The future of industrial manufacturing
Connecting Virtual with Physical
Combining processes

Designing technology
Combining processes

Testing technology

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Software for all stages of the value chain
Shorter Time to Market

Time to Market

50%
Comprehensive Software Offering

- PLM Software
  - Mechatronic Concept Designer
- Virtual Numeric Control
- Automation
  - CAD-Software NX
  - Data Driven Services
  - Computer Aided Design
- Visualization
  - SIMATIC IT Preactor
- COMOS
- Simulation
- Design
- Tecnomatix
- Condition Monitoring
- Optimization
- Industry Software
  - COMOS Walkinside
- Planning
- Production Engineering
Increase production availability and reliability

Including proven benefits:

- Reduction of work in progress
- Increase in productivity
- Increase in on-time-delivery
Challenges:
Manufacturing is changing faster than ever before

Increasing competitiveness

1. Increase efficiency
   - Energy and resource efficiency are decisive competitive factors

2. Shorten time-to-market
   - Shorter innovation cycles
   - More complex products
   - Larger data volumes

3. Enhance flexibility
   - Individualized mass production
   - Volatile markets
   - High productivity

Leveraging future manufacturing initiatives helps managing production challenges
In economies around the world, industry is again seen as an engine of growth and stability

<table>
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<tr>
<th>Country</th>
<th>Key initiatives</th>
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| USA     | "Manufacturing Renaissance"  
- Formation of a "National Network for Manufacturing Innovation"  
- Lower cost energy initiatives  
- Smart Manufacturing Leadership Coalition |
| 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  
- Intelligent Manufacturing |
| Japan   | A cohesive “innovation program” at all levels  
- Science, technology and industry linked together  
- Retain manufacturing of complex products  
- “Innovation 25” initiative |
The Future of Manufacturing:
From vision to reality - three core elements

1. Production network
   Realization of flexible value chains based on powerful MOM: Manufacturing Operations Management

2. Fusion of virtual and real world
   Integration of product design and production engineering based on a common Digital Enterprise Platform

3. Cyber-physical systems
   Migration towards an intelligent „plug 'n' produce“ integration of automization; modulare, flexible production units
**Industrie 4.0**
Production based on cyber-physical systems

**“Smart” products**
- The product to be manufactured has all the necessary information for every step of its production

**Flexible production units**
- Optimized organization of networked production facilities taking into account the entire value chain
- Production steps are configured flexibly in response to changing situations

**Reduction of complexity due to “smarter” structures**
Roadmap towards future manufacturing: Evolution, not Revolution

- Introduction of electronics and IT to further automate production
- Integration and optimization of the entire product development process
- Optimization of production through cyber-physical systems (CPS)

1960 2010 2030

On the way to Industrie 4.0 … smart manufacturing…. Intelligent manufacturing … etc.
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
- 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

- Rule framework and architecture for dynamic topologies
- Massively extended semantics for M2M communication
- Integrated process simulation
- …
Example for discrete industries:
Covering entire product and production lifecycles

Product design → Production planning → Production engineering → Production execution → Services

PLM Software → Totally Integrated Automation

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The automation portfolio for discrete industries

Enterprise Level
- ERP
- PLM

Management Level
- MES

Operator Level
- SCADA

Control Level

Field Level
- SIMATIC NET
  Industrial Communication

NX
  Product Development

TEAMCENTER
  Collaborative PDM

TECNOMATIX
  Digital Manufacturing

PLM

SIMATIC IT Production Suite

SIMATIC IT Intelligence Suite

SIMATIC WinCC
  SCADA System

TIA PORTAL
  Engineering Framework for Automation Tasks

SIMATIC Controllers

SIMATIC HMI

SINUMERIK
  CNC

SIMOTION
  Motion Control

SIRIUS
  Industrial Controls

SIMATIC IDENT
  Industrial Identification

SIMATIC Distributed I/O

SINAMICS
  Drive Systems

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Smarter decisions, better products.
Tecnomatix – Digital Manufacturing
What is Digital Manufacturing

Digital Manufacturing is an integrated suite of tools that work with product definition data to support tool design, manufacturing process design, visualization, simulation, and other analyses necessary to optimize the manufacturing process” - CIMData
Digital Manufacturing
Is an Integral Part of our PLM Strategy

Digital Manufacturing
Supporting the Life Cycle from Planning through Production

1. Plan
2. Simulate
3. Optimize
4. Validate

Manufacturing Time?
Cost?
Manufacturability?
Make or Buy?
Resources?
Output?
Reference Projects?
Space Allocation?
...?
Utilization?
Delivery Date?
Location?

1. Plan
2. Simulate
3. Optimize
4. Validate

Typical Mfg. Engineering Scenario

Digital Manufacturing
Supporting the Life Cycle from Planning through Production

Make or Buy?
Space Allocation?
Reference Projects?
Cost?
Manufacturing Time?

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Location?
Utilization?
Delivery Date?...?
We have the most complete manufacturing software portfolio
WHY?

To handle the complexity and challenges of bringing products to market faster while ensuring that manufacturing processes are aligned for aggressive product launch goals are the key drivers that cause leading manufacturers to look for such a solution.
WHY?
Reduce cost of change with early detection
Reduce cost & eliminate human factor issues upfront
Increase productivity of new or existing production facilities by 20 percent
Optimize ROI for capital equipment investments

Right-First-Time Manufacturing Plans
WHY?

In the manufacturing phase less than optimal decisions will have a lasting effect on productivity and delays can quickly erode profitability.

Flawless Launches and Continuous Improvement
Planning

- Manufacturing Process Planner
- Advanced Assembly Planning
- Process Designer
- Electronic Work Instructions
- 3D-PDF Work Instructions
- FactoryCAD
- FactoryFLOW
- In Context Editor
- Variation Analysis (VSA)
Simulation

- Process Simulate Assembly
- Automatic Path Planner
- Process Simulate Robotics
- Robcad
- RobotExpert
- Plant Simulation
- Value Stream Mapping
- Jack
- Process Simulate Human
- Jack Occupant Packaging
- Jack Task Analysis Toolkit
Production

- Issue Management and CAPA
- Plant Simulation
  - Virtual Commissioning
  - Process Simulate Commissioning
- PLM-MES Collaboration
  - Shop Floor
  - IntoSite
- Dimensional Planning & Validation (DPV)
New developments and upcoming tools
What is IntoSite?

IntoSite is a cloud based web application that enables 3D navigation through production sites and provides simple access and sharing of Digital Manufacturing and Production info in 3D context.
Key Values

IT Information easily available

- For managers, engineers and plant personnel alike
- Leverages IT investment and makes it available company wide

Sharing and collaboration

- Break the “wall” between central planning and factories
- Encourage Interaction & knowledge exchange
What is IntoSite iPad Application?

IntoSite iPad Application is a location aware application that display to the user PLM and IT information from IntoSite and allows him to add information to IntoSite directly from the shop floor.
Techniques for Location aware app

- QR codes
  Created in IntoSite, scanned on the shop-floor

- Company addresses
  Created in IntoSite to reflect “addresses” in the plant.
  App user can search for any address
Capabilities

View information

Display placemarks in the given radius around the factory position

Filter the Results

Search placemark from the list
Capabilities

View information

Add information

Select type of information to upload to IntoSite

Current:
Photo or Video
Wearable device use cases
Google Glass – first prototype

- **Electronics working instructions** are presented to the operator in shopfloor through wearable device, to enable hands-free operation
  - Step sequence: textual instructions, 2D images, 3D and animation are presented
  - Voice recognition to navigate between screens
  - Text to speech to hear instruction

- **Share information or report issues** from the shop floor using wearable device based on the user location in the factory
  - Add photo or movie

- **View placemarks content** in the context of the machine
Google Glass on the shop floor

Placemark was added Successfully to IntoSite
Successes
More than 300 own factories worldwide

More than 1400 reference projects in the industry
Siemens PLM recognized as the world leader in DM technologies
Tecnomatix references
Thank You!