SNS COLLEGE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

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DEPARTMENT OF FOOD TECHNOLOGY

COURSE CODE & NAME: 19FTT202 & Food Plant Layout and Management

II YEAR / IV SEMESTER

UNIT : IV PRODUCTION PLANNING AND CONTROL

TOPIC 5 : MAINTENANCE MANAGEMENT SYSTEM

Introduction

Modern maintenance management is not to repair broken equipment rapidly. Modern maintenance management is to keep the equipment running at high capacity and produce quality products at lowest cost possible.

Introduction contd…

Maintenance, then and now

✓Many years ago, the manufacturing and production work was done with relatively simple technical equipment and the involvement of more manpower.

✓Maintenance was of course simple and impact to certain extent to the function of machines.

✓During the industrialization, production equipment has been more developed. In connection with the high technical development the impact of productivity and quality has moved from man to machine.

✓The importance of maintenance has considerably increased.

Introduction contd…

✓There are many reasons why maintenance is becoming more and more important. In developing countries , where many old machines are operating, the spare part problem are arising. Some times it is difficult to find spare parts for equipment and if it is possible to find them, they are usually very expensive and must be paid on foreign currency.

✓Due to long lead times of supply of spares, it is common that the spare part inventory is growing bigger than necessary. A very essential part in maintenance management is developing countries to reduce the need of spare parts, as well as to maintain the minimum level of shock to save foreign currency, but still keeping the productivity high.

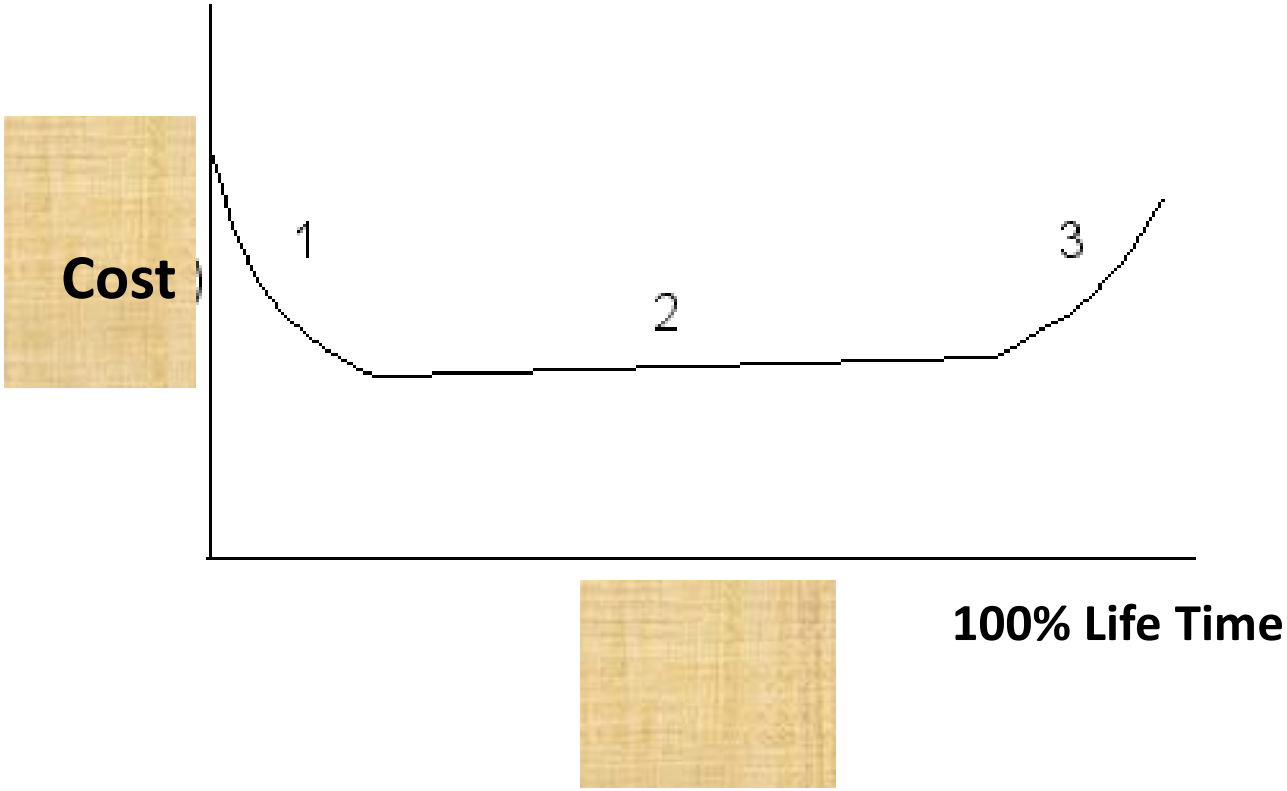
Introduction to Life Cycle Cost(LCC)

Maintenance has to be taken into consideration in very early stage of work of procuring new equipment to ensure a good and cheap operation.
High quality equipment will give high reliability and maintainability which secure high productivity and equipment efficiency.
The lifetime of the equipment can be spilt up in six phases

1. Idea
2. Specification
3. Design
4. Procurement(Manufacturing)
5. Operation
6. Windup

Bath Tub Curve

The bath tub curve describes the cost of equipment over its lifespan. From commissioning to winding up.



LCC – What Dose It Stand For?

LCC – Life Cycle Cost – is commonly understood to be the customer's total cost and other sacrifice during the actual life time of the product. Hence LCC includes the acquisition cost as well as all future costs for operation and support of the product until it is finally discard.

LCC Is Used For….

- Comparison of alternative products.
- Improvements of products.
- Adaptation of the maintenance and support organization.

Objectives of Maintenance and Maintenance Cost

Objectives of Maintenance

During the years the maintenance function has not been seen as a condition for production output. The previous approach has been that maintenance is the necessary evil, one among the cost generators in the organization. Very often the maintenance strategy in plants has been to reduce the maintenance cost as much as possible without thinking of the consequences.

Objective of the maintenance is , as priority one , to create an availability performance which is suitable for production demands in the organization. No mechanized/atomized company has yet succeeded to produce with stopped equipment. Production buy availability performance from maintenance.

1.
Keep up the planned availability performance

2.
At the lowest cost

Above all
Within the safety prescriptions

Maintenance Cost

All enterprises and organizations are interested in lowering maintenance costs. A very common delusion is that

THE PRODUCT GIVES THE INCOME

MAINTENANCE COSTS MONEY

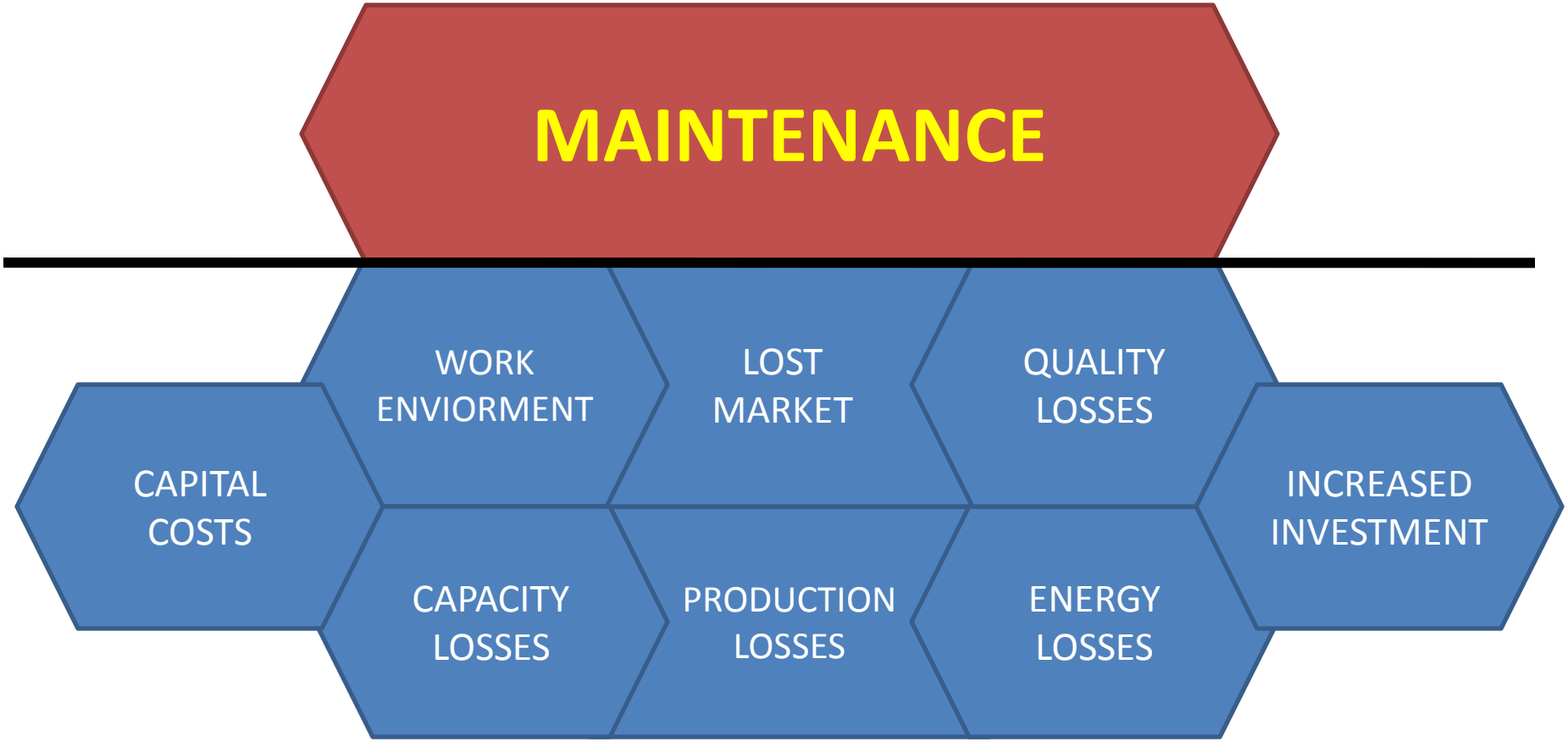
MAINTENANCE WICH IS NOT CARRIED OUT ,WILL COST EVEN MORE THAN MONEY !!!!!!

Contd…

There are two ways of managing the maintenance costs

- The cost controlled maintenance is not considered as modern maintenance management, The reason why maintenance has been treated as a cost controlled activity, Is often that engineers and technical staff have had some dilemma to measure the results of investments in maintenance in total economical terms. It is simple to find the direct cost for maintenance but it could be difficult to see the results.
- The upper priority in the objectives of maintenance is to “keep up planned availability performance at the lowest cost possible” . This means that the long term results are important. The maintenance cost must be put in relationship with overall results achieved by maintenance in production facility.

The Hidden Possibility



Indirect & Direct Maintenance Costs

The maintenance cost can be split up in two different categories.

- ✓ **Direct maintenance costs -** The costs are directly related to the performance of the maintenance works
- ✓**Indirect maintenance costs -** Losses due to maintenance

Contd…

Direct maintenance costs

- Wages & Salaries
- Material Costs
- Administration Costs
- Costs for training
- Spare parts costs
- Contracted work forces
- Modification Costs

Indirect Costs

- Loss of revenue or other losses as a result of interruption to production as a result of maintenance.

Measurement of Maintenance Efficiency

Many times there are needs to measure the maintenance efficiency. However, maintenance can not be measured by the cost it creates. There must be an connection to the production out put some way. It is naturally impossible to determine anything about the size of the direct costs. One method to control the direct maintenance is to use the PM-factor.”P” stands for prime product produce and “M” stands for maintenance cost. When using the PM-factor, the result of the maintenance impact on the production is measured. How many products are produced per a 1000 units of “maintenance money”.

$$\text{PM} - \text{Factor} = \frac{\text{Prime Production}}{\text{Maintenance Cost}} \times 1000$$

Availability Performance & Productivity

AVAILABILITY PERFORMANCE

The ability of equipment to function properly, Despite occurrence of failures, disturbances and Limitations in the maintenance resources.

Contd…

Availability performance can be divided in to tree parts:

- Reliability Performance
- Maintenance Support Performance
- Maintainability Performance

Reliability Performance

The ability of an item, under stated Conditions of use, to perform a required Function under stated conditions for a stated period of time.

Maintenance Support Performance

The ability of a maintenance organization, Under stated condition, to provide upon Demand the resources required to Maintain an equipment.

Maintainability Performance

The ability of an equipment, under started conditions of use, To be retained or restored to state in which it can perform a required function, when maintenance is performed under stated conditions and using stated procedure and resources.

Maintenance Definition

In order to set up maintenance strategy for an enterprise, it is necessary for every body in a company to understand the maintenance concept and speak the same language.

MAINTENANCE

The term maintenance covers all
Activities undertaken to keep equipment in a
Particular condition or return
It to such condition

The term maintenance consists of three main parts

- Corrective maintenance
- Preventive maintenance
- Improvement maintenance

CORRECTIVE MAINTENANCE (CM)

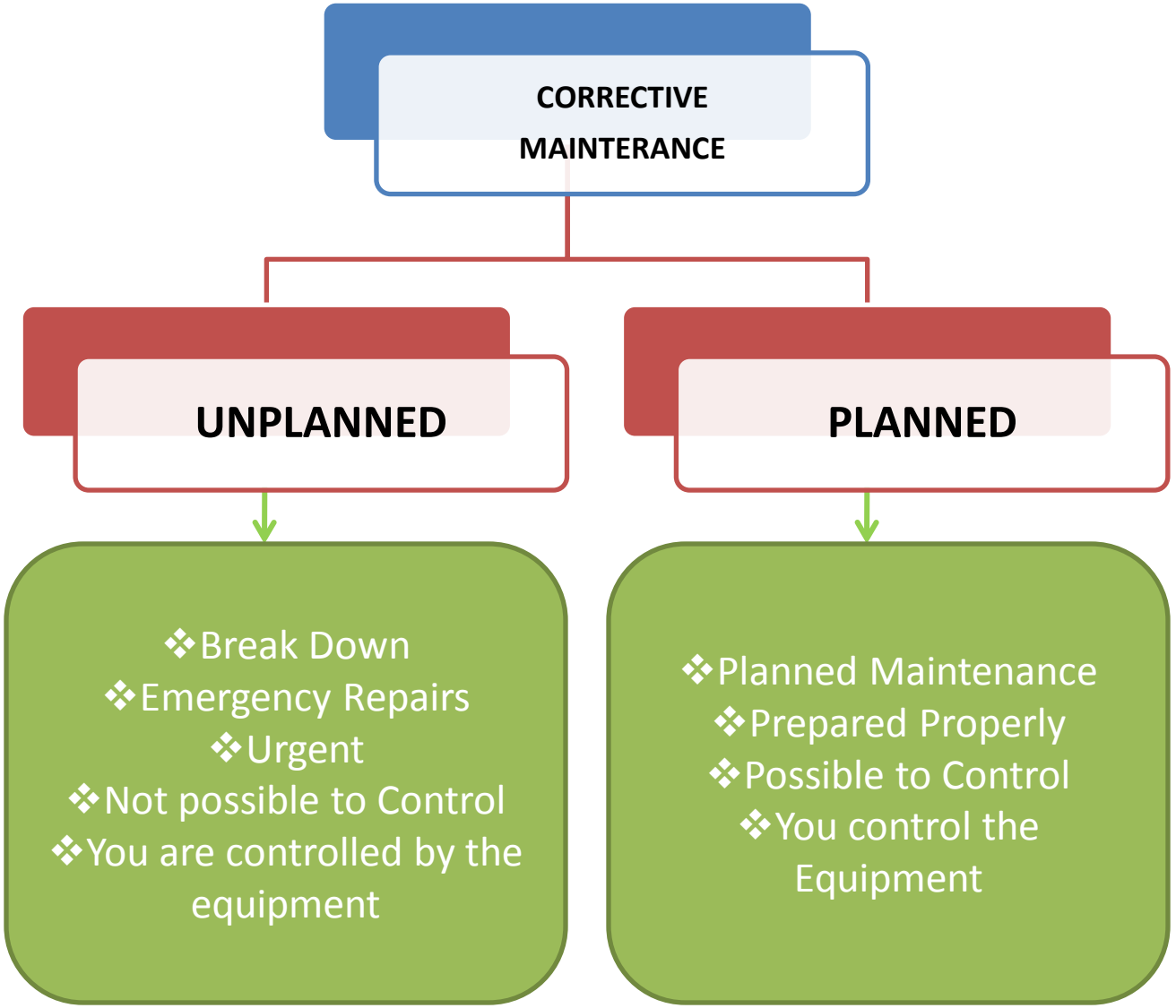
Corrective maintenance covers all Maintenance which is carried out in Order to correct (repair) a fault in equipment

WHAT IS FALIURE ?

Digress of demands of a certain quality

Planned & unplanned corrective maintenance

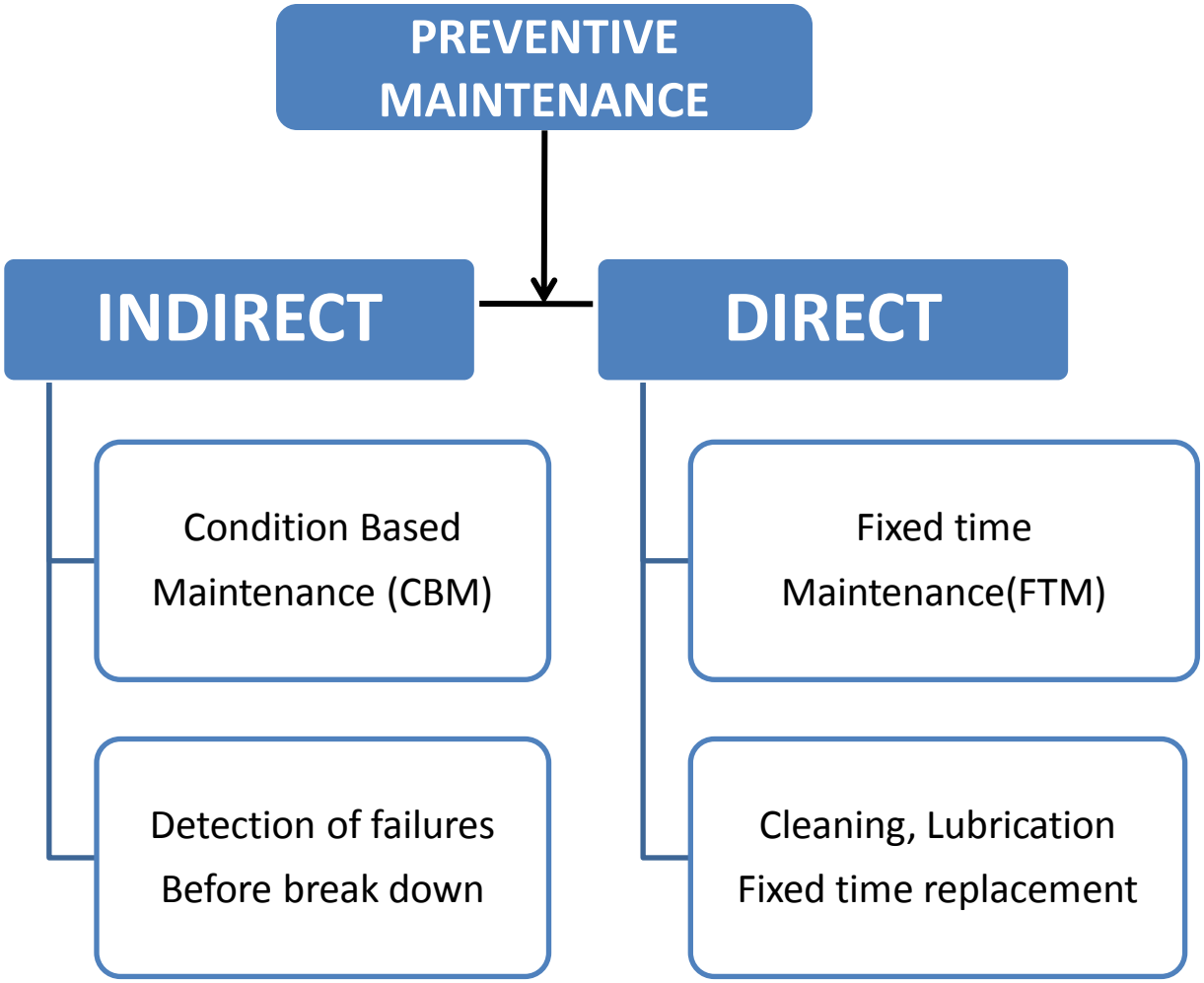
Corrective maintenance is divided in



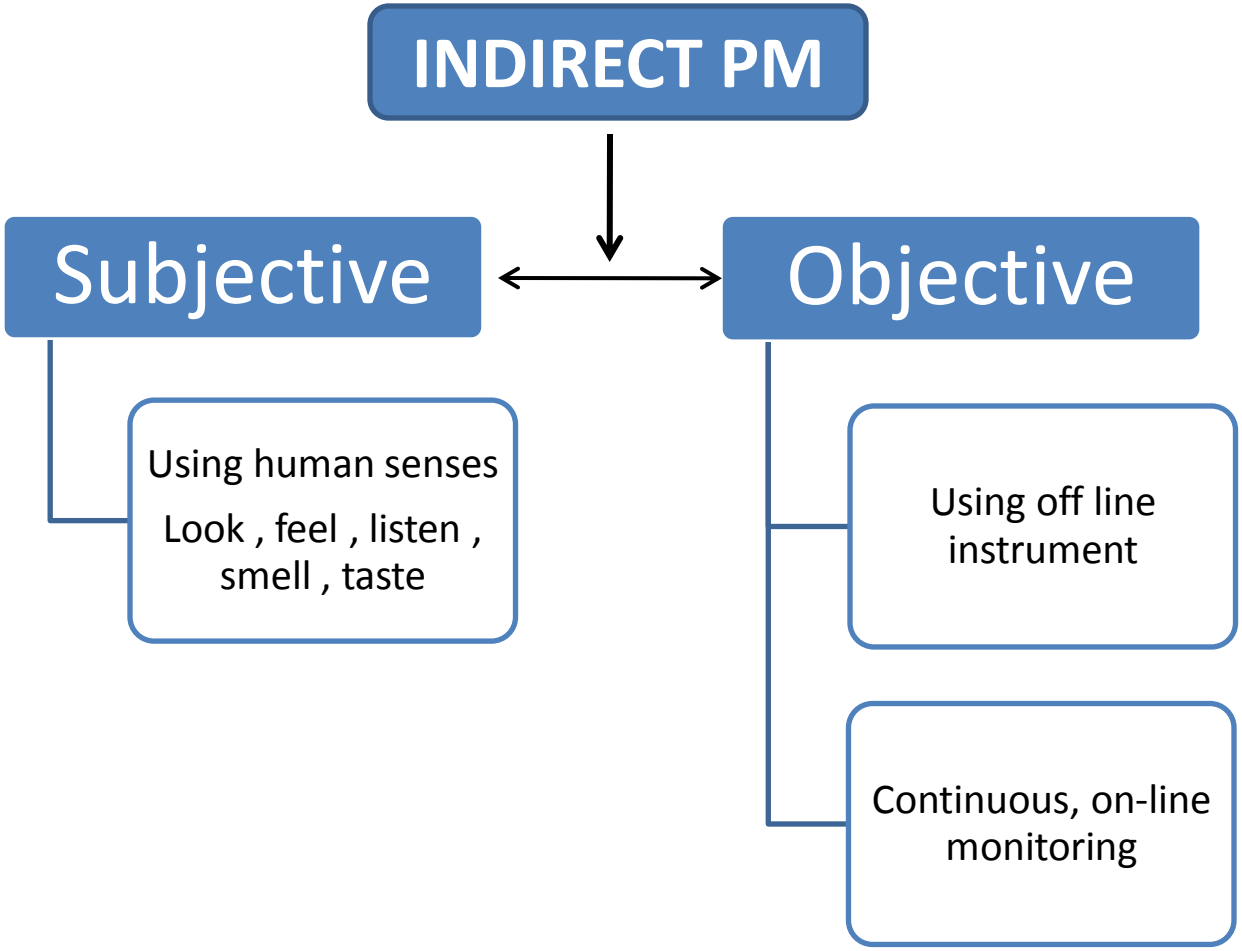
PREVENTIVE MAINTERANCE (PM)

Preventive maintenance covers all Programmed maintenance which is carried out in order to prevent the Occurrence of failures before they Develop to a breakdown or Interruption in production.

Preventive Maintenance is Divided In



Indirect Maintenance



IMPROVEMENT MAINTENANCE (IM)

Improvement maintenance is used When to modify the equipment so the Condition improves. Improvement Maintenance includes activities which are carried out once. The objectives of improvement maintenance are to Design out the failure i.e. the failure Will never occur again or extend the life time of parts.

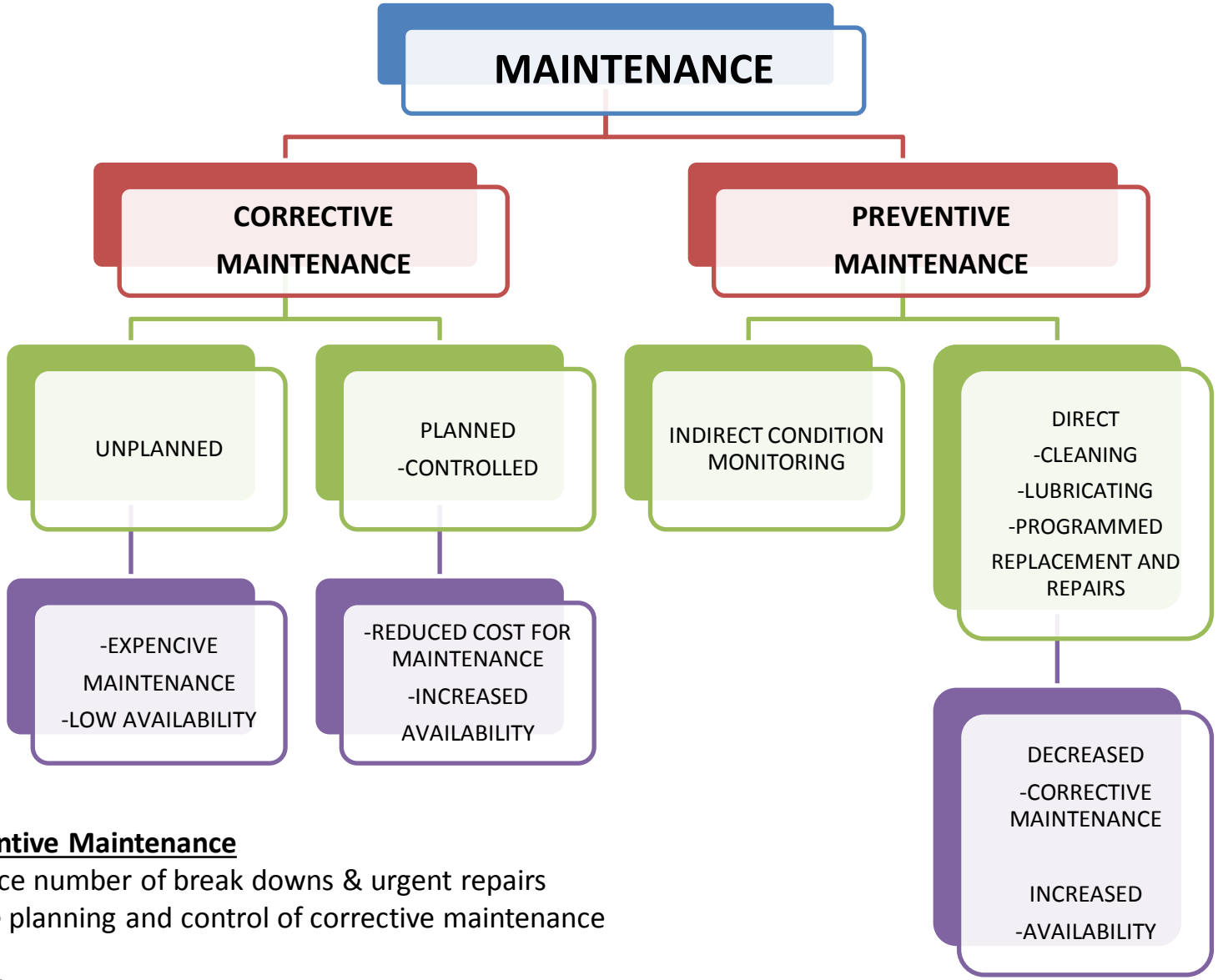
How to Get Unplanned Repair Jobs Planned

One of the objectives of the maintenance job is to get them planned
This gives increased availability performance and lower direct maintenance costs and a lot of other advantages. The load on the maintenance department will for instance be lower and the quality of the jobs higher.

- ***Use of condition monitoring***

  Through condition monitoring the failure development and it is therefore possible to plane the forthcoming jobs before a break down occurs. By condition monitoring the unplanned jobs are transferred to planned job.

- Planned maintenance resulting in lower costs for maintenance and lesser down time.



Preventive Maintenance

-Reduce number of break downs & urgent repairs

-More planning and control of corrective maintenance

Result

-Increased availability performance & efficiency

-Decreased cost of maintenance

Proper Planning

Results in the correct maintenance work is carried out

- ❑ At the right time
- ❑ In the right way
- ❑ By the right professional
- ❑ With the right spare parts

“Real maintenance management is impossible without condition based preventive maintenance”

Maintenance Procedures

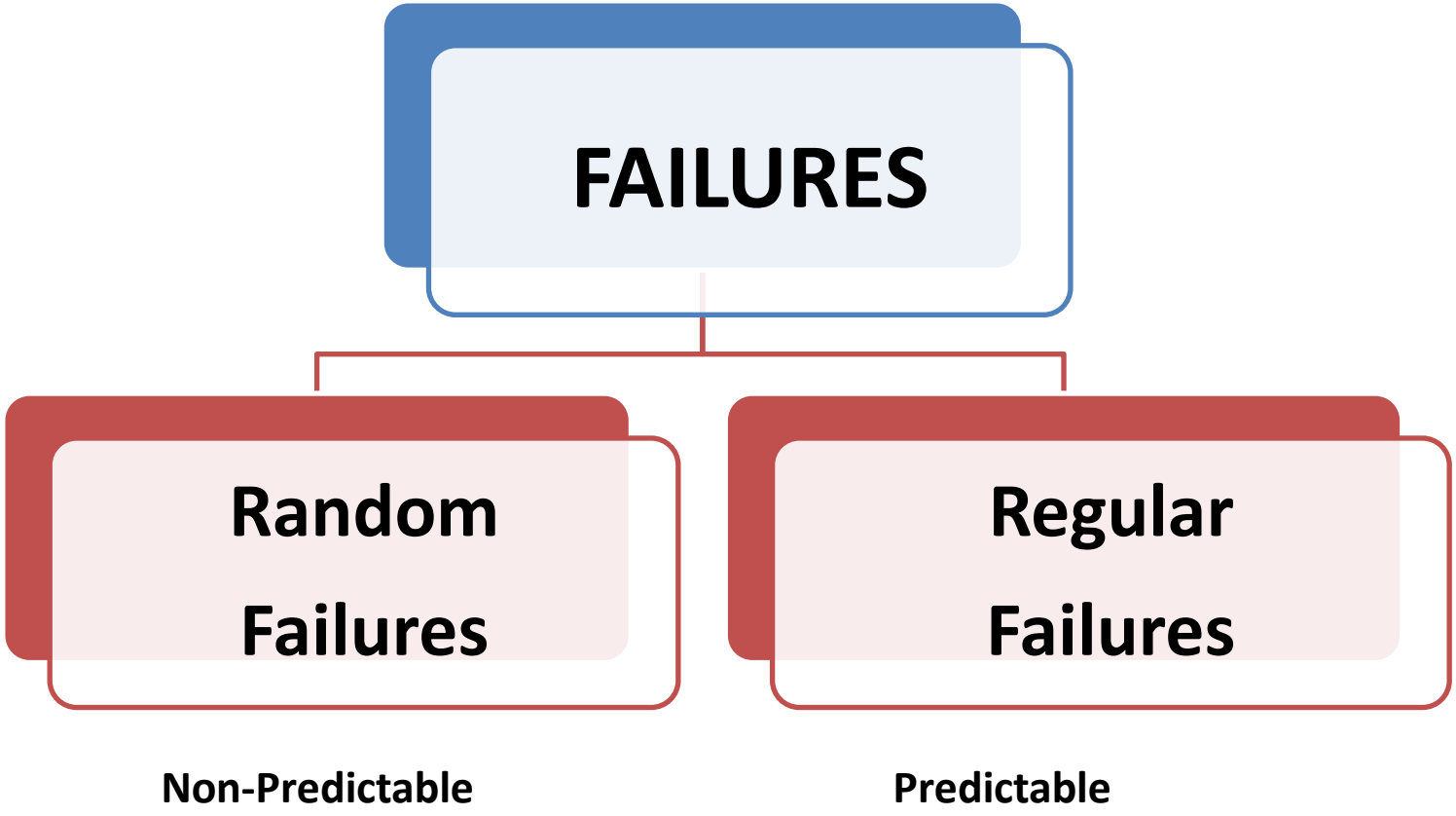
When a maintenance strategy is going to be formulated, there are many maintenance procedures that could be chosen, From sophisticated procedures to low level procedures.

- Operate to break down (unplanned corrective maintenance), O.T.B.D
- Fixed-time maintenance, F.T.M
- Condition-based maintenance, C.B.M
- Design out maintenance, D.O.M
- Life-time extension, L.T.E
- Redundancy, RED

Failure Development

INDIVIDUAL LIFE TIME

Machines, spare parts, all types of equipment, have their own individual lifetime. The individual life time is different from part to part and is influenced by the quality of the product but also by other outside factors such as environment, handling etc.
Some failures are occurring after a certain, expected time, and can almost be predicted. Some failures are occurring completely unexpected.


FAILURES
Random Failures
Regular Failures
Non-Predictable
Predictable

Failure Developing time(FDT)

Some failures either they are random or regular, have longer or shorter failure development time. The failure development time is the deterioration time from the moment condition departs from the normal condition until the moment of break down occurs.

Failures with failure development time is easier to handle than the failures without failure development time.

Shorter FDT – Continuous on line condition monitoring has to be applied

Longer FDT – Off-line condition monitoring has to be applied

Total Productivity Maintenance

Total Productivity Maintenance (TPM)

❖ TPM is a way of organizing maintenance to support productivity & quality through increased equipment efficiency and to reduce costs.

❖TPM concept means that all employees work in small groups to maximize the improvement of equipment efficiency.

❖Operators are working independently with all maintenance activities of their own equipment and have also the total responsibility of operation and maintenance.

Fundamental Goals of TPM

- ✓Increased productivity and quality
- ✓Zero defects
- ✓Reduced cost of maintenance and production
- ✓Increased motivation among all employees
- ✓Zero accident
- ✓Shorter lead time
- ✓Zero unplanned stops
- ✓Development of staff through training
- ✓Improvement of work environment

Incentives for MMS or CMMS (rule of thumb)

Reduction on MDT	about 20%
Increased machine life	about 20 %
Saving on labour and spares	10 – 20%
Savings on maintenance budget	10 – 20%

Maintenance Management Systems

General of maintenance systems

The maintenance function must also have necessary aids to manage the maintenance activities to coop up to the main target of the enterprise. Maintenance management means a better control of the maintenance organization and the related area. To properly control the maintenance of a facility, information is required to analyze what is occurring.

To be able to manage the maintenance activities in the right way, a maintenance management system is necessary. The system can be either manual or computerized. The main purpose of a maintenance management system is in operation and works properly.

The Basic Maintenance Cycle

The basic function of a maintenance management system can be :

1. Preventive maintenance
2. Plant and unit record(Equipment)
3. Inventory and spare parts control system, Purchasing system
4. Document record
5. Planning system for maintenance and work order routines
6. Technical/economic analysis of plant history, maintenance and machine availability

Questions