

# Introduction to Maintenance

# Questions?

Why do we need maintenance?

What are the costs of doing maintenance?

What are the costs of not doing maintenance?

What are the benefits of maintenance?

How can maintenance increase profitability of company?

# Purpose of Maintenance

Attempt to maximize performance of production equipment efficiently and regularly

Prevent breakdown or failures

Minimize production loss from failures

Increase reliability of the operating systems

# Maintenance Costs

Cost to replace or repair

Losses of output

Delayed shipment

Scrap and rework

# Types of Maintenance

Maintenance may be classified into four categories:  
(some authors prefer three categories, where scheduled and preventive maintenances are merged)

Corrective or Breakdown maintenance (Reactive)

Preventive maintenance  
Scheduled maintenance

} Planned

Predictive maintenance (Condition-based)

# Corrective or Breakdown Maintenance

Corrective or Breakdown maintenance implies that repairs are made after the equipment has failed and can not perform its normal function anymore

Quite justified in small factories where:

*Down times are non-critical and repair costs are less than other types of maintenance*

*Financial justification for scheduling are not felt*

# Disadvantages of Corrective/Reactive Maintenance

Breakdown generally occurs at inappropriate times leading to poor and hurried maintenance

Excessive delays in production & reduction in output

Faster plant deterioration

Increased chance of accidents and less safety for both workers and machines

More spoilt materials

Direct loss of profit

Can not be employed for equipments regulated by statutory provisions e.g., cranes, lifts and hoists etc

# Scheduled Maintenance

Scheduled maintenance is a stitch-in-time procedure and incorporates:

- inspection

- lubrication

- repair and overhaul of equipments

If neglected can result in breakdown

Generally followed for:

- overhauling of machines

- changing of heavy equipment oils

- cleaning of water and other tanks etc

# Preventive Maintenance (PM)

Principle – “Prevention is better than cure”

Procedure - Stitch-in-time

It locates weak spots of machinery and equipment's and provides them periodic/scheduled inspections and minor repairs to reduce the danger of unanticipated breakdowns

# Advantages of PM

## Advantages:

- Reduces breakdown and thereby down time
- Less odd-time repair and reduces over time of crews
- Greater safety of workers
- Lower maintenance and repair costs
- Less stand-by equipments and spare parts
- Better product quality and fewer reworks and scraps
- Increases plant life
- Increases chances to get production incentive bonus

# Predictive Maintenance (Condition-based)

In predictive maintenance, machinery conditions are periodically monitored, and this enables the maintenance crews to take timely actions, such as machine adjustments, repairs or overhaul

It makes use of human sense and other sensitive instruments, such as

audio gauges, vibration analyzers, amplitude meters, pressure, temperature and resistance strain gauges etc.

# Predictive Maintenance (Condition-based)

Unusual sounds or smells, coming out of a rotating equipment can predict a problem

An excessively hot electric cable can predict a problem

Simple hand touch can point out many unusual equipment condition and thus predict a problem