IND4.0 - Expectations and opportunities of the manufacturing industry

Aleš HANČIČ, Dragan KUSIĆ

TECOS, Slovenian Tool and Die Development Centre

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Introduction

- The most comprehensive definition of IND4.0 is introduction of ICT technologies on **massive scale** into production processes in order to achieve 30 % productivity improvement
- IND4.0 main purpose is to improve the existing level of production automation with the digitalization of production and integration of all production sites in the total value chain.

Introduction

- Production sector will significantly benefit from the implementation of such solution, which will enable:

- efficient flexible production,
- short production cycle,
- lower consumption of energy and materials.

Introduction

- The aim of future 'smart factories‘ is to establish mutual communication between machines, devices and future end products (barcode, RFID, etc.).
- Incoming raw materials, equipment and machinery are connected to industrial IoT (modular way) in early stage .
- Ensure highly flexible and individualized mass production.

Barriers in implementation

- **Courage** to carry out serious changes?
- Coordination within the company?
- **Lack** of proper staff competencies
- Questionable **security and data protection**
- The reasonableness of the eligibility of investments for the modernization of the entire IT architecture

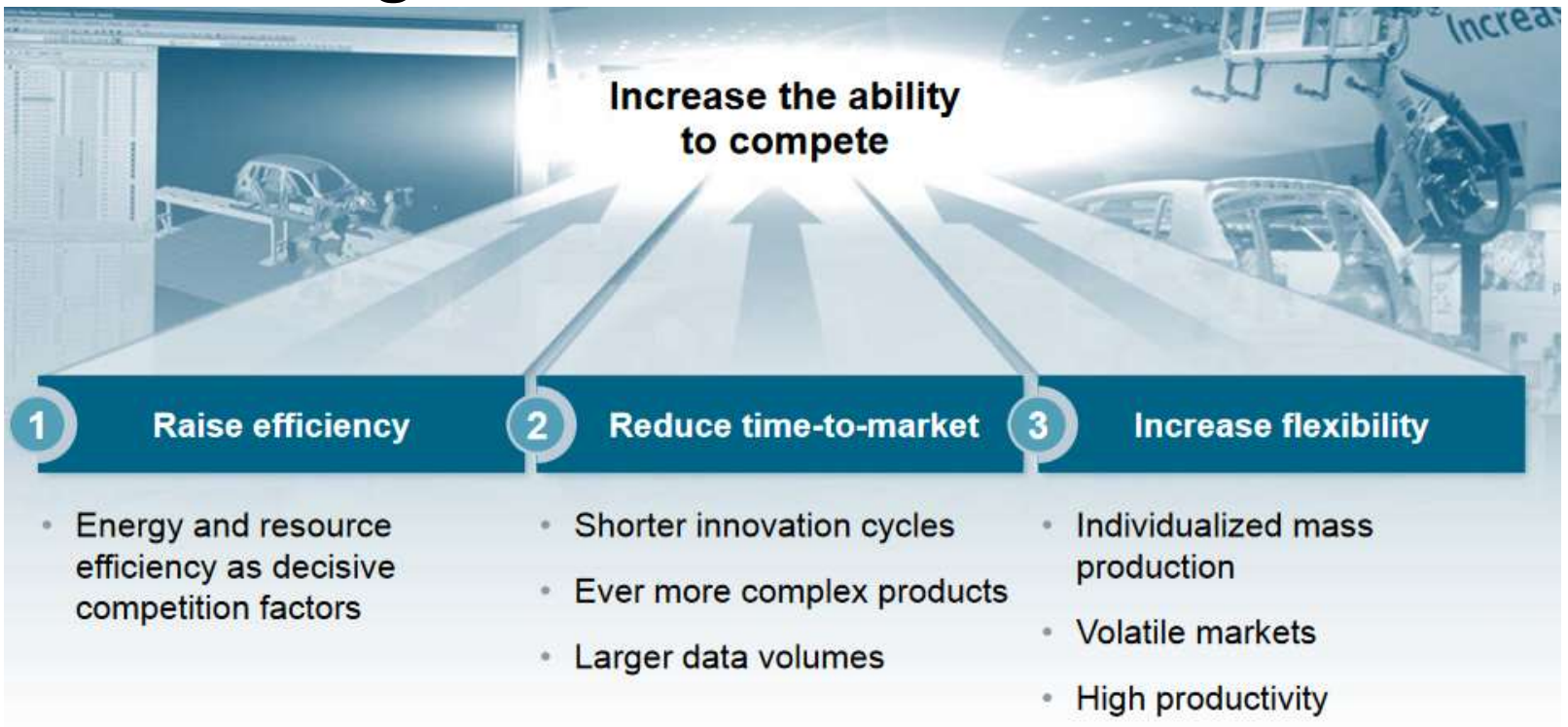
Barriers in implementation

The biggest manufacturing challenges:

- What data (or information) to collect?
- Who or what will get the information derived from the data?
- How will we use the information?
- Were the correct decisions taken?

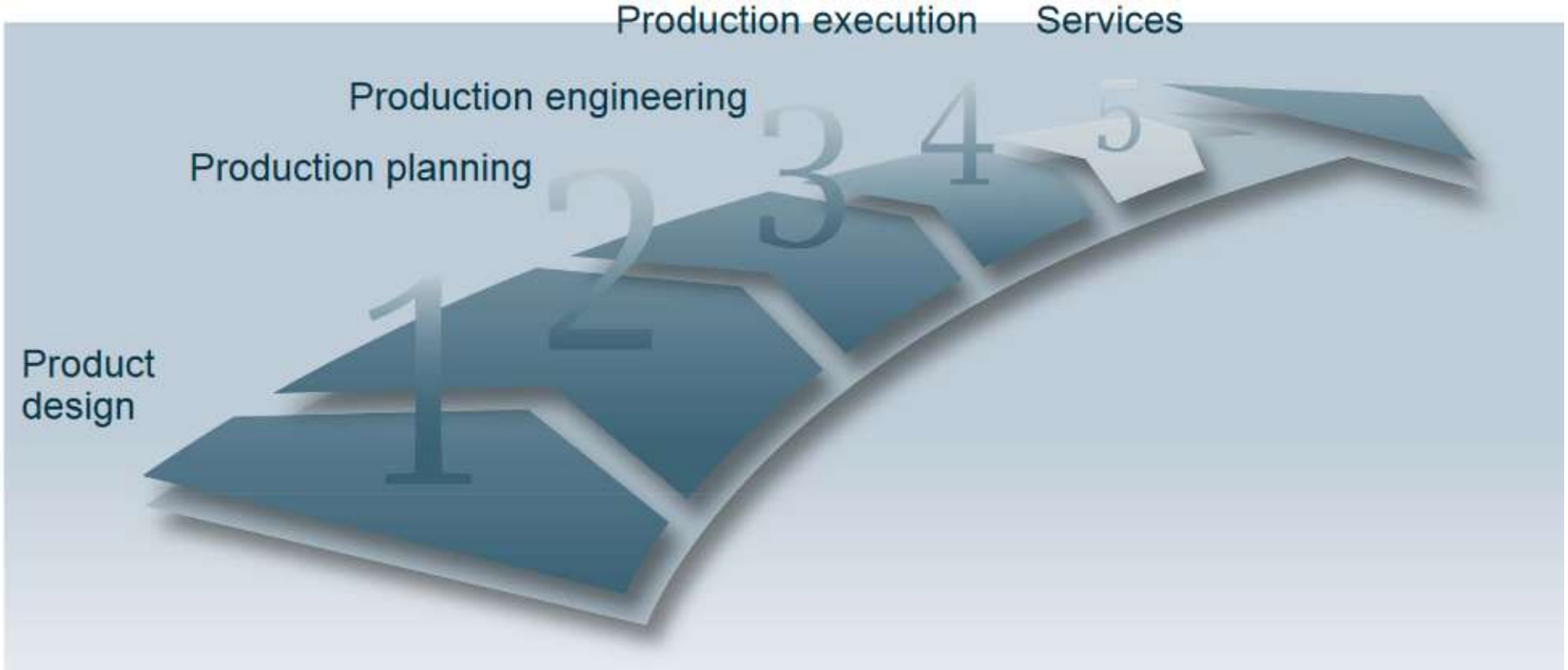
The future of manufacturing - Siemens view

- Manufacturing changes are needed faster than ever before and Industry 4.0 will help to overcome the challenges it faces

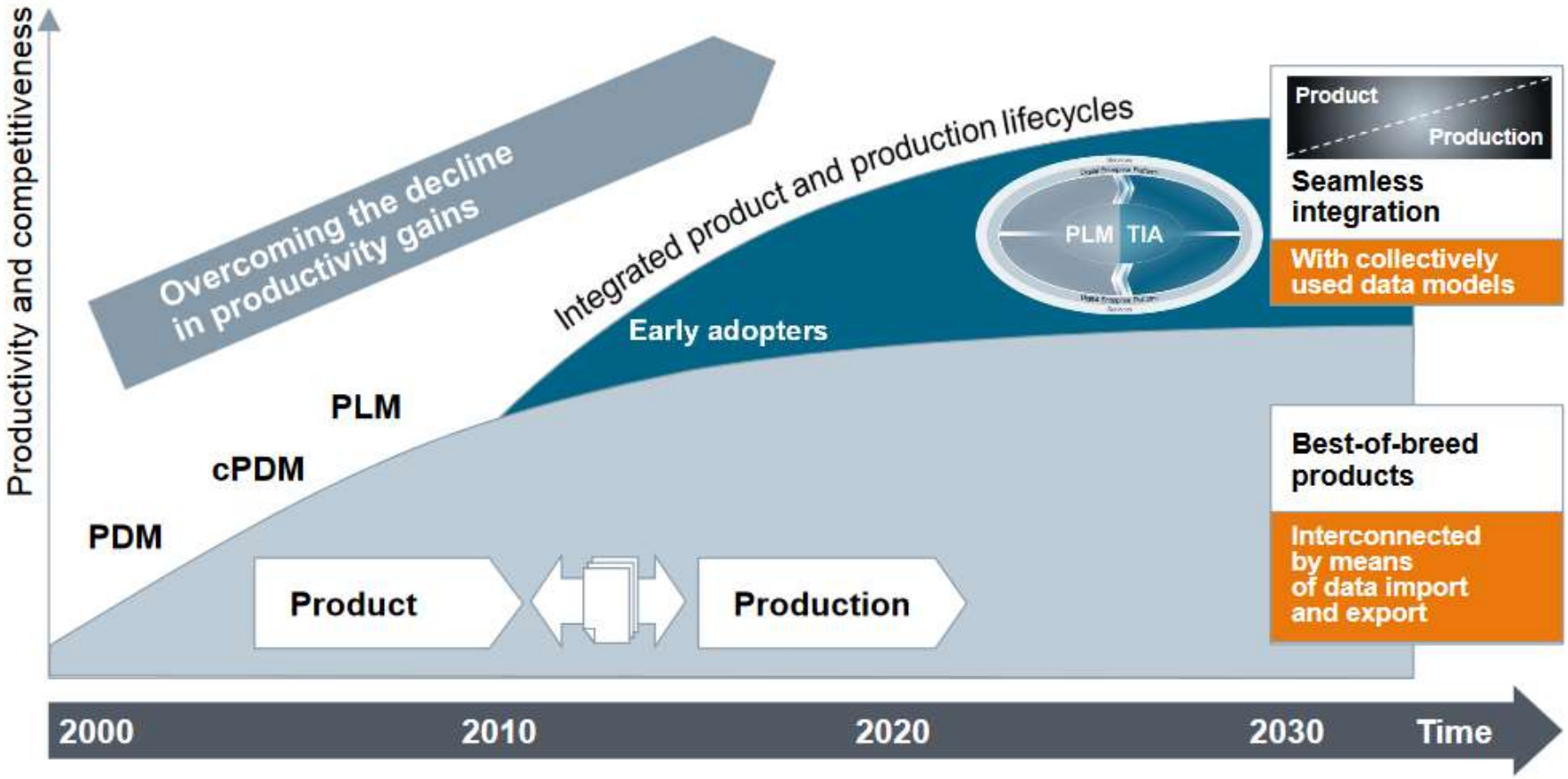


The future of manufacturing - Siemens view

- 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.

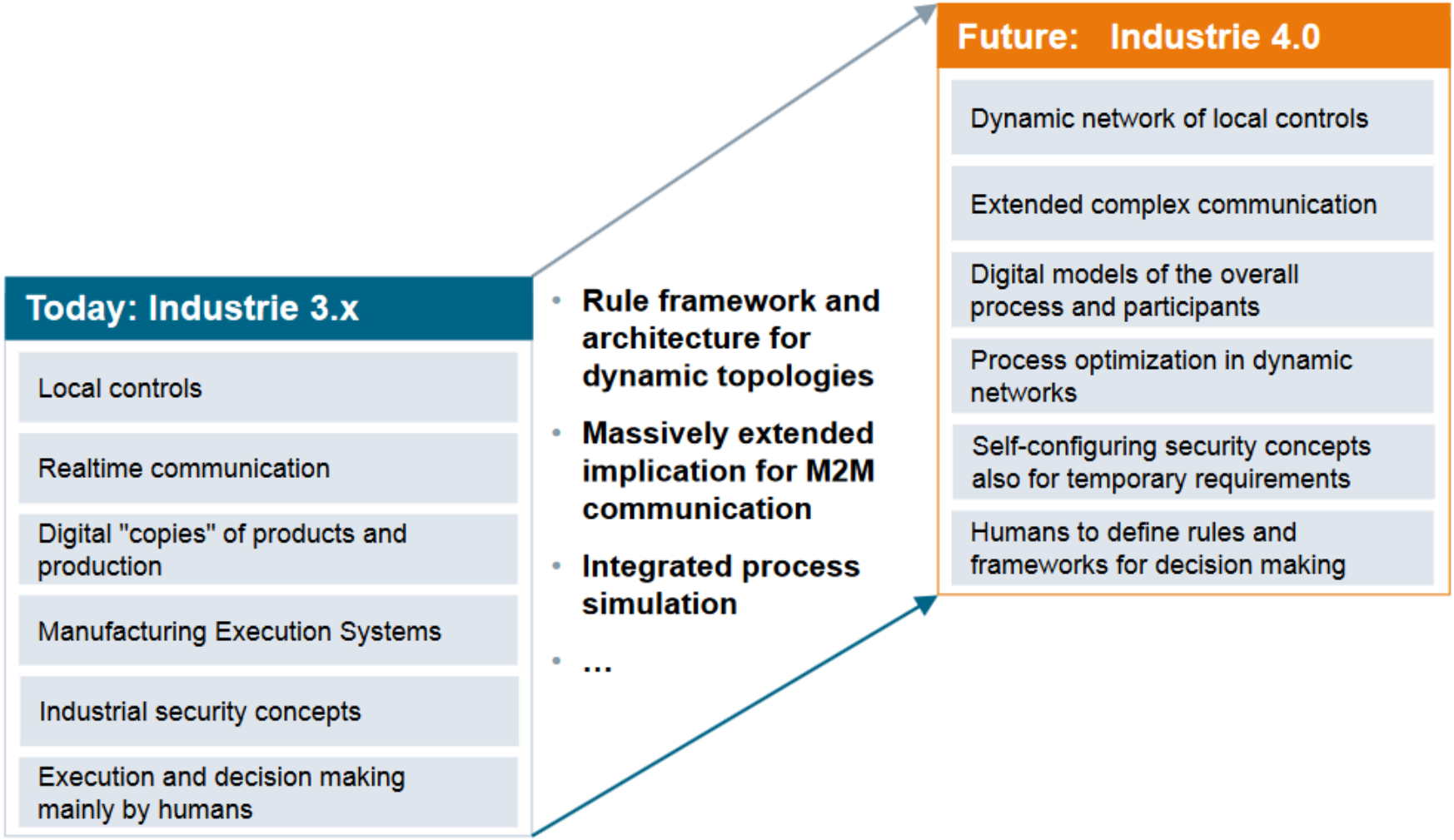


The future of manufacturing - Siemens view



Change of paradigms for the next productivity stage:
Integrating product and production lifecycles can reduce time-to-market by 50%

The future of manufacturing - Siemens view



The future of manufacturing - Siemens view

- Manufacturing beyond 2025

Plattform INDUSTRIE 4.0

Industry 4.0 …

- Organisation and control across entire value chain & product life cycle
- Individualised to customer wishes
- Encompassing all phases:
  - From idea to order
  - Development and production
  - Delivery to the customer
  - Even recycling and related services

Key research areas

- Horizontal integration via value-added networks
- End-to-end engineering across the entire value chain
- Vertical integration and networked production systems

Source: acatech, April 2013 "Recommendations for implementing the strategic initiative Industrie 4.0"

Solution: Machine Tool 4.0

- Schaeffler- leading manufacturer of industrial bearings for automotive, aerospace and machine building industry
- Data-oriented production
- Digitalization of total production
- Accurate monitoring of machines (optimum performance)
- Ensuring adequate maintenance

Solution: Machine Tool 4.0

- Machine Tool 4.0 created on the basis of joint R&D project with DMG MORI
- 2 prototype machines (DMC 80FD duo block machining center) used for the implementation of Industry 4.0 solution

Solution: Machine Tool 4.0

- Actual manufacturing machine

Solution: Machine Tool 4.0

- Bearings are key components in drive systems
- Present in all the moving parts of the machine
- The installation of digital sensors in the bearing elements
- Collecting, analyzing and sharing information leads to better decisions in the production process
- Machine parts connected to industrial IoT help to increase the utilization rate and product quality

Solution: Machine Tool 4.0

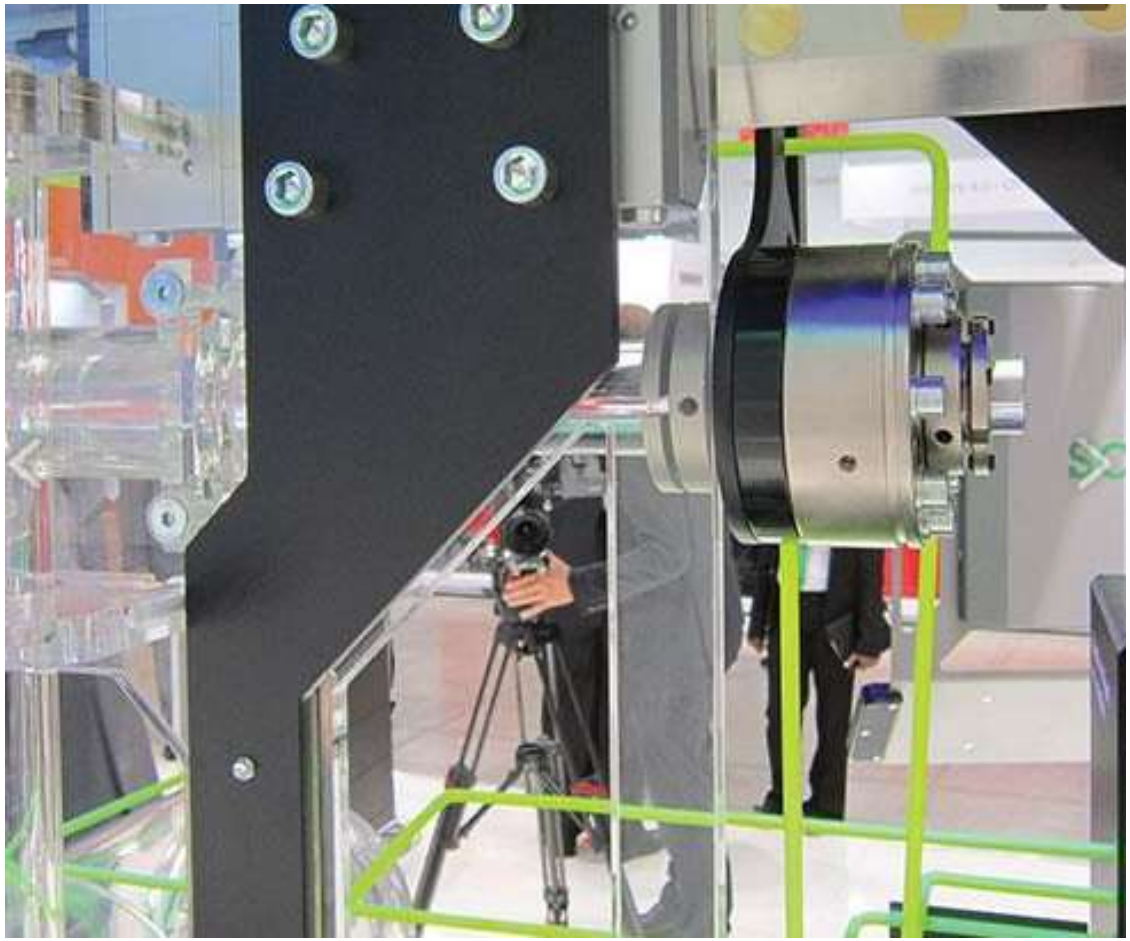
- Control system in both prototype machines have built-in programs for the manipulation of measured sensor data and analysis of the machinery state

Solution: Machine Tool 4.0

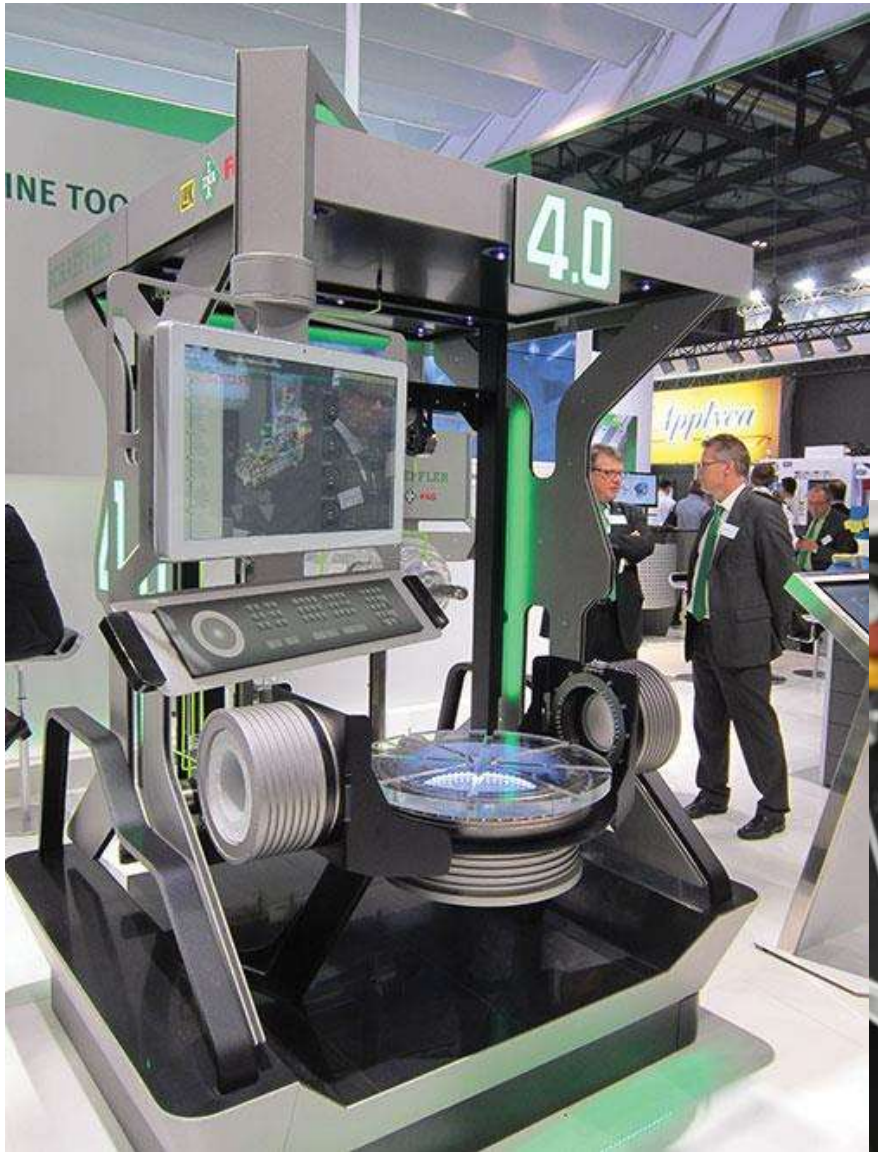
- In both machines more than 60 sensors are built-in to measure vibration stress forces, temperatures and pressures in specific points of individual bearings.
- The machine is connected to a Profibus network to which the user can connect additional sensors and actuators, and external control units
- OPC UA protocol used to exchange data between the control system and Celos GUI.

Solution: Machine Tool 4.0

- Machine Tool 4.0 presented on the Hannover fair

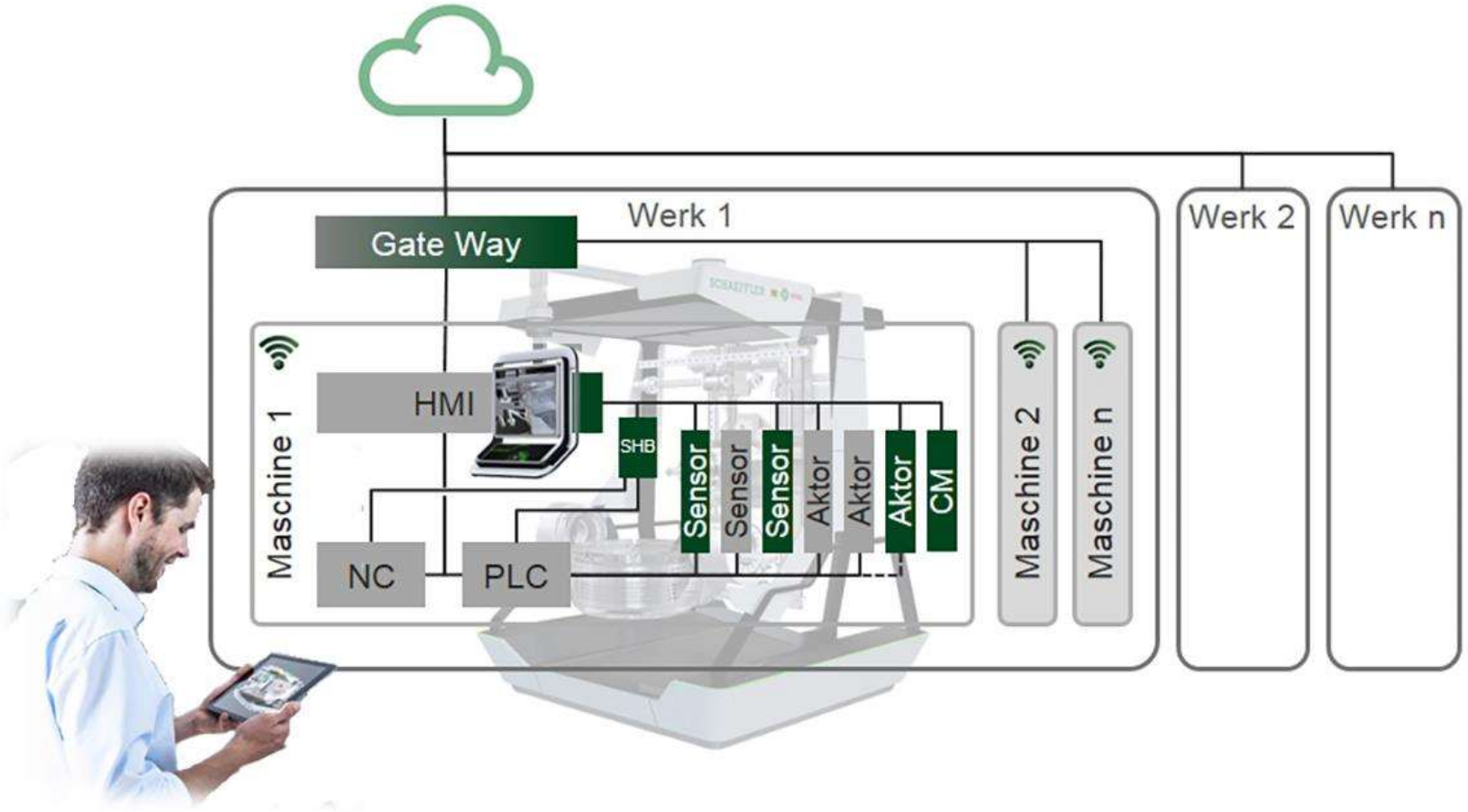


Solution: Machine Tool 4.0



Solution: Machine Tool 4.0

- Architecture



Solution: Machine Tool 4.0

- Data can be transferred to cloud
- Improving methods for preventive detection of faults in the bearings
- With the digitization of production they achieved better flexibility
- Individual (isolated) solutions, which require manual interventions, are blocked
- Vertical integration enables connection to ERP system - automatic processing of orders

Solution: Machine Tool 4.0

- Easy monitoring of entire production

Conclusion

- Future of manufacturing will increasingly be based on improved: accuracy, productivity and efficiency!
- Improved automation level will allow greater production flexibility and easier integration with emerging innovative production technologies
- Built-in intelligence will allow better production cycle optimization

Thank you for your attention.

dr. Ales Hancic
TECOS, Kidričeva 25, 3000 CELJE
ales.hancic@tecos.si
www.tecos.si