INTRODUCTION TO MAINTENANCE

- Maintenance and reliability is important
- Maintenance and product quality
- Maintenance and productivity
- Maintenance and safety
- Maintenance and supply chain, JIT
- Failure cause disruption, waste, accident, inconvenience and expensive

- Operators less able to do repairs themselves
- Machine and product failure can have effect on company's operation and profitability
- Idle workers, facility
- Losses due to breakdown

MAINTENANCE IN SERVICE INDUSTRY

- Hospital
- Restaurants
- Transport companies
- Banks
- Hotels and resorts
- Shopping malls / retail
- Gas station

MAINTENANCE IN MANUFACTURING COMPANIES

- Electronic
- Automotive
- Petrochemicals
- Refinery
- Furniture
- Ceramics
- Food and beverages

MAINTENANCE

- All actions necessary for retaining an item, or restoring to it, a serviceable condition, include servicing, repair, modification, overhaul, inspection and condition verification
- Increase availability of a system
- Keep system's equipment in working order

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

PRINCIPLE OBJECTIVES IN MAINTENANCE

- To achieve product quality and customer satisfaction through adjusted and serviced equipment
- Maximize useful life of equipment
- Keep equipment safe and prevent safety hazards
- Minimize frequency and severity of interruptions
- Maximize production capacity through high utilization of facility

PROBLEMS IN MAINTENANCE

- Lack of management attention to maintenance
- Little participation by accounting in analyzing and reporting costs
- Difficulties in applying quantitative analysis
- Difficulties in obtaining time and cost estimates for maintenance works
- Difficulties in measuring performance

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 categoriesscheduled and preventive maintenances are merged)
- Corrective or Breakdown maintenance
- Scheduled maintenance
- Preventive maintenance
- Predictive (Condition-based) maintenance

CORRECTIVE OR BREAKDOWN MAINTENANCE

 Corrective or Breakdown maintenance implies that repairs are made after the equipment is 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 type of maintenance
- Financial justification for scheduling are not felt

DISADVANTAGES OF CORRECTIVE MAINTENANCE

- Breakdown generally occurs inappropriate times leading to poor and hurried maintenance
- Excessive delay in production & reduces output
- Faster plant deterioration
- Increases chances 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, lift and hoists etc

SCHEDULED MAINTENANCE

- Scheduled maintenance is a stitch-in-time procedure and incorporates
 - inspection
 - Iubrication
 - 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
 - Iocates weak spots of machinery and equipments
 - provides them periodic/scheduled inspection and minor repairs to reduce the danger of unanticipated breakdowns

CANDIDATES FOR PREVENTIVE MAINTENANCE

Frequency of Failure



Mean Time Between Failure (MTBF)

ADVANTAGES OF PM

• Advantages:

- Reduces break down and thereby down time
- Lass 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 (CONDITION-BASED) MAINTENANCE

- In predictive maintenance, machinery conditions are periodically monitored and this enables the maintenance crews to take timely actions, such as machine adjustment, repair or overhaul
- It makes use of human sense and other sensitive instruments, such as
 - audio gauge, vibration analyzer, amplitude meter, pressure, temperature and resistance strain gauges etc.

PREDICTIVE MAINTENANCE (CONTD.)

- Unusual sounds coming out of a rotating equipment predicts a trouble
- An excessively hot electric cable predicts a trouble
- Simple hand touch can point out many unusual equipment conditions and thus predicts a trouble



Maintenance Commitment



Commitment

MAINTENANCE COSTS



Maintenance Commitment

MAINTENANCE COSTS

