FLUKE® Reliability

A game plan to proactively manage your assets

Michael N. Smith

Life Cycle Engineering

Accelix™

Webinar Series

Michael N. Smith

Senior Reliability Engineering Consultant
Life Cycle Engineering

- 30 years in maintenance, engineering, and plant management
- Multiple types of industries
- CMRP
- Reliability Engineering Certifying Instructor
- Certified Change Management Leader

Mike utilizes his 30 years of experience in maintenance and manufacturing to lead clients developing effective maintenance strategies. His experience includes managing plants, and leading corporate level maintenance and reliability organizations.

RCG SERVICES

Life Cycle Engineering

We engage, coach, and educate people, building your organization's capabilities

Atlas

Atlas draws from Life Cycle Engineering's 40+ years of experience helping asset-intensive organizations achieve significant benefits: greater capacity, lower operational costs, reduced capital investment, extended asset life cycle, improved safety, and enhanced regulatory compliance

Step Change Transformation

Implementing industry best practices and transforming the client's workforce using change management, on-the-job training, and on-site coaching and mentoring

Engineering

Solving complex problems, using Subject Matter Experts (SME), proprietary work processes, tools, and diagnostics

Services

Augmenting a client's resources and talent to expedite routine tasks/projects or perform unique, non-routine tasks, including client site direct placement

Adult Training and Education

Formal O&M and change management training and education based on adult learning principles

Chat in your favorite football team

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POLL QUESTION No. 1

How would you classify your reliability program?

(Click only one answer)

- Reactive
- Emerging
- Proactive
- World-class

FLUKE Reliability

RE and DC responsibilities

Reliability Engineer

- Key member of the plant leadership
- Defines systems to prevent failure
- Determines the plan of attack for each asset
  - Utilizes a defense in depth approach to reduce failure
  - Studies the asset failure modes using FMEA
- Uses RCA to understand how a failure occurred
- Defines corrective actions to improve the performance of the asset

Football Defensive Coordinator

- Key member of the team leadership
- Defines systems to prevent scoring
- Determines the plan of attack for each opponent
  - Utilizes a defense in depth approach to reduce scoring
  - Studies the offense using game analysis and films
- Uses film study to understand how a score occurred
- Determines improvements needed for the next game

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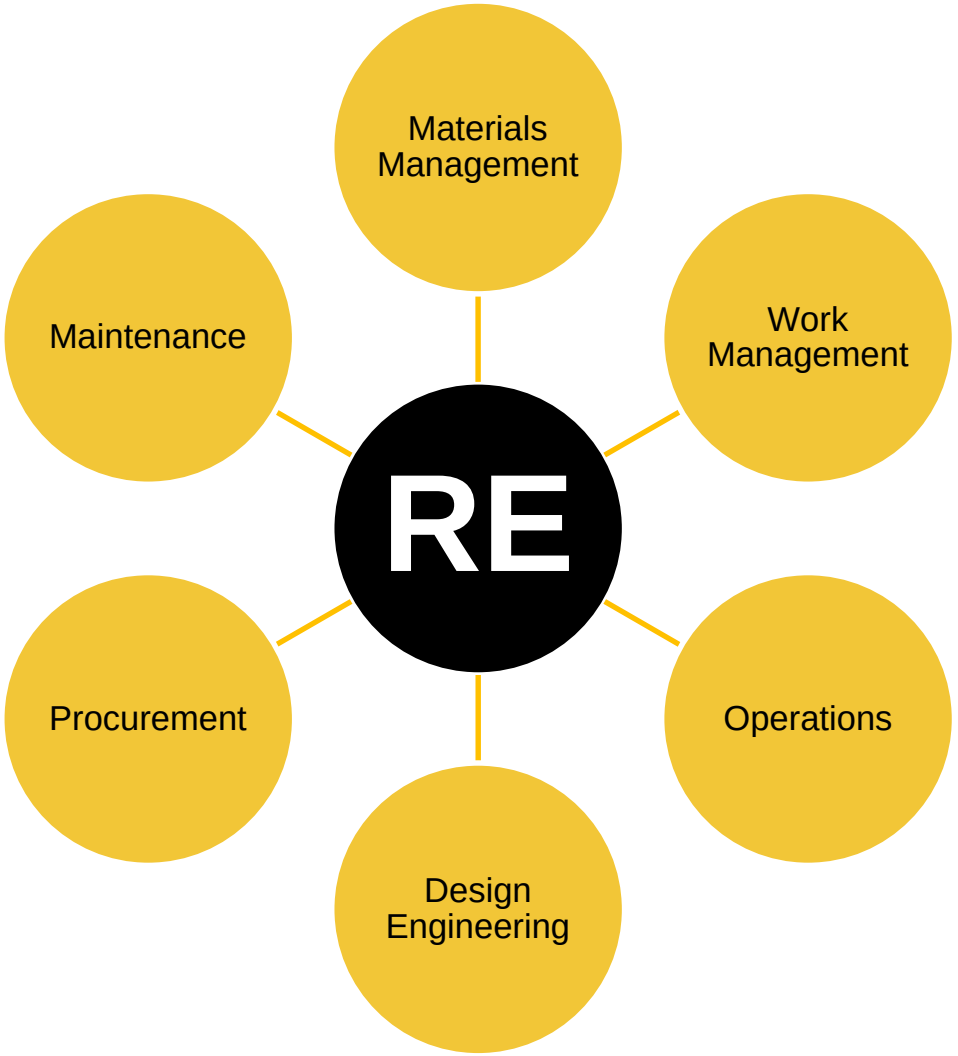
Reliability Engineering and Key Management Partnerships

Interdepartmental partnerships



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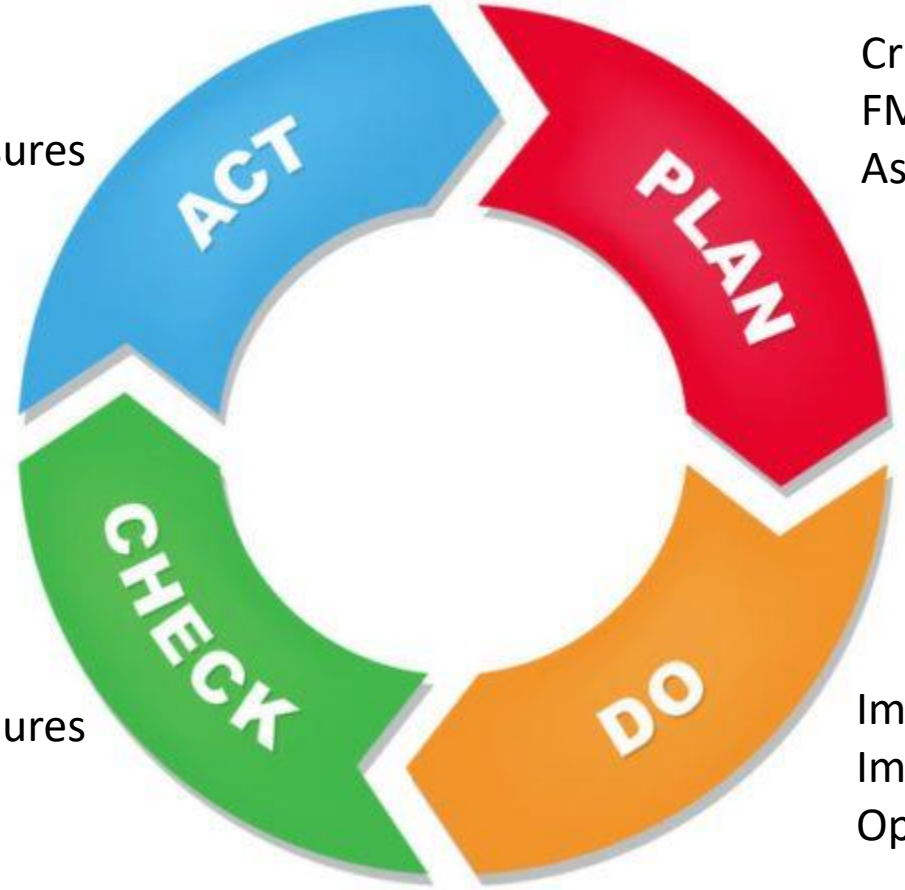
Continuous improvement for reliability

Corrective and Preventive Measures



Criticality Analysis
FMEA
Asset Management Plans

Analyzing CMMS for Repeat Failures
Root Cause Analysis

Implement Maintenance Plans
Implement Predictive Tools
Optimize PM

Understanding Your Opponent

Functional Failure

Terms: Reliability and Functional Failure

Reliability

The probability that a device, system, or process will **perform its prescribed *function* without failure** for a known **time period** and known **environment**

Functional failure

The ***inability*** of an asset to meet a specified ***performance standard***

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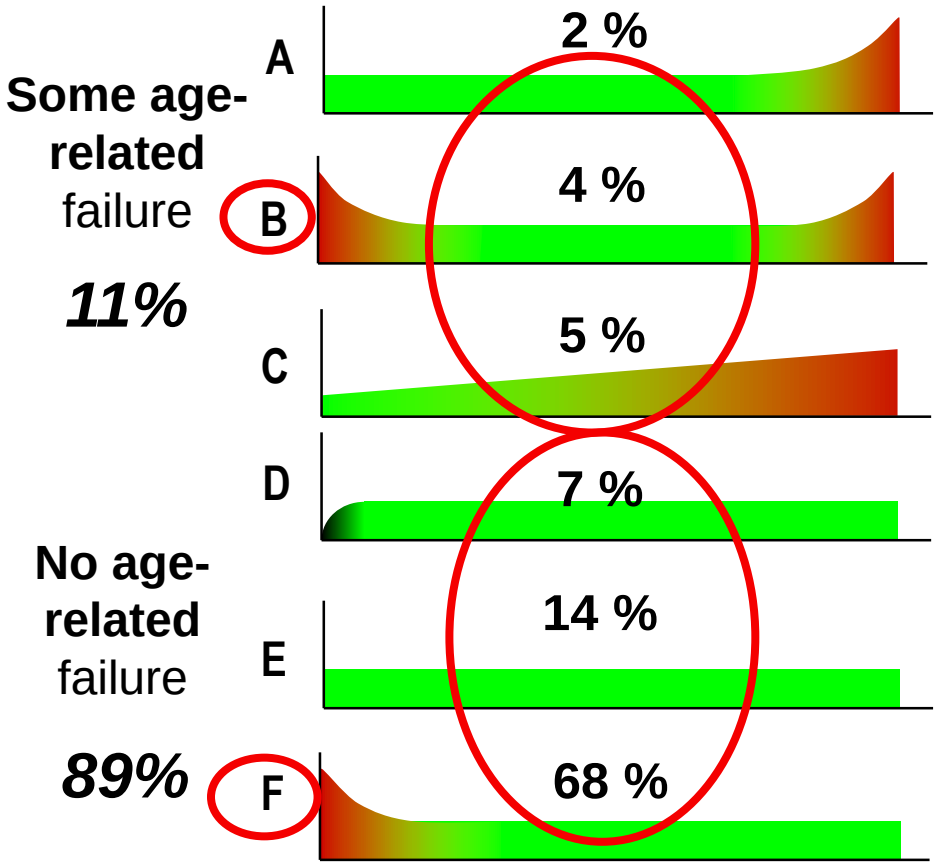
Failure patterns: how components fail



Traditional View
Random failure then a wear out zone

Bathtub Curve
High infant mortality, low-level of **random** failure, wear out zone

Slow Aging
Steady increase in the probability of failure

Best New
Sharp increase in the probability of failure, then random failure

Constant Random Failure
Random - no age-related failure pattern

Worst New
High infant mortality then **random** failure

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Chat on ways to reduce infantile failure

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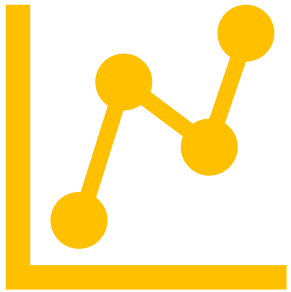

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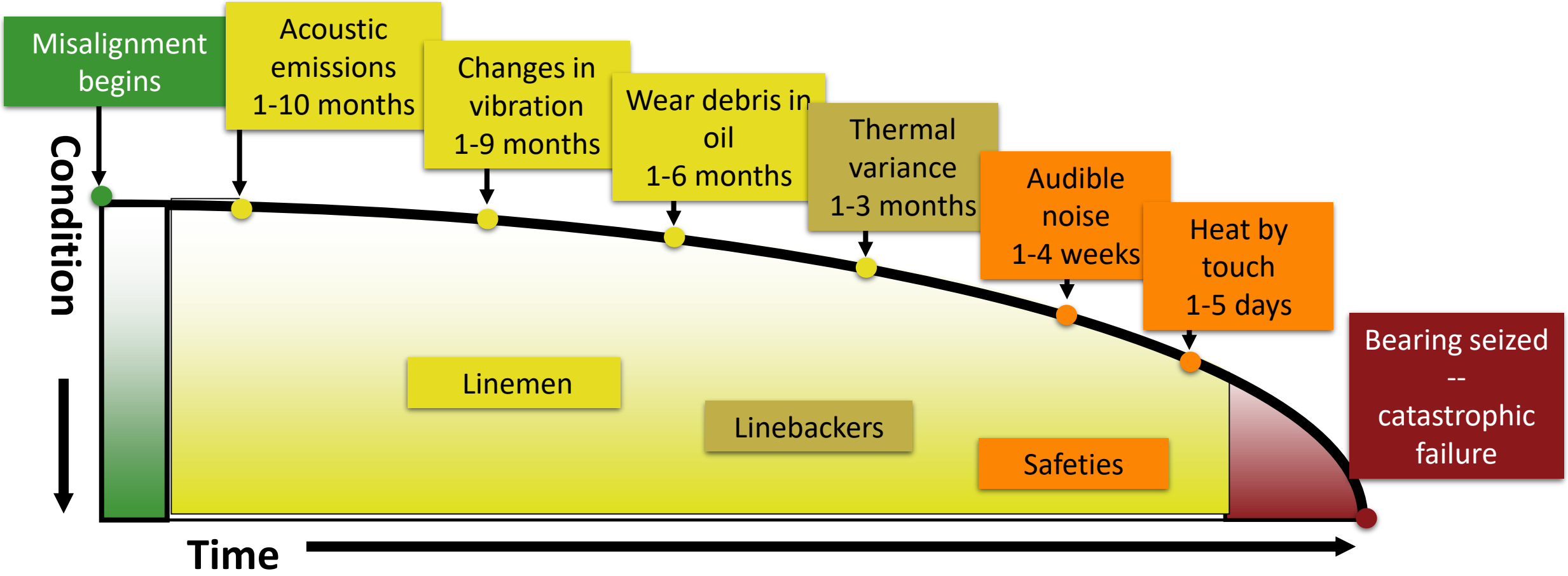
What does failure look like?
How do we build a defense against it?



POLL QUESTION No. 2

Which defensive positions (strategies) do you currently use?

(Click all that apply)

- Acoustical emissions and/or vibration
- Human inspections
- Tribology
- Thermal imaging

FLUKE Reliability

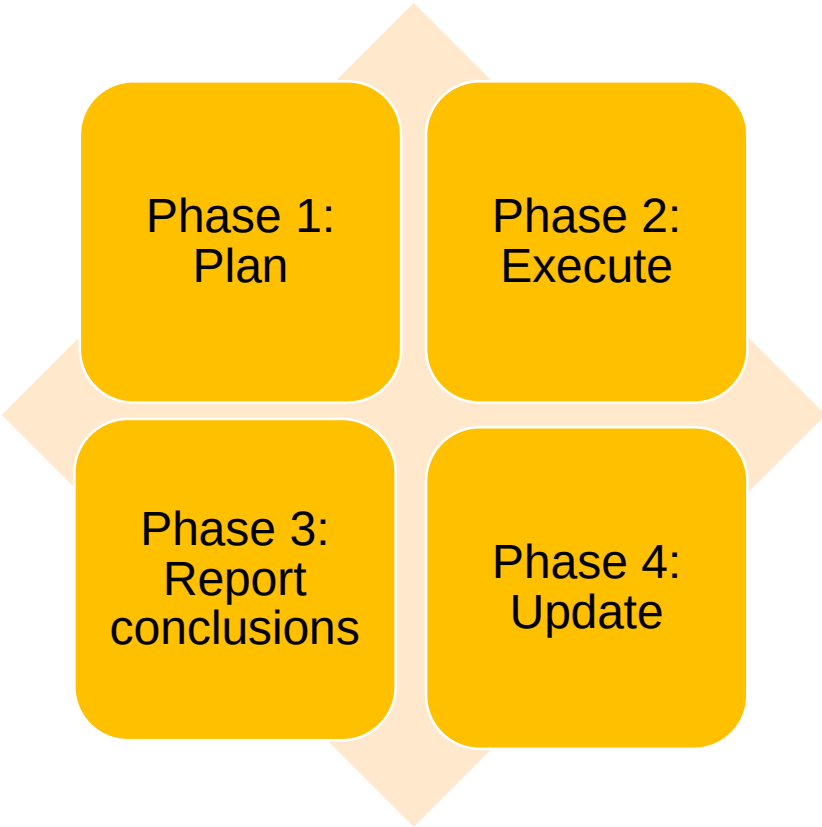
Developing the Game Plan

Failure Modes and Effects Analysis (FMEA)

FMEA objectives and phases
Per ISO standard 60812

- Identify:
  - Failures
  - How each failure mode affects different system levels
- Improve:
  - System reliability and safety
  - Maintainability
- Define:
  - Criticality
  - Priority of failure modes

FMEA phases



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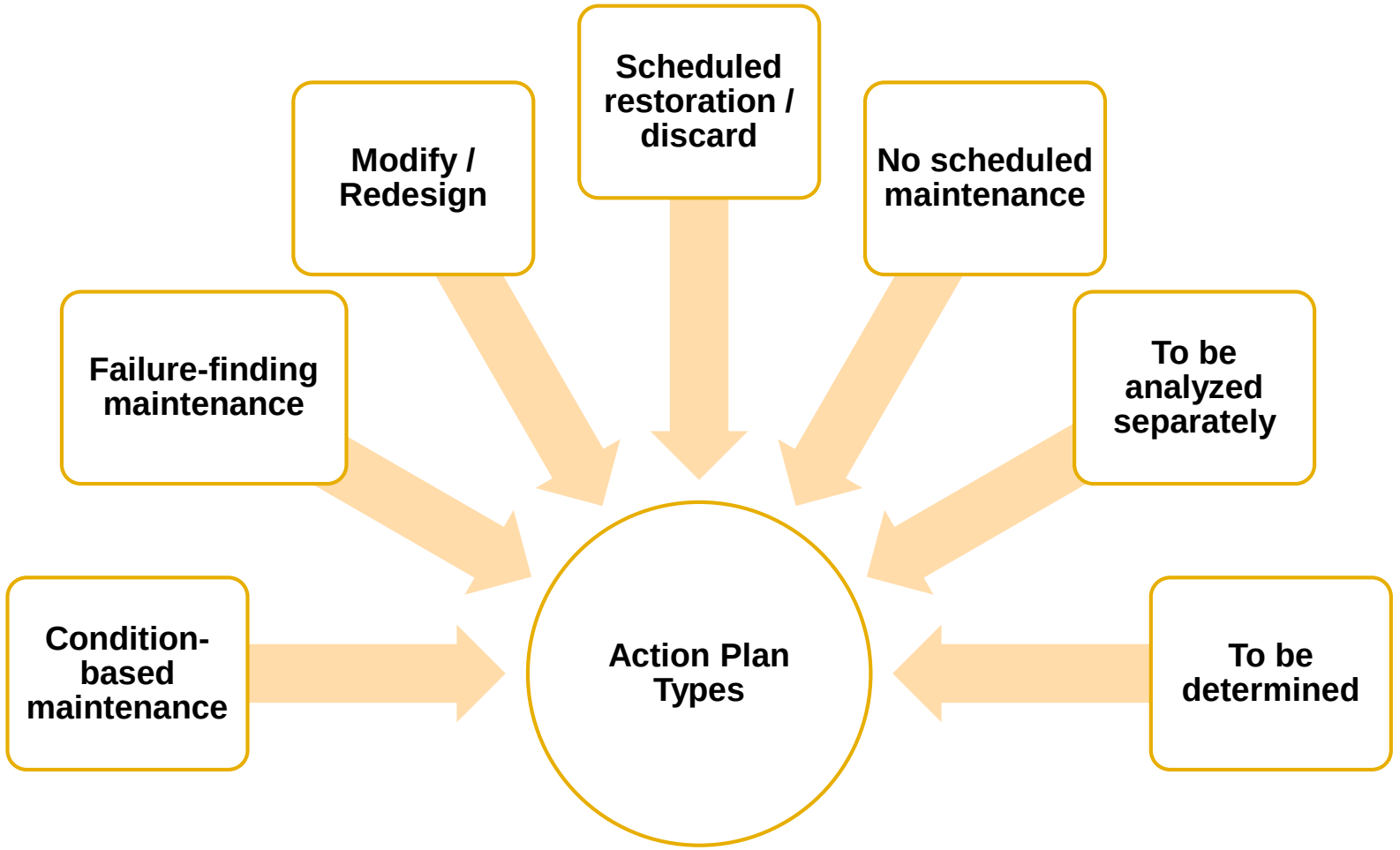
FMEA leads to control strategies

Recommended actions will either prevent a functionally failed state, or handle the failed state



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The other team scored

How are we going to prevent it in the future?

The RCA process

1.  NOTIFICATION	2.  CLARIFICATION/ CLASSIFICATION	3.  ROOT CAUSE ANALYSIS
4.  CORRECTIVE ACTION EVALUATION	5.  VERIFICATION	6.  DOCUMENTATION

Step 1: Notification

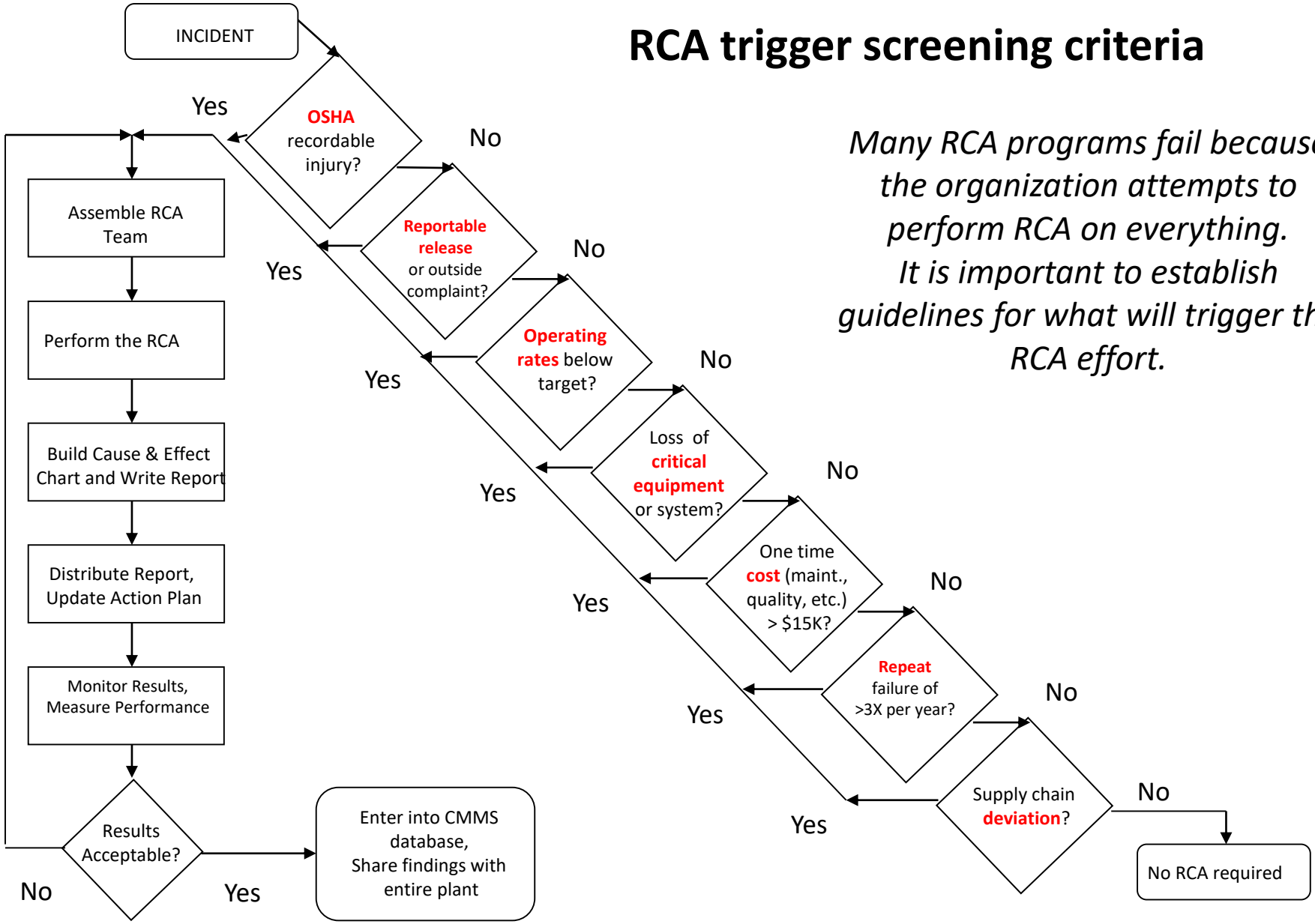
Sources of RCA Investigations

- Data analysis
  Reliability Engineers identify potential problems before they manifest as actual problems
- Workforce reports a problem or pending problem

  If there is no current process, problems can be reported through informal methods, e.g., phone calls, email, personal contact

RCA trigger screening criteria

Many RCA programs fail because the organization attempts to perform RCA on everything. It is important to establish guidelines for what will trigger the RCA effort.



Step 2: Incident clarification / classification

- Clarification
  - Is root cause analysis needed?
  - Approach or type of analysis to use
- Classification
  - Equipment damage or failure
  - Operating performance
  - Product quality
  - Capacity restrictions
  - Economic performance
  - Safety/regulatory compliance

Step 3: RCA

1. Design/Application Review
2. Ishikawa (Fishbone)
3. Sequence of Events
4. Fault Tree Analysis
5. Change Analysis
6. FMEA
7. Events and Causal Factors

Step 4: Corrective action evaluation

- List all potential corrective actions
- Evaluate technical merit of each
  - Will it correct the problem and prevent recurrence?
  - Could it cause other problems?
- Cost and benefit analysis

Step 5: Verify corrective actions

Questions:

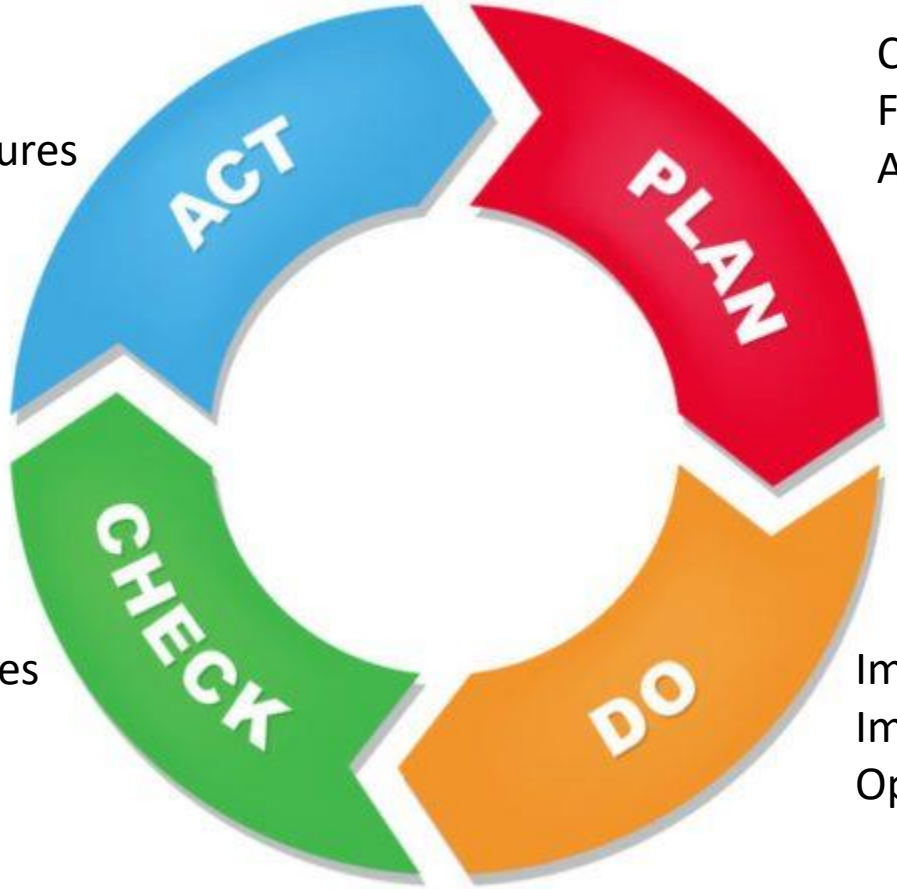
- Were action items completed?
- Will the initial problem recur?
- Did the action create another problem that may affect reliability or costs?
- Did we get the expected return?

Step 6: Proper documentation

- Final report:
  - Problem, its impact, root causes and recommended corrective actions
- Follow the Engineering Change Management (ECM) or Management of Change (MOC) Process

Continuous improvement for reliability

Corrective and Preventive Measures



Criticality Analysis
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Root Cause Analysis

Implement Maintenance Plans
Implement Predictive Tools
Optimize PM

Winning and reliability feel good!

Questions

QUESTIONS?

Thank you!

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Next webinar: Exploring the tree of unreliability and what drives downtime

BEST PRACTICE WEBINAR

Wednesday, Sept. 2, 11 a.m. ET

Exploring the tree of unreliability and what drives downtime

An infinite number of causes can lead to lost production and unplanned downtime. But some have common physical roots and underlying latent roots related to our reliability issues. Presenter **Shon Isenhour**, founding partner of Eruditio, has reviewed or participated in thousands of root cause analyses.

In this webinar, he discusses cases with more obvious roots at the surface, as well as the more neglected, and often completely missed, organizational troubles that can haunt reliability efforts. He pulls real examples to give attendees some areas to focus on and organizational issues to be aware of as part of their reliability journey.

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