



Reliability: IP69K & Monitoring your Investment

Reliability & IP69K

Simply put, a reliable plant is one that has
available assets to meet customer's
needs on schedule and at cost

IP69K Products: Problem Solver

Longer lasting

Lower cost of Maintenance

Increased "run time" reduced downtime.

What is IP69K?

Referring to the poster, you can see that IP69K refers to the product being dust, high-pressure, and high temperature wash down resistant. These products are also stainless steel.

Products that are IP69K rated offered:

Bearings
Gearboxes
Motors



IP RATING GUIDE

INGRESS PROTECTION

LEVEL	EFFECTIVE AGAINST	DESCRIPTION	LEVEL	PROTECTIVE AGAINST	EFFECTIVE AGAINST
X	—	X means there is no data available to specify a protection rating with regard to one of the criteria.	0	None	—
0	—	No protection against contact and ingress of objects.	1	Dripping water	Dripping water (vertically falling drops) shall have no harmful effect on the specimen when mounted in its normal operating position onto a turntable and rotated at 1 RPM.
1	>50mm	Any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a body part.	2	Dripping water when tilted at 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle of 15° from its normal position. A total of 4 positions are tested within 2 axes.
2	>12.5mm	Fingers or similar objects.	3	Spraying water	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect (utilising an oscillating fixture, or a spray nozzle with a counterbalanced shield).
3	>2.5mm	Tools, thick wires, etc.	4	Splashing of water	Water splashing against the enclosure from any direction shall have no harmful effect (utilising an oscillating fixture or a spray nozzle with no shield).
4	>1mm	Most wires, slender screws, large ants etc.	5	Water Jets	Water projected by a nozzle (6.3mm at 12.5 litres/minute) against enclosure from any direction shall have no harmful effects.
5	Dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment.	6	Powerful water Jets	Water projected in powerful jets (12.5mm nozzle at 100 litres/minute) against the enclosure from any direction shall have no harmful effects.
6	Dust tight	No ingress of dust; complete protection against contact (dust tight). A vacuum must be applied. Test duration of up to 8 hours based on air flow.	6K	Powerful water Jets with Increased pressure	Water projected in powerful jets (6.3mm nozzle at 75 litres/minute) against the enclosure from any direction, under elevated pressure, shall have no harmful effects.
7	Immersion, 1m depth	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water of 1m depth for 30 minutes.	8	Immersion, 1m or more depth	The equipment is suitable for continuous immersion in water under conditions specified by the manufacturer with depth & duration greater than requirements for IPX7.
9K	Powerful high temperature water Jets	Protected against close-range high pressure, high temperature (80°C) spray downs.			

EXAMPLE:

IP 6 8

Ingress Protection

First digit:
Solid particle protection

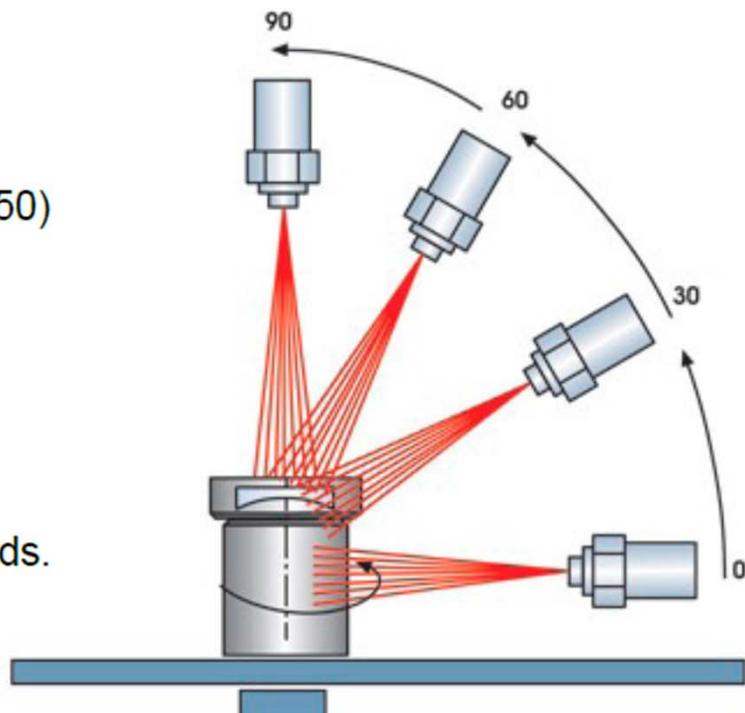
Second digit:
Liquid Ingress protection

Why use IP69K?

This rating allows for heavily washed down areas to be subjected to high pressure whereas IP68 allows only for slight immersion into water, but not at a high temperature. IP69K also allows for a heavier washdown application with peace of mind that equipment is not allowing water into the mechanics, therefore increases life. This rating also makes the CIP process easier and more efficient.

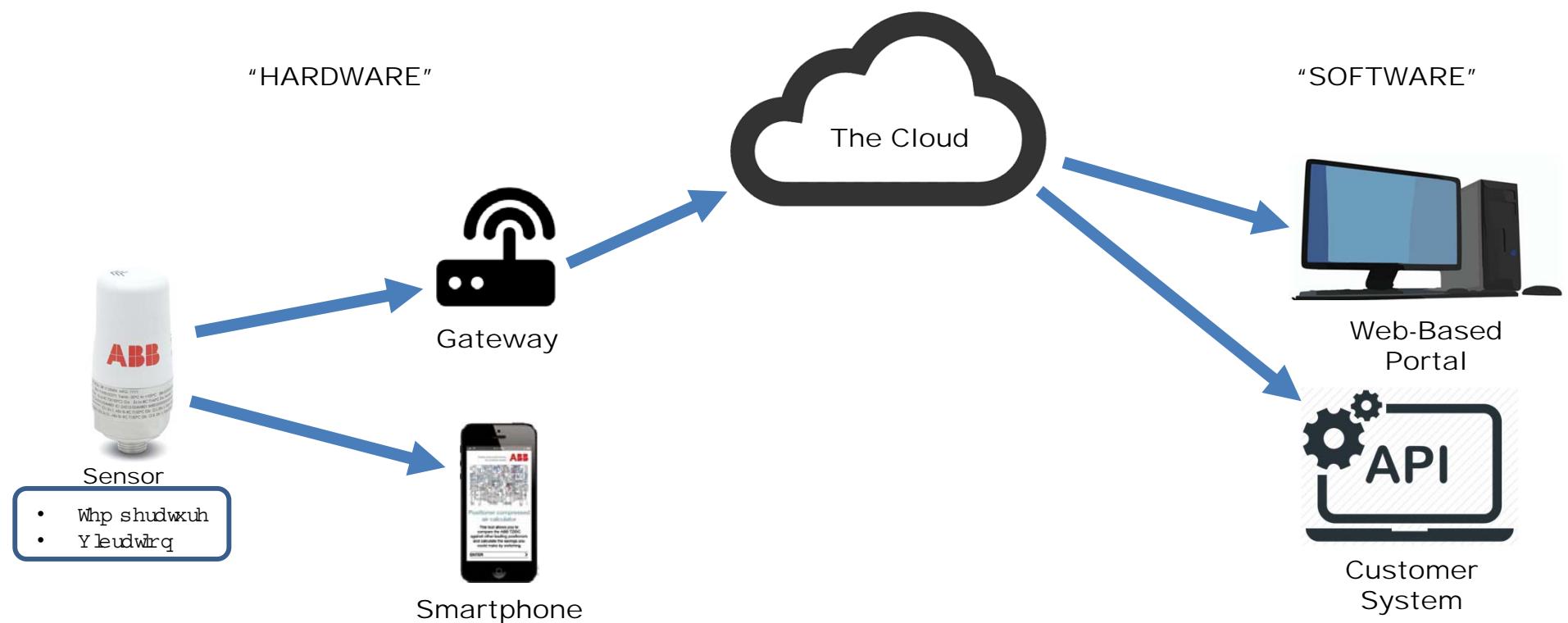
Testing procedure per ISO 20653:
(depicted in image to right)

- A spray nozzle that is fed with 80°C water at 80–100 bar (~1160-1450) and a flow rate of 14–16 L/min.
- The nozzle is held 10-15cm from the tested device at angles of 0°, 30°, 60° and 90° for 30 seconds each.
- The test device sits on a turntable that rotates once every 12 seconds.



Condition Based Monitoring

CBM Typical System Overview



Why monitor equipment?

The benefits are compelling:

- Higher production volume from fewer production interruptions
- Increased capacity without costly capital investment
- Increased market share thru more competitive pricing
- Increased market share thru higher quality product
- Lower maintenance requirements due to a reduction in equipment failures
- Lower maintenance material cost due to a reduction in equipment failures
- Higher sales price (margin) derived from higher quality product
- Lower unit cost by distributing costs over a higher volume of product
- Fewer environmental incidents caused by equipment failure (lower regulatory costs)
- Fewer injuries!

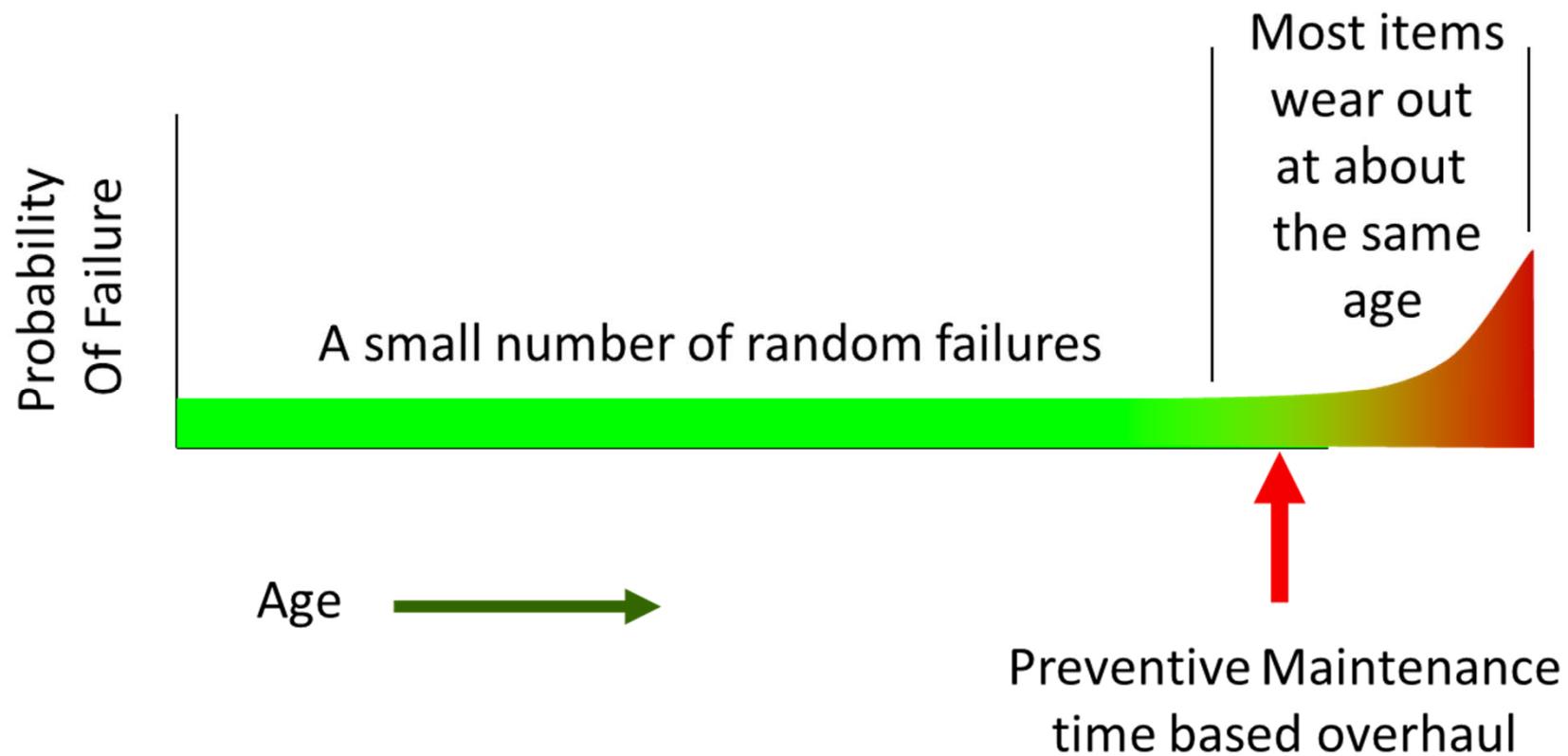
How do you ‘measure’ Reliability?

O.E.E.

Overall Equipment Effectiveness

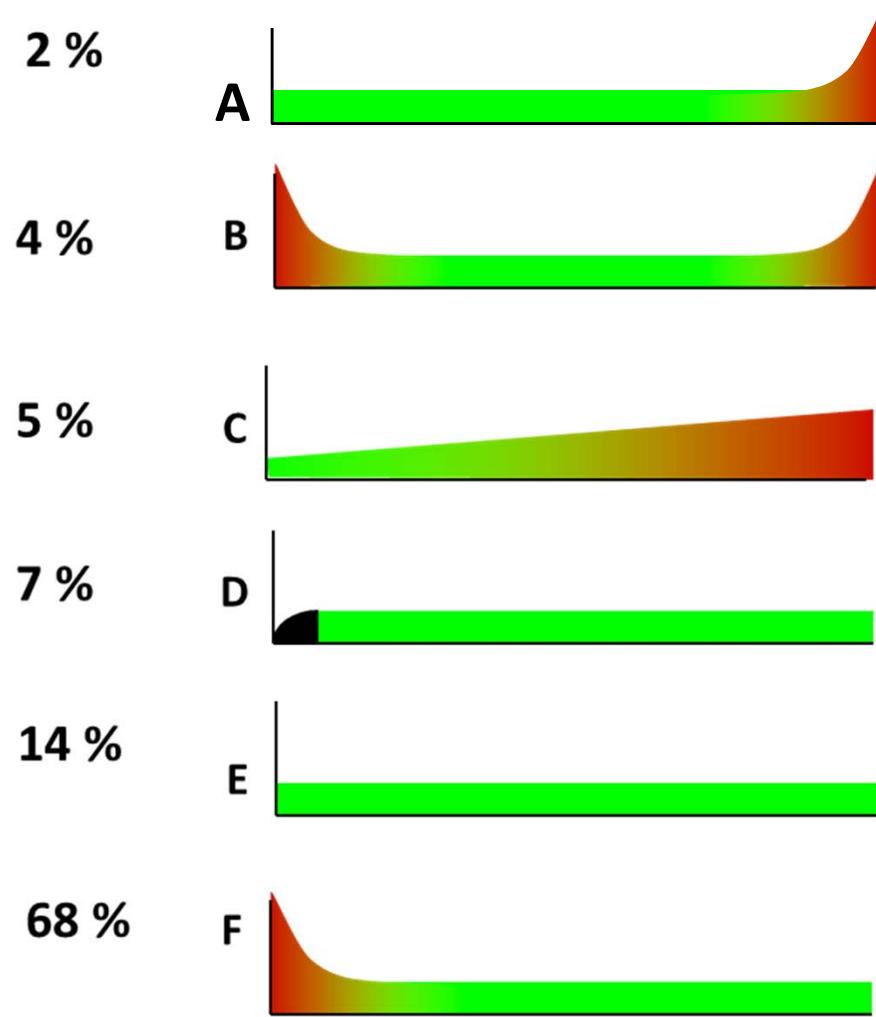
Metric to evaluate production based on:
Availability, Throughput, and Quality

Traditional View of Equipment Failure



What percentage of equipment 'wears out'?

The Reality of Failure



"Traditional View" - Random failure then a wear out zone

"Bathtub Curve" - High infant mortality, then a low level of random failure, then a 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

- Only 11% of failure are age-related (A+B+C)
- 72% of failures are due to infant mortality (B+F)

Maintenance related Terminology

Reactive Maintenance	Maintenance activities are performed only when equipment no longer performs its intended function. Typically run-to-failure.
Preventive Maintenance	Maintenance activities are performed on a regularly scheduled basis prior to anticipated wear-out. Based on time, cycles, tonnage, etc.
Predictive Maintenance	Maintenance is performed only when the condition of the equipment warrants it. Degradation in equipment is typically determined thru use of a PdM technology (vibration, IR, oil analysis, etc.) or thru monitoring process parameters in the DCS, PLC, etc. <u>Misnomer</u> . The term is largely being replaced by 'Asset Condition Monitoring'.
Proactive Maintenance	A holistic approach, describes a maintenance program which applies the appropriate maintenance strategy based on the business needs.
Corrective Maintenance	As action performed to restore equipment function.

Reliability & Throughput

Customer Lens: Global competition is driving focus on improved asset management.

Inherent Reliability

Characteristic of design and manufacturing. No amount of monitoring or maintenance will improve its innate capability.

Proactive Asset Management

Maintenance Plan

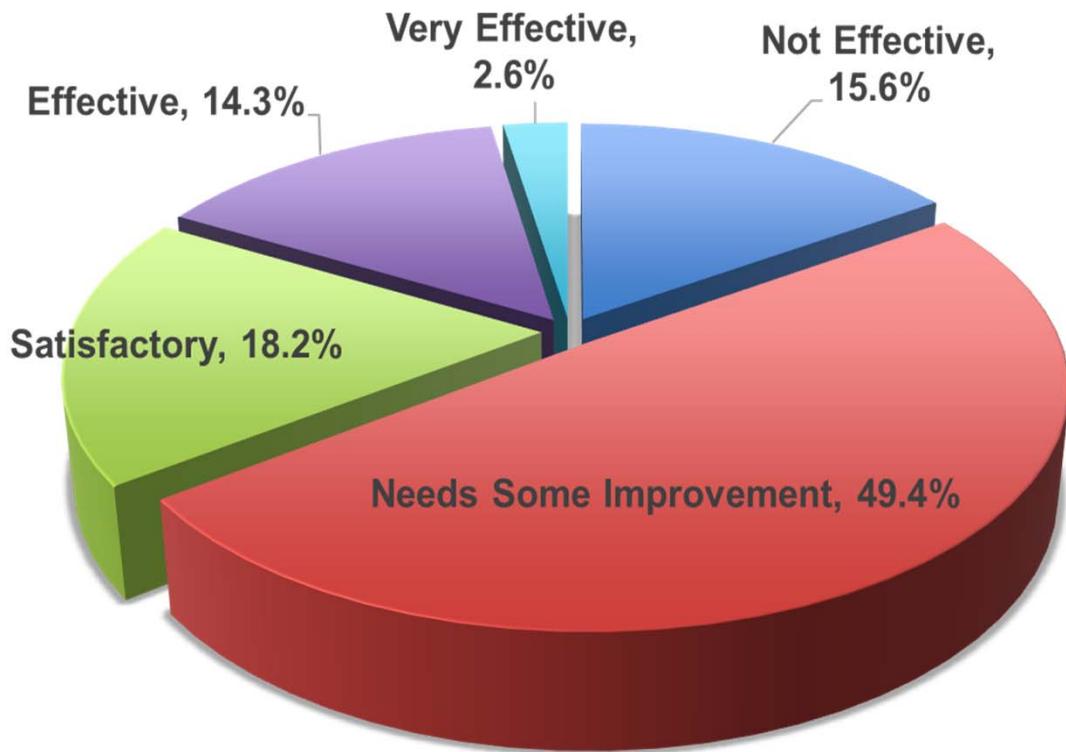
Determines how to maintain/service the asset: time-based, condition-based, etc.

Operation

Ambient conditions, efficiency, as well as operator skills and training.

How well is everyone doing?

Plant Services Survey Question- Please rate the effectiveness of your PdM Program.



Only 16.9% of respondents find their PdM program effective or very effective.

Don't shy away from customers who have an existing program!

Perception & Outlook

Rate the **drivers** for deploying PdM solutions:

Driver	Top 3
Improve Uptime	78%
Reduce Maintenance Costs	66%
Reduce Operational Costs	62%



Rate the **obstacles** limiting the success of your PdM initiatives.

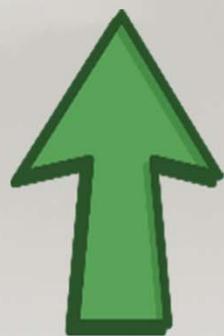
Driver	Top 3
Undefined Financial Benefits	36%
Budget Constraints	34%
Undefined Operational Benefits	27%



Need to target the right persona, with the right message, with ROI

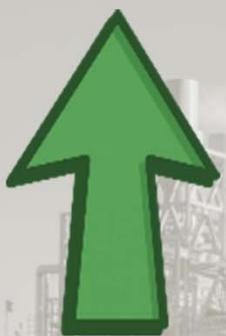
What Top Performers are Doing and Why

Condition Monitoring/PdM



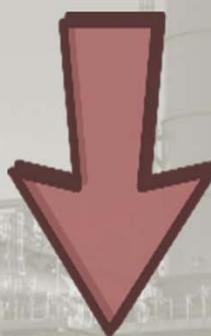
90% of assets are covered by Vibration, IR, Ultrasound, Oil Analysis

Defect Elimination



Changes inherent reliability, equipment and work practices

Preventive Maintenance



Often does more harm than good

Operator Driven Reliability



Instills ownership throughout facility

CMMS Data Integrity



Ensures program sustainability

These are leading indicators.

According to a 2016 Plant Service Survey, only 17% of facilities are satisfied with their PdM program

The Outcomes...a direct impact on Shareholder Value

Availability,
Throughput,
Quality



Largest gains typically
from increased
availability

Safety &
Environmental
Incidents



Increased employee
welfare, fewer
environmental releases

Inventory &
Capital
Replacement



Stocking less MRO,
reducing carrying costs
(can be upwards of 20%)

Unless there is a fundamental behavioral shift throughout the organization to believe that failure free operation is possible and to reward proactive rather than reactive behaviors, improvements will be slow to materialize. – Jeff Dudley, Solomon Associates

Reliability Centered Maintenance

Apply a Predictive Task

Only perform maintenance activity when equip condition warrants it

Use some form of technology to determine asset health. DCS and/or PdM tech (vibe, torque, IR, oil)

Preferred method.
Most cost effective.

Apply a Preventive Task

Perform maintenance task based on time, cycles, etc.

Weekly walk-arounds, NDT, inspection, 'recertification'

Somewhat effective, costs 30-60% more than PdM

No Scheduled Maintenance

Run to Failure

Directed towards least critical assets only.

Sounds business decision if failures have little impact.

Re-Design

Failure modes cannot be eliminated or mitigated.

Usually due to improper product application or upgrades/re-rates

Often chosen when PdM technologies are not understood, or

Why Improve Systems?

- Investing in CBM
 - Provides active data on how equipment is functioning allowing maintenance as needed versus unnecessary maintenance intervals
- Investing in IP69K
 - Increased lifetime due to reduced failure opportunities
 - Supports decrease in maintenance costs while increasing throughput

Conclusion

- Maintenance Monitoring & IP69K Products
 - Machine monitoring: Critical to Throughput
 - Holistic Approach to Maintenance
 - Increased Throughput
 - Perform Maintenance as needed
 - Monitoring equipment allows you to protect and maximize your investment in IP69K products