Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [On the way to Industry 4.0]
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Re: []

Abstract: [This document is presented to support Interest Group's activities to make a new standard on enhanced dependability in wireless networks which is focusing on use cases in car industry by showing its demand in MAHLE. By introducing MAHLE group's current and future business opportunity, Such a demand for dependable wireless networks can be shortly described Some ongoing projects in Germany and Japan are introduced to keep manufacturing initiatives on the way to Industry 4.0.]

Purpose: [information]

MAHLE at a Glance

MAHLE - Business Units & Division

BUSINESS UNIT

BU1	BU2	BU3	BU4
Engine Systems & Components	Filtration & Engine Peripherals	Thermal Management	Aftermarket

Division

Mechatronics

Profit Center

PC03	PC04	PC10	PC12	PC20	PC30	PC34	PC36
Compres-sors	Engineering Services, Motorsports & Special Appl.	Large Engine Components	Small Engine Components	Industrial Filtration	Industrial Thermal Management	Control Units (BHTC)	Front-end Modules (HBPO)

MAHLE - Dual Strategy

strengthen our existing market position

shape the future in a changing mobility world

Highly efficient combustion engines

Emerging markets

Heating Ventilation Air Conditioning

New projects

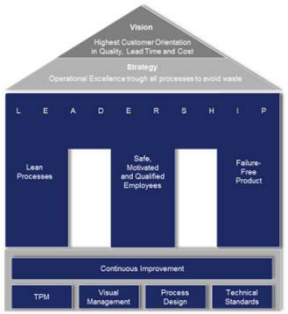
Commercial vehicles & Off-Highway

Aftermarket

Electric auxiliaries

Electric drives & Power electronics

Raise the Bar: Manufacturing Initiatives



Take manufacturing to the next level!

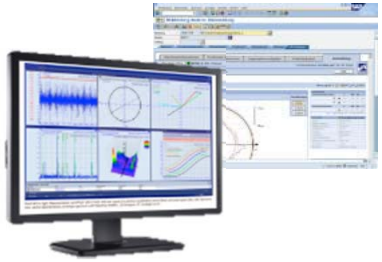
MAHLE Production System

Industrie 4.0

MAHLE Manufacturing initiatives

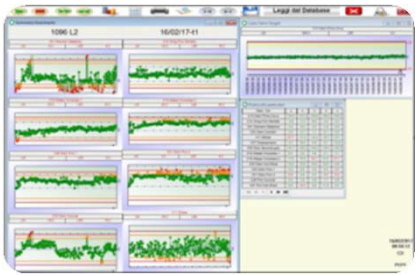
MAHLE Europe- On the way to Industry 4.0

BU1



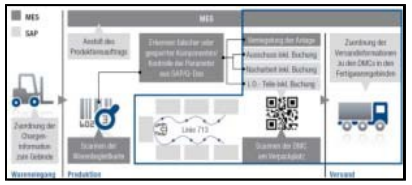
Predictive Maintenance
@ Stuttgart & Yingkou

BU1



Quality Automated Decision System
@ La Loggia

BU2



Manufacturing Execution System
@ St. Michael

BU3

RFID Technology
@ Kirchberg

BU3

Video Assisted Training for Maintenance
@ Neustadt a.d.D.

BU4

Autonomous Transportation Systems
@ Schorndorf

IT

Mobile Devices for Maintenance
@ Mühlacker

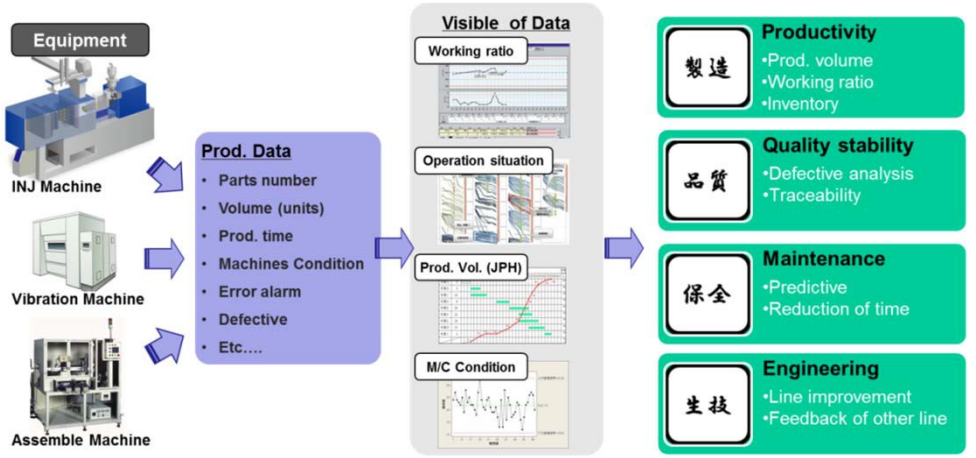
IT

Big Data for Production
@ Rottweil & other plants

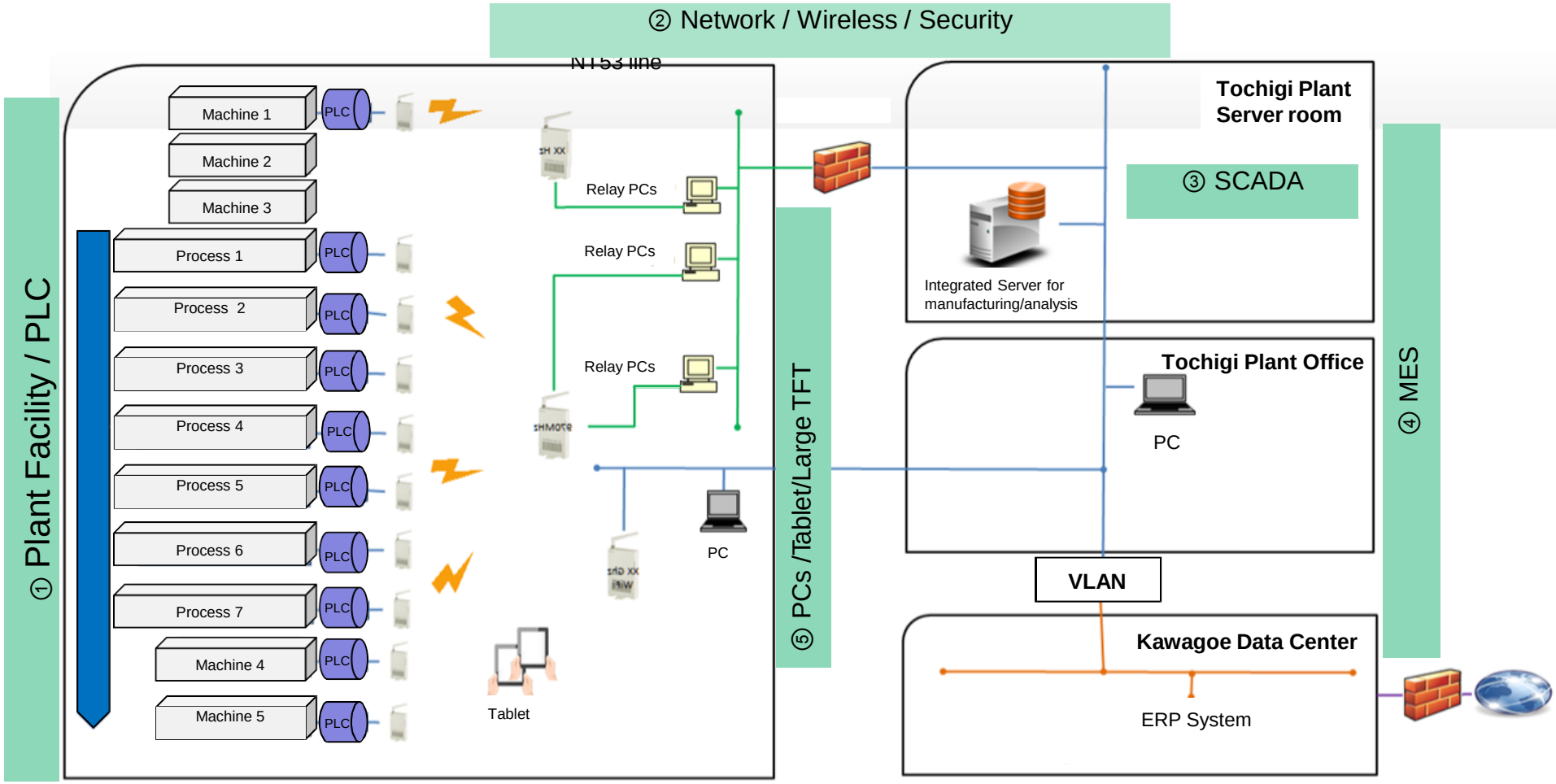
MAHLE Japan - Tochigi advanced plant IoT

Purpose of proactive innovation: **Factory line w/o any waste by advanced IoT technology**

- **Improve productivity**
  - Product volume management
  - Availability of plant facilities
  - Yield and Inventory reduction
- **Stabilization of products quality**
  - Production and products traceability
  - Reduction of defective products
- **Predictive Maintenance**
  - Improve machine availability
  - Reduction of equipment-induced defects
  - Energy saving of plant facilities
- **Automation to assembly line**
  - Assigning man-hours to new production activities



MAHLE Japan - Pilot IoT Assembly Line



SCADA(**S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition) : Process control and monitoring with production data and equipment parameter
MES(**M**anufacturing **E**xecution **S**ystem) : Inbound and out bound management with ERP and equipment control

Superior Quality is Part of MAHLE DNA

“Good quality is of crucial importance: there is always room for improvement!“

Ernst Mahle