Digitale Transformation in der Smart Factory mit Industrie 4.0

Connect | Transform | Reimagine

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Internet of Things / Industry 4.0
The 4th Industrial Revolution

End of 18th century
Mechanization:
Use of water and steam power to run mechanical production facilities

Beginning of 20th century
Electrification:
Use of electrical power to enable work-sharing mass production

Early 1970s
Computerization:
Use of electronics and IT to automate production

Today
Networking:
Use of cyber-physical systems to connect, transform and reimagine business
Industrie 4.0 – Driving Innovation
Building blocks for Industrial Internet of Things

- Self Organizing Production
- Autonomous Systems
- Cyber Physical Systems
- Connected Machines
- Big Data
- Integration Interaction Intelligence
- Performance Management
- IoT
- Lot Size 1
Internet of Things and Industrie 4.0
SAP Connected Manufacturing runs Industrial IoT with Industrie 4.0 scenarios

Industrie 4.0
» All industries
» All things and devices

» Manufacturing industries
» OT-IT Convergence
» Systems, things and devices in the Shop floor

Internet of Things
» All industries
» All things and devices

Internal INDUSTRIAL scenario
External scenario
Enabling the Internet of Things with SAP solutions
Industrial IoT and External IoT

SAP Predictive Maintenance & Service
SAP Connected Manufacturing
SAP Connected Logistics
SAP Augmented Reality
IoT Innovation Bundle

Industrial Automation ➔ “Industrial Internet” / Industrie 4.0

“Internet of Things” ← Smart Devices, Personal Area Networks
SAP Strategy, Product Networks
From Sequential Processes to Product Networks

YESTERDAY
SAP Strategy, Product Networks
From Sequential Processes to Product Networks

TODAY

Design
Plan
Respond
Operate
Deliver
Connected Manufacturing

Manufacturing Control Center

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As simple as possible and as complex as necessary

**COST**

Operations view on product individualization

- Higher Raw Materials Stock Level
- Smaller purchasing volumes / Lotsizes
- More Change Overs in production
- Higher finished Goods Stock Levels
- More Complexity in Logistics
- Higher Planning Efforts in production

“YOU CAN PAINT IT ANY COLOR AS LONG AS IT IS BLACK”

H. Ford

**VALUE**

Sales view on product individualization

- Conquer New Customer Groups
- Have a Complete Portfolio
- Improve Brand Image
- Develop New Products to be profitable midterm
- Retailers demand Complete portfolio

“ENDLESS CHOICE IS CREATING UNLIMITED DEMAND”

C. Anderson

The “Intelligent Factory” should comprise of and is focused on creating intelligent processes, products, equipment and enable people to work in this environment (IT systems). All components (human beings, machines, products and objects), due to the built-in sensors, should communicate with each other as naturally as in a social network, without human intervention. Nowadays sensor technologies become cheaper and more available. Thus, almost any process can now be measured. The “Intelligent Factory” can be characterized by the following attributes:
Intelligent and Connected Equipment in a Broader Context

Plant, equipment, tools, products/objects, databases and people are interconnected and continuously exchanging the information with each other. Equipment can be further connected to electronic devices or networks via different protocols such as Bluetooth, http, OPC, NFC, Wi-Fi, 3G, etc. Moreover, not just machines are connected to each other, but machines can communicate directly with various systems within the whole supply chain getting necessary information about customers, suppliers, parts, tools, products, calibration and maintenance schedules, etc. Every system is able to recognize its condition and publish that information so it and all other interoperating devices can take immediate and appropriate action.

Equipment data from the shop floor is available in the cloud can be accessed by:

- Customers / Suppliers
- Parts & Tools Calibration & Maintenance Schedules
- Quality Systems
- Analytic / Predictive Systems
- Asset Management Systems
- Aftermarket Service / Remote Maintenance
- Other…
Enabled People and Processes: Knowledge

Intelligent Processes

- Observation and monitoring of process execution
- Feedback from user experience
- Production steps or process

Worker

Output (Product)

Customer Engagement

Industrie 4.0 – Basic Principles and Business Relevance

Well-prepared and Technology-enabled Human
Human-Machine Co-operation: Example 1

Robots will be no longer locked in their work cells, but co-operate with each other and or with humans. Fenced working cells will be considered as a past scenario. The new production planning should consider the hybrid approach, where several robots or human and robots are integrated in the production chain and work jointly together.

For example, an object (product being produced) can be directly transferred from the robot body to the hands of the human. The robot should be capable of evaluating the possible grasping options and offer the best grasping position to the human. This optimal decision making will help to increase the efficiency of the production process.
Connected Manufacturing
5 Scenarios of “Connectedness”

1. Shop Floor to Top Floor
3. e-commerce Integration
4. Manufacturing Collaboration
5. Machine Cloud
Industrie 4.0
Open Integrated Factory

Die OIF zeigt im Live-Betrieb, wie durch den Einsatz offener, konfigurierbarer Systeme und Kommunikationsstandards höchste Flexibilität für die Produktion der Zukunft (Stichworte: Losgröße = 1, resiliente Fabrik) realisiert werden kann.

Die nahtlose Integration von Anlagen- und Automatisierungstechnik mit der Prozesssteuerung und Auftragsverwaltung kommt OHNE LEITRECHNER aus.

Virtualisierte Systeme und Cloud-basiertes Management von Produktionsmassendaten powered by SAP HANA eröffnen für Produktion, Logistik, Service und Entwicklung eines Unternehmens völlig neue Möglichkeiten der Produkt- und Prozessgestaltung.

https://www.youtube.com/watch?v=eI_XxsunVfg#t=11

Supply (Magazine) | Drilling letright | Temper | Assembly by root | Camera Q-inspection | Leakage Test | Switch | Manual pick

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A radically new approach is required to unlock potential

Forrester IT Survey, 2013

28% Drive business innovation

72% Keep the lights on

McKinsey study, 2013

40% executives worry that their organizations will not keep pace with technology change and lose their competitive edge.

“”
The solution: Make all data readily available to all applications
Reduce data movement and data latency – improve business agility & innovation

Unified application workloads
Unified data – single copy
Real-time processes

Complete business view
Ability to react in real-time
Ability to innovate
The solution is only possible with in-memory data management
Only data in-memory enables all applications to become real-time

No waiting for data access and processing
All application logic (OLTP & OLAP) processed in one system
All data types processed in one system
Speed
Simplicity
Innovation
Challenge: System Yield

Predictive analytics on health status of high-tech manufacturing equipment

An end-to-end solution spanning from the collection of raw sensor data to an interactive real-time visualization

Goal: increase system yield by utilizing sensor data for predictive maintenance

ECD Process - Novellus Sabre
Challenges

High-velocity streaming sensor data
• 100s of sensor per machine with 1kHz

Near zero latency analysis
• Current solution: 30 minutes delays

Advanced analytical algorithms
• Clustering on streaming data

Novellus Sabre Plating Cell
Goals of Analysis

Correlation of sensor data for non-trivial insight into system health

Automatic filtering of meaningful correlations

Predictive analytics for maintenance

Novellus Sabre SOIC Controller – Bathmodule and Plating
Analytics for advanced scenarios: Adaptive maintenance planning and Risk Management

Advantages

- Proactively and correctly schedule maintenance and determine uncertainties of equipment to prevent unexpected failures, ensure maximum availability and improve performance.

- Increase machine and systems self-awareness capabilities.
thank you

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Feedbacks geben und an der Verlosung des **FitBit Armbands** teilnehmen!