

Methodologies for Innovation in industrial environment: an example of Eco-sustainable solutions design

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Valeria Serpi







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COMAU is a leading GLOBAL provider of

advanced manufacturing systems, **INNOVATIVE** sustainable automation and service solutions.







COMAU STRATEGY

SOLUTION ORIENTED

- The best automation competence across a wide range of key technologies
- Fully integrated capability in product, process and service solutions

GLOBAL

- 25 operative centers located in 15 countries, led by global processes
- 70% resources in BRIC countries
- Global project management based on PMI® standards, customized for local market needs and cultures

INNOVATIVE

- High density automation cells to hone and optimize investments
- Energy saving products and service solutions
- Lean production approach



GLOBAL AUTOMATION DRIVERS

- New production technologies facilitate the introduction of technological innovations in consumer goods and services, that are key to achieving sustainable new products at affordable costs
- Industry global automation trends in manufacturing systems are characterized by the following drivers:
 - FLEXIBLE & SCALABLE MANUFACTURING SYSTEMS
 - LOW COST MANUFACTURING SYSTEMS
 - MATERIALS AND ENERGY CONSUMPTION REDUCTION
 - NEW MATERIALS
 - LEAN MANUFACTURING CONCEPT



GLOBAL AUTOMATION DRIVERS

Depending from the different **REGIONS** where the manufacturing industries are located, the development of new manufacturing systems are driven by the application of a low-cost per unit strategy balancing quality, cost effective automation technologies and personnel-energy-logistic costs



MANUFACTURING SYSTEMS & GLOBAL AUTOMATION

MANUFACTURING SYSTEMS EVOLUTION

SUSTAINABLE HI-TECH ASSEMBLY SOLUTIONS
HIGH QUALITY PROCESSES AND PRODUCTS

• ENVIRONMENTAL SUSTAINABILITY

- o Power management strategies
- o Novel actuators and drives
- o Light weight structures

SOCIAL SUSTAINABILITY

- Safe and ergonomic solutions for human-equipment interaction
- Simple interface for human-equipment interaction

• **PRODUCTION COMPETITIVENESS**

- High performance solutions
- High process quality
- o Modular system architecture
- o e-Services
- o Virtual manufacturing

Grant Agreement no: 285363

PROJECT	EMC2-Factory Eco Manufactured Transportation Means from Clean and Competitive Factor					
FUNDING AGENCY	European Commission – FP7-NMP-FoF 2011-1					
FUNDING SCHEME	Collaborative Project - Large Scale Project					
MAIN OBJECTIVES	Cleaner and more resource-efficient production in the manufacturing of transportation systems					
PROJECT KEYWORDS	 Sustainable manufacturing Holistic perspective in efficiency approaches Manufacturing demonstrators 					
TIMETABLE	Oct 2011 – Sep 2014 (36 months)					

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PROJECT SCENARIO

PROJECT VISION

"By 2020, European transport sector eco-factories will be able to reduce energy, resource consumption, and emissions by more than 30% per output unit below 1990 levels"

OVERALL OBJECTIVE

Enable European manufacturing industries to overachieve Europe 20/20/20 program targets through development of advanced sustainable technologies, methods and tools while enabling industrial applicability and commercial exploitation

Reduction of energy and resource consumption in the European transportation manufacturing

- Energy and resource efficient process technologies (focus on machining, joining, assembly)
- Innovative production control systems and efficient process control devices (e.g. drives, actuators and sensors)
- New methods and tools for planning, optimization and life cycle evaluation to support the design and management of eco- factories (e.g. simulation, decision support tools)
- **Provide an holistic perspective** moving away from isolated resource efficiency approaches

BW AUTOMOTIVE PILOT: THE PLANT

Jeep Renegade Class B-Suv

BW AUTOMOTIVE PILOT

ASSEMBLY PROCESS

TOOLING

JOINING PROCESS

Independently from the process type and from the panels material used, the Assembly process is driven by 2 main factors:

- To achieve and maintain the Quality and Geometry of the panels assembly
- To freeze the Geometry of the assembly obtained trough a robust Joining process The panels flow through the operations is assured by the Material Handling, that along with the type of Tooling used and the technological level of the Joining process define the plant Automation level

MATERIAL HANDLING

Robot Handling

Transfer System (Versaroll)

Line feeding

In order to perform all the needed operations the elements have to be:

- taken to and introduced into the line area (line feeding)
- moved into the tooling to perform the joining operation (loading) and taken out from the operation position after the process is completed (unloading)
- moved from an operating station to the next one or from a line to the next one (transfer system)

The Part Transfer can be realised by robots or by means of a transfer system

DATA COLLECTION & MONITORING

WELDING LINE LIGHTENING

- Compact Welding Gun
- COMAU Smart Robot Lightening
- Compact Cell Configuration "BRIC"

JOINING PROCESS OPTIMIZATION

- Conventional car production lines employ spot welding for sheet metal joining
- Laser welding was examined as a possible energy efficient replacement
- Energy consumption technology comparison
 - Resistance spot welding
 - Laser welding

ENERGY SIMULATION TOOL

1. INPUT DATA	
Nominal	Ope

4. SHOP FLOOR VALIDATION

	Nominal Values	Qty	Time in the Cycle Time [s]	Movements in each cycle	Main Consumption Parameters	Nomina Power [kW]
1	Versaroll (First floor + Ground Floor)	1	6	2	Motor	
2	Robot	1	-		All	
3	Welding Spot	1			<u> </u>	90
4	MCP	1	Continuous			1
5	Tip Dresser	1	3	•	1	0.37
6	4CE	1	6.5	2	notor	7.5
7	Versalift	1	2.5	2	Motor	7.5
8	Pallet Conveyor	1	Continuous		Motor	1.5
9	Gluing	1	20			1.76
10					P1	10

2. ENERGY/AVAILABILITY CALCULATION

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Manufacturers at the global level will continue to push for new manufacturing systems based on a **low-cost per unit strategy**

CONCLUSIONS

Research and innovation for affordable automation technologies will represent therefore a major challenge to meet growing demand for manufacturing new products balancing quality with personnel/energy/logistics costs

A new **holistic approach**, viewing manufacturing system as a whole, integrated towards machines, tools and building facilities energy efficiency is required in order to meet this balance for future manufacturing system.

A **methodology** for cleaner and more resource-efficient production in the manufacturing of transportation systems, developed inside the European project **EMC²- Factory**, has been illustrated, along with the application in the Automotive for Body Welding Environment.

THANK YOU FOR YOUR ATTENTION http://www.emc2-factory.eu/

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COMAU S.p.A.

Via Rivalta, 30 10095 GRUGLIASCO (TO)

ITALY

www.comau.com

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