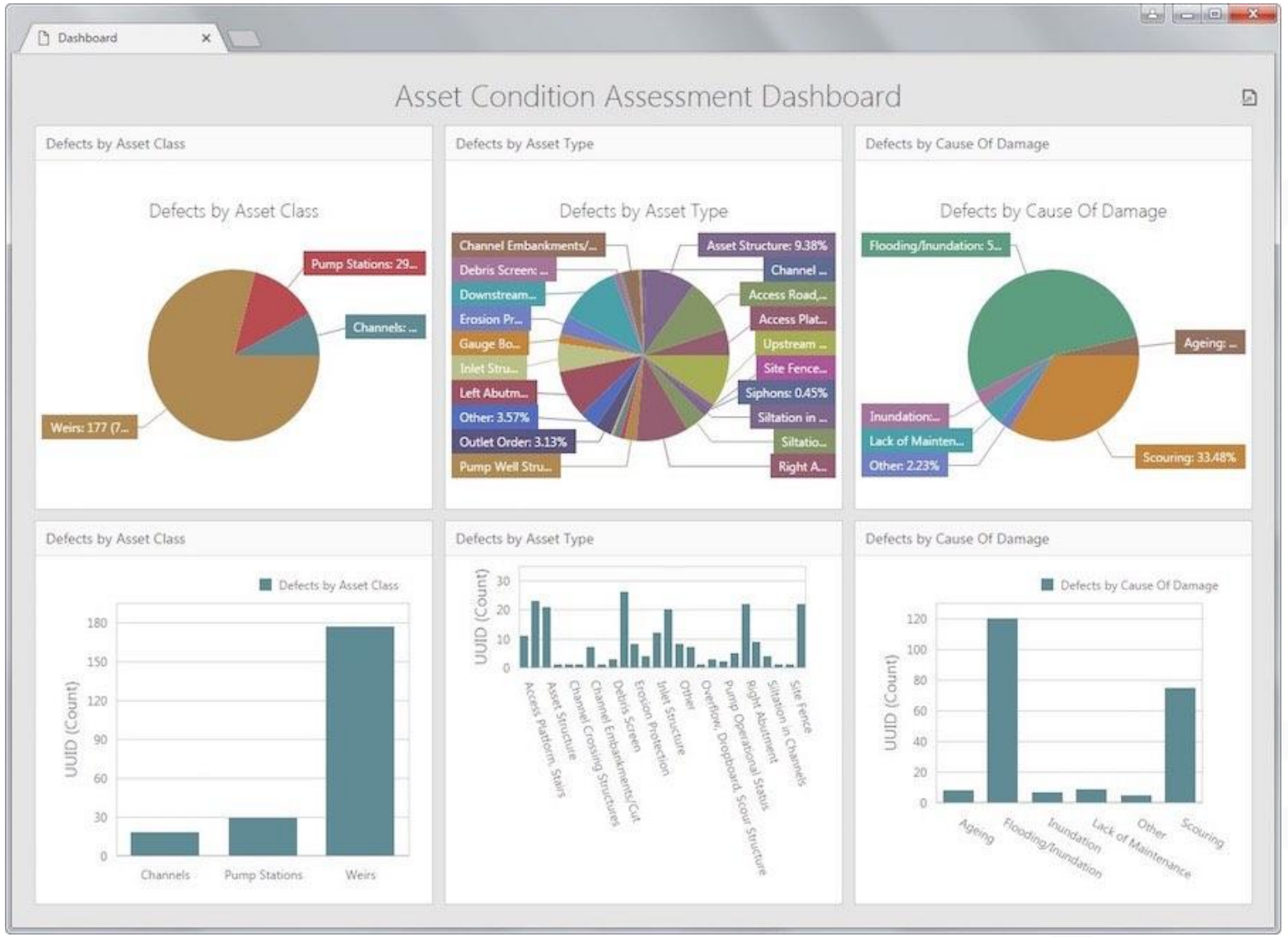

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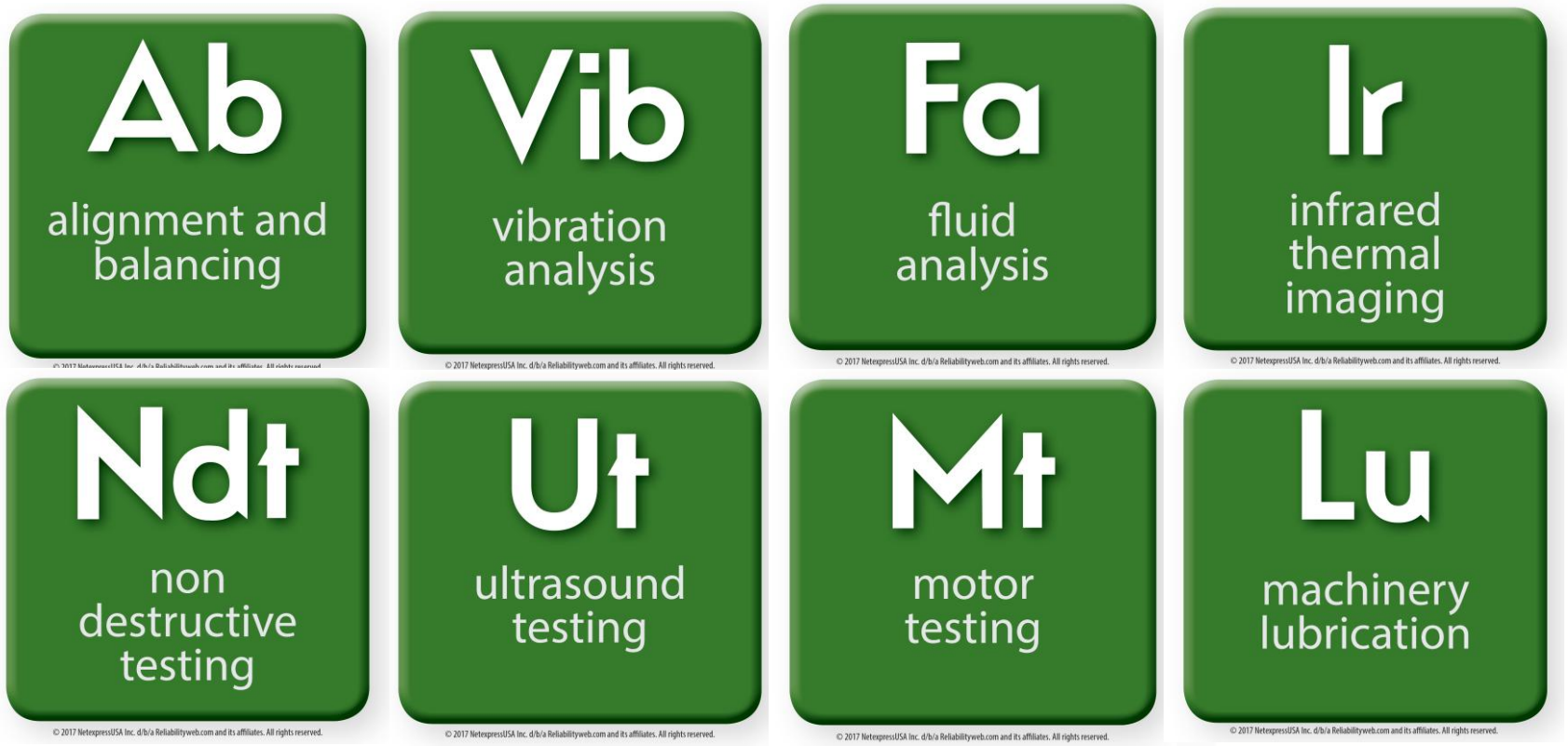

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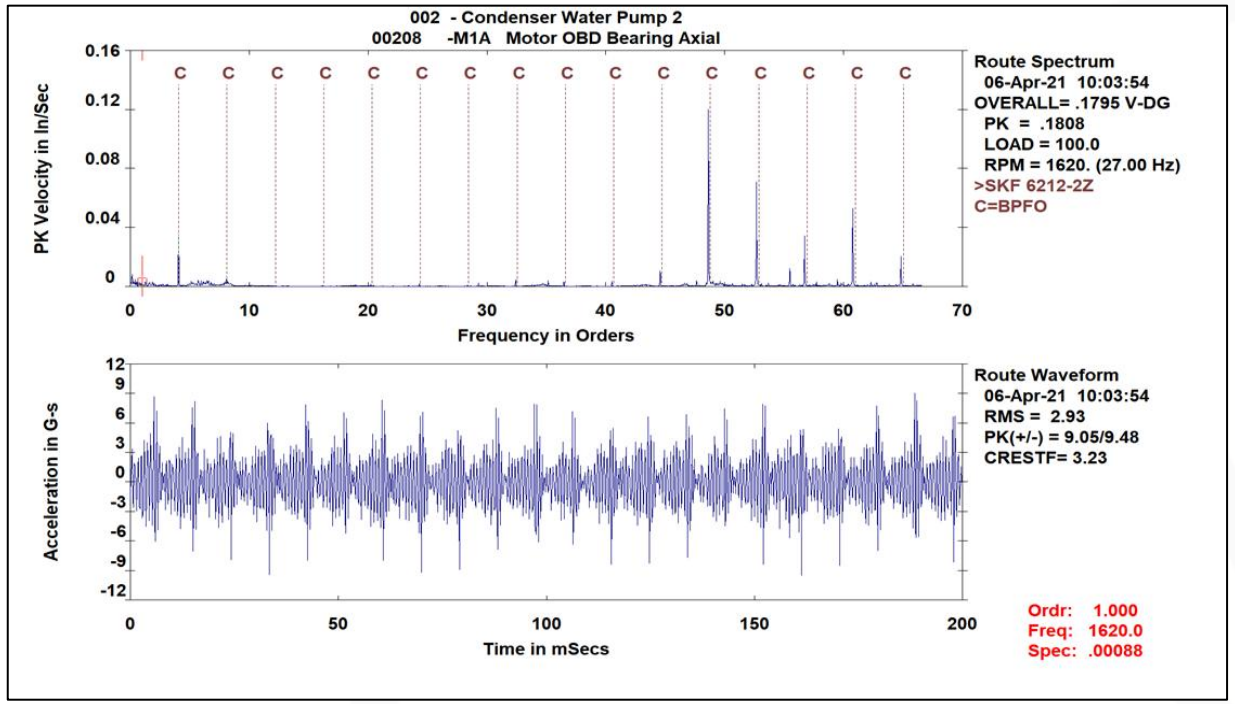
Measurements that detect the onset of system or component degradation (lower functional state), thereby allowing casual stressors to be eliminated or controlled prior to any significant deterioration in the component physical state.

Results indicate current and future functional capability.



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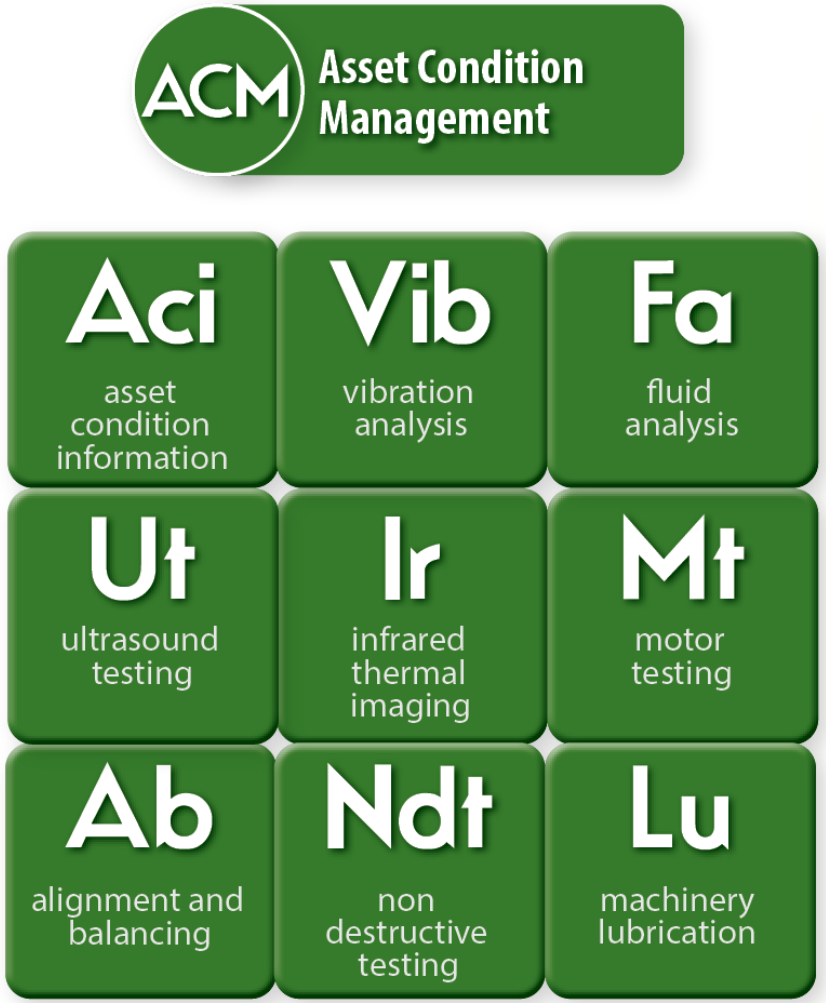

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CMMS Functions in Reliability

- More than just a workflow management tool
- Informs reliability engineering analysis
- Repository for compliance documentation
- Gives actionable visibility to condition monitoring
- Track & Report asset management effectiveness

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- Deployment is greater than features
- Correct deployment is more important that timely
- Do the up-front work to get it right the first time
- Upgrade is less invasive than replace
- Begin with a performance standard

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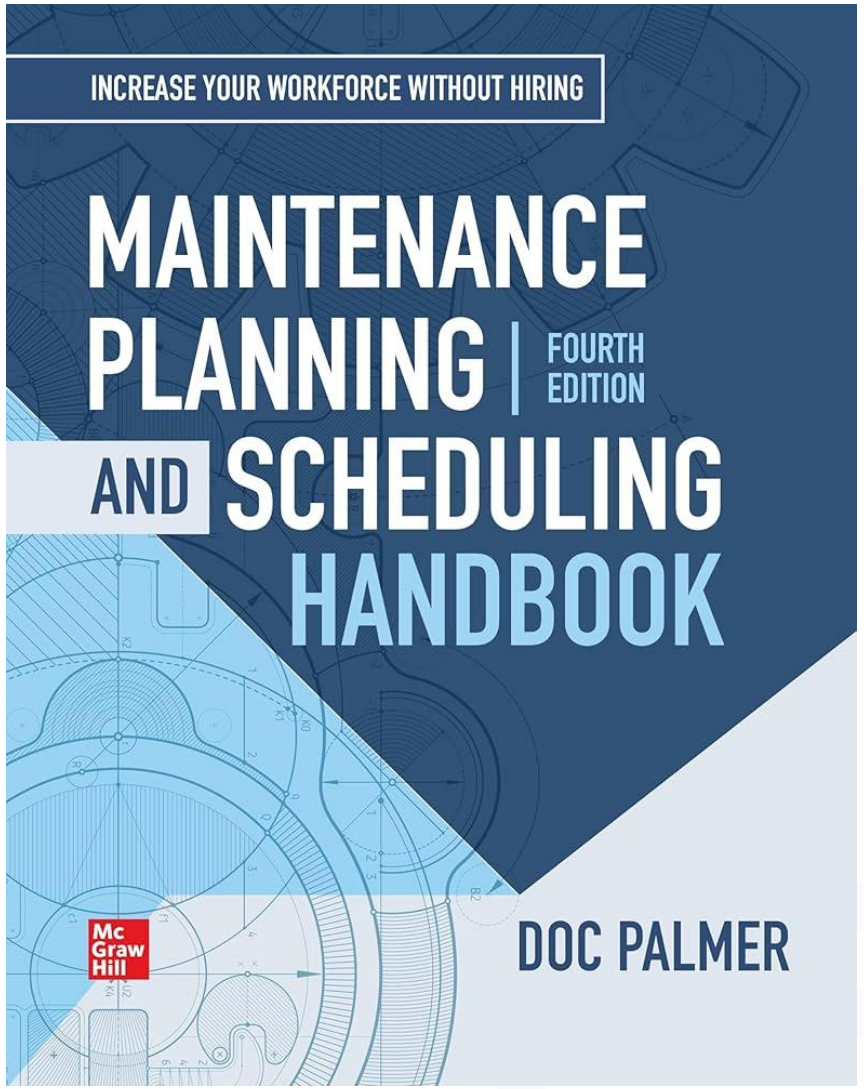

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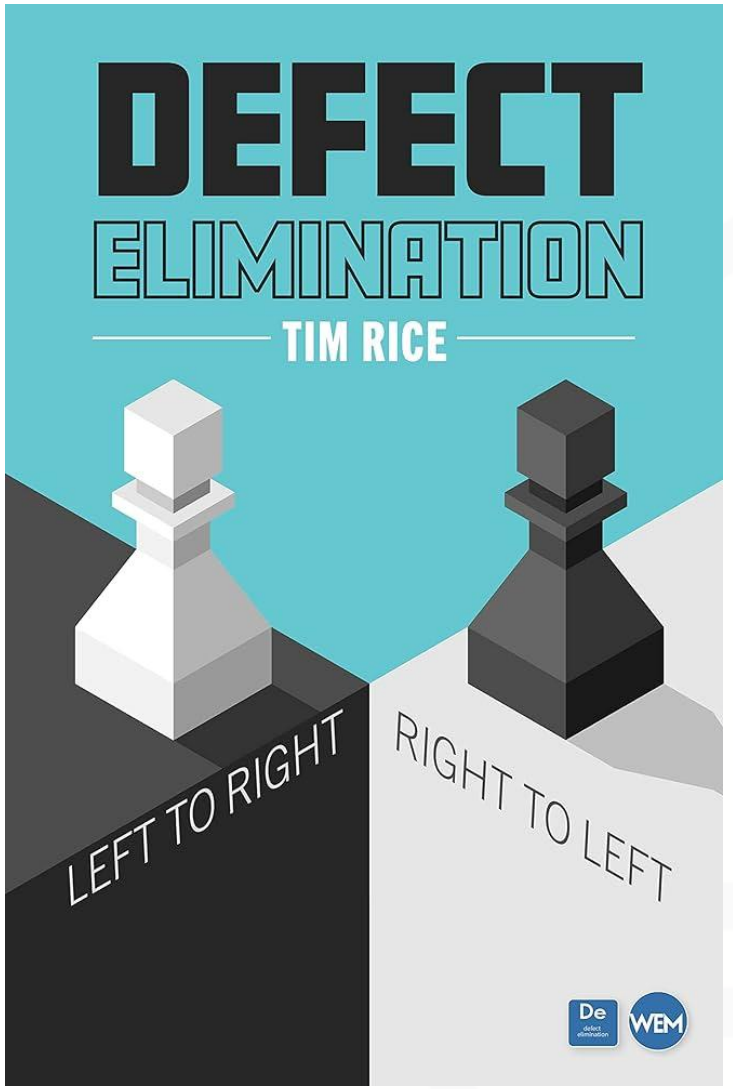

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- Position-specific
- Vendors can provide training
- ASHE Associate organizations
- Organizational needs
- Keep HR engaged

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May 12, 2026

Four steps to develop, track and report KPIs

MEMBER TOOLBOX

Key performance indicators (KPI) can guide better decisions — but only if they're built and used correctly. This article lays out a practical, four-step approach to developing, tracking and reporting KPIs for health care facilities. It explains how to break down operating expenses, highlight discretionary spending opportunities, document deferred maintenance needs and organize metrics by risk and criticality. The result is a clearer picture of both operational and capital priorities, giving facility leaders a stronger foundation for communicating needs and supporting long-term asset planning.

HFM

The Uptime Elements™

- Our common horizon
- Activities for managing physical assets
- Align asset performance to mission
- Consistently deliver functional outcomes

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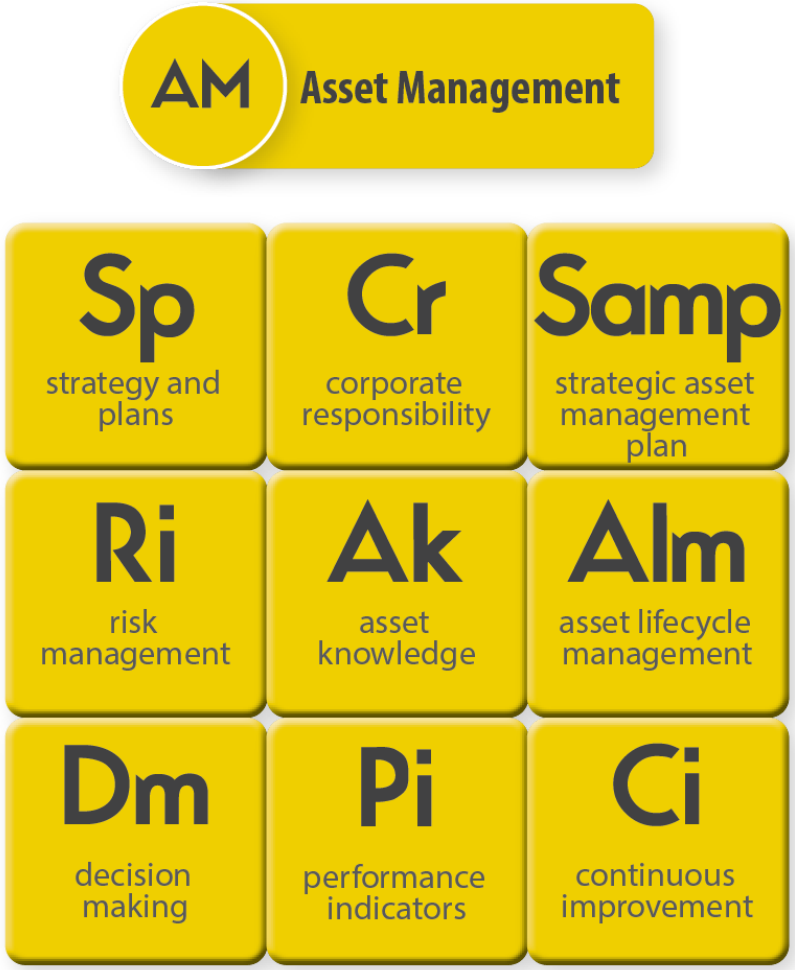

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The CRL Black Belt

CRL Black Belt
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Reliability Certifications

ASQ CERTIFIED Reliability Engineer

SMRP | CMRP
Certified Maintenance & Reliability Professional

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