IoTWeek
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Challenges for future food production

Growing demand
• World population growth: 10 billion in 2050
• Increasing demand from developing countries

Limited resources
• >25% of food is wasted in production, processing and consumption
• Water and arable land are becoming scarce resources

Lack of consumer trust
• Missing transparency in food production and processing
• Insufficient food safety in some regions

Lack of integration along value chain
• Fragmented market

Food production and processing must become more...

... transparent
... sustainable
... efficient
... personalized
... integrated
Industrie 4.0 - The next level of manufacturing

- Humans, devices and systems are connected along the entire value chain
- All relevant information are available in real-time – across suppliers, manufacturers and customers
- Parts of the value chain can constantly be optimized with respect to different criteria, e.g. cost, resource utilization, customer needs
“Industrie 4.0“ impacts on every food company in 3 dimensions

01 Digitization and integration of vertical and horizontal value chains
02 Digitization of product and service offerings
03 Innovative digital business models

Smart factory
Smart plant
Smart services
Smart products

Source: ZVEI following PwC
The Digital Enterprise for the discrete and process industries brings the virtual and real worlds together

Digital Enterprise

### Discrete industry
- **Product design**
- **Production planning**
- **Production engineering**
- **Production execution**
- **Service**

### Process industry
- **Product design**
- **Process design**
- **Engineering**
- **Operation**
- **Service**

#### Optimizing the entire value chain
- Industrial software and automation portfolio
- Industrial communication
- Industrial security
- Industrial services

From “Integrated Engineering” to “Integrated Operation”
The Digital Enterprise for the discrete and process industries brings the virtual and real worlds together.

**Integrated Engineering**
- Cloud platform and operating system
- Data analytics
- Asset Performance Management
- (2D/3D) & commissioning

**Digital Twin & Simulation**
- Recipe, feedstock quality, ...
- Process & plant documentation
- Real Plant

**Integrated Operations & Services**
- Secure Connectivity
- Digitally enhanced products
- Maintenance

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1. Product design
2. Process & plant design
3. Engineering & commissioning
4. Operation
5. Service

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The digital twin is the “heart” of the smart factory

- Digital **Product** Twin
  - Ideation

- Digital **Performance** Twin
  - Utilization

- Digital **Production** Twin
  - Realization

MindSphere: The cloud-based, open IoT operating system
Digital Twin of a Food Product

MindSphere

Feed back insights to continuously optimize product and production

Packaging  Formulation

Digital Twin of the product  Digital Twin of the production  Digital Twin of the performance

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Example
Flexible production system

1. Product specified independently from production equipment

2. Production equipment provides machine capabilities (skills)

3. System maps the production task to skills provided by available equipment

4. Sensor feedback enables robust skill execution

5. Skill plans are determined using artificial intelligence and reasoning about assembly knowledge

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Summary

The Digital Twin and adjacent technologies transforms the whole food value chain to become more…

... efficient

... sustainable

... transparent

... personalized

... integrated