DTE Energy
Detroit Edison

Preventive Maintenance

State Energy Assessment Workshop

By:

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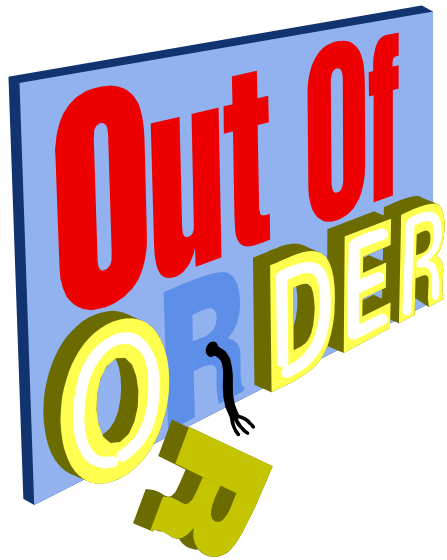
Do you know?

World wide research has shown that one of the reasons causing 80% of the accidents is **deficient equipment inspection or maintenance.**



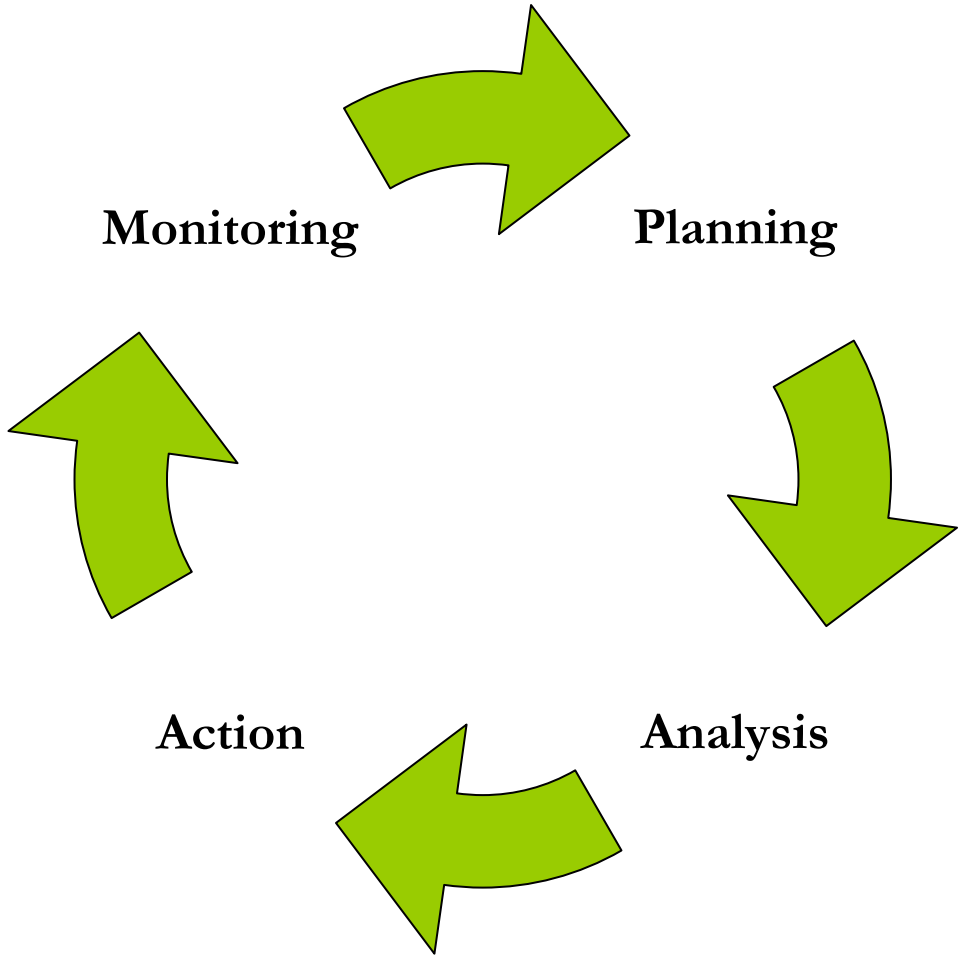
Do you know?

- Energy efficiency decreases due to the aging of major energy-related systems such as boiler & steam distribution, HVAC, and compressed air systems.

What Shall We Do

Expert's Proposal

- Implement a "Continuous Improvement" approach to an energy maintenance program.
- Elements of energy maintenance program includes Planning, Analysis, Action and Monitoring



I. Planning

- The first phase, sets the stage for the entire process.
- Planning steps are
  - Identify energy related maintenance function
  - Estimate energy related maintenance cost
  - **Determine present maintenance state of major energy systems and equipment**

I. Planning (Cont'd)

- Determine maintenance task requiring immediate attention
- Develop a list of ongoing preventive maintenance tasks
- Determine initial monitoring procedures
- Choose energy maintenance goals

Maintenance-directed Inspection of Major Energy-related Systems

- Boilers and the Steam Distribution System
- Motors
- HVAC and Industrial Refrigeration
- Building Envelope
- Lighting
- Hot Water Distribution
- Air Compressors and Compressed Air Distribution System
- Electrical Distribution
- Waste Reduction

A- Boilers and Steam Distribution System

- Boiler Gauges:
  - All gauges are working properly?
  - If there is any rust in any of the gauges?
- Boiler Controls:
  - Amount of combustion air i.e. perform flue gas analysis to make sure boiler is operating with the right amount of outside air.
  - For an instance, too little air would cause incomplete combustion
  - Boiler water level- To prevent overheating of tubes

A- Boilers and Steam Distribution System (Cont'd)

- Steam Traps:
  - Stream traps can fail open or shut
  - If steam trap fails open, steam passes directly into condensate return lines.
- Steam lines and Condensate lines:
  - Leaks can reduce both the pressure and amount of delivered fluid
- Water treatment:
  - Water entering must be treated correctly to avoid scale build up, reduced heat transfer and tube failing.

B-Motors

- Worn Bearings:
  - Noise problem
  - Cause shaft to seize up
- Lubrication:
  - Appropriate lubrication level
- Unbalanced Voltage:
  - Degraded insulation, heat build-up, reduced motor life

B-Motors (Cont'd)

- Power Quality:
  - Irregular voltage spikes
- Alignment:
  - Any angular difference can cause bearing wear
- Belts and Belt Tension:
  - Too loose- will create slip
  - Too Tight- increased bearing wear

B-Motors (Cont'd)

- Frame and Anchor:
  - No cracks in frame
  - Anchor should be tight
- Brush Maintenance (DC Motors)
  - Brush wear out- should be replaced whenever they are less that ¼" long

C- HVAC and Industrial Refrigeration

(Cont'd)

- Ductwork:
  - Check for damage or blockage
  - Duct insulation
- Heat Transfer Surfaces:
  - Dirt or debris on heating/cooling coils or fins
- Filters:
  - Clogging- Clogged filter requires more fan energy to filter

C- HVAC and Industrial Refrigeration

(Cont'd)

Fans:

- Locate excess dirt on fan blades
- Turning direction

C- HVAC and Industrial Refrigeration

(Cont'd)

- Control Systems:
  - Settings for temperature, defrost cycle time and other parameters.
- Cooling Towers:
  - Spray nozzles for scaling
  - Water return drain blockages
- Dampers:
  - Jamming of dampers

D-Building Envelope

- Doors and Window:
  - Crack and gaps around doors and windows
- Roof Insulation:
  - Insulation damage-causes heat to escape in cold climate , and to come into conditioned spaces in a hot climate

E-Air Compressor and Compressed Air Distribution System

- Air compressor:
  - Heat transfer fins should be clean of debris
  - Compress gaskets should not make noise or show leaks
  - Connections should not leak
  - Dryer should be working properly to take out moisture out of air
- Air Leaks:

F- Electrical Distribution

- Transformers:
  - Dielectric fluid samples
  - Fins-Dirt or debris
- Junction Boxes:
  - Frayed wires
  - Burned insulation

F- Electrical Distribution (Cont'd)

- Wiring:
- Insulation- Cracking or wear out can cause a short
- Outlets Damage:
- Grounding:

II. Monitoring

- In this stage, energy usage is recorded, along with any production problem caused or avoided by the maintenance
- Energy costs are noted and compared
- All maintenance actions are logged

III. Analysis

- What did we do right, and how can we do it again?
- What did we do wrong, and how can we avoid doing it again?
- What results have we achieved?
- What new actions should we undertake?

IV. Action

- Monitoring phase yields a new list of maintenance tasks and a refined method of estimating their benefits.
- New tasks are carried out based on the new list formulated.

Conclusion

- An effective preventive and corrective maintenance program based on diligent surveillance, monitoring, detection, and inspection will prevent or reduce both the equipment out of service time and the losses in energy efficiency.

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Any Questions ?
Thank you