Preventive Maintenance

Maintenance activities designed and executed to assure that equipment/ machinery/facilities are up and running at suitable efficiency.

Preventive maintenance aims at minimizing sudden failures and therefore reducing interruptions in service delivery.

Preventive Maintenance

Preventive maintenance activities are performed at different levels relating to the type of component addressed.

Complicated systems can be decomposed into main components and maintenance programs can be designed to for each component level (according to system hierarchy: main part – auxiliary part – peripherals – power sources – software, etc).

Preventive Maintenance

Preventive maintenance activities should be performed at predetermined times and frequencies with trained personnel and responsibilities and authorities.

Preventive maintenance policy determines how often we should maintain our facility or equipment.

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As preventive maintenance frequency increases, maintenance costs will increase, and

As maintenance frequency decreases the chances of sudden failures will increase, and therefore additional costs will be incurred.

Costs of sudden failures include: material loss, time loss, unhappy customers, unhappy employees, decreased morale, and others.

❖ إدارة الصيانة

Preventive Maintenance

Two conflicting factors:

1. Maintenance Cost
2. Sudden Failure Cost

Frequency	6 month	3 month
Cost of Maintenance	Low	High
Cost of Failure	High	Low

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Therefore, to solve this problem we need to have a compromise point where the total maintenance and failure costs are at minimum:

Total Cost = Sudden Failure Cost +
            Preventive Maintenance Cost

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TC = preventive maint. cost + sudden failure cost

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Total Cost

Preventive Cost

Sudden Failure Cost

Best Point

Maintenance Frequency
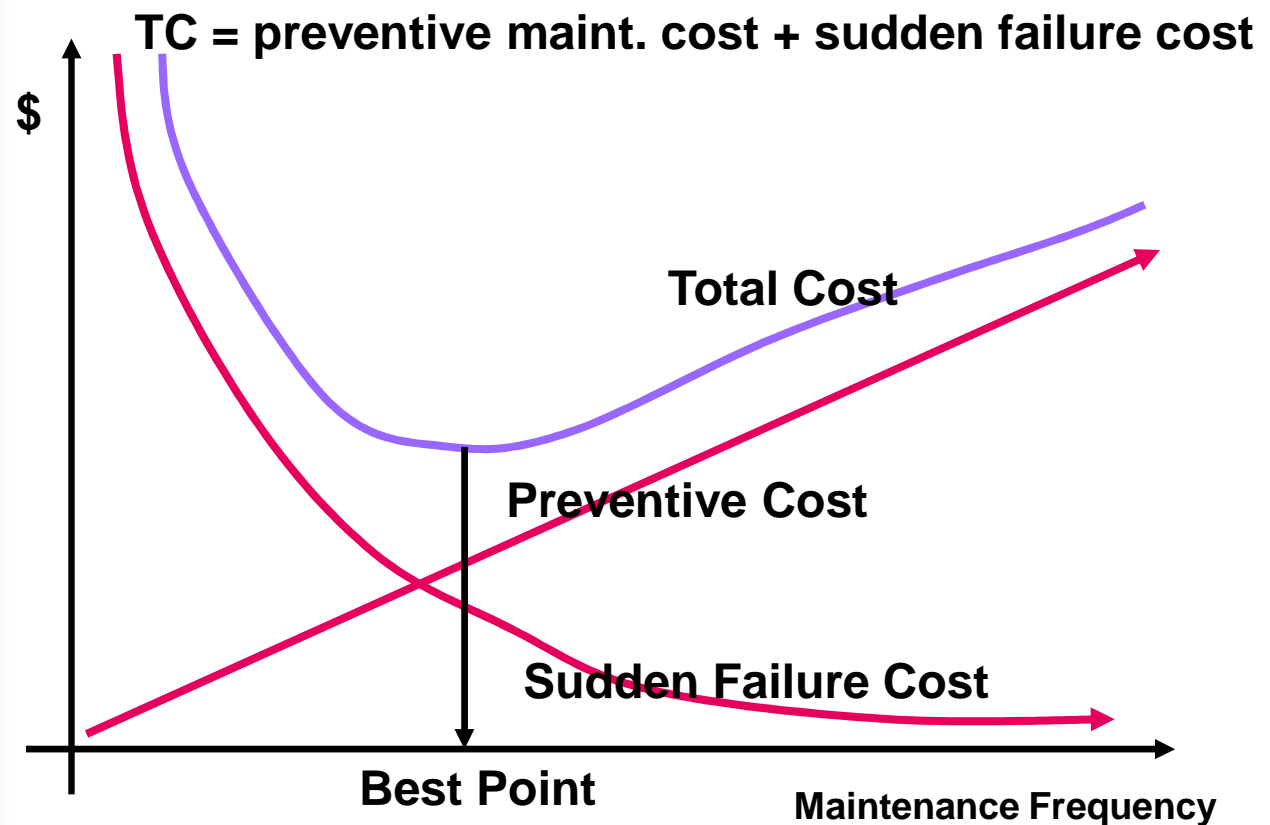
Preventive Maintenance

Model Formulation

Problem: A machine in a group of n machines is serviced when it breaks down. At the end of T periods, preventive maintenance is performed by servicing all n machines.

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Model Formulation

Data Needed:

1. The chance that a machine will break during a given time period **t** (call it **Pt**).
2. The cost of repairing a broken machine (call it C1).
3. The cost of preventive maintenance per machine (call it C2).
4. Number of machines (n).

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Variables:

EC(T) = Expected cost of failure and maintenance.

E(nt) = Expected number of broken machines during a given period t.

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Solution:

$$EC(T) = [\, C1.(Pt.\, n) + C2.(n)\,]\, /\, T$$

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Procedure:

1. Obtain data
2. Calculate EC for various values of T
3. Choose the value of T that will make EC minimum.

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Example:

Consider a case of 50 telecommunication machines, where the cost of sudden failure is 100$ and the cost of preventive maintenance is10$.

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Solution:

T	Pt	Cum. Chance of failure	EC(T)
1	0.05	0.00	500$
2	0.07	0.05	374$
3	0.10	0.12	366$
4	0.13	0.22	400$
5	0.18	0.35	450$

Preventive Maintenance

Practical Issues:

1. Availability of data

   - maintenance records

   - engineering specs

2. What if data is not available?

3. Calculations – use the computer