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► Risk management in maintenance and repair works

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► What is maintenance, repair and periodic control?



Maintenance

It refers to an operation in which one or more of the following are carried out on work equipment and its components: revision, repair, replacement, adjustment, troubleshooting, cleaning, and calibration.



Repair

It refers to the elimination of faults identified as a result of maintenance of machines, or the replacement of certain components at specified intervals; in other words, the process of restoring the machine to working condition.

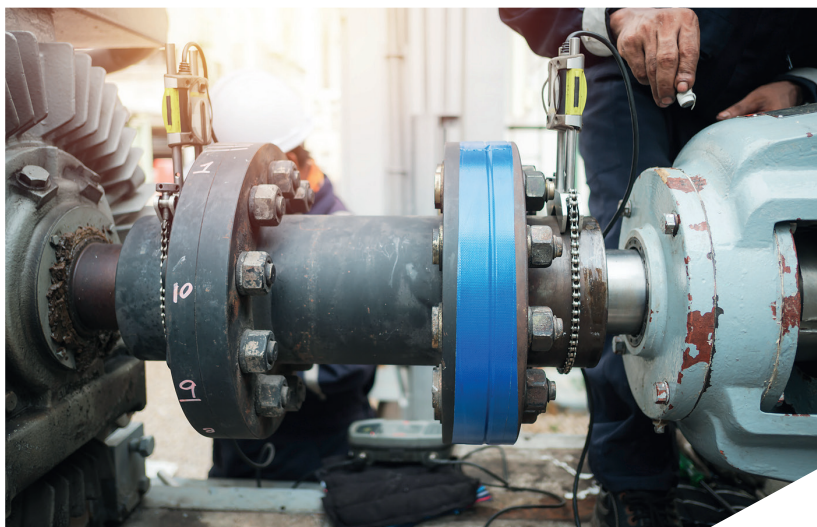


Periodic control

It refers to control and/or testing activities carried out by authorized persons at the intervals specified and in accordance with the methods prescribed in the Regulation on Health and Safety Conditions in the Use of Work Equipment.



► What is the difference between maintenance and periodic control?



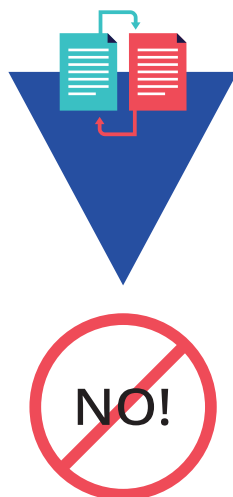
Maintenance refers to all operations carried out on work equipment, such as cleaning, adjustment, and calibration, whereas periodic control is defined as the inspection, examination, and testing activities carried out by authorized persons at the intervals specified and in accordance with the methods prescribed in the Regulation on Health and Safety Conditions in the Use of Work Equipment.

Any control shall acquire the status of a periodic control only if it is carried out at the intervals specified and in accordance with the standards set out in the Regulation on Health and Safety Conditions in the Use of Work Equipment.

By performing maintenance, the service life of the work equipment is extended. In periodic control, it is determined whether the work equipment is operating safely.

► Can a maintenance record form be used instead of a periodic control report?

- Periodic controls shall be carried out by authorized persons at the intervals specified and in accordance with the standards set out in the Regulation on Health and Safety Conditions in the Use of Work Equipment.
- In addition, persons authorized to carry out control must be registered in the EKİPNET system, and an appropriate contract must be arranged in the İSG-KATİP system between the employer and the authorized person at least one day prior to the performance of the periodic control service, and signed by both parties.
- Reports to be prepared as a result of periodic controls must include the sections specified under Annex 3.1.7 of the Regulation on Health and Safety Conditions in the Use of Work Equipment.
- For maintenance record forms to be prepared after maintenance, there is no such requirement.



► Can the personnel who perform the maintenance of the equipment also carry out its periodic control?

Pursuant to the second paragraph of Article 14/A of the Regulation on Health and Safety Conditions in the Use of Work Equipment, the persons who perform maintenance shall not carry out periodic controls.



► On the basis of which considerations shall the maintenance and repair of work equipment be carried out?

It shall be carried out at the intervals and in accordance with the criteria specified in the relevant national and international standards, taking into account the manufacturer's data and the requirements of science and technology.

► How frequently is the maintenance of work equipment carried out?

Work equipment shall be subject to maintenance in accordance with the criteria and intervals specified in the relevant standards and by the equipment manufacturer.



It shall be carried out as specified in the relevant standards or as determined by the manufacturer.

If no maintenance interval is specified in the relevant standard for the work equipment and/or no maintenance interval is determined by the manufacturer, the frequency of maintenance of the work equipment in question shall be determined by the workplace environment, working conditions, and the data contained in the risk assessment report.

**By whom shall the maintenance of work equipment be carried out?**

Maintenance of work equipment shall be carried out by services authorized by the manufacturer or by persons designated by the workplace.

**How shall maintenance and repair records be kept?**

All maintenance and repair carried out on the work equipment shall be recorded and shall be retained throughout the service life of the work equipment.

► Into how many categories are maintenance and repair activities divided?

Unplanned Maintenance

It is the maintenance carried out when a malfunction occurs or the machine or equipment breaks down. Under this type of maintenance, maintenance and repair are performed following an unexpected failure in the operation. Due to such drawbacks, this method is not used today unless absolutely necessary.

Planned Maintenance

Maintenance is carried out in accordance with a plan.

- Periodic maintenance (preventive maintenance)
- Preventive maintenance (proactive maintenance)
- Condition-based maintenance (predictive maintenance)

► What are the basic rules of maintenance and repair activities?



Rule 1 Plan

Rule 3 Act according to the plan

Carrying out maintenance activities under time constraints as a result of incidental situations during production may lead to adverse outcomes. For this reason, the implementation of a pre-established plan is of great importance.



Rule 2 Make the environment safe

- Ensuring that the work area is made clean and safe
- Shutting down power sources
- Securing detachable parts of machinery
- Providing temporary ventilation
- Ensuring the security of entry and exit
- Placing safety signs



Rule 4 Use the right equipment

- The use of the correct equipment during the maintenance process is of vital importance.
- The tools required for maintenance are often different from those normally used.
- An attempt by a worker to use a tool with which they are not familiar increases the risk



Rule 5 Perform the final check

Cleaning, waste disposal, and restoring to operational condition are of utmost importance.

► Why are maintenance and repair activities highly hazardous?



Hazards;

- may arise during fault diagnosis.
- may arise due to residual energy or substances remaining within the system even if it has been shut down.
- may arise while maintenance/repair activities are being carried out.
- may also arise during controls and testing performed after maintenance/repair.
- may cause harm to others while maintenance/repair activities are being carried out.
- may cause harm to the environment while maintenance/repair activities are being carried out.

► What are the most common types of accidents encountered in maintenance and repair activities?



Electrocution

- Failure to isolate the system's energy
- High conductivity of the environment
- Inadequate insulation of portable electrical equipment
- Portable lighting not being low voltage



Injury from Moving Parts

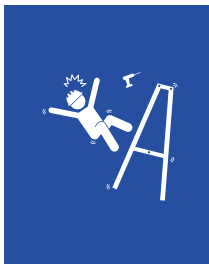


Poisoning and asphyxiation occurring due to harmful, toxic gases, dust, and mists

- Lack of adequate ventilation,
- Failure to use appropriate personal protective equipment



Accidents occurring in the form of ignition and explosion



Accidents occurring in the form of falls from height

- Absence of appropriate scaffolding and platforms
- Failure to install guardrails
- Failure to use appropriate personal protective equipment

► How should maintenance and repair activities be carried out?

- Potential hazards in the work area (electricity, work at height, chemicals, mechanical risks, etc.) shall be identified.
- The energy of machinery or equipment shall be cut off, energy isolation shall be ensured, and lockout-tagout (LOTO) procedures shall be implemented.
- Maintenance and repair instructions shall be prepared for each machine and installation. These instructions shall specify at which intervals and what types of maintenance activities shall be carried out, identify the parts to be replaced, and clearly define the timeframes or wear levels and conditions under which these parts shall be replaced.
- Adequate and sufficient lighting shall be provided in maintenance and repair work.
- In maintenance and repair work, workers shall have toolboxes in which they can place all their materials and carry them easily.
- In maintenance and repair work to be carried out in buildings and installations, appropriate and safe fixed ladders, as well as platforms, walkways, and scaffolding, shall be provided on a temporary basis.
- In cases where repair and maintenance by welding are to be carried out on containers containing flammable and explosive substances, such equipment shall be completely cleaned.
- In the event of possible poisoning, the necessary first aid materials and personnel shall be readily available.
- Pressure vessels and boilers shall not be repaired while under pressure.
- The connection of tanks or reservoirs to be repaired with other tanks or reservoirs shall be disconnected.
- If there is a mixer inside the tank or reservoir to be repaired, its energy supply shall be cut off and the mixer shall be secured before starting the repair. (For example, by chocking, supporting, or fastening.)
- Operators shall be informed of any changes made during maintenance and repair so as to prevent accidents after maintenance and repair.
- In workplaces, machinery, benches, and installations shall not be operated unless the protective systems removed during repair and maintenance operations are reinstalled.

► What personal protective equipment is used by maintenance personnel?

The personal protective equipment to be used by maintenance personnel shall vary depending on the location where maintenance and repair are carried out



In work carried out at height, protective equipment such as horizontal and vertical lifelines, helmets, and lanyards shall be used, and their use shall be monitored.



In work carried out in areas where ventilation is insufficient and harmful, toxic gases are present, personal protective equipment such as oxygen-supplied respiratory masks shall be used.



During electrical maintenance; insulated electrician's gloves, insulated footwear, electrician's helmets, flame-resistant clothing, etc. shall be used.

▶ Why is the lockout-tagout (LOTO) system important?

One of the most common workplace hazards is the release of hazardous energy during maintenance or repair work on machinery or equipment. If appropriate safety procedures are not followed, this may lead to serious injuries or even fatalities. An important safety measure to prevent such accidents is the implementation of lockout-tagout (LOTO) procedures.



The lockout-tagout process is applied to safely isolate or disable all energy sources used during the process and to maintain this safe condition.

► What types of energy must be controlled during the application of LOTO?



ELECTRICITY

Electrical Panels,
Switches,
Motors,
Fans, etc.



MECHANICAL

Gear Movements
Blades and Propellers
Presses
Conveyors etc.



CHEMICAL

Chemical Tanks
Pumps
Pipes
Valves etc.



HYDRAULIC

Platforms
Presses etc.



PNEUMATIC

Pistons
Valves etc.



THERMAL

Steam Boilers
Ovens
Pipes
Valves etc.

► What types of work and systems require lockout-tagout (LOTO)?

Maintenance and repair operations

- Planned maintenance activities of machinery and equipment
- Fault detection and repair operations
- Replacement of worn or damaged parts
- All interventions carried out in electrical, hydraulic, pneumatic, and mechanical systems

Assembly - disassembly operations

- Installation of new machinery and equipment
- Relocation or dismantling of existing equipment
- Disconnection or reconnection of connections in hydraulic and pneumatic systems

Cleaning and lubrication operations

- Cleaning of the internal and external surfaces of machinery
- Lubrication or greasing of moving parts
- Cleaning operations using chemicals or compressed air

Electrical works

- Maintenance and repair in electrical panels, circuit breakers, or transformers
- Work on high-voltage lines
- Replacement of electronic boards or circuit components

Operations related to pressurized systems

- Maintenance of steam, hot water, and compressed air lines
- Control of fire water systems
- Leak testing of gas lines or pipe replacement

Work in confined spaces

- ▶ Entry into areas where there is a risk of exposure to hazardous gases
- ▶ Maintenance in tanks, boilers, wells, or large piping systems

Work involving chemical and fuel systems

- ▶ Repair or cleaning of fuel and petroleum lines
- ▶ Maintenance or replacement of pipes containing chemical substances
- ▶ Work on systems carrying toxic or flammable gases

▶ What are the steps for applying lockout-tagout (LOTO)?

1 Preparation and Information

- ▶ The equipment on which the work will be carried out is identified.
- ▶ Energy types (electrical, mechanical, hydraulic, pneumatic, chemical, etc.) and their hazards are analyzed.
- ▶ Relevant employees are informed.

2 Shutting Down the Equipment

- ▶ If the machine or equipment is operating, it shall be completely stopped. Normal shutdown procedures shall be applied.
- ▶ If there is a possibility of continued rotation or movement, it shall be ensured that the equipment has come to a complete stop.

3 Isolation of the Energy Source

- ▶ Electrical connections, fuses, and pneumatic or hydraulic valves shall be shut off.
- ▶ Fuel, gas, or steam flow shall be stopped.
- ▶ Compressed air systems shall be vented. Any stored energy shall be safely released.

4 Lockout-Tagout

- ▶ Locks shall be applied to the isolated energy sources.
- ▶ A warning tag shall be affixed for each energy isolation point.
- ▶ The lock and tag shall be placed in such a way that only authorized personnel can remove them.
- ▶ If more than one person is working, a group lockout system may be applied.

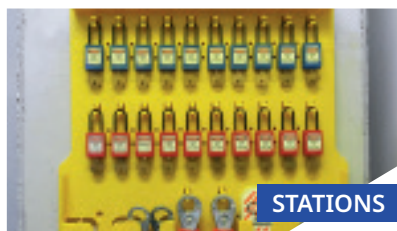
5 Safety Check

- ▶ Checks shall be carried out to verify that the energy has been completely isolated.
- ▶ It shall be ensured that the machine does not operate by pressing the start button.
- ▶ It shall be verified whether any residual energy or pressure remains.
- ▶ Work shall not commence unless it is confirmed to be safe.

6 Restoration of Energy After the Operation

- ▶ Once the operation is completed, all tools and personnel shall be moved to a safe area.
- ▶ LOTO locks and tags shall be removed only by the authorized person concerned.
- ▶ Energy sources shall be re-energized in a controlled manner.
- ▶ The equipment shall be tested and, after it is confirmed to be operating safely, it shall be returned to service.

► What are lockout-tagout (LOTO) equipment?



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