

Executive Summary

In the Asset Management document hierarchy the Equipment Maintenance Plan (EMP) sits below the Asset Management Plan (AMP). The EMP is the document that consolidates and summarizes the maintenance tasks required to ensure the asset meets its intended business purpose, what ISO 55001 refers to as the stakeholder value. Although the EMP is not the detailed task list that is recorded in the CMMS, it does provide many of the critical components of that job plan. The EMP is often used to summarize the maintenance strategy developed during a system FMEA. However, it is also a powerful tool when used alone.

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Developing Equipment Maintenance Plans

The Equipment Maintenance Plan, or EMP as it is commonly called, is a document in table format that is used when developing the tasks needed to properly maintain facility, plant or equipment. The EMP helps lead the person or persons developing the required maintenance tasks by ensuring that the development is done consistently for all equipment. Each EMP should include one or more maintenance tasks designed to ensure the continued operation and maintenance of an equipment item, process or system. Each of these tasks has the following characteristics:

- A *descriptive title* for each maintenance task to be performed
- A *frequency* assigned for performing each task
- Assignment of a specific *craft* or workgroup and the number of each craft or workgroup required to perform the task
- *Equipment condition* required for performance of the task (i.e. running or shut down)
- *Type of Work* – Preventive Maintenance (PM), Predictive Maintenance (PdM), Corrective Maintenance (CM), Operator Care (OC), etc.
- *Procedure / Task number* – Unique identifier for the task, or file name if linked to another document that gives the individual task instructions
- *Estimated time* to perform the task
- *Special tools, materials and equipment* required to perform the task

The EMP can also provide the following planning and budgeting information if set up properly in a spreadsheet format:

- Annualized hours for performing the task
- Annualized hours for shutdown of the equipment during performance of the task
- Annualized hours for performance of the task by craft

Each EMP consists of the following defined sections that contain specific information (See example EMP at the end of this paper):

EMP Header

- *Equipment Type* – this identifies the equipment type or class to which the maintenance tasks apply, i.e. fans, centrifugal pumps, belt conveyors, etc.
- *Description* – identifies the specific equipment that is covered by the EMP. Usually the equipment number and description, as listed in the CMMS, is used here
- *Location* – number identifies the physical location of the equipment within the plant or facility
- *Documentation* – number lists what technical documentation is available and where it is stored or maintained
- *Validated* – this area requires a "yes" or "no" indication of whether or not the equipment nameplate data has been validated

Maintenance Task Description

- *Item number* – identifies each of the maintenance tasks listed on the EMP, giving each a line item number
- *FMEA Index number* – when the EMP is used as part of the FMEA process
- *Maintenance task description* - this area is where the very brief description of the work to be performed is entered, i.e. Clean and lubricate pump, inspect and lubricate fan, etc.
- *Frequency* - identifies the frequency at which the maintenance task is to be performed, i.e. 7 days, 30 days, 90 days, 180 days, 365 days, etc. Usually days are used, rather than weekly, monthly, quarterly, etc. Meter-based frequencies can also be used, i.e. 100 Hrs, 500 Hrs, etc. Situational frequencies based on inspection results can also be included.
- Existing, Revision, or New – This field is used to indicate if there is an existing maintenance task for the activity, if there is an existing task that needs to be revised, or if this is a new task.

Task Support Information

- *Craft* - identifies the type of craft or skill required to perform the maintenance task, i.e. MECH, ELECT, CONTR, etc.
- *Craftsmen required* - indicates the number of crafts persons required to perform the maintenance
- *Equipment condition* – indicates if the equipment must be running or shut down when certain maintenance tasks are performed
- *Type* - the type of maintenance task is entered here, i.e. PM, PdM, CM, etc.
- *Procedure/Task number* – the unique procedure or task number is entered here; typically this will be the unique identifier used in a CMMS or a file name.
- *Est. time (Hrs)* – this is where the estimated time to complete the task is entered. This is an educated estimate based on previous experience or established estimating standards.
- *Special tools/Materials/Remarks* - identifies any special tools not usually carried in a craftsman's toolbox, i.e., torque wrenches, man-lifts, ladders, etc. or a hazardous waste container, personal protective equipment, etc., and any additional remarks that apply specifically to performing the task.

Planning/Budgeting Section

- *Annual (Hrs)* – used to calculate the total annual hours required to perform each specific maintenance task
- *Annual Scheduled Maintenance Hrs* – used to total all the annual hours required to perform all the maintenance tasks listed on the EMP
- *Annual Shutdown Hrs* – Used to calculate the required hours of shutdown needed to perform all the maintenance tasks listed on the EMP
- *Annual Operator Hrs* – Used to calculate the total hours of operator time needed to perform the maintenance tasks listed on the EMP
- *Annual Mechanic Hrs* – Used to calculate the total hours of mechanic time needed to perform the maintenance tasks listed on the EMP
- *Annual Electrician Hrs* – Used to calculate the total hours of electrician time needed to perform the maintenance tasks listed on the EMP
- *Annual Contractor Hrs* – Used to calculate the total hours of contractor time needed to perform the maintenance tasks listed on the EMP.

You can develop an EMP for each equipment item, type of equipment or system as part of the FMEA process or stand alone. It is generally best to develop the EMP for each type or class of equipment and then apply the identified maintenance to all the equipment you have that is of the same type or class. When you have the same type of equipment, but in different operating environments, you may want to develop separate EMPs for each of them and apply different frequencies, man-hours and special tools/materials to each. The EMP is a very flexible document and can be used to accommodate almost any need for maintenance requirement development. Use it the way it best fits your needs and specific requirements.

When developing EMPs you are defining the tasks or procedures and all associated information needed to properly maintain your equipment. You must first determine what equipment you want to include in the maintenance program and develop EMPs for those equipment items. Consider the criticality of your equipment before you start, and develop EMPs for the most critical equipment first.

Once you know what equipment you will be including in the maintenance program you need to gather the needed information to develop the required maintenance. Gather the equipment information that you want to include in your maintenance records. This generally includes the equipment nameplate data, including manufacturer, model number, serial number, electrical characteristics, specifications, operating parameters, etc. It is always best to get as much information directly off the equipment nameplate as possible because vendor manuals, equipment drawings, etc. do not usually provide all the useable information and many times are not accurate.

Next, you need to gather the documentation available for the equipment. This is generally vendor operation and maintenance manuals, catalog cuts, shop drawings, construction drawings, P&IDs, parts lists, and exploded views. You need these to develop the equipment-specific maintenance tasks, and special tools and materials list.

The EMP is an evergreen document and should be periodically reviewed to ensure that the asset is meeting its desired performance targets. If an asset is not performing as expected, a root cause analysis should be completed and the EMP should be updated to reflect additional tasks or frequencies required to ensure that the asset does meet its performance goals.

EQUIPMENT MAINTENANCE PLAN

EQUIPMENT TYPE	DESCRIPTION	LOCATION	DOCUMENTATION AVAILABLE	NAME PLATE VALIDATED

[illegible]

ANNUAL SCHEDULED MAINTENANCE HRS	
ANNUAL SHUTDOWN HRS	
ANNUAL OPERATOR HRS	
ANNUAL MECH HRS	
ANNUAL ELEC HRS	
ANNUAL CONTRACTOR HRS	

To learn more about LCE's asset management services or training, please email us at info@LCE.com or call 843-744-7110.

