TE 4225

Machine Maintenance, Materials Handling and Safety

Elements of Maintenance IMPORTANT

(Briefly Discuss Elements of Maintenance)

- Inspection or checkups
- Lubrications
- Planning and Scheduling
- Records and Analysis
- Training to maintenance staff
- Storage of spare parts

1. Inspection or checkups

- Inspection is an essential function of the maintenance programme. Crews (stuff) kept for this purpose should be well trained. These crews carry out both external and internal inspection.

- *External inspection* means to watch for and detects from a) Unusual sound/ vibration b) Unusual heat/ smoke etc. when machine is in operation.

- *Internal inspection* means inspection of internal parts such as gears, bearings etc.

- Frequency of inspection should be decided very carefully, as too less inspection may cause breakdowns, as defects could not be traced out and rectified immediately; while too much inspection means wastage of machine time and labor productivity.

1. Inspection or checkups…

- For the purpose of inspection, machine can be categorized as:

1. *Important Machine:* Those machine which can disturb whole of the production, are delicate and require much time to repair. More attention should be given for inspection of these machines and schedule for inspection, cleaning, lubrication should be followed rigidly.

2. *Ordinary Machine:* Frequency of inspection can be kept as low as they do not affect the production.

2. Lubrications

- Mechanical components like gears, bearings and other frictional surfaces give good performance for long periods, when they are systematically lubricated.

- *Systematic lubrication* means the application of right type of lubricant at the right time, at right place and in right quantity.

- For lubrication, a lubrication schedule should be prepared and that should be followed strictly.

3. Planning and Scheduling

- Every preventive maintenance work should be pre-planned in detail on the basis of the analysis done on the past records.

- A scheduled program thus prepared should be followed strictly.

- Program should be in detail specifying the point requiring daily, weekly. Monthly, half yearly or yearly attention.

4. Records and Analysis

- Good record keeping is essential for good maintenance, as it helps in forecasting maintenance. For this purpose following records are generally maintained-

  - ✓ Operation Manual
  - ✓ Maintenance instruction manual
  - ✓ History cards and history registers
  - ✓ Spares procurement register
  - ✓ Inspection register
  - ✓ Log books
  - ✓ Defects register

4. Records and Analysis....

- These records helps the plant engineers and General Manger to take decisions. The analysis made on the basis of these records help in-

✓ Preventing defects rather than rectifying after break-downs.

✓ Knowing the machine reliability and thus helps in production planning.

✓ Deciding life of machine.

✓ Forecasting defects and planning to rectify them before the failure occurs.

✓ Frequency of inspection and check-ups.

✓ Deciding for the purchase of a machine.

5. Training of Maintenance Personnel

- For the success of maintenance, a sound training is essential for the maintenance personnel.

- Hence the technicians and supervisors are trained to carry out maintenance, inspection and repairs in a systematic way.

6. Storage of spare parts

- Sometimes machine remain idle for want of spare parts for considerable time and thus it affects considerable loss of production.

- Hence it is essential to keep the spare parts so as to avoid loss of production.

- But the judgment and experience of high order is required for deciding the number of such parts. As storage of a large number of parts will mean blocking of capital.

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Planning of Maintenance Work

In planning of maintenance work, following steps are involved-

- ✓ Forecasting of maintenance work.
- ✓ Visualization of the nature and detail to that work.
- ✓ Determination of the best method to perform the work.
- ✓ Arranging for the required material.
- ✓ Scheduling of maintenance work to conform to production plans.
- ✓ Allocation of works to individuals.
- ✓ Instructing the individuals about schedules and methods.
- ✓ Following up and checking of works.
- ✓ Evaluation of work and performance.

Scheduling of maintenance works to specify time periods

Types of schedule	Activities	Sources of information
Long Term	✓ Lubrication ✓ Inspection ✓ Cleaning ✓ Replacing	✓ Machine recommendations ✓ Technical experience ✓ History of machine ✓ Analysis of life span ✓ Techno-economic evaluation
Short Term	✓ Repairs ✓ Replacements	✓ Inspection ✓ Complains of breakdown ✓ Analysis of history ✓ Techno-economic evaluation

Requirements for good maintenance (Previous)

For achieving maintenance of high order, following are some of the essential requirements-

- ✓ Good supervision and administration of maintenance department.
- ✓ Proper control of work.
- ✓ Correct, clear and detailed instructions be given to the maintenance crew and to the operators.
- ✓ Well training is essential.
- ✓ A good lubrication program should be chalked out.
- ✓ Proper maintenance record should be maintained.
- ✓ Adequate stock of spares should always be kept.
- ✓ Surroundings should be dust free and clean with proper ventilation and illumination.
- ✓ Manufacturers of the machine tools should be consulted as and when required.
- ✓ Maintenance department should remain in contact with planning and purchasing department in deciding the types of machine tools to be purchased.

Determining the size of repair crews

- A weaving factory has 200 looms and the maintenance engineer supervises the repair crews who repair malfunctioning machines. The maintenance policy is to repair the broken down looms and bring back in production within 2 hours on the average. If average breakdown rate is 3.5 looms/ hour and each repair crew can repair 0.25 looms per hour on the average, how many repair crews are required?

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Solution:

The formula for average repair rate μ is-

- $t_s = \dfrac{1}{\mu - \lambda}$

- Or, $\mu = \lambda + \dfrac{1}{t_s}$

- Where, μ = Repair Rate

    - λ = Arrival rate of malfunctioning looms

    - t_s = Average time of arrivals in the system

    - Required average repair rate: $\mu = 3.5 + \dfrac{1}{2} = 4$ looms/hour

    - So, Number of crews required= μ / looms per hour a crew can repair

    - = 4/0.25= 16 repair crews.