iMaintenance – next-generation maintenance via intelligent applications

Thomas-Peter Wilk | Hannover Messe 2013
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Agenda

1. The idea
2. Modular structure
3. Customer benefits
4. System architecture
The idea behind iMaintenance

**Production goals**
- High availability and reliability
- Minimum costs with a fixed yield rate
- “Extremum” principle

**Determinants**
- Avoidance of unplanned down times
- Condition-driven servicing and inspection
  > iMaintenance: “work determined by the condition of the plant”
iMaintenance - the idea
Existing situation

Static maintenance intervals:
- No review of the maintenance intervals
- No allowance made for use-based capacity utilisation
- Environmental conditions not factored in

Purpose of iMaintenance
To determine the optimum maintenance interval
# Existing situation

**Maintenance and inspection is scheduled on a time basis regardless of the condition and utilisation of the plant**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Effect</th>
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<tbody>
<tr>
<td>Maintenance intervals static and scheduled on a time basis</td>
<td>Generally more maintenance performed than required</td>
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<td>Occasional down time even after (time-based) inspection</td>
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<tr>
<td>No check of the time-based intervals in the life cycle of the industrial asset</td>
<td>Intervals remain static due to lack of information on duration and insufficient ability to assess the plant (as well as a lack of process data)</td>
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<td>No feedback from maintenance staff on the maintenance performed</td>
<td>No early error detection possible</td>
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<td>No link between plant management and maintenance instruments</td>
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*iMaintenance – the idea*
iMaintenance – the idea
Existing situation

Static intervals tend to be selected cautiously (OEM specifications)

Expectation

Generally longer intervals

Inspection and maintenance expense can be reduced by 40-60%.

Experience

Estimate
Subjective evaluation
Static vs. dynamic interval

Static interval

Use of a mobile terminal

Does not take into account the extent of utilisation of the asset or the environment factors.
Subjective evaluation
Static vs. dynamic interval

Does not take into account the extent of utilisation of the asset or the environment factors.
Module 1

Condition-based maintenance – basic version
- Assessment of maintenance performed by the maintenance staff
- Adoption of utilisation-based scheduling of maintenance plans (manual)

Module 2

Condition-based maintenance – extended
- Adoption of utilisation-based scheduling of maintenance plans (automatic)
- Measurements coupled to actions

Module 3

Multi-variant diagnoses
- Automatic error pattern detection
- Duration forecasts

Definition of critical items by RCM

Overview

intelligent Maintenance

iMaintenance – next-generation maintenance via intelligent applications
Assessment of maintenance performed by the maintenance staff

- Use of mobile devices
- Evaluation of the maintenance/inspection performed
- Progressive determination of the optimum interval for each item of equipment
- Evaluation and decision documented

Manual adoption of utilisation-based scheduling of maintenance plans

- Adoption of meter-based scheduling
- Cyclical recorder of meter data (e.g. operating hours)

+ Minor investment
- Resource requirements for maintenance activities
Modular structure
Module 2

Automatic adoption of utilisation-based scheduling of maintenance schedules linked to existing plant management/sensor systems

- Adoption of meter-based scheduling

+ Automation

- Investment necessary

Measurements coupled to actions

- Linked to existing plant management/sensor systems
- Combination of various measurements, e.g. temperature, vibration etc.

+ Target-oriented management of activities

- Extensive plant expertise necessary
Implementation of new knowledge-base maintenance schedules

- Data mining by means of assessment systems based on computer-controlled statistical knowledge trees
- Postponement of inspection dates, under permanent observation by a server-based system.
- Step towards prediction of service life

High level of plant integrity

Investment necessary / functionality only after a corresponding volume of data in the system
Customer benefits

iMaintenance – next-generation maintenance via intelligent applications

Costs

Expense 1

Expense 2

Added value

1

2

Fixed time-based interval

Condition-based interval

iMaintenance results in optimisation of maintenance costs
System architecture
Overview

Console

iMaintenance

enginius® Middleware Application server

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