Smart Factory

The Future of Manufacturing Process

Lean & Industry 4.0 – Journey to Operational Excellence

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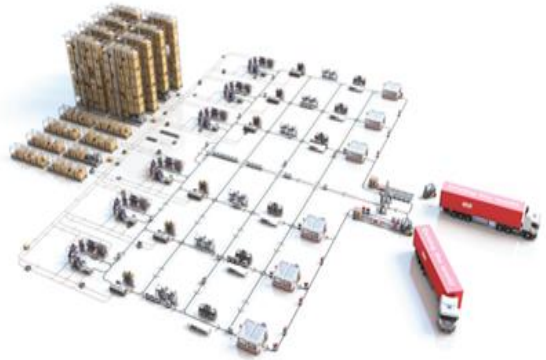
Journey to Operational Excellence (SEW Italia)

Assembly lines really long (25mt) and not flexible

2007 – Lean Deployment



2018 – Smart Factory

Optimization of the entire Value-Added-Chain

With the definition **“Added Value”** we mean all the activities that give a benefit to the customer. We can say that it is “all the customer pay for”.

Customer

Customer

The organization has to improve all the Added Value activity and eliminate/reduce the wastes.

How and with which tools lean is implemented in Solaro

- Quicly and flexible reaction to the market requests → **One Piece Flow**
- Production based on the real needs of the customers and not with forecasts → **PULL**
- Easy scheduling and control of the production → **Kanban**
- Ergonomics and reduction of the movement of the operators → **U-shape cells**

Intra-logistics evolution

- Labor (Flexibility)

- Conveyors (Efficiency)

- Automated Guided Vehicles AGVs (Safety)

- AIVs (new technological method of material transport)

Natural Feature Navigation

- Self-navigating operation with NO facility modifications
- Automatically avoids people and obstacles
- Real-time scanning LIDAR localization sensor
- Acuity™ overhead lighting localization
- On board navigation controls via a digital map.

Natural Feature Navigation

Natural Feature Navigation

Passive Localization

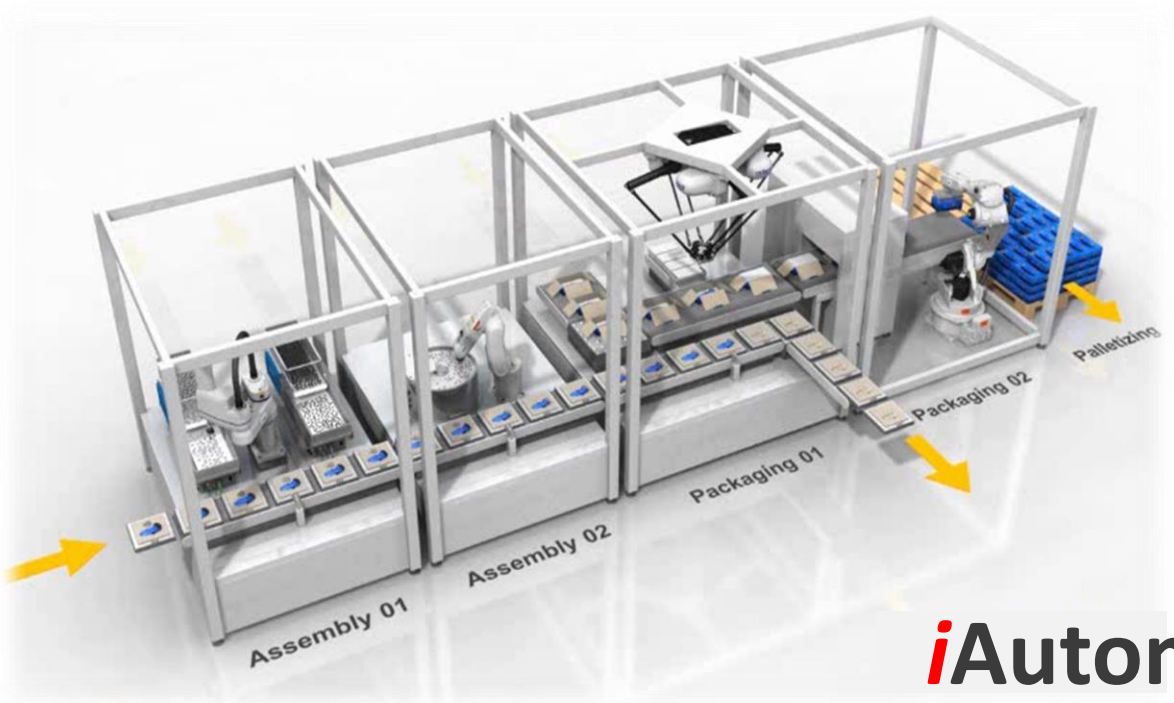
- Indirect measurement of the robot robot configuration (position – – rotation)
- Errors due:
  - Wheel slip
  - Uncertainty of geometrical geometrical parameters parameters
  - Numerical integration

Active Localization

- Main laser to "watch" the environment
- map owned by the robot (teaching)
- Comparison between the estimated position and the actual position

Lean Manufacturing: 8 deadly wastes

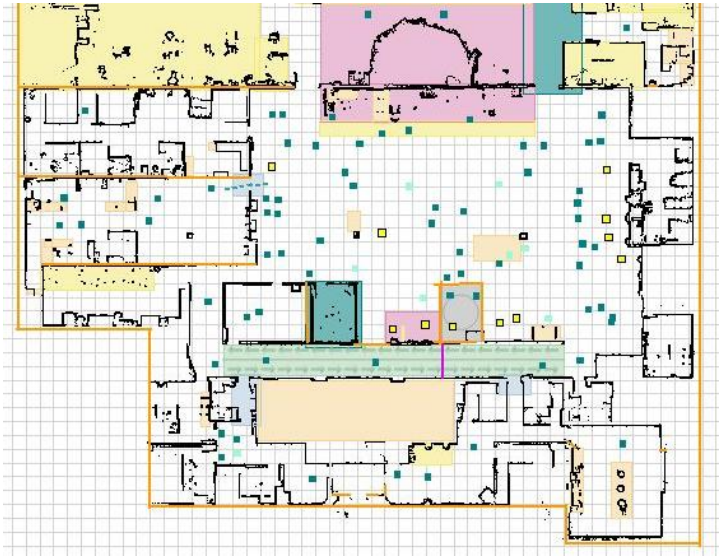
1. No errors – computer driven task list with traceable actions
2. Small-lot inventory (WIP & FGI) movement automated material flow optimized movement of WIP from cell to cell
3. Labour redeployment to high value-add tasks
4. "Necessary" movement performed by robot
5. No walking or manual material handling



*i*Automation

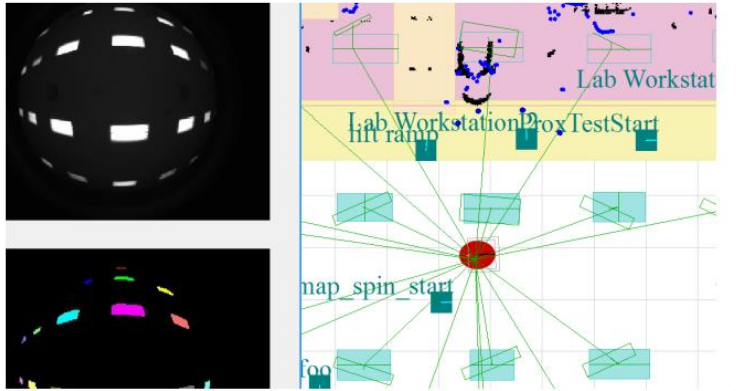
Mapping the work space

Sample Map



Acuity™

- Acuity is required when an environment changes so much that the robot's scanning laser alone is not an optimal solution
- The laser is highly robust for localization, but requires 20% of the features it detects to match with those previously mapped
- Acuity looks instead at overhead features, which typically do not change, even if the floor area on which the robot will drive is in constant flux
- Most manufacturing environments are very dynamic and change >80%



Fleet Manager

Coordinating collective robot motion:

- Job dispatch and management
- Centralized configuration management
- Facilitates traffic flow
- Centralized point of communication
- Each EM controls up to 100 robots

Solaro Smart Factory (MI)

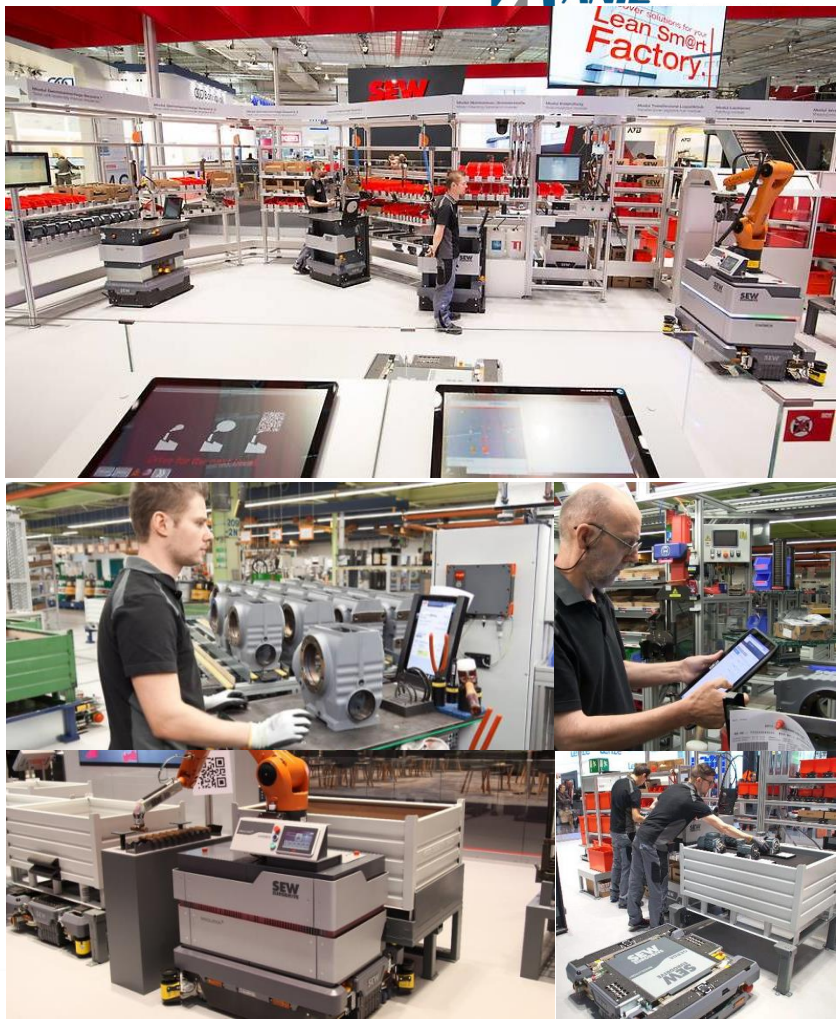
In the assembly plant of solaro some SEW Eurodrive tecnologies were implemented in order to improve the processes for the assembly and for the intralogistic. All the cells are connected by 45 *Automated Guided Vehicle (AGV) that share information with the other machines and with the fitters. In our meaning the AGV become a MAS (mobile assistance system).*

Performances of the Smart Factory:

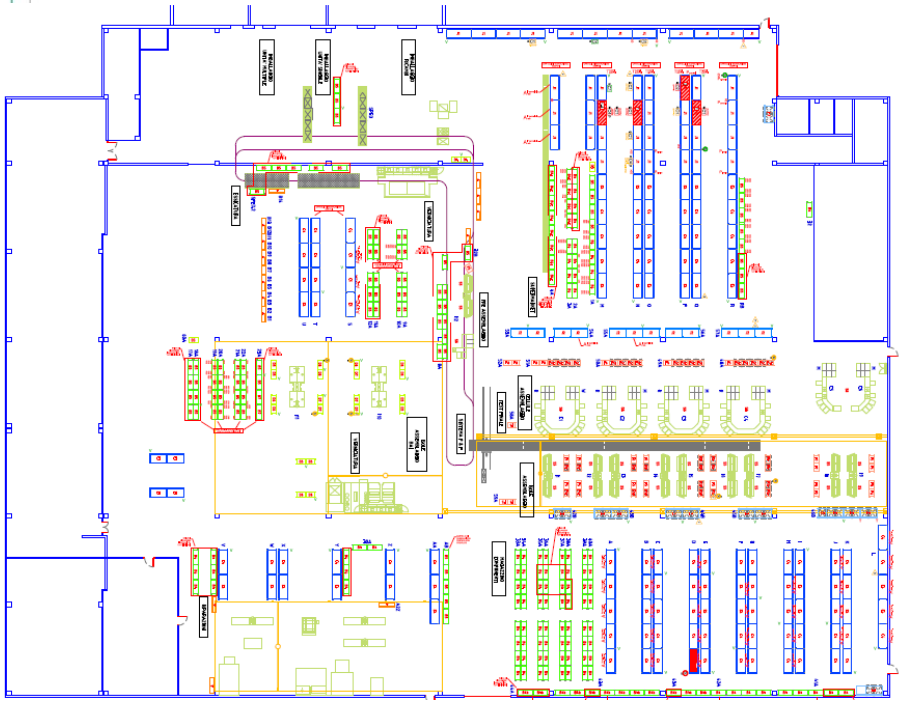
- Daily output +70%
- Increasing of the assembly spectrum (product portfolio)
- Improvement of the Lead Time
- Improvement of the productivity +25% (with the same fitters)

Cyber Physical Production System

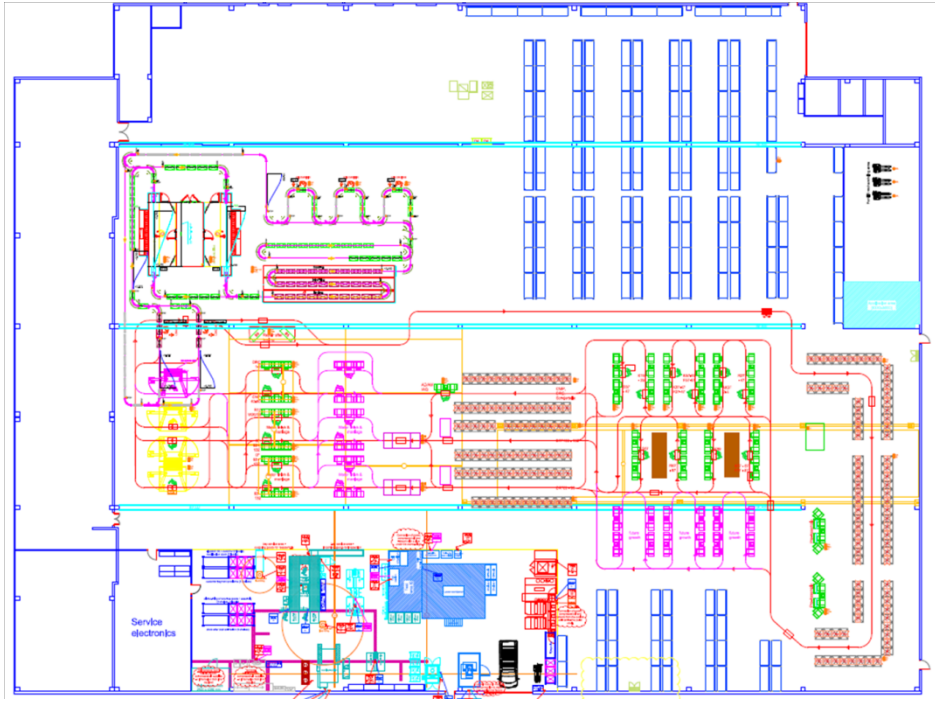
- **Smart combination between man, tecnology and IT**
  Tecnology is not only a tool for the workers, it become a partner
- **Smart Factory Assembly**
  Lean at the basis of Indusrty 4.0
- **Smart Factory Production**
  Also the project of new products is done following the lean principles (all the produts are modular)
- **Mobile Assistance System**
  For a better co-operation between man and machine



Lean → Industry 4.0



Lean (2007 - 2018)



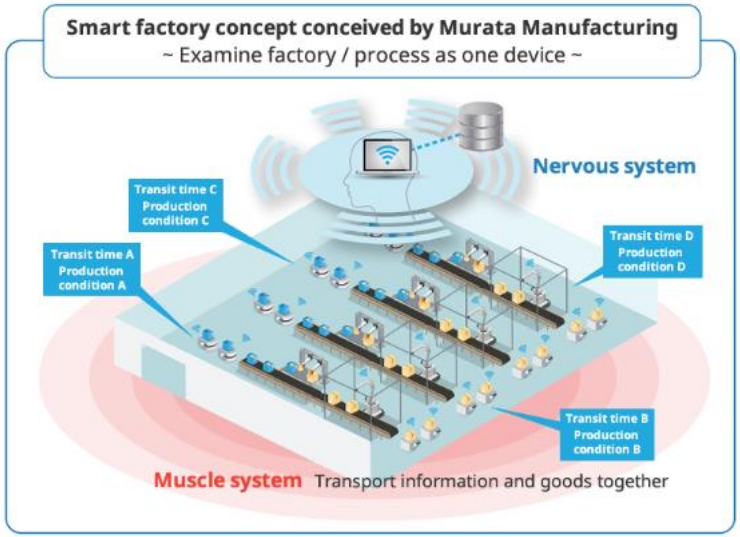
Lean + Industry 4.0 (2018 - ?)

Results and goals

Year	2004	2008 (Lean)	2015 (Lean)	Goal 2025 (Lean + I 4.0)
Lead Time	4/5 Settimane	3/4 Settimane	10/15 Giorni	5 Giorni
Workers	11+24 (logistica+assemblaggio)	10+24 (logistica+assemblaggio)	9+23 (logistica+assemblaggio)	11+29 (logistica+assemblaggio)
PCs assembled/day	180	200	205	350
PCs delivered/day	371	440	514	700

The smart factory concept

Murata Manufacturing is on the cutting edge of manufacturing for these components. Blending information technology with factory automation, the smart factory concept.



https://www.edge-link.omron.com/articles/188.html

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