

Different maintenance practices for industrial electrical equipment's

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Abstract:

In a variety of industrial projects, different practices of equipment maintenance are followed. Latest maintenance technologies are used to improve the efficiency of equipment as well as to reduce the chances of fault occurrence. The different types of maintenance are listed as: Preventing schedule breakdown and Predictive & Conditions based maintenance. All types of electrical motors, circuit breakers, isolators, fuses and various other equipment's need periodic maintenance. In an industry, various maintenance functions have to be integrated together along with other operations so as to have effective and desired results. These projects aim in utilizing latest technologies of maintenance and with a range of practices which can improve reliability of system, extension in life of equipment, lesser asset replacement and improve employer's safety.

Keywords —maintenance, maintenance practice, periodic maintenance, preventive maintenance

I. Introduction

The developing industries nowadays require use of latest equipment's & machinery. Due to frequent & continuous usage of the equipment's, it needs maintenance quite often. Also a healthy maintenance practice will ensure to prevent frequent breakdowns & reliable operations. So due to this reliability is increase of the operating systems .and also breakdown or failures are also prevents and maximize performance of production equipment efficiently and regularly. So due to this maximize production capacity is increase and life of equipment is also increase and plant efficiency will increase.

Aim of maintenance:

The aim of maintenance is to maximize performance of production equipment efficiently and regularly and also prevent breakdown or failures, minimize production loss from failures and increase reliability of the operating systems

1. Maintenance:

All necessary action that has been used for retaining an item, or restoring to it, a serviceable condition, which include servicing, repair, modification, overhaul, inspection and condition verification .that Increase availability of a system Keep system's equipment in working order.

2. Types of maintenance:

I. Corrective maintenance:

Definition –Repair of equipment / machinery in order to bring on to back to its original operating condition. Its scope is very vast and that may include different type of action like typical adjustment in equipment and minor repair to minor redesign of equipment.

II. Routine Maintenance:

Routine maintenance is the upkeep practices that an organization performs on a regular basis with an eye towards preventing harm to workers and large-scale, expensive repairs.

III. Preventive Maintenance:

Process of inspecting, testing, analyzing, servicing, and easing risks associates with an electrical systems and equipment with the purpose

of maintaining safe operations and production by reducing or eliminating system interruptions or equipment breakdown.

IV. Condition-Based Maintenance:

Condition based maintenance (CBM) is a maintenance strategy that monitors the actual condition of the asset to decide what maintenance needs to be done. CBM command that maintenance should only be performed when certain indicators show signs of decreasing performance or upcoming failure.

V. Periodic Maintenance:

Various different activities to ensure that the smooth operation of a machine, equipment, system or plant that was carried out on a regular, preset schedule.

VI. Scheduled Maintenance:

Scheduled maintenance is a procedure that incorporates inspection, lubrication, repair and overhaul of equipments. If neglected it can result in breakdown. Generally followed for overhauling of machines, changing of heavy equipment oils, cleaning of water and other tanks etc.

VII. Condition monitoring

Condition monitoring is the process of monitoring a parameter of condition in machinery like vibration, temperature, in order to identify a significant change which is inductive of a developing fault. It is a major component of predictive maintenance.

Maintenance practice in industry

1. Battery maintenance:

The battery cells can be recharged by reversing the direction of discharge current, in the battery. This is done by connecting, positive terminal of a dc source with positive terminal of the battery and similarly, negative terminal of the dc source with negative terminal of the battery. A rectifier type battery charger of suitable capacity is used as dc source for charging battery. Due to charging current (reverse of discharging current) positive plates change to lead peroxide and negative plates change to pure lead. As soon as load is connected across the battery terminals, discharge current starts flow through the load and battery starts discharging. During discharging process, acidity of the electrolyte solution decreases and lead sulphate deposits on both positive and negative plates. In this process of discharge the amount of water in the electrolyte solution increases that is specific gravity of the electrolyte decreases. Theoretically, this discharge process continues until the negative and the positive plates contain maximum amount of lead sulphate and at that point both types of plate becomes electrically similar that means there is no potential difference between the electrodes of the cell. But practically, no battery cell is allowed to be discharged up to this point. The battery cells are allowed to be discharged up to a predetermined minimum cell voltage and specific gravity. A fully charged lead acid battery cell has voltage and specific gravity, 2.2v and 1.250 respectively, and this cell is normally allowed to be discharged till the corresponding values become 1.8V and 1.1 respectively.

If the cells are over charged, the physical property of lead sulphate gradually changes, and it may become obdurate from which it becomes difficult to convert by

charging process. Hence, the specific gravity of the electrolyte decreases for which rate of chemical reaction is hampered.

The following rules to be obeyed during operation, control and emergency lighting service of the storage battery.

- 1) Do not allow the battery to stand idle for long time this may cause inactivation of the battery cells.
- 2) Do not charge the battery with very high rate of current because high rate of charging causes high temperature rise and excessive gassing resulting in heavy loss of water and sometime overflowing of electrolyte from the battery cells.
- 3) After every complete discharge, the battery should be immediately charged before returning it to its regular floating service. Otherwise there may be a chance of deposition of sulphate film on the plates.
- 4) As already mentioned, the battery cells should be charged gently at normal rate so that there will be no chance of immediate gassing and temperature rise over 40°C. Otherwise there may be damage to the battery cells due to high temperature. During charging of batteries, continuous monitoring is required, if gassing starts and the temperature reaches the said limit, reduce the rate of charging. If after reducing the charging rate, the temperature is still approaching to the limit, it indicates the completion of charging process because even the normal rate of charging may produce high temperature rise if the battery approaches to the fully charged condition.
- 5) The voltage of each of the battery cells should be checked before conclusion of charging and each of the cells are properly and equally charged and the readings should also be tallied with previous record.
- 6) If the electrolyte level inside the battery cell comes down, it must be filled with distilled water up to the level marked on the cell itself. This is to compensate the loss of water due to evaporation.
- 7) During filling up distilled water in the battery cell, it must be carefully watched that the electrolyte level in the battery cells should not exceed the line marked on it. Otherwise there may be a chance of overflowing of electrolyte during gassing of the battery. High level of electrolyte may also cause softening the sealing compound on the top cover and subsequent leakage in the battery cell.
- 8) The specific gravity should be measured after at least two weeks from topping up to ensure thorough mixing of water in electrolyte.
- 9) The battery should be discharged up to the allowable limit and then it should be overcharged

once in 2 to 3 months. The rate of overcharging must be followed as specified by the manufacturer. This operation is very important to maintain the acid storage battery in the active state.

- 10) When specific gravity of electrolyte is measured, it should not be forgotten to correct it for temperature. So that, all hydrometer readings will be referred to same temperature. The hydrometer should be kept clean with distilled water otherwise the hydrometer will cause incorrect readings and as well as spoil the quality of electrolyte. The specific gravity of electrolyte must be within 1.180 to 1.240. Low value of specific gravity decreases the capacity of battery and on the other hand high value is harmful for the battery plates.
- 11) So these are mainly check points.
- 12) Gravity of distilled water.
- 13) Voltage of cells.
- 14) Connection contact.
- 15) Cleaning the surface

CONCLUSION

If the specific gravity is too high the acid damages the positive and negative plate materials and reduces the cell life hence the specific gravity is in the range of 1180 to 1220.

CONDITION MONITORING:

1. ROTOR UNBALANCE

In any rotating machinery the rotor unbalance is always present and it is one of the most common sources of severe vibration. The unbalance is defined in chapter 2, which is the product of the rotor mass and its eccentricity (the eccentricity is a distance of the centre of gravity of the rotor from its centre of rotation). When a severely unbalanced rotor is rotated freely on frictionless bearings, it stops at nearly fixed orientation. It indicates that the unbalance force acting at centre of gravity pulls the rotor to a fixed orientation due to its eccentricity. The position of the unbalance is also called the heavy (or hot) spot. The point on an unbalanced rotating shaft with the maximum displacement to the centre of rotation (figure 17.1) is called the high spot. It is observed by a vibration pickup as the point of maximum positive amplitude. the high and heavy spot may or may not coincide, depending on where the rotor is operating relative to its critical speeds the vibration occurs at machine rotational frequency, in general, but

sometimes higher-harmonics of rotational speed are excited. Machine vibration caused by unbalance can mostly be detected by monitoring shaft displacement amplitude and phase as the machine is run through its critical speed, filtering out non-rotational speed frequencies by using tracking filter.

2. MISALIGNMENT

Unbalance and misalignment (the objective of the alignment is to have two coupled shafts perfectly collinear under operating conditions or between the bearing and the shaft their axis should be collinear or two bearings carrying a common shaft should have their axis collinear) are the two most common source of machinery vibration. Accordingly, misalignments can be classified as (I) parallel (ii) angular, and (iii) combination of parallel and angular misalignments (figs. 17.4 and 17.5). Like the unbalance, the misalignment is an installation and subsequent maintenance problems, since it can be corrected and prevented by using the proper installation and maintenance procedures. shafts with a heavy pre-load carried by the bearings (e.g., in angular contact ball bearings in tandem the preloading must be applied to keep the bearing in assembled position), as distinct from the out-of-balance load, can show variation characteristics similar to those caused by bearing misalignment (figure 17.6). This category of fault is probably the second most common cause of machine vibration, after the unbalance. A pre-load might also be applied at a bearing as a consequence of gear-mesh forces, aerodynamic forces and hydrodynamic forces. Misalignment may be present because of improper machine assembly or as a consequence of thermal distortion, and it results in additional loads being applied to the bearing.

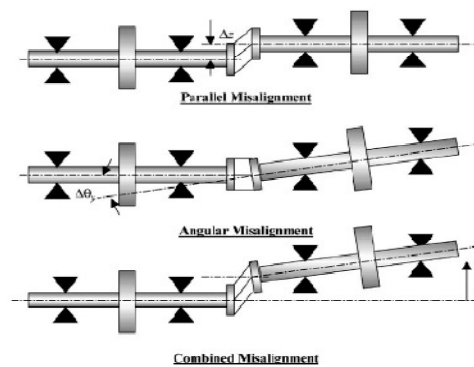


Fig. 2. Schematic of rotor with misalignment at a coupling.

1. CONCLUSIONS

We conclude that due to the maintenance of the equipment the maximize useful life of equipment and it also keep the equipment safe and to prevent safety hazards and minimize the frequency and severity of interruptions and increase production capacity – through high utilization of facility.

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