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## Measures to augment safe and adequate maintenance of plant & machinery

### Overview

Running machines with zero breakdowns is most challenging. Scheduled maintenance helps to keep your organisation up and running by enhancing the efficiency of equipment, while lowering power expenses. Maintenance also helps in extending the useful lifecycle of equipment, decreasing the need for capital replacements. The basic philosophy of managed maintenance is to economically maintain equipment and facilities in proper condition, identifying problems in their incipient stage, making appropriate adjustments, and correcting problems at the first opportunity, while minimising unplanned shutdowns.

We at Liberty Videocon General Insurance value the importance of safe upkeep and maintenance of the machinery inside factories and facilities; and intend to suggest some useful measures for the same. We sincerely hope that the measures suggested in this document will help follow better practices when it comes to maintenance of machinery.



Source: <http://www.thelisticles.net/wp-content/uploads/2012/03/Machinery-Maintenance.jpg>

### Case Study

#### Poor Maintenance of forklift causes death of operator

As the forklift operator was in the process of loading a paper block, the forklift suddenly reversed out from the side of the ramp and toppled off the ramp. The helpless operator was pinned onto the ground by the forklift and was killed.

#### Key Findings

1. The deceased had not undergone the mandatory Forklift Driver's Training Course prior to the accident.
2. Forklift involved in the accident was poorly maintained and there was no proper maintenance regime for the forklifts in the workplace.
3. Unsafe work method of operating forklift on ramp propped up by paper blocks.
4. There was no risk assessment conducted on the work activity.
5. There was also no safe work procedure established.

#### Learnings

1. It is important to ensure forklift operators are trained and competent.
2. It is critical for ensuring machineries such as forklifts are safe and without risks for workers; to have a proper maintenance regime for the forklifts in the workplace.
3. It is necessary to conduct risk assessment for identifying and implementing control measures which include proper and safe work procedure for forklift operations.

## Types of Machinery Maintenance

### Predictive Maintenance

This type of maintenance program employs repair methods only as the conditions warrant. If trouble indications surface like high temperature, vibration or other warning lights, a machine may be shut down before it fails completely. This is one of the most efficient and least-expensive machine-maintenance programs.

### Preventative Maintenance

This type of maintenance involves routine inspections of machines on certain calendar days or operating hours. This schedule helps identify wear and tear on a machine based on

a predetermined schedule. Any signs of degradation must be spotted and scheduled for repair, to prevent a total breakdown of machinery. This is one of the least expensive forms of maintenance.

### Breakdown Maintenance

This maintenance program allows machines to work until failure. The equipment is maintained after break down. This type of maintenance is often most expensive because worn equipment can damage other parts and cause multiple damages. It also leads to a forceful and avoidable shut down of operations.

## Causes of Machinery Breakdown

- Non-compliances of the operator's manual / poor operational practices
- Poor electrical connections
- Overrunning machine's capability
- Not replacing worn parts when needed
- Improper weather-related use
- Ignoring warning signals
- Asking untrained personnel to operate equipment

## The ways to initiate a good Maintenance Program

Following is a list of some basic steps that will help to initiate maintenance of facility:

1. Develop a master equipment list identifying the equipment in your facility.
2. Prioritise the listed components based on importance to process.
3. Assign components into logical groupings.
4. Determine the type and number of maintenance activities required and periodicity using:
  - a. Manufacturer's technical manuals
  - b. Machinery history
  - c. Root cause analysis findings - Why did it fail?
  - d. Good engineering judgment
5. Assess the size of maintenance staff.
6. Identify tasks that may be performed by operations maintenance personnel.
7. Analyse equipment failure modes and effects.
8. Identify effective maintenance tasks or mitigation strategies.

## Tips for Machinery Maintenance

- Be sure to conduct a safety walk. Conduct a safety and lock out review before hitting the floor each day. 
- Maintain the history card. Near misses record system helps in taking corrective measures. 

History Card	
DATE	
TIME	
PERSON	
LOCATION	
- Have a clearly defined written maintenance program in your organisation which includes:
  - a policy statement and a maintenance manual, or equivalent, spelling out a definite assignment of responsibilities and accountabilities; and
  - Preventive maintenance practices and procedures.
- Mandate facility personnel to ensure that equipment is operated within design parameters, and preferably, within control limits. 
- Ensure that all necessary testing and monitoring programs are implemented in a logical manner (i.e., following manufacturer's recommended practices)
- Make sure the personnel conducting repair work are qualified to carry out the job.
- Conduct supervision of the equipment to ensure that performance is within its design specifications and control limits. 
- Ensure operating personnel are aware of the proper response to prevent or control damage when operating parameters reach their limits or change drastically.
- Have operating records regularly reviewed and evaluated by trained, qualified personnel who are empowered to take appropriate actions. 
- Ensure that the equipment and systems are regularly checked and calibrated in accordance with the equipment manufacturer's specifications. Calibration should be performed within prescribed time periods.
- See that suitable testing is done after completion of repair work prior to operation to establish and record new baselines for monitor. 
- Have suitable tags permanently attached in visible locations, to facilitate equipment identification, where applicable.
- Train maintenance and operating personnel appropriately. Devise programs such that the personnel familiarise with the performance characteristics of the equipment, as well as with mechanical components and the work of other disciplines.