

MECHANICAL MAINTENANCE

This competency may be defined as the combination of knowledge and skills required for carrying out the maintenance and improvement of all the Mechanical equipment during manufacture of the herbicides, insecticides, fungicides and other related products / key intermediaries

Key Indicators

This competency is demonstrated through the following-

- Understand the construction and operation of all Mechanical equipment used in the production and offsites facilities at the plant
- Carry out preventive, predictive, break-down and shut-down maintenance of the above equipments to minimize downtime and enhance efficiency and life
- Plan short and long shutdowns to carry out non-routine maintenance and to upgrade/revamp the equipment to enhance the efficiency and life
- Educate and train all the Mechanical maintenance personnel in latest techniques to ensure maximum availability of equipment

Key Coverage aspects

- Static Equipments - Ejector system, Scrubbers, Columns, Heat Exchanger, cooling towers etc.
- Rotary Equipments - Air Compressors / Pumps / Gear Box / Blowers / Centrifuge, Separator, RVD, ANF, Hoist etc.
- Boiler, Furnace
- Piping / Valve, Fabrication
- Insulation
- Statutory Compliances

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Static /Rotary Equipments

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- Understands the characteristics and applications of various material of construction such as MS, SS, GI, CS, CI, PP, HDPE, FRP, PVDF, PTFE, PPRC etc.
- Can identify the material of construction of each equipment/component
- Is familiar with the types, purpose and nomenclature of various types of bearings
- Is familiar with the types of oils / greases/ lubricants and their purpose and storage methods
- Is aware of the safety fittings installed on each equipment like - safety relief valves, rupture disks, vibration trips, temperature fuse plugs etc.
- Is familiar with the safety auxiliaries fitted on rotating/moving equipment like- coupling/belt guard, side boards, cages, barricades etc.
- Is aware of the special safety features of the equipment handling explosive material like special earthing, conductive jumpers across flanges etc.
- Is familiar with the types and purpose of anti-vibration supports provided for the high-speed machines

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- Is aware of the maintenance manuals of all critical equipment and understands the troubleshooting methods
- Is familiar with the measuring tools like vernier, screw gauges, callipers, tapes, scales etc.
- Is familiar with all tools and tackles like Chain blocks, spanners, cutting and welding appliances, vice, lathe, saw etc.

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Boiler / Furnace

- Has basic knowledge of Operation, Pressure rating, Temperature, Capacity, Quality & Quantity of Operating Medium, & its characteristics, Types of Accessories & basic working principles

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- [REDACTED]s

Piping, Valves

- Understands piping systems - underground, over-ground, flanged, welded, screwed, their standard sizes and material of construction

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Fabrication

- Is able to understand basic fabrication process ie., Cutting, Bending, Grinding, Welding, Drilling, Machining, Structural support etc.

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Insulation

- Is aware of the types of insulations / applications considering operating Pressure, Temperature, Operating Medium & its characteristics

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Maintenance Practices

- Is aware of the basic maintenance practices such as preventive maintenance, routine maintenance, breakdown maintenance, annual maintenance, annual turnaround plan in terms of purpose and significance etc.

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LEVEL 2

- Is conversant with the duty conditions of various equipment (both static and rotary) in the plant like the chemicals handled, pH, temperature, pressure, flow and other characteristics
- Understands the MOC of the body and the liners (if any) / Size / Rated Capacity / Components / Connected Power / Utilities requirement / Make etc..

[illegible]

- Is conversant with methods of providing protective coatings of equipment and structures such as -
 - a) Application of additional coats of protective cement / paint / resins / compounds
 - b) Doing patch work on the repaired areas
 - c) Scheduled replacement of the protective coating by removing the old coating, inspecting the surface, repairing/ rebuilding any damaged portion and finally providing fresh coating
- Is conversant with the NDT tools like thickness testing, dye penetration testing, ultrasonic testing, radiography, skin temperature profiling, vibration analysis and can initiate action to prevent anticipated breakdown

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- Is aware the frequency of testing of equipments and accessories / components to be covered, as per statutory compliance requirement.
- Maintains track records of equipments inspection

Static /Rotary Equipments

- Is able to differentiate between SS, SS304, 316, 316L, and their mechanical and chemical properties
- Is able to understand suitability of above materials with the medium being handled and the external environment

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- Is able to identify the problems (Low Oil Pressures, Abnormal Noise, Vibration, the static equipments getting heated up etc.) and take corrective actions & suggest preventive measures to avoid recurrence of the problem
 - Adhere to the maintenance schedule, Keep record of observations in history cards and recommended any changes in the schedule and initiate corrective actions as per requirements
 - Is able to identify the stock level and recommend any changes in the workshop and engineering store
 - Is conversant with the types of heat exchangers like shell and tube, plate type, coil type etc. and their internals, material of construction etc.
 - Can analyze causes of malfunctioning of heat exchanger
 - Is conversant with the procedures of repairs of tubes like flaring, re-welding, temporarily plugging the damaged tube etc.
 - Can identify short circuiting in the plate heat exchangers and replace necessary gasket
- Pumps, Compressors, and Blowers
- Understands causes of common problems of like -
 - ✓ Vibration, flange leakage, high amperage, high skin temperature, body leakage, low pressure developed, low flow, gland leakage etc. and can rectify the same
 - ✓ Is conversant with all critical parts, which need attention like piston rings, gland packing, valves, mechanical seal, balancing disc, balancing piping etc.

- ✓ Understands the importance of proper mounting of the suction and discharge piping without ant tension being transferred from the piping system to the pump and mounting of expansion bellows to protect the piping
- ✓ Understand the supporting system of various piping/ valves connected to the pump and can identify any shift causing mal-operation of the pump
- ✓ Is conversant with the rectification of wear and tear of parts like piston rings, bearings of connecting rod and crank shaft etc. and the lubrication methods
- ✓ Can carry out rectification of common problems arising due to improper functioning of valves and do lapping, timely replacement etc.
- Is able to align and operate blowers at optimum vibration level
 - ✓ check proper functioning of the capacity regulating suction dampers
 - ✓ check the lubrication system for the blower and the gear box
 - ✓ check the Impeller balancing
 - ✓ monitor the functioning of the gland sealing and take preventive measures
 - ✓ monitor the sound level of the blower

Boiler / Furnace

- Is able to identify the problems (Low Pressures, Abnormal Noise, Vibration, getting heated up etc.) and take corrective actions & suggest preventive measures to avoid recurrence of the problem

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Piping, Valves, Fabrication

- Is able to study and understand the P&I diagram of the plant
- Is able to differentiate between SS, SS304, 316, 316L and their mechanical and chemical properties

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Insulation

- Understands the suitability of materials with the medium being handled and the external environment

Maintenance Planning

- Is able to estimate and plan the time, manpower, spares and other requirements and can schedule the activities in a proper manner to reduce the overall non-productive hours

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SAMPLE
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LEVEL 3

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- Can identify new materials of constructions to withstand better the corrosive nature of some of the chemicals handled in the plant
- Can progressively monitor the consumption pattern of spare parts and components and can identify non-moving items and finds alternative use for these items or disposal method to realize best value possible
- Can interpret the statutory rules and regulations / amendments related to the plant equipments and guide personnel on these issues
- Can evolve action plans to enable the company achieve the objectives of safety / environment policy
- Is able to carry out trend analyses and determine the best life of critical components in every equipment and recommend a schedule for their replacement even before their failure to provide uninterrupted service of the equipment
- Can analyze non-destructive test results for all the critical equipments to bring about improvements
- Can analyze causes of static and dynamic unbalancing and suggest proper actions
- Is fully conversant with developments worldwide in the design and construction of various rotating / heavy duty equipments / their components including newly developed materials to enhance the effective life of equipment
- Can prepare the preventive and predictive maintenance schedules and procedures to minimize equipment downtime

- Can develop good and reliable spare part suppliers
- Can study the operation parameters and interpret the working of the equipment vis-a-vis its design conditions to monitor its performance.
- Is fully conversant with the present Indian and international safety rules to recommend maintenance procedures

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Maintenance Planning

- Is able to plan the monthly, half yearly, Annual Turnarounds etc.. taking into consideration the priority, backlogs and the resource requirements
- Can identify mandatory and discretionary preventive maintenance activities and build credible preventive maintenance procedures for weekly/monthly/yearly PM activities
- Can identify the tools & techniques for carrying out the predictive maintenance and other activities
- Can carry out accurate estimation for large maintenance works such as shutdown, annual turnarounds etc.. and prepare the detailed estimation sheet (including the time and manpower details)

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Maintenance Planning

- Can scan, map and correlate maintenance best practices, including establishment of benchmark metrics for various key performance indices
- Can make comprehensive evaluation based on economic, technological, proprietary information etc. for purpose of partial or in-toto outsourcing options of maintenance

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