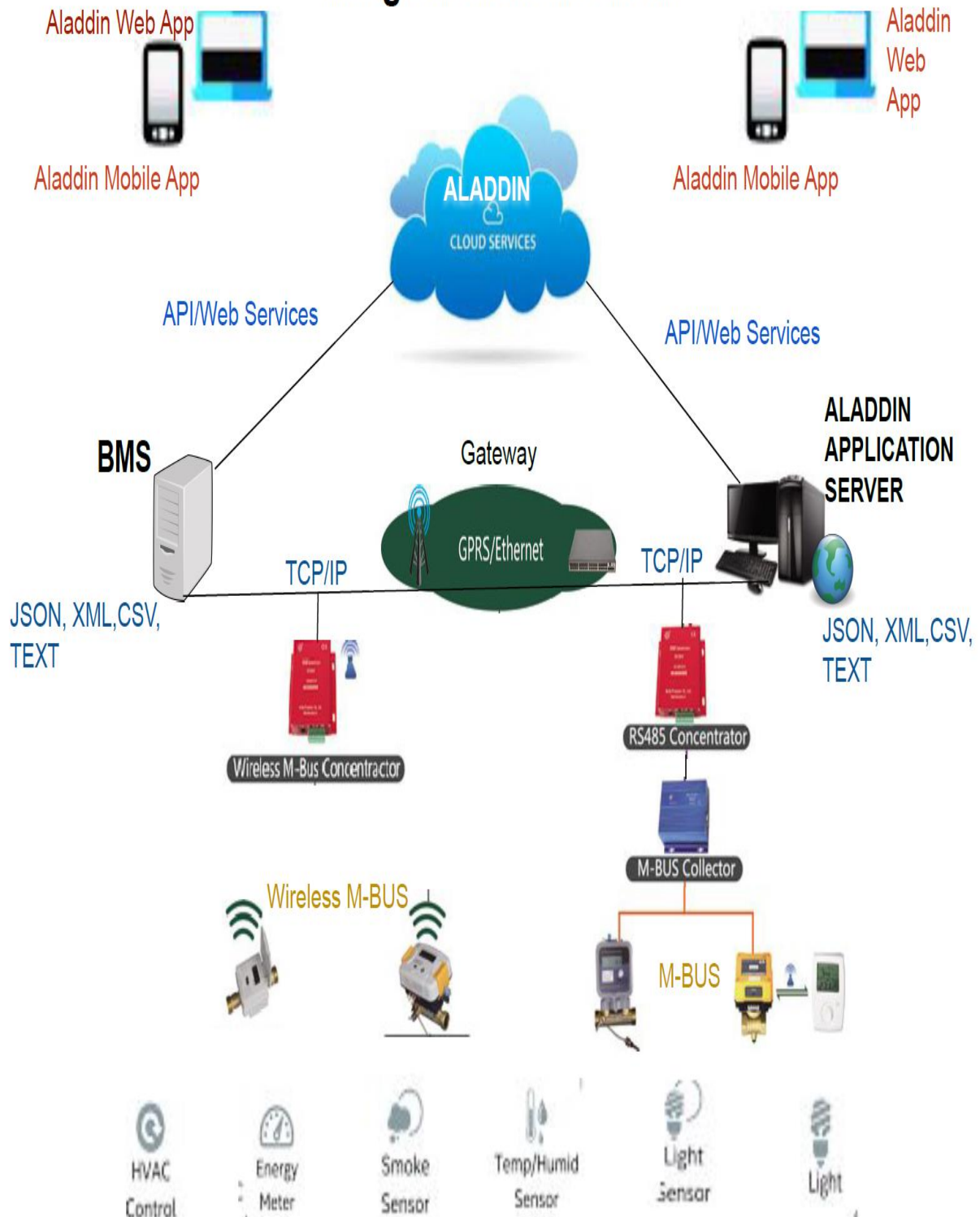


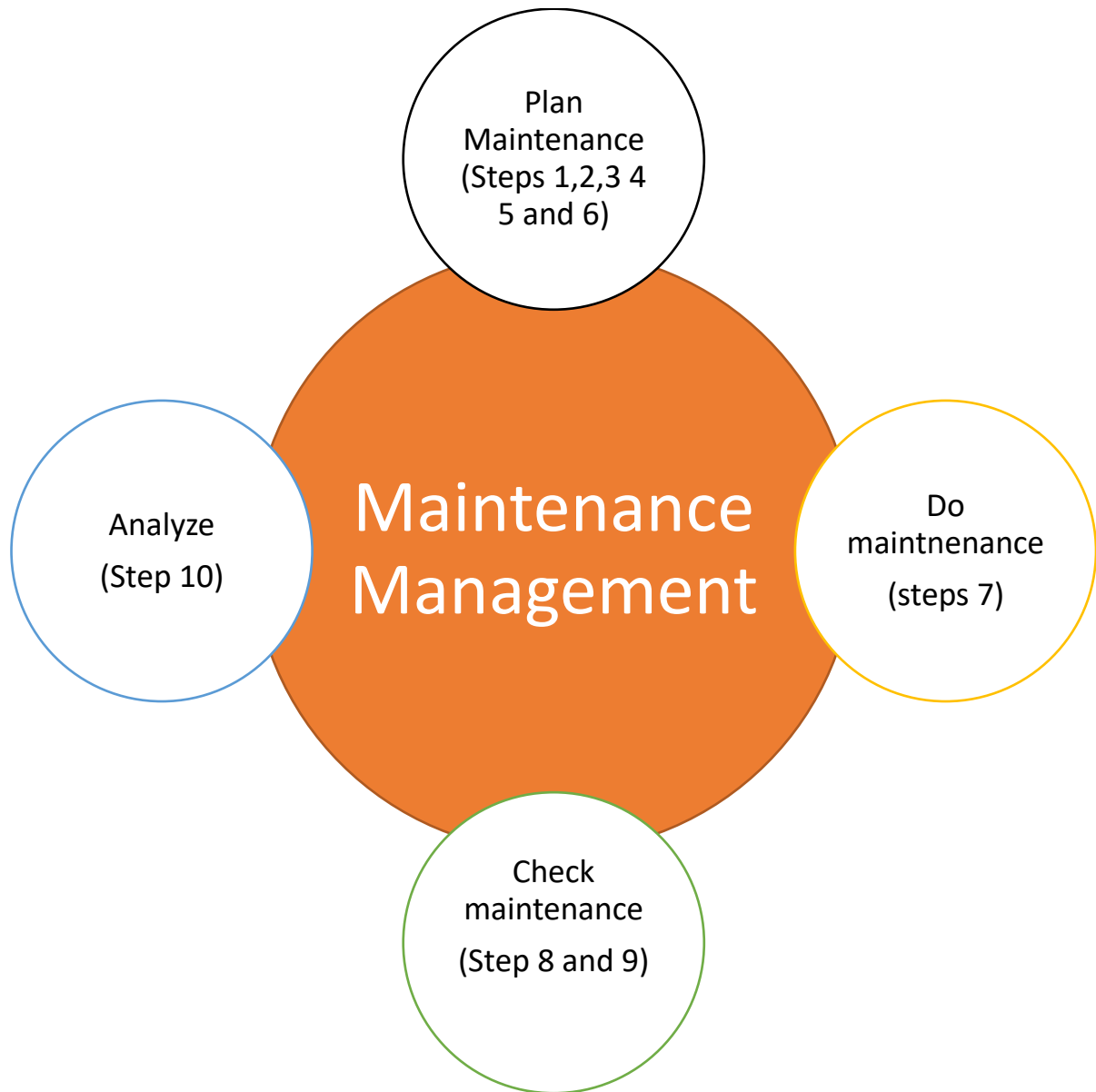
Maintenance Management for Utilities and Infrastructure's physical assets in 10 steps:

(Health Care Hospital station, Hotels, Airports, Shopping Centres, Building Utilities, others)

Integration Framework



Maintenance Management implementation in 10 steps



Step 1 - To define the asset criticality criteria

| | | | Aspects | | | |
|-------------------------|---|---------------|---|--|---|--|
| | | | Safety | Environment | Availability | Cost |
| Consequences severities | 6 | Catastrophic | Catastrophic injures with multiples deaths and effect on people outside | Catastrophic environment impact without environment recovery | More than one System Physical Asset Unavailable (100%) | > US\$ 500.000,00 |
| | 5 | Severe | Severe injures with death, its possible to affect people outside | Severe environment impact with long time environment recovery | One System Physical Asset unavailable (100%) | Between US\$100.000,00 and US\$500.000,00. |
| | 4 | Critical | Critical injures, employee stay a period of time out of workplace | Critical effect on environment with medium time environment recovery | More than one Equipment Physical Asset Unavailable (100%) | between US\$50.000,00 and US\$100.000,00 |
| | 3 | Moderate | Moderate injures with first aid assistance required | Moderate effect on environment with short time environment recovery | One Equipment Physical Asset Unavailable (100%) | Between US\$10.000,00 and US\$50.000,00 |
| | 2 | Minor | Minor injures with minimum first aid assistance required | Minor effect on environment with fast environment recovery | One Equipment Physical Asset performance reduction | Between US\$1.000,00 and US\$10.000,00 |
| | 1 | Insignificant | No effect | No effect | No effect | Lower than US\$ 1.000,00 |

Step 2 - To define the physical asset criticality priority list

| Criticality List | | | | | | | | |
|------------------|-------------------------|--|--------|-------------|--------------|------|-------------|----------------------|
| ITEM | Equipment | Function | Safety | Environment | Availability | Cost | Criticality | Safety critical item |
| 1 | HVAC | Cooling the ambient | 1 | 1 | 5 | 3 | 15 | No |
| 2 | Generator | Provide backup Energy | 1 | 1 | 6 | 3 | 18 | Yes |
| 3 | Fire Suppression System | Protection against fire | 3 | 1 | 1 | 3 | 9 | Yes |
| 4 | Wall | Protect infrastructure from outside events and sustain the | 5 | 1 | 2 | 4 | 40 | Yes |
| 5 | Roof | Protect infrastructure from outside events | 6 | 1 | 4 | 6 | 144 | Yes |
| 6 | Transformer | Supply energy | 1 | 1 | 6 | 3 | 18 | Yes |
| 7 | Substation | Supply energy | 1 | 1 | 6 | 3 | 18 | Yes |

Step 3 - To understand the maintenance types applied to each asset.

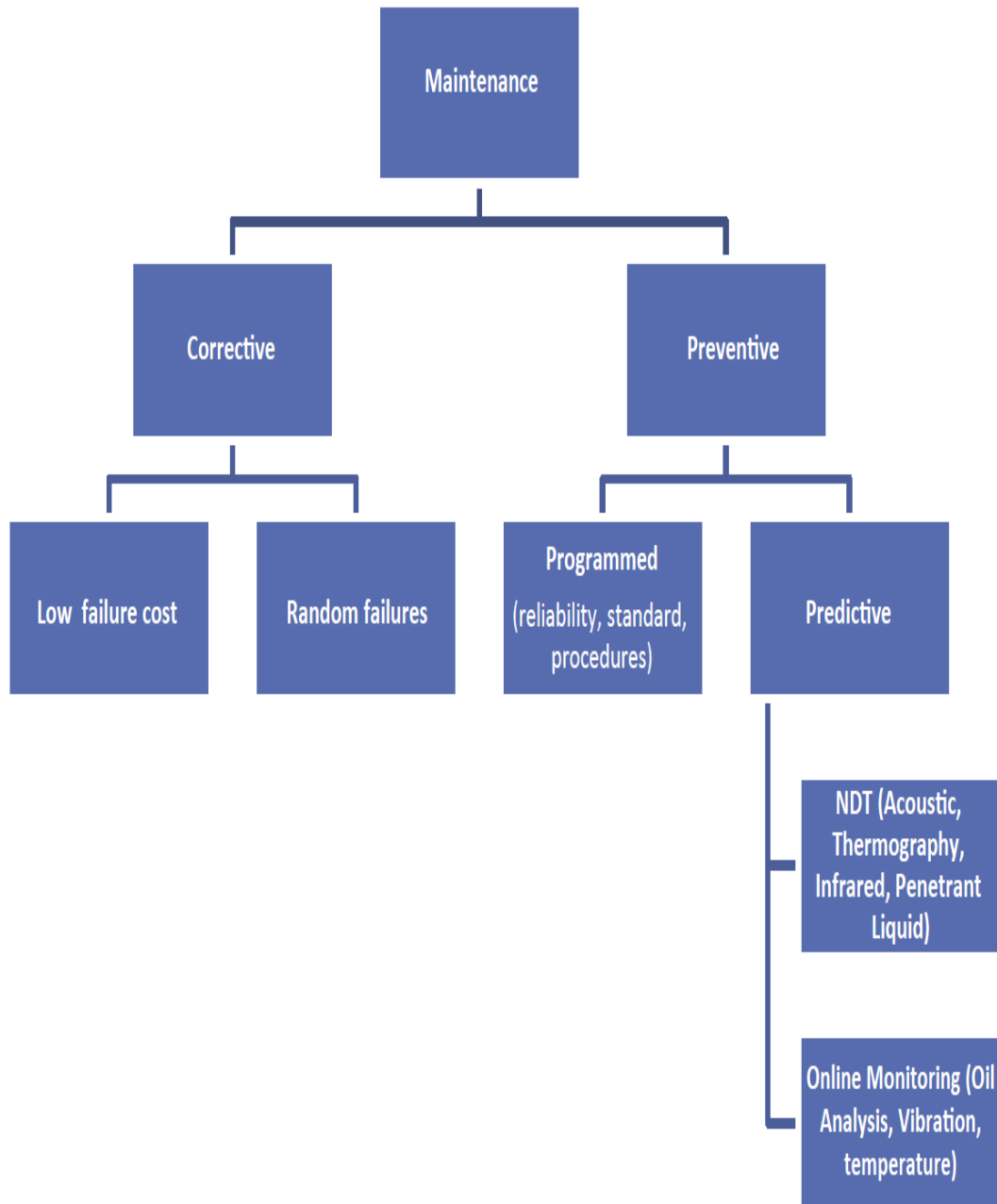


FIGURE 3.7

Maintenance strategies.

Step 4 - To define the critical asset maintenance type based on impact on availability, that means downtime and frequency.


| | | | | |
|------------------|----|-------------------------------------|------------------------------|-------------------------------|
| | | DOWNTIME | | |
| | | Low | Med. | High |
| FREQUENCY | | | 10 | 20 |
| | | Low | O.T.F. [H] | F.T.M. (When ?) [F] |
| Med. | 5 | F.T.M. (Who ?) [I] [J] | F.T.M. [E] | F.T.M. (What ?) [A] |
| High | 10 | S.L.U. [G] | F.T.M. (How ?) [D] | D.O.M. [C] |

CBM: Condition Base Monitoring
 SLU: Skill Level Upgrade
 FTM: Fixed Time Maintenance

OTF: Operate To failure
 DOM: Design Out M/C.

Figure 3-16 Title: Decision Map
 Source: Ashaf W. labib, Euromaintenance, 2011

Step 5 - To include the physical asset list in the asset management system.



English العربية

> Asset List Eduardo Calixto

Asset List Asset Transfer Reconciliation Sale/Disposal

Add Assets Upload Data File

Add

| Asset Name | Asset Number | Description | Model | Serial Number |
|--|--------------|-------------|--------------------|---------------|
| Aquino V40 X 1 (Melda control) | PP-00001 | | 1/2/2015 12:00... | 42055 |
| Aquino LTC-10 x 1 | PP-00002 | | 1/3/2015 12:00... | 42064 |
| V25 Machining centre x 1 | PP-00003 | | 1/4/2015 12:00... | 42095 |
| Supertech Grinder Mod G30A-50 x1 | PP-00004 | | 1/5/2015 12:00... | 42125 |
| Aquino V40 Cnc Mill | PP-00005 | | 1/6/2015 12:00... | 42156 |
| LTC-20B Cnc Turning Centre | PP-00006 | | 1/7/2015 12:00... | 42186 |
| Leaderway 450 M/centre | PP-00007 | | 1/8/2015 12:00... | 42217 |
| Leaderway V650 CNC | PP-00008 | | 1/9/2015 12:00... | 42248 |
| Aquino T7 CNC Machine | PP-00010 | | 1/11/2015 12:00... | 42309 |
| Aquino T7M | PP-00011 | | 1/12/2015 12:00... | 42339 |
| Briquetting Press | PP-00012 | | 1/1/2016 12:00... | 42370 |


Step 6 - To include the physical asset maintenance plan in the asset management system.

The screenshot displays the Aladdin Maintenance Management Software interface. On the left is a blue sidebar with navigation icons and labels: Dashboard, Work Order, PPM, Scheduling, Assets, Personnel, Clients, Inventory, KPI, and Reports. The main content area is titled '> PM Task' and includes a user profile 'Eduardo Calixto' in the top right. Below the title, there are tabs for 'PM Task', 'PM Generated', and 'Meter Update'. A 'Customize Columns' button is visible. On the right side, there are buttons for 'Add', 'Import Instructions', and 'Import PM Task'. The central part of the screen features a table with the following columns: Task No., Name, Asset, Asset No., Model, Serial Number, Manufactur..., Location, PM Task Type, PM Start Date, Frequency, and Every. Two rows of data are visible in the table:

| Task No. | Name | Asset | Asset No | Model | Serial Number | Manufactur... | Location | PM Task Type | PM Start Date | Frequency | Every |
|------------------------------|------------------------------|---------------|----------|-------------------|---------------|---------------|----------------|--------------|---------------------|-----------|-------|
| 20190416 1-1 | Routine Check ups of Oil ... | Supertech ... | PP-00004 | 1/5/2015 12:00... | 42125 | | JAFZA > Sto... | TimeBased | 18/04/2019 03:28 PM | Weekly | 1 |
| 20190312 1-1 | Service the Lathe Machine | LTC-20B C... | PP-00006 | 1/7/2015 12:00... | 42186 | | JAFZA > Sto... | TimeBased | 15/04/2019 01:30 PM | Monthly | 1 |

At the bottom of the table, there is a pagination control showing '1' of 2 items, a dropdown for '15' items per page, and a '1 - 2 of 2 items' indicator.


Step 7 - To perform the physical asset maintenance based on maintenance plan defined in maintenance system.



English العربية

> Work Order Eduardo Calixto

Work Request Work Order

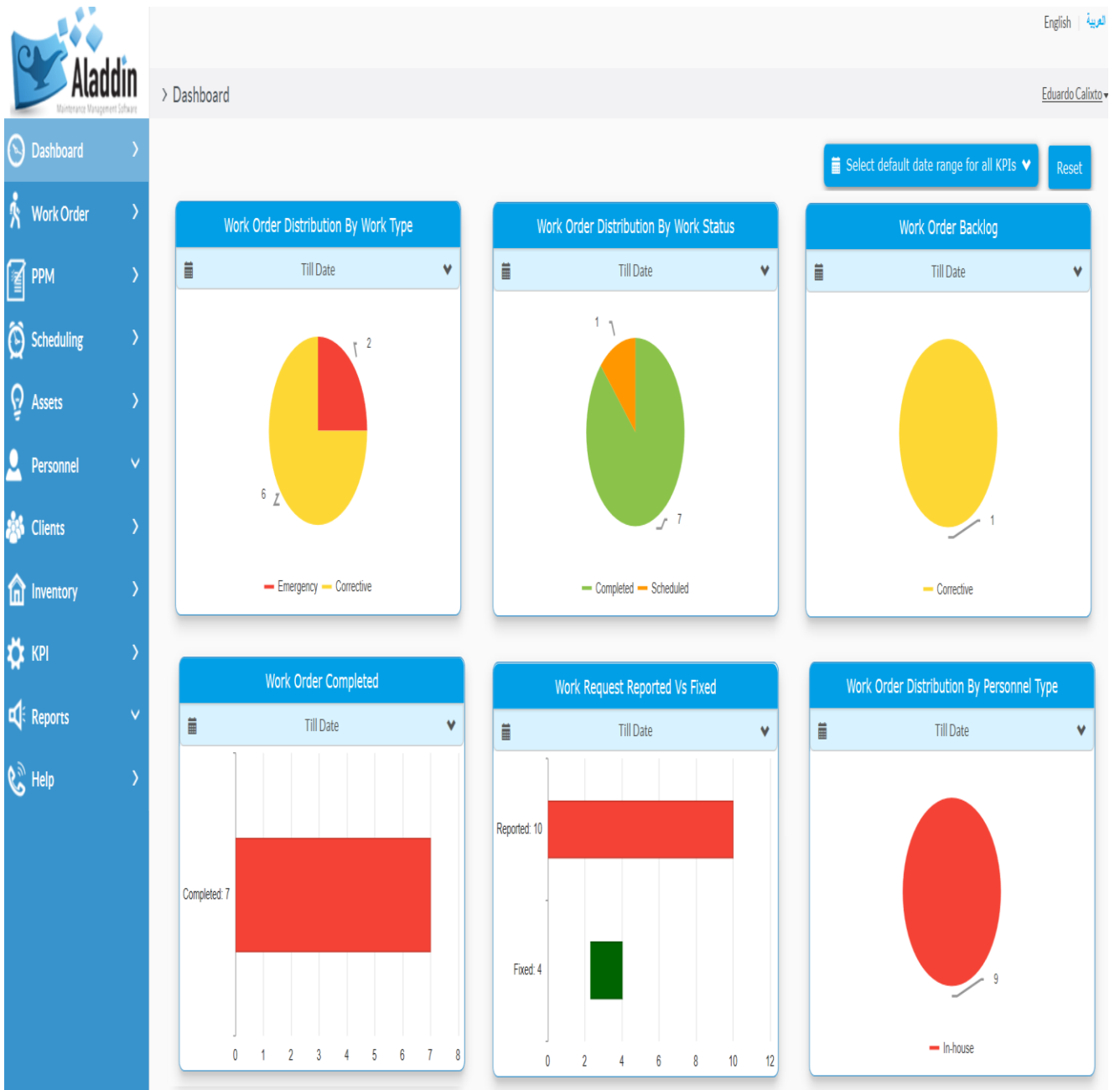
Customize Columns 

| Work Order No. | Created Date | Scheduled Date | Completion Date | RequestNumber | Problem Desc | Work Order Desc |
|----------------------------|------------------------|------------------------|------------------------|---------------|------------------------------------|----------------------------|
| 20190417_1 | 17/04/2019 08:42:08 AM | 18/04/2019 11:30:00 PM | 21/05/2019 03:01:00 PM | | Routine checks of Oil level | Oil Checks |
| 20190416_2 | 16/04/2019 03:12:13 PM | 17/04/2019 03:13:00 PM | 30/04/2019 09:01:00 AM | 20190416_1 | check the leakage and fix the p... | Fix the leakage |
| 20190416_1 | 16/04/2019 01:58:59 PM | 18/04/2019 01:59:00 PM | 09/05/2019 11:24:00 AM | 20190414_1 | key doesnt work | Fix the key board |
| 20190320_1 | 20/03/2019 06:18:39 AM | 22/03/2019 06:19:00 AM | 20/03/2019 06:22:00 AM | 20190320_1 | battery problem | regfsggh |
| 20190312_2 | 12/03/2019 12:25:31 PM | 14/03/2019 01:00:00 PM | 24/03/2019 03:45:00 PM | | Sand Mill not working | Sand Mill not working |
| 20190312_1 | 12/03/2019 12:22:01 PM | 14/03/2019 11:30:00 AM | 18/03/2019 12:12:00 PM | 20190312_2 | doesn't cool | Cooling fan is broken down |
| 20190311_2 | 11/03/2019 05:45:02 AM | 12/03/2019 05:45:00 AM | | | Leak on flexible joint | Repair to Pump 002 |
| 20190311_1 | 11/03/2019 05:30:24 AM | 13/03/2019 05:30:00 AM | 27/06/2019 03:04:00 PM | | New panel filters | Replace filters in AHU |


< >

1 15 items per page 1 - 8 of 8 items

Step 8 – To Check the preventive Maintenance plan execution.



Step 9 – To Check the preventive Maintenance plan execution based on team members activities



English العربية

> Reports Eduardo Caixto

Personnel Work Order Report

Personnel: All From Dates: From Dates

Skills: All End Dates: End Dates


Type: All Apply Clear

Customize Columns

| Work Order No. | Asset Name | Work Order Desc | Problem Desc | Note Desc | Personnel | Work T |
|----------------|------------------------|----------------------------|---------------------------------------|--|-----------------------|--------|
| 20190311_1 | Air Handling Unit | Replace filters in AHU | New panel filters | Work Order Ended Successfully by Husam Crew | Husam Crew | Correc |
| 20190311_2 | Chilled Water Pump | Repair to Pump 002 | Leak on flexible joint | | John Doe | Correc |
| 20190312_1 | Aquino LTC-10 x 1 | Cooling fan is broken down | doesn't cool | Work Order Started Successfully by Azra Syed | Azra Syed | Correc |
| 20190312_2 | Sandmill | Sand Mill not working | Sand Mill not working | Work Order Ended Successfully by Azra Syed | Azra Syed | Correc |
| 20190320_1 | HP Laser Printer | regfsggh | battery problem | Work Order Ended Successfully by Husam Crew | Azra Syed, Husam Crew | Emerg |
| 20190416_1 | Office Desks (5) | Fix the key board | key doesnt work | Work Order Ended Successfully by Azra Syed | Azra Syed | Correc |
| 20190416_2 | Aquino V40 X 1 (MeL... | Fix the leakage | check the leakage and fix the problem | Work Order Ended Successfully by Azra Syed | Azra Syed | Emerg |
| 20190417_1 | Hydrovane 170 Air C... | Oil Checks | Routine checks of Oil level | Check the rubbers and all valves | John Doe | Correc |

1 15 items per page 1 - 8 of 8 items

Step 10 – Analyse the maintenance plan performance and go through the PDCA again.


English | العربية

> Reports
Eduardo Calixto

- Dashboard >
- Work Order >
- PPM >
- Scheduling >
- Assets >
- Personnel >
- Clients >
- Inventory >
- KPI >
- Reports >
 - Work Order
 - Work Request Report
 - Work Order Report
 - Work Order Maintenance Cost Report
 - Work Order Report By Status
 - Preventative Maintenance Instruction Report

Work Request Report

From Dates

End Dates

Status

General Search

| Work Request | Work Reque... | Work Order ... | Customer Name | Problem ... | Email | Phone | Status | Cancel Reason | Location | Created Date | Modified Date |
|--------------|----------------|----------------|---------------|----------------|---------------------|------------|----------|---------------|--------------|------------------------|------------------------|
| 20190722_1 | Leakage | | Benjamin Bank | Lots of le... | bbank@trixi.com... | 0000000... | Pending | | United Ar... | 22/07/2019 10:45:00 AM | |
| 20190627_1 | Scheduled m... | | Husam Khan | requirem... | husam@starinsp... | 0000000... | Pending | | United Ar... | 27/06/2019 03:36:28 PM | 14/07/2019 12:00:39 PM |
| 20190416_1 | Leakage | 20190416_2 | Azra Syed | check the ... | azz_syed@hotmail... | 0000000... | Appro... | | United Ar... | 16/04/2019 10:27:26 AM | 16/04/2019 03:12:10 PM |
| 20190414_1 | Breakdown | 20190416_1 | Azra Syed | key doesn... | azz_syed@hotmail... | 0000000... | Appro... | | United Ar... | 14/04/2019 09:41:49 AM | 16/04/2019 01:58:56 PM |
| 20190328_1 | Breakdown | | Azra Syed | | Azra.syed@gma... | 0000000... | Pending | | United Ar... | 28/03/2019 07:00:34 AM | |
| 20190320_1 | Breakdown | 20190320_1 | Husam Khan | battery p... | husam@starinsp... | 0000000... | Appro... | | United Ar... | 20/03/2019 06:12:54 AM | 20/03/2019 06:18:34 AM |
| 20190312_2 | Breakdown | 20190312_1 | Azra Syed | doesn't c... | Azra.syed@sgem... | 0000000... | Appro... | | United Ar... | 12/03/2019 12:19:58 PM | 12/03/2019 12:22:02 PM |
| 20190312_1 | Breakdown | | Azra Syed | Ac is not c... | Azra.syed@sgem... | 0000000... | Pending | | United Ar... | 12/03/2019 08:13:57 AM | |
| 20190311_2 | Leakage | | Noel Matthews | Another L... | noel@matthews... | 0000000... | Pending | | United Ar... | 11/03/2019 05:53:24 AM | 11/03/2019 05:55:34 AM |
| 20190311_1 | Leakage | | Noel Matthews | Damaged ... | noel@calistodata... | 0000000... | Pending | | United Ar... | 11/03/2019 05:13:05 AM | 11/03/2019 05:55:25 AM |

items per page

1 - 10 of 10 items