



FUSS & O'NEILL

The Importance of Maintenance in Your Safety Program



January 2018



Search "Maintenance"



UNITED STATES
DEPARTMENT OF LABOR



Maintenance



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Working in cold weather

Plan to prevent injuries and illnesses this winter season. Remember, take precautions to avoid [carbon monoxide poisoning](#) when using gasoline-powered tools and [generators](#).

TAKE ACTION



Contact OSHA



File a safety and health complaint



Report a death or severe injury



Get whistleblower information

NEWS

[More News](#)

January 5, 2018

U.S. Department of Labor Imposes Maximum Fines on Motion Picture Company for Failing to Adequately Protect From Fall Hazards

January 5, 2018

U.S. Department of Labor Urges Employees and Employers Engaged In Snow Removal and Cleanup to Be Aware of Potential Hazards

January 5, 2018

OSHA Cites Schnabel Foundation Company, Proposes \$212,396 in Penalties

OSHA WORKING WITH EMPLOYERS

Training

Compliance Assistance

Cooperative and Recognition Programs

Below are just a few examples of our cooperative programs that work with and recognize employers who create safe workplaces.

[R.C. Bigelow](#) ID: Reduced injury rates with help from OSHA's On-Site Consultation Program.

Results “Maintenance” – January 15



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maintenance



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Everything

[Whistleblowers.gov](#)

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[Construction](#)

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[Lead: Battery Manufacturing eTool - Maintenance](#)

https://www.osha.gov/SLTC/etools/battery_manufacturing/maintenance/index.html

Maintenance personnel are at risk of exposure to lead fumes and dust during **maintenance** operations involving equipment that is contaminated with lead.

[Qualifications of maintenance & repair employees ...](#)

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS...

1926.1429(a)Maintenance, inspection and repair personnel are permitted to operate the equipment only where all of the following requirements are met:

MAINTENANCE & CARE OF RESPIRATORS

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458,000

[Lead: Battery Manufacturing eTool - maintenance - Example ...](#)

https://www.osha.gov/SLTC/etools/battery_manufacturing/maintenance/checklist.html

Lead: Battery Manufacturing eTool - **Maintenance**, Example Checklist ... The following checklist is provided as a guideline to assist with the ...

[Shipyards Employment eTool > Shipbreaking: Personal ...](#)

https://www.osha.gov/SLTC/etools/shipyards/ship_breaking/ppe/maintenance.html

Shipyards Employment eTool > Shipbreaking: Personal Protective Equipment (PPE) - Cleaning, **Maintenance** and Replacement

08/11/1994 - Construction vs. **Maintenance** | Occupational

So....

So how important, or how much are we relying on our Maintenance Department for compliance?

19 ELEMENTS of VPP



VOLUNTARY PROTECTION PROGRAMS PARTICIPANTS' ASSOCIATION

Volunteers for Total Quality Protection



<p>1 Management Commitment and Planning</p> <p>Clearly established policies and procedures. Goal-oriented objectives and accountability. Resources (Safety & Health).</p>	<p>2 Accountability</p> <p>Documented system for holding all line managers and supervisors accountable for Safety & Health.</p>	<p>3 Disciplinary Program</p> <p>Written Program that is communicated to ALL employees. Covers both supervisors and their employees.</p>	<p>4 Injury Rates</p> <p>Three-year average rate for illness cases and both total and lost time/restricted cases.</p>
<p>5 Employee Participation</p> <p>Meaningful ways for employees to participate in the Safety & Health Program.</p>	<p>6 Self-Inspections</p> <p>General Industry <i>Monthly</i> – Cover entire worksite quarterly; Tracking of hazards to correction. <i>Construction</i> – Management inspections of entire worksite weekly; Safety & Health committee inspections of entire worksite monthly; Tracking of hazards to correction.</p>	<p>7 Employee Hazard Reporting System</p> <p>Formal written reporting system. Timely and appropriate responses. Tracking of hazards to correction.</p>	<p>8 Accident/Incident Investigation</p> <p>Written procedures. Written reports of findings. Tracking of hazards to correction.</p>
<p>9 JSA/Process Reviews</p> <p>Analysis of hazards associated with individual jobs and processes. Safety & Health training. Tracking of hazards to correction.</p>	<p>10 Safety & Health Training</p> <p><i>Supervisor training</i> – Must understand hazards in their work areas. <i>Potential effects on their employees</i>. Ensure employees follow rules. <i>Employee training</i> – Aware of hazards; Safety work procedures; Emergency situations; PPE use.</p>	<p>11 Preventive Maintenance</p> <p>Written Preventive Maintenance Program. Ongoing monitoring and maintenance of work-pl...</p>	<p>12 Emergency Programs/Drills</p> <p>Written emergency program. Drills for ALL employees.</p>
<p>13 Health Program</p> <p>Baseline surveys. Sampling, testing, and analysis with written records of results. Tracking of hazards to correction.</p>	<p>14 Personal Protective Equipment</p> <p>Appropriate PPE. PPE training on care and use. Replacement of PPE.</p>	<p>15 Safety & Health Staff Involved with Changes</p> <p>Safety & Health staff must be involved with analysis of all new processes, materials, or equipment. Safety & Health staff must be involved with any changes.</p>	<p>16 Contractor Safety</p> <p>Selection criteria. Training. Enforcement.</p>
<p>17 Medical Program</p> <p>Availability of physician services. Personnel trained in First Aid/CPR.</p>	<p>18 Resources</p> <p>Commitment of adequate Safety & Health staff. Access to Certified Safety Professionals (CSP) and Certified Industrial Hygienists (CIH).</p>	<p>19 Annual Evaluation</p> <p>Must be in written narrative form. Must have action dates. Must cover all of the 19 program elements. Must cover the status of the action dates from the prior year annual evaluation.</p>	

#11 On The List

Preventive Maintenance

Written Preventive
Maintenance Program.
Ongoing monitoring and
maintenance of work-place
equipment.

OSHA Web Site



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Find it in OSHA



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Most Frequently Cited Standards

[ABOUT OSHA](#) ▾ [WORKERS](#) ▾ [EMPLOYERS](#) ▾ [REGULATIONS](#) ▾ [ENFORCEMENT](#) ▾ [TOPICS](#) ▾ [NEWS & PUBLICATIONS](#) ▾ [DATA](#) ▾ [TRAINING](#) ▾

Frequently Cited OSHA Standards

This page allows the user to list the most frequently cited Federal or State OSHA standards for a specified 6-digit North American Industry Classification System (NAICS) code. Also available is [Industry Profile for OSHA Standard](#) which lists NAICS classifications having the most occurrences of citations for a specified OSHA standard.

Select number of employees in establishment:

All 1-9 1-19 1-99 20-49 20-99 50-99 100-249 1-249 250+

Federal or State Jurisdiction:

Federal



NAICS:

221320

(Submit empty for NAICS list.)

Submit

The data shown reflects OSHA citations issued by the Federal or State OSHA during the specified fiscal year; see [definitions](#). If you are interested in obtaining the NAICS code for a particular industry, references are available on the [NAICS Manual](#). This manual contains descriptions of every NAICS sector.

Top Cited Items for "Sewage"



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NAICS Code: 2213 *Water, Sewage and Other Systems*

Listed below are the standards which were cited by **Federal OSHA** for the specified NAICS Code during the period October 2016 through September 2017 rather than initial amounts. For more information, see [definitions](#).

Standard	Citations	Inspections	Penalty	Description
Total	54	14	\$26,435	<i>All Standards cited for Water, Sewage and Other Systems</i>
19100134	13	6	\$8,870	Respiratory Protection.
19101200	6	2	\$0	Hazard Communication.
19100178	4	2	\$0	Powered industrial trucks.
19100146	3	1	\$2,716	Permit-required confined spaces
19100095	2	2	\$0	Occupational noise exposure.
19100119	2	1	\$0	Process safety management of highly hazardous chemicals.

Powered Industrial Trucks

Open flames shall not be used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

1910.178(q)

Maintenance of industrial trucks.

1910.178(q)(1)

Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made in safe locations.

1910.178(q)(2)

No repairs shall be made in Class I, II, and III locations.

1910.178(q)(3)

Those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in safe locations.

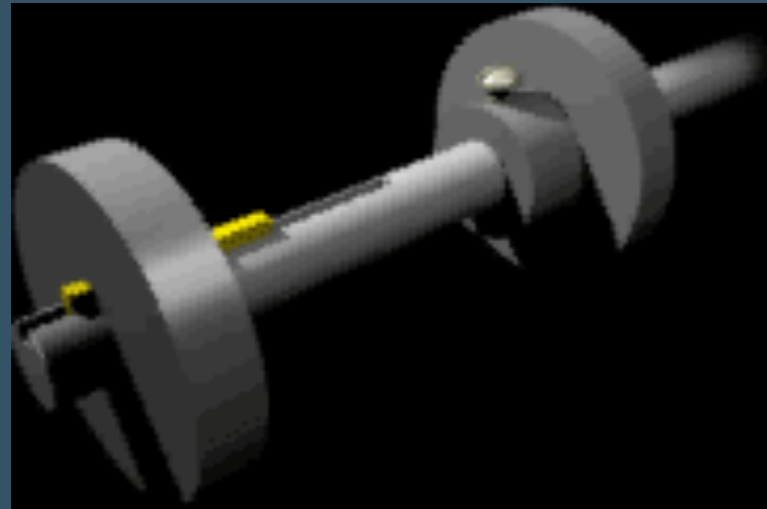
1910.178(q)(4)

Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.

1910.178(q)(5)

All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with the original parts.

Shafts



Mechanical Power Transmission Apparatus

1910.219(p)

Care of equipment -

1910.219(p)(1)

General. All power-transmission equipment shall be inspected at intervals not exceeding 60 days and be kept in good working condition at all times.

1910.219(p)(2)

Shafting.

1910.219(p)(2)(i)

Shafting shall be kept in alignment, free from rust and excess oil or grease.

Mechanical Power Transmission Apparatus

1910.219(p)(2)(ii)

Where explosives, explosive dusts, flammable vapors or flammable liquids exist, the hazard of static sparks from shafting shall be carefully considered.

1910.219(p)(3)

Bearings. Bearings shall be kept in alignment and properly adjusted.

1910.219(p)(4)

Hangers. Hangers shall be inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly.

1910.219(p)(5)

Pulleys.

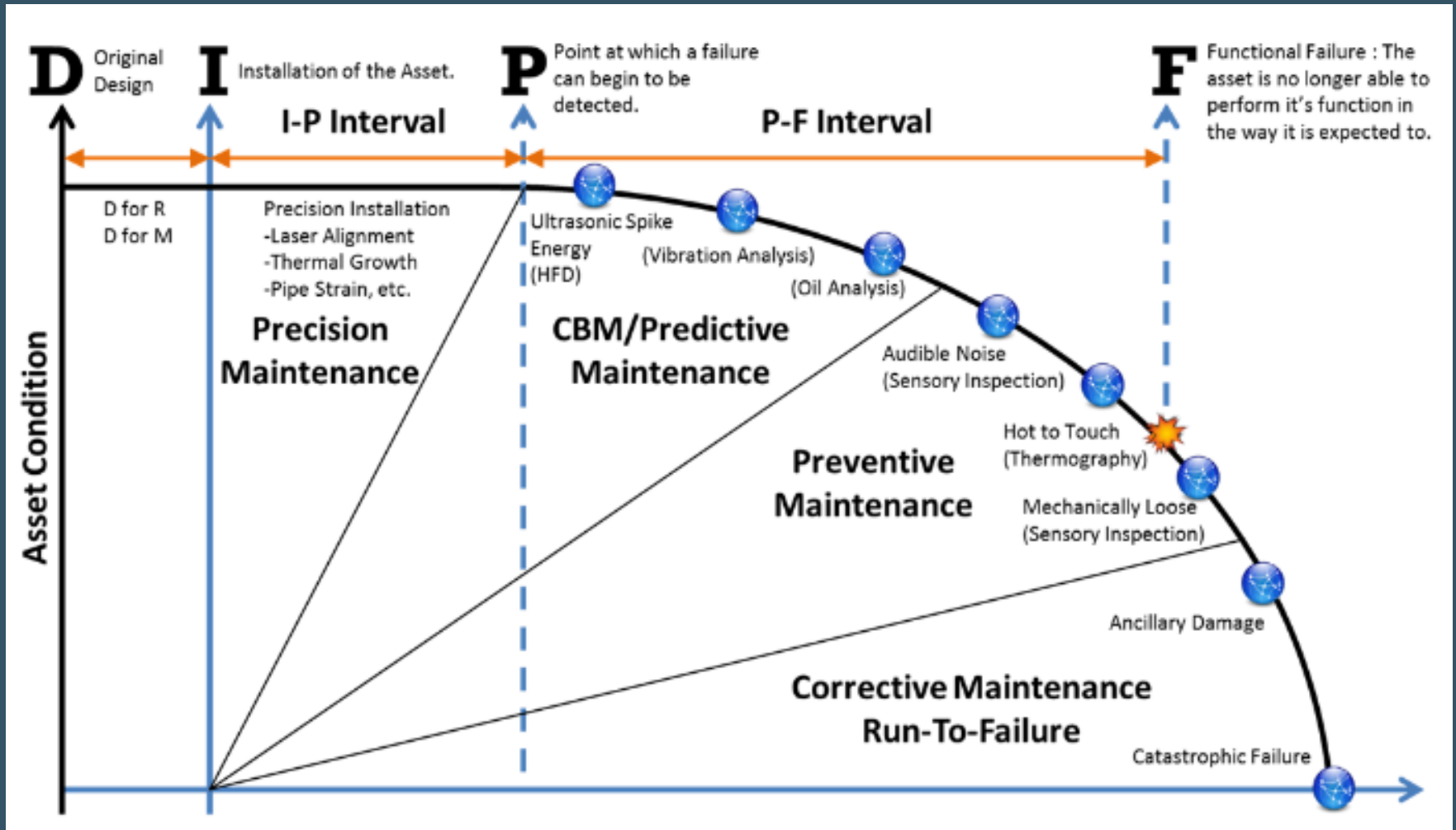
1910.219(p)(5)(i)

Pulleys shall be kept in proper alignment to prevent belts from running off.



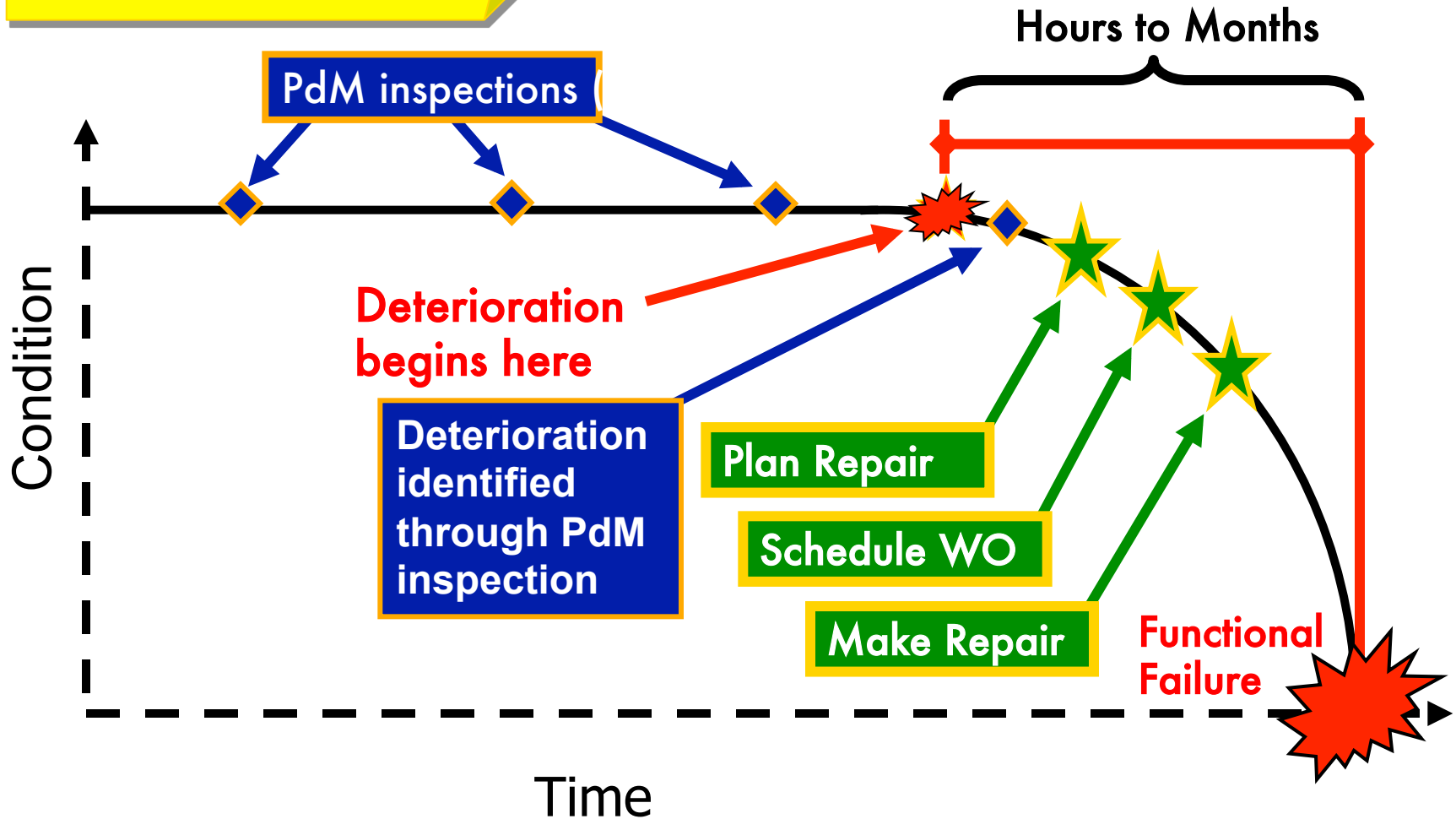
Foundations of Maintenance

Potential Failure to Functional Failure

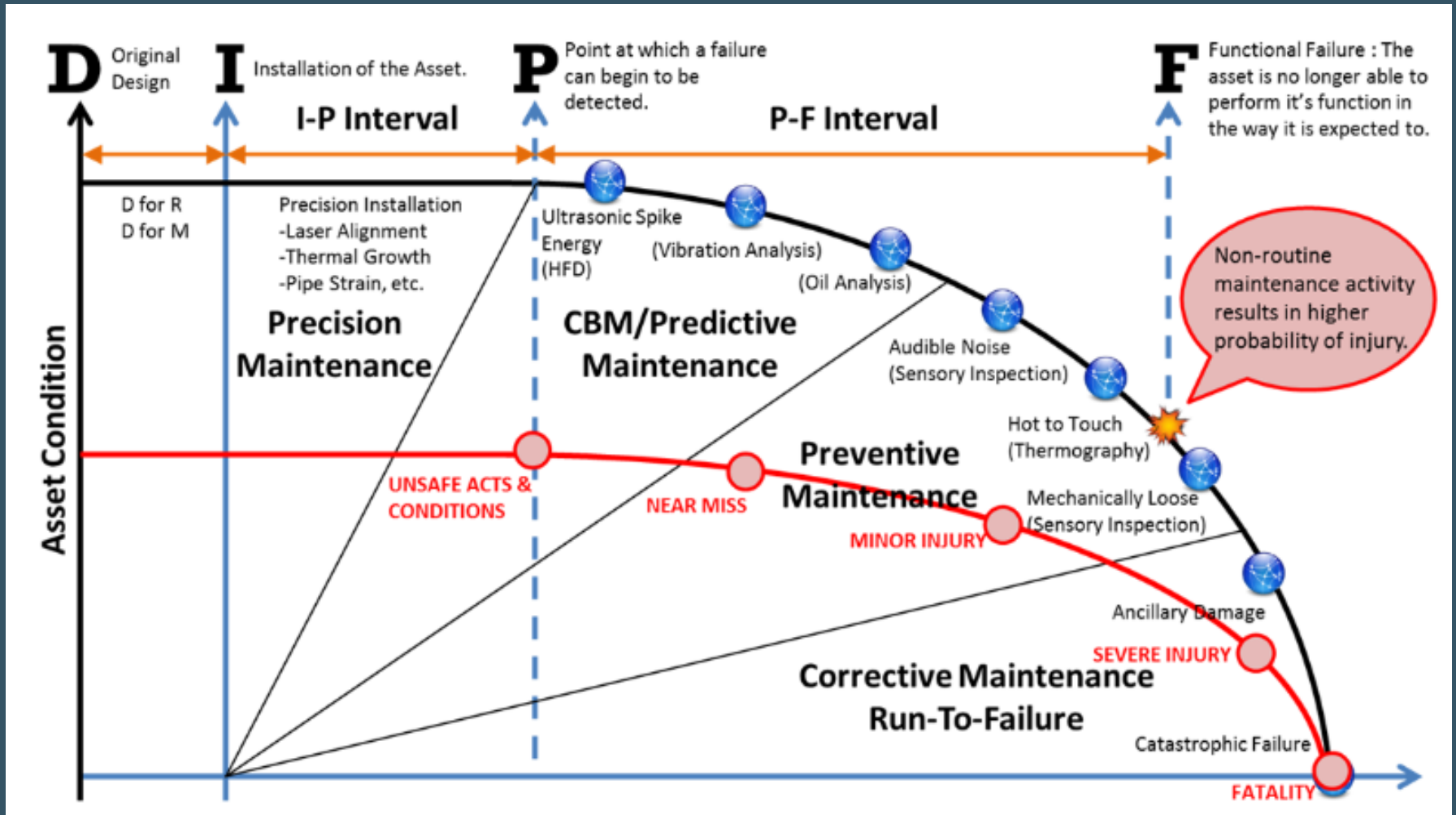


Potential Failure to Functional Failure Interval “P-F Interval”

The P-F interval allows us to proactively plan and make the repair before the equipment fails.
Effective inspections are essential.



Overlay Risks and Injuries





Maintenance Based Examples

Bar Racks



How Did this Happen?



Repairs



Avoiding Repairs



Name the Risks

Removal of the impeller
Hoisting of load
Continued failure of metal
and.....



Risk Matrix

RISK ASSESSMENT MATRIX				
SEVERITY PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			

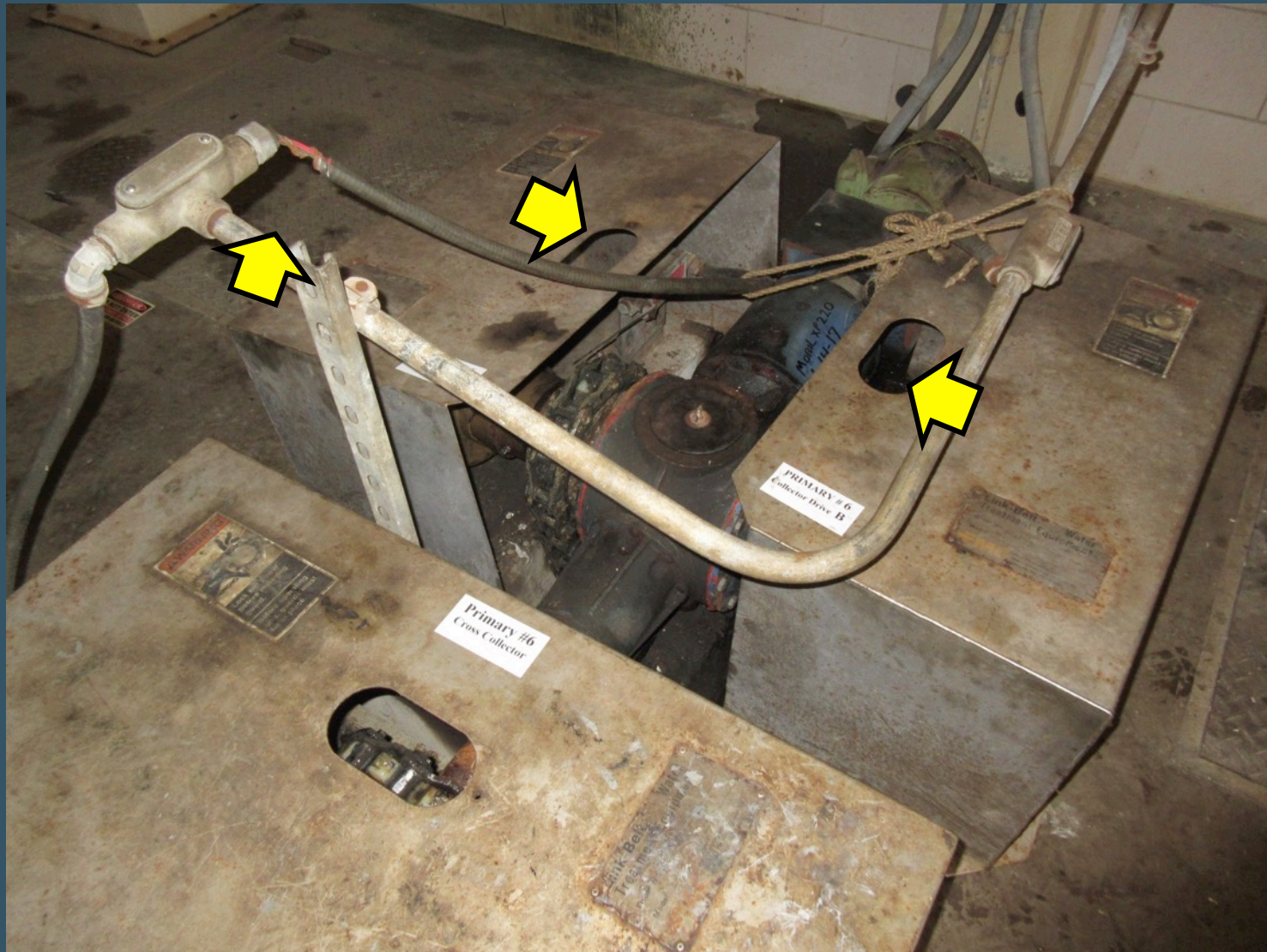
Repairs Needed



Status of this Repair?



What is the State of this Asset?



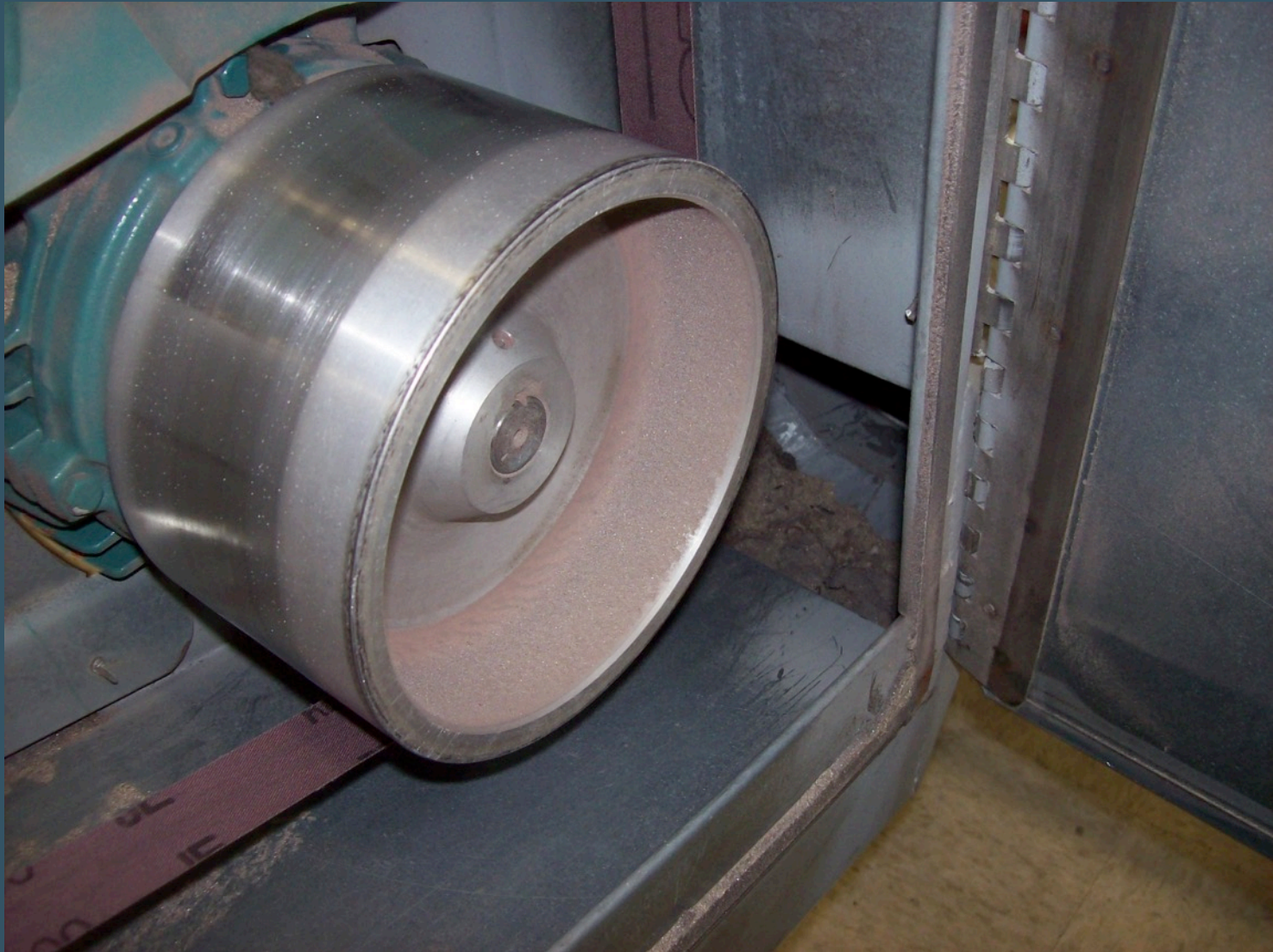
Actual Problems



How Efficient is it Working?



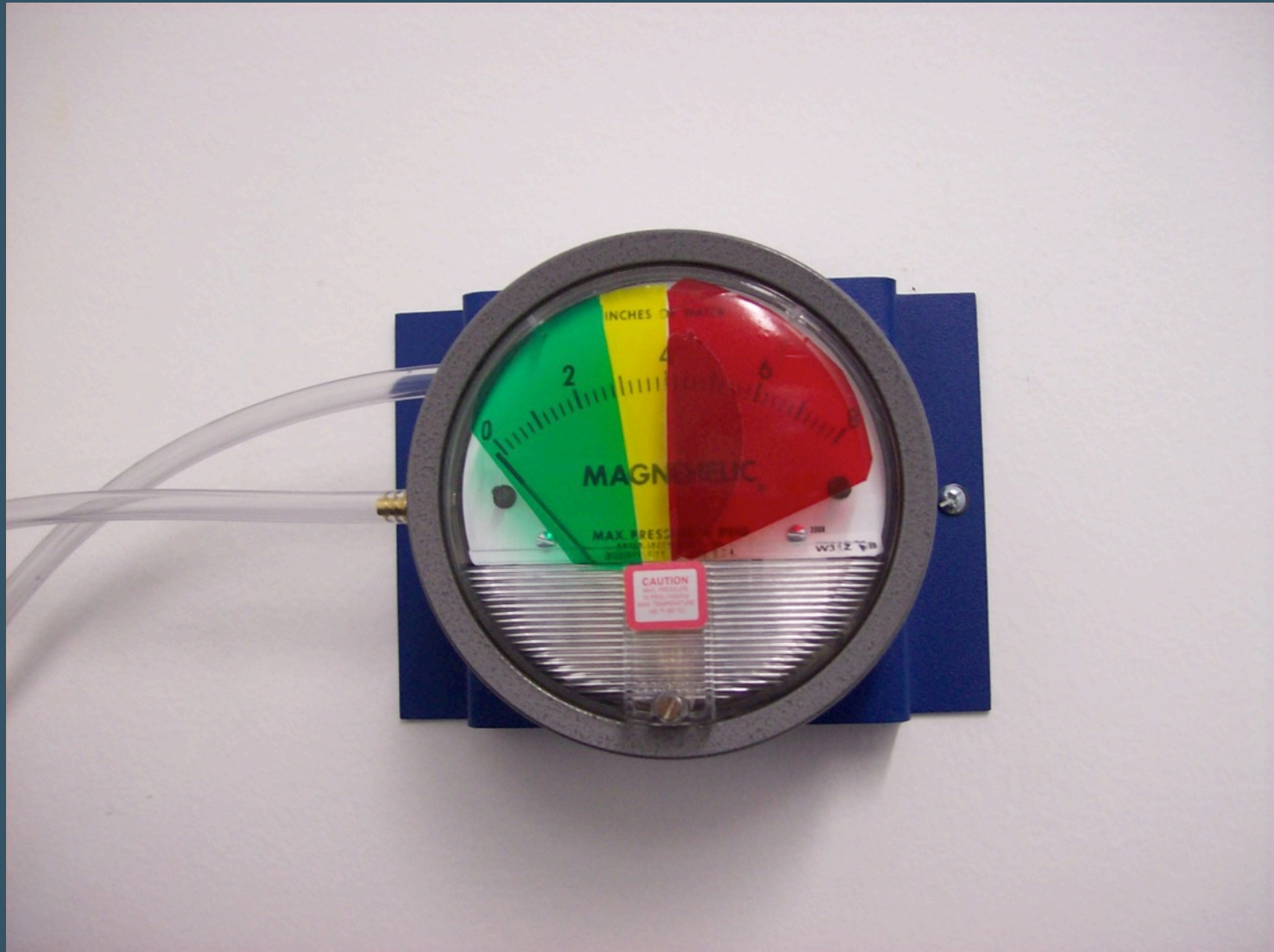
How Efficient is it Working?



How Efficient is it Working?

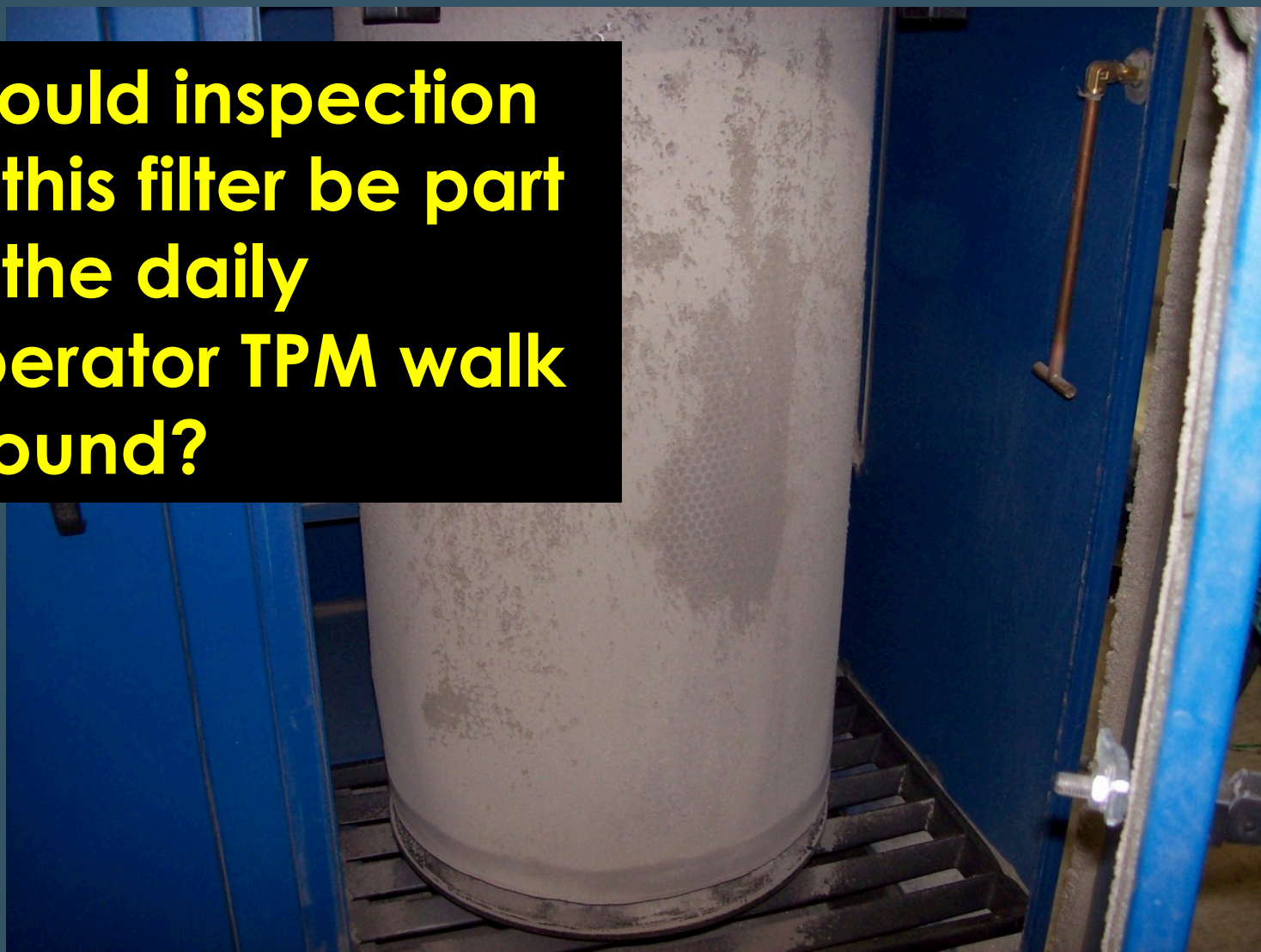


When Do We Perform Maintenance?

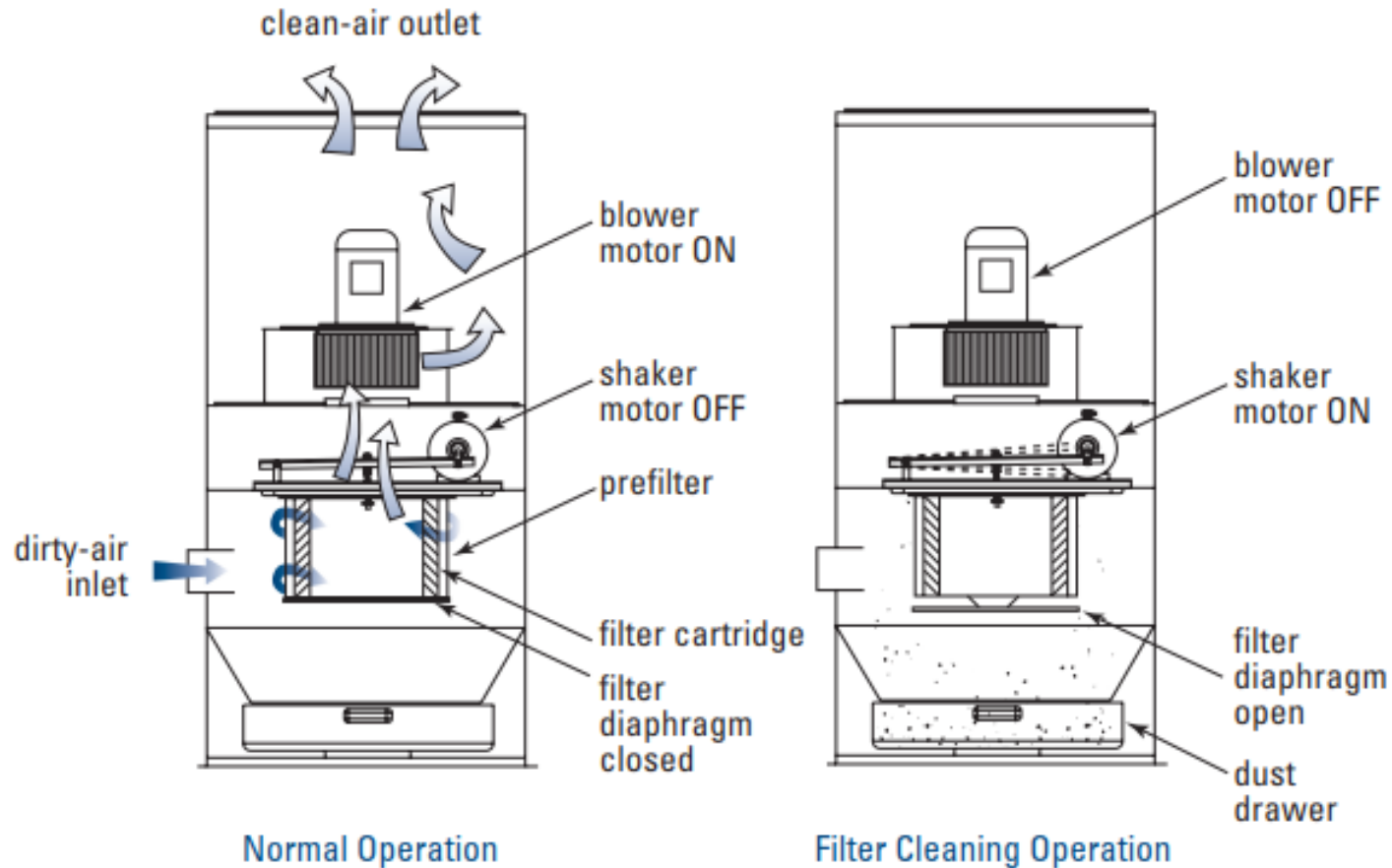


How Can We Spot Check?

Should inspection of this filter be part of the daily operator TPM walk around?



How Does it Work?



Automatic mechanical self-cleaning ensures the filter cartridge is cleaned every time the unit is shut off. It does an excellent job more cost effectively, and it does it quietly because of heavy-duty construction, special sound-attenuating material, and a vibration isolation motor mount.

How Well are the PM's Being Performed?



At What Point Does an Asset Need Repair?



So What is this and How Does it Work?



Babbitt Bearing



Bearing Internals



Damaged Bearing Internals



Damaged Bearing Internals



Best Practice





We need to store the guns horizontally....

Bearings



08/28/2015

Failure of Bearing Components

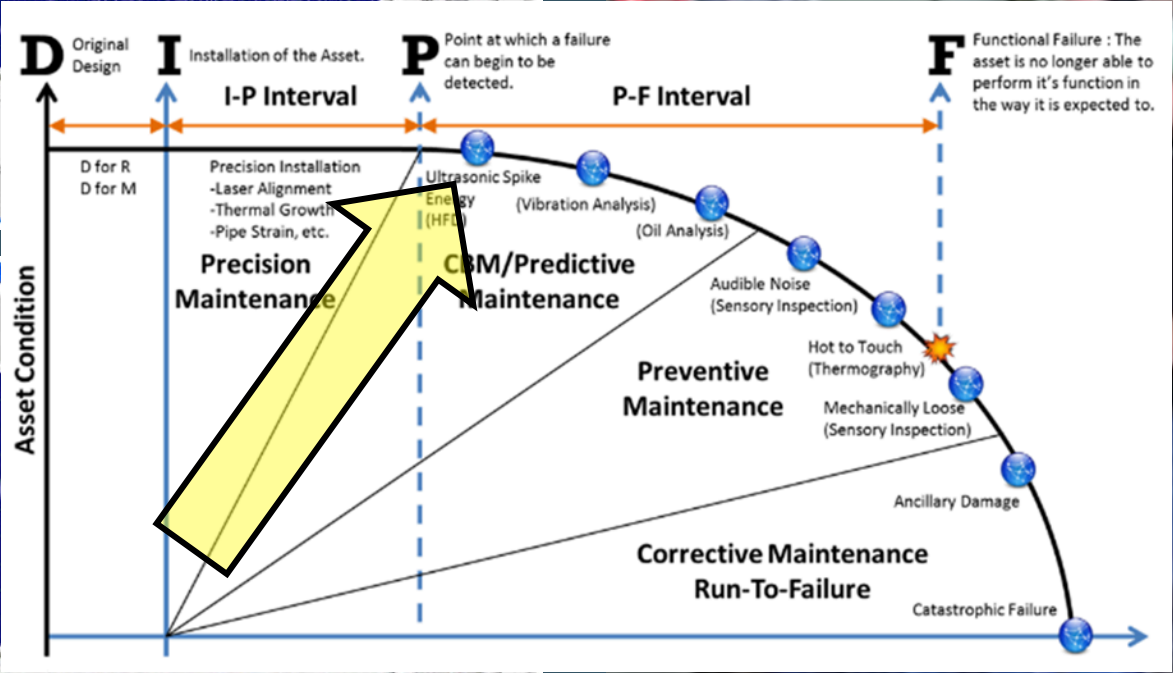
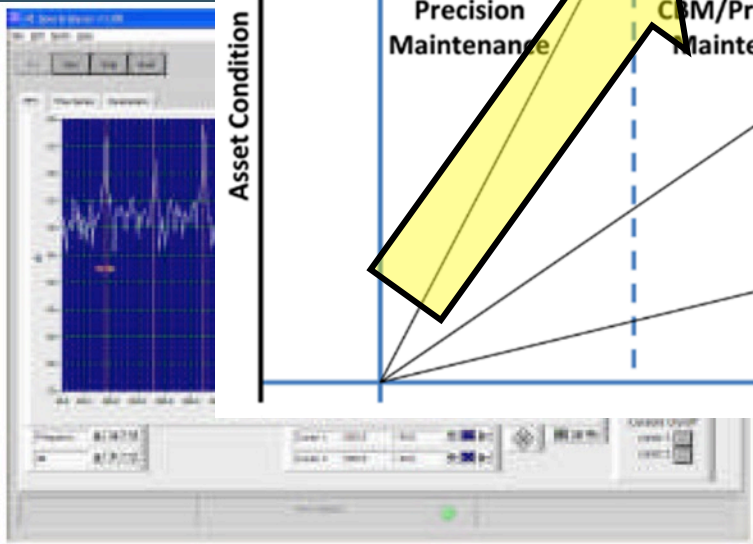
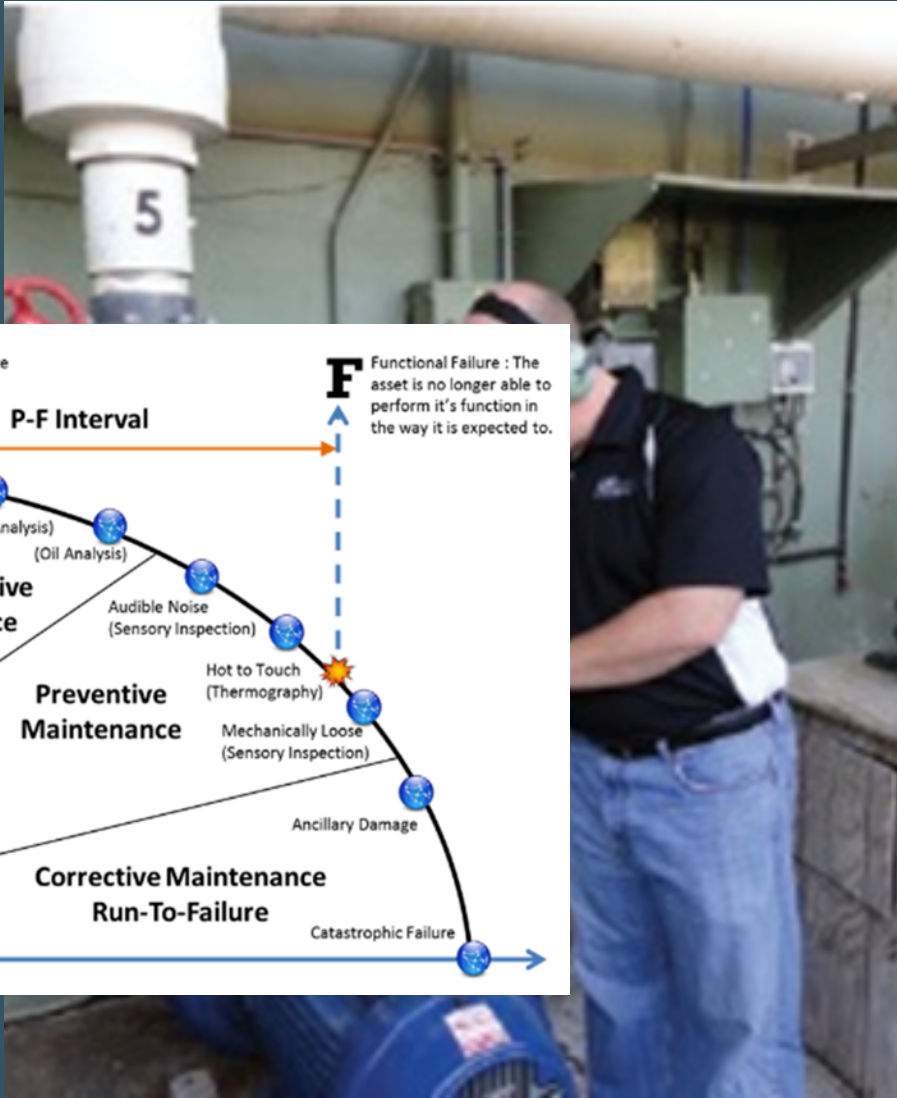
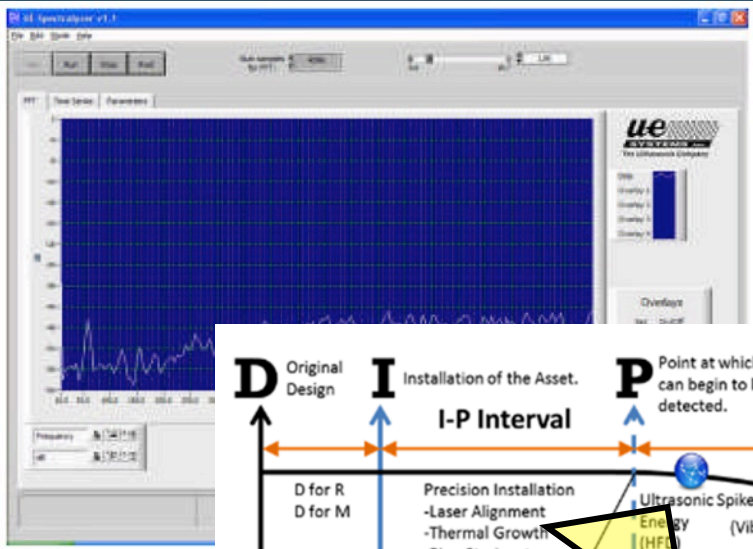


08/28/2015



How Can We Prevent This?

Ultrasonic Predictive Tool

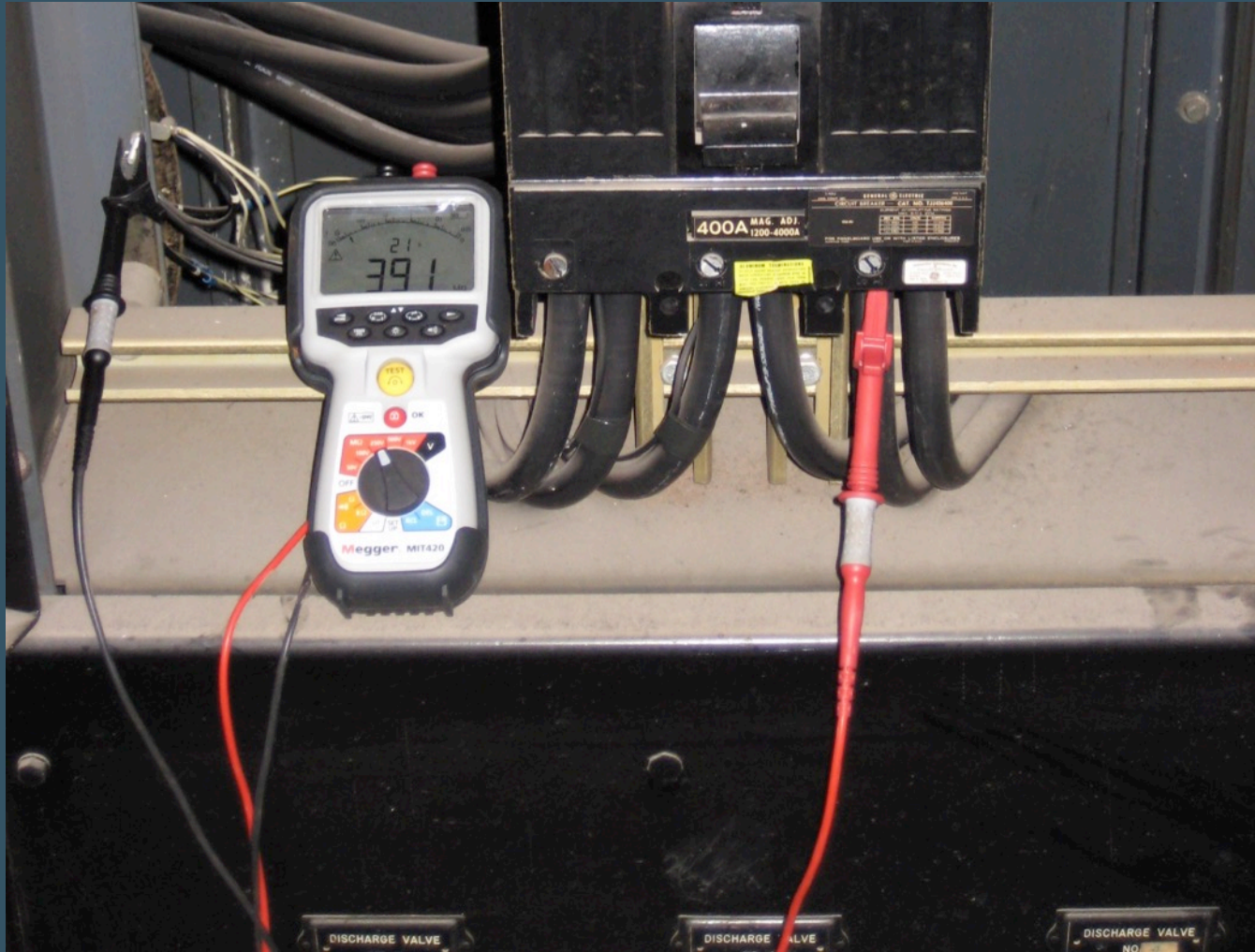




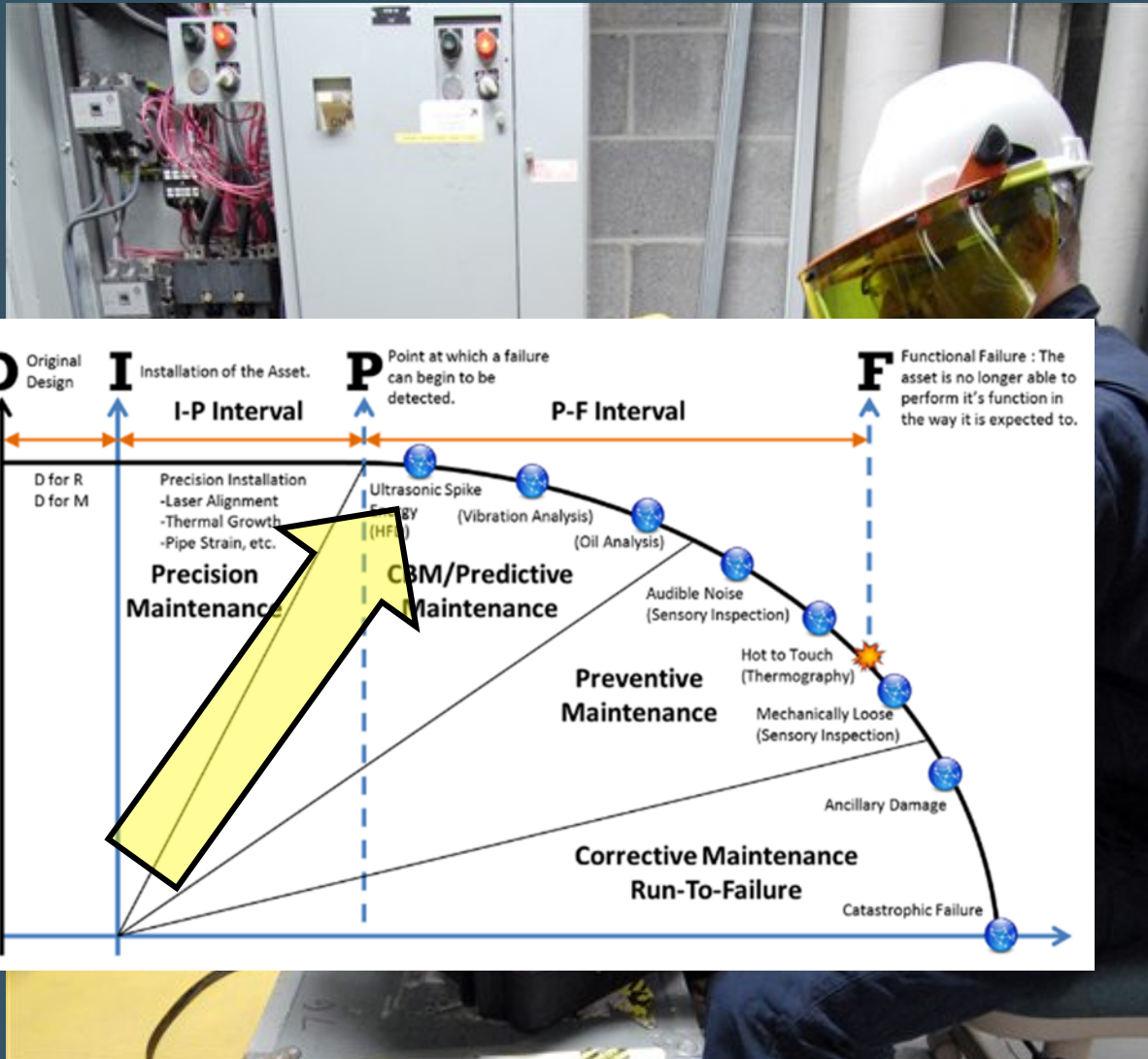
Condition of Motors



Insulation Resistance Testing









Motor Signature Analysis



Current State Maintenance Map

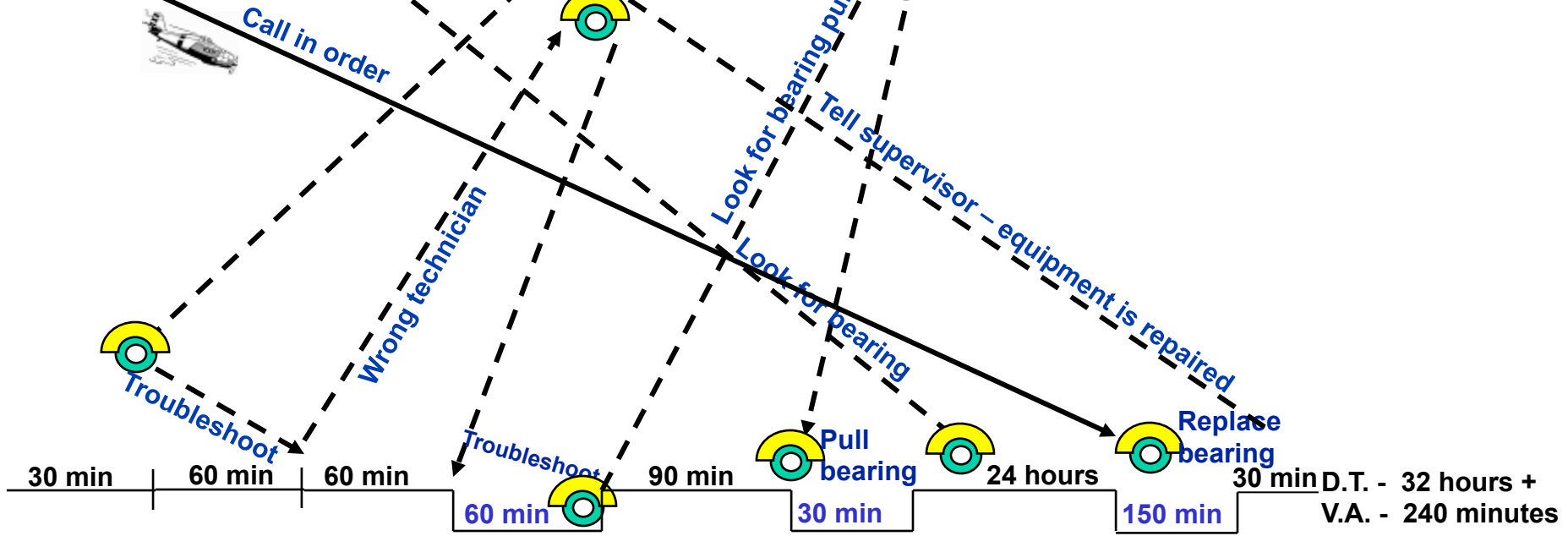
Production line breakdown

Utilization - 67%
OEE - 52%
Planned vs unplanned - 10%
\$\$ per hour down - \$2,000

-  Walking
-  Telephone
-  Electronic
-  Maintenance
-  Regular parts shipment
-  Emergency air shipment

Maintenance Management







Parts ordering system	Repairable spare parts <i>Get signatures</i>	Spare parts Inventory	Fasteners Plumbing Adhesives	Office Supv. attend. Skills matrix	W.O. System Failure history	Equip. docum. Manuals, prints, etc.	Maintenance tools : hydraulic jacks, bearing puller, power wash, drills, saws, etc.	Safety area: ladders, slings, lifts, PPE, LOTO center, etc.	Machining area: lathes, drill, grinder, arbor press etc.	Lubrication area: Oils, greases, dispensing	Waste area: Rags, oil, grease, speedi-dry
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Potential Future State
Maintenance Map

Production line Office

Utilization - 67%
OEE - 82%
Planned vs unplanned - 70%
\$\$ per hour down - \$2,000

-  Walking
-  Telephone
-  Electronic
-  Maintenance
-  Planner/Scheduler/Reliability Engineer
-  Regular parts shipment

Maintenance Management

Parts ordering system	Repairable spare parts	Spare parts Inventory	Fasteners Plumbing Adhesives	Office Supv. attend. Skills matrix	W.O. System Failure history	Equip. docum. Manuals, prints, etc.	Maintenance tools : hydraulic jacks, bearing puller, power wash, drills, saws, etc.	Safety area: ladders, slings, lifts, PPE, LOTO center, etc.	Machining area: lathes, drill, grinder, arbor press etc.	Lubrication area: Oils, greases, dispensing	Waste area: Rags, oil, grease, speed-dry
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E-mail to Production Supv

Planner orders bearing

Planner opens job & estimates

Planner kits parts

Pulled old bearing & estimated

Returned bearing & installed new

Returned bearing puller

Determine cause of bearing failure

Reliability Engineer determines that this bearing should be part of a vibration analysis route. At some point the bearing starts to fail and is picked up by the vibration analysis equipment.

45 min	5 min	30 min	30 min	180 minutes	150 min	10 min	30 min
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D.T. - 3 hours
V.A. - 300 minutes

Contractors for Maintenance

- Contractors are a part of daily life
- Often they perform Maintenance tasks
 - HVAC
 - Air Compressors
 - PIV Service
 - Cranes
- Many times performing high risk maintenance functions
- How do you manage this?
 - Ensure compliance
 - Work together on a safer workplace

To lubricate these fittings we have to:

Lock out the machine,
climb the ladder and
lubricate.....



**During TPM Focused Improvement Event,
Changed and relocated these fittings
Lower to access ...**



Grease fittings are now only 3 feet from floor level!

They can be greased during normal operation!



Respiratory Protection



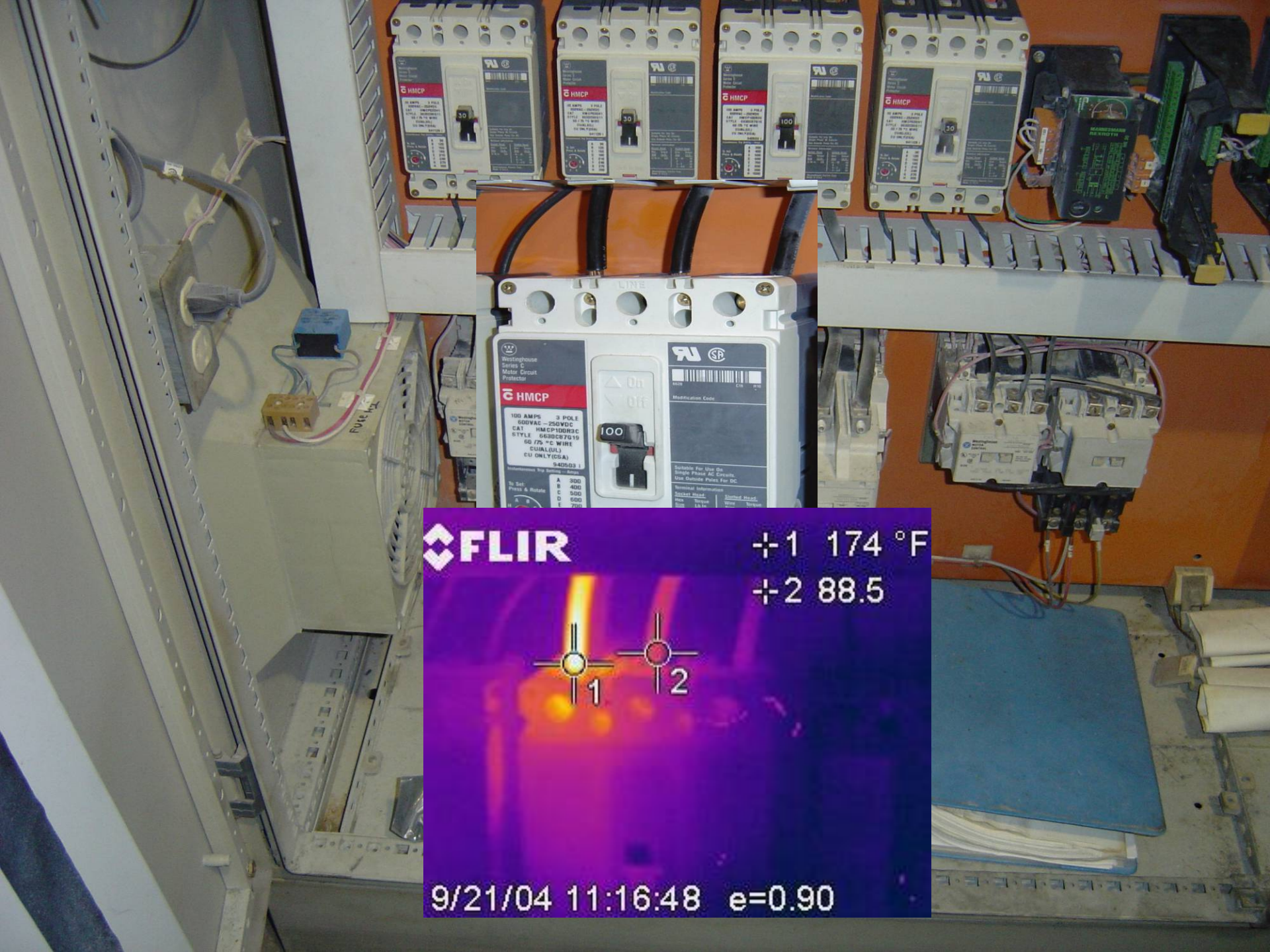
Respiratory Protection

- **1910.134(h) Maintenance and care of respirators.** This paragraph requires the employer to provide for the cleaning and disinfecting, storage, inspection, and repair of respirators used by employees.
- **1910.134(h)(1) Cleaning and disinfecting.** The employer shall provide each respirator user with a respirator that is clean, sanitary, and in good working order. The employer shall ensure that respirators are cleaned and disinfected using the procedures in Appendix B-2 of this section, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness. The respirators shall be cleaned and disinfected at the following intervals:
 - **1910.134(h)(1)(i)** Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
 - **1910.134(h)(1)(ii)** Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals;
 - **1910.134(h)(1)(iii)** Respirators maintained for emergency use shall be cleaned and disinfected after each use; and
 - **1910.134(h)(1)(iv)** Respirators used in fit testing and training shall be cleaned and disinfected after each use.

PPE usually needed when exposed to voltage

(using NFPA tables)





HMCP
100 AMP, 3 POLE
500VAC, 250VDC
CAT HMCP-100R3C
STYL 6500CH 70 19
50 75 °C WIRE
CU/AL(L) (CSA)
942053

LINE
HMCP
100 AMP, 3 POLE
500VAC - 250VDC
CAT HMCP-100R3C
STYL 6500CH 70 19
50 75 °C WIRE
CU/AL(L) (CSA)
942053

HMCP
100 AMP, 3 POLE
500VAC, 250VDC
CAT HMCP-100R3C
STYL 6500CH 70 19
50 75 °C WIRE
CU/AL(L) (CSA)
942053

HMCP
100 AMP, 3 POLE
500VAC, 250VDC
CAT HMCP-100R3C
STYL 6500CH 70 19
50 75 °C WIRE
CU/AL(L) (CSA)
942053

FLIR

+1 174 °F
+2 88.5



9/21/04 11:16:48 e=0.90

Infrared Viewing Ports



What you rather do?



Typical Medium Voltage Distribution System



Problem?



What's Next?

- Teambuilding
 - Focused Events – Total Productive Maintenance (TPM)
- Integration of Lean and Safety
- Audits
- Integration of your CMMS for regulatory based inspections

Thank You

Maintenance
& Safety
Professionals



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