

How to Write an Effective PM Procedure Made Simple

"You cannot perform PM on equipment that continues to fail"

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Preventive Maintenance is a “controlled experiment”

Process: Equipment, Component, part, and asset is put into a maintainable level then Maintained

As such one must understand a few things

1. Preventive Maintenance is not a silver bullet
1. PM involved Maintenance, Operations, purchasing, etc.
example:
 - During my VA Hospital visit I noticed their was new flooring installed in an office incorrectly, I returned at a later date and floors were “repaired” not to made to “like new” or “restored condition”
 - Over a period of 6 months this new flooring was changed again
 - Most organizations do not understand the objective of PM
 - Preventive Maintenance “preserve, restore, protect” and not “Run to Failure”, unless this is your maintenance strategy (PM, PdM, OpCare – even in facilities, and RTF)
3. Preventive Maintenance inputs and outcomes must be measured and controlled
4. Very few organizations have the knowledge or will to execute PM effectively at Optimal Reliability at Optimal Cost (PM cost vs Repair/Restoration cost)

Basic Requirements for Writing a PM Procedure

- ▶ Must be Repeatable
- ▶ Written to the lowest level
- ▶ Version controlled
- ▶ Step by step instructions
- ▶ Specifications
- ▶ Initials for each step
- ▶ Requires discipline in execution and manage of the process (not optional)
- ▶ Focused on Failure Modes (how something fails)
 - ▶ Example: Rolling element bearing (keeping it simple)
- ▶ I Have a question Who should write the procedure?

- fatigue
- ineffective seals
- inadequate lubrication
- heavier loading than anticipated
- wrong or inadequate fits
- incorrect installation

Types of PM procedures

- ▶ Inspect
- ▶ Adjust
- ▶ Lubricate
- ▶ Operator Care



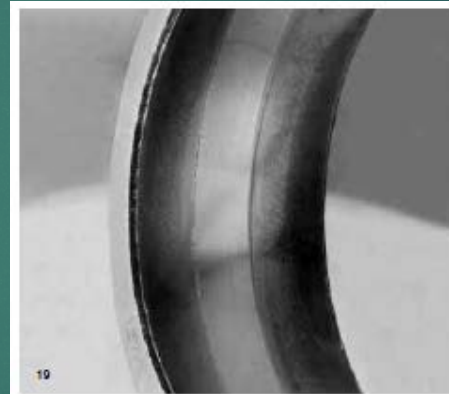
Step 1: Identify each part/component on an asset

- ▶ Bearings – Rolling element, ball type, etc.
- ▶ V-belts
- ▶ Timing belts
- ▶ Centrifugal pumps

Step 2: Determine how each part or component will fail

Example:

- ▶ Electric Motor
 - ▶ Bearings
 - ▶ Rolling element bearing (use SKF Bearing Failure Manual)
 - ▶ Lack of lubrication
 - ▶ Misalignment
 - ▶ Improper installation
 - ▶ Contamination
 - ▶ Etc.



Step 3: Write PM procedure

- ▶ Minimum – Noun, Adjective and Verb for each step
- ▶ If a step is over one line make this step two steps
- ▶ Make it simple and make it easy to understand, write to lowest education level of your staff – if unknown write to 9th grade level
- ▶ Must have actionable steps with specifications/tolerances
- ▶ Require comments when additional action is required
- ▶ Condition as found, condition as left, and any additional comments

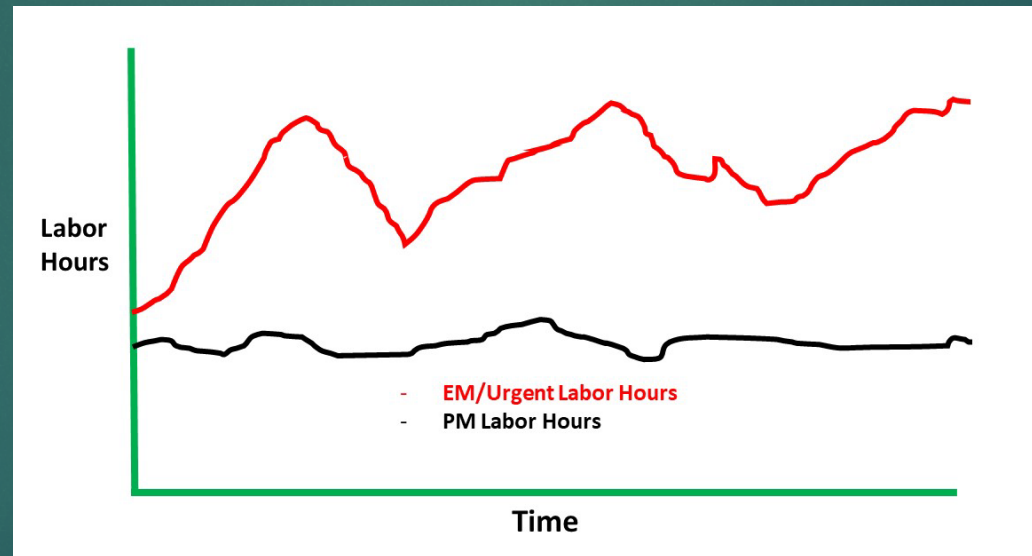
Step 4: If a failure occurs review PM procedure

- ▶ Identify if the failure was due to human or procedure error or possibly both

“70-80% of Equipment Failures are Human Induced”

Step 5 – Measure

- ▶ PM Compliance using the 10% Rules (30 day PM = 3 days or out of compliance)
- ▶ PM Labor Hours vs EM/Urgent Labor Hours



Step 6: Define Roles and Responsibilities using RACI

- R – Responsible “the Doer”
- A – Accountable “the Buck stops here”
- C – Consulted “in the Loop”
- I – Informed “Kept in the picture”

Lubrication Roles and Responsibilities						
Task / Position	Maintenance Planner	Maintenance Supervisor	Maintenance Manager	Reliability Engineer	Maintenance Technician	Plant Mgr.
Lubrication Program Design	I	C	A	R		I
Lubrication Effectiveness	C	A	I	C	R	I
Lubrication Execution	I	C	A	C	R	I
Work Order Close Out	C	C	C			R
Pull Weekly Lube Metrics Effectiveness	R	C	A	R	R	I
Lubrication FRACAS, “Failure Reporting, Analysis, Corrective Action System”	C	R	A	R	R	I

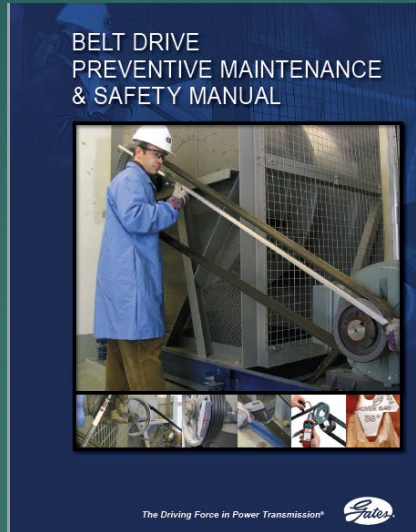
Responsibility	“the Doer”
Accountable	“the Buck stops here”
Consulted	“in the Loop”
Informed	“kept in the picture”

Utilize Free Resources for Preventive Maintenance



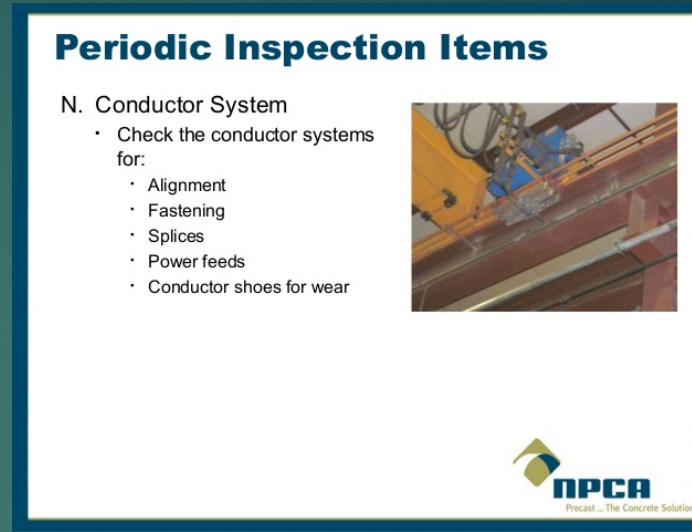
TIMKEN
Where You Turn

Timken Bearing Damage Analysis with Lubrication Reference Guide



BELT DRIVE PREVENTIVE MAINTENANCE & SAFETY MANUAL

The Driving Force in Power Transmission® *Fulcrum*

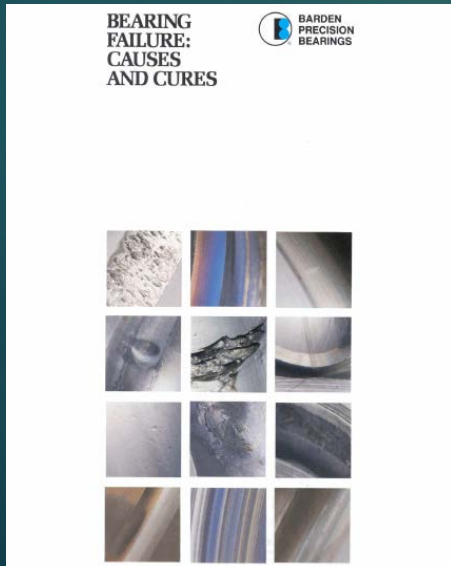


Periodic Inspection Items

N. Conductor System

- Check the conductor systems for:
 - Alignment
 - Fastening
 - Splices
 - Power feeds
 - Conductor shoes for wear

NPCA
Precast... The Concrete Solution



BEARING FAILURE: CAUSES AND CURES

BARDEN PRECISION BEARINGS



Operator Care – 4 Elements to Enhanced Operator Inspections

"TOOL BOX TRAINING"

By Mike Gehloff, GPAIled@applied.com

ELEMENT 1 – Focus on Abnormalities, not Failures:

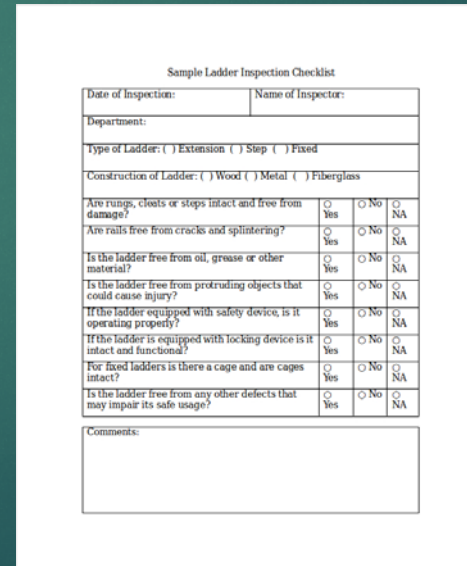
ELEMENT 2 – Formal Routine Inspection Forms:

ELEMENT 3 – Focus on Abnormalities, not Failures:

ELEMENT 4 – Focus on Abnormalities, not Failures:

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If you have questions or suggested topics send an email to gmh@applied.com
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Sample Ladder Inspection Checklist

Date of Inspection: _____ Name of Inspector: _____

Department: _____

Type of Ladder: () Extension () Step () Fixed

Construction of Ladder: () Wood () Metal () Fiberglass

Are rungs, cleats or steps intact and free from damage?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
Are rails free from cracks and splintering?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
Is the ladder free from oil, grease or other material?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
Is the ladder free from protruding objects that could cause injury?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
If the ladder equipped with safety device, is it operating properly?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
If the ladder is equipped with locking device is it intact and functional?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
For fixed ladders is there a cage and are cages intact?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA
Is the ladder free from any other defects that may impair its safe usage?	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> NA

Comments: _____



ROOFING PREVENTATIVE MAINTENANCE MANUAL

Questions

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