The Lies Reliability & Maintenance Professionals Tell

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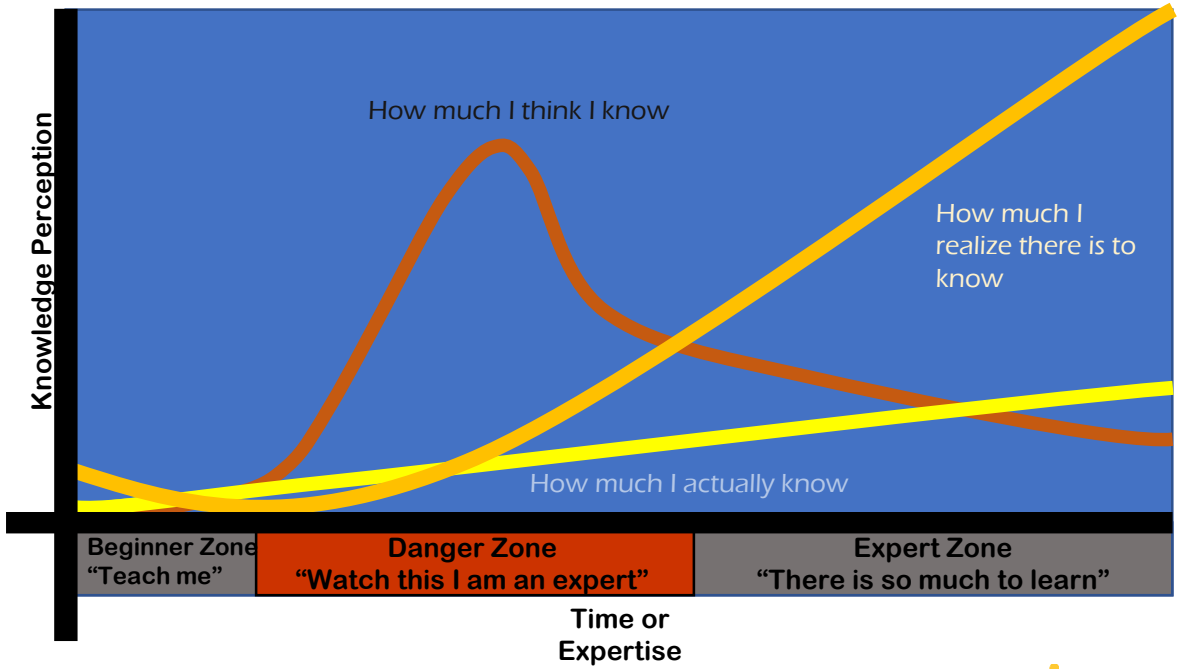
- **Shon** specializes in Business Process Management, Adult Education, Strategic Planning, Organizational Change Management, Leadership, and Reliability Engineering and has lead improvement initiatives for industries such as pharmaceuticals, metals, petrochemical, paper, and power generation, among others. Shon has been asked to speak at numerous professional conferences on these topics in the US as well as Europe, South America, and the Middle East.
- Shon is currently serving as the Past Chairman of the National Board and past Director of Education for the Society of Maintenance and Reliability Professionals and is a past committee vice chairman in the area of benchmarking. Shon also serves on the boards of other global asset management organizations including GFMAM and WPIAM. Shon is a Certified Maintenance and Reliability Professional (CMRP) and Certified Asset Management Assessor (CAMA), and has been certified by Prosci and Colorado State University as a Change Management Professional.

Title: The Lies Reliability & Maintenance Professionals Tell

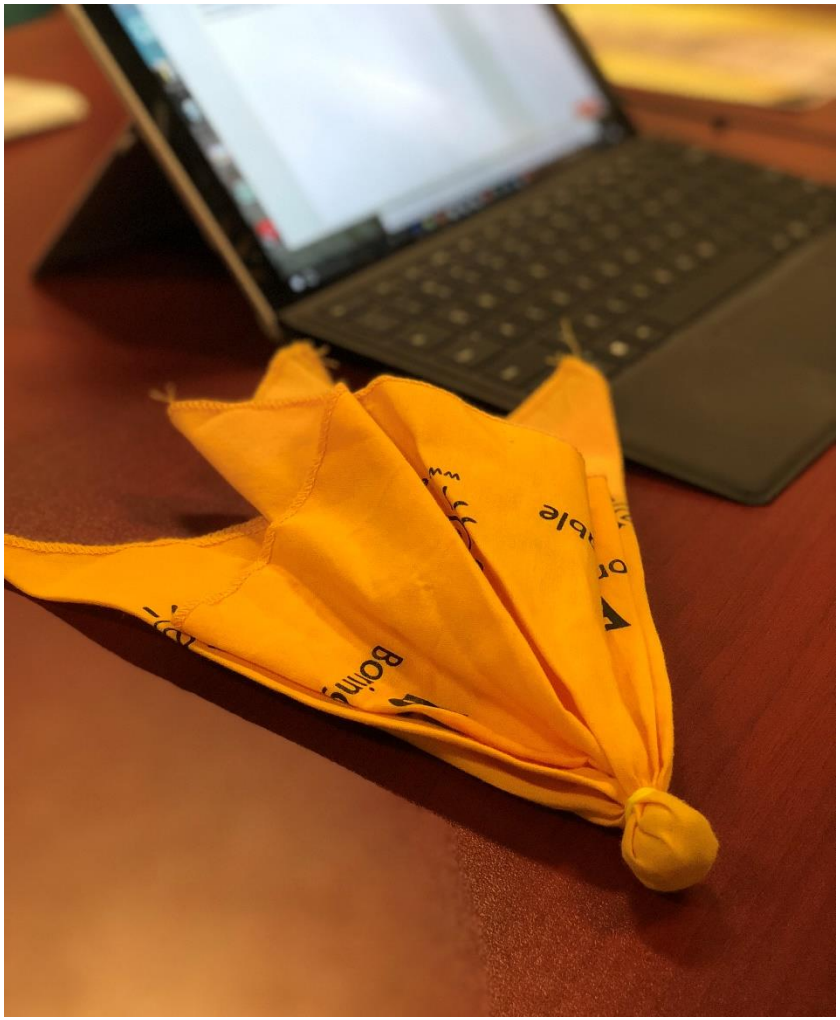
- Summary (50 words): In this session we will look at the lies, fabrications, and confusions of Reliability & Maintenance. In this fun and nerdy session we will talk about many of the common models and tools and what is just not quite right about the way they has been explained.

- Abstract (250 words):
- Let's take a fun look at the tenets of reliability and where they get a little messy. We will help the attendees better understand these concepts and where confusion can and has crept in. This will be a great session for those of you studying for an exam or just wanting to geek out a little. You will leave the session with new knowledge, interesting facts, and explainable models that you can take back to your facility and share.
- We will look at:
- Turbo Implementations?
- The criticality of criticality (both of them)
- Something funny about the P-F interval
- The funky failure curves of Reliability Centered Maintenance
- Why Root Cause Analysis is a lie
- And the fact that predictive tools can't predict
- Bring your own confusions and a willingness to participate in the dialogue as we break each of these down and toss out a few lies.

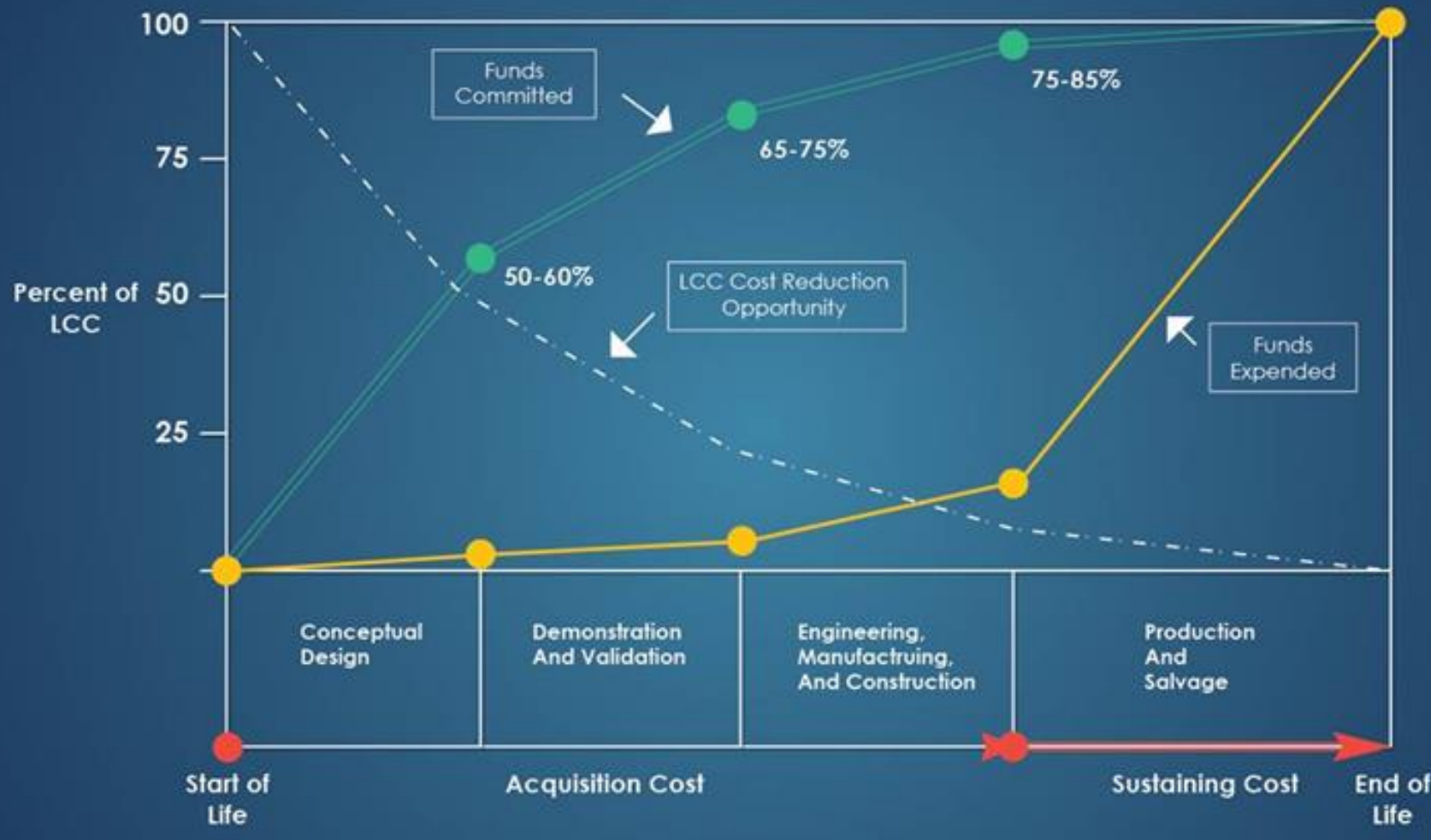
Expectations of Learning: Knowledge Perception Curve



Turbo Implementations?



LIFE CYCLE SPAN



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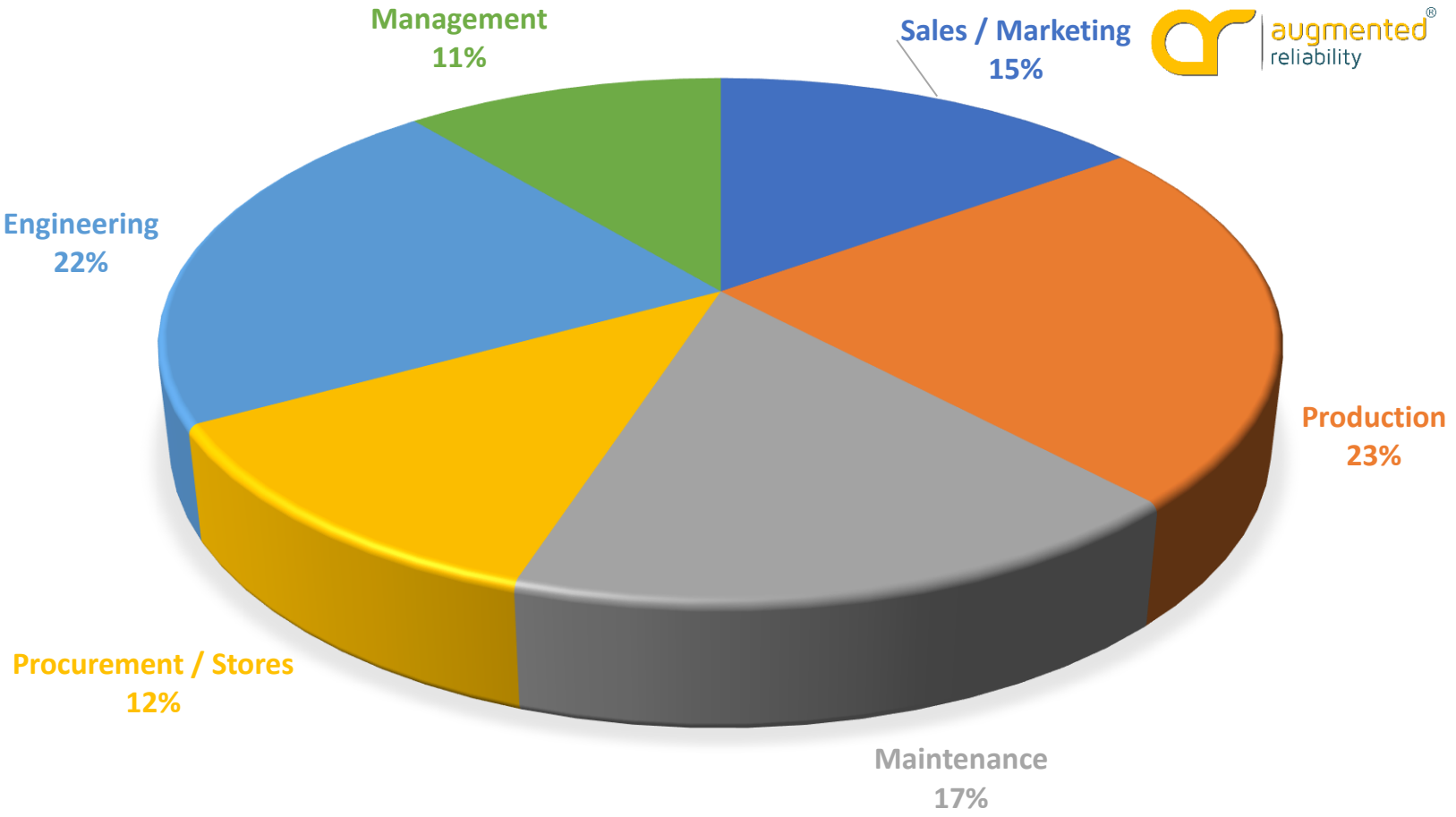
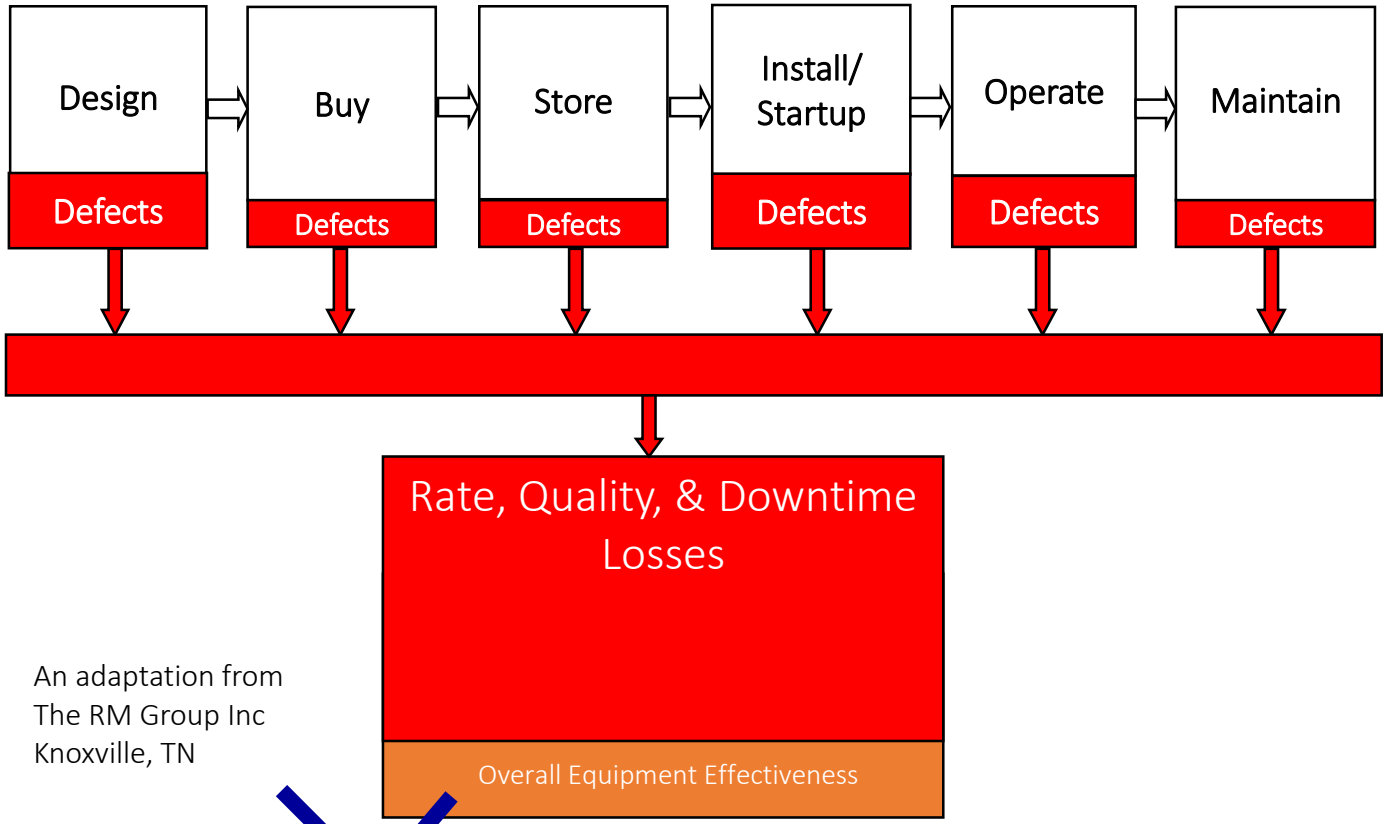
Where Do Defects Come From?

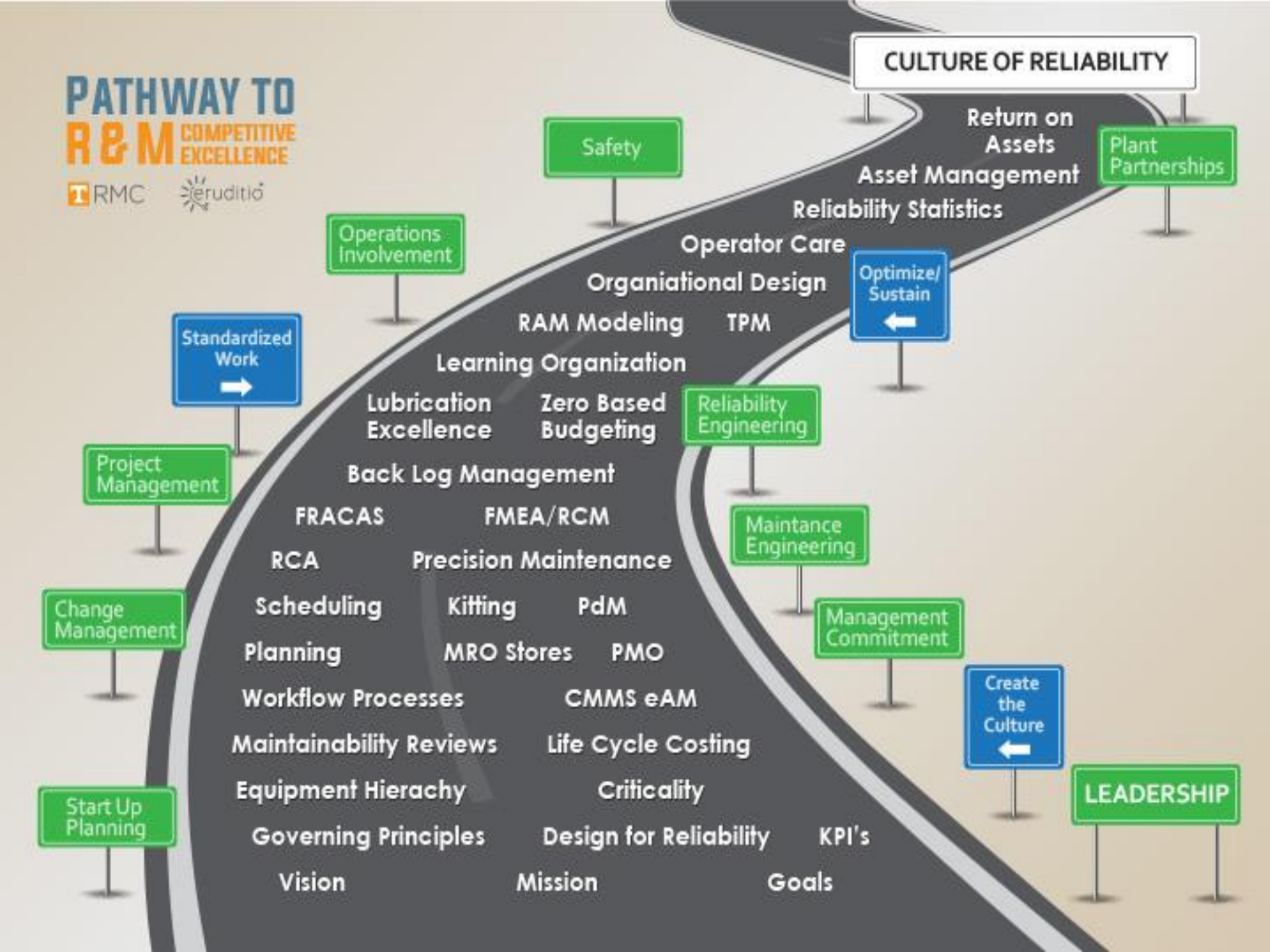


Eliminating Defects to Reduce the Unit Cost of Production



An adaptation from
The RM Group Inc
Knoxville, TN

OEE + ~~Defects~~ = Minimum Unit Cost of Production


PATHWAY TO
R&M COMPETITIVE EXCELLENCE
RMC
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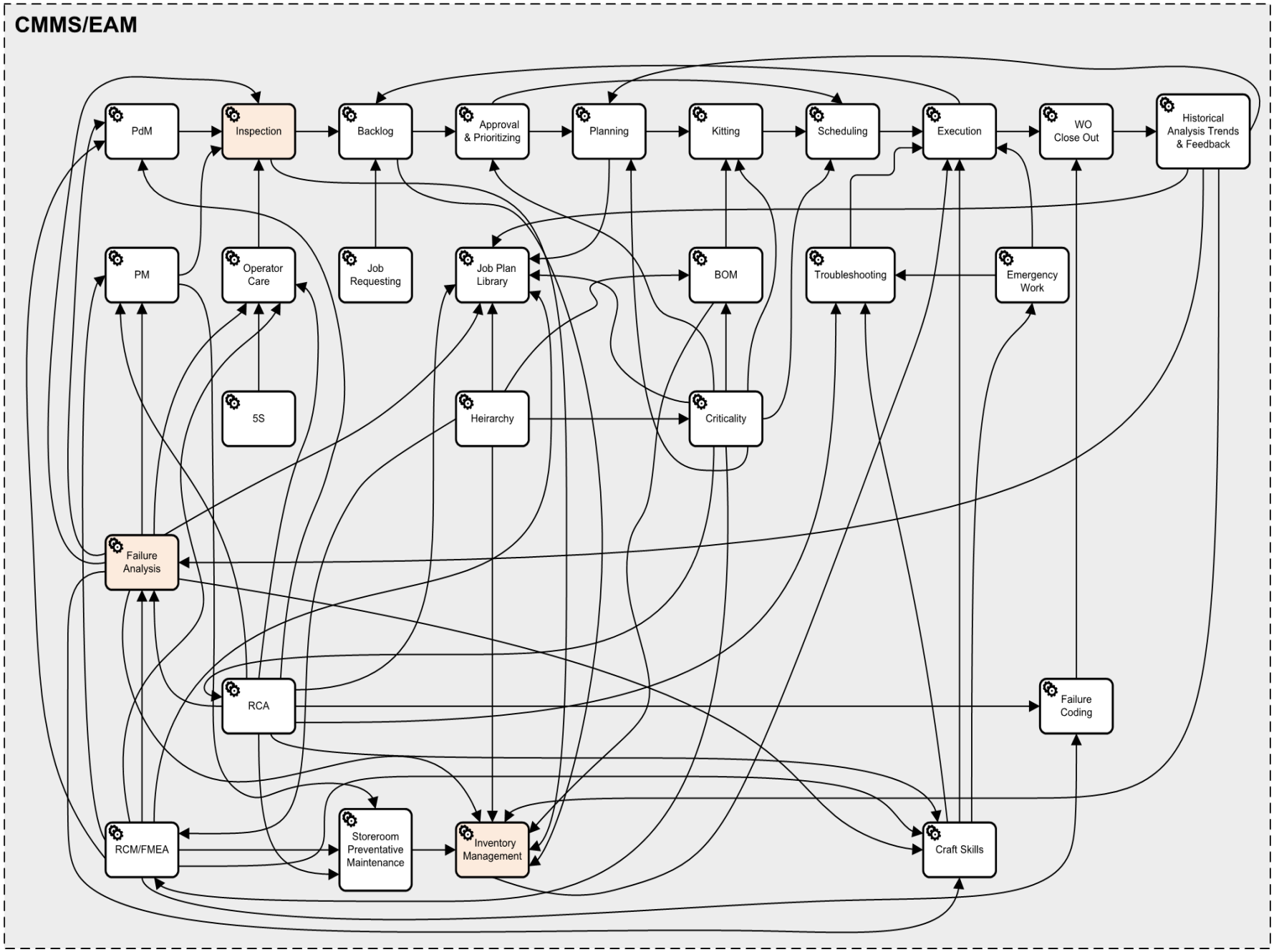
CULTURE OF RELIABILITY
Return on Assets
Asset Management
Reliability Statistics
Operator Care
Organiational Design
RAM Modeling
TPM
Learning Organization
Lubrication Excellence
Zero Based Budgeting
Back Log Management
FRACAS
FMEA/RCM
RCA
Precision Maintenance
Scheduling
Kitting
PdM
Planning
MRO Stores
PMO
Workflow Processes
CMMS eAM
Maintainability Reviews
Life Cycle Costing
Equipment Hierachy
Criticality
Governing Principles
Design for Reliability
KPI's
Vision
Mission
Goals
Safety
Plant Partnerships
Operations Involvement
Optimize/ Sustain
Standardized Work
Reliability Engineering
Project Management
Maintance Engineering
Change Management
Management Commitment
Create the Culture
Start Up Planning
LEADERSHIP

Web of Reliability



Business Process Mapping

Start/End

Step

Decision

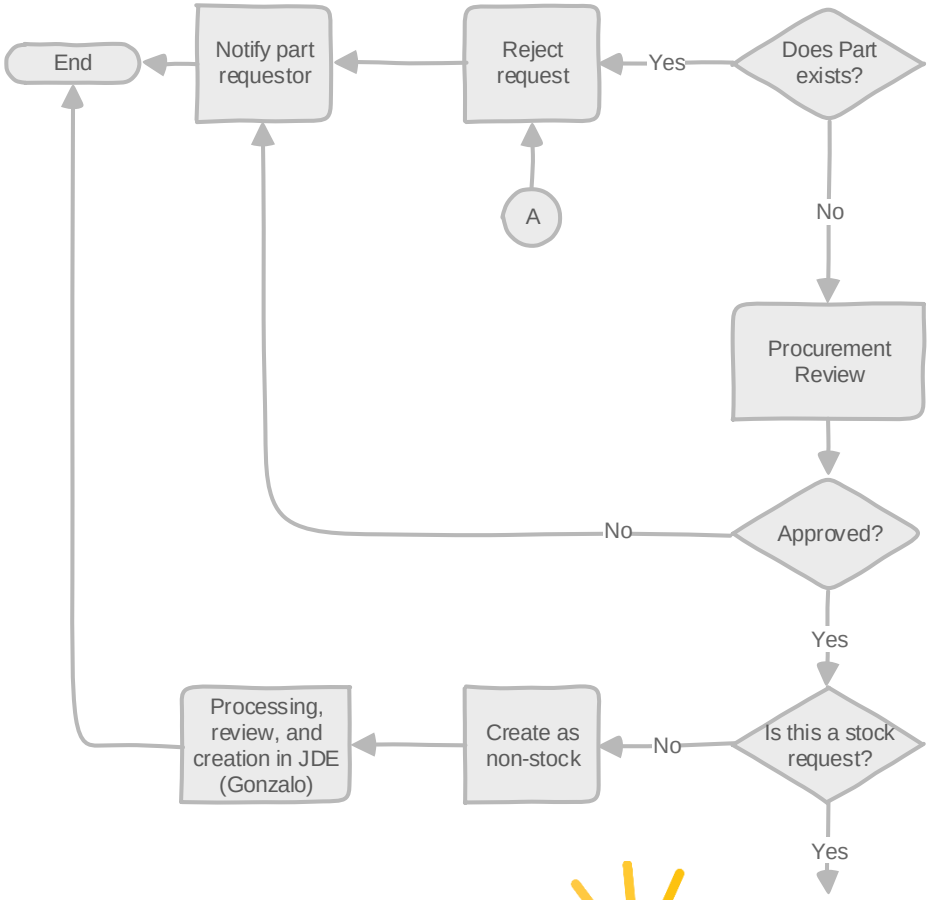
Setup/ Prep

Document

Database

Continues

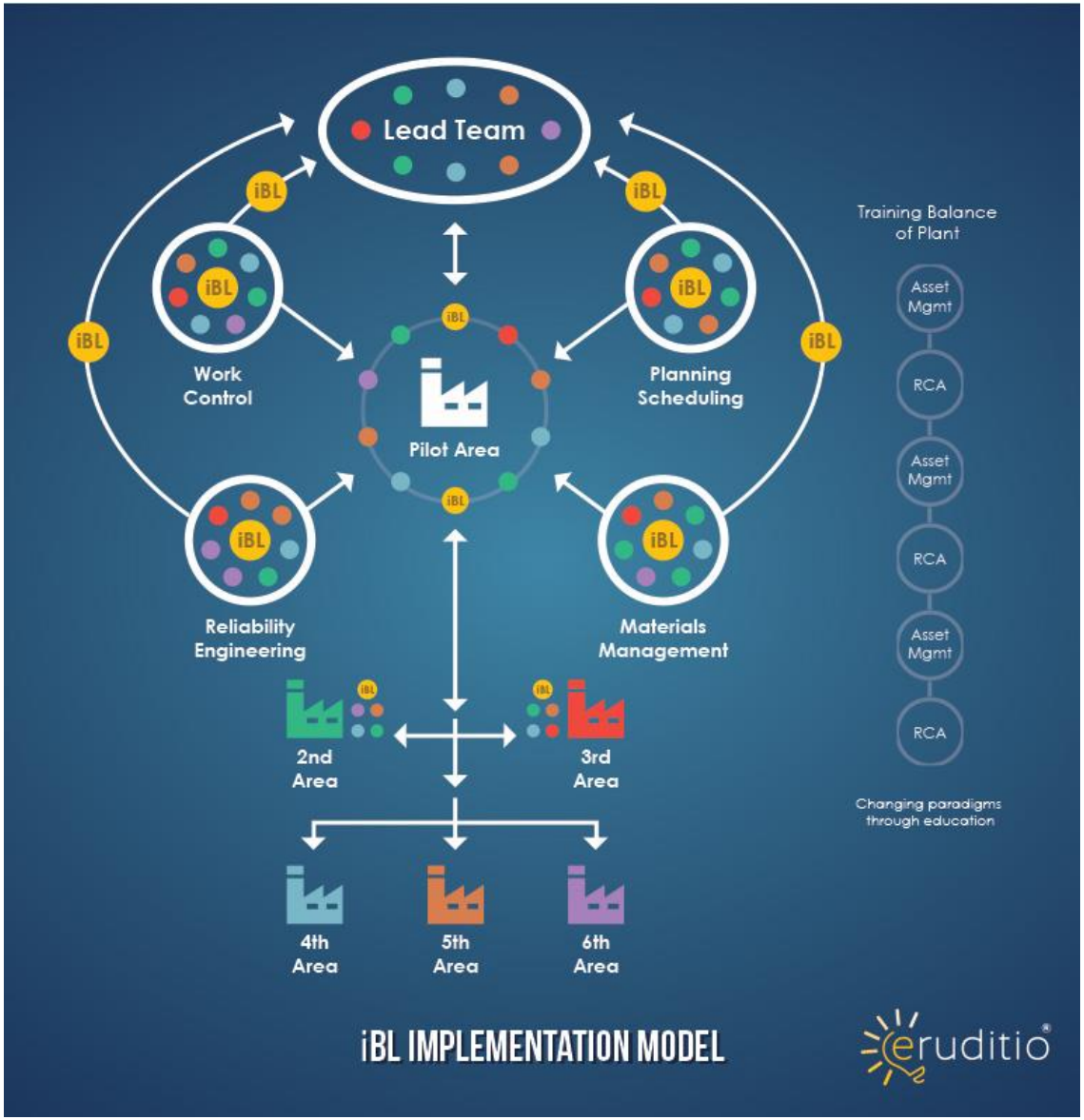
Delay



Tasks	Maint Supervisors	Maint Planner	Maint Technician	Maint Mgr	Reliability Engineer	Production Manager

Responsibility	"the Doer"
Accountable	"the Buck stops here
Consulted	"in the Loop"
Informed	"kept in the picture"

Implementation Model



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Change Management

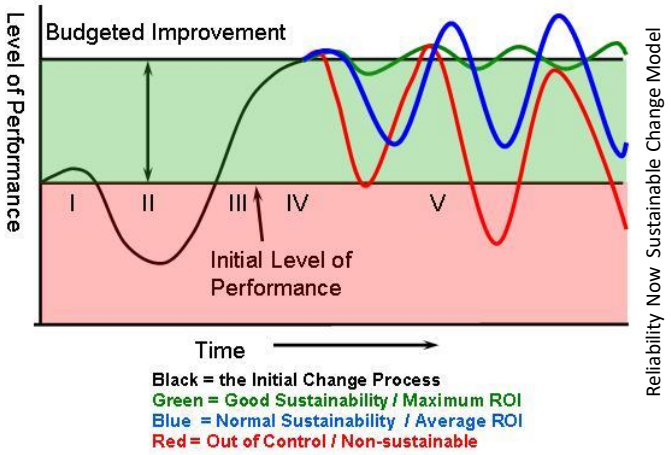
Topic Description

All changes are hard for the organization to make and sustain. You must have leadership, a process, and a few very important tools.

Why You Should Care

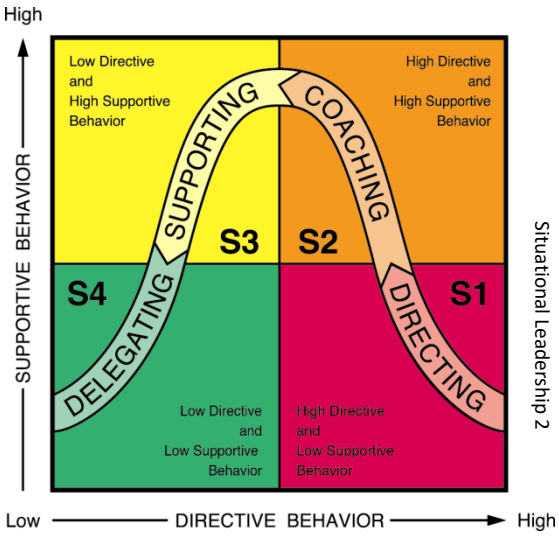
Until you change the behavior and sustain the new culture, you can not attain your return on investment.

Sustainability of Your Change
Figure 1

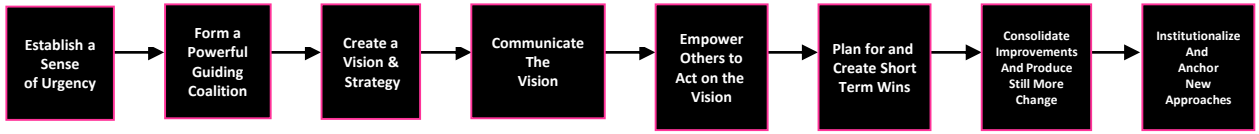


Key Facts

- Soft stuff is the hard stuff!
- Risk and communication plan as part of your project plan, which is connected to the site master plan
- Leadership styles change through the project
- Metrics should link to behavioral change and should not be permanent



Kotter Organizational Change Model



ADKAR Model for Individual Change

- Awareness
- Desire
- Knowledge
- Ability
- Reinforcement

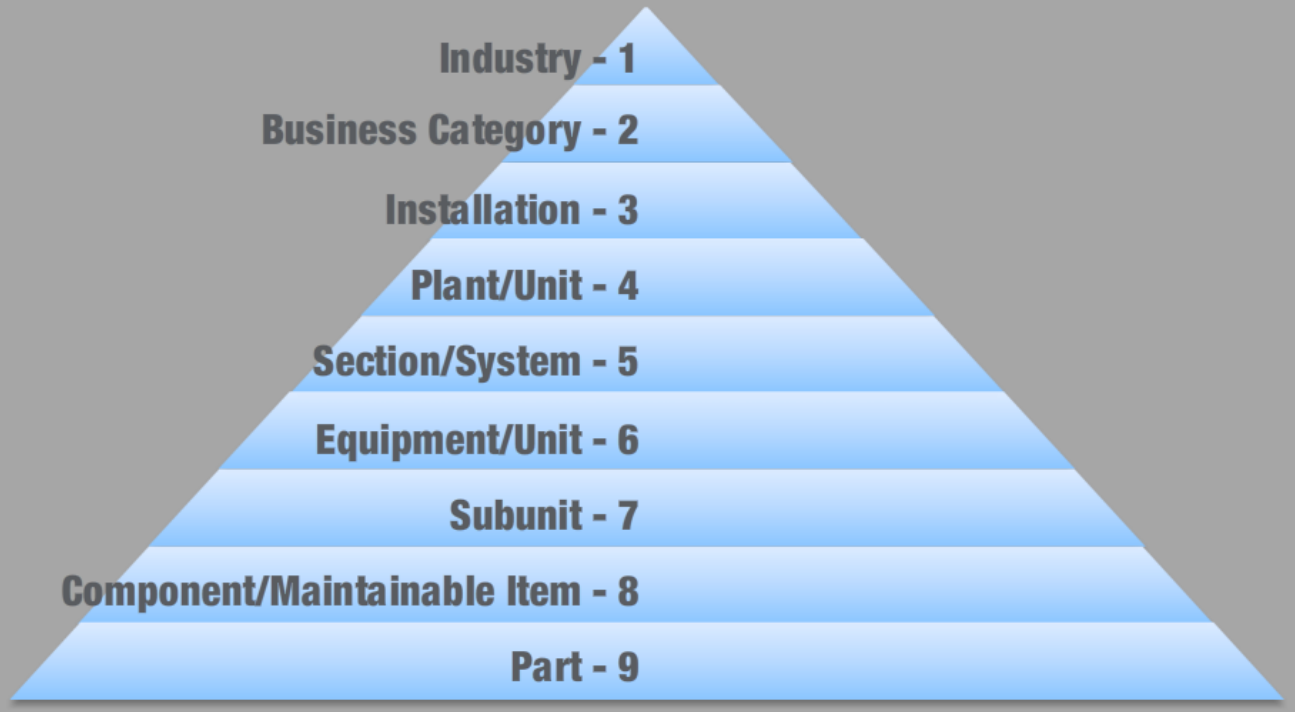
Sources

ADKAR by Jeffrey Hiatt
Situational Leadership 2 Ken Blanchard
Leading Change John Kotter
ReliabilityNow.com

The criticality of criticality (both of them)

- There are two… They are not the same. They should really never even meet.

ISO 14224 - Asset Hierarchical Structure



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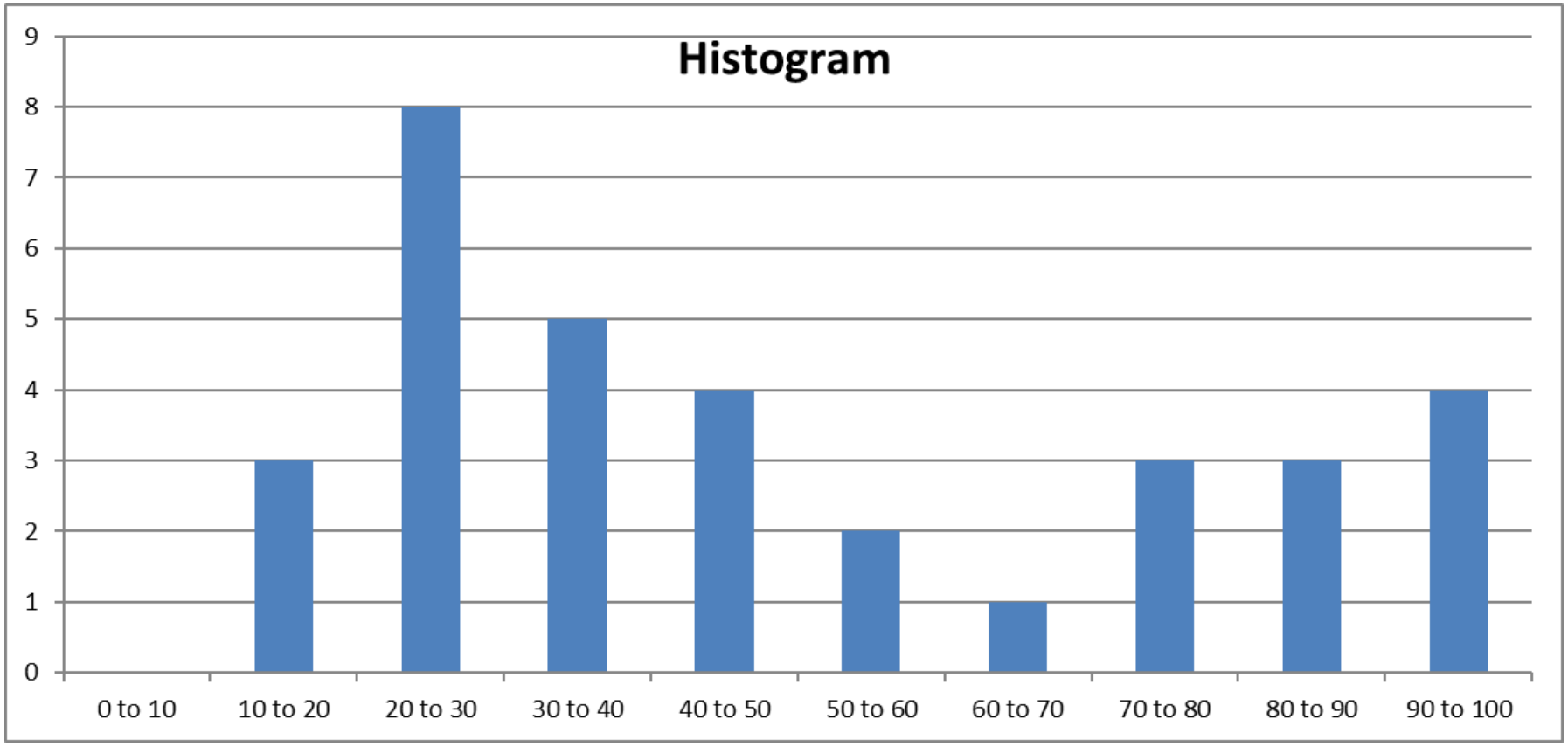
Asset Criticality

		Operations	Safety			Environment		Design	Maintenance		MRO	
Asset Number	Asset Description	Operational Severity	Personal Injury	Fire/Explosion	Safety While Maint.	Air Emissions	Chemical Spills	Single Point Failure	Maintainability	Failure Rate	Spares Lead Time	Asset Criticality
B-F3P101APMP	3A Filter feed pump	100	12	0	24	0	30	40	25	20	0	251
B-F3P101A	3A filter feed piping	100	12	0	24	0	30	40	50	20	0	276
B-F3P101BPMP	3B filter feed pump	20	12	0	24	0	30	40	25	20	0	171

Impact of Occurrence										Severity of Occurrence
		Financial Risks			*Image Risks*	*Reliability, Availability, Maintainability Risks*				
Customer	Capacity	PM	Cost CM	RAV	EH&S	MTBF	Planned Utilization Rate	Single-point Failure	Spares Lead-time	
10	10	10	10	10	10	10	10	10	10	Catastrophic
9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	
9	9	9	9	9	9	9	9	9	9	
8	8	8	8	8	8	8	8	8	8	
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	Major
7	7	7	7	7	7	7	7	7	7	
6	6	6	6	6	6	6	6	6	6	
5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
5	5	5	5	5	5	5	5	5	5	Minor
4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
3	3	3	3	3	3	3	3	3	3	
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	Insignificant
2	2	2	2	2	2	2	2	2	2	
1	1	1	1	1	1	1	1	1	1	
0	0	0	0	0	0	0	0	0	0	

Asset Criticality



Failure Mode Effect Criticality Analysis

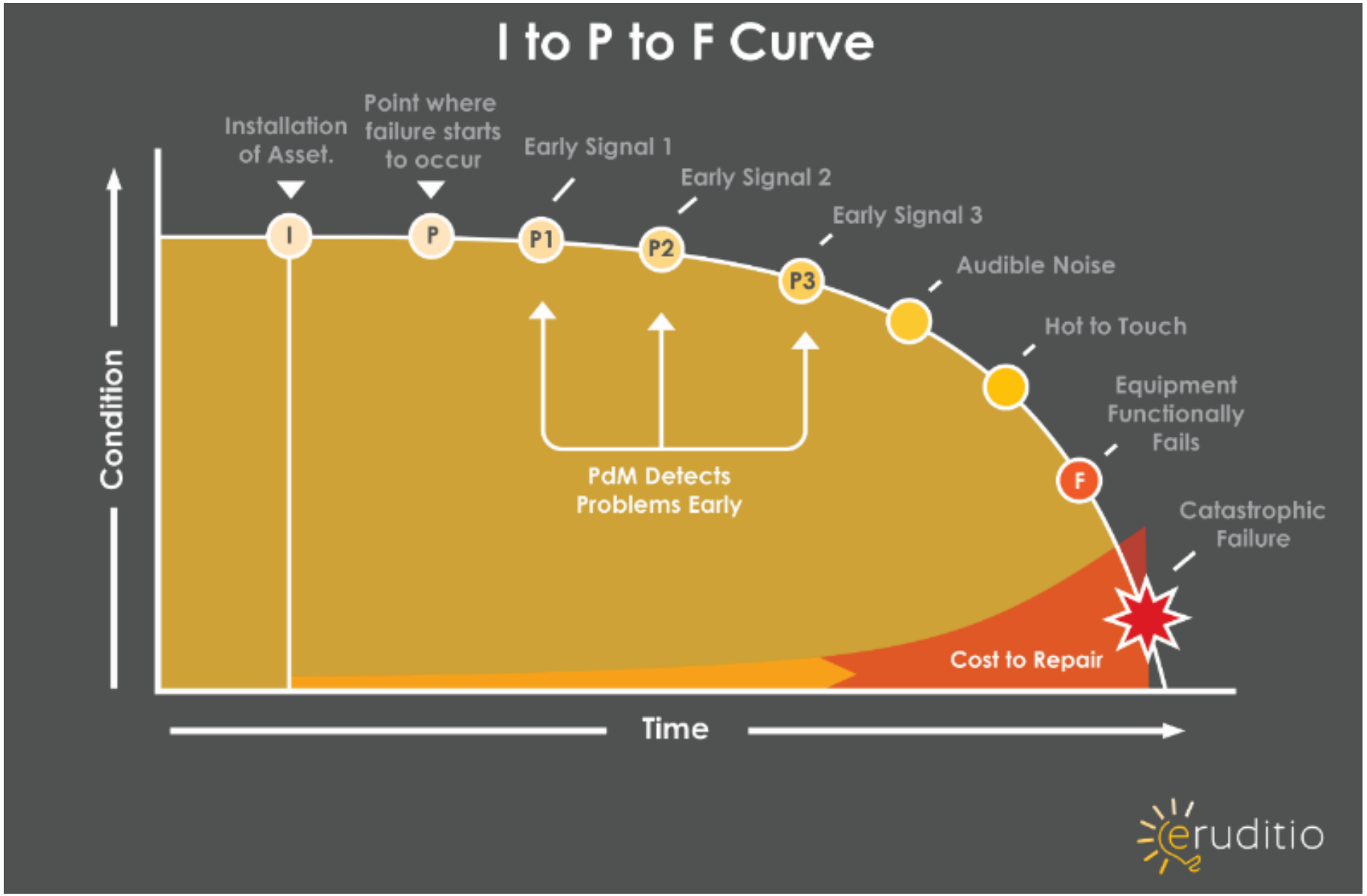
FAILURE MODE AND EFFECTS ANALYSIS

Item:	Drill Hole	Responsibility:	J. Doe	FMEA number:	123456
Model:	Current	Prepared by:	J. Doe	Page :	1 of 1
Core Team:	J. Doe (Engineering), J. Smith (Production), B. Jones (Quality)			FMEA Date (Orig):	2008-01-01 Rev: 1

Process Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls	Detec	RPN	Recommended Action(s)	Responsibility and Target Completion Date	Action Results				
												Actions Taken	Sev	Occ	Det	RPN
Drill Blind Hole	Hole too deep	Break through bottom of plate	7		Improper machine set up	3	Operator training and instructions	3	63							0
	Hole not deep enough	Incomplete thread form	5		Improper machine set up	3	Operator training and instructions	3	45							0
			5		Broken Drill	5	None	9	225	Install Tool Detectors	J. Doe	2008-03-01	5	5	1	25
									0							0
									0							0

Something funny about the P-F interval

- It is failure mode specific
- It is not predictable with a limited data set
- It is not based on probability


I to P to F Curve
Installation of Asset.
Point where failure starts to occur
Early Signal 1
Early Signal 2
Early Signal 3
Audible Noise
Hot to Touch
Equipment Functionally Fails
Catastrophic Failure
I
P
P1
P2
P3
F
PdM Detects Problems Early
Cost to Repair
Condition
Time
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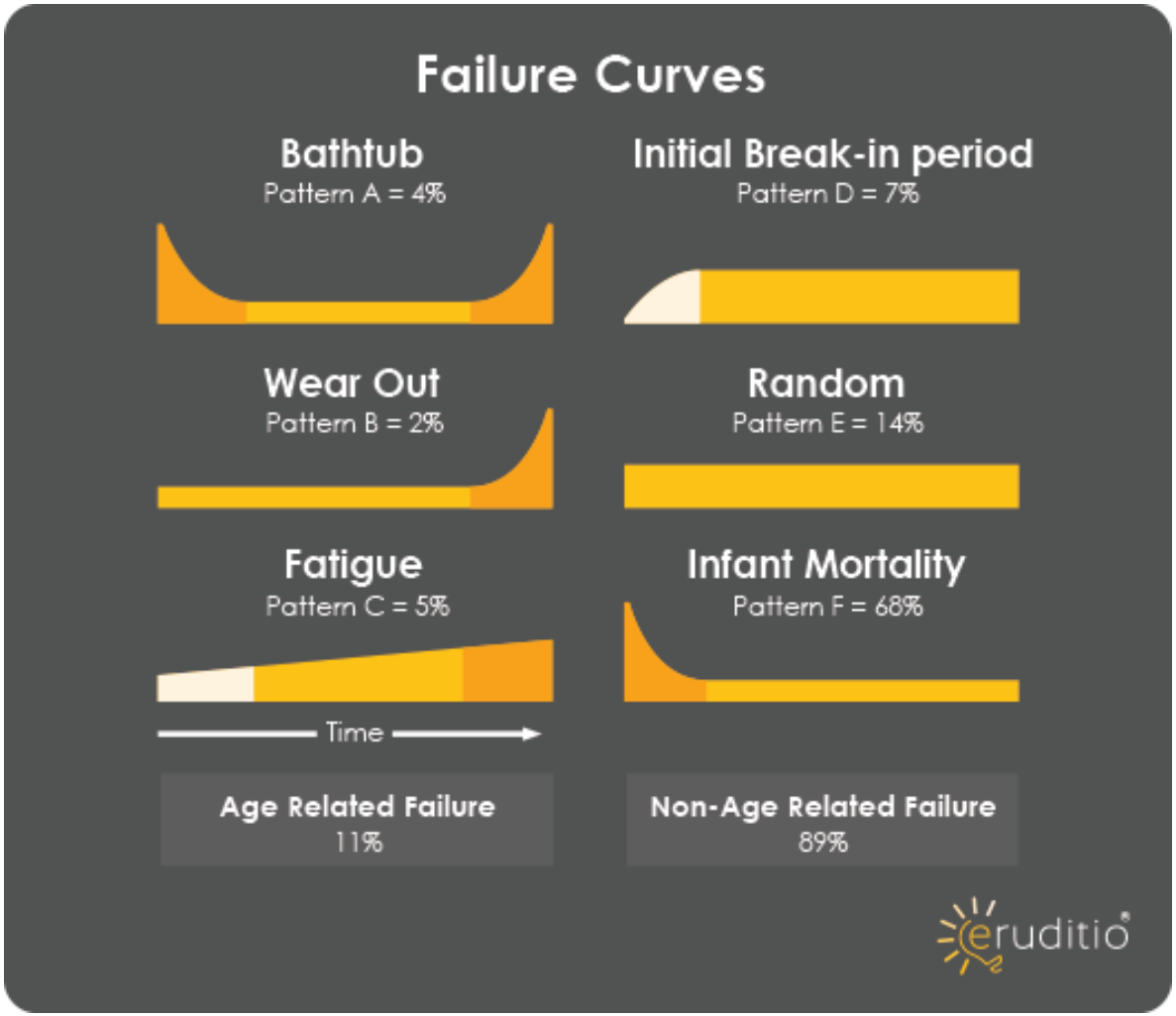
Failure Curves
Bathtub
Pattern A = 4%
Initial Break-in period
Pattern D = 7%
Wear Out
Pattern B = 2%
Random
Pattern E = 14%
Fatigue
Pattern C = 5%
Infant Mortality
Pattern F = 68%
Time
Age Related Failure
11%
Non-Age Related Failure
89%
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Why Root Cause Analysis is a lie

- No such thing as Root Cause
- There is no end
- There is not one

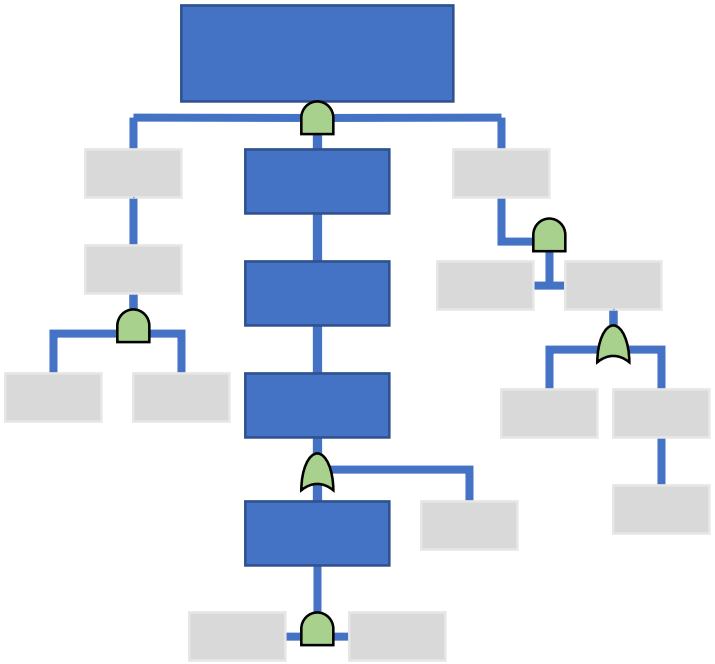
Problem Solving

Topic Description

CA is how you identify and understand the underlying causes of failures in your systems and equipment and mitigate or eliminate them.

Why You Should Care

Without Root Cause Analysis, you will face the same losses and problems repetitively.



Key Facts

- Get past the physical and human roots
- Action and Condition
- Solve for maximum return on investment
- No such thing as root cause
- Nothing saved until solution implemented and verified
- Must have a process
- Many tools that cover time, tree, transparency

And

Or

Transitional CA

Five Why

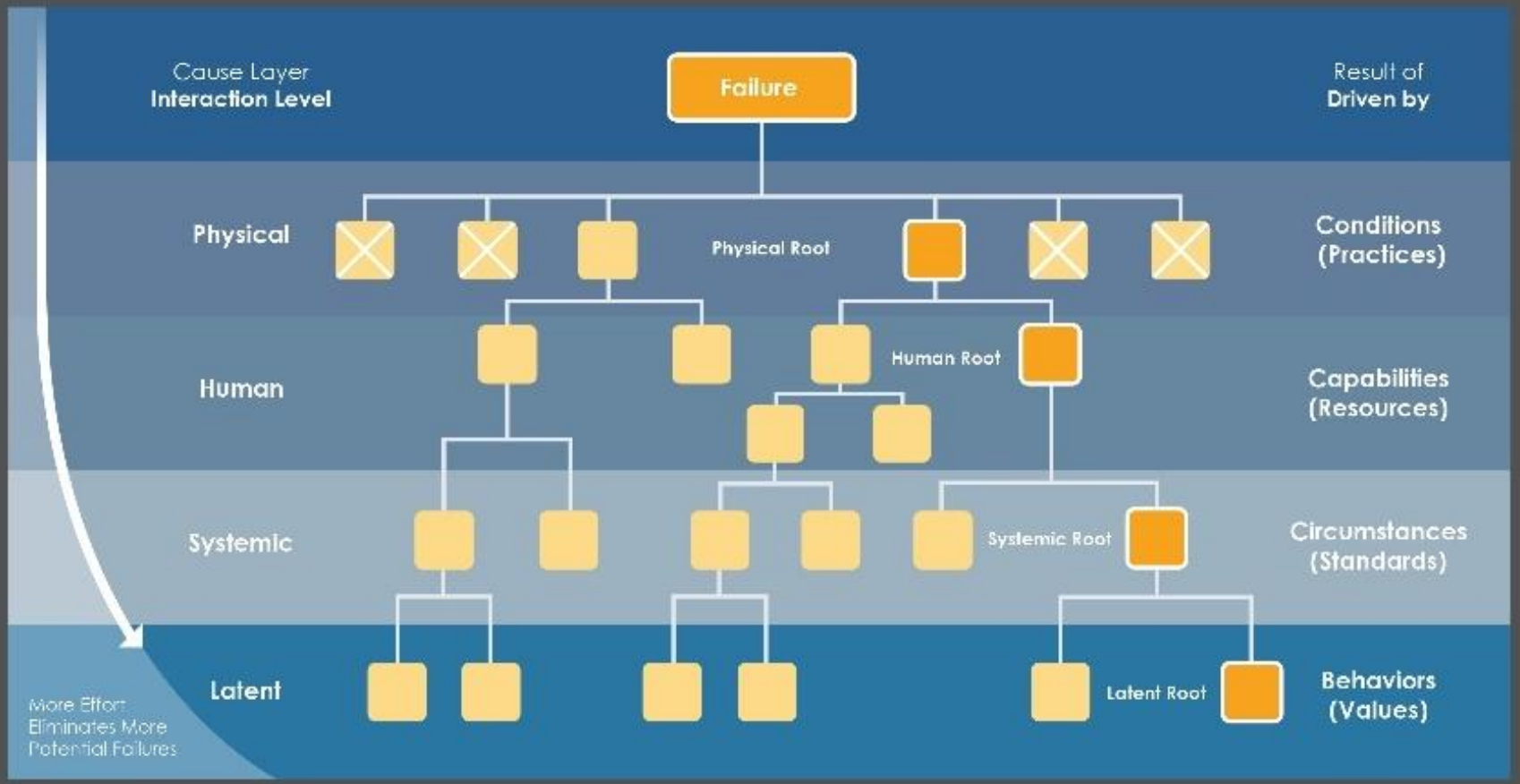
Fault Tree

Logic Tree

Sources

ReliabilityNow.com
T3 Methods Guide Shon Isenhour

Root Cause Analysis



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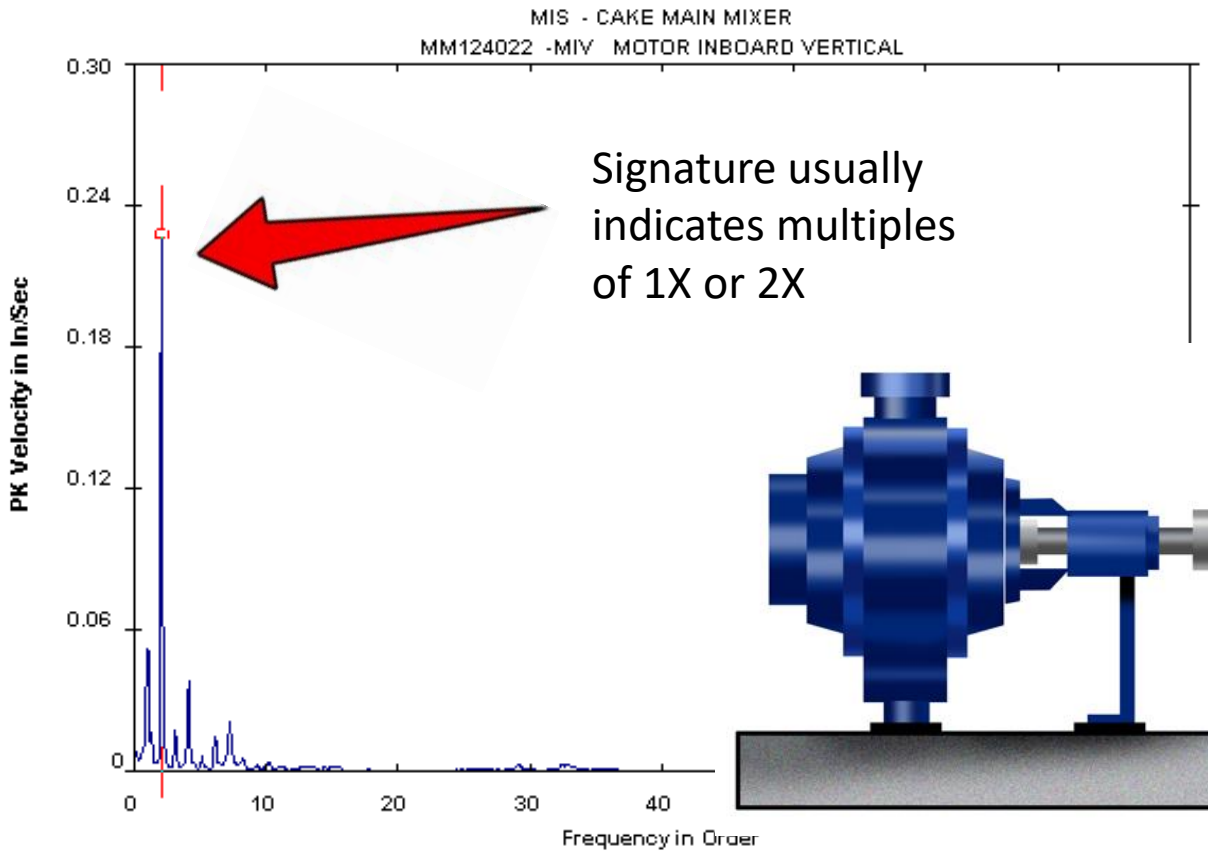
Predictive Tools

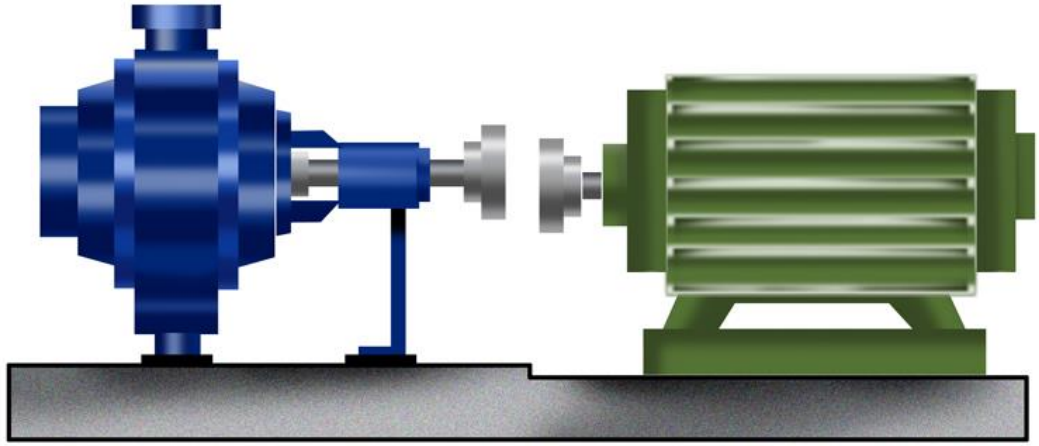
- Don’t predict they identify

- Once defect is present we start the planning and scheduling process.
- Likely two or more present

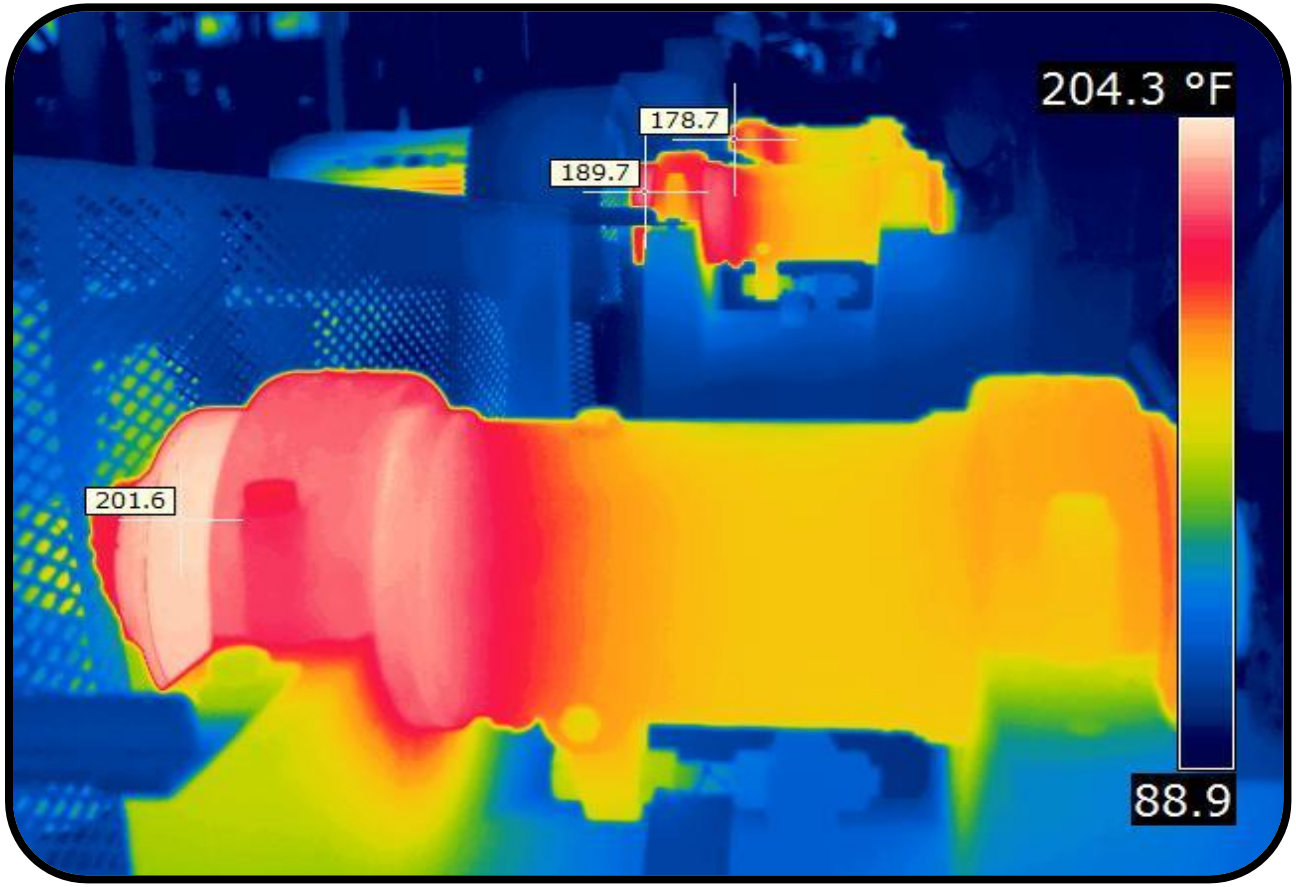
Failure Mode - Misalignment



Signature usually indicates multiples of 1X or 2X

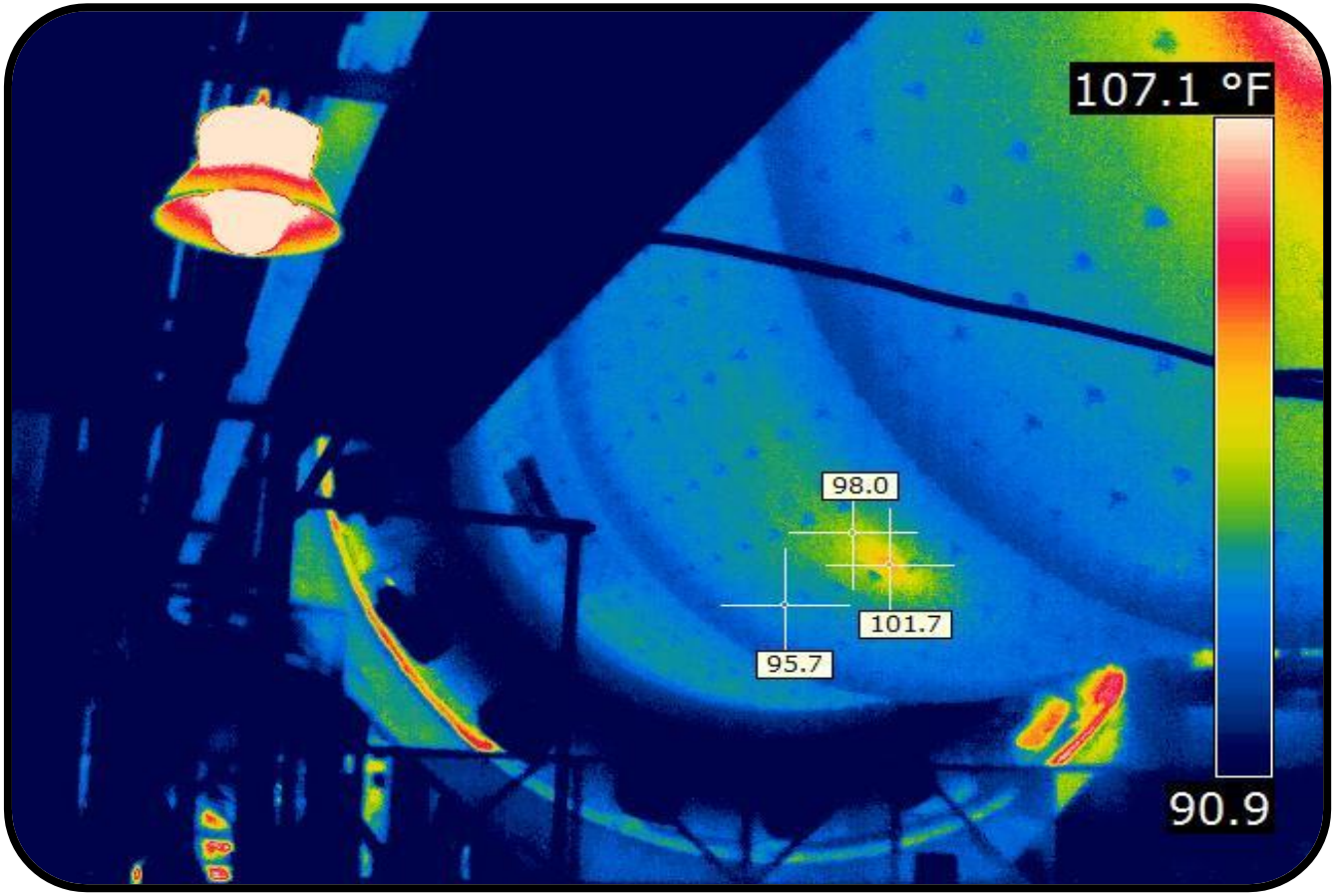


Failure Mode - Excessive Belt Tension



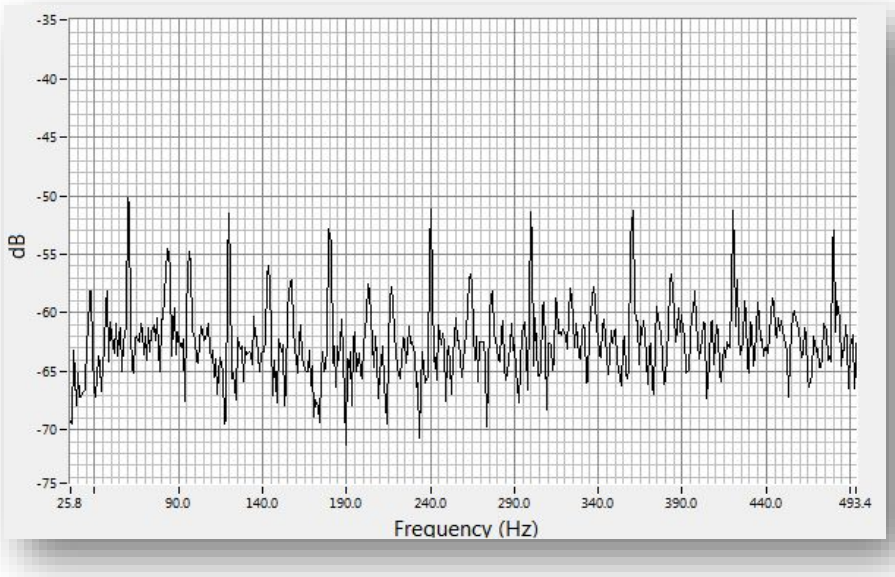
Failure Mode - Loose Connection

Failure Mode - Worn Liner



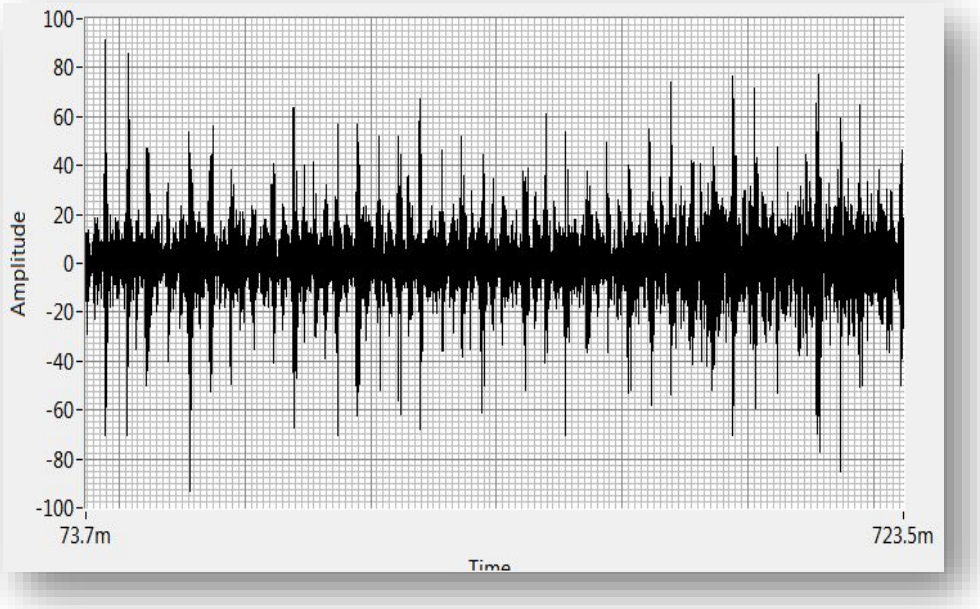
Electrical Inspection

- Corona
  - Ionization of air surrounding an electrical connection greater than 1000 volts
  - By-product of ionization is nitric acid
  - Does not produce significant heat



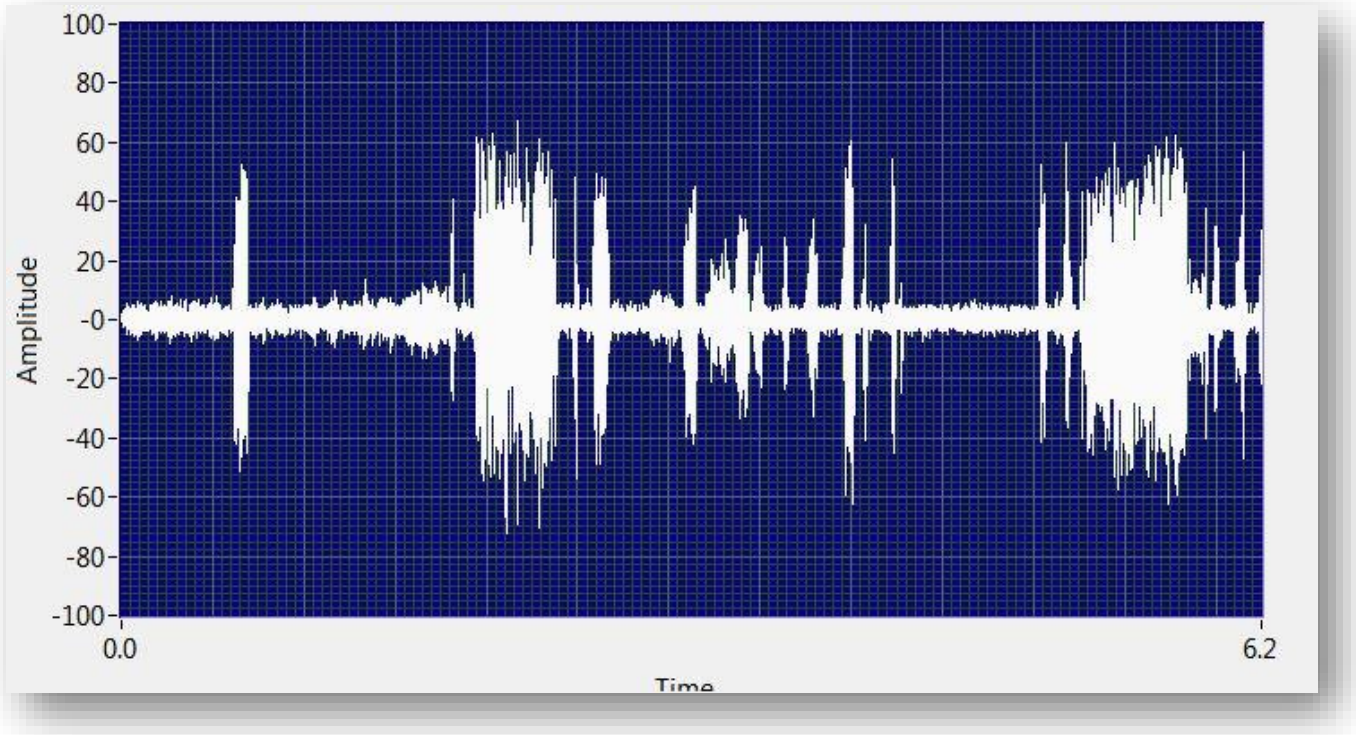
Electrical Inspection

- Tracking
  - Low current pathway to ground across an insulator
  - Can be present at any voltage



Electrical Inspection

- Arcing



Arcing Time Series

Bonus lie

- Vendor provided PMs are effective

Vendor PM Recommendations are fine

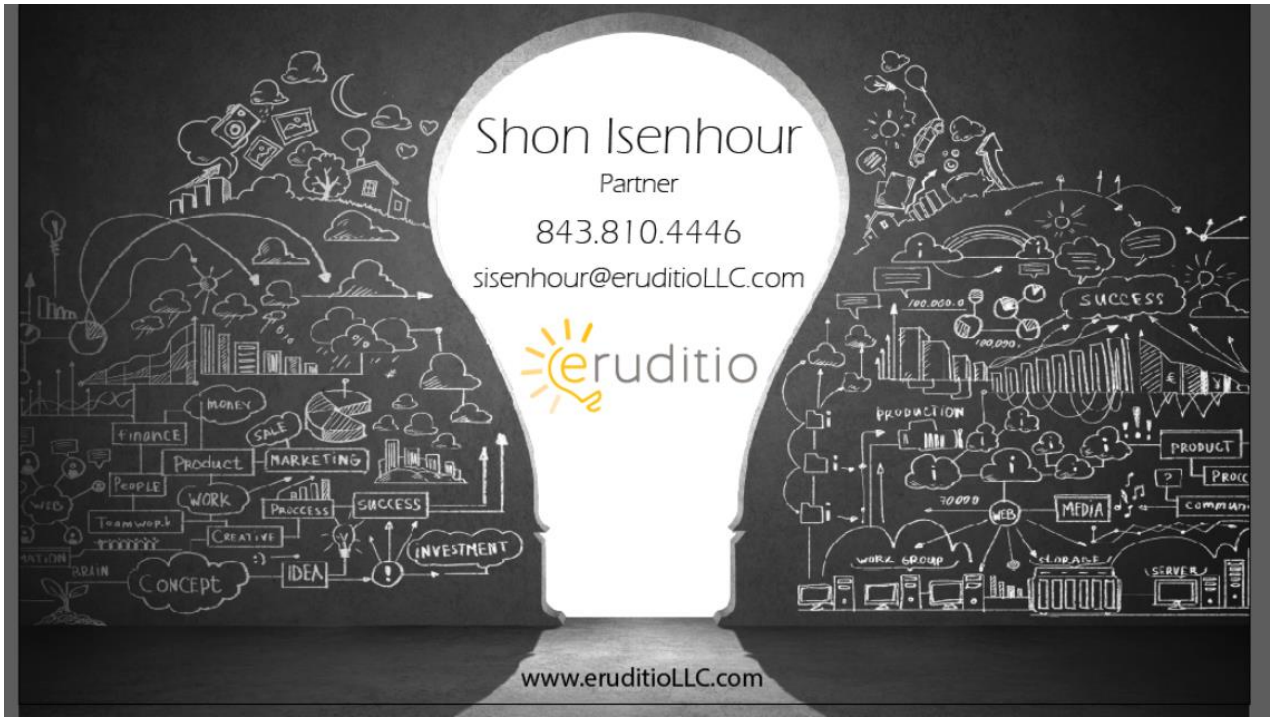
Bonus lie

- Leadership Management Hand Grenade

Leadership vs Management

- DEFINITION: Leadership is the action of leading a group of people or an organization.
- DEFINITION: Management is the process of dealing with or controlling things or people

Questions?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Thank You