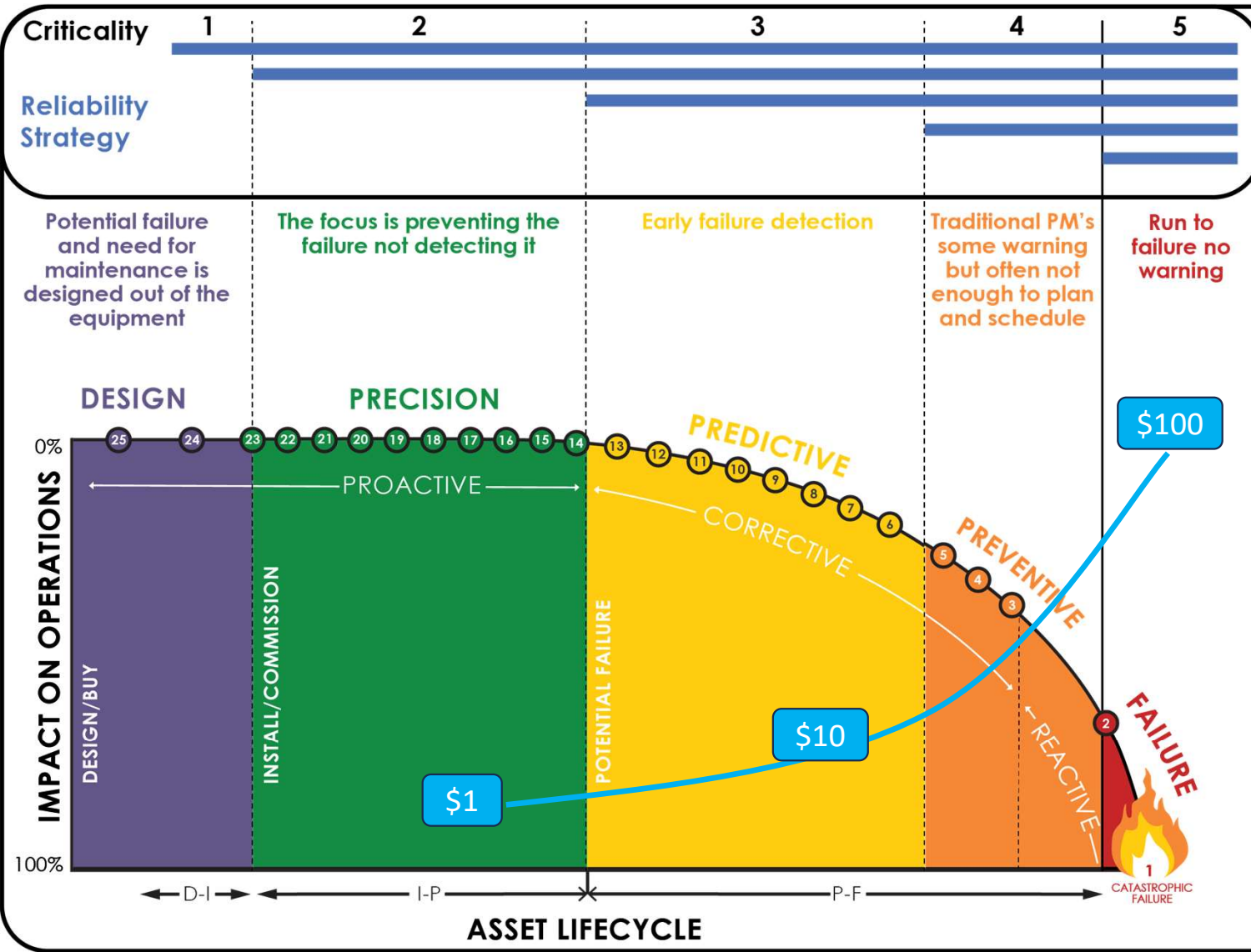




SIMON MURRAY
COACH | TRAINER | SPEAKER | MENTOR

Exploring The DIPF Curve



DESIGN/BUY

- 25 Design for Reliability (DFR)
- 24 Purchase for Lifecycle cost

PRECISION

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- 8 Infrared Imaging
- 7 Non Destructive Testing
- 6 Motion Amplification

PREVENTIVE

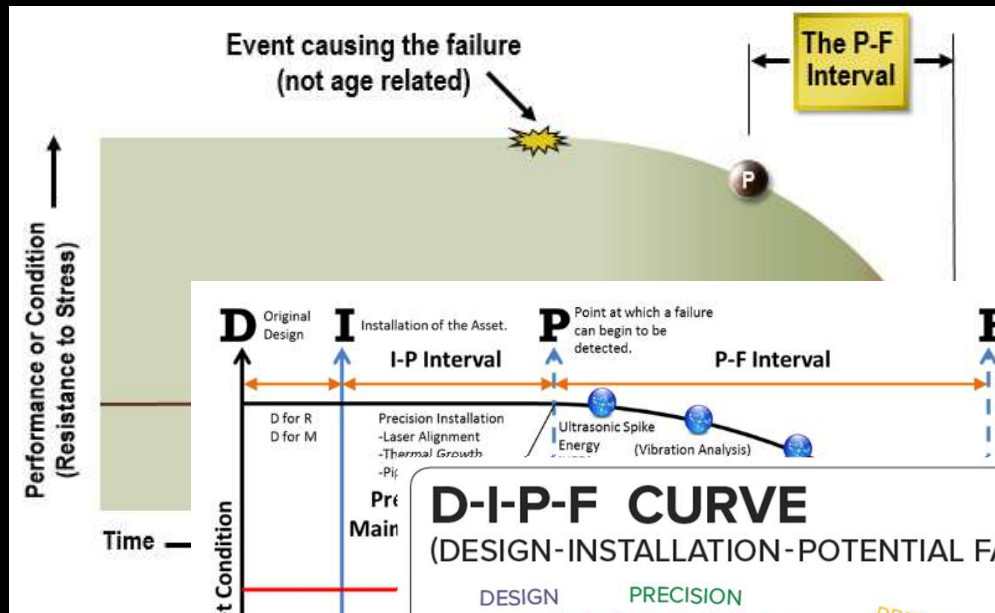
- 5 Usage Based - Adjustment and Changes
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FAILURE

- 2 Functional Failure - Machine Running
- 1 Catastrophic Failure - Machine Stopped

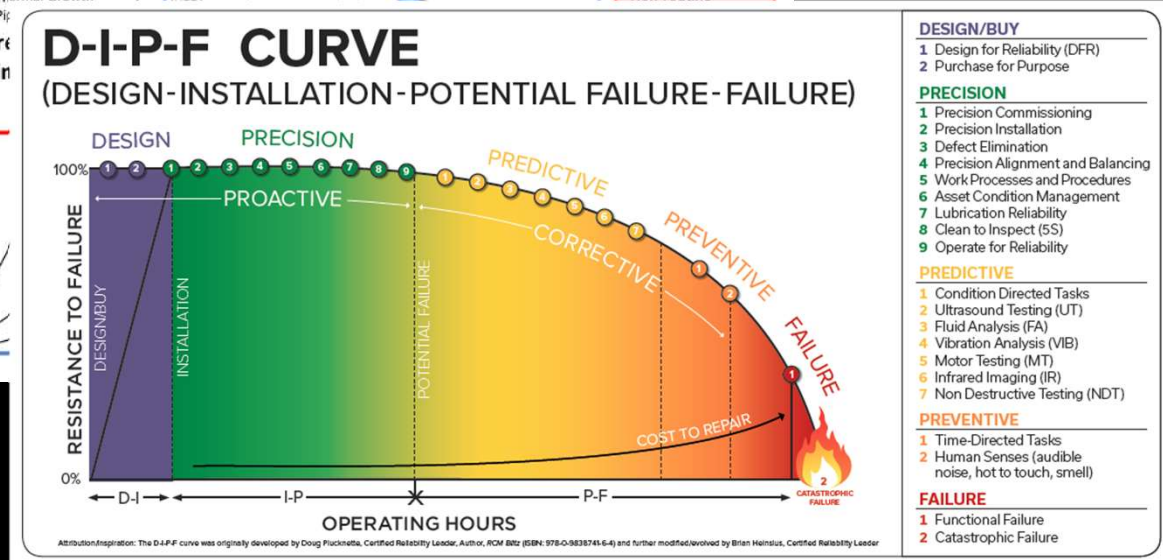


P-F CURVE v DIPF CURVE



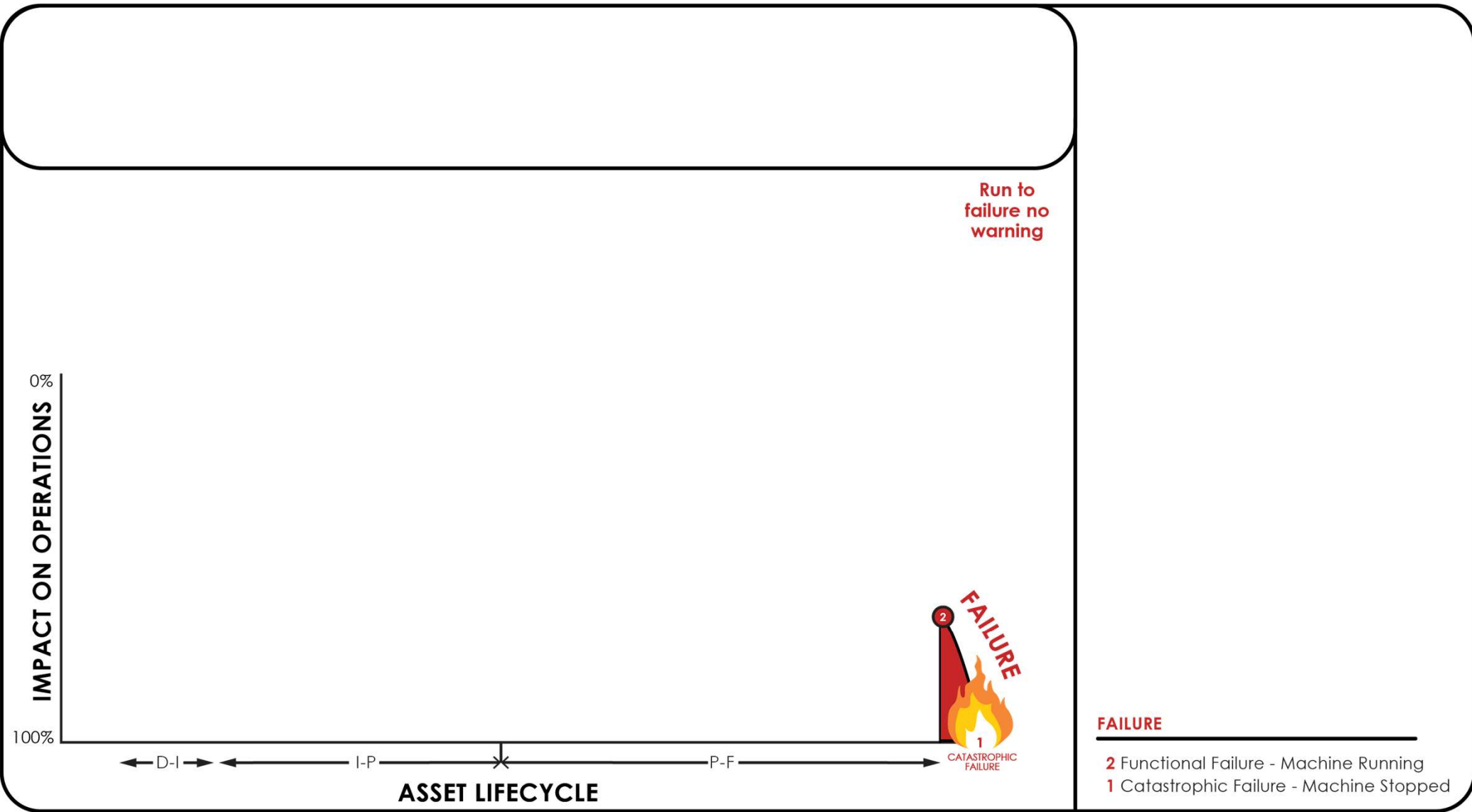
P-F Curve, Nowlan & Heap 1970's
Key message was to establish that failure was detectable before it became catastrophic.

Doug Plunkett



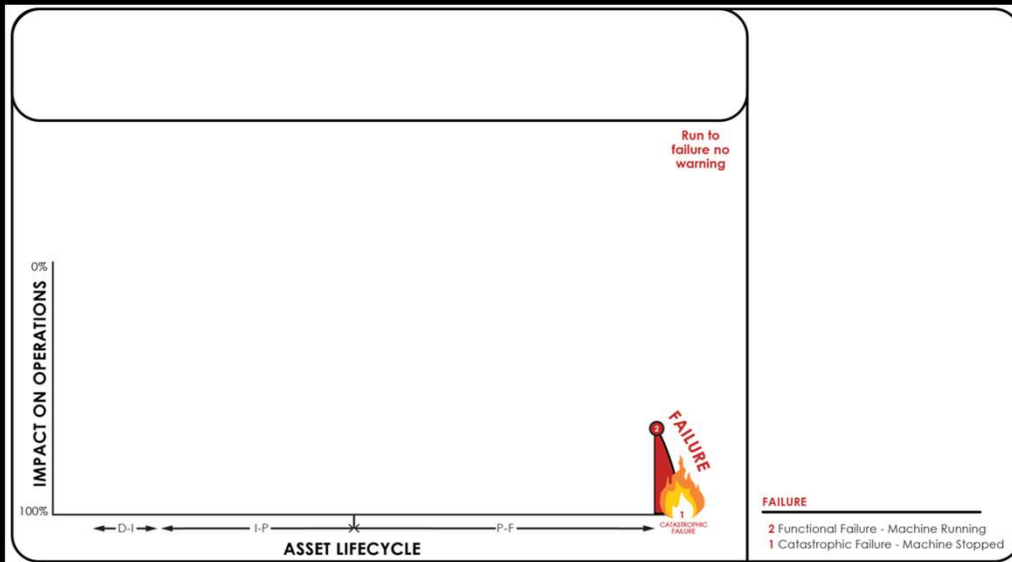
Brian Heinsius & ReliabilityWeb







FAILURE ZONE



Here work is NOT identified from a PM or operator inspection:

- Stopped
- Not running well
- Visibly broken

Somebody already know about all these issues – are they in your Maintenance Backlog?

The first goal of maintenance leadership is to prevent issues getting to this zone.

FAILURE

- 2 Functional Failure - Machine Running
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DISCUSSION



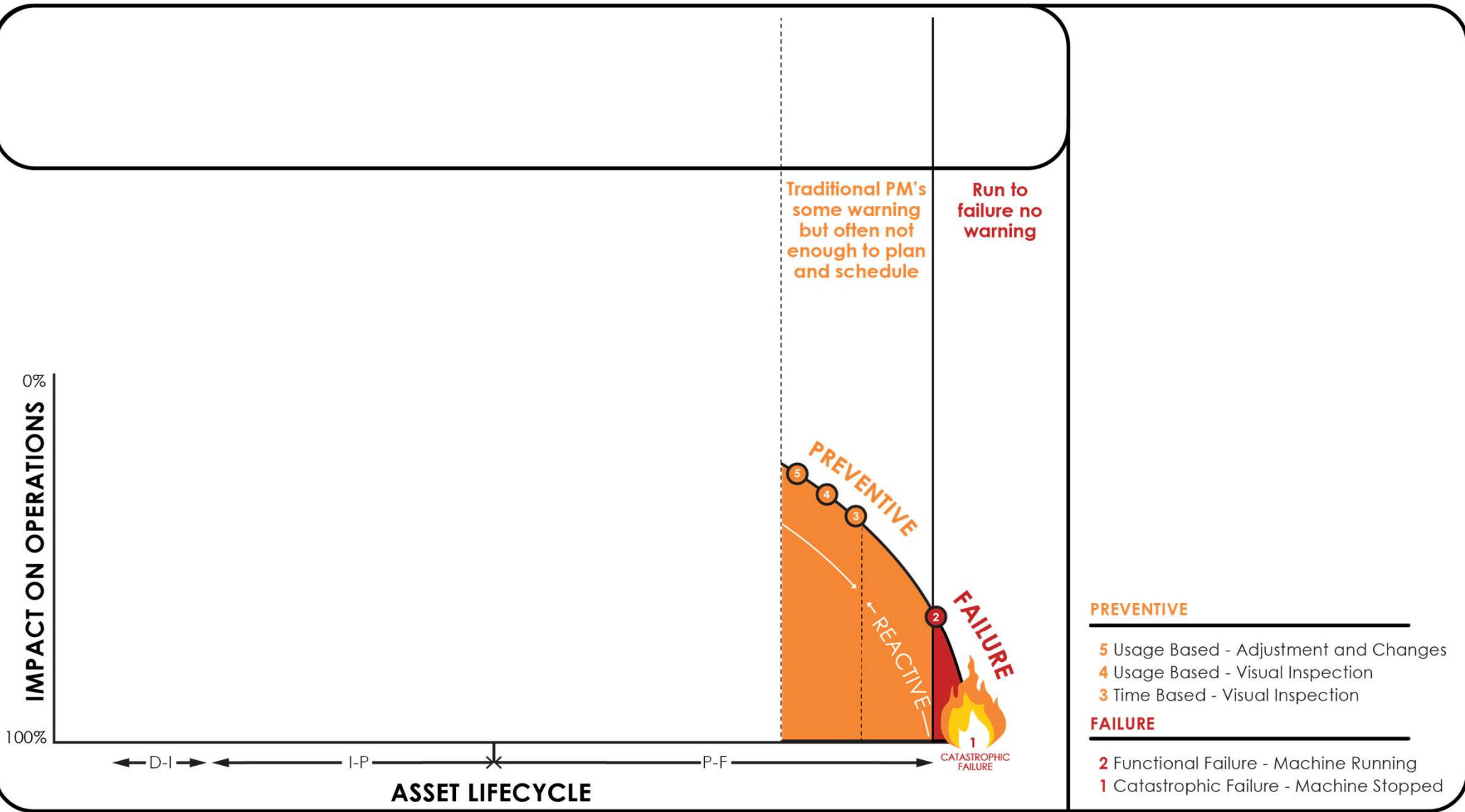
Do you have breakdowns?

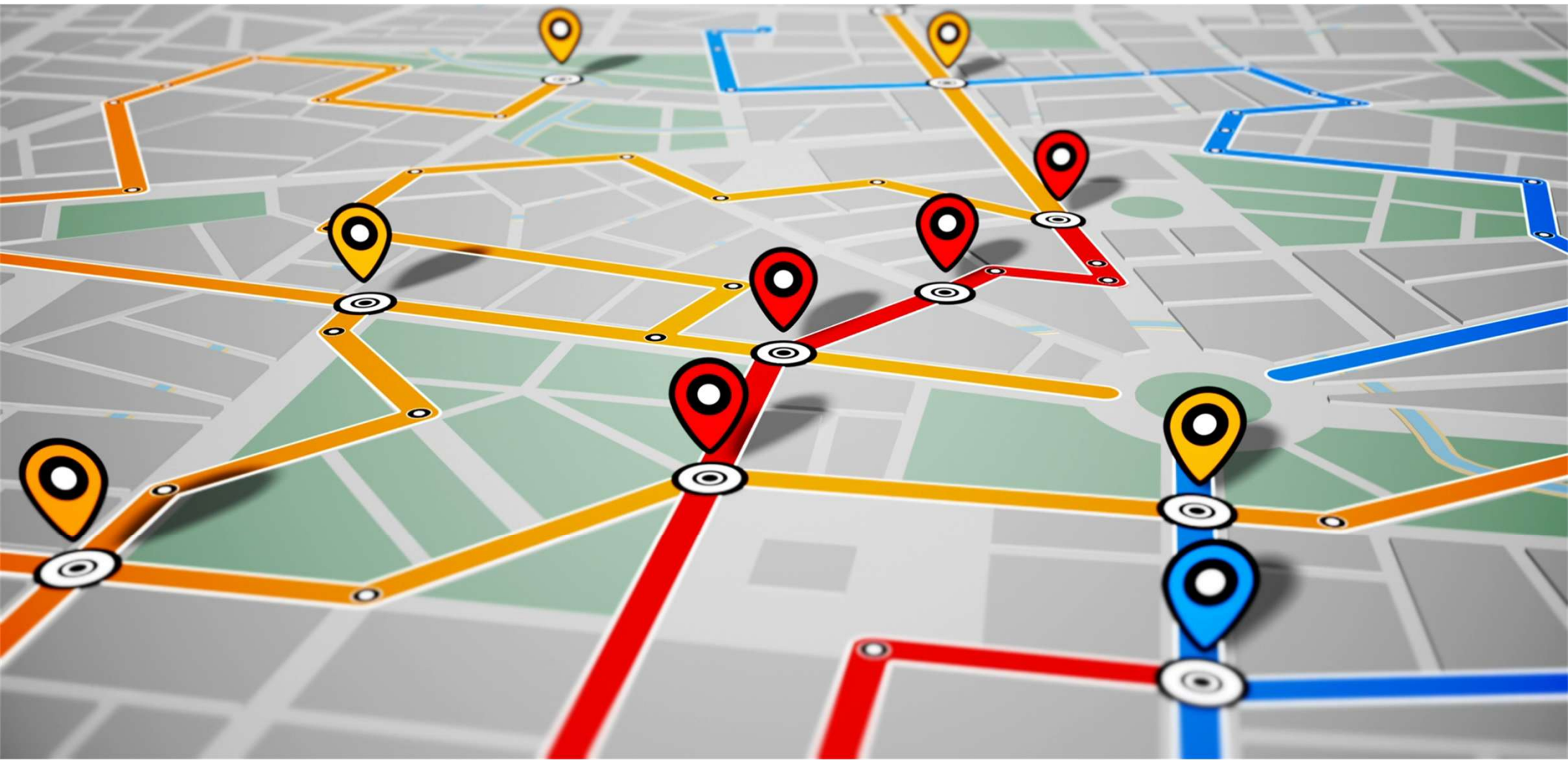
How much work is NOT found from a PM or operator inspection?

What impact is this having on your team and your business?



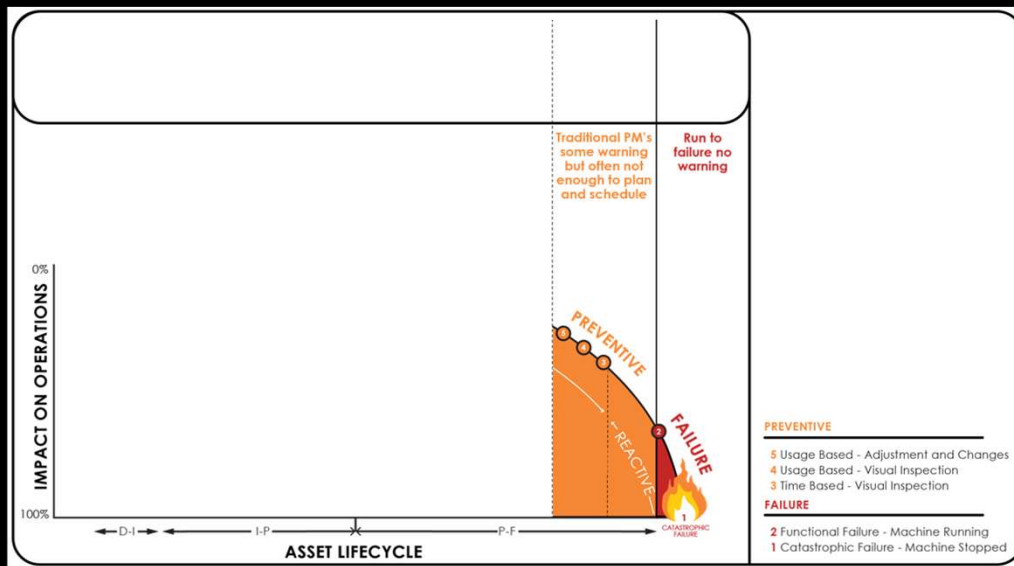
The Preventative Zone





WHERE DO YOUR PMs COME FROM?

PREVENTATIVE ZONE



PREVENTIVE

- 5 Usage Based - Adjustment and Changes
- 4 Usage Based - Visual Inspection
- 3 Time Based - Visual Inspection

PM Challenges:

- Typically, labour-intensive visual inspections.
- Hot to touch, noisy or loose.
- Adjustments and scheduled parts change out.
- Change outs typically not based on accurate and current data.
- Tasks often assigned to the wrong people (trade v equipment owner).
- Tasks generated randomly.

DISCUSSION



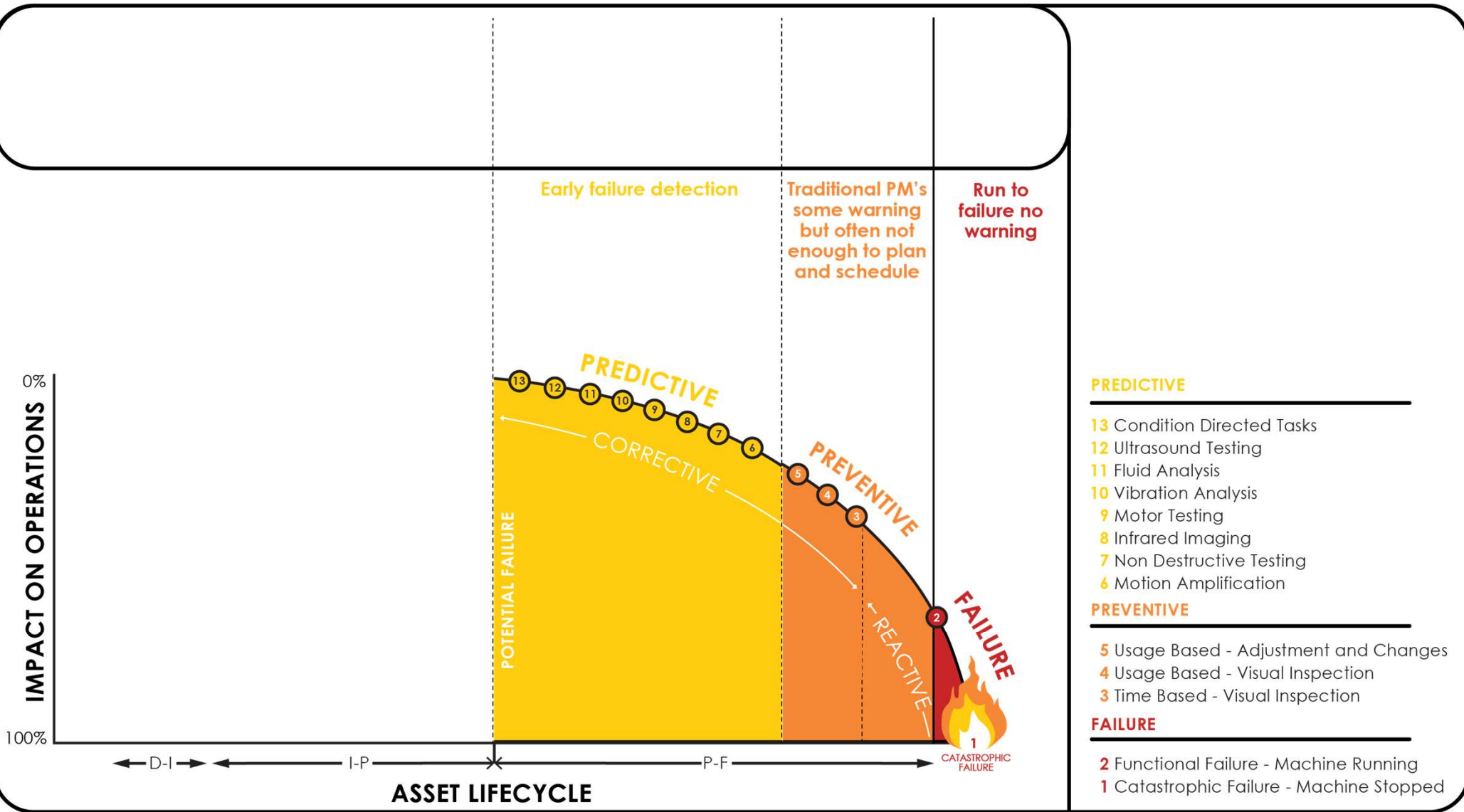
Are you happy with your current PM's?

Do they find issues in time to properly plan and schedule repairs?

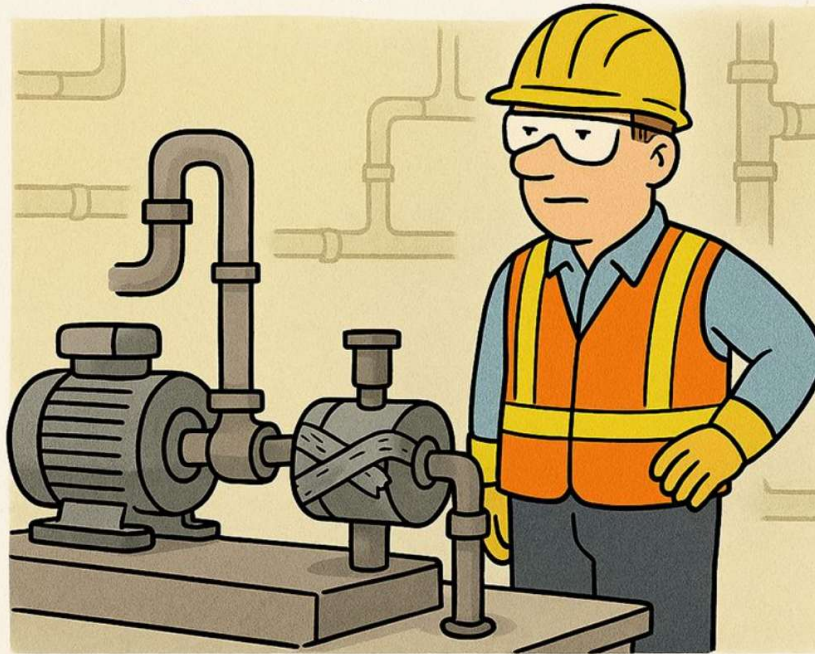
Do you change parts out for the right reasons?



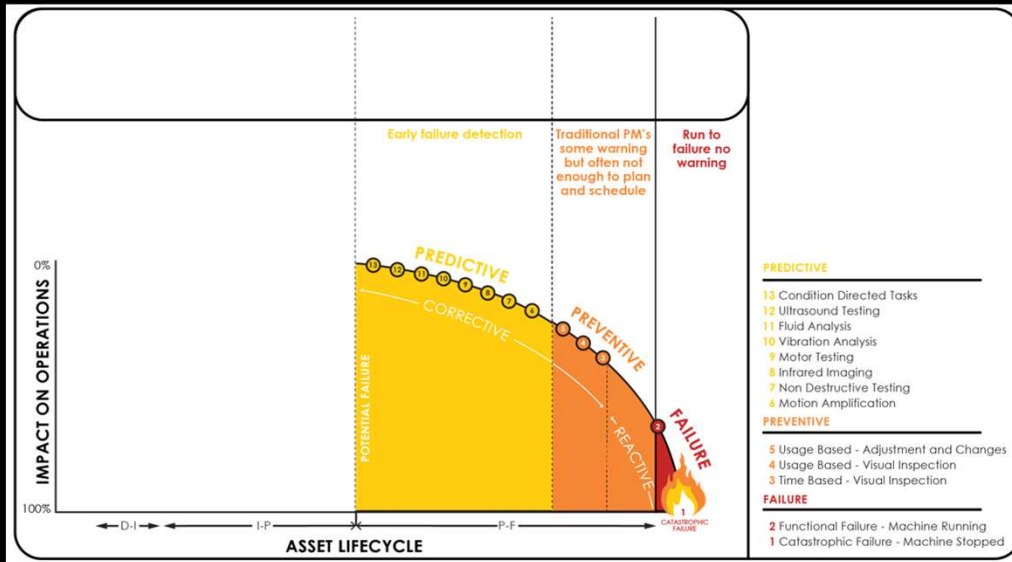
The Predictive Zone



“Yes, I do predictive maintenance... I predict we’ll be fixing this again tomorrow.”



PREDICTIVE ZONE



More consistent and accurate than human inspection.

Needs equipment running.

Identifies issues long before our human senses can.

Lowers the amount and cost of periodic parts replacements.

Condition Monitoring includes basic measurements and gauges.

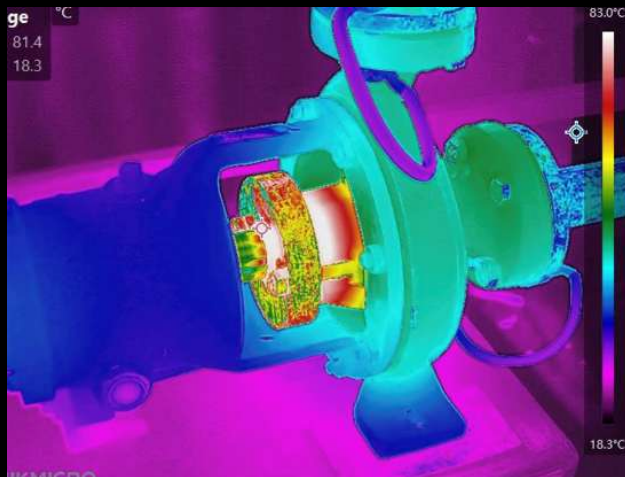
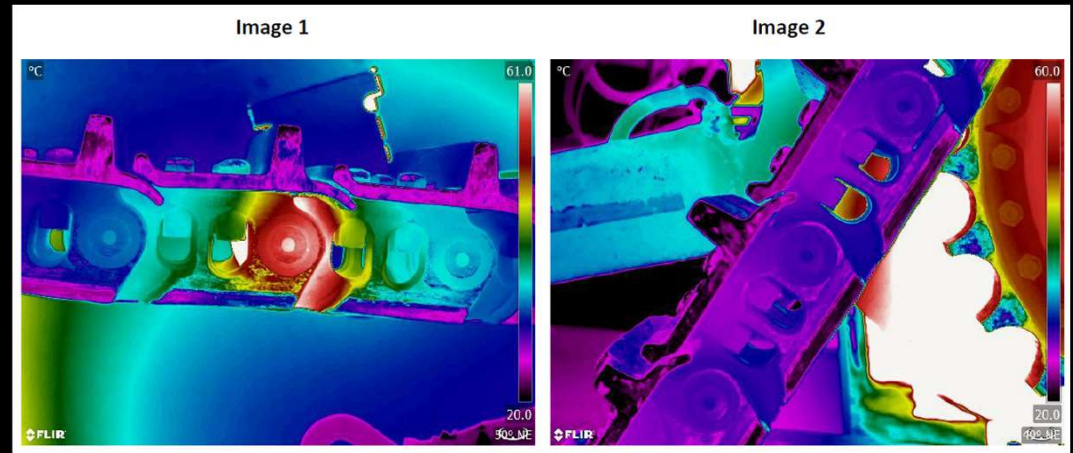
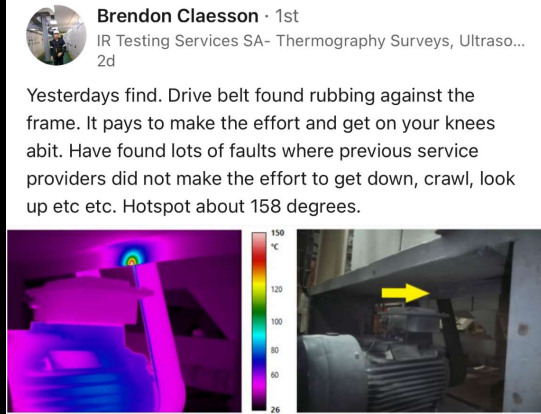
PREDICTIVE

- 13** Condition Directed Tasks
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- 9** Motor Testing
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- 7** Non Destructive Testing
- 6** Motion Amplification

MOTION AMPLIFICATION

wood.

MECHANICAL THERMOGRAPHY





<https://www.youtube.com/watch?v=9pZQ29RSz4I>

DISCUSSION



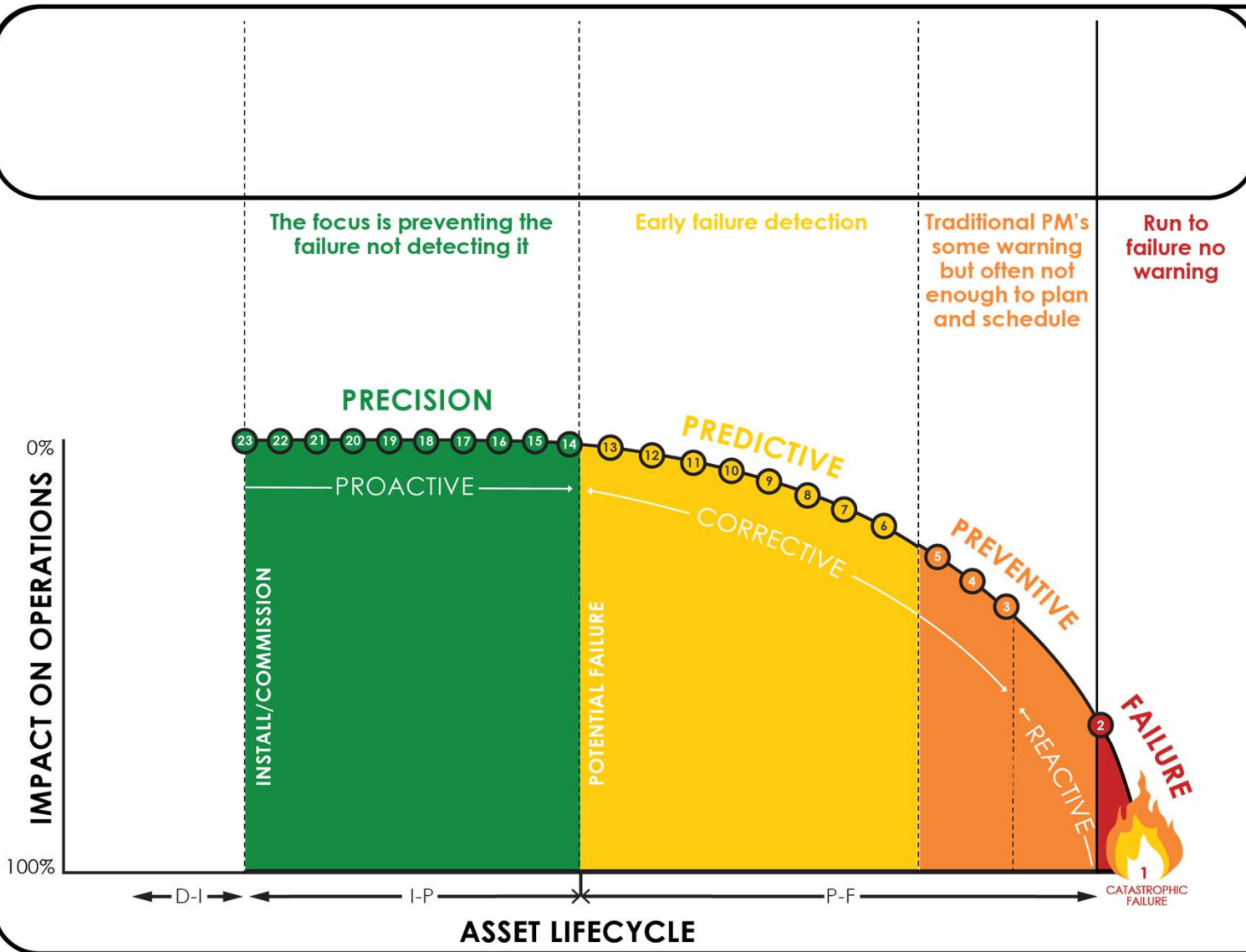
Which Condition Monitoring tools do you use?

How effectively do you action the results?

Do you consider every 'find' a failure?



The Precision Zone



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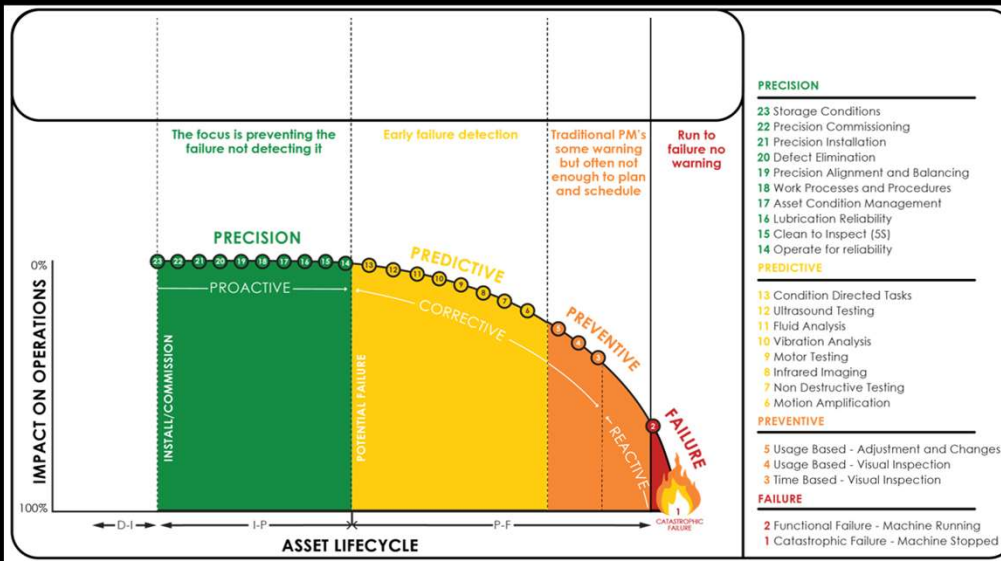
WHAT STANDARDS DO YOU SET



OR



PRECISION ZONE



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Focus is on preventing equipment degradation, keeping it in the as new condition.

Requires a strong relationship with operations.

Most cost-effective maintenance activity.

Techniques that are all the foundation of Lean / CI / IWS.

Requires strong leadership and the right culture.

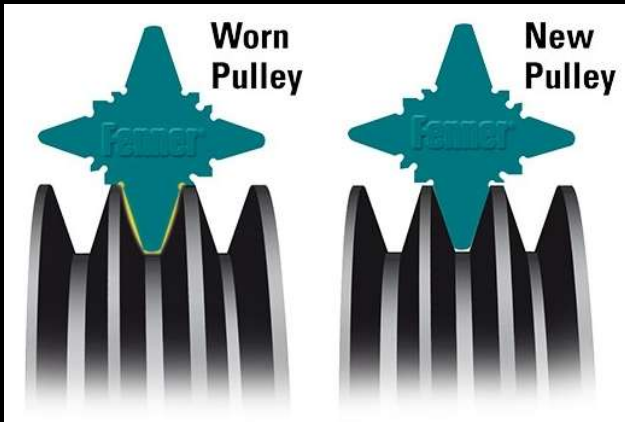
DISCUSSION



Which green activity do you do?

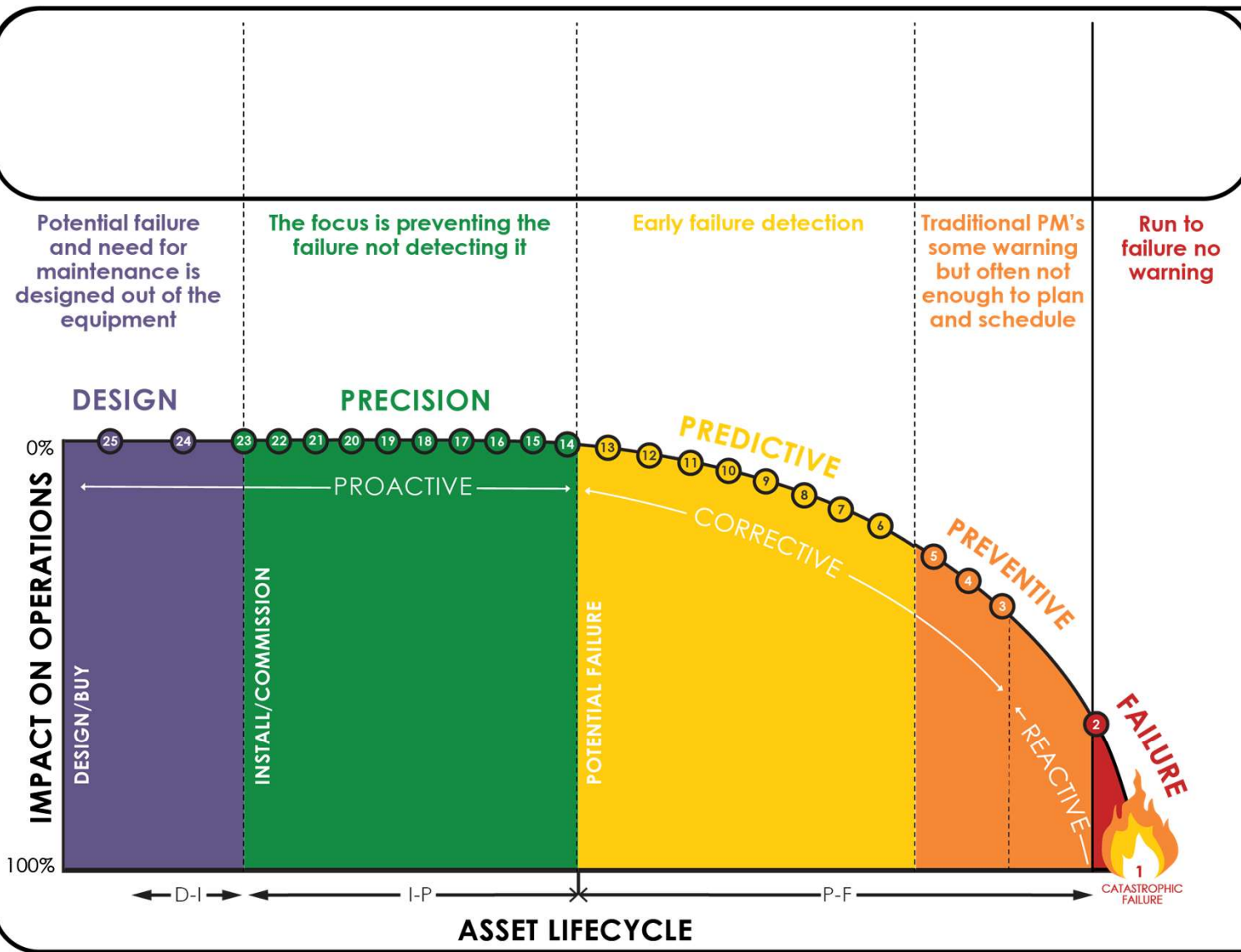
Do you consider Right First Time a non-negotiable? Or is it ok to rush jobs to get production back up and running?

PRECISION MAINTENANCE MADE EASY





The Design Zone



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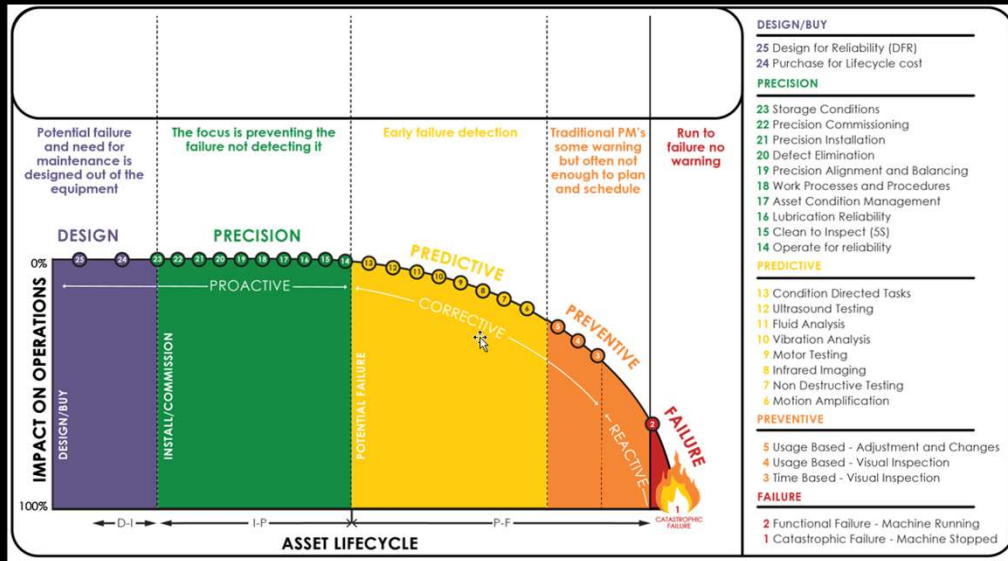
PREVENTIVE

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DESIGN ZONE



Best when considered for new equipment.

Relates to both root cause correction of failures and defect elimination exercises.

Lifecycle cost is considered on minor and major purchases.

DESIGN/BUY

- 25 Design for Reliability (DFR)
- 24 Purchase for Lifecycle cost

DISCUSSION



What examples do you have of Design for BETTER maintenance?

What examples do you have of Design for LESS maintenance?

Do you purchase for Lifecycle Cost?



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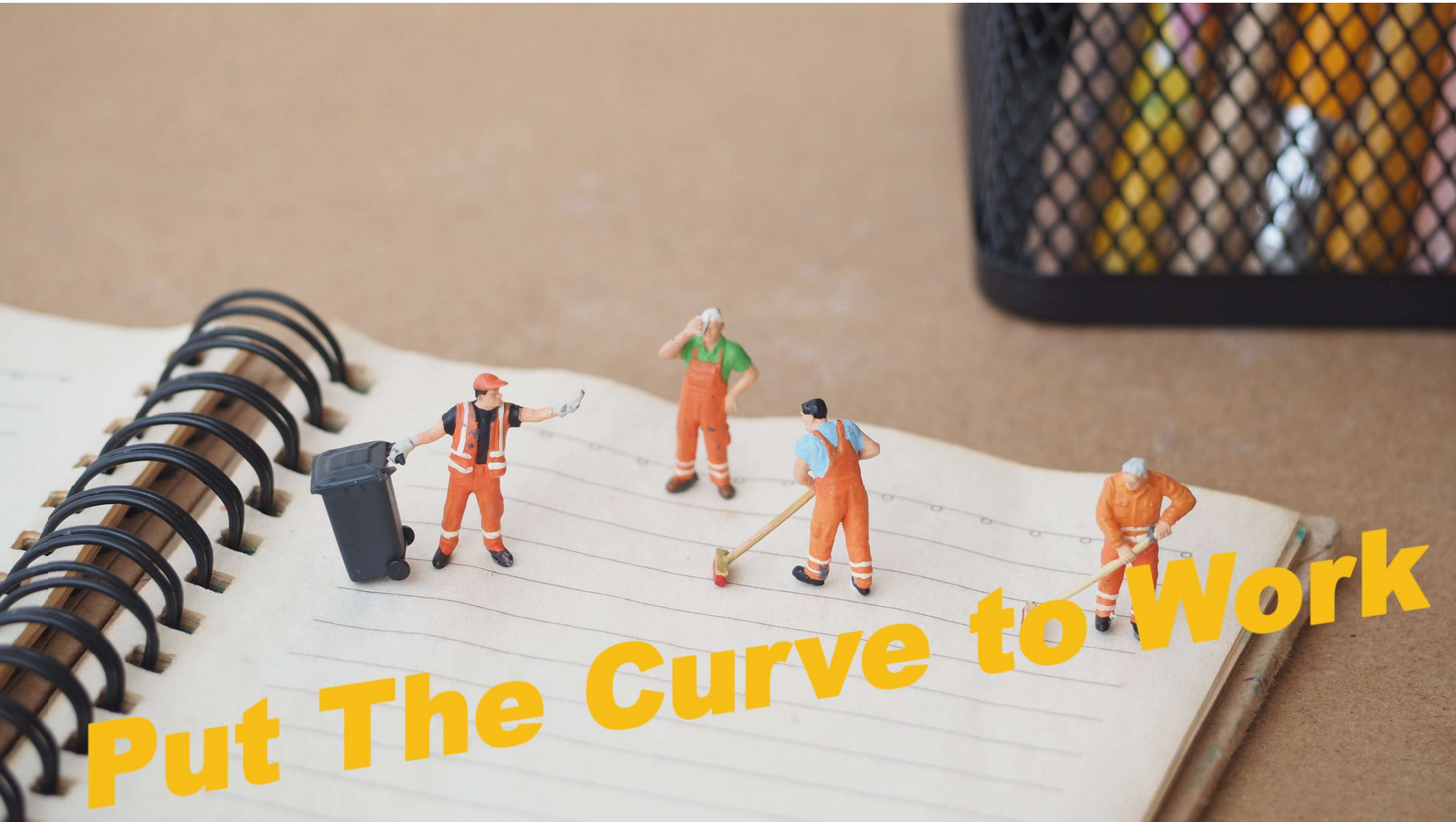
Thank You



**YOUR
MAINTENANCE
COACH**

SIMON MURRAY
COACH | TRAINER | SPEAKER | MENTOR

Using The DIPF Curve



CURVE USES

A discussion tool

To build your Reliability Strategy

To address the root cause properly





**PROVOCATIVE
MAINTENANCE**

RELIABILITY STRATEGY

Considers needs throughout the asset lifecycle and asks what is our total cost of ownership.

Not just the maintenance activity:

- How do we operate?
- How do we clean?
- How do we maintain?
- How do we improve?
- What spares do we carry?
- What overhauls do we need?
- When do we dispose of the asset?

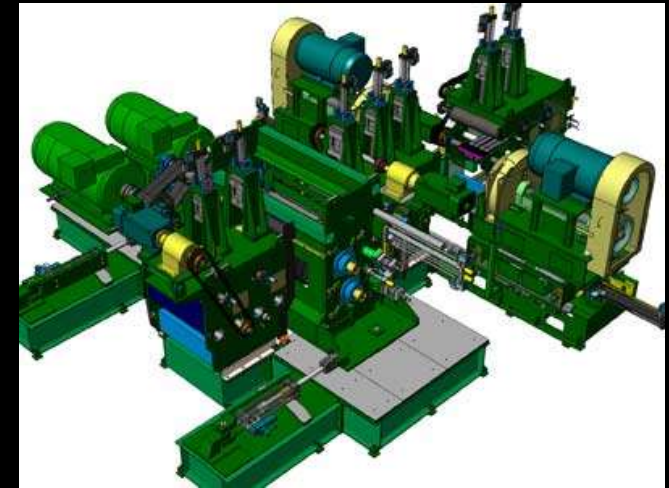
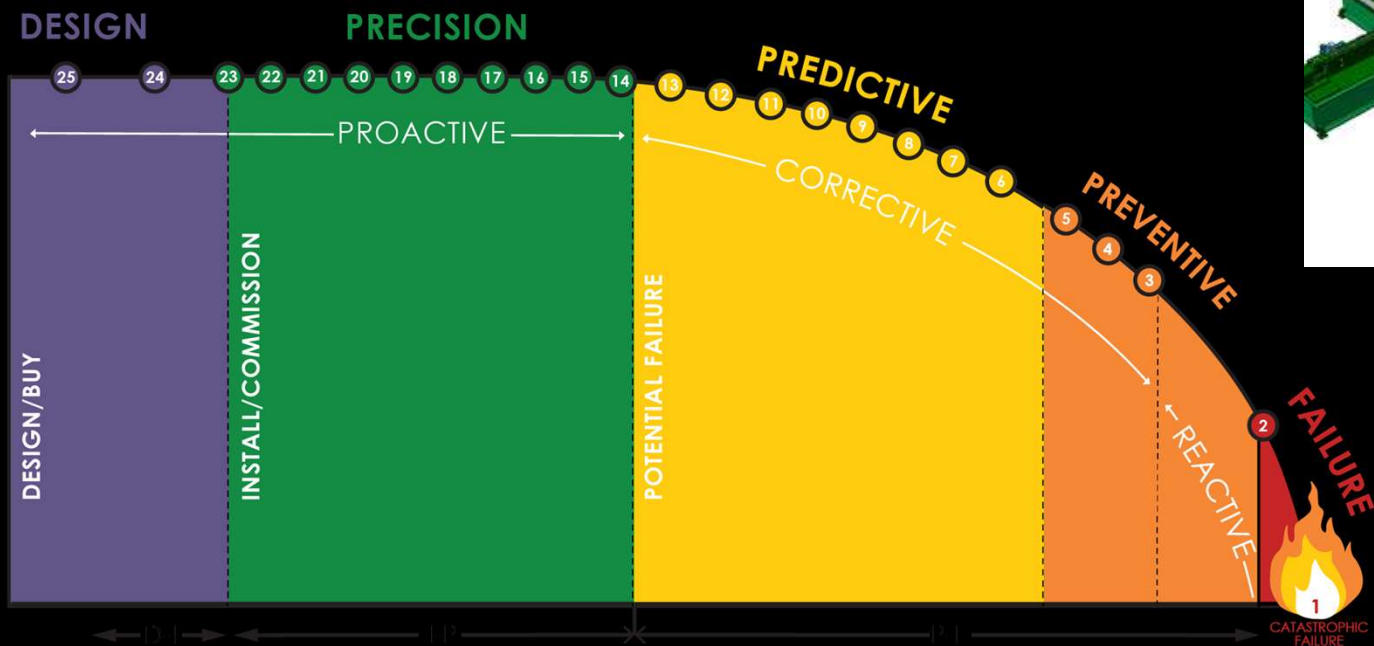
GETTING TO THE ROOT CASUE

PM's in the I-P area are about
PREVENTING failure.

PM's in this zone improve **RELIABILITY**

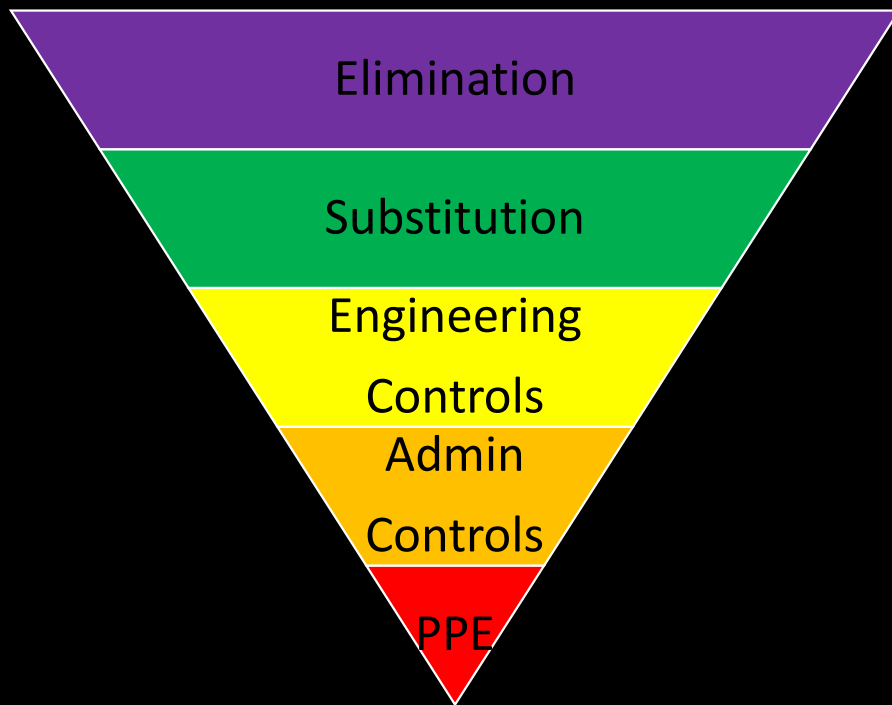
PM's in the P-F area are about
DETECTING failure.

PM's in this zone improve **AVAILABILITY**



THE RELIABILITY HIERARCHY OF CONTROL

Safety



Reliability

