Predictive Maintenance Technologies

Mechanical Reliability Solutions

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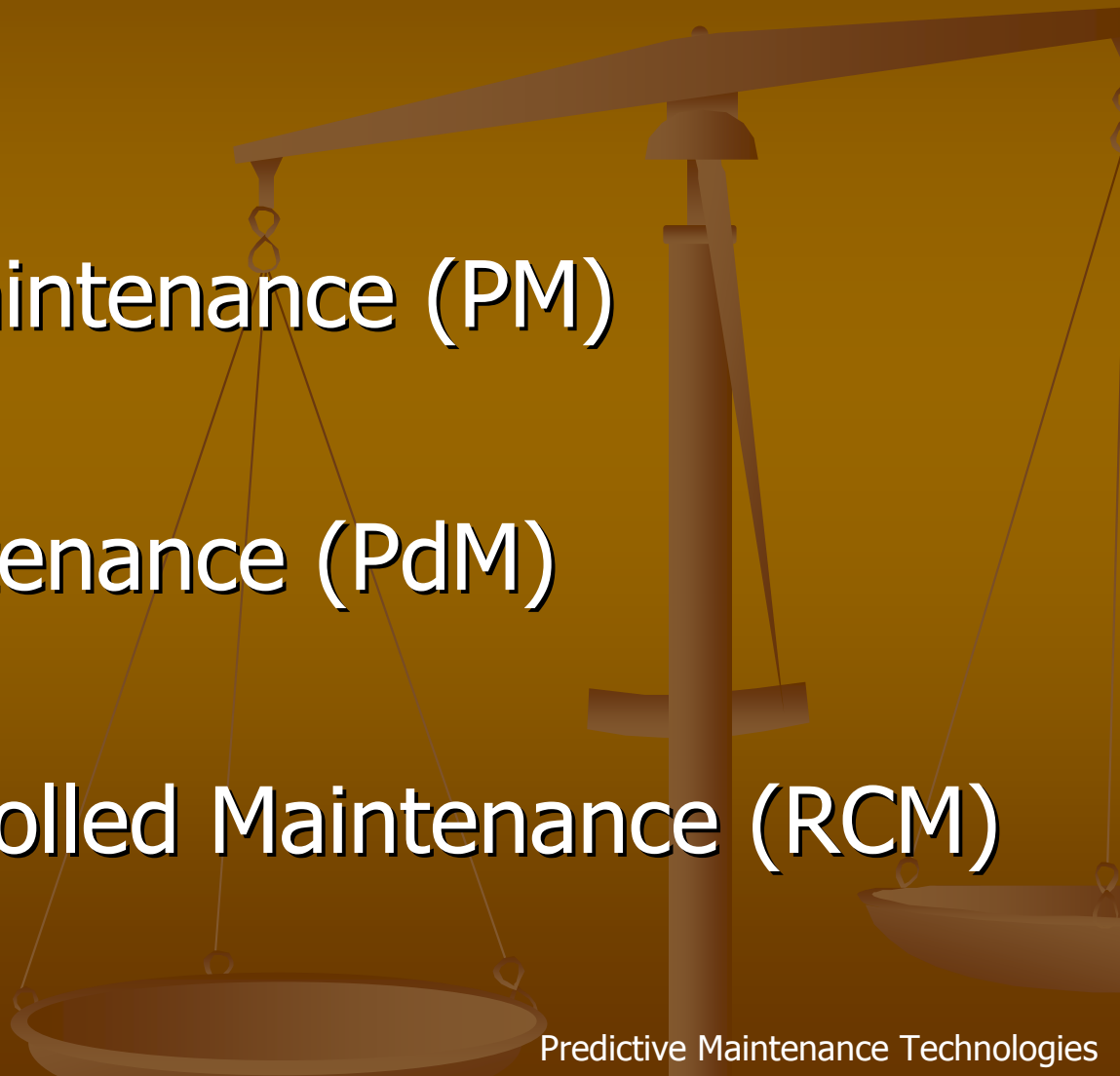
Defining Maintenance: PM, PdM, and RCM

Understanding the best methods for your plant and equipment!

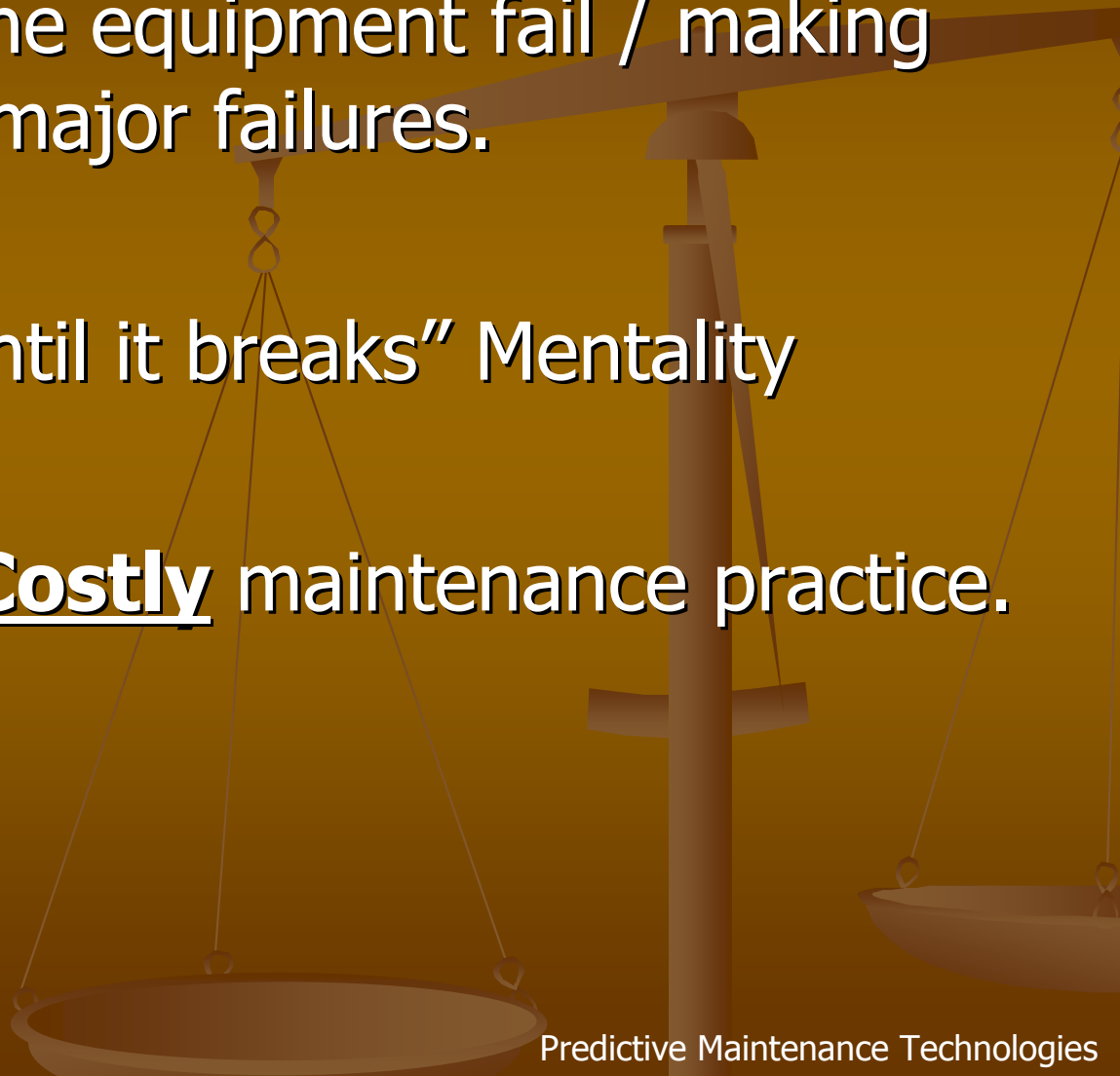
Types of Maintenance Practices

- Run-to-Failure
- Preventative Maintenance (PM)
- Predictive Maintenance (PdM)
- Reliability Controlled Maintenance (RCM)



Run-to-Fail Maintenance

- Based on letting the equipment fail / making repairs only after major failures.
- The "Don't fix it until it breaks" Mentality
- This is the **Most Costly** maintenance practice.



Preventative Maintenance (PM)

- Based on the time-clock.
- Every X-amount of time a service is performed.
- Most common and generally practiced maintenance philosophy
- Good – Equipment regularly inspected / maintained.
- Bad – Still potential for failures. The maintenance that was performed may not have been necessary.

Predictive Maintenance (PdM)

- Based on the equipments current condition.
- Allows for planned maintenance actions at the time they are actually needed.
- Usually implemented only for critical path equipment.
- Usually includes only 1-2 of the several PdM technologies.

Reliability Controlled Maintenance (RCM)

- This is the **Most Cost Effective** approach to maintenance.
- Based on complete equipment/plant reliability.
- Designed to be all-inclusive – Will appropriately cover everything from the 1/3Hp conveyor gearbox to the 700HP Air Compressor

What is included in a RCM Program?

- Vibration Analysis – All major rotating equipment.
- Electrical Infrared Thermography – All electrical switchgear and MCC's
- Mechanical Infrared Thermography – All mechanical equipment
- Motor Current Analysis – All AC motors over 25HP or critical path motors.
- Air System Scanning – Entire plant compressed air system
- Steam System Scanning – Entire plant Steam system
- Corrective Actions – Laser alignment and field balancing as needed.

Measuring Value & Cost Avoidance

Each maintenance philosophy will give some return on investment, when used appropriately.

Run-To-Failure Values

- Run-to-Fail is appropriate for equipment that will have zero effect on a companies production and bottom line.
- A very general example would be a light bulb. When it burns out, you change it. It may have failed, but did not effect production.
- This idea would apply to most small, non-repairable, not-related directly to production equipment found in a plant.

Preventative Maintenance Values

- This generally is focused on lubrication and bearing/filter changes.
- Maintenance actions are taken according to a chronological value.
- In most cases, it is difficult to measure the amount of return from a PM program.

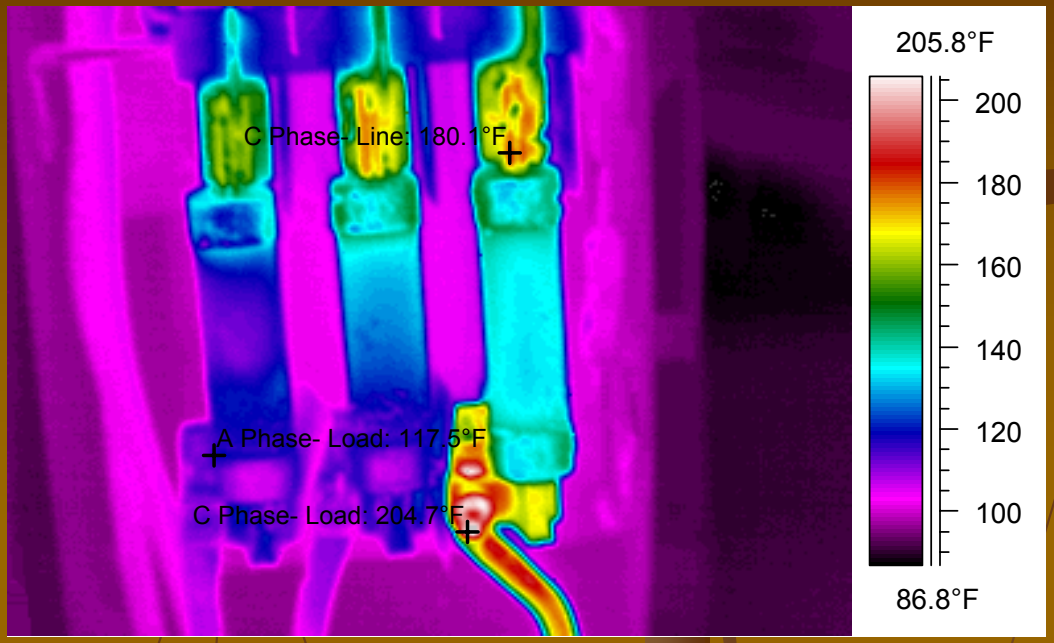
Predictive and Reliability Controlled Maintenance Values

- PdM and RCM Values are directly derived from identifying and repairing the small issues as compared to allowing a complete failure or increased operating cost.
- Examples:
  - Replacing one failing bearing in a motor will be far less then rewinding/replacing the motor.
  - Tightening one loose screw on an overload will be far less then replacing the entire overload.
  - Identifying and Repairing 20 air leaks could reduce an air compressors operation by 50% and save thousands in energy costs.
  - Poor or degraded boiler seals/insulation could be decreasing the boiler efficiency and increasing your production costs.

Case History

- Infrared Thermography was used to identify the following issue.
- This issue was identified but left unrepaired.
- You will see how this company *COULD HAVE* saved up to $5000 on just one issue.

Fuse Clip Heating



- This issue was located as part of an annual infrared inspection at a grain elevator.
- Repairs were not made in the recommended timeframe and the wires that supplied the control box burnt up in the conduit, due to the extra loading.
- The following page shows the costs directly related to this one issue.

Fuse Clip Failure Cost Avoidance

Cost Justification for Immediate Repair			
400V Fused Disconnect – Loose Connection			
	Estimate Cost for Repairs at Current Condition:	Estimated Cost for Repairs after Failure:	Cost Savings of Maintenance Action Now:
Material	$0	New Disconnect, Wires, and Misc. Components $2500	$2500
Labor	Tighten the Fuse Clip 1 Technician X 0.5 Hours $15	Change Disconnect and Re run Control Wires 2 Technician X 2 Hrs $80	$65
Unplanned Downtime	$0	2 Hours @ $1,000 $2,000	$2,000
Total Savings for Maintenance Actions Performed Now:			**$4,565.00***
Other Cost Factors to Consider:	**Power Consumption, Potential For Fire**		

***These numbers were calculated using industry standards for an approximate equipment size. These may need adjustment to fit your specific equipment. You are strongly encouraged to use your own numbers or contact Predictive Maintenance Technologies for a more specific cost justification.**

With these services, as you can see…

- The company:
  - *could have* only spent $15 for the time to tighten the fuse clips.
  - *could have* saved production time.
  - *could have* used their time to repair other important issues.
  - ***instead*** lost an estimated $4500.
  - ***instead*** risked the chance of a fire.
  - ***instead*** decreased their profits.

In conclusion:

- This has been a very brief overview of the available technologies/services. Contact your local service provider for clarification on the topics.
- Set goals for implementing these technologies in your plant.
- The Main Point is to GET STARTED. The longer you wait, the more you could lose!