

Cause & Remedy of Electrical Safety in Automobile Industry

¹⁾ Dr.Nihal Siddiqui, ²⁾ Vinod Kumar, ³⁾ K.S.Yadav

- 1) University of Petroleum & Energy Studies, Dehradun, 248007, India
- 2) Escorts Agri Machinery, Faridabad, 121007
- 3) Escorts Agri Machinery, Faridabad, 121007

Abstract

Electrical safety is not only to provide work permit, PPE, Rubber mat etc. It is about the elimination of Electrical Hazard through various methods & techniques. Lock out tag out & Thermography is the techniques by which most of the Electrical hazards as Electrocutation, Arc blast, Electrical Fires, Short circuit can prevent. Thermography provides major solutions for failure of connectors, overloading, loose connections, hot spots, mechanical failures, insulation failure, pressure contact failure, conductor fracture etc. Lock out tag out has another major role in Electrical Safety during preventive maintenance. It ensures the isolation of energy in control and person is safe.

Keywords: *Electrical Safety, Remedy of Electrical Hazards, Thermography benefits, LOTO Benefits.*

1. Introduction

Electricity is essential in present era, whether it is at home or office. Electricity is safe when used in controlled way. But it is not controlled at any point it becomes dangerous. Electrocutation, Arc Flash, Electrical fires are common Electrical hazards. Many of the preventive & corrective action are taken to avoid these accidents. But due to lack of knowledge & technology most of the accident not avoided. When we are in contact with these hazards this becomes dangerous. Severity of shock will vary depending upon physical condition like man or women, wet or dry, body part etc. in Automobile industry Electrocutation & Electrical fires are common.

2. Objective & Scope of the study

Objective of this study can be summarized as follows:

- To provide a strong base for the management to take a decision on further implementation of Electrical Safety in its business units.
- To find out the present status of the Electrical Safety system implemented in Automobile industry.

- To analyze the strength and weakness of the present Electrical Safety system implemented in Automobile industry.
- To find out recommendations for improvement
- To enhance the preventive maintenance to ensure the elimination of Electrical hazards

3. Myth about Electrical Fire in industry

Whenever there is any fire in industry, Hospitals, Market & homes, I hear that fire is due to short circuit. Short circuit has certain reasons behind it. After analysis of more than 100 Fire investigation reports, even in single report actual cause is not identified. Electricity has certain properties, we have to understand it and provide actual path & condition to it.

4. Cause of Electrocutation & Electrical Fire in Automobile industry

While considering industry scenario major cause of electrocutation & fire in industry, it was very difficult to identify the exact cause of both hazards. Most of the time either hazard were hide or not known due to lack of recording during incident investigations. More than 100 fire incidents are electrocutation incident were analyzed to identify root causes. Major causes are given below:

3.1 Cause of Electrocutation

Electrocutation is major physical accident in industry. Some of the reasons are naked cable, wrong connections etc. these hazards can be eliminated if we can take care following causes:

- Unskilled manpower working on electricity
- Unauthorized working in hazardous area
- Non availability or use of standard PPE
- Training & Awareness
- Ineffective preventive maintenance schedules

3.2 Cause of Electric Fire

Cause of electrical fires is again categorized in two parts:

Immediate Cause:

- Short circuit
- Burning of cables, joints
- Loose wires etc

These immediate causes are not the root of these incidents. Further to identify root causes, following four major causes has come up:

- Overloading
- Insulation Failure
- Pressure contact failure
- Conductor fracture

Above all four root causes are not instant cause of fires. Development of these causes takes some time depending upon different parameters.

One common thing comes that while developing these causes and when current is flowing through circuit, heat is generated. Heat generation is proportional to square of the current flowing through circuit.

5. Methodology to prevent the Electrocutation & Electrical fire

During implementation of the system following methodology can be used as:

- Collect Data from past breakdowns, Incidents, Safety items procurement, Training & Awareness sheets, insurance claims, Medical data etc.
- Analysis of all data collected
- Prioritization of Focus area
- Selection of Team
- Training to all personal for Hazards & its controls
- Preparation of checkpoints for equipments & machines
- Gap analysis of actual implementation Vs requirement.
- Further Training on focus area considering use of technology available, IS Codes etc.
- Updation of preventive maintenance schedules.
- Authorization of trained person
- Use of Lockout tag out system
- Use of thermography in assessment of overloading, insulation failure, pressure contact failure, conductor fractures.

6. Remedy Focus Area

Details analysis of past data & present conditions reflect that most of the reasons are interconnected and can be controlled if focused on

- Lock out tag out &
- Thermography (Hot spot measurements)

Use of LOTO:

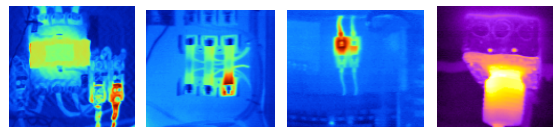
- It can be use on Electrical, Mechanical, Hydraulic energies etc.
- It isolates the energy to release
- Only authorized person can work on it
- Access to release the energy is with the person working
- Provision of group lock outs



- Ensure the safe working condition
- Elimination of accident chances
- Its secure against reconnections
- Verification that installation is dead.

Use of Thermography:

- If using properly at right duration, it eliminates the chances of fire.
- Provide detail of overloading resulting heat generation
- Provide details of loose connection resulting increase of the resistance and heat.
- Provide the detail of unequal load distribution through hot spots.
- Wherever the temperature is higher than ambient temperature it provide the red spots depending upon the range.
- Once hot spot identified it is very easy to rectify the cause.
- Thermography most common uses at Electrical circuits, Mechanical devices & refractory/insulation.



A) Controller B) 3 Phase Fuse C) Fuse Clip D) Wall Plug

Typical view of red spots during thermography

7. Technical aspects in Electrocuttion & Electrical Fire.

In Electricity three terms are used Voltage (V), Current (I) & Resistance (R).

Ohm's Law $V=IR$

Electrocuttion is that when current is passing through body.

Control Areas:

- Reduce the Voltage level,
- Reduce the Current level
- Increase the resistance

In LOTO first two parts are focused.

Relation between Heat & Current is

Heat (H) = Square of Current x Resistance x Time.

Whenever there is gap between two terminal increased or over current flowing, Heat generation will increase, resulting fire.

8. Conclusions

Electrical hazards are not so typical to control. It can be controlled easily. Electricity has no mind; it is flowing in shortest & easiest path, which we are providing. The main aspect with Electrical Safety is to understand the chemical, physical property.

9. References

- [1] Mr. A A Hattangadi Former General Manager, Chittaranjan Locomotive Works, Electrical Fires & Failures, Tata McGraw - Hill Publishing Company Limited, New Delhi.
- [2] Prof. H L Saluja, S Rao " Electrical Safety, Fire Safety Engineering & Safety Management, Khanna Publishers, New Delhi.
- [3] Indian Electricity rules-1956