

# OPERATIONS & MAINTENANCE - TRAINING MANUAL



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## Contents

PREFACE.....	2
1. MASTER DATA IN PLANT MAINTENANCE:.....	4
2. LINEAR ASSET MANAGEMENT (LAM):.....	10
3. MAINTENANCE ORDER IN “PLANT MAINTENANCE” MODULE (PM): .....	13
3.1 MATERIAL WITHDRAWAL FOR “CARRYING OUT MAINTENANCE ACTIVITIES” .....	22
3.1.1 Material indents, allotments and withdrawals in O&M.....	22
3.1.2 Procurement of External Service in O&M .....	25
3.2 MATERIAL ALLOTMENTS .....	29
4. BREAK-DOWN MAINTENANCE: .....	31
5. PREVENTIVE MAINTENANCE PROCESS:.....	36
6. CORRECTIVE MAINTENANCE: .....	41
7. REFURBISHMENT PROCESS: .....	42
8. EXECUTION OF RMI WORKS: .....	46



## **PREFACE**

As all of us know APTRANSCO is shortly going to migrate to SAP ERP system from the existing IFS ERP. The SAP implementation project in APTRANSCO is named as 'APTUNES' (Andhra Pradesh Transmission Utility New Enterprise Solution).

The following functional modules are included in the 'APTUNES' project.

- ✓ EAM (Enterprise Asset Management)
- ✓ FICO (Finance and Control )
- ✓ HCM (Human Capital Management)
- ✓ MM (Materials Management)
- ✓ PS (Project Systems)
- ✓ QC (Quality Control)
- ✓ SD (Sales and Distribution)

The EAM module which is also called Plant Maintenance (PM) module deals with the core processes pertaining to the 'Operation and Maintenance (O&M)' of Transmission Network. The EAM module is suitably integrated with the other modules, to facilitate tracking of all the relevant information pertaining to various business processes in O&M. The real benefits of ERP implementation can be reaped only when the required data is properly captured by the system. In order to ensure this, it is very essential that the end users of ERP should have proper know-how of various transactions they are supposed to perform in ERP as part of their respective day to day job functions.

A thorough training of end users is necessary for making them well acquainted with the system before they actually perform ERP Transactions. End user training would be a continuous process in the organization as employees keep changing their positions from time to time.

As the number of end users who are spread across the state is high, it has been decided to initially train certain selected 'Power Users' in each Zone/Circle. After undergoing training, the Power Users in turn are required to train various end users in their respective places. The selected 'Power Users' are also required to carryout "User Acceptance Tests" for their concerned processes and certify that they are in line with the Business Process requirements of APTRANSCO.



EAM module has several processes such as Preventive Maintenance, Breakdown Maintenance, Corrective Maintenance etc. Each process has multiple transactions pertaining to various departments such as shift staff, Maintenance, MRT, TRE, Stores, Finance etc. Thus a complete cycle of any process involves transactions by multiple end users in different wings indicated above. Hence it is sufficient if an end user possesses knowledge of only a few transactions which are actually required to be performed by him/her based on the role assigned. Training and on hand practice on the system is highly essential before starting real time transactions.

This training manual provides an overall insight of various processes covered in the EAM module with clear illustrations of all the important transactions. The content of the manual is designed in the Question-Answer format to clarify most of the doubts that are likely to arise to a new user of SAP EAM Module. Based on the feedback from the trainees, the training manual will be further modified to meet the additional requirements if any.

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# 1. MASTER DATA IN PLANT MAINTENANCE:

- ❖ What is meant by 'Master Data' in SAP PM module.

The 'Master Data' in SAP is the essential data which would play a key role in the Core operation of the respective module. The following data is the important master data in PM module.

- Functional location
- Characteristics
- Class
- Equipment
- Equipment BOM
- Task list
- Measuring point
- Work Center
- Maintenance Plan etc.

- ❖ What is meant by a "Technical Object" in SAP PM module.

A technical object is a component in a structured technical system on which a maintenance task is performed and assets need to be maintained. Either a part of the total technical system or a physical object that is maintained as autonomous unit like an individual equipment can be defined as technical objects. Technical objects are classified as "Functional Locations" and "Equipment Objects".

In APTRANSCO, the Sub-stations, Lines, Sub-station Bays, Equipment in SS bays and towers are defined as technical objects.

- ❖ What is a "functional location" in PM module.

A "Functional Location" (FL) is an organizational unit that structures the maintenance objects according to functional, process oriented, or spatial criteria. The FL represents the place at which a maintenance task is performed.

In APTRANSCO, the Sub-stations, Bays and Lines are defined as Functional Locations.

❖ How to create a “Functional Location”.

A “Functional Location” can be created through the T-Code ‘IL01’ “Create Functional Location”.

❖ What is an “equipment object” in PM module.

An individual Physical object that is maintained as an autonomous unit is called an “Equipment Object”. The maintenance history and cost of maintenance on ‘Equipment’ can be tracked. In APTRANSCO, the Sub-station equipment and ‘Towers’ are defined as ‘Equipment Objects’.

❖ How to create ‘equipment object’.

An equipment object can be created through the T-code IE01 “Create Equipment”.

❖ Is the master data of various Sub-Stations/Lines/Towers/Bays/Bay Equipment which are in service in APTRANSCO created in SAP.

Yes. The master data pertaining to all the existing technical objects in APTRANSCO has been created in SAP as per the details furnished/validated by the respective field wings. However the same needs to be further updated wherever certain details are missing.

❖ What is the role of field engineers in creation of master data pertaining to Transmission infrastructure.

Whenever new Sub-Stations/Bays/Lines are constructed and whenever any modifications to the existing set up are made, either new master data should be created or existing master data should be modified accordingly.

❖ Whenever any new Functional Locations/Equipment Objects are to be created should all the details need to be entered afresh.

No. Whenever technical objects like Functional Locations/Equipment which are similar to any existing ones are created, master data for the new technical objects can be easily created through a reference technical objects already existing. All the relevant data automatically flows from the reference object. Only certain data which is specific to the new objects being created needs to be entered.

❖ How to copy the existing equipment while creating similar new equipment.



In the “Create Equipment” (IE01), there is a provision to copy the master data pertaining to any existing equipment into a new equipment object being created.

- ❖ How to attach equipment to a functional location.

In the ‘Structure’ tab available in the ‘Change Equipment’ screen we can assign the equipment to any selected functional location. (T-code IE02).

- ❖ How to attach a functional location to its superior functional location.

In the ‘Structure’ Tab available in the “Change Functional Location” screen (T-code: IL02) a functional location can be assigned to its superior functional location by selecting the superior functional location from the ‘drop down’ menu available.

- ❖ What is meant by technical object structure in SAP PM module.

The technical object structure indicates the hierarchical relation between the various technical objects i.e. Functional Locations and equipment. For example in APTRANSCO the various equipment objects installed in a Sub-station bay are assigned to their superior technical object i.e. the Sub-station bay which is defined as a functional location. Similarly, the various bays in the Sub-station are in turn assigned to the Sub-station which is also defined as a functional location at next hierarchical level above the bays.

- ❖ How to create the technical object structure.

By assigning an equipment/functional location to the respective superior objects, a technical object structure is created.

- ❖ What is meant by “Maintenance Plant”

Maintenance Plant is an organizational element in Plant Maintenance where all the technical objects (Equipment, Functional Locations) are physically installed. Whenever a ‘Plant’ in enterprise structure of MM module is created, a logical Maintenance Plant is automatically created by the system in PM module. It is a 4 digit alpha numeric key.

- ❖ What is meant by “Planning Plant”.

A ‘Planning Plant’ is the place in the organization where all the maintenance planning activities take place. Planning Plant is assigned to “Maintenance Plant” depending upon the type of maintenance planning. It is a 4 digit alpha-numeric key.

- ❖ What is meant by a ‘Location’ in PM module.

Location is a place in a maintenance plant at which a technical object is physically located.



The key in the 'Location' field indicates a location within a plant. It allows a maintenance Plant to be classified according to spatial or situation (Place).

- ❖ What is meant by a "Plant Section" in PM module.

"Plant Section" enables to subdivide the maintenance plant from the point of view of maintenance responsibility.

The equipment and functional locations can be assigned to a plant section.

The Plant Section can be used for evaluation purposes.

In APTRANSCO each Sub-Station is defined as a Plant Section.

- ❖ What is meant by a "Planner Group".

"Planner Group" is the group of employees who carry out the complete maintenance planning. The 'Planner Group' is created with respect to Planning Plant. It is a 3 digit alpha numeric key.

- ❖ What is meant by a "Work Centre".

The 'Work Centre' or 'Main Work Centre' is the group of 'Persons' or 'Machines' or 'Labour' who actually execute the maintenance work in field. It is created with reference to 'Plant'. It is '8' digit alpha numeric key.

- ❖ What is meant by "Catalog" and 'Catalog Codes' in SAP module.

'Catalog' is a master data in PM module. It is used to capture information related to maintenance history in the form of codes. The Catalog Codes and description can be stored in a Catalog. Hence a Catalog is a group of Catalog Codes. While entering the maintenance history, the user can avoid entry of the same maintenance history again and again. He/she can simply use the predefined Catalog Code.

- ❖ What is meant by "Catalog Profile" of an equipment.

A Catalog profile contains the Catalog, Catalog groups, Catalog Codes and Code Texts pertaining to that equipment.

- ❖ What is meant by "Characteristic" in PM module.

'Characteristics' are the Parameters that indicate the specification of a technical object. Example: Voltage, Current, Frequency etc.

- ❖ What is meant by "CLASS" in PM module.





'Class' is nothing but a set of Characteristics with values that describe the specification of a specific equipment.

- ❖ What is meant by "Measuring Points" in PM module.

"Measuring Points" of technical objects i.e. equipment/functional locations describe the physical or logical locations at which a condition is described. The measuring points form a part of the master data. For every measuring point there should be a corresponding "Characteristic" to measure the reading.

- ❖ What is meant by measurement documents.

The data transferred to the system after a measurement has been taken at a measuring point of an equipment/functional Location is described as "Measurement Document".

- ❖ What is meant by an "Asset" in PM module.

An 'Asset' is a resource controlled by any enterprise as a result of past events and from which future economic benefits are expected to flow to the enterprise.

As per the SAP finance module implemented in APTRANSCO all the major equipment installed in Sub-stations and lines are identified as individual assets and tracked.

Depreciation is applied to all the assets created as per their respective anticipated life spans.

- ❖ What is meant by 'Company'.

A 'Company' in SAP is an organizational unit for which individual financial statements can be drawn according to the relevant commercial law.

- ❖ What is meant by "Equipment BOM".

The "Equipment BOM" is the short form of "Equipment Bill of Materials". It is a part of master data in SAP PM module. It is used to capture the spare parts of a particular 'Equipment'. This is useful in readily identifying the relevant spare parts to be replaced if any; during maintenance process, instead of searching in the complete material master.

- ❖ What is the difference between 'Material BOM' and 'Equipment BOM'.

In case any inventory item in MM module is an assembly of several other inventory items, a 'Material BOM' is created and maintained in MM module, for the main inventory item. It is a part of master data in MM module. For example: material 'BOM' is maintained in MM module for "Transmission Towers". Which are assemblies of various child parts of the tower.



Whereas the 'Equipment BOM' is created in PM module whenever the 'Material BOM' for the equipment is not available in MM module, for the ease of identification of required spare parts of the equipment to be replaced during maintenance process. Apart from the various spare parts which constitute the equipment, list of certain other consumables which may be necessary during maintenance of the equipment can also be included in the "Equipment BOM" created in PM module.

- ❖ Is creation of 'Equipment BOM' mandatory for all the equipment objects.

No. Creation of equipment BOM is only optional.

- ❖ What is meant by 'Tower BOM'.

'Tower BOM' is the short form of "Tower Bill of Materials". It is nothing but the material BOM pertaining to 'Tower'. As the name suggests, it indicates the details of various components that constitute a transmission tower of a specific design.

It is a part of the master data in the SAP MM module of APTRANSCO. In MM module both the 'Tower BOM' as well as each and every component of the tower (Child Parts) are assigned a unique "Material Number" and maintained as inventory items which can be stored as stocks in the Central Stores.

- ❖ What is meant by "Technical Object Type".

"Technical Object Type" is a key which enables to group the equipment of similar usage, for better reporting.

- ❖ What does the "Construction Type" field in the master data of Technical Objects i.e. Functional Locations/Equipment indicate.

The "Construction Type" field indicates the "Material Number" of the "Technical Object".

- ❖ What is meant by "Material Number".

The "Material Number" is a part of master data pertaining to the "Materials Management" (MM) module. It is a unique inventory reference code assigned to each of the inventory items in MM module.

## 2. LINEAR ASSET MANAGEMENT (LAM):

- ❖ What is meant by “Linear Asset Management” (LAM) in SAP PM module.

The “Linear Asset Management” is a business function in SAP which enables to describe, display and manage linear assets such as ‘Transmission Lines’, Pipelines, Railway Lines etc., whose condition and properties may vary from Section to Section.

- ❖ Why LAM is suitable for defining EHT lines in APTRANSCO.

The EHT lines in APTRANSCO can be considered as linear assets as they connect two substations which are separated by large distances. In Linear Asset Management there is provision for defining the start point, end point, distance markers, offset etc. which can depict an actual EHT line. Further all other maintenance activities which are carried out on the non linear assets such as sub-station equipment can be carried out on the linear assets also. Hence the LAM is more suitable for defining EHT lines in APTRANSCO.

- ❖ How is an EHT line defined in LAM.

An EHT line is defined as a functional location in LAM.

- ❖ How is a “Transmission Tower” defined in LAM.

A Transmission Tower is defined as an equipment under the “EHT line” which is a functional location.

- ❖ What is meant by “Linear Reference Pattern” in LAM.

Linear Assets require a Linear Referencing Method as a mean to describe and locate a position along its length. The LRP specifies a group of markers (such as towers, mileposts, well-known locations etc.) that are placed along a linear asset.

- ❖ How to create a ‘Tower’ in LAM.

Tower Equipment object created through the T-code IE01”Create Equipment”.

- ❖ How to create “EHT line” in LAM.

EHT Line Functional Location object created through the T-code IL01”Create Functional Location”.



- ❖ How to create Linear Reference Pattern of an EHT line.

Linear Reference Pattern of an EHT Line created through the T-code IK81"Create Linear Reference Pattern".

- ❖ What is meant by 'Marker' in the LAM.

A marker is a reference point on a linear asset such as highway route markers or marker posts for giving the distance in miles or kilometers from reference point.

- ❖ What is meant by 'offset' in LAM.

'Offset' is the distance or displacement of an object from the reference line of the linear asset.

Example: The distance of signal post from the middle of a railway line or the distance of a manhole cover from the edge of a road.

The Offset can be either perpendicular offset from the reference line i.e. lateral displacement to the right or left or vertical offset from the reference line i.e. distance above or below the reference line.

In case of the EHT lines, the minimum clearances that are required to be maintained between the live parts of the line to the Tower members and cross arm members and ground etc can be defined as offsets.

- ❖ Is the process of maintenance of the EHT lines different from that of the EHT Substations.

The process involved in maintenance of both the linear and non-linear assets is the same in SAP. Hence the process of maintenance of Sub-stations and lines. which are defined as non linear and linear assets respectively is the same.

- ❖ How to incorporate the data pertaining to the 'Tower BOM'.

Tower BOM object created through the T-code IB01"Create Equipment BOM".

- ❖ How to incorporate the other details of tower design and foundations in LAM.



Tower design and Foundation details can be incorporated using Characteristics Functionality by assigning Characteristics to Tower Equipment through T-code IE01 "Create Equipment" & T-code IE02 "Change Equipment"

- ❖ How to incorporate the details of 'Spans' in the LAM.

Span details can be incorporated using Characteristics Functionality by assigning Characteristics to EHT Line Functional Location through T-code IL01 "Create Functional Location" & T-code IL02 "Change Functional Location"

- ❖ What is meant by "Networks" in SAP PM module.

'Networks' in SAP PM and LAM modules is the graphical representation of the technical object structure indicating the various functional locations and equipment which are inter connected.

- ❖ How to create "Networks".

Networks created through the T-code IN21 "Create Network".

- ❖ Is it possible to create notifications/maintenance orders etc., through "Networks".

Yes. It is possible to create Notification/Maintenance orders against technical objects through the "Networks" itself by clicking on the respective Technical Objects.

- ❖ Is it possible to navigate to the master data of an EHT line/tower through "Networks".

Yes. It is possible to navigate to the master data of various technical objects. (Functional Location/Equipment) in the 'Networks' by clicking on the respective Technical Objects.

### **3. MAINTENANCE ORDER IN “PLANT MAINTENANCE” MODULE (PM):**

❖ What is a “Maintenance Order”

The “Maintenance Order” is a document created in PM module for planning, execution, monitoring and overall tracking of various maintenance activities.

❖ What can be done through a Maintenance Order.

Through “Maintenance Order”, it is possible to:

- \* Plan the maintenance tasks to be carried out with regard to scope, time and other resources required.
- \* Draw the materials required for execution of the desired maintenance activities.
- \* Estimate and avail the external services if any required for carrying out maintenance activities.
- \* Report the technical activities carried out as part of maintenance.
- \* Define rules for assignment and settlement of accounts.
- \* Assign and settle the maintenance costs.
- \* For carrying out capital nature of works such as RMI works etc.
- \* For carrying out repair of equipment at the work of external agencies by sending the ‘Equipment’ to their premises.

❖ In how many ways can a Maintenance Order in PM module be created.

In case of Corrective Maintenance, Breakdown maintenance/processes etc the maintenance orders are manually created through “Notifications”. But in case of Preventive Maintenance process, the system automatically generates the maintenance orders as per the predefined maintenance plans.

Apart from the above two ways, the maintenance order can also be created directly by the users. This can be done through T-code IW31.



But it should be noted that even if the maintenance order is directly created manually, the system generates a 'Notification' in the back ground against each maintenance order created by default.

❖ What is the "Order Type" in PM module.

The "Order Type" field in the maintenance order indicates the purpose of the order. It differentiates the various maintenance orders created in PM module according to their purposes. Consists of control information that is important for managing orders.

The typical order Types used in APTRANSCO are :

PM01	-	Breakdown Maintenance Order
PM02	-	Corrective Maintenance Order
PM03	-	Corrective Maintenance Order
PM04	-	Preventive Maintenance Order
PM04	-	Refurbishment Order
PM05	-	Calibration Order
PM06	-	Capital Investment Order
PM07	-	Facility Maintenance Order

❖ What does the 'Maintenance Activity Type' field indicate.

The Maintenance activity type field in the 'Maintenance Order' header data tab uniquely identifies the type of maintenance activity carried out through maintenance order. PM activity Types are mainly used for reporting purposes. Cost reports can be classified and reported based on PM activity Types.

❖ What are the different Statuses of "Maintenance Order".

The various Statuses of "Maintenance Order" are indicated below:

CRTD	--	Created
REL	--	Released



MANC	--	Material Availability Not Checked
NMAT	--	No Material Components
NTUP	--	Dates are Not Updated
PRC	--	Pre-Costed
SETC	--	Settlement rule Created
CNF	--	Confirmed (Confirmation of Operations)
TECO	--	Technically Completed
WCM	--}	Work Clearance Management is associated
WOCO	--	Work Completed (Connected to WCM)
GMPS	--	Goods Movement Posted.
CLSD	--	Complete (Business)

- ❖ What are the major steps involved in execution of maintenance work through a “Maintenance Order”.

The Major steps involved in execution a ‘Maintenance Order’ are :

- ‘Creation
- Planning and scheduling.
- Releasing
- Confirmation
- Technical Completion
- Order Settlement
- Business Completion

- ❖ What does the ‘Header Data’ tab in the Maintenance Order screen indicate.





The “Header data” tab in the Maintenance Order Screen provides high-level answers to the questions who, when, what and how pertaining to the maintenance activity, as indicated below:

Who	--	by displaying “Person Responsible” Sub-Tab.
When	--	By displaying the “Dates” sub-Tab.
What	--	By displaying the “Reference Object” sub-Tab.
How	--	By displaying “First Operation” sub-Tab.

❖ What is the significance of “Operations” tab.

The “Operations” tab provides information about which operations are carried out, by whom, in which sequence and for what duration.

❖ What is the significance of “Components” tab

The “Components” tab is used whenever any materials are required to be withdrawn from the stores for carrying out the maintenance activities.

The details of various materials and quantities required against each operation indicated in “Operations” tab can be indented here.

❖ What is the significance of “Costs” tab.

The “Costs” tab is used to display the planned and actual costs against the Maintenance Order.

❖ What is the significance of ‘Partner’ tab.

The ‘Partner’ tab displays the Partners involved in the maintenance order.

❖ What is the significance of “Objects” tab.

The “Objects” tab is useful whenever multiple objects are involved in the maintenance work. It also specifies which maintenance notification is linked to the order.

❖ What is the significance of “Additional Data” tab.

The “Additional Data” tab displays the static finance related organizational data. Hence it has no impact on the process as such.

❖ What is the significance of “Location” tab.



The “Location” tab displays the “Location” of the data from both logistics and financial view points. It displays the maintenance Plant as well as the account assignment data for the order costs.

❖ What is the significance of “Planning” tab.

It displays the maintenance plan and the task list from which the preventive maintenance order is generated.

The “Planning” tab is relevant only for the orders created in preventive maintenance process. It is not relevant in case of orders created in other processes such as corrective, Breakdown, condition based maintenance processes etc.,

❖ What is the significance of “Control” tab.

The “Control” tab contains the administrative data as well as co-partners related to the order.

❖ What is meant by “Release” of the Maintenance Order.

“Release” operation is a pre-requisite operation to carryout any further activities through the maintenance order after creation. Material drawals, external service order etc., would be possible only when the maintenance order is in “released” status.

❖ What is meant by ‘Operations’ in a Maintenance Order.

The individual activities involved in execution of a maintenance work through a maintenance order are created as ‘operations’. It is possible to plan various resources required to execute the work against each ‘Operation’ separately.

❖ What is meant by ‘Sub-Operations’ in a Maintenance Order.

If multiple ‘Work Centres’ have to execute the work against any “Operation”, the main operation can be divided into various sub-operations and the respective Work Centres can be assigned to the sub-operations. However for the main operation, the Work Centre which coordinates the total work may be assigned.

❖ What is significance of ‘Control Key’/field in ‘Operations’ tab screen of a Maintenance Order.

The control key is a default value which defines how an operation should be processed. It is entered against each operation in the “Operation overview” screen by selecting from the drop down.

The typical values for the control key are PM01, PM03.



- ❖ What can be done with an operation created in the Maintenance Order.

Against each operation created in Maintenance Order detailed Planning of the work can be made as indicated below.

- In-corporating description of work to be performed.
- Assigning work centres responsible for execution of work.
- Specifying 'Control Key' to determines the nature of operation.
- Assign materials required for carrying out operation.
- Assign external services required etc., for carrying out operation.

- ❖ What is meant by 'Item Category'/field in the 'Components Tab' screen.

The item category indicates category of a material item which is indented in the 'Components' tab.

Item category 'L' indicates that the required material item is a 'stock material' i.e., maintained as stock in the stores. Item Category 'N' indicates that the material item indented is a non-stock consumable item such as stationary etc.,

- ❖ What is the significance of "Production Resources/Tools" (PRTs) icon.

PRTs are the utilities that are required to perform an operation at a certain work centre. Ex: Tools, Cranes, Measuring Instruments etc.,

PRTs can be assigned against each operation independently. PRTs can not be assigned against sub-operations. In the SAP PM module implemented in APTRANSCO, the PRTs is used to record 'Measuring Points' against an operation. The values against various measuring points that are defined for the concerned reference object pertaining to the 'Operation' carried out can be recorded in the PRTs.

- ❖ What is meant by 'Purchase Requisition'.

'Purchase Requisition' is the indent raised by the maintenance wing for procurement of either non stock material or any services from external agencies.

The PR and Purchase Order are created whenever any external services are to be procured for carrying out the work within the organization. In case the services of external agencies are rendered outside the organization, at their works refurbishment order are created.

- ❖ Where can the Purchase Requisition (PR) for external services be prepared.



The PR for any external services can be created in the “Operations” tab of the maintenance order. Whenever a maintenance operation/activity entered in the “Operation tab involves procurement of external services, the control key ‘PM03’ should be selected.

The system automatically generates a “Purchase Requisition” based on certain additional information entered by the user in this tab. The generated PR number would also be displayed.

❖ How to create P.O. from PR created in a Maintenance Order.

The Purchase Order (PO) which is issued to external Vendor for providing the required service is created against the ‘Purchase Requisition’ generated by system in the Maintenance Order.

For creation of P.O, the ‘PR’ is called from the “Create PO” screen. By adopting the PR in the ‘Create PO’ screen, the required information would automatically flow into the P.O. screen and Purchase Order can be created. The detailed procedure to be followed in this process is explained in the training manual of MM module.

❖ What is meant by “Service Entry Sheet” transactions.

The ‘Service Entry Sheet’ is the transaction which is to be performed after completion of the ‘Maintenance Activity’ by the external agency against the P.O for providing external services. Through the ‘Service Entry Sheet’, the necessary billing for the actual quantum of work carried out against the P.O. can be processed. It is nothing but confirmation of receipt of services from the Vendor. Based on the “Service Entry Sheet”, the concerned finance wing would process the release of payment to the external agency, through ‘Invoicing’ process. The ‘Service Entry Sheet’ can be prepared through the T-code: ML81N.

❖ Where is the cost towards invoice amount released to the external agency against the service P.O. settled.

The expenditure towards the payment made to the external Vendor against the service PO is settled against the concerned cost center of the “Maintenance Order” through which the PR and PO for the external service have been generated.

❖ How to know the total cost incurred against a “Maintenance Order”.

The total actual costs against a Maintenance Order can be viewed in the ‘Costs’ tab of the Maintenance Order.

The actual costs towards materials drawn from the stores and the costs incurred towards procurement of external services/materials are displayed here.



❖ What is meant by “Confirmation” of Maintenance Order.

The ‘Confirmation’ in Maintenance Order is to indicate the progress of execution or various operations against the order. The details of ‘time spent’ in carrying out the tasks, the actual work carried out against each operation etc can be entered from time to time in the ‘Confirmation document’. Partial confirmation of an operation is also possible during execution of an operation and before completion of the same. There is a flag for “final confirmation” to indicate that there is no work remaining against the operation. When all the operations of an order are ‘final’ confirmed, the order would have system status ‘CNF’.

❖ What is the t-code for “confirmation” of Maintenance Order.

T-code IW41 should be used for confirmation against each “operation” of the Maintenance Order.

Through the transaction code IW42, multiple confirmation against multiple operations can be done simultaneously.

❖ What is the significance of “Goods Movements” button in the Maintenance Order Confirmation screen.

The ‘Goods Movements’ button enables to confirm the material consumed against the order.

❖ What is meant by “Technical Completion” of the Maintenance Order.

The ‘Technical Completion’ of a maintenance order which is denoted as ‘TECO’ is a handing over of the work from the maintenance wing to finance wing for further processing. When all the maintenance order operations are “Finally Confirmed” the order can be technically completed.

The Technical Completion is a standard system status valid only at the order header level. After TECO of the order any material allotments against the order for which material is not withdrawn from the stores will be cancelled automatically. Similarly all existing PRs, for which POs are not created are flagged for deletion.

❖ How to complete the Maintenance Order technically.

The technical completion of the order can be done through “T-Code IW32-Change Order” by clicking the “Complete (technically)” icon appearing as black and white flag in the ‘Header Data’ tab of the Maintenance Order, when the order is in change mode.

❖ What is meant by settlement of an order.



The 'Costs' that arise from processing an order (cost towards material, external services) are initially collected on the order. The same are transferred subsequently to the settlement receiver specified in the 'Settlement Rule'.

The above process is called settlement of order. This is a function related to Finance/Accounts wing.

❖ What is meant by "Settlement Rule".

The 'Settlement Rule' defines what proportion of the costs incurred against the Maintenance Order should be settled to which receiver (s). Proper defining of the 'Settlement Rule' would ensure correct settlement of costs. Usually the settlement receiver in case of Maintenance activities would be the concerned "Cost Centre" only.

❖ What is meant by "Complete" (Business) of Maintenance Order.

The "Business Completion" of a maintenance Order is done when no further costs are expected to be posted to the order.

The Business completion can also be done even if some of the planned works have not been performed. However the status for such uncompleted activities is indicated as "Not performed".

❖ How to do complete (Business) of a "Maintenance Order".

The Business completion of a Maintenance Order can be performed by the concerned finance wing by clicking the button "Complete (Business)" available at the top of the "Header Data" tab of the Maintenance Order.

❖ What are the pre-requisites conditions for performing 'Complete (Business)'.

The pre-requisites for doing business completions are indicated below:

- "Technical Completion" should be completed.
- "Settlement" of the Order should be completed.
- No outstanding Purchase Orders (Commitments) should exist against the Maintenance Order.
- All the data pertaining to the reference object of the Maintenance Order should be available and correct.



➤ All relevant data in the 'Operations' and sub-operations should be available and correct.

- ❖ What would be the status of 'Maintenance Order' after performing 'Complete (Business)'.

After business completion, Maintenance Order obtains the status "Completed".

- ❖ What is the significance of 'Permits' in the "Header Data" tab of 'Maintenance Order' screen.

The 'Permits' button is used whenever there is LC process (Line Clear) involved in the maintenance work proposed to be carried out against the Maintenance Order.

The LC process is carried out through the sub module "Work Clearance Management" (WCM). The various steps involved in obtaining LC and returning of LC are covered in WCM module. By clicking the "Permits" button, the WCM module is activated against the Maintenance Order.

### 3.1 MATERIAL WITHDRAWAL FOR "CARRYING OUT MAINTENANCE ACTIVITIES"

#### 3.1.1 Material indents, allotments and withdrawals in O&M

The process of indenting materials/equipment required for various maintenance/RMI activities and withdrawal of the same from stores against allotments made by the concerned authority is a very important process in SAP. The above process involves multiple transactions to be performed by multiple users in different functional wings of APTRANSCO.

The various steps included in the process are narrated below for the purpose of clarity to the end users.

Step-1: Raising of indent for the materials/equipment: (By Maintenance wing)

- ❖ Any indent for materials/equipment is made by the concerned maintenance wing, in the 'Components' tab of the 'Maintenance Order' which is created for the work.
- ❖ The 'Material number', 'Quantity' required and "Storage Location" in which material is to be received are to be entered in 'Components' tab.
- ❖ In case of RMI works, the 'Special Stock Indicator' field should also be entered as '2' which indicates that material is to be issued from project stock.



- ❖ Any number of items can be requisitioned in the “Components tab”. However each item is indicated in a separate line.

#### Step-2: Creation of Stock Transfer Requisition: (By system)

- ❖ For each item indented, the system automatically generates an ‘STR’ in the background. ‘STR’ (Stock Transfer Requisition) establishes a link between the ‘Maintenance Order’ and the allotment order (STO) which is issued by the concerned allotment authority.

#### Step-3: Allotment of material: (By allotment authority)

- ❖ The concerned allotment authority who is competent to make allotment of materials /equipment would create a ‘Stock Transfer Order’ (STO) against each “Stock Transfer Requisition” (STR).
- ❖ In the STO, which is nothing but the allotment order, the allotment authority may modify the quantity of an indented item and the ‘Stores’ from where the material is to be allotted.
- ❖ After saving of STO by the allotment authority, the system generates an ‘Outbound delivery document’ (OBD) which enables the field wing to draw the requisitioned items from the stores as per the allotment of material. The generated OBD number can be viewed in the ‘PO History’ tab of the STO.
- ❖ The allotment authority would have an option to make multiple allotments i.e., STOs against one STR as per the availability of material. However total allotted quantity through STOs cannot be more than total indented quantity as per STR.

#### Step-4: Approaching Stores for withdrawal of Materials: (By Maintenance wing)

- ❖ The maintenance wing can view the details of STOs created against a maintenance order, in the “Other Details” tab of the maintenance order.
- ❖ In the ‘Other Details’ tab of the concerned maintenance order, tracking details of the entire process of indenting, allotment and withdrawal of materials can be viewed by the maintenance wing.
- ❖ The field maintenance wing can withdraw the allotted material / equipment from ‘Stores’ by accessing the ‘OBD’ created by the system in the ‘STO’ as mentioned in step-3 above.





- ❖ As per the convenience of the concerned maintenance engineer, the total quantity of allotted material / equipment can be withdrawn either in one consignment or in multiple consignments.
- ❖ In case it is desired to withdraw the material in multiple consignments, multiple OBD documents are created against each withdrawal. The OBDs thus created subsequently can also be viewed in the 'PO History' tab of 'STO'.
- ❖ They shall take a printout of the 'Form' designed for the purpose and approach the "Stores" for withdrawal of material.

Step-5: Issue of Material: (By Central stores)

- ❖ The concerned 'Stores' authority would issue the allotted material as per the OBD (Out Bound Delivery) document created and produced by the field maintenance wing. (Through 'MIGO' transaction).
- ❖ There is a provision for the Stores authority to issue either full or partial quantity of the material indicated in the OBD. In case partial quantity is issued for any reasons, the maintenance wing may again create another OBD to withdraw the balance allotted quantity subsequently.
- ❖ The quantity of material issued by the stores against OBD from the Stores Storage location is initially reflected as "Stock in Transfer" in the receiving Storage location which is the concerned Sub-Station storage location.

Step-6: Receiving Materials: (By Maintenance wing)

- ❖ The concerned maintenance wing would perform a transaction to receive the material issued by the stores from "Stock in transfer" status to "Unrestricted-Use" stock status. (Through 'MIGO' transaction).

Step-7: Issue of Materials to work: (By Maintenance wing)

- ❖ As the final step, the concerned maintenance wing would perform another transaction to issue the material to the concerned maintenance order after consumption/utilization of the material. (Through 'MIGO' transaction).
- ❖ For each material item indented, the indented quantity and quality issued to the maintenance order can be viewed in the 'General Data' tab in the 'Components' tab screen of the Maintenance Order.



- ❖ Once the material is issued to the Maintenance Order, the cost of the same is posted to the concerned 'Cost-Center'. The details of the same can be viewed in the "Costs" tab of the maintenance order in 'actual cost' field.

### 3.1.2 Procurement of External Service in O&M

As part of carrying out various maintenance activities by the field O&M wings, sometimes certain services from external agencies are availed wherever necessary, by placing a purchase order on the external agency.

The various SAP Transactions involved in the above process starting from proposal of the work to billing of the work is narrated below step by step for clear understanding of the end users.

The processing of payment against the work already billed is covered in the FICO module and hence the same is not described below:

#### Step-I: Preparation of Purchase Requisition for procurement of services:

(By the Maintenance wing)

- ❖ Through the 'Operations' tab of the 'Maintenance Order', the 'Service item' to be procured and quantity are entered by the concerned maintenance wing by selecting the same from the service master, as per the stipulated procedure.
- ❖ In case the price is not flowing from the service master, the "Gross Price" field is also entered.
- ❖ Whenever the external services are involved, control key "PM03" should be used in the 'operations' tab.
- ❖ The system then automatically creates a 'Purchase Requisition' (PR). The PR number can be viewed in 'Act Data' tab which is available at the bottom of the 'Operations' tab screen.
- ❖ The PR is nothing but an indent for procurement of external services.

#### Step-II: Creation of Purchase Order:

(By PO placing authority CE/SE)



- ❖ The concerned authority who is competent to award work to the external agency would create a 'Purchase Order (PO)' against the "Purchase Requisition" (PR) which is created by the system as mentioned in Step-I above.
- ❖ Details such as terms of payment, name of Vendor/Contractor, Purchase Organization etc are updated in the PO by the PO placing authority.
- ❖ The P.O. is then released as per the release strategy.

#### Step-III: Preparation of 'Service Entry Sheet': (By Maintenance wing)

- ❖ After completion of the execution of work by the external agency, the concerned maintenance wing would perform the "Service Entry Sheet" transaction.
- ❖ 'Service Entry Sheet' is the process of billing of the actual work carried out against the P.O. created as per the Step-II mentioned above.
- ❖ In Service Entry Sheet, the actual quantity of work executed is recorded by the concerned maintenance wing.
- ❖ As per the requirement of the work, single/multiple 'Service Entry Sheets' can be made against the same P.O limiting the total quantity to the P.O. quantity.
- ❖ Based on the 'Service Entry Sheet', invoice for making payment to the external agency would be created in the "FICO" module. The same would be processed by the finance wing.
- ❖ In case the work executed by the external agency involves M-book entries, the "Service Entry Sheet" transaction is carried out through M-book process in SAP. The M-book process is explained separately.

#### Step-IV: Processing of Payment:(By Finance wing)

- ❖ This step involves processing of invoice and release of payment against the P.O.
  
  
  
  
  
  
  
  
  
  
- ❖ How to indent the material/equipment required to carryout maintenance activities.

The material/equipment etc if any required for carrying out various maintenance activities can be indented through the concerned "Maintenance Order" created in SAP PM module. The "Components" tab in the "Maintenance Order" screen is used for this purpose.

- ❖ How to know the exact “material number” of the required material/equipment proposed to be indented in a Maintenance Order.

In the ‘components’ tab of the “Maintenance Order” screen, there is a provision to choose and indent the required material items by making use of the search option available. In order to obtain the ‘material number’ of the exact item required, various search parameters including the “Description” of the item can be used.

- ❖ Is it possible to predefine the material/equipment which would normally be required to carry out a maintenance activity on any equipment / functional location.

Yes. The various tasks/activities that are carried out on the equipment as part of maintenance are predefined as “Task lists” in PM module. It is also possible to incorporate the details of the material required for carrying out each and every task so that indent for the same can be instantly created during execution of the respective tasks/activities through “Maintenance Orders”.

- ❖ How to know whether any material/equipment required for maintenance work is available in the ‘Stores’ for allotment.

The availability of stocks of various materials indented in Maintenance Orders can be checked/verified from the ‘Components’ tab of the Maintenance Order. Details of the same can also be viewed by operating the transaction code MMBE. The availability of the unrestricted stock of the selected material items in various stores and other virtual locations of APTRANSCO can be viewed here.

- ❖ What is meant by a “Virtual Location”.

All the central stores and various circles in APTRANSCO are denoted as “Plants” in SAP. Each ‘Plant’ is further sub-divided as locations. Various locations are defined within each stores plant. Similarly each Sub-Station within a circle plant is defined as a location. The actual stocks of materials are maintained in the stores locations only. However whenever materials are withdrawn from the stores, the material stocks are first transferred in the system to the concerned Sub-Station location from the stores location. The material stocks continue to virtually appear in the Sub-Station location till the material is recorded as consumed to the concerned work. Once the material is booked to the work, the stock of material will no more be in the Sub-Station location. Here the ‘Sub-Station Location’ explained above is denoted as virtual location as the same is not meant for maintaining any physical stocks of material.

- ❖ How to know whether the material/equipment indented in the maintenance order is allotted by the concerned allotment authority.



The maintenance wing who has indented material/equipment for maintenance works can track the status and all other details of allotments made by the respective allotment authorities, through “Other Details” tab available in the maintenance order screen.

- ❖ How to know the actual quantities of material/equipment allotted by the allotment authority as against the total quantities indented by the maintenance wing.

The maintenance wing who has indented material/equipment for maintenance works can track the status and all other details of allotments made by the respective allotment authorities, through “Other Details” tab available in the maintenance order screen.

- ❖ How to know the details of the stores from which the allotted material/equipment is to be drawn/lifted.

The maintenance wing who has indented material/equipment for maintenance works can track the status and all other details of allotments made by the respective allotment authorities, through “Other Details” tab available in the maintenance order screen.

- ❖ Should the total quantity of the allotted material/equipment be withdrawn from the stores at once or is it possible to withdraw in phases as per the convenience and actual requirement.

The total quantity of material allotted by the allotment authority need not be drawn by the maintenance wing at a time. The material may also be withdrawn from the stores in multiple consignments as per the convenience.

- ❖ If drawal of partial quantities/items allotted against a maintenance order is possible, how to do the same.

By making use of the transaction called “Out bound Delivery” the allotted material items can be drawn from the designated stores in multiple consignments. The T-code for the same is VL02N.

- ❖ How is the cost of material/equipment drawn from the stores booked as maintenance expenditure.

Through Goods Issue process with T-code ‘MIGO’ (Movement Type 261), the material withdrawn from the stores and reflected as stock in the concerned Sub-Station location can be booked to the concerned work.



- ❖ How to devolute the leftover material if any, after completion of the PM activity.

In the 'components' tab of the "Maintenance Order" screen, to devolute leftover material items by entering negative Quantity against in Requirement Quantity Column against the Component.

## 3.2 MATERIAL ALLOTMENTS

- ❖ How does the allotment authority know the details of pending indents raised by the various maintenance wings, for allotment of material items.

For various material/equipment items indented in the 'Components' tab of the "Maintenance Order", Multiple Stock Transfer Purchase Requisition (STR PRs) are automatically created by the system.

The allotment authority would check for the outstanding STR PRs against which allotments are to be made, by operating the transaction code ME5A from time to time. Through the STR PRs displayed, the allotment authority can find out the details of the material/equipment that are indented by various maintenance wings.

- ❖ How does the "Allotment Authority" allot the material/equipment indented by the field maintenance wings.

For the STR PRs created by the systems against various material indents raised by field maintenance wings, the allotment authority would create STO POs for allotment of material as per availability.

- ❖ What is meant by a STR PR/STO PO and normal PR/PO.

STR PR is short form of Stock Transfer Purchaser Requisition. STO PO is Stock Transfer Purchase Order.

The normal Purchase Requisition in SAP is a document created to indent for procurement of either material/services from external agencies. Based on the purchase requisition, the purchase wing creates "Purchase Orders" for procurement of material / services from external agencies.

But unlike the normal Purchase Requisition (PR) and Purchase Order (PO) indicated above, the STR PR and STO PO are not meant for procurement of material / services from external agencies. STR PR and STO PO are meant for transfer of material from one location/plant to other location/plant within APTRANSCO.



- ❖ Is it possible to make partial allotment by allotting partial items/quantities out of total indented items/quantities.

Yes. The allotment authority may choose to allot either partial/total quantity of any material indented by the maintenance wings.

- ❖ Is it possible to make multiple allotments against an indent.

Yes. Allotment authority may make multiple allotments against the same indent. But total quantity allotted cannot be more than indented quantity.

- ❖ How to revoke/modify an allotment.

Refer MM Process

- ❖ How to cancel an allotment.

Refer MM Process

- ❖ Is it possible to allot items of material which are not indented.

No.

- ❖ Who can allot material.

Allotment in respect of the material/equipment which is procured centrally at headquarters (Vidyut Soudha), are made by the concerned functional head at head quarters. Allotments in respect of the items procured at Zonal level are made by the concerned Zonal Chief Engineers.

- ❖ Is it possible to allot more than the indented quantity.

No.

- ❖ Is it possible to issue the material allotted against one maintenance order to other orders.

Yes.

- ❖ What would happen if the material allotted by the allotment authority is not lifted by the concerned maintenance wing even after longer period of time.

## 4. BREAK-DOWN MAINTENANCE:

- ❖ What is meant by break-down maintenance in the SAP Plant Maintenance Module.

Breakdown maintenance is an unplanned maintenance activity which is carried out whenever there is failure of any equipment(s), in order to rectify the defect(s) and bring back the system into normal operating condition.

- ❖ Whenever an abnormal condition in the system or break-down of equipment occurs what should be created in the SAP system in the first instance.

In the first instance, a 'Notification' should be created in the SAP system.

- ❖ What is meant by 'Notification' in SAP Plant Maintenance module.

'Notification' is an application component in the SAP PM module.

A notification is created whenever there is a malfunction/abnormal condition in the technical system.

It is used to describe the condition of an equipment/SS bay/EHT line etc or to report any malfunction observed on the above, in order to facilitate the concerned maintenance wing to take necessary remedial action.

A notification documents maintenance tasks completely and makes them available for analysis in the long term.

- ❖ What is meant by "Reference Object" in a 'Notification'.

The reference object in a Notification is nothing but the technical object such as Equipment/Functional location on which the malfunction/abnormal condition is observed.

- ❖ Why should a "Notification" be created in Plant Maintenance Module.

A notification helps to document the condition of the technical object and the maintenance tasks carried out on it. By tracking the same, performance of the technical object during its period of service can be analyzed through various reports.

Further, in case the remedial maintenance work to be carried out on the equipment involves any expenditure, necessary 'Maintenance Order' can also be created through 'Notification'

- ❖ Why should a Maintenance Order be normally created through a "Notification".





The 'Notification' is useful only to track the performance of the equipment and the maintenance tasks carried out on the same.

In case the maintenance activities involve any expenditure towards material/external services etc., a "Maintenance Order" should be created. A maintenance order can be easily created from the "Notification" screen itself. All the relevant data would automatically flow from "Notification" to "Maintenance Order".

Hence it is desirable to create a Maintenance Order only through "Notification".

- ❖ Should all the details in a 'Notification' screen be manually entered which creation of a Notification.

No. Once the reference technical object is selected, most of the information pertaining to the technical object (i.e. Equipment/SS Bay/Line etc) would automatically flow to 'Notification'. Only the information pertaining to the malfunction/abnormal condition observed needs to be entered in the Notification.

- ❖ What is meant by "Notification Type"

The "Notification Type" field in the Notification screen is used to differentiate the various categories of Notifications and the origin of a created Notification. Based on notification type, it would be known whether a notification is created as part of Breakdown maintenance or preventive maintenance etc.

The "Notification Types" used in APTRANSCO are indicated below:

M1	--	Maintenance Notification (used for Corrective maintenance)
M2	--	Malfunction Notification (used for Breakdown maintenance)
M3	--	Activity Report (used for notification created through preventive Maintenance)

- ❖ What is meant by Notification Status.

The 'Status' field in the notification screen indicates the present status of processing of the notification

- ❖ What are the different statuses of Notification.

The abbreviations of different statuses of the Notification in SAP PM module are indicated below:

OSNO	--	Outstanding Notification.
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NOPR	--	Notification in Process.
NOCO	--	Notification Completed.
ORAS	--	Order Assigned (ie. a Maintenance Order has been created against the Notification).

❖ Who should create the “Notification”



Normally the shift staff who are on duty in the concerned sub-station should create the ‘Notification’ as they are the people who actually watch the performance of the system. However in certain cases, where the maintenance personnel happen to notice any abnormality/defect, they may also create Notification.

❖ How to create a ‘Notification’ in the SAP Plant Maintenance module.

Notification created through T-code IW21 “Create PM Notification”.

❖ What is the information contained in the “Notification”.

The ‘Notification’ created in the PM module would have complete details of the functional location/equipment and the abnormal conditions/defects noticed on the same. In case of breakdown of equipment, the details of the concerned maintenance wing which is supposed to take up the rectification work is also indicated in the notification.

❖ How the maintenance wing would know whether there are any pending notifications against which they are required to take up necessary remedial/rectification works.

Pending Notifications viewed through T-Code IW28 “Change Notifications” & T-Code IW29 “Display Notifications”.

❖ What should be created in SAP to carry out the required Break-down maintenance of an equipment or a functional location.

A “Maintenance Order” should be created in order to carryout the breakdown maintenance works.

❖ What is the necessity of creation of a maintenance order for taking up any breakdown maintenance work.

“The Maintenance Order” created in PM module facilitates the concerned maintenance wing to plan the works, create material indents, external service orders etc and to track the maintenance works including the expenditure incurred for the same.



- ❖ How to create a breakdown maintenance order through a 'Breakdown Notification'.

In Notification Screen, Order Field is available for creation of Order from Notification.

- ❖ When a maintenance order is created through a notification, should the information pertaining to the abnormality/break down in the system be manually entered in the maintenance order.

No. Whenever a maintenance order is created through a notification, most of the information pertaining to the abnormal condition/breakdown would be automatically fetched from notification. Only certain additional information such as proposed time period of execution of the work, material required for the works etc need to be entered by the maintenance wing.

- ❖ Is a breakdown maintenance order automatically created by the system or should it be created manually.

The breakdown maintenance order is not created by the system automatically. The concerned maintenance wing should manually create the "Maintenance Order" through the "Breakdown Notification".

- ❖ What is meant by "Breakdown Maintenance Cycle".

The total process involved in execution of a breakdown maintenance activity right from creation of "Notification" to financial closing of the "Maintenance Order", after completion of the maintenance works is known as breakdown cycle.

- ❖ What are the steps in SAP that are involved in a "Breakdown cycle".

Creation of "Breakdown Notification".

- Creation of "Maintenance Order" through Notification.
- Release of the maintenance order.
- Planning of breakdown maintenance activities to be carried out through maintenance order.
- Indenting the materials required for carrying out the maintenance works through maintenance order.
- Creation of purchase requisition and Purchase Order in case of external services required.
- Performing the required works.



- Entering of technical information such as findings, causes, breakdown lines and activities in the order.
  - Confirmation of Technical Completion of the Order (TECO).
  - Settlement of Cost.
  - Business Closure of the order.
- ❖ When there is a fault condition observed in a functional location like feeder/sub-station bay why a second notification should be created after location of the actual defective equipment/tower under the functional location.

The initial 'Notification' which is created immediately after identification of any abnormal condition/breakdown in the system indicates only the reference of the concerned functional location i.e. "Sub-station Bay". After identification of the actual defective equipment, a second notification and subsequently a maintenance order should be created in order to execute the required rectification/breakdown maintenance activity on the same. By creating the "Breakdown Maintenance Order" on the specific faulty equipment, tracking of the performance and expenditure incurred on the individual equipment would be possible.

- ❖ How to create the second notification/maintenance order as indicated above.

It is possible to create Notification in Objects Tab in Maintenance Order Screen for the Existing Maintenance Order.

- ❖ Should a "Maintenance Order" be inevitably created against each and every notification created in the PM module.

No. Creation of maintenance order is optional. The notifications in PM module are to be created whenever there is any abnormal condition in the functioning of the power system. The 'Notification' indicates the necessary information regarding the abnormality. The abnormal conditions may sometimes be only momentary faults which may not lead to breakdowns. The creation of maintenance order would be necessary only when there is a maintenance work proposed to be taken up on account of the abnormality/breakdown noticed and the same involves materials/external services/expenditure.

- ❖ Is the process of execution of breakdown maintenance work through the breakdown maintenance order different from the process of execution of preventive, corrective and other types of maintenance works.

No. The actual process of execution of the breakdown maintenance activity is not different from that of other types of maintenance works. However the nature of the maintenance



work carried out through a maintenance order can be identified by the field “Maintenance Order Type” in the “Maintenance Order” screen.

## 5. PREVENTIVE MAINTENANCE PROCESS:

### ❖ What is meant by “Preventive Maintenance”

Maintaining technical equipment/system in satisfactory operating conditions by providing systematic inspection, detection, correction and prevention of incipient failures before they become actual or major failures is called Preventive Maintenance.

It is also called planned maintenance. Through preventive maintenance we try to avoid ‘Breakdowns’ of equipment which lead to unwanted shutdowns of the system.

### ❖ What are the two types of ‘Preventive Maintenance’.

‘Time ‘Based’ maintenance and ‘Performance Based’ maintenance are the two types of Preventive Maintenance. In ‘Time based’, various maintenance activities on the equipment / technical object are carried out with predefined time cycles. In ‘Performance based’ the same are carried out after the equipment/technical object reaches a predefined parameter values. In AP Transco ‘Time based’ Preventive Maintenance is followed.

### ❖ What is meant by ‘Task list’ in the SAP Plant Maintenance?

A “Task list” describes the sequence of Predefined individual maintenance activities / sub-activities which are supposed to be performed repeatedly on an Equipment/Functional Location. Task Lists are used to standardize the recurring work sequences and Plan them more effectively.

T Codes used: IA01 “Equipment Task list”.

IA05 “General Task list”

IA11 “Functional Location Task list”

### ❖ How to define preventive maintenance activities on any equipment/functional location like SS bay.

The various Preventive Maintenance activities which are required to be carried out on technical objects such as individual equipment/Bays in a SS/Transmission Lines etc are defined in SAP PM module by creating “Task lists” for the respective Technical Objects.

- ❖ In case any preventive maintenance activity involves carrying out of certain tests and recording of certain test results, how to define such activities on any equipment / functional location.

The test to be carried out on any equipment/functional location and the relevant readings to be noted can be defined as operation/activities in the concerned 'Task List' of the equipment / functional location.

- ❖ What is meant by 'maintenance strategy' in SAP plant maintenance module.

A maintenance Strategy represents the scheduling rules for performing preventive maintenance tasks. Maintenance Strategy is required to be used for complex maintenance cycles. i.e. whenever different activities in a task list are required to be carried out in different intervals. It contains general scheduling information and therefore can be assigned to many maintenance task lists. A maintenance strategy contains "Maintenance Packages" in which the following information is defined.

- The cycle in which the individual activity should be performed (Time interval in case of APTRANSCO).
- Certain other data which effects the scheduling.

- ❖ How to schedule the activities such that each activity is carried out at the desired predefined periodicity /frequency.

By assigning a "Maintenance Strategy" to the 'Task lists' created for the Technical Objects such as equipment/SS Bays/Transmission Lines etc, it is possible to schedule the various maintenance tasks in such a way that they are executed periodically with specified time interval.

- ❖ What is meant by "Maintenance Plan" in SAP plant maintenance module.

Maintenance Plan is used for scheduling the actual dates of execution of various activities in a task list. In maintenance Plan, a link is established between the technical object such as an equipment/SS bay/Transmission line etc and the concerned task list.

As per the maintenance strategy already assigned to the task list, the actual dates on which the various activities in a task list are required to be carried out can be defined through the 'Maintenance Plan' by giving a start date. The system automatically generates the "Preventive Maintenance Orders" on the scheduled dates, as per the Strategy Plan.

- ❖ What is meant by 'Scheduling' a Maintenance Plan.

Scheduling of a 'Maintenance Plan' is nothing but instructing the system to generate "Preventive Maintenance Orders" as per the predefined cycles in a specified period of time called Scheduling Period.

In order to enable the system to create the maintenance order as mentioned above for the first time, a "Start Date" should be indicated in the system.



- ❖ How to schedule the activities such that the PM actions on multiple equipment located in a particular bay are carried out in a particular time.

By creating a task list for the SS bay (also called a functional location task list), and by assigning maintenance strategy to the same, it is possible to schedule the various activities on the multiple equipment in the SS Bay such that the desired activities on all the equipment in the Bay are carried out simultaneously in a particular time.

- ❖ How to generate a single maintenance order for execution of PM activities on multiple equipment in a bay in a particular point of time based on the predefined periodicity.

A task list is first created for the SS bay which is defined in SAP as a functional location. The SS bay task list includes various PM activities that are required to be carried out on all the individual equipment located in the SS bay.

An appropriate 'Maintenance Strategy' is assigned to the task list such that each and every activity in the task list is scheduled to be carried out as per the desired periodicity. Through 'Maintenance Plan' a single maintenance order can be created for execution of Preventive Maintenance activities on multiple equipment located in the bay, on the scheduled dates as defined in the maintenance plan. The step by step procedure is indicated in the separate document "Preventive Maintenance Process Flow".

- ❖ How to know the details of the pending preventive maintenance works to be carried out in a particular time and the details of the maintenance orders generated by the system for those works.

The Preventive Maintenance orders generated by the system can be viewed by querying in the SAP system with the T-Code IW 38.

Various query parameters would be available to fetch the required Maintenance Orders. The Maintenance Orders with "Created Status" and order type "Preventive Maintenance Order" PM03 can be fetched to know the details of the orders generated by the system.

- ❖ How to access the maintenance orders generated by the system for the PM activities.

After querying and fetching the list of orders generated by the system as mentioned above, by clicking on the selected order number, the individual 'Maintenance Order' screen can be accessed.

- ❖ How to report the observations made/readings taken during the execution of PM activities.

In the 'PM Order Confirmation' screen, the detailed status of completion of each activity, time of completion and measurement readings etc can be updated.

T Code: IW41, IW42.

- ❖ How to know whether preventive maintenance activities on any equipment / functional location are carried out by the concerned maintenance wing as per the predefined schedule.

Since the SAP system automatically generates Preventive Maintenance Orders as per the predefined schedules, the pending Preventive Maintenance activities to be completed on any equipment/functional location can be reviewed by tracking the status of respective maintenance orders generated by the system. This can be achieved by querying the outstanding maintenance orders with the help of various query parameters through T Code IW 38.

- ❖ It is possible to reschedule the Preventive maintenance activities defined on an equipment/functional location, when the concerned maintenance wing wishes to carry out the work at a later date.

Yes. The “Maintenance Plan” which is already scheduled can be rescheduled. Further, in case the concerned maintenance wing wishes to carrying out any preventive activities on a selected date, a maintenance order can be generated through ‘Manual Call’ without disturbing the subsequent portion of the schedule.

- ❖ Can we cancel the maintenance orders which are automatically generated by the system (based on the predefined schedule) when we want to postpone the preventive maintenance work due to any reason.

As mentioned above, it is possible to reschedule the activities. However in case a ‘Maintenance Order’ is already created by the system the status of the Order need to be changed to Do not execute.

- ❖ Are the maintenance orders generated by the system in Preventive Maintenance Process different from the maintenance orders created in other processes such as Breakdown maintenance, Corrective maintenance etc.,

No. the functions of the maintenance orders created in preventive maintenance process are same as other maintenance orders.

- ❖ How to know whether a maintenance order pertains to preventive maintenance.

Through the “Maintenance Order Type” key which is available in the header data tab of the maintenance order, it is possible to differentiate the various orders. The order type ‘PM03’ indicates that the order pertains to Preventive maintenance.

- ❖ What should be done any equipment is found to be prone to failure, during execution of preventive maintenance.

During carrying out various preventive maintenance activities like visual inspection or testing etc, in case any equipment is found to be Vulnerable for failure, necessary corrective





measures should be taken in order to bring the equipment back to normal operating conditions.

- ❖ What should be done in case the corrective maintenance work to be carried out on any equipment involves materials/external services etc.

The Preventive maintenance orders are normally created with reference to the concerned Sub-Station Bays/EHT lines etc which are functional locations. The various activities under Preventive maintenance normally do not involve any material/external service etc.

If any such requirement is identified in case of a specific equipment/Tower under the functional location, a separate maintenance order with order type PM02 (Corrective maintenance) should be created with reference to the equipment on which work is to be carried out. By doing so, the actual expenditure incurred towards O&M of the equipment can be tracked.

- ❖ Is it possible to indent material/external services etc against the maintenance order with order type PM03 i.e. Preventive Maintenance.

Yes. Activities such as material drawals/availing external services etc can be carried out in the Preventive maintenance orders also. However the Preventive maintenance orders are normally generated with reference to the concerned SS bay/EHT line etc and the expenditure incurred against the Preventive maintenance order, would be booked to the concerned cost centre. But in such cases it would not be possible to track the details of the expenditure incurred on a specific equipment/tower under the functional location against which maintenance order is created. Hence it is essential to create a separate order with reference to the specific equipment whenever expenditure is involved, for better tracking and reporting purposes.

## 6. CORRECTIVE MAINTENANCE:

- ❖ What is meant by Corrective Maintenance.

Some times during execution of preventive maintenance or during general observations by the concerned shift/maintenance wings, certain defects/abnormal conditions may be noticed on a particular equipment.

However the equipment may still continue to be in operation. In such cases in order to avoid break down of the equipment which leads to unscheduled outage of the system, it is desirable to carry out the necessary remedial activities on the same.

The maintenance activity in such cases is denoted as “Corrective Maintenance”.

- ❖ What should be done if any defects are noticed in any equipment/line, during preventive maintenance process or during general observation by the concerned maintenance wing.

Whenever any defects/Malfunctions/abnormal conditions are observed a ‘Notification’ should be created in SAP PM module duly indicating all the observations made.

A notification should always be created with reference to either an equipment / functional location.

**NOTE: Please refer to the ‘Breakdown Maintenance’ for the remaining process to be followed.**

## 7. REFURBISHMENT PROCESS:

- ❖ What is meant by “Refurbishment Process”.

Any defective/failed equipment removed from service may sometimes require repair/rectification by external agencies at their works. By carrying such repair / rectification, the equipment could again be put in service. The process of removal of the defective equipment from service, sending the equipment to external repair works and receiving back after repairs is denoted as “Refurbishment Process”.

- ❖ What is the first step to be carried out in SAP in “Refurbishment Process”.

When an equipment is identified as defective/failed, the same should be first “dismantled “ from service.

- ❖ What is meant by “Dismantling” of equipment in service.

Removal of the defective/failed equipment from service is called “Dismantling”. By dismantling an equipment in service, its status is changed from equipment status to Material Status (Inventory).

- ❖ By dismantling an ‘equipment’, would it loose its history of service rendered as equipment

No. Even after dismantling of the equipment from service, it would still have the equipment tag which indicates the entire history of service rendered and the maintenance carried out on it in the past.

- ❖ Does the dismantling of ‘equipment’ have any implications in the “Finance” module.

The dismantled equipment would continue to be an ‘Asset’ even after dismantling. But in case the same is put in service after refurbishment in a different plant, the asset value of the two plants would have to be adjusted accordingly. However in case the dismantled equipment is declared as unserviceable, the concerned finance wing would delete the same from asset structure.

- ❖ How does the concerned finance wing know that an equipment has been dismantled.

Whenever an existing equipment is dismantled, and subsequently declared as unserviceable, information regarding the same would automatically be passed on to the

concerned 'Accounts Officer' for necessary action to delete the same from asset structure. When the concerned Accounts Officer logs on to the SAP system, the message can be seen in the SAP 'In box'.

- ❖ What is meant by "Split Valuation system" in MM module.

"Split valuation system" enables to value stocks of the same material item differently, depending upon the condition/status of the material item i.e new, damaged, repaired/refurbished, unserviceable/scrap etc.,

- ❖ What is meant by "Valuation Type" in MM module.

'Valuation Type' of a material item in stock indicates the condition/status of the same ie. New, damaged, repaired/refurbished, unserviceable/scrap etc., Stocks and values for the same material with different valuation types are maintained separately.

- ❖ What would be the valuation type of a 'Dismantled' equipment in the refurbishment process.

After dismantling of a damaged equipment in service, its status is converted from equipment to inventory item with valuation type "Damaged".

- ❖ What would be the valuation type of a repaired/refurbished equipment received from the external agency after carrying out refurbishment.

The valuation type of the equipment received from external agency after carrying out repair/refurbishment is denoted as "Repaired/Refurbished".

- ❖ When an existing equipment in service is dismantled, can it be replaced with a similar equipment.

Yes. After dismantling and removal of the defective/failed equipment, a similar equipment in working condition can be installed in its place, depending upon the necessity.

- ❖ What are various steps involved in the "Refurbishment Process" in SAP PM module.

The following are the major steps that are involved in the "Refurbishment Process" in SAP.

1. Dismantling of the defective/faulty equipment.
2. Assessment of the feasibility of getting the equipment repaired to bring back to operating condition.

3. Assessment of the expenditure to be incurred for repair.
  4. Creation of PR (Purchase Requisition) for external services to get the equipment repaired/reconditioned in case the repair is feasible.
  5. Creation of P.O. (Purchase Order) for carrying out necessary repair/ reconditioning by the external agency (The external agency may be the original equipment manufacturer or any other repair agency).
  6. Sending out the defective/damaged/faulty equipment to the works of external agency for carrying out repair/reconditioning.
  7. Receiving back the repaired equipment from the work of external agency.
  8. Preparation of 'Service Entry Sheet' against the service Purchase Order for carrying out repair.
- ❖ After completion of the 'Refurbishment' of defective equipment, what can be done with the repaired equipment.
- The "Refurbished Equipment" can again be put in service wherever required. However until it is installed in a new location, it would continue to be an inventory item which is maintained as stock in stores.
- ❖ After re-installation of the refurbished equipment, would its 'Equipment ID' be changed.
- No. Only the original 'Equipment ID' of the equipment would continue even after its re-installation after refurbishment.
- However certain information like cost centre, work centre planner group etc may be required depending upon the place of reinstallation.
- ❖ Is creation of a "Maintenance Order" mandatory for carrying out the "Refurbishment Process".
- Yes. A maintenance order with order type "Refurbishment Order" needs to be created for carrying out refurbishment process.
- ❖ What is the information that can be tracked in the "Refurbishment Process".
- In 'Refurbishment', the entire process of getting a defective/faulty equipment repaired, including the cost incurred and time taken for repairs at the works station of the external agency can be tracked by the system.



- ❖ How is the expenditure incurred towards repair/rectification of the equipment in the “Refurbishment process” accounted for.

The expenditure towards refurbishment of the equipment is booked to the ‘Cost Centre’ pertaining to the location where the equipment was in service before getting dismantled.

- ❖ In case of defective/damaged/faulty equipment, how can the decision to carry out the refurbishment be taken.

In case the equipment is in reparable condition, the estimated cost of the repair is first arrived at. If the same is less than 30% of the latest purchase price of the equipment, the refurbishment of the equipment can be carried out. If the same is more than 30% of the latest purchase price of the equipment, refurbishment can not be taken up.

- ❖ Would the system stop to proceed with the refurbishment process if the estimated cost of the refurbishment is more than 30% of the latest purchase price of the equipment.

The SAP system compares the estimated cost of refurbishment entered in the maintenance order with the latest purchase price of the ‘Equipment’. In case the estimated refurbishment cost is more than 30% of the latest purchase price, system would not allow to release the maintenance order duly throwing a pop up message indicating the same.

However in case the concerned authority still decides to carry out the refurbishment, there is provision in the system to proceed with the refurbishment process.

- ❖ What should be done in case the estimated repair cost of the faulty equipment is more than 30% value of its latest purchase price.

The equipment should be survey reported and declared as unserviceable/scrap item, and disposed off accordingly.

## 8. EXECUTION OF RMI WORKS:

- ❖ What is meant by RMI works.

The “Renovation, Modernization and Improvement” works that are carried out in the existing Transmission network are called RMI works. Unlike the normal O&M expenditure, the expenditure towards RMI works is a capital expenditure.

- ❖ What is the difference between O&M expenditure and Capital expenditure.

The O&M expenditure is the expenditure that is carried out on any existing asset for the day to day functioning of the system. The O&M expenditure normally includes wages, maintenance and repairs, replacement of spans etc. Whereas capital expenditure is the expenditure towards creating future long term benefits i.e. procurement of new assets like machinery, equipment, buildings etc., which have a useful life beyond the concerned tax year or adding value to an already existing asset extending etc., useful life beyond the tax year.

- ❖ What is the difference between normal O&M works and RMI works.

The expenditure incurred towards day to day O&M of the EHT Sub-stations and lines is called ‘O&M Expenditure’ and the same is booked to the concerned cost centre. Whereas the expenditure incurred towards RMI works is termed as capital expenditure since it involves either creation of new capital assets or enhancement of the asset value of the already existing capital assets in Sub-stations/lines. Hence such expenditure is separately booked and capitalized accordingly.

- ❖ Is there any difference in the process of carrying out O&M works and RMI (Capital) works.

Both the ‘O&M’ and ‘RMI’ works are carried out in SAP by creating “Maintenance Order” in Plant Maintenance module. The process of planning, mobilization of resources such as materials and external services etc is also same for both O&M and RMI works. But in case of a RMI work, a “WBS” element should be created and attached to the Maintenance Order in order to enable the tracking and posting of the expenditure as capital expenditure.

- ❖ What is meant by ‘WBS’ element.

'WBS' is the short form of "Work Breakdown Structure". In SAP, the 'Project Systems' (PS) module is used for execution and tracking of various capital projects. The 'WBS' is an important tool which helps to keep an overview of the Project. For any 'Project' to be executed at least one 'WBS' element should be created in SAP. A 'WBS' is a model of the work to be performed in a project organized in hierarchical structure. There can be more number of 'WBS' elements under one main 'WBS' created for the project. Each WBS defines certain tasks and assign resources to those tasks. The 'WBS' is nothing but a bucket where all the activities pertaining to that particular part of the project are captured.

- ❖ What is mandatory in PM module for carrying out RMI works by O&M wings in APTRANSCO.

Creation of a 'WBS' element and attaching the same to the concerned 'Maintenance Order' is mandatory for carrying out RMI works by O&M wings.

- ❖ Why the creation and attaching of 'WBS' element to 'Maintenance Order' is mandatory in respect of RMI Works.

Since RMI work is a capital nature of work, the expenditure incurred for the same should be booked as capital expenditure only. In SAP Finance and Control module, it is configured in such a way that any Capital expenditure can be booked only through 'WBS' element. Hence the creation of WBS element and attaching the same to the concerned Maintenance Order through which the RMI works are carried out is mandatory.

- ❖ How to identify whether a Maintenance Order pertains to RMI work.

Through "Maintenance Order Type" it can be identified whether a particular Maintenance Order pertains to RMI works.

- ❖ In APTRANSCO, who procures the material/equipment required for the RMI works.

The total material/equipment required for the RMI works in all the three Zones i.e. Vijayawada, Visakhapatnam and Kadapa are centrally procured at head quarters by Chief Engineer/Construction in Vidyut Soudha.

- ❖ Who process and award the contracts in respect of service portion of the RMI works.

The Contracts in respect of execution of RMI works are processed and awarded by the respective Zonal Chief Engineers/Superintending Engineers at field level.

- ❖ Who allot the material/equipment which is centrally procured at head quarters, to the RMI works carried out at field.

The Chief Engineer/Construction/Vidyut Soudha/Hyderabad/Superintending Engineer/(P&MM)/Vidyut Soudha/Hyderabad who actually procure the material/





equipment at headquarters allot the same to the field units against field indents for the specific RMI works.

- ❖ How can the field units indent the material/equipment required for the RMI works.

The respective units where the RMI works are carried out can indent the material/equipment required for RMI works through the “Maintenance Orders” created at field level in the similar process as they indent the material for O&M works.