

# TE 4225

## Types of Maintenance Programs

( Types & Which is more popular maintenance and why )

# Reactive Maintenance

- Reactive maintenance is basically the “run it till it breaks” maintenance mode. No actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached.
- The referenced study breaks down the average maintenance programs follows:
  - >55% Reactive
  - 31% Preventive
  - 12% Predictive
    - 2% Other.

# Reactive Maintenance

## Advantages

- Low cost.
- Less staff.

## Disadvantages

- Increased cost due to unplanned downtime of equipment.
- Increased labor cost, especially if overtime is needed.
- Cost involved with repair or replacement of equipment.
- Possible secondary equipment or process damage from equipment failure.
- Inefficient use of staff resources.

# Preventive Maintenance

- Preventive maintenance can be defined as follows:
- Actions performed on a **time- or machine-run-based schedule** that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling degradation to an acceptable level.

# Preventive Maintenance

## Advantages

- **Cost effective** in many capital-intensive processes.
- **Flexibility** allows for the adjustment of maintenance periodicity.
- Increased component **life cycle**.
- Energy savings.
- Reduced equipment or process **failure**.
- Estimated **12% to 18%** cost savings over reactive maintenance program.

## Disadvantages

- Catastrophic failures still likely to occur.
- Labor intensive.
- Includes performance of unneeded maintenance.
- Potential for incidental damage to components in conducting unneeded maintenance.

# Predictive maintenance

- Predictive maintenance can be defined as follows:
- Measurements that **detect** the onset of a degradation mechanism, thereby allowing casual stressors to be eliminated or controlled **prior to any significant deterioration** in the component physical state. Results indicate current and future functional capability.

# Predictive Maintenance

## Advantages

- Increased component **operational life/availability**.
- Allows for preventive **corrective actions**.
- Decrease in equipment or process **downtime**.
- Decrease in **costs** for parts and labor.
- Better product **quality**.
- Improved worker and environmental **safety**.
- Improved worker **moral**.
- Energy savings.
- Estimated **8% to 12%** cost savings.

## Disadvantages

- Increased investment in diagnostic equipment.
- Increased investment in staff training.
- Savings potential not readily seen by management

# Predictive Maintenance

- In fact, independent surveys indicate the following industrial **average savings** resultant from initiation of a functional predictive maintenance program:
  - Return on investment: 10 times
  - Reduction in maintenance costs: 25% to 30%
  - Elimination of breakdowns: 70% to 75%
  - Reduction in downtime: 35% to 45%
  - Increase in production: 20% to 25%.



# Reliability Centered Maintenance

“a process used to determine the maintenance requirements of any physical asset in its operating context.”

- Basically, RCM methodology deals with some **key issues** not dealt with by other maintenance programs. It recognizes that all equipment in a facility is not of **equal importance** to either the process or facility safety. It recognizes that equipment design and operation differs and that different equipment will have a higher probability to undergo failures from different degradation mechanisms than others.
- It also approaches the **structuring** of a maintenance program recognizing that a facility does not have unlimited financial and personnel resources and that the use of both need to be prioritized and optimized.
- In a nutshell, RCM is a **systematic approach** to evaluate a facility's equipment and resources to best meet the two and result in a high degree of facility reliability and cost-effectiveness.

( V.V.I )

# Reliability Centered Maintenance<sub>(RCM)</sub> ( Previous )

## Advantages

- Can be the **most efficient** maintenance program.
- Lower costs by eliminating unnecessary maintenance or overhauls.
- Reduced probability of **sudden equipment failures**.
- Able to focus maintenance activities on **critical components**.
- Increased component **reliability**.
- Incorporates **root cause analysis**.

## Disadvantages

- Can have significant startup cost, training, equipment, etc.
- Savings potential not readily seen by management.

# How to Initiate Reliability Centered

## (How to start in Textile Industry) Maintenance (V.V.I)

The road from a purely reactive program to a RCM program is not an easy one. The following is a list of some basic steps that will help to get moving down this path.

1. Develop a **Master equipment list** identifying the equipment in your facility.
2. **Prioritize** the listed components based on importance to process.
3. Assign components into **logical groupings**.
4. Determine the **type and number of maintenance activities** required and periodicity using:
  - a. Manufacturer technical manuals
  - b. Machinery history
  - c. Root cause analysis findings - Why did it fail?
  - d. Good engineering judgment
5. Assess the **size** of maintenance staff.
6. Identify **tasks** that may be performed by operations maintenance personnel.
7. Analyze equipment failure **modes and effects**.
8. Identify effective maintenance tasks or **mitigation strategies**.