Automation Scandinavia 2016
Condition Monitoring and Condition Based Maintenance
Condition Based Maintenance
More competitive together

1. **Increased industrialization**
   Where are we now with proven, cost-effective solutions

2. **Enable condition monitoring**
   Infrastructure and configuration required to turn diagnostics into information

3. **Transition to condition based maintenance**
   Choose the maintenance strategy which gives maximum reward

More competitive together — reduce maintenance costs by standardized solutions and services within condition monitoring
Condition Monitoring
Enables Improved Maintenance Activities

Evolution towards preventive & predictive maintenance
Maintenance Practices

Corrective/Reactive
Preventive
Predictive
Reliability Centered

Corrective maintenance can cost ten times as much as a predictive maintenance strategy.

Corrective maintenance – Fix on failure
Preventive maintenance – Maintain on schedule
Predictive maintenance – Maintain when condition detected
Reliability Centered – Strategy based upon the role of the asset, safety and criticality

Cost of maintenance

10x
5x
1x

Corrective Preventive Predictive

Asset categorization

5% Critical - Predictive (continuous)
25% Essential - Condition based (periodic)
30% Important - Preventive
40% Basic - Reactive

Critical
Essential
Important
Basic
Condition and Performance Monitoring

Predicting failures

Good statistical knowledge, and feedback from operations are important for accurate predictive maintenance.

Time to react increased with improved predictive methods.

Failure patterns observed in multiple plants can be identified early in measurements.

Integrating and analyzing monitoring data from a variety of installations of the same device type throughout the industry is essential.
Condition Based Maintenance
Where are we now?
Condition Monitoring in ABB
The full scope

Condition monitoring:
- Electro
- Vibration
- Instruments and valves
- Telecom systems
- Servers and systems
Condition monitoring system
Generic structure of a plant-wide condition monitoring solution

Common Data presentation and Work Processes

Data Presentation and Aggregation

System Performance Monitoring

Asset Optimizer Maintenance Workplace

Field Equipment with diagnostics

Field /Process Equipment without diagnostics
Condition Monitoring
From bytes to decisions

- HART
- Analog
- Profinet
- DriveBus
- IEC 61850
- ModuleBus/OPC

- Safety
- Control
- Vibration
- LV / MV Electro
- HV Electro
- 3rd party
Modern Condition Monitoring
Example: monitoring the whole compressor train

Electrical  Vibration  Process  Valves and Instruments

Protection Relay  TEC  DriveMonitor  MCM800  MCM800  AC800  transmitters
Office Applications
Collaboration, Visualization and Reporting

- Integrates information from disparate data sources
- Support for condition based maintenance and collaboration
- One view to the whole plant
Where are we now

4 years ago

Now

Future

Expert support
Field service

Service center

Analytics

Related data

ABB Cloud

Secure conn.

System installation
Device monitoring
Building a Maintenance Plan based on data
Perception of Risk and Reward

Risk and reward must always be balanced, there is normally no reward without a risk, but knowing the risk and how to reduce it is the key to success.

Risk can be reduced by increasing knowledge:
- Experience, trained personnel
- Gained from design right use of collected data
# Transformation to a predictive maintenance regime

## 8 steps to a maintenance plan including CBM

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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| 1.   | Input: Maintenance strategy  
      | Decide on overall strategy equipment or system based on cost vs. benefit.  
      | 1. Run to failure  
      | 2. Preventive Maintenance  
      | 3. Condition-based |
| 2.   | Input: FMEA/RCM Analysis  
      | Analysis will indicate critical equipment, failure modes and availability.  
      | Risk assessment of maintenance strategy decisions. |
| 3.   | Input: Maintenance Manuals  
      | Gather preventive Maintenance activities and time intervals.  
      | Prepare excel sheets with all maintenance activities related to subjected device or system |
| 4.   | Define: Required Sensing  
      | Define sensors or solution to monitor a failure mode on critical equipment  
      | Implement a system for data collection for CM and PM |
| 5.   | Identify: Gaps and overlaps  
      | Compare maintenance activities with failure modes and potential monitoring.  
      | Where there are no failure mode and maintenance activity, criticality defines the action |
| 6.   | Improve: Procedures  
      | Refine  
      | Maintenance procedure implementation  
      | Spare part solution implementation  
      | Maintenance Strategy |
| 7.   | Implement  
      | Implement system to follow up both CBM and Preventive Maintenance  
      | Secure competency by training  
      | Tune and adapt |
| 8.   | Sustain and improve  
      | Establish procedure:  
      | Continuous improvement  
      | Handle changes in operation profile,  
      | System upgrades, |
Condition Based Maintenance
More competitive together

1. **Increased industrialization**
   Where are we now with proven, cost-effective solutions

2. **Enable condition monitoring**
   Infrastructure and configuration required to turn diagnostics into information
   - Supplier standards give proven, cost-effective solutions
   - Harvest the benefits from reuse of good solutions

3. **Transition to condition based maintenance**
   Choose the maintenance strategy which gives maximum reward
   - Take a life cycle approach when building topologies
   - “Solid wood” from devices and systems to the user
   - Balance risk and reward; define maintenance activities according to criticality and failure modes
   - Continuously improvement in procedures and implementation

More competitive together – reduce maintenance costs by standardized solutions and services within condition monitoring
Power and productivity for a better world™