

Maintenance Policies for Small Overhead Cranes

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ABSTRACT

This paper focuses on the reduction of equipment downtime through a proper maintenance schedule for improved productivity and overall cost reduction. The major equipment in the plant studied being cranes, hoists, air compressors and lift. One of the area of concern here is proper maintenance schedule of cranes and loss of man hours due to failure in cranes. Another concern being unavailability of proper manual for the crane, as it was assembled one. Also there is no guidance by the installer on further issues. In this paper, maintenance schedule for cranes is recommended. The recommendation is based on the analysis of actual parameters of the cranes observed and then relating that data to the standards available. Also a detailed schedule of the activities currently performed and the recommended schedule with its benefits are presented.

Keywords: Cranes, downtime, maintenance, scheduling, productivity, maintenance cost.

I. INTRODUCTION

The farming sector in India is moving towards mechanisation quite steadily over the past few years. Also, from the ancient times, agriculture has been the source of income for most of the people in India. Hence, the need of machines for performing various agricultural works is on the rise and so the industry of the same. Currently, this industry has reached the medium scale level of manufacturing and moving towards the mass production type of industry. As with any field of manufacturing, it is a known fact that as the production increases, the maintenance activities also increase. For effective productivity, it is recommended to have a good maintenance plan for avoiding the loss of man hours due to equipment downtime. Basically, maintenance plays a very important role in the profitability of the company on long term basis. The motive behind this research is to focus on maintenance as a dedicated work rather than a forced work as per the general mentality. Also the proper type of maintenance can only be determined by the thorough analysis of the cost of maintenance. As a general rule, in small scale industries it is

recommended to use breakdown maintenance as the cost of preventive maintenance would be too high as per the manpower and production. Similarly, it is recommended to use the preventive maintenance in the large scale industries as the breakdown of any machine will cause very higher losses in terms of production as well as man-hours. But, the main problem lies with choosing a maintenance plan for a medium scale industry. Whether to opt for preventive maintenance strategy or breakdown maintenance strategy? The answer to this question varies according to the need of the situation and as per different maintenance engineers. In case of those medium scale industries, generally the cost of preventive as well as breakdown maintenance is nearly same. So, some different strategy has to be used. This strategy falls in kind of preventive type maintenance, but differs in many ways from it.

List of major Equipment:-

Table 1:- List of equipment in the division

Sr. No.	Description of Equipment	Machine No.	Capacity	Quantity
1	Loading Crane	DR & AF/LC/1	5 Ton	1
2	Loading Crane	DR & AF/LC/2-3	2 Ton	2
3	Store Lift	DR & AF/SL/1	2 Ton	1
4	Electrical Chain Hoist	DR & AF/ECH/1-4	500 kg	4
5	Electrical Chain Hoist	DR & AF/ECH2/1-7	250 kg	7

In this paper, we are going to focus only on cranes and their maintenance.

Current Maintenance plan:-

Loading Crane(5 Ton):-

Here breakdown maintenance strategy is being used. It is quite important to note that this has caused severe loss of production and increased maintenance cost with lowering equipment life.

Loading Crane(2 Ton):-

As with the earlier case, breakdown maintenance is being used currently.

II. RECOMMENDED PLAN

Overhead cranes are widely used machineries in industries for heavy load transfer. These machineries are operated by humans and pose high risk of accidents that may happen as a result of errors committed by the operators. Safety in working with cranes has always been a subject of concern and many researchers have worked on different aspects of failures and fatalities. However, most of the studies pertain to structural and other technical aspects of the cranes. Apart from structural deficiencies, errors committed by the human operators also contribute substantially towards failures during operations of overhead cranes. Human error is an unavoidable part in the overhead crane operations; as a result sometimes even smaller errors related to action, selection, retrieval communication, checking may lead to catastrophic consequences. Thus, analysis of the human errors becomes very vital in risk analysis of overhead crane operations.

This type of maintenance works on the fact of studying the condition of the equipment and its components. This type is quite suitable for the cases where regular preventive maintenance is quite costly and breakdown causes severe loss of production. In the case discussed, the manpower is limited and worker cannot be allotted for maintenance specifically on regular basis as the cost would increase significantly for the maintenance personnel salary. So, the solution lies with the fact of allotting separate machines / equipment for a worker or a group of workers and making them periodically monitor the condition of the equipment they are operating. This will not only result in cost saving, but also in proper care of the equipment. Also, the schedule for this periodic checking and maintenance of the equipment can be prepared and distributed among them to guide them for a proper maintenance plan.

What should you check for when inspecting a crane before maintenance?

- Lower hoist to unload rope sheaves.
- Unwind all wire rope from the hoist drum to expose all parts of a rope, making sure that the rope does not rewind in the reverse direction.
- Inspect sheaves, sockets, dead-ends, thimble joints, and all wire rope hardware.
- During rope changes, check the sheaves for worn bearings, broken flanges, proper groove size, smoothness, and contour.
- Inspect all parts of the cable, cleaning wire rope only as required to complete an inspection. Excessive removal of lubrication will lead to damage.
- Re-lubricate rope to prevent corrosion, wear, friction, and drying out of the core.
- Check for ropes that may have been operated dry (unlubricated). Replace dry ropes. There may be hidden damage that is not detected by visual inspection.
- Compare the rope length and diameter with the original dimensions.
- Lengthening accompanied by diameter reduction is often an indication of interior core defects.
- Visually examine the crane structure for deformed, cracked or corroded members in the structure and boom. Check for loose bolts or rivets. Check for excessive wear on brake and clutch system parts.
- Check for deterioration or leakage in air or hydraulic systems.
- Check all control mechanisms for poor adjustment or excessive wear.
- Check accuracy of marking on the load/radius indicator over full range.
- Establish a schedule of rope replacement to change wire rope before it breaks. Periodic replacements do not take the place of inspections. If rope breaks or inspections reveal abnormal wire breakage or defects, reduce the time between replacements. Do not make wire rope slings from used wire rope.

Table 2:- Maintenance plan for cranes

Check list	Plan	Areas to check
Wire Rope	Weekly	The wire rope diameter should be checked weekly and the reduction in diameter should be noted down. When it reaches the permissible value, it should be immediately changed. The permissible deviations can be obtained from manufacturer's catalogue or from the various standards available.
Motor	Daily	The motor should be examined for wiring and fixtures on which it is mounted. It should be

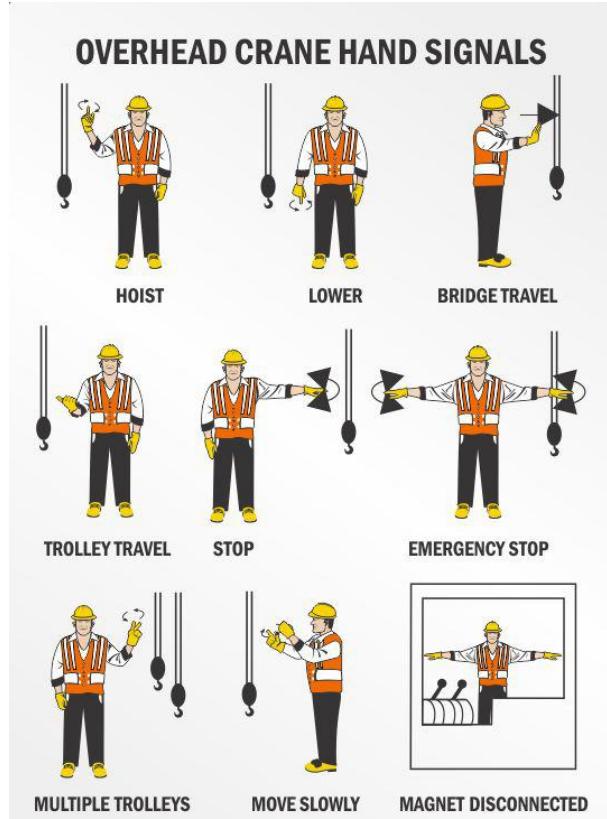
		observed whether the wiring is soiled or cut somewhere. Also it should be checked that the motor is rigidly fixed on the fixtures.
	Monthly	The motor should be disassembled monthly and cleaned properly to ensure the long life of the motor.
Brake	Daily	The brake should be checked daily before the shift. The crane should be turned on and the brakes should be checked for proper working
Roll wheel	Daily	The wheel should be checked for out of roundness and whether it is properly mounted on the shaft or not.
Operating switches	Daily	The operating switches should be checked well at the starting and if any switch is not working, it should be replaced immediately.
The guide ways	Daily	The guide ways must be checked for straightness and buckling daily. If a guide way is buckling, it may lead to crane slippage and some serious accident. Also, the supports of the guide ways must be checked for any damage daily.

What are some things to remember when repairing a crane?

- Take a crane to a location where repairs will least interfere with other cranes.
- Ensure that all controllers are placed in the "off" position, and the main switches are open and locked.
- Place on the switch a standard warning tag stating "DO NOT START." The tag must be filled out and signed
- Place rail stops or make other safety provisions when another crane operates on the same runway.
- Use fall protection equipment.
- Do not carry anything in your hands when going up and down ladders. Items that are too large to go into pockets or belts should be lifted to or lowered from the crane by a rope.
- Prevent loose parts or tools from falling to the floor.
- The area below the crane must be cleared and a barrier erected to prevent injury from a falling object.
- Replace all guards and other safety devices before leaving a crane.

- Remove all stops, tools, loose parts and other material and dispose of them before completing the repair job.
- Enter all service inspections and repairs in a crane log book or file.

The following standardised hand signals should also be followed and the workers should be made aware of it:-



III.RESULTS

The results can be best understood by comparison between the current scenario and the scenario after the application. At present, the average downtime of the crane is of about 2-4 days per month. And in some extreme cases, the breakdown results in downtime of continuous 4 days. Through recommended plan, it is expected to reduce the downtime to zero theoretically. Even if it is not achieved, the recommended can reduce the downtime to 3-4 hours per month which will not only result in better equipment utilisation, but also in the improved life of the equipment. Also, the cost of breakdown maintenance is higher compared to the proposed method.

The overall accident chances can be reduced drastically. The life of crane will definitely get increased.

IV.CONCLUSION

From the above discussion, it can be concluded that: Reduction in equipment downtime can be obtained through the use of the proposed plan. The cost of maintenance can be

reduced drastically with a well planned maintenance program.

Also, implementation of a comprehensive and disciplined inspection and maintenance plan has the following benefits:

- Reduced chance of fatality or injury to personnel.
- Reduced liability exposure.
- Improves equipment productivity.
- Prolongs equipment service life.
- Ensures compliance with laws, codes, and standards including: OSHA, ANSI, and ASME.

Hence, it is recommended to use the prepared plan in future.

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