

# Industry 4.0

## Qs Group Road to IoT



## Who we are ... What we do ...

A group of companies that for **over 40 years** operates internationally in **various industrial sectors** such as: household appliances, automotive, food & beverage, pharmaceutical, chemical, health and mechanical in general.

The Group's **areas of specialization** range from the design and construction of machinery, industrial automation systems and dies, the **development of industrial software** and artificial vision systems, to co-design and product engineering services and after-sales assistance services.

### Organization

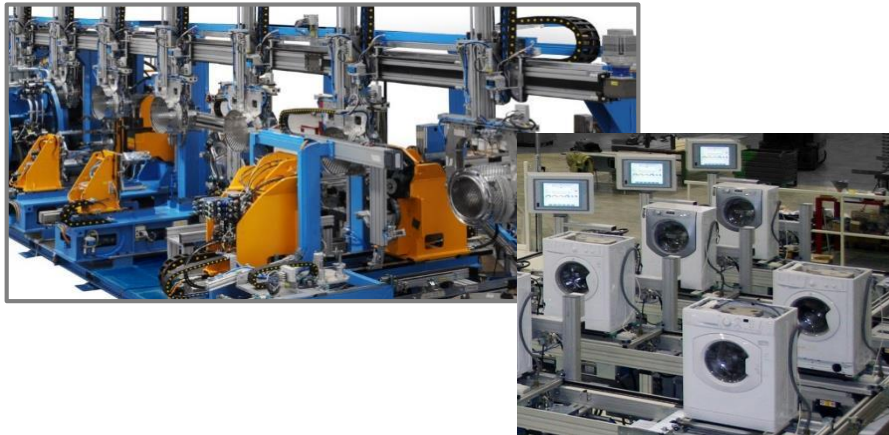
Founder	Giovanni Porcarelli
Employees	280 between white and blue collars
Turnover	60 Mln Euro
Manufacturing Centres in Italy	Cerreto d'Esi (AN) - 15.000 sqm Fabriano (AN) - 8.000 sqm Abbiategrosso (MI) - 5.000 sqm

### Engineering Team

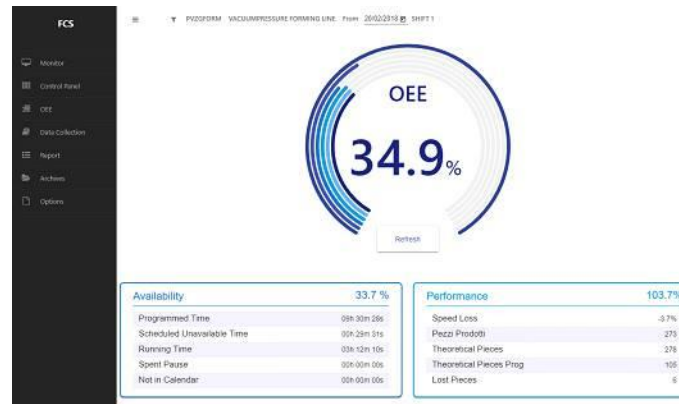
45 Mechanical Designers
10 Electrical Designers
5 Hydraulic Designers
25 Software Designers



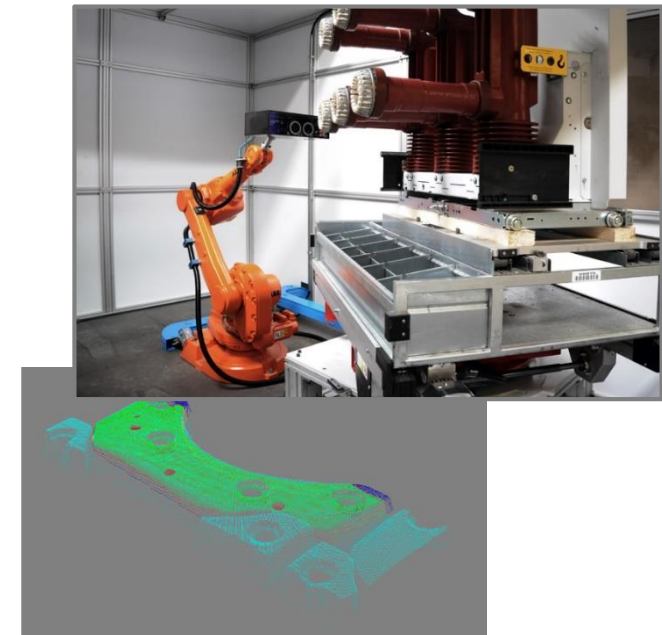
- Sheet Metal Division
- Thermoforming Division
- Polyurethane Division
- Handling and Storage Division
- Assembly and Control Division



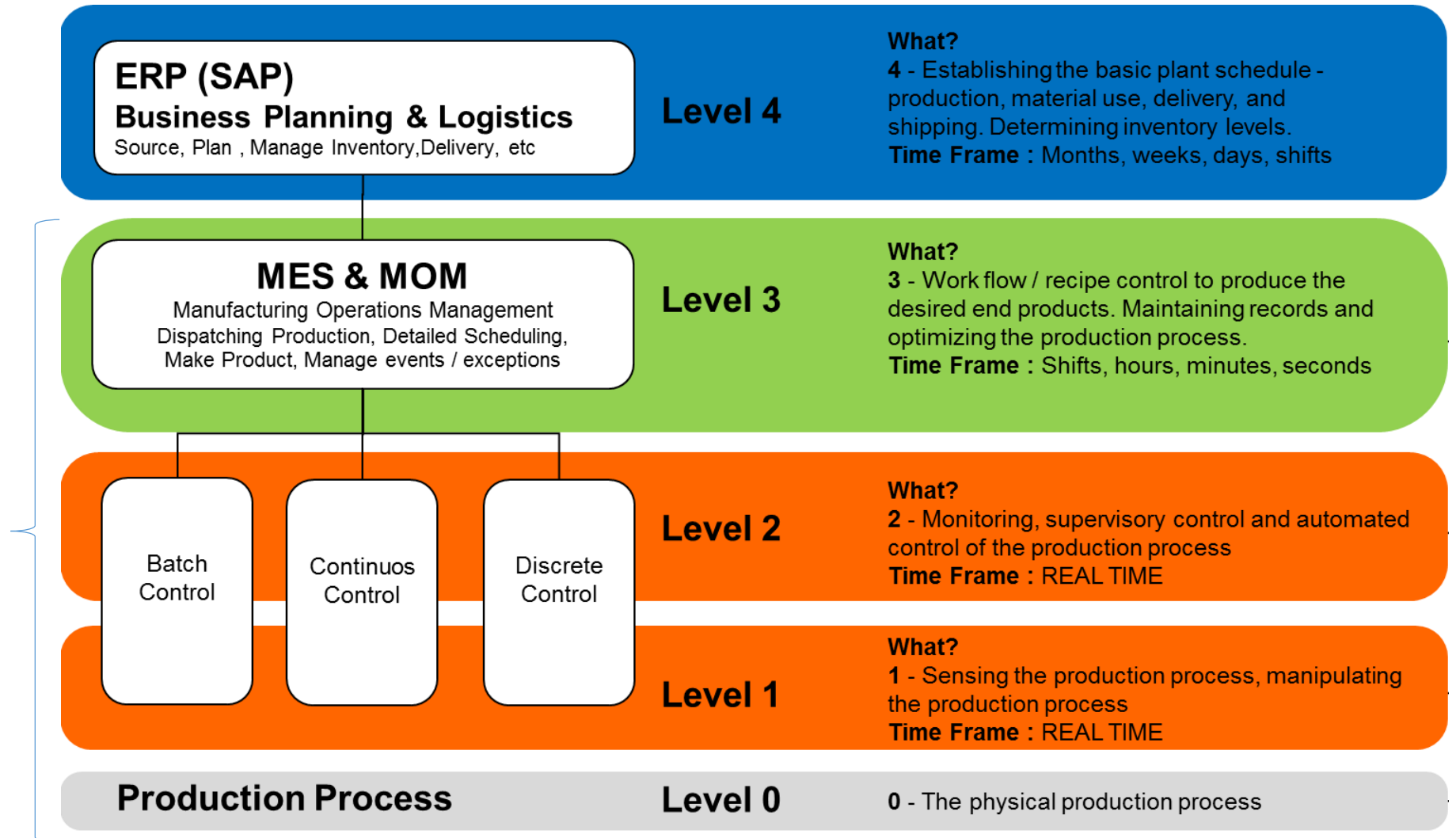
- MES  
*(Manufacturing Execution System)*
- WMS  
*(Warehouse Management System)*
- SCADA  
*(Supervisory Control And Data Acquisition)*
- AIDC  
*(Automatic Identification and Data Capture)*



- Cyber-physical system
- 2D/3D Localization
- Inspection System
- Dimensional control
- String Recognition



# A Team able to communicate at all levels of ISA 95 (Business, Operations, Control)



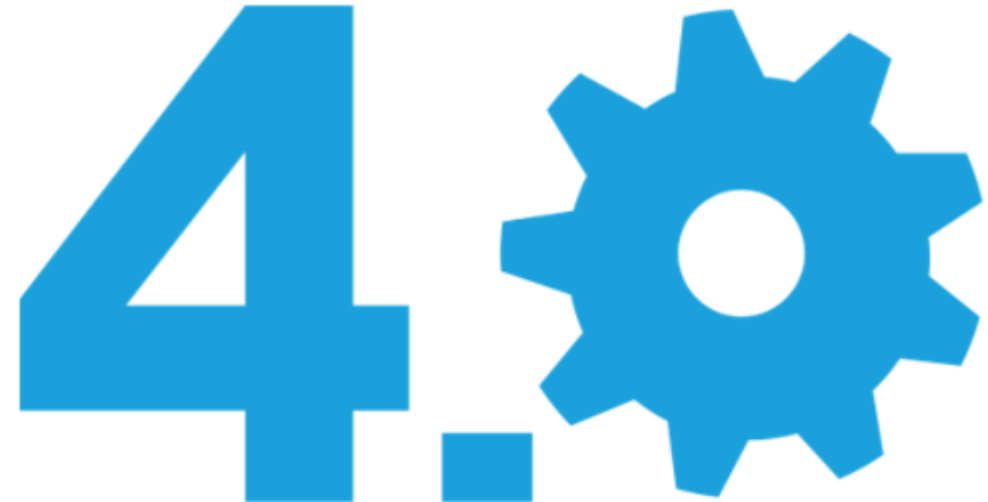


## Some References



## Why Industry 4.0 ?

- Being competitive
- Continuous Improvement
- Performance Optimization
- Downtime Reduction
- New services to reduce TCO
- After sales services and monitoring
- ...**market's request**



## What Market requires

- Zero Errors /Quality improvement
- Manual operation reduction
- IIoT / Big Data Analysis
- Integrated Solutions
- Integrated Supply Chain
- Modelling and Simulation
- Mass Customization
- Zero Heating & Light



# Our Pillars

**Cyber-Physical  
System**

**Augmented  
Reality**

**M2M**

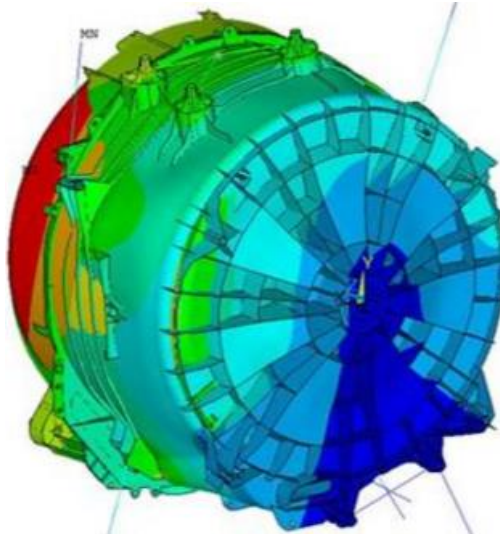
**Predictive  
Maintenance**

**Smart  
Assistance**



## Case History: Cyber-Physical System

- **Request:**  
To automate a manual assembly process for feeding 7 production lines.  
The components to be assembled are very similar, so there is a high probability of error.



## Case History: Cyber-Physical System

- **Solution:**

Integrating an automated assembly station in line (*Cyber-Physical System*)

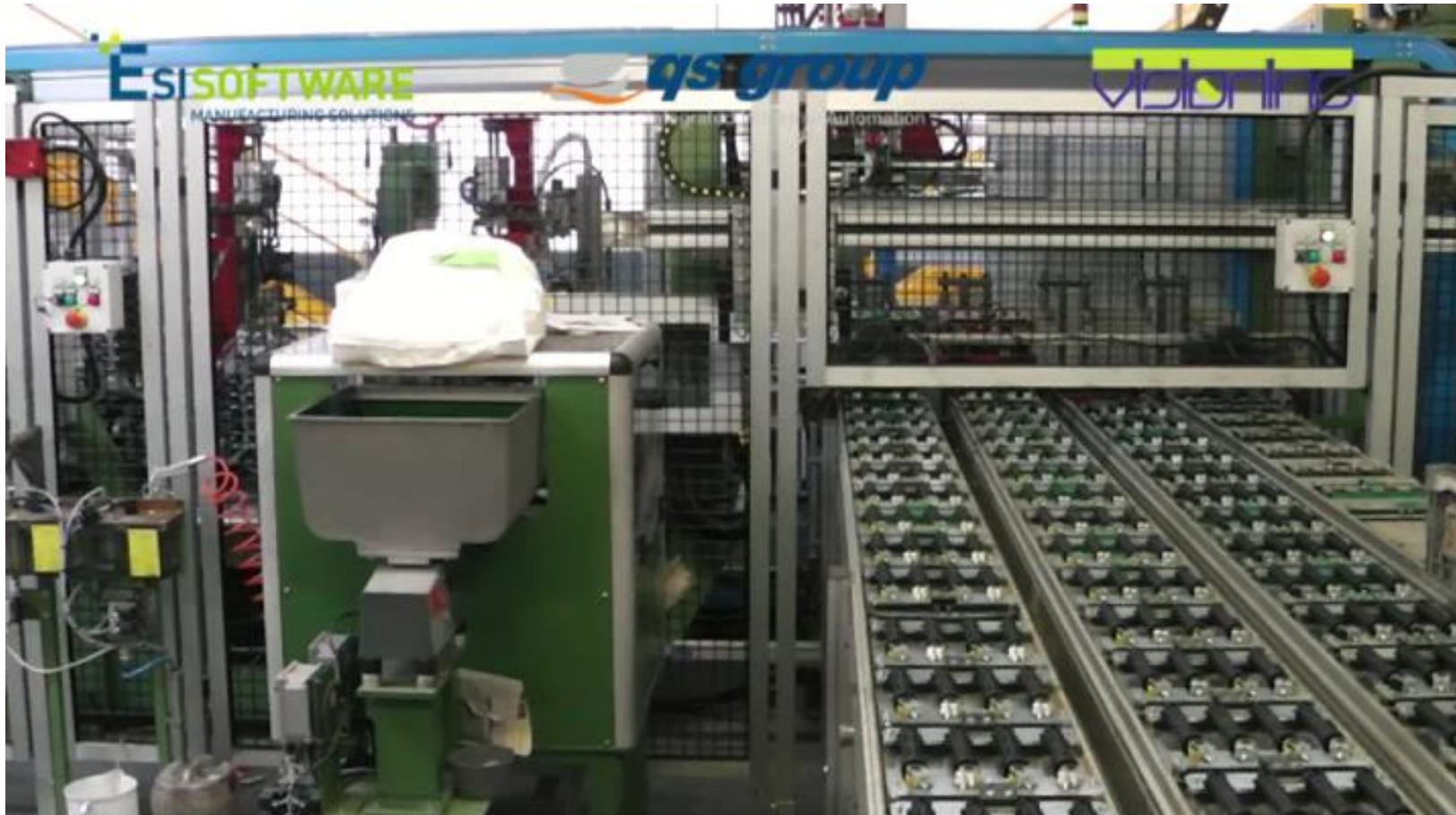
- **Main characteristics:**

- Integrating Supermarket in line
- Integrating vision systems (*Machine Vision*)
- Integrating RFID in order to implement communication between the assembly station and sub-assembly product (Dynamic Group) (*M2M*)



# Case History: Cyber-Physical System

## Integrated Supermarket in line and Vision system



# Case History: Cyber-Physical System

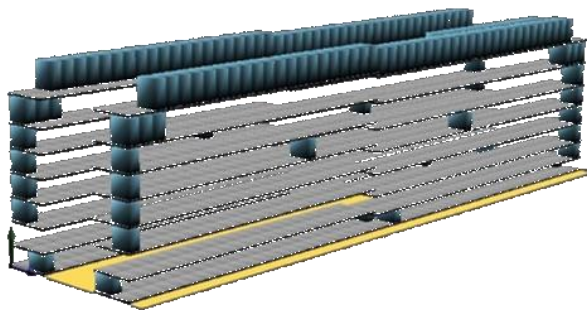
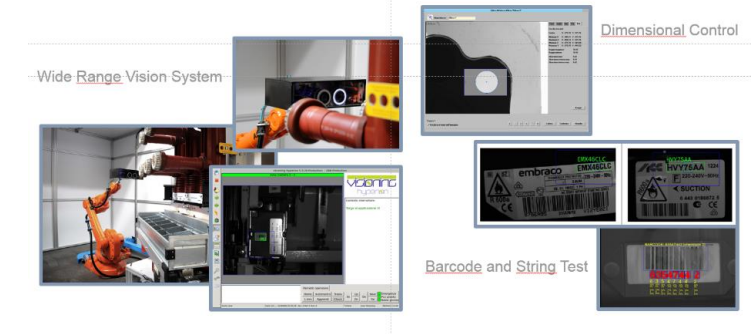
## M2M – RFID and Automatic Assembling





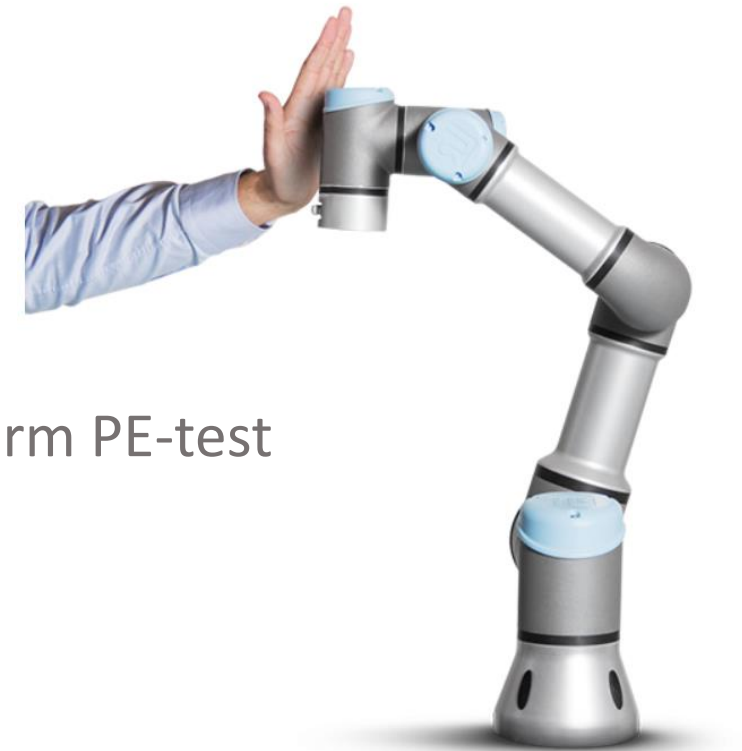
## Case History: Cyber-Physical System

- Extension : automatic refilling of counter-weight
- Extension: integration with Automatic Warehouse system
- Extension: integration with MMS (Material Management System)



## Case History – One Piece Flow / Mass Customization

- **Focus: manual activities reduction and introducing Mass customization system**
  - ERP / MES Integration
  - Integrating Vision System (*Machine Vision*)
  - Integrating Anthropomorphic Robots for manipulation
  - Automatic Components Fitting and Traceability
  - Collaborative anthropomorphic Robot (COBOT) to perform PE-test



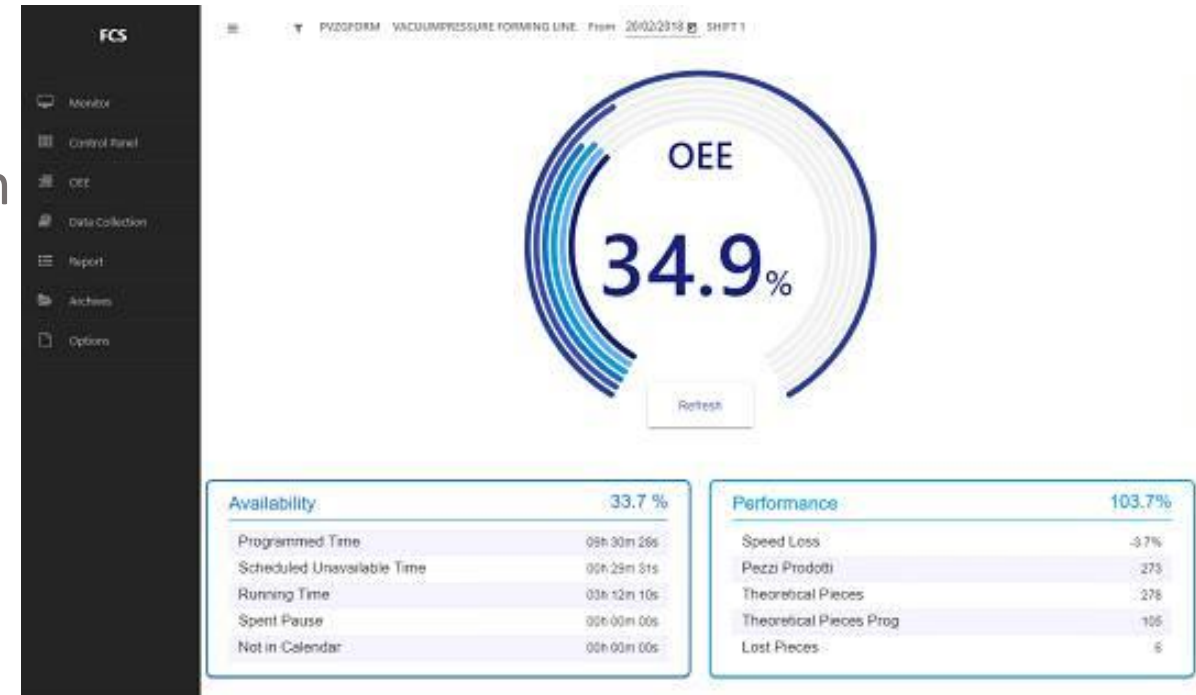
# Case History – One Piece Flow / Mass Customization

## Automatic Assembly Line



## Case History: Smart Assistance

- **Focus: downtime reduction**
  - Know-how digitalization
  - Documents and procedures digitalization
  - Maintenance activities tracking
  - Solutions rating
  - KPI

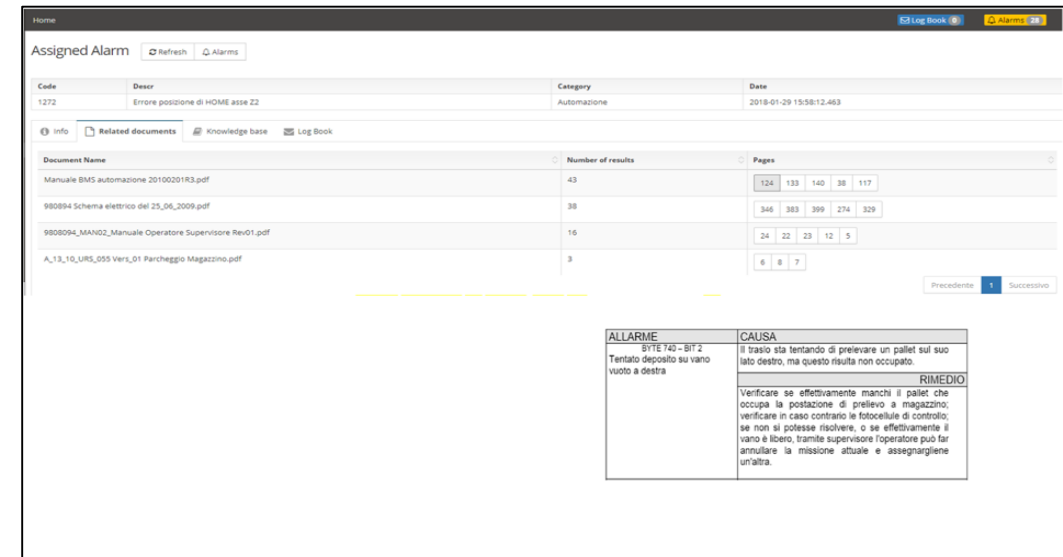
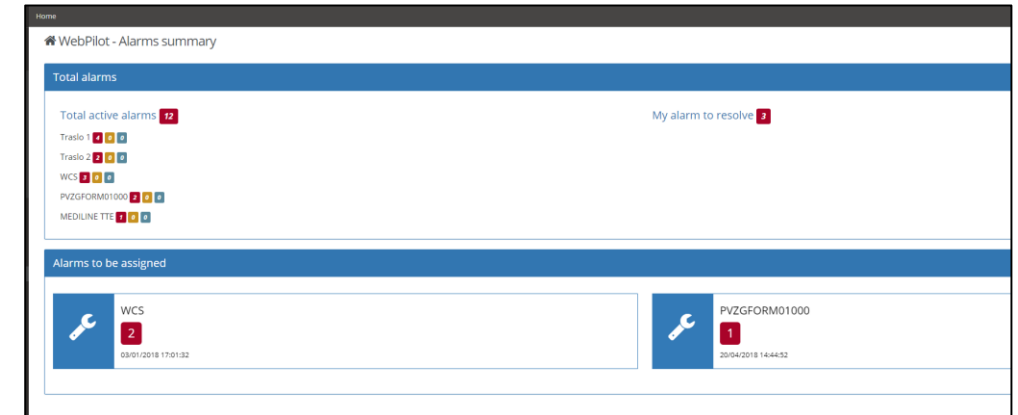




# Case History – Smart Assistance

## Main Features

- Alarm notification in real time
- Multi asset configuration
- Multi zone configuration
- Alarm severity management
- Ldap integration for user management
- Notification escalation
- Contextualized document search
- Preview of each page



# Case History – Smart Assistance

## Digitalization

Scope is to provide to operator all the information:

- Electrical Drawings
- Layout
- 3D Drawings
- User Manual
- Maintenance user
- Image /Video Tutorial
- Check List / Procedure

The screenshot displays the EsiSOFTWARE Manufacturing Solutions interface. The top navigation bar includes the EsiSOFTWARE logo, a search bar, and user information for Luca.Cesari. The left sidebar lists navigation options: Home, Managements, Log Book, Warehouse, and Smart Assistance. The main content area shows an 'Assigned Alarm' section with a table of alarm details.

Code	Descr	Category	Date
190	Machine in emergency state	MEDILINE TTE	2018-04-03 08:41:24.567

Below the table, there is a 'Knowledge base' section with a tabbed interface. The 'Knowledge base' tab is active, showing a detailed entry for the alarm. The entry includes a title, a description, and a step-by-step solution with accompanying images.

**1. Safety relay in the machine has been released**

This alarm indicates that the safety relay in the machine has been released. This may happen for various reason as opening a door and/or pressing the emergency button. It also appears when you first start the machine.

**Step for solution:**

1. Make sure the doors are closed
2. Make sure emergency button has been reset
3. Press the RESET button to reset this alarm

The interface also includes a '+ New Cause and Solution' button at the bottom.

# Case History – Smart Assistance

## Real time 3D

- 3D web virtualization
- Remoted sensor data (on the right)
- Different predefined views

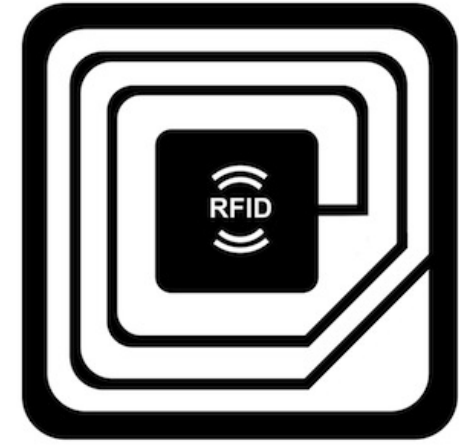
The screenshot displays the 'Smart Assistance' web interface. On the left is a navigation menu with options: Admin, Home, Managements, Configurations, Security, Log Book, KPI, Warehouse, Logic Plant State, Traslò 1, Traslò 2, and Smart Assistance. The main area shows a 3D model of a warehouse crane with a yellow platform. Above the model is a 'Sensors real-time' section with tabs for Camera, Fronte, Lato, Retro, Sopra, Carrello SX, and Carrello DX. On the right is a detailed sensor data panel with a table of active sensors and their values.

All	Active
<b>Carrello</b>	
● Posizione carrello:	346305.00
<b>Altezza lato SX</b>	
● Controllo altezza 600 mm lato SX:	1
● Controllo altezza 800 mm lato SX:	1
● Controllo altezza 1000 mm lato SX:	1
● Controllo altezza 1200 mm lato SX:	1
<b>Altezza lato DX</b>	
● Controllo altezza 600 mm lato DX:	0
● Controllo altezza 800 mm lato DX:	1
● Controllo altezza 1000 mm lato DX:	1
● Controllo altezza 1200 mm lato DX:	0
<b>Sagoma traversale</b>	
● 1° controllo sagoma trasversale lato SX:	1
● 2° controllo sagoma trasversale lato SX:	1
● 3° controllo sagoma trasversale lato DX:	0
● 4° controllo sagoma trasversale lato DX:	0
<b>Vano lato DX</b>	
● Controllo vano 1° profondità DX:	1
● Controllo vano 1° profondità da 2° profondità DX:	0
● Controllo vano 2° profondità DX:	0
● Mancato forcolamento 1° profondità DX:	0
● Mancato forcolamento 2° profondità DX:	1
<b>Presenza pallet</b>	
● Presenza pallet a bordo traslo:	1
<b>Vano lato SX</b>	
● Controllo vano 1° profondità SX:	0
● Controllo vano 1° profondità da 2° profondità SX:	0
● Controllo vano 2° profondità SX:	1
● Mancato forcolamento 1° profondità SX:	0
● Mancato forcolamento 2° profondità SX:	1
<b>Forcole</b>	
● Forcole al centro 1° verifica:	1
<b>Nessun sensore selezionato.</b>	

## Case History: Integrated Supply Chain

### Objectives:

- Create an integrated supply chain system to manage the order and receiving of packaging materials.
- Pallet shipment optimization
- Warehouse areas optimization
- Reduction of acceptance activities
- NO MIX-UP





## Case History: Integrated Supply Chain

- **Solution:**

Introduction of RFID technology

- **Main characteristics:**

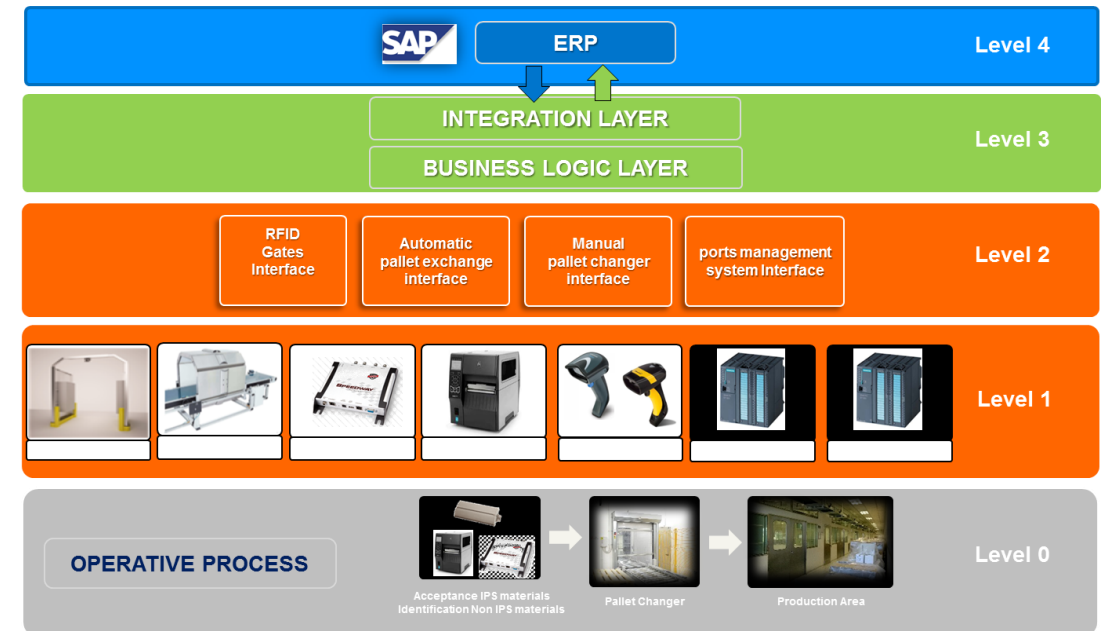
- Identification of boxes and pallets with *RFID* LABEL
- Integration between packaging line with pallettizing system (*M2M*)
- Installation and integration of RFID GATE



# Case History: Integrated Supply Chain

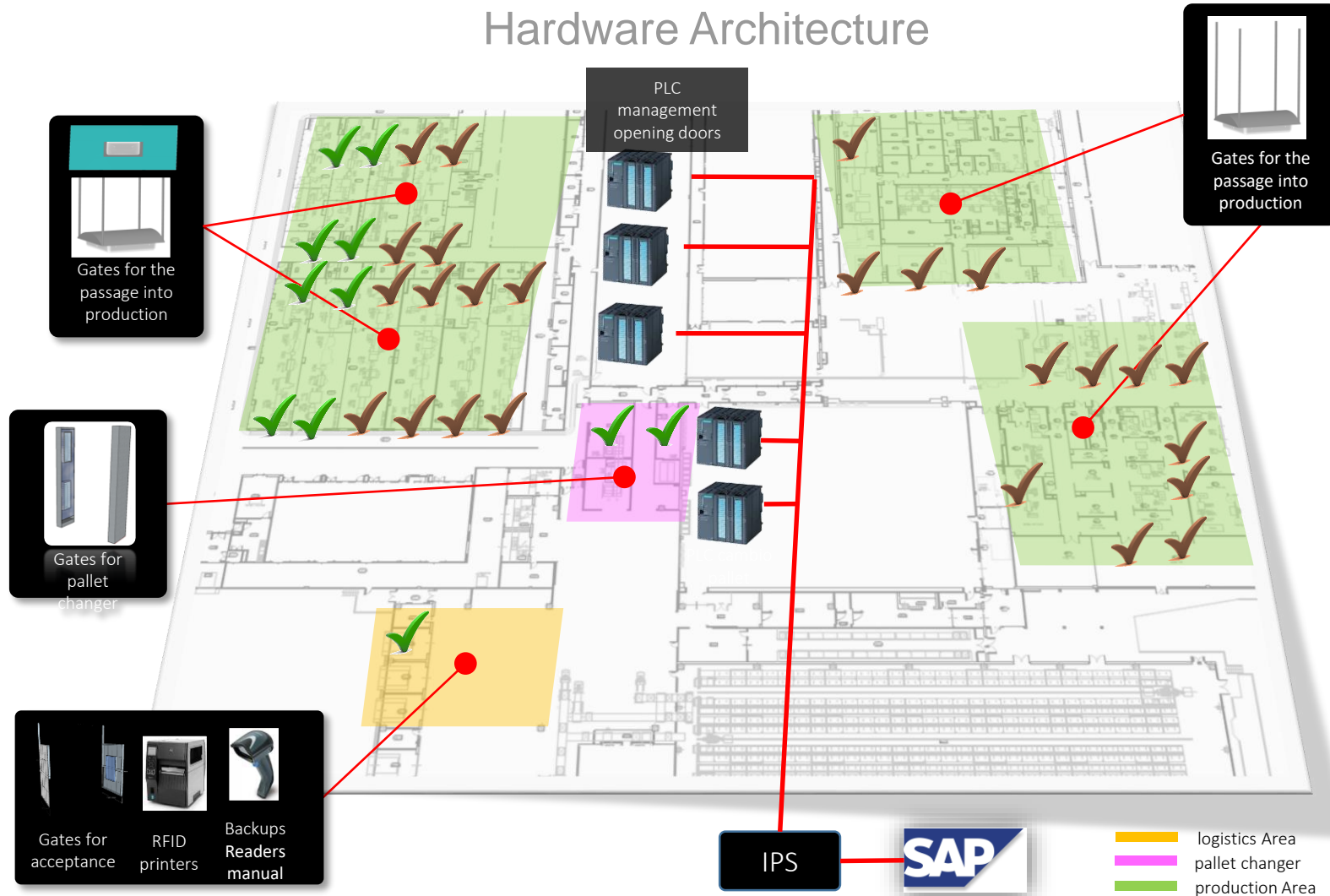
## Main Activities

- Material flow analysis / data
- RFID tag selection
- Selection of antennas
- Reader selection and RFID device
- Execution of field tests for reading tests
- Engineering gates
- Electromechanical installation
- Qualification



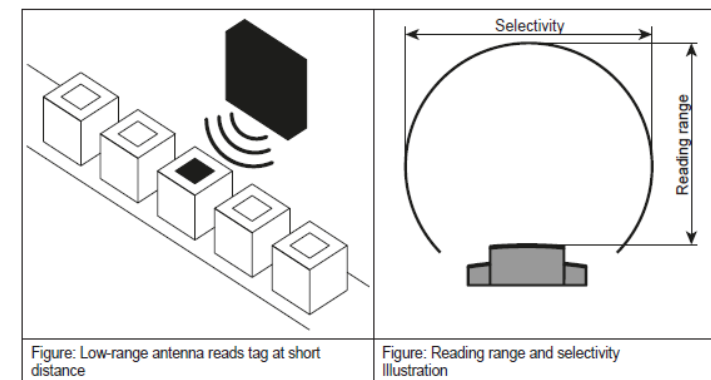
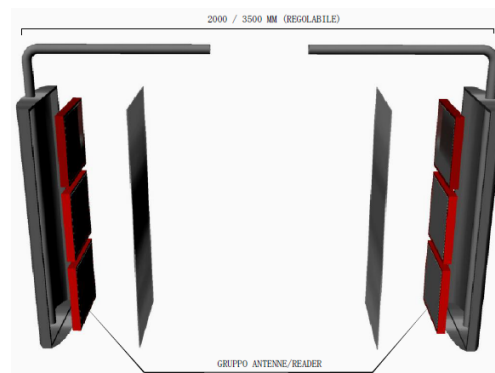
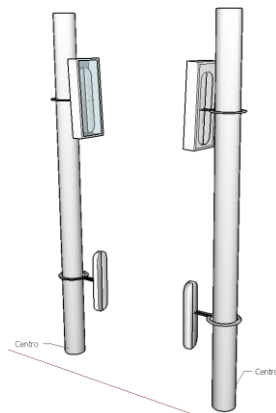
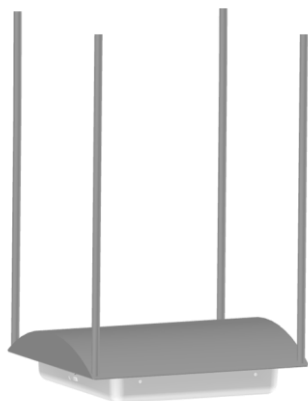
# Case History: Integrated Supply Chain

## Hardware Architecture



# Case History: Integrated Supply Chain

## Concepts and Realizations



## Conclusions

- Industry 4.0 as an opportunity:
  - Internal : new skills and challenges
  - External: products innovation
  - IT/OT convergence as mission
- New technologies to know better and to act faster
- Servitization....opportunities or new challenges?



## Next Steps

- Predictive Maintenance
- Digital Twin



# Thank you!

