

## Basic Concepts of Maintenance

Ignoring for the moment the strictness of a standardized definition we can define **maintenance** as the *set of activities developed to ensure proper running of equipment and systems, ensuring that technical intervention is taken at the right opportunities with the right scope and in accordance with good technical practices and legal requirements, in order to avoid loss of function or reduction of efficiency and, should any of these occur, ensure that they are returned to good operating conditions at the earliest possible delay, all at an optimized overall cost.*

Maintenance activities are classified as shown:

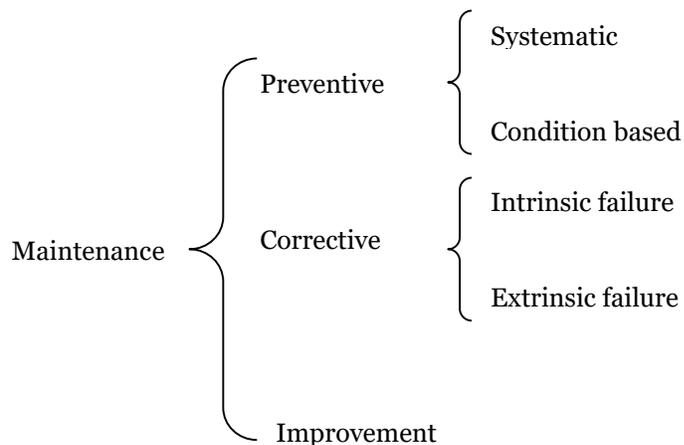


Figure 1. Maintenance activities

**Preventive maintenance** is a schedulable type of maintenance that aims at *preventing* failures, loss or reduction of function. Prevention is *always* the prime objective of management. Preventive maintenance can be further classified in accordance with the nature of the originating conditions:

- **Systematic maintenance**, also designated *pre-determined* maintenance, when the opportunity for the intervention is blindly determined, based on pre-defined frequency: calendar or running units (hours, km, cycles, etc). Typical title descriptions: Weekly inspection; Monthly lubrication; 10000 hours' overhaul; 20000 km service.
- **Condition based maintenance**, when the opportunity to carry out the work is based on symptoms detected along an inspection or running parameters, before loss or significant reduction of function. Typical title descriptions: Replace slack driving belt; Adjust valve; Replace bearing.

**Corrective maintenance** is a non-schedulable maintenance action following a failure or unexpected loss of function which may have occurred as a result of:

- ***Intrinsic failure***, a loss of function due to a cause intrinsic to the maintenance item: equipment broke down; pipe broke; overheated bearing.
- ***Extrinsic failure***, a loss of function due to a cause external to the maintenance item: accident, collision, poor operation. Although penalising the operational availability of the equipment this failure does not contribute to the theoretical maintenance indicators or intrinsic reliability of the item.

***Improvement maintenance*** nowadays is a recognized and stimulated maintenance approach aimed at improving the performance of the equipment in its context. It is schedulable. Typically, an improvement is identified and a modification is studied and planned to improve the running conditions, energy efficiency, and/or maintainability, among many others.

Indeed, there is usually much scope for improvements in any industrial or facilities plant, as long as there is a basic positive attitude towards this approach: introducing automation; equipment monitoring; improving running efficiency; energy saving; reducing emissions; noise; improving accesses for maintenance; reducing maintenance necessities.

Further to its strictly technical scope, maintenance covers nowadays a wide spectrum of activities related to the fulfilment of legal requirements, certification, safety, security and social sustainability – understood as the capability of the organization to exhibit and be in a position to demonstrate at any time that it runs its activities using practices that are safe, preserve the environment and are socially acceptable.

These considerations and the technological profile of modern equipment explain why the maintenance function has become a first line activity requiring multi-disciplinary expertise, training of technicians and managers, involving a wide range of responsibilities in any organization. The times where maintenance was considered the poor partner in an organization and we had to convince the boss that managing it properly would bring significant advantage are far away. Neglecting maintenance management to-day may simply condemn the whole organization.