Future of Manufacturing

Towards Industrie 4.0
Industry is once again considered the driver for growth and stability worldwide

**USA**
"Manufacturing Renaissance"
- Formation of a "National Network for Manufacturing Innovation"
- Use of national shale gas and oil deposits (fracking)

**Germany**
Maintain leading industrial position
- Sustainable investment in innovative strength
- High level of exports
- **Industrie 4.0 as new guiding principle**

**China**
Higher product quality by use of high-end technology
- Rising wages
- Need for quality driven demand for automation
- Energy efficiency legislation

**India**
Increased investments to improve production technologies (quality, safety, efficiency)
- Industry contributes to about 25% of GDP
- Energy Conservation legislation in place
- Need to improve productivity through Automation

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Challenges:
Manufacturing changes are needed faster than ever before

Raise efficiency
- Energy and resource efficiency as decisive competition factors

Reduce time-to-market
- Shorter innovation cycles
- Ever more complex products
- Larger data volumes

Increase flexibility
- Individualized mass production
- Volatile markets
- High productivity

Industrie 4.0 will help manufacturing overcome the challenges it faces
Roadmap towards Industrie 4.0: Evolution, not Revolution

Introduction of electronics and IT to further automate production

Integration and optimization of the entire product development process

Industrie 4.0 – Optimization of production through cyber-physical systems (CPS)
- All components of production are connected with the aid of sensors, RFID chips.
- The product itself is an active part of the production process.
- All information related to product & production life cycle mgmt. is available as a digital model.

On the way to Industrie 4.0
Industrie 4.0 – A vision on the way to reality

The Siemens way to Industrie 4.0
The future of manufacturing – covering the entire product development and production process

• Need to integrate all the steps along the value chain through seamless data connection based on excellent industry software to improve productivity and efficiency
• For each product, alongside its physical depiction, a virtual depiction is available at every stage of the value adding process which continues to undergo further development.
Merging the virtual and real manufacturing worlds: Digital Enterprise Platform

- Cohesive data connection across every stage of the value adding process leading to optimum integration of real & virtual worlds is established using the elements of the Digital Enterprise Platform
Change of paradigms for the next productivity stage: Integrating product and production lifecycles can reduce time-to-market by 50%
Real and virtual worlds are converging thanks to our Digital Enterprise Platform

• It is only through digital depiction of the complete value chain, that we will be able to achieve all conceivable advances in productivity
2. Portfolio for Discrete Manufacturing
Siemens Industry Software

Process Steps

PLM
- Teamcenter
  (cPDM – collaborative Product Definition Management)
- NX
  (CAD-CAE-CAM)
- Tecnomatix
  (Manufacturing planning)
- LMS
  (Simulation and Testing Solutions)

MOM
- SIMATIC IT
  Manufacturing Execution System / Advanced Production Scheduling
- IBS
  Quality Management System

TIA
- Planning Efficiency
- TIA Portal
  Engineering Framework
Example for discrete industries:
Covering entire product and production lifecycles
Automotive manufacturers reach the next level of production thanks to industry software

**BMW: Integrated industry software optimizes production at BMW in Shenyang**

Electrical and mechanical turnkey solution in BMW Brilliance¹) assembly factory

- Totally Integrated Automation (TIA), STEP 7 for PLC, LIS and integrated PROFIsafe, SIMATIC S7 controllers, SINAMICS drives
- All BMW cars can be produced on one manufacturing line (so far X1 and 3 Series) – future extension possible
- Ergonomic adjustments to production plant and high safety standards
- 99%+ availability – helping assembly plant to avoid bottlenecks:
  - Low downtimes
  - High quality

¹) Joint venture of BMW Group and Brilliance China Automotive Holdings Ltd
Industrie 4.0 – A vision on the way to reality

To dos: A lot needs to be done!
Vision of Manufacturing: Industrie 4.0

Product development, production and services communicate through software and networks.

Machines and products exchange information and instructions in real time.

Autonomous control and optimization.
Our perspective of Industrie 4.0
What needs to be done!

Today: Industrie 3.x
- Local controls
- Realtime communication
- Digital "copies" of products and production
- Manufacturing Execution Systems
- Industrial security concepts
- Execution and decision making mainly by humans

Future: Industrie 4.0
- Rule framework and architecture for dynamic topologies
- Massively extended implication for M2M communication
- Integrated process simulation
- ...

- Dynamic network of local controls
- Extended complex communication
- Digital models of the overall process and participants
- Process optimization in dynamic networks
- Self-configuring security concepts also for temporary requirements
- Humans to define rules and frameworks for decision making

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Siemens
The right partner to realize Industrie 4.0

Siemens’ expertise …

- Great experience as pioneer in automation since 1958 with SIMATIC
- Leading global automation vendor with largest installed base – 20 billion Euro investment
- Trendsetter with Totally Integrated Automation, introduced in 1996
- Establishing of PLM environment since 2007
- Driver for standardization like Profinet, IEC, PLC open, …
- Digital Enterprise Platform, the best-in-class, integrated product portfolio to manage design and production complexity