The Evolution to Condition Based Maintenance

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REAL. WORLD. EXPERIENCE.

NORTH AMERICA  EUROPE MIDDLE EAST  ASIA PACIFIC
USA CANADA  EUROPE MIDDLE EAST  SOUTHEAST ASIA
AUSTRALIA NEW ZEALAND
AGENDA

- Concepts of Condition Based Maintenance
- Getting to Condition Based Maintenance
- Technology Platform – SAP MII
- How Can We Help You?
  - Enablers from SAP and Vesta
CONCEPTS OF CONDITION BASED MAINTENANCE
MAINTENANCE IN MOST ORGANISATIONS TODAY

Time-based or reactive practices are common
Can’t identify problems between scheduled inspections
Not cost effective for asset reliability
THE CONDITION BASED MAINTENANCE EVOLUTION...

First Steps

| No preventive Maintenance |
| Preventive/Scheduled Maintenance |
| Mobile Rounds Functionality populating Measurement documents |
| Sensors populating Measurement documents |
| Sensors feeding Rule engine to make decisions about maintenance necessary |

**THE CORE OF THE PROBLEM**

Preventive maintenance focuses on the basics:

- Performed on a specified scheduled basis / interval e.g. Run Time, Time interval, Number of Cycles etc.
- Corrective action identified during PM activities / inspections
- Tasks are often performed before the asset has operated for its entire life expectancy or too late – asset has failed.

**Problem: Failures don’t happen at fixed times:**

- When is the failure going to occur? - How do I detect a failure before it impacts the business?
- Why do I perform maintenance activities with the same intervals on equipment’s that are not running as frequently?
CONDITION BASED MAINTENANCE

- Condition Based Maintenance is the Process of monitoring the condition of an asset and taking an action to avoid the consequences of a failure.
  - Utilizes some form of technology to detect equipment problems as they are developing & predict future condition.
  - Accomplished through trending & analysis of condition parameters.

- Common tools & techniques.....
  - Vibration, temperature, pressure, flow, speed, voltage/current, thermography, sonics, particulate count, oil, etc.

<table>
<thead>
<tr>
<th>Transformer</th>
<th>Pump</th>
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<tbody>
<tr>
<td>Current</td>
<td>Water in Oil sensor</td>
</tr>
<tr>
<td>Temperature</td>
<td>Bearing temperature</td>
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<tr>
<td>Voltages</td>
<td>Temperature Sensor</td>
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<td></td>
<td>Ball float sensor – leakage detection in housings</td>
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- Focus on eliminating all critical equipment breakdowns.
- Use the right techniques and tools for the right equipment.
THE CONDITION BASED MAINTENANCE EVOLUTION...

Next Steps

| No preventive Maintenance | Preventive/ Scheduled Maintenance | Mobile Rounds Functionality populating Measurement documents | Sensors populating Measurement documents | Sensors feeding Rule engine to make decisions about maintenance necessary |

CONDITION BASED MAINTENANCE

- Equipment state observed & condition monitored continually / real time
- Deviations from standard / tolerance cause alarm or trigger response, allowing time to respond within the P-F interval.

**Goal:**
- Detect failure as far along failure curve as possible
- Take action to prevent failure

**Decreased cost**
- Execute on the right things at right time
- Minimize spare parts
- Reduce downtime

**John Moubray, Reliability Centered Maintenance II**
CONDITION BASED MAINTENANCE BENEFITS

- Improved reliability
- Reduced quantity & severity of failures
- Improved operational safety
- Decreased number of maintenance activities causing reduction in human error influences
- Optimized equipment maintenance intervals
- Process and equipment is only touched when necessary
- Lowering of maintenance cost
- Continuous equipment health monitoring

![Graph showing cost comparison between Breakdown, Preventive, and Predictive/CBM maintenance.](image)
GETTING TO CONDITION BASED MAINTENANCE
CURRENT SITUATION

- A lot of equipment is delivered with built in sensors today - New sensors are very affordable.

- Challenge: Lots of Data – Little Information

  - The historian collects lots of data but provides little information to SAP.
  - Investments in the historian data are not leveraged.
  - EAM groups do not have visibility to condition data in SAP to make/optimize their decisions.

Transformer

- Current
- Voltage
- Temperature

Pump

- In Operation
- Leakage
- Temperature

CURRENT SITUATION - MISSED OPPORTUNITY

Transformer
- Current
- Voltage
- Temperature

Pump
- In Operation
- Leakage
- Temperature

Data Historian

Or other manufacturing system.

Work order

SAP ERP

Technician is executing work

Work orders are created in regular Intervals

SOLUTION: INTEGRATED CONDITION BASED MAINTENANCE

Transformer
- Current
- Voltage
- Temperature

Data Historian
- Create Measurements Document.
- OR
- Determine whether or not to create notification or work order

SAP MII
- Or other manufacturing system.

SAP ERP
- Work order is made available to the Technician

Transformer
- In Operation
- Leakage
- Temperature

Pump
- In Operation
- Leakage
- Temperature

Pump
- In Operation
- Leakage
- Temperature

Technician is executing work

Technology Platform
“Manufacturing Integration and Intelligence”

SAP MII
SOLUTION : SAP MII

Visibility for Action
• Access to plant floor data sources for viewing & reporting.

Visibility & Process Integration for Actions
• Use plant floor data for alerting or enabling actions.
• Link industrial data and processes to SAP processes.
• Drilldown Analysis.
• Triggering Automated or simplifying manual processes.

Process Augmentation
• Add MII processes to enhance SAP or plant processes without changes to existing systems.
AUTOMATE PROCESSES

Event & Condition Management

1. Data Event or Condition Occurs

2. Data Event or Condition Occurs and detected by monitoring software

3. Posts event & details to MII

4. Condition or Event interpretation

5. Present to End User for Action or Alert

6. Build notification or work order for posting to SAP ERP

7. Post into SAP PM

7a. Sends email/text alerts

8. View results, history and current conditions

SAP ERP

MII Event Scheduler

MII Business

SAP Server

MII

Analyze

HOW CAN WE HELP YOU GET STARTED?
SAP CONDITION BASED MAINTENANCE RDS

What’s included – solution scope

**Integration**
The condition-based maintenance process is automated by leveraging seamless and real-time integration between a shop floor monitoring system and SAP Enterprise Asset Management.

**Dashboards**
Intuitive dashboards allow your maintenance team to easily access and visualize information related to condition-based maintenance that shows the health of your enterprise assets.

**Charts**
Equipment operators can view asset performance and multivariable charts to better understand performance history and the relationship between measurement points to drive maintenance decisions.
SAP CONDITION BASED MAINTENANCE RDS

What’s included – Service scope

- Enable condition-based maintenance for a set of critical equipment at a single plant and shop floor system
- Enable SAP MII connectivity for existing shop floor system via SAP Plant Connectivity software
- Set up critical asset structure data
- Configure up to 5 measurement points or tags per equipment (examples include pressure, temperature, vibration, and flow)
- Set up plant database for storing shop floor aggregate data
- Deploy three predefined CBM dashboards
- Manual transactional data entry screen in SAP MII
- Maintenance notification in SAP ERP Central Component (SAP ECC)
- Set up archiving of shop floor aggregate data

A special step-by-step guide describes each activity during the deployment.
VESTA CBM - AN ADD-ON TO SAP MII

A configuration environment for the business analyst that ...

... simplifies the steps for implementing a CBM strategy that ...

... integrates asset conditions to SAP Enterprise Asset Management ...

... using SAP MII.

1. Select Asset
2. Select Rule
3. Associate Tags and/or fixed values
4. Select Frequency
5. Submit to database
CONCLUSION
BENEFITS OF CONDITION BASED MAINTENANCE

- Decreased maintenance costs
  - Maintenance is only performed when necessary
  - Reduced manual steps to enter information
- Improved system reliability
- Better informed decisions when replacing assets
- Enable maintenance personnel to act on conditions before they cause a breakdowns, lost production, or equipment degradation
- Puts configuration and control of monitoring processes into the hands of maintenance subject matter experts (Vesta CBM)
- Recommendation: Put initial focus on critical equipment
Evolving to Condition Based Maintenance

- Becoming easier to really consider CBM approach fully integrated with SAP EAM
- Measure and evaluate impacts and value
- Challenge is now less about technology but more about organization and process
- Look at integration on more extensive level than ever before
  - All groups
  - Plant level systems and IT systems