

# Industry 4.0 – opportunities for industrial and non-industrial sectors in Colombia



Dipl.-Ing. **Thorsten Körner**  
**Bosch Rexroth Colombia**

# Industry 4.0: Opportunities for Colombia

## Why we are talking so much about I4.0?



We are main provider  
for industrial solutions  
at the more than 270  
plants worldwide



We are part of the  
**Bosch Group**

We lead the  
**Industrial Technology area**

We are leaders in **hidraulics,**  
**automation and control**

We co-created **Industry 4.0**

# Industry 4.0: Opportunities for Colombia

## What is **not** Industry 4.0?



- ▶ A standard product
- ▶ A warranty for success
- ▶ A unique solution
- ▶ Forced automation

Then... **what is it?**

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It is the **potencialization** of two technologies



Industrial technologies are combined and enriched with IT tools, generation a **higher benefit** for the organization.



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## It is an industrial **revolution**



**Mechanization**



**Electrification**



**Digitalization**



**IoT, IIoT, AIIoT**

## It is a human and organizational **revolution**



The main change relies on **people and organizations.**

New concepts generate **new challenges.**

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## Data: the main ingredient



### Requirements

#### Real data

- Data taken from real processes
- Trustable data

#### Real-time data

- Data acquired and processed electronically and automatically

### Data types

#### Conventional data

- Process-related

#### Datos „periféricos“

- Datos relacionados al entorno (p.ej. temperatura, humedad)





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## It is a roadmap: **factory of the future vs. reality**

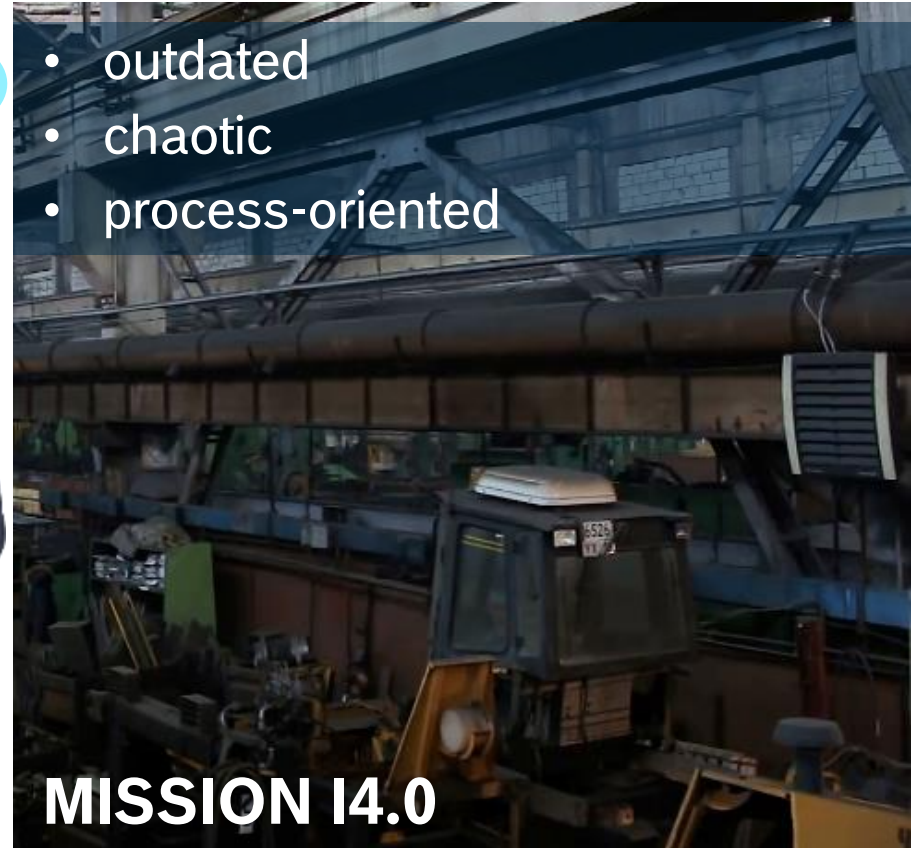
- modern
- interconnected
- autonomous
- **product-oriented**



¿Now what?



- outdated
- chaotic
- process-oriented





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## Expectations for Industry 4.0

Cost reduction

Reduce machine stops

Improve and optimize productivity

Traditional goals

Minimize scrap

Avoid bottlenecks

Minimize stock

New methods / tools

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## Characteristic: **Interconnected machines**



**Flexible Manufacturing  
Control via MES (Manufacturing Execution System)**

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## Characteristic: **digital twin**



## Virtual reproduction of objects and its conditions

- Virtualization at early stages (e.g. functional design) avoids high prototyping/testing costs
- „Life“ twin makes a complete product lifetime simulation possible without even produced a prototype





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## Characteristics: **fast interconnection** and **flexible configuration**



### Value net based on IT infrastructure

- Interconnecting machines, processes and persons

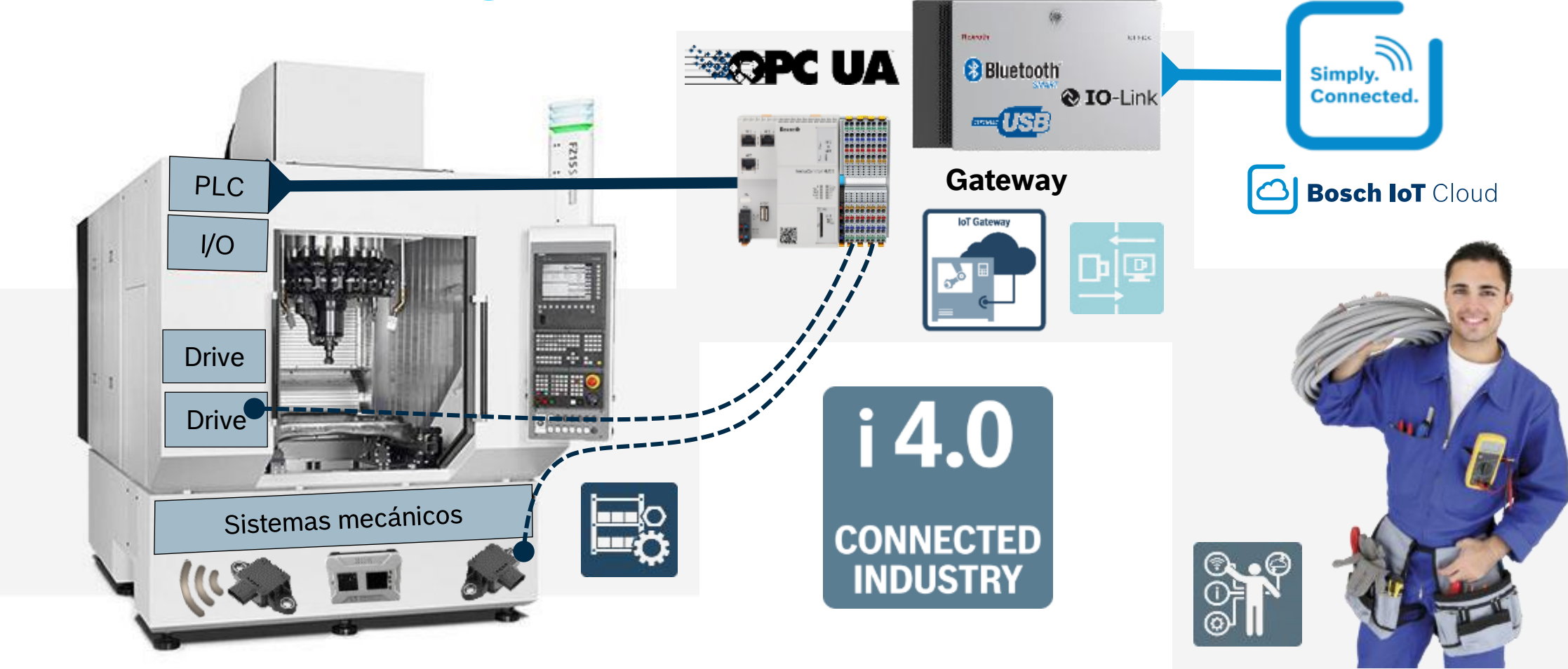
### Flexible machine integration and configuration

- Process divided into steps / modules
- Machines able to align to the process
- „Plug and produce“ concept
- **Product leads the process**



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## The easy way to begin with



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## Implementation phases

**Phase 3**  
Learning



**Artificial Intelligence  
Machine Learning**

**Autonomous  
process  
modification**

**Phase 2**  
Controlling



**Algorithms**

**Complex and  
autonomous  
decisions**

**Phase 1**  
Connecting



**Software  
+  
Hardware (sensores,  
interfases)**

**Maintenance  
+  
Process  
supervision**

**complex  
expensive  
profitable**

**slow**

**implementation  
fast**



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## But wait... please be **LEAN**



Why do we need a LEAN process before implementing I4.0?

It makes no sense to implement a new technology on **WASTE**



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So far for **production...**

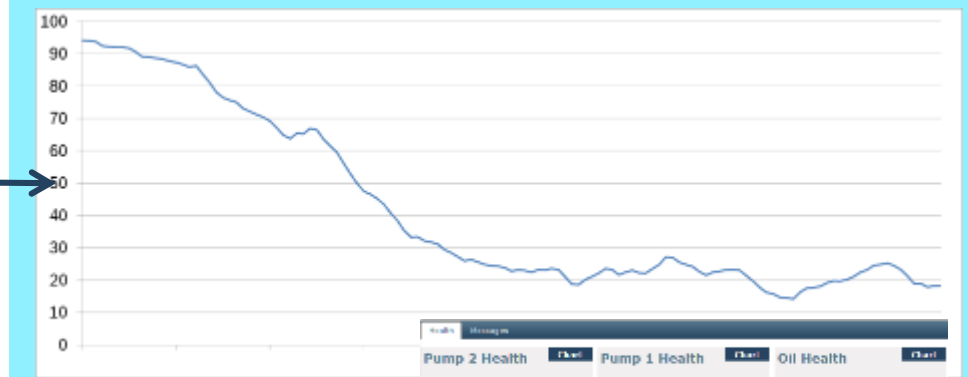
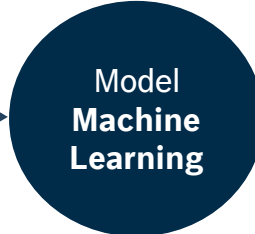
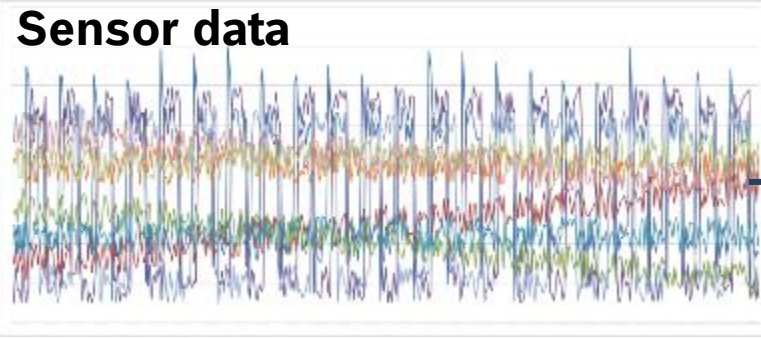




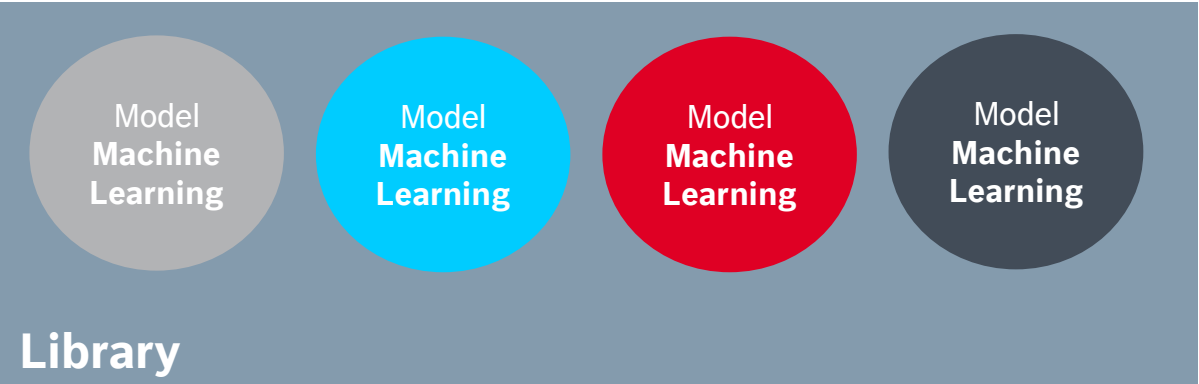


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## Data Management



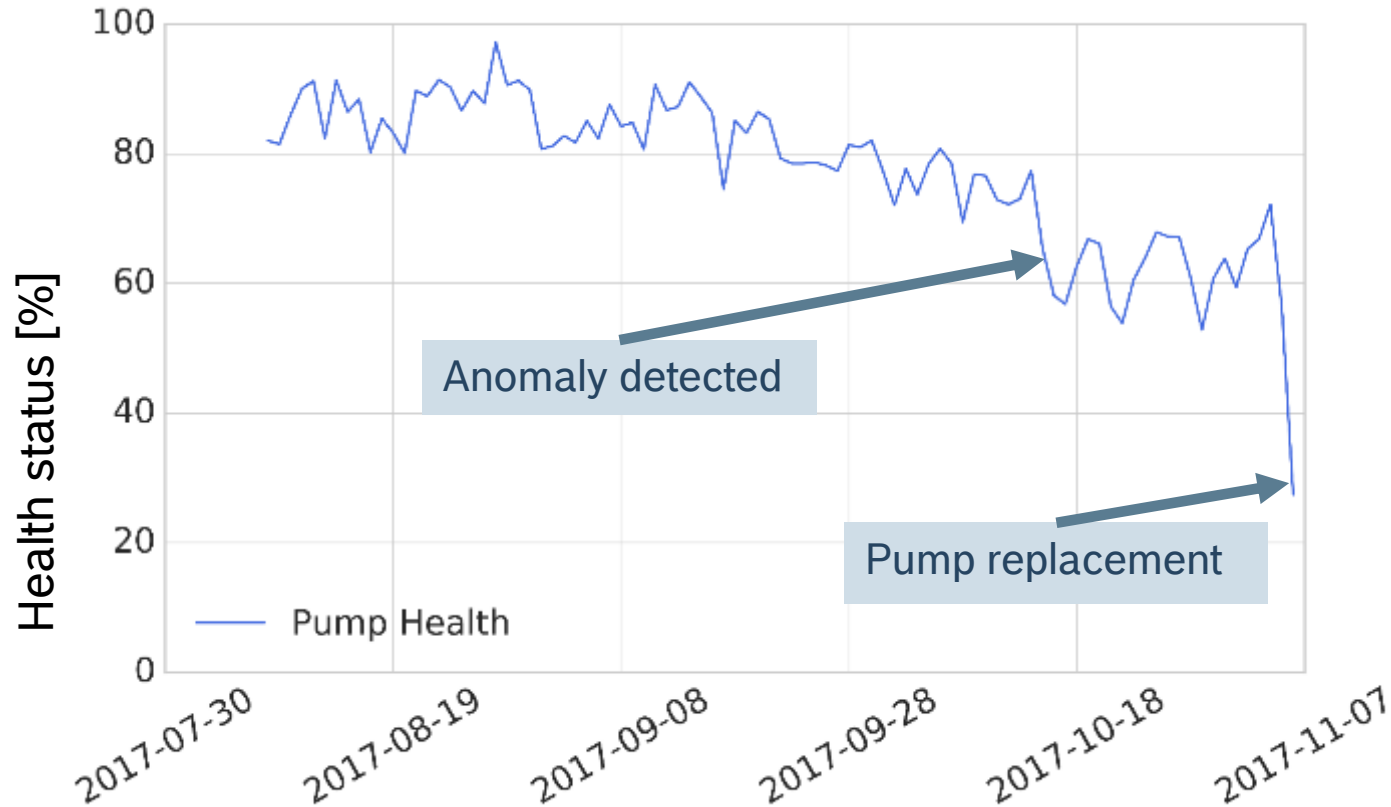
“Health” status



Who knows better the component behaviour than the **manufacturer**?

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## E.g. hydraulic pump

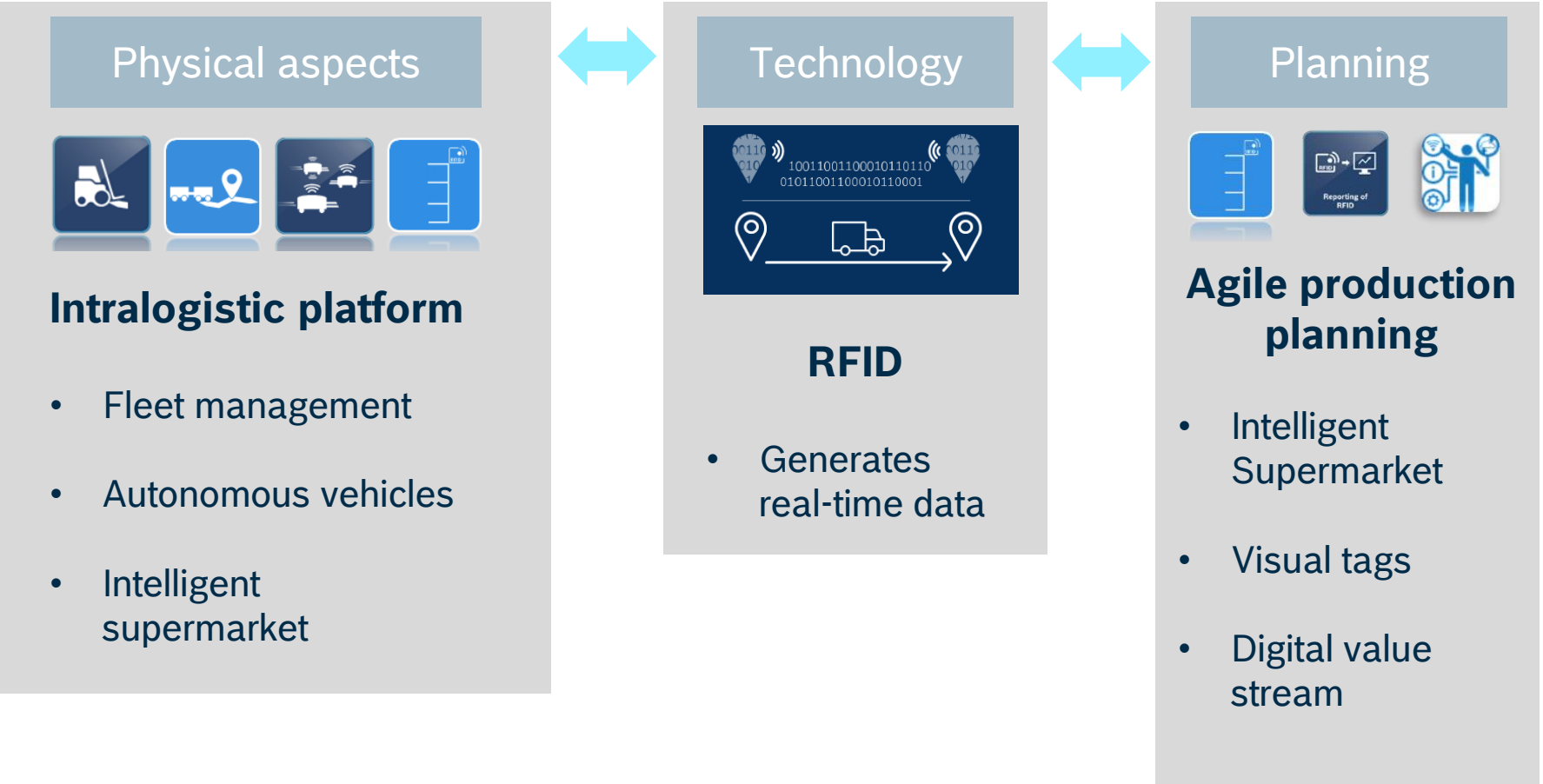


### Results:

- Damage prediction
- Pump worked until replacement
- Unplanned machine stop avoided

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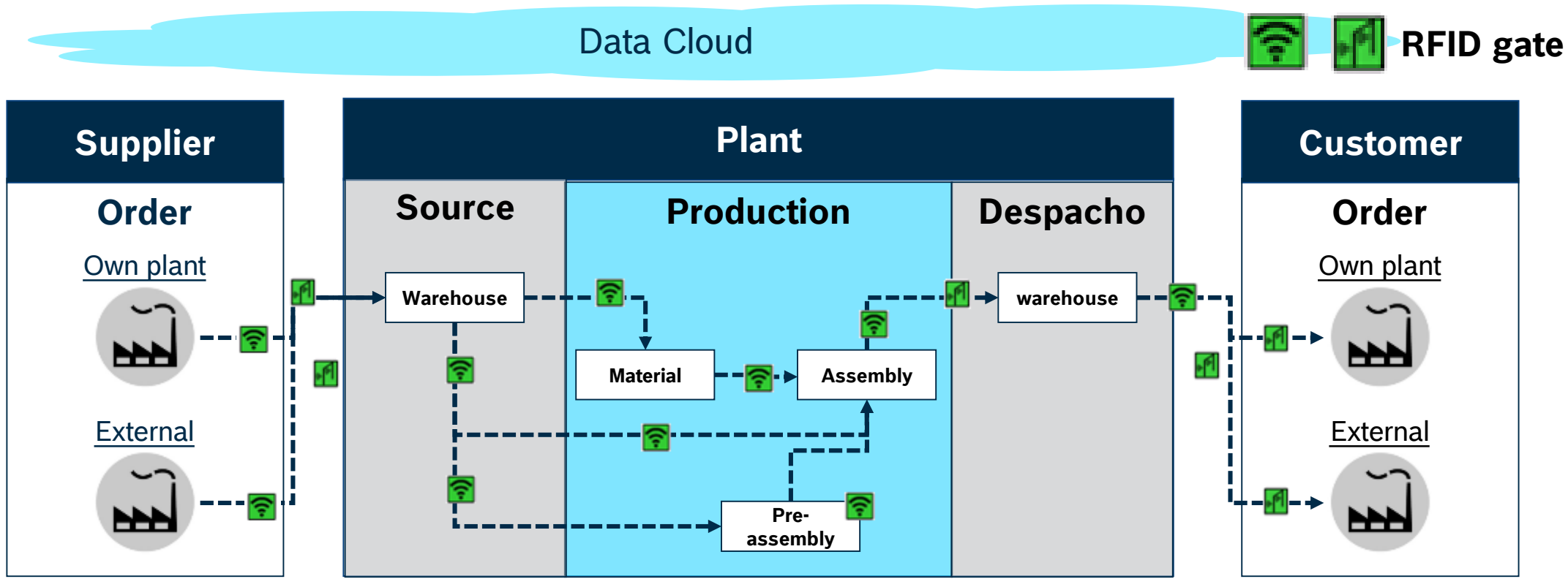
## Logistic assistance system





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## RFID in the value stream



Industry 4.0 related technology applied outside the typical plant boundaries

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## Video: What do the customers want **today**?



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## Unknown for much: **the human factor**



- The professional has to know **all the tools**.
- He must decide **which** tool to use **where** and **when**.
- The suitable solution **depends** on the person.

**Do we have the right professionals?**

**Is our educational system prepared for this new mindset?**



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## Key tasks for education in Industry 4.0

### New talents



- agile
- receptive
- bold
- ...



- impulsive
- chaotic
- without experience
- ...



### Professionals



- experimented
- methodic
- planified
- ...



- slow
- unflexible
- narrow-minded
- ...



**Education has to focus on both groups!**

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## The impossible turned into **reality**

*Lathe acquired by Robert Bosch in 1887*

**Ready for Industry 4.0**



