

Breakdown maintenance

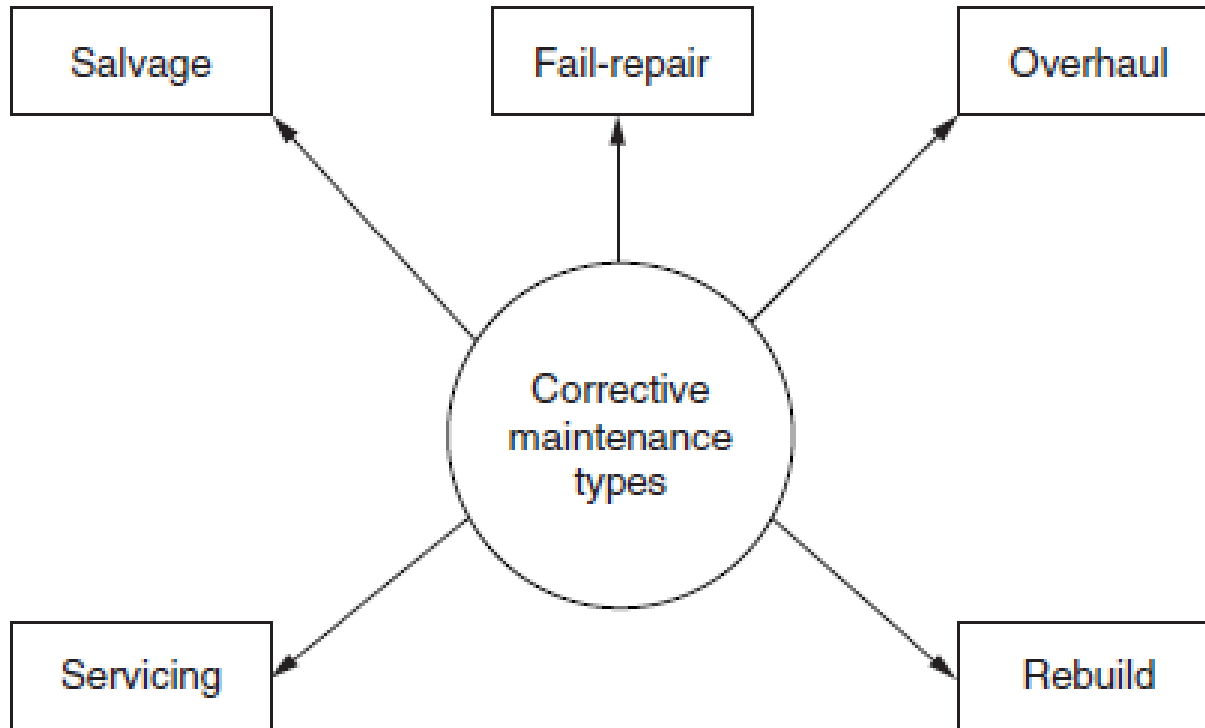
- An old maintenance philosophy
- Fix it only when it breaks e.g. filters
- Despite all Preventive Maintenance, breakdown occurs sometimes
- Attributable causes – engineering, human factors, operation beyond limits etc.

- Breakdown Maintenance is a repair service actioned normally by user departments and can be categorised into three classes
- Routine repairs when the breakdown is seen as an inconvenience but otherwise does not affect usual services
- Urgent repairs where vital facilities and services are disrupted because of failure of fabric or services.
- Emergency repairs where failure of an item which then presents an immediate danger to the health and safety of employees or the general public or a major disruption of a vital service

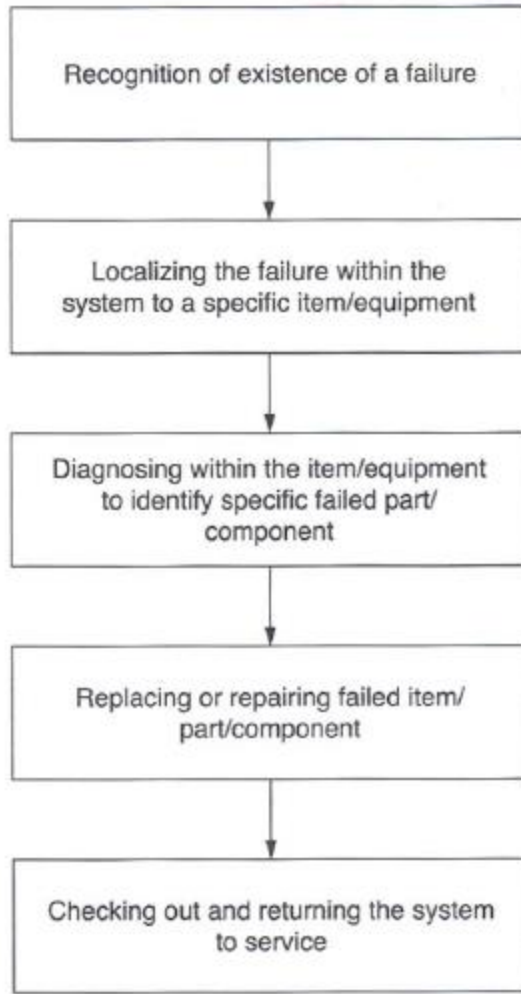
Breakdown or Corrective Maintenance

- Usually, corrective maintenance is an **unscheduled** maintenance action.
- It is basically composed of **unpredictable** maintenance needs that **cannot be preplanned or programmed** on the basis of occurrence at a particular time.

Corrective Maintenance Types



Corrective Maintenance Steps



- Corrective maintenance composed of five major sequential steps. These steps are:
 - fault recognition
 - Localization
 - Diagnosis
 - Repair
 - checkout.

Corrective maintenance sequential steps.

Corrective Maintenance Downtime

- The major corrective maintenance downtime components are:
 - Active repair time
 - Preparation time
 - Fault location time
 - Spare item obtainment time
 - Fault correction time
 - Adjustment and calibration time
 - Checkout time
 - Administrative
 - Logistic time
 - Delay time.

Reduction in corrective maintenance time is useful to improve maintenance effectiveness.

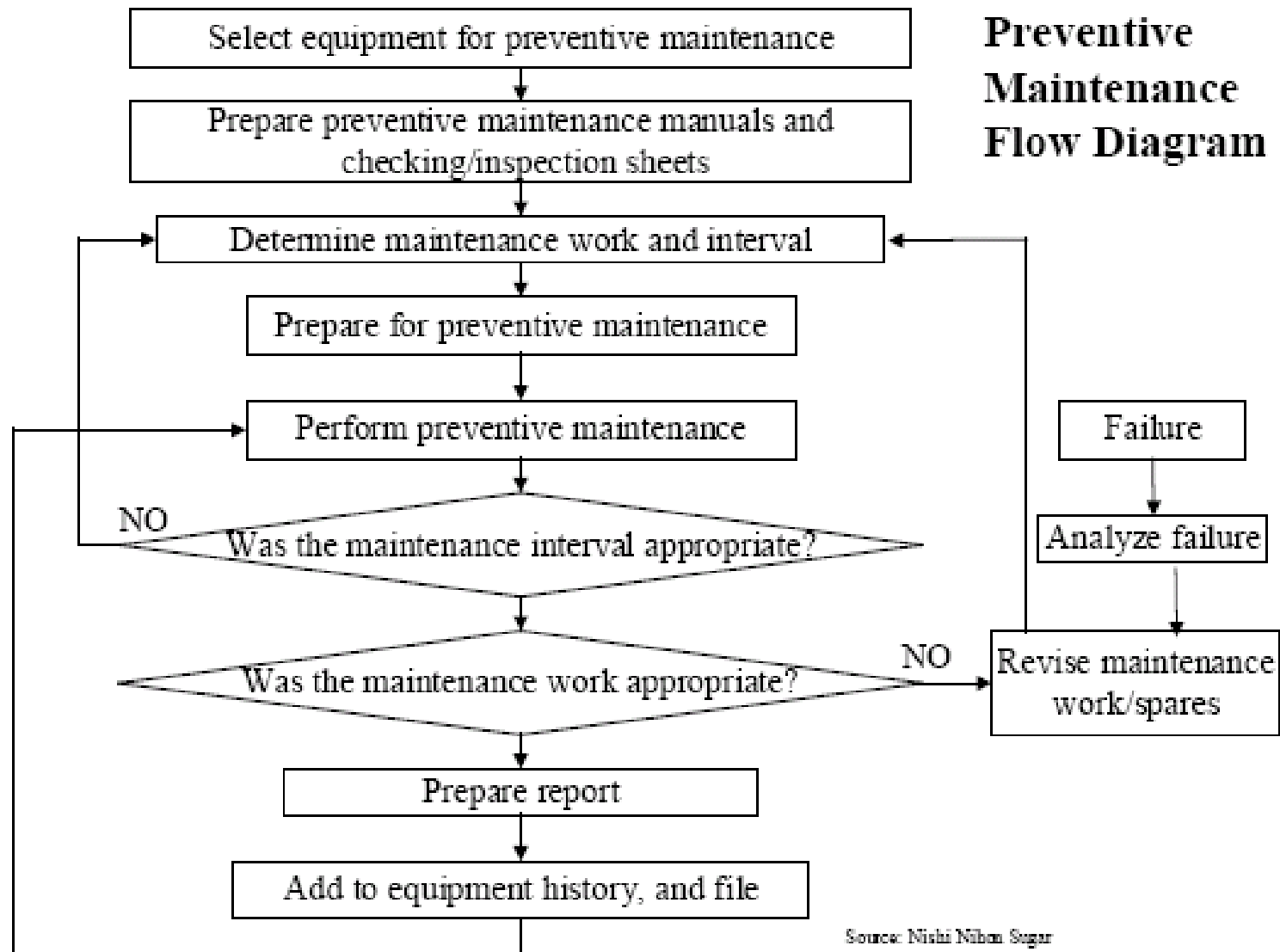
Preventive Maintenance

Unless the PM Program is Successful,
Nothing else will be

Preventive Maintenance (PM)

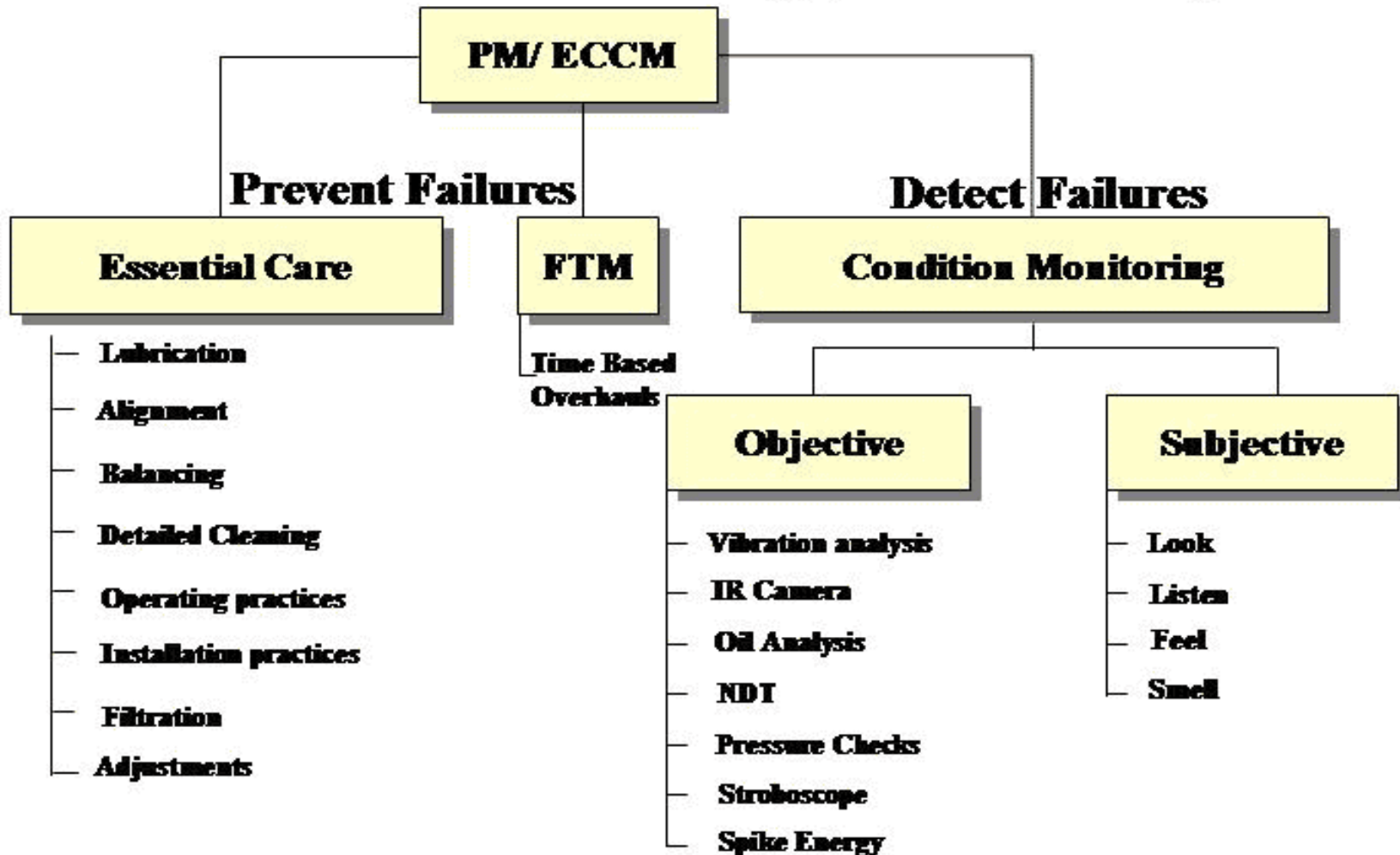
- **All actions performed to prevent failures.**
Lubrication, alignment, balancing, installation and equipment design, operating procedures, detailed cleaning, adjustments, fixed time replacements, and filtration.
- Note: **Maintenance prevention** and **condition monitoring** are the two components of preventive maintenance

Preventive Maintenance Flow Diagram



Source: Nishi Nihon Sugar

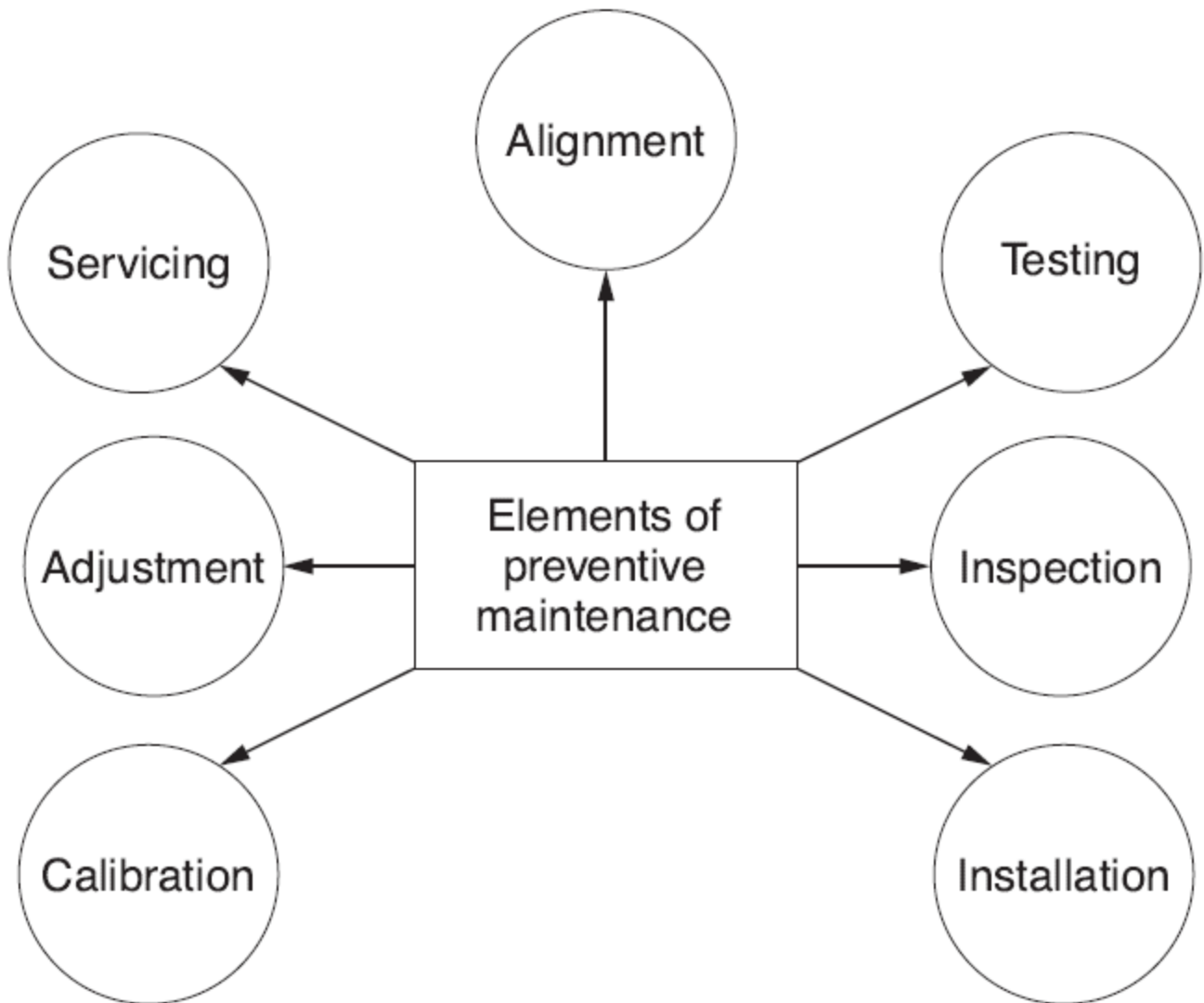
Preventive Maintenance / Essential Care and Condition Monitoring (PM/ECCM)



PM objectives

- To enhance capital *equipment productive life*.
- To reduce *critical equipment breakdowns*.
- Allow better *planning and scheduling* of needed maintenance work.
- Minimize *production losses* due to equipment failures.
- Enhance *health and safety* of maintenance personnel.

PM Elements



PM Is Four Dimensional

- Economic, Engineering, Psychological, Management.
- Economic
 - Will PM cost the company less/more than Breakdown maintenance for a certain task?
 - Should I (maintenance person) perform PM on the component or wait until it breaks down then fix it!
 - Safety factor is to be considered.

- Engineering

- Understanding reason of failure.

- Engineering will deliver

- The right task to

- The right component using

- The right tool at

- The right frequency by

- The right craftsman.

- Engineering helps by re-engineering the machine to make PM tasks;
 - Easier
 - Safer
 - Quicker to complete
 - To require less labor
 - To use less materials
- Engineering makes tasks cheaper to perform

– Psychological (The human factor)

The best PM system will fail without doing the tasks as designed and at the right frequencies.

– Management

Management structure is an important dimension to insure that correct procedures occur.

Misconceptions about PM

- 1. PM is only a way of trying to determine when and what will break or wear out so that you can replace it before it does.*

PM is much bigger than that. It is an integrated approach of budgeting and failure analysis, and permeate correction of problem areas.

2. *PM systems are all the same. You can just copy the system from the manual or from your old job and it will work.*

PM systems must be designed for the specific equipment as set-up, age of the equipment, product, type of service, hour of operation, skills of operators and many other factors.

3. *PM is extra work on top of existing workloads and it costs more money.*

PM increases uptime, reduces energy usage, reduces unplanned events ... etc.

There are hundreds of ways PM saves the organization resources.

4. *With good forms and descriptions unskilled people can do PM tasks.*

Unskilled (in maintenance) people can do some of PM tasks successfully with good training and clear forms. For greatest return on investment, skilled people must be in the loop. Inspection benefits greatly from experienced eyes and hands.

5. *PM is a series of task lists and inspection forms to be applied at specific intervals.*

PM includes the most modern approaches such as vibration routes, infrared surveys or condition based maintenance checks.

6. *PM will eliminate breakdown.*

In PM words “ PM can't put iron into a machine ”.

Even the most advanced PM, there will still be a breakdowns.

Task List

- In its highest form, the task list represents the accumulated knowledge of the manufacturer, skilled machines, and engineers, in the avoidance of failure.
- The best task lists.

- All task lists are designed to perform one of two functions:
 - Life extension; clean, tighten, lubricate.
 - Detection;
 - Inspection
 - Scan
 - Smell
 - Take readings
 - Measure
 - Take sample for analysis
 - Interview operator

Common PM Tasks

- Type of task
 1. Inspection
 2. Predictive Maintenance
 3. Cleaning
 4. Tightening
 5. Operate
 6. Adjustment
 7. Take readings
 8. Lubrication
 9. Scheduled Replacement
 10. Interview Operator
 11. Analysis