



Industry 4.0 – Competitive advantages through networked production

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Industry 4.0

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Agenda

- What is Industry 4.0?
- Practical implications
- Examples "4.0"
- Summary



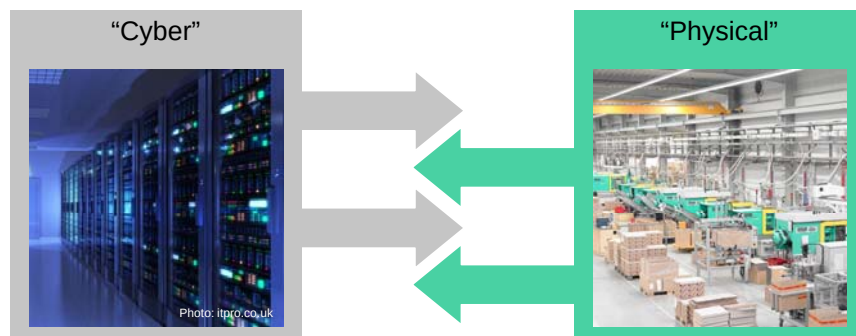
What is Industry 4.0?

Industrie 4.0
powered by Arburg

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Information technology meets machine manufacture.

Cyber-physical systems*



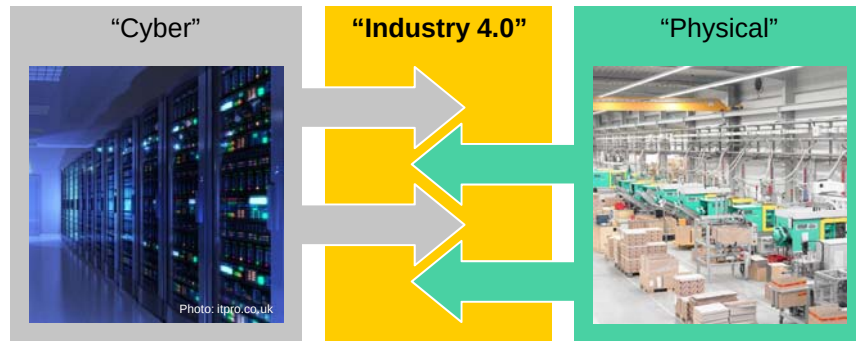
* Composite of software components with mechanical and electronic parts, which communicate via networks

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Cyber-physical systems*



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What is Industry 4.0?

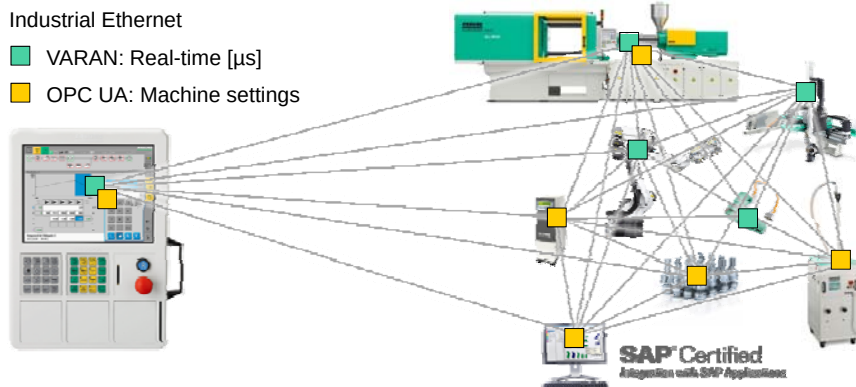
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Prerequisite 1: Integration and networking

Industrial Ethernet

■ VARAN: Real-time [μ s]

■ OPC UA: Machine settings



What is Industry 4.0?



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Prerequisite 2: Flexible production technology



Quick set-up –
change parts easily



Integrated work steps –
“ready-to-use” parts



Industrial additive
manufacturing

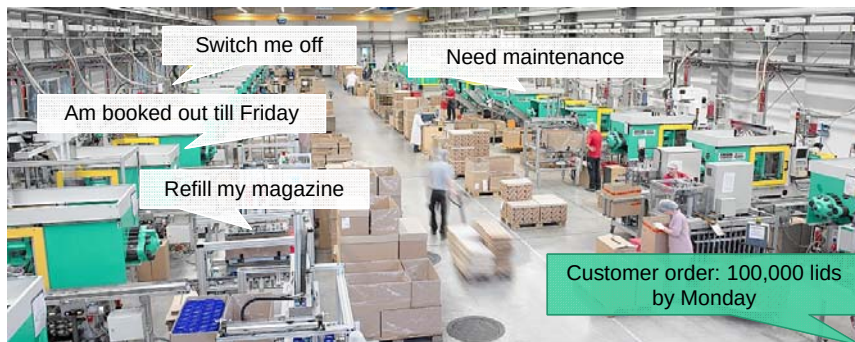
What is Industry 4.0?



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The result: Smart factory

Networked production in the digital factory

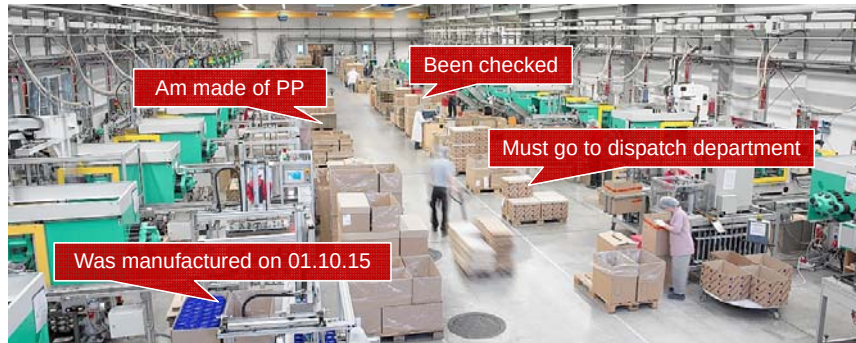


What is Industry 4.0?

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The result: Smart factory

Products also control their manufacturing process themselves



Practical implications

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Components for Industry 4.0

Central machine control system	• Integrated functions for automatic process regulation and active operator support • Integration of robotic systems and peripheral equipment
Flexible production technology	• Simplification of set-up processes • Integration of work steps with automation • Combination of conventional processes with industrial additive manufacturing
Information exchange across all locations	• Networking of complete production • Online data acquisition and archiving • Provision of information on any mobile device
Efficient logistics	• Fine planning of available resources • Design and support of scanner or handheld solutions

Examples „4,0“



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Practical implementation of Industry 4.0

Individualised one-off part



Batch-specific bulk goods



Individualised one-off part



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Establishing new business ideas – with "4.0"

Online orders



- Free choice between eight product versions
- Individualising products with lettering
- Online order immediately initiates production order

Production



- Linking injection moulding with additive manufacturing
- Integrating a production line via OPC UA
- Recording and archiving data online

Logistics



- Unique product labelling and improved traceability
- Calling up data online
- Each product has its own website in the cloud

Individualised one-off part

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Production-on-demand – without set-up

ALS host computer system
guides the operator

- Human/robot cooperation facilitates product changeover
- Automatic provisioning of round or pointed scissors
- Direct visual feedback signal: Scissors properly inserted



Individualised one-off part

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Production-on-demand – without set-up

ALS host computer
system controls
process sequence

- Combination mould for left- and right-handed scissors
- Automatic enabling of a cavity by core pull



Individualised one-off part

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Production-on-demand – without set-up

ALS host computer system networks production

- Unique product identification with ID
- Production process is controlled by the ID
- Automatic transfer of order data for individualisation
- In-line quality assurance



Batch-specific bulk goods

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Improving traceability - with "4.0"

Order planning



- Efficient planning of orders with host computer system
- Integrating production with material feed and quality assurance

Production



- Improving process reliability with transparent material supply
- Recording and archiving data online

Quality management



- Labelling products with material and batch information
- Calling up data online
- Traceability from the finished part to the granulate

Batch-specific bulk goods

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Networking optimises processes

ALS host computer system synchronises production with material supply

- [Material verification through bar code detection](#)
- Automatic assignment of material data to orders
- Labelling with material data
- Traceability from the finished part to the granulate



Batch-specific bulk goods

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Material verification in detail

- Scanning the bar codes at the vacuum point, granulate feed hopper and raw material
- Checking values using a Koch controller
- Enabling material feeding and transfer of material data to host computer system
- Order-based material control by means of an automatic supply switch including emptying system



Batch-specific bulk goods

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Networking optimises processes

ALS host computer system synchronises production with quality assurance

- Start of inspection order with production order
- Automatic transfer of production data to quality management



Summary

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Competitive advantages through networked production

- Industry 4.0 requires
 - rethinking – also for employees
 - special data safety concept
- Industry 4.0 offers
 - reliably informed employees
 - maximum flexibility in production
 - efficient production of small production batches and one-off parts
 - maximum traceability – each product has its own website



