

THE MAINTENANCE UNDER OPENCAST PROJECT- AN APPROACH

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ABSTRACT

The cost of production is based on the quality of system of working, environment, equipment, quality of maintenance which affect on long run and increases the life of equipment. The cost of maintenance is increasing day by day due to various factor like types of equipment, lack of skilled labour, supporting equipment, requiring proper planning of maintenance system, lack of technology for up keeping the plant, etc.

Compared to periodic maintenance, predictive maintenance is condition based maintenance. This is a method in which the service life of important part is predicted based on inspection or diagnosis, in order to use the parts to the limit of their service life. It manages trend values, by measuring and analyzing data about deterioration and employs a surveillance system, designed to monitor conditions through an on-line system. Ongoing maintenance activities such as cleaning washrooms, grading roads hand mowing lawns, which are required because of continuing use of the facilities.

The authors are interested to bring the notice by presenting this paper for attention of maintenance as per quality of products and services render to it and also for better life of equipment and machines..

INTRODUCTION

A number of researchers have worked in the field of maintenance management with a view to improving the maintenance system performance. Some authors have examined the evolution of the maintenance practice for a fleet of equipments highlighting the aspects of manpower utilization and the role of maintenance manager with regard to the existing systems in Indian mines.

There is only one reason to support a planned maintenance program. Planned maintenance increases profits. The primary objective for any business is to produce profits for the owner. Profit oriented goals apply to an elderly couple operating a corner grocery store, as well as to large corporations. Even maintenance consulting firms have to operate on profit. Various researchers have worked on different constraints of maintenance system as mentioned below:

Gupta et al[1] has worked on job evaluation considering different prevailing situations has got reputed work in this field. Whereas Agrawal et al [2] have developed a model on maintenance considering long range objectives. It means maintenance affects on production system with due consideration of cost which affect in long range planning.

Kumar et al[3] has highlighted about the system of dumper maintenance working in fleet. He had also presented job evaluation on maintenance strategy in different influencing factors.

Kumar et al[4] have developed a goal model on maintenance strategy for the fruitful work.

Optimal maintenance policy based on multiple criteria decision making had been submitted by Kumar et al[5]. A goal programming approach to job evaluation had been developed by Gupta et al[6].

Verma et al[7][9] had contributed by presenting a model on Job cost of sugar industries. Bansal et al[8] had discussed the approaches on a real-time predictive maintenance system for machine systems.

Similarly, the contribution of Kumar et al[10] had presented the base rate estimation with the help of Fuzzy Logic Approaches on optimization of maintenance process.

MAINTENANCE MANAGEMENT

Fig. 1.1 Presents Operation and system working of Earthmoving machines where maintenance play an important role.

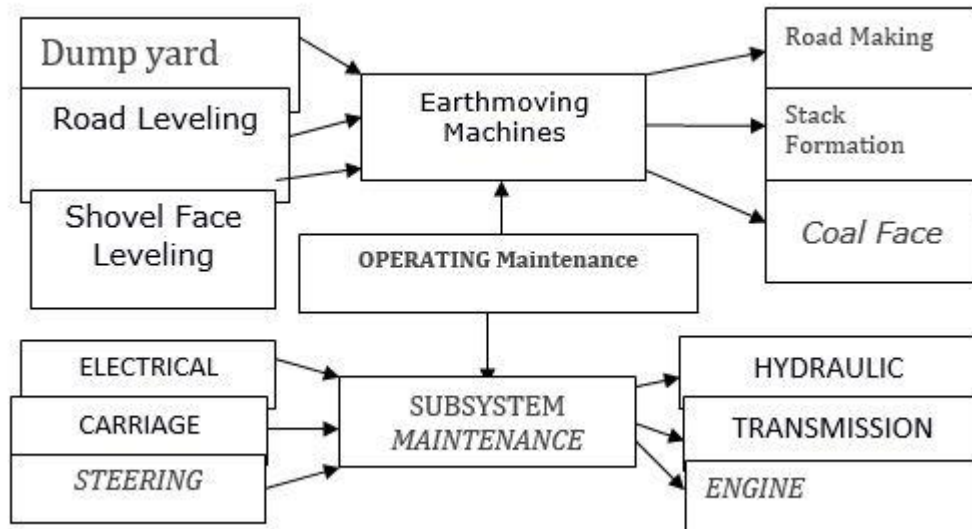


Fig. 1.1: Types of System and subsystem Operations [3]

The Maintenance Management is to maintain the capability of the system while controlling costs:
Maintenance is all activities involved in keeping a system's equipment in working order or in operating condition.

Maintenance is concerned with avoiding or minimizing downtime or to avoid undesirable results due to system failure.

FUNCTIONAL SCOPE OF MAINTENANCE

Primary Function:

- Maintenance of existing plants & equipments.
- Maintenance of existing plant buildings and grounds.
- Equipment inspection and lubrication.
- Utility generation and distribution.
- Alterations to existing equipments and buildings.
- New installations of equipments and buildings.

Secondary Function:

- Storekeeping (keeping stock of spares parts).
- Plant protection including fire protection.
- Waste disposal.
- Salvage.
- Insurance administration (against fire, theft, etc.).

MAINTENANCE OBJECTIVES

- To increase functional reliability of production facilities.
- To enable product or service quality to be achieved through correctly adjustment, serviced and operated equipment.
- To maximize the useful life of the equipment.
- To minimize the total production or operating cost directly attributed to equipment service & repair.
- To minimize the frequency of interruptions to production by reducing breakdowns.
- To maximize the production capacity from the given equipment resources.
- To enhance the safety of manpower.

POOR MAINTENANCE RESULT

- Low Production capacity
- High Production costs
- Poor Product and service quality
- Decreases Employee or customer safety
- Lower Customer satisfaction

ADVANTAGES OF MAINTENANCE

- a. Reduced inventory
- b. Lower operating cost
- c. Continuous improvement
- d. Improved quality
- e. Higher productivity
- f. Faster and more dependable throughput
- g. Improved capacity
- h. Increased life of equipment.

MAINTENANCE APPROACHES

a. Fig.6.1 shows the maintenance planning factors.

- Maintenance Planning
- Performing Maintenance activities
- Inspecting maintenance work done
- Evaluating Maintenance

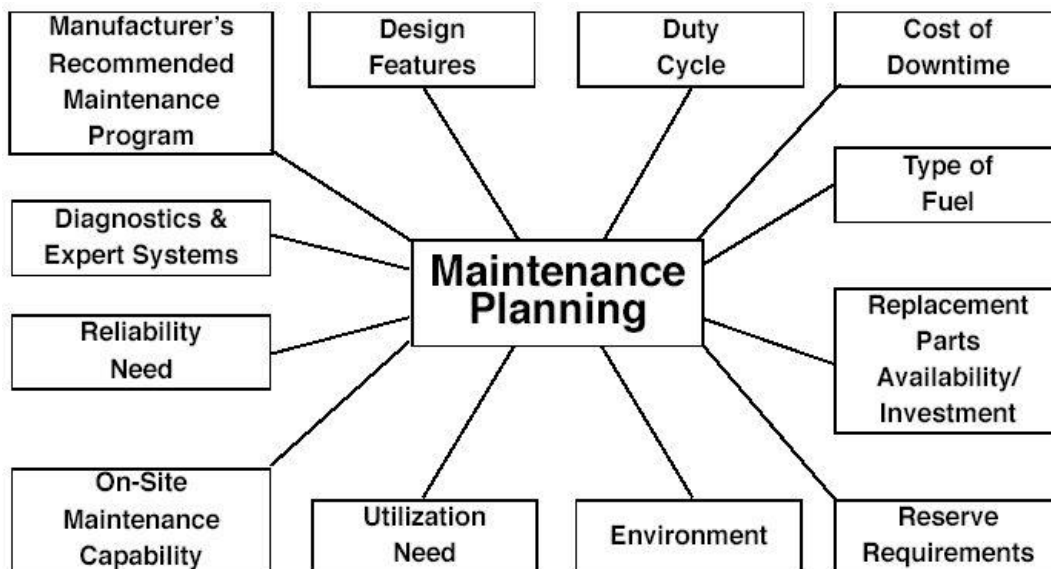


Fig.6.1: Maintenance Planning Factors [3]

b. Systematic Methodological Approaches

- Proper identification and location of machines/equipment by codification.
- Selection of critical machines and systems.
- Identifying components/elements.
- Fixing conditions parameters.
- Monitoring Techniques.
- Trend monitoring.
- Follow up.

MAINTENANCE CO-RELATION

The Informations had been received from opencast mines from different sections which have been shown in Fig.7.1 presents the maintenance co-relation approach among maintenance whereas Fig. 7.2., 7.3, 7.4, 7.5 & 7.6 [3] represents different groups of problem and their remedial actions to solve the maintenance activity problems.

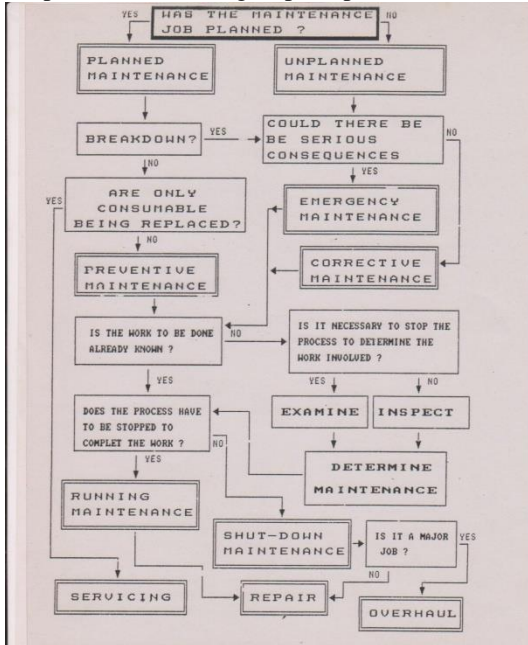


Fig.7.1: Maintenance Co-relation

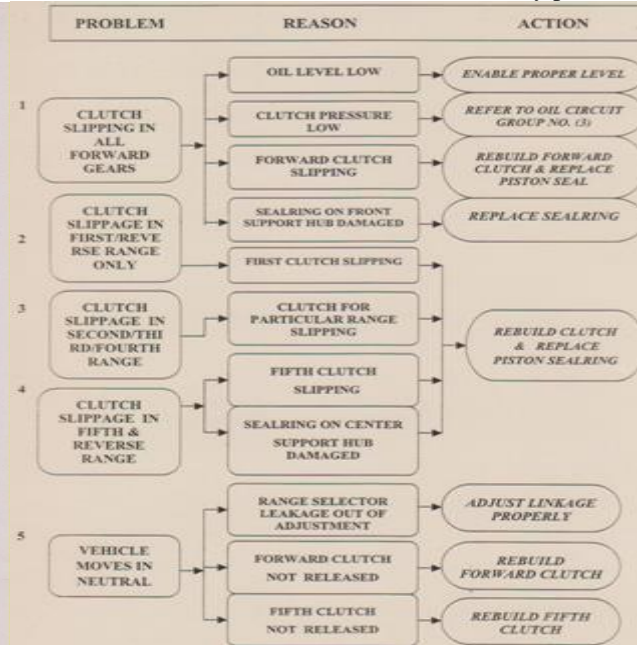


Fig.7.2: Clutch Group Problem

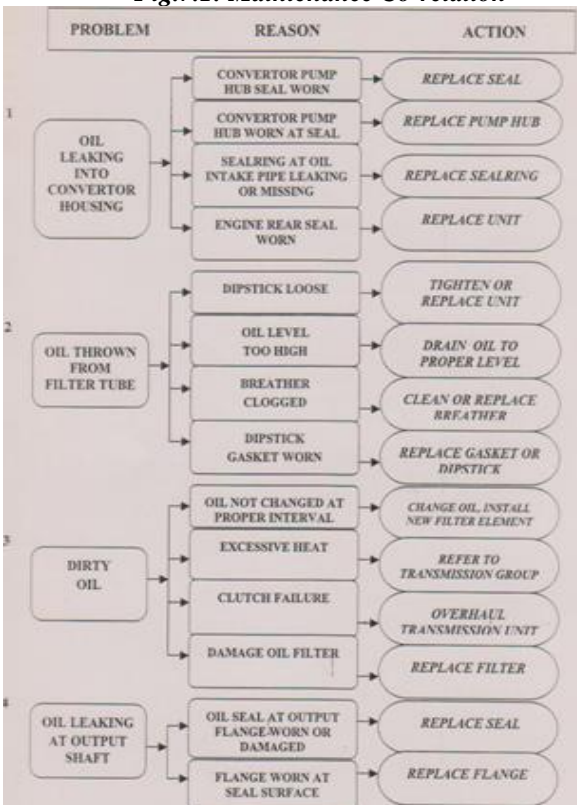


Fig.7.3: Converter Group Problem

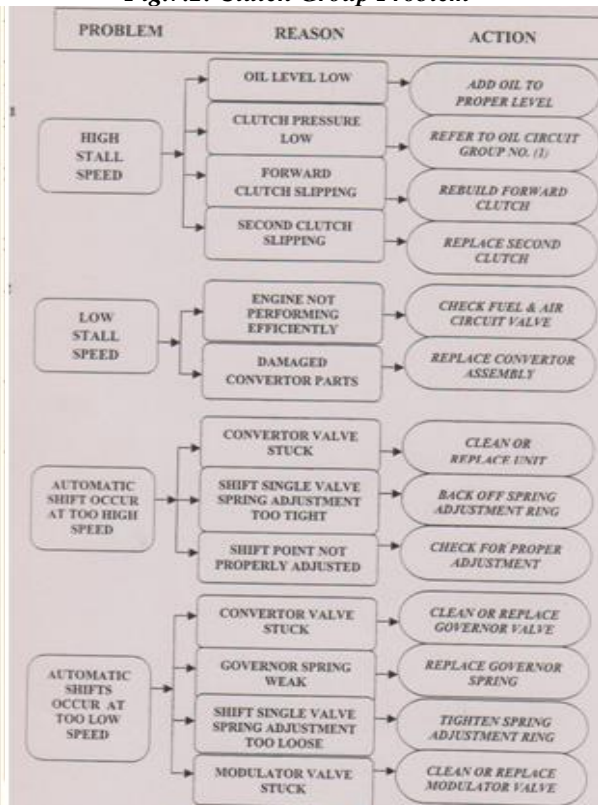


Fig.7.4: Engine Group Problem

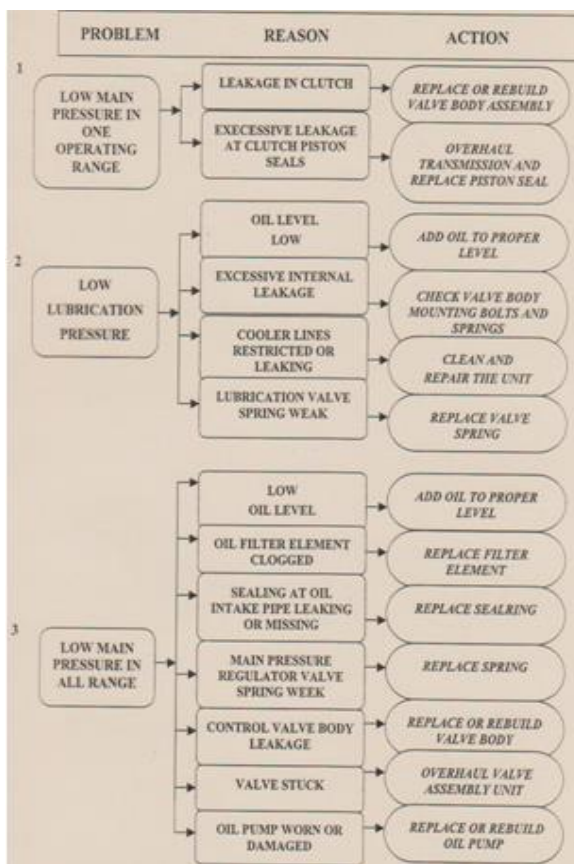


Fig.7.5: Oil Circuit Group Problem

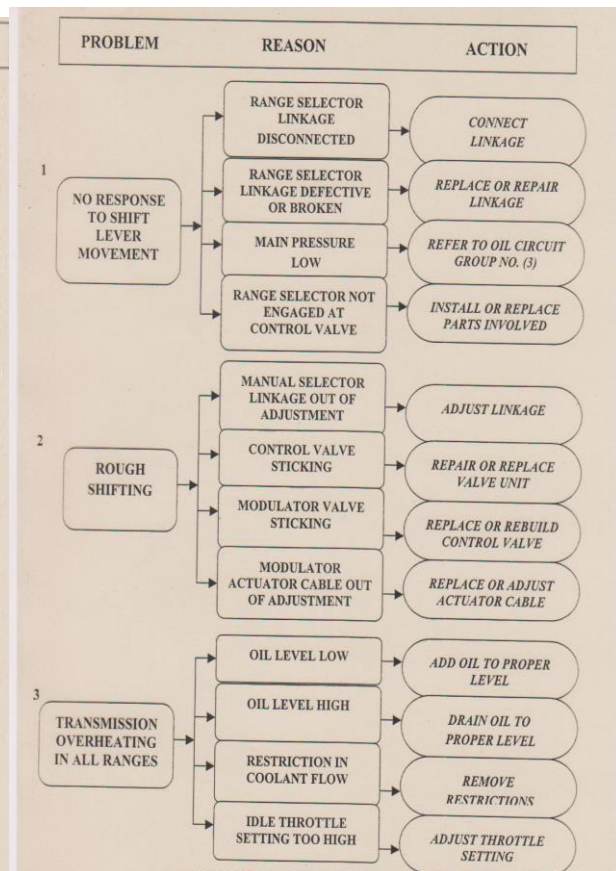


Fig.7.6: Transmission Group Problem

MAINTENANCE PARAMETERS

Breakdown Maintenance

1. Involves performing maintenance activities after a machine breakdown or malfunction has occurred and then must be repaired on an emergency or priority basis.
2. Breakdown maintenance includes repairs, replacement of parts or even overhaul to ensure the machine is put back in operating condition.

Preventive Maintenance

1. Involves performing maintenance activities before the equipment fails.
2. Objectives are :
 - i) To reduce frequency and severity of interruptions to production caused by machine malfunctions.
 - ii) To detect potential problems earlier and avoid the associate cost.
3. Preventive Maintenance activities includes regular inspection, machine adjustments, lubrication, cleaning and parts replacement
4. Two type of preventive maintenance
 - a. Routine maintenance
 - b. Inspection

Predictive Maintenance

This is a method in which the service life of important part is predicted based on inspection or diagnosis, in order to use the parts to the limit of their service life. Compared to periodic maintenance, predictive maintenance is condition based maintenance. It manages trend values, by measuring and analyzing data about deterioration and employs a surveillance system, designed to monitor conditions through an on-line system.

Routine Maintenance

Ongoing maintenance activities such as cleaning washrooms, grading roads hand mowing lawns, which are required because of continuing use of the facilities.

Planned Maintenance

There is only one reason to support a planned maintenance program. Planned maintenance increases profits. The primary objective for any business is to produce profits for the owner. Profit oriented goals apply to an elderly couple operating a corner grocery store, as well as to large corporations. Even maintenance consulting firms have to operate on profit.

Maintenance control in a mine, fleet or plant can increase profits in two ways:

- Increased production:** Reduction of wasteful or unnecessary downtime increases production, thereby increasing profits.
- Reduced costs:** Higher productivity, method improvements or material changes can reduce maintenance costs, thereby increasing profits.

Total Productive Maintenance (TPM)

Additional requirements of: Designing machines that are reliable, easy to operate and easy to maintain.

Emphasizing total cost of ownership when purchasing machines, so that service and maintenance are included in the cost.

Developing preventive maintenance plans that utilize the best practices of operators, maintenance departments, and depot services.

Training workers to operate and maintain their own machines.

MAINTENANCE COST

Cost associated with maintenance are shown in Fig.9.1: Traditional View & Full Cost View

- Downtime (Idle time cost) cost due to equipment breakdown.
- Cost of spares or other material used for repairs.
- Cost of maintenance labour and overheads of maintenance departments.
- Losses due to inefficient operations of machines.
- Capital requirements required for replacement of machines.

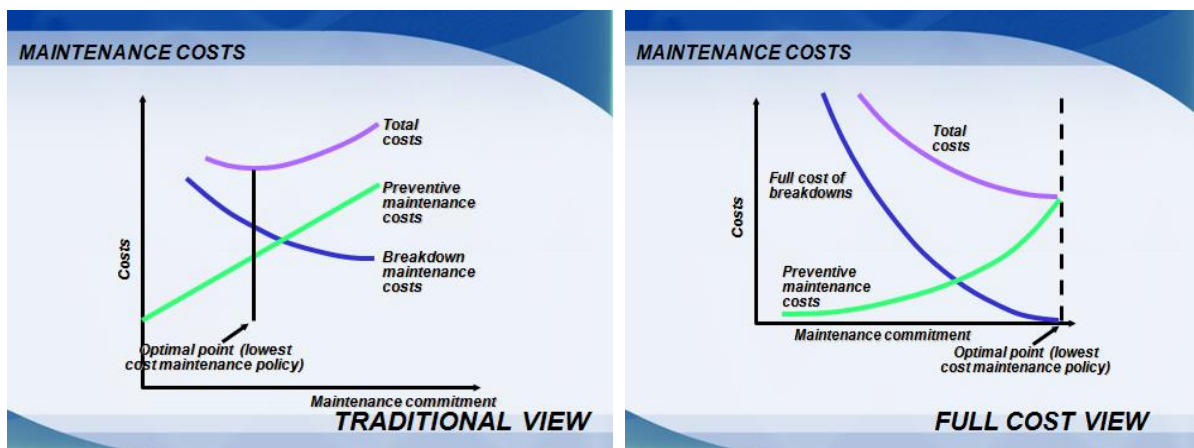


Fig.9.1: Maintenance cost Curve

CONCLUSION

A proper manpower utilisation can only help to perform an effective maintenance of critical machine subsystems for minimizing the duration of equipment breakdown.

A study in this area would help to reap the benefit of formulating an economic maintenance strategy. An estimation of the breakdown maintenance times under the prevailing conditions would help to assist in a proper manpower planning for possible reduction in manpower cost in maintenance and to plan the maintenance budget

in future. The approach made in this paper would hopefully provide the opportunity to improve the maintenance system for equipment on an overall basis as indicated trouble shooting.

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