Comau Business Cases

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Agenda

- Automotive Pirelli Case
- Energy Enel Case
- FMCG Not DIsclosed

Automotive
Pirelli & Comau

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Before | The traditional manufacturing process

The traditional way to make tyres is represented by typical **mass production systems**:

high level of work-in-process, large inter-operational stocks, long throughput-time.

Low level of flexibility :

batch change is complex and takes many hours to be performed;

difficulty to introduce a new model tyre in production;

it not easy to increase the cycle time if higher production rate is needed.

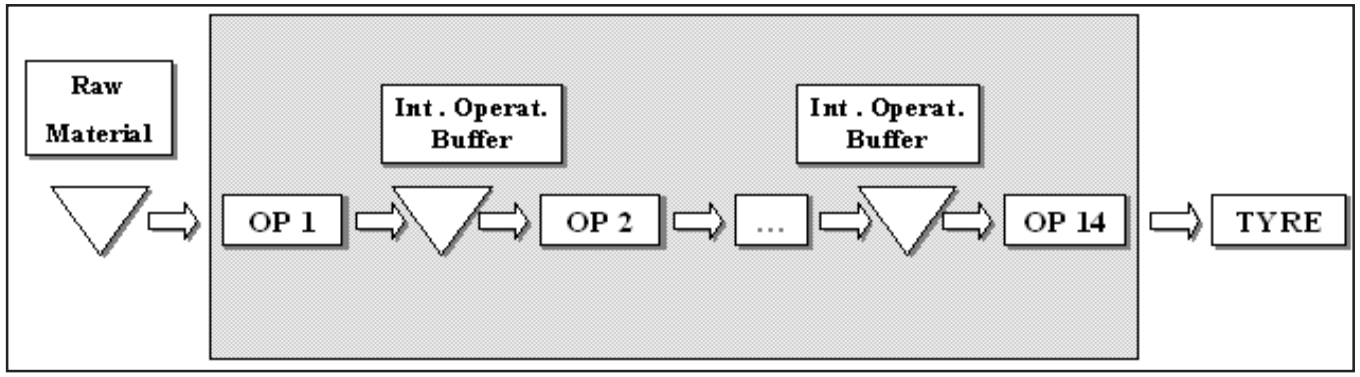
Typical performance indicators:

Production rate: min. 25.000 - 30.000 tyres /day

Throughput-time: 3 - 6 days / Batch change: 3 days

12% WIP in operation, 88% in stock / Number of manufacturing operations: 14

One large plant located in Italy



After | The new manufacturing process: MIRS

The new manufacturing system = Mini factories

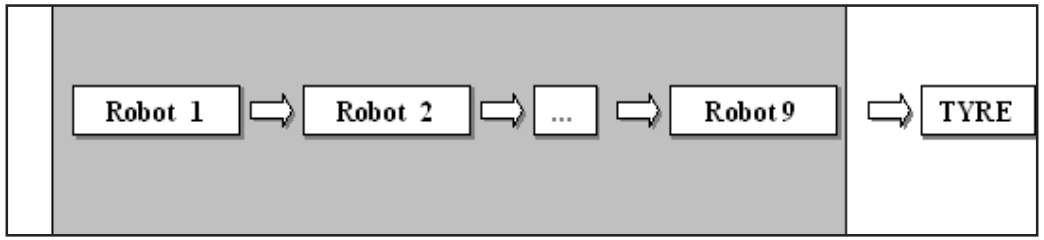
High flexibility with many small production units, with **short throughput-time**, low work-in-progress and optimal logistic operations

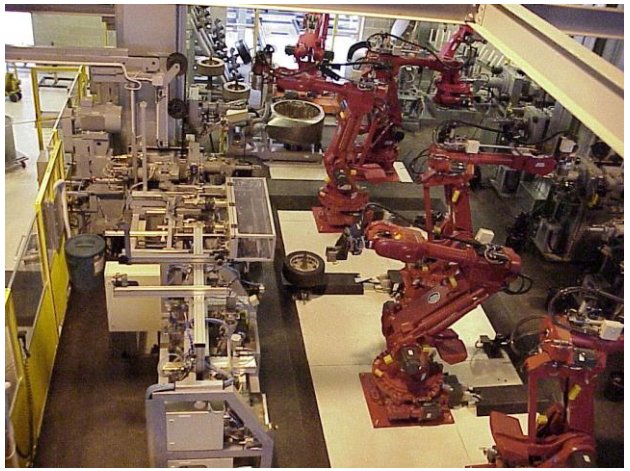
A single production cell is composed by 9 Comau robots, equipped with specific devices, programmed with dedicated software and calibrated with special procedures.

Timing:

Proto line: 1 year after kick off

Tested solution: 2 years after kick off





Several Mini factories close to local market

Some key aspects of this Success Story

- The main prerequisite of a paradigm shift is based on the **strategic vision of the company management**
- Organisational solution: **independent platform of professionals** from different functions
- Selection of strategic partners compensating the unavoidable gaps of competence.
- Development of the project with **simultaneous engineering approach**
- **Protection of intellectual property** to defend competitive advantages.
- **Severe testing phase** to be performed considering possible technical re definitions.
- **Good communication** & final delivery of the project followed by widespread sharing with the rest of organisation.

Energy
Enel & Comau

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| Photovoltaics automation

Project Overview

- One of the key pillars of the Engineering & Construction (R)evolution project
- Project start on 2017
- Joint development of technical solution
- Comau designed and built the solution
- In-house and on-field prototype testing

Technical Highlights

- Heavy duty AGV for all-terrain operation
- Standard Comau robot and process technologies
- Open-field operation
- Field tests to validate Comau design

Comments

Some examples of how this revolution is already a reality can be found at the Passo Martino laboratory in Catania, Sicilia, where, thanks to a collaboration between **EGP and COMAU**, a global leader in Industrial Automation and Robotics and part of the FCA Group, they are **testing the use of robots on AGV** (Autonomous Guided Vehicles) for the **installation of photovoltaic modules**.

"In the case of the E&C (R)evolution project, for example, **several external companies specialized** in robotics have been involved. We've **tried to adapt these realities** to other renewable technologies besides solar."

Umberto Magrini, Head of Engineering & Construction for EGP

Fast Moving Consumer Goods

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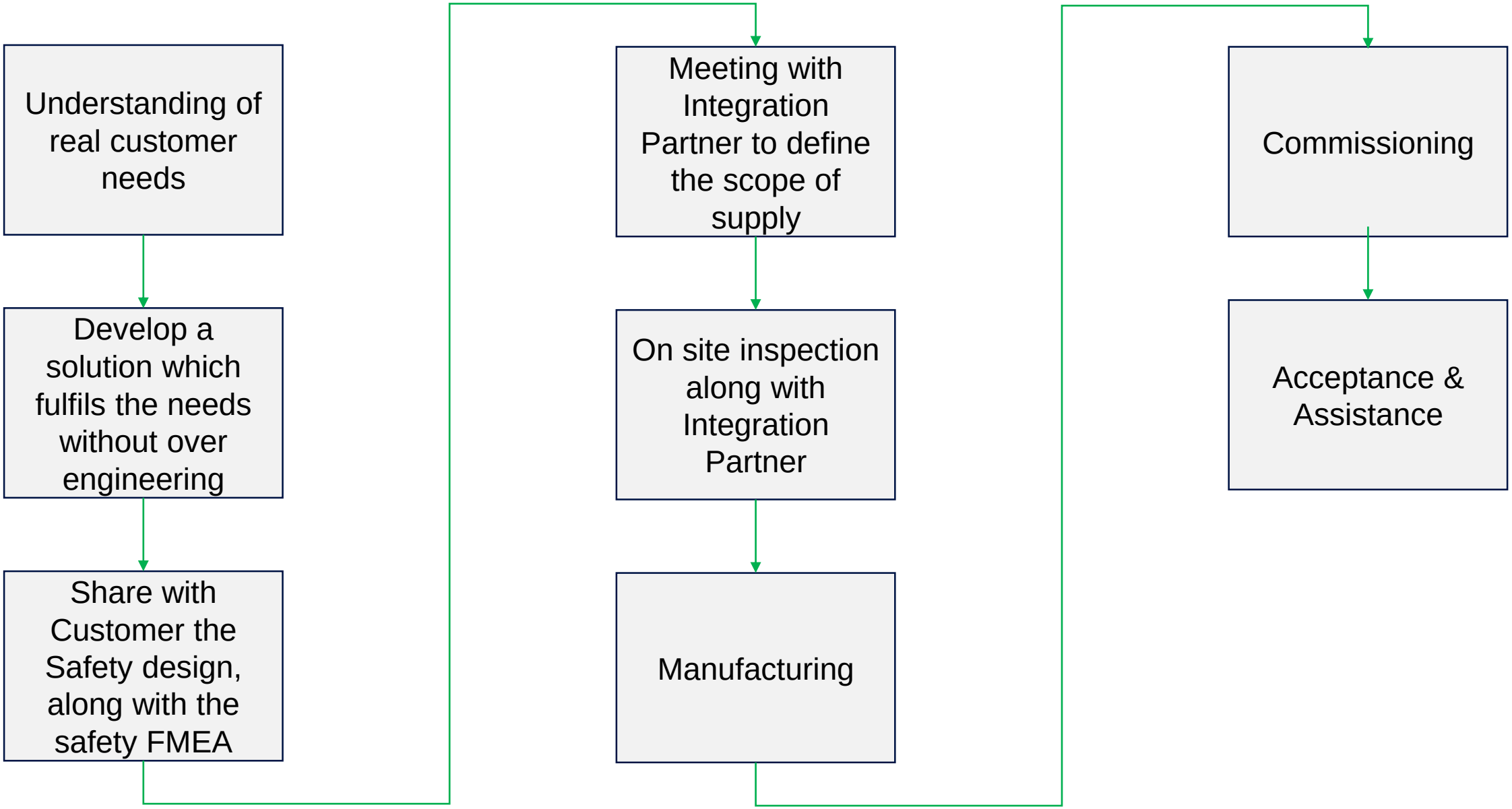
General Project Stages



Critical Factors

We consider the **Safety aspect** of any system as a basic requirement, for which is important to **avoid under estimations of risks.**

Following the **WCM Model**, we can clearly identify all the risk, eventually modifying the solution or implementing additional safety devices to meet the required performance level.

COMAU WCM World Class Manufacturing

RISK ANALYSIS — ENGINE A 0

Reference: | Index: -

Risk analysis and evaluation

Nr	List of hazards: Type or group	List of hazards: Origin	Identification of dangerous situation: Potential consequences	Identification of dangerous situation: Danger zone	Identification of dangerous situation: Phase of life	Detailed description of Risk	Damage	Quotation: Severity	Quotation: Frequence	Quotation: Possibility of Avoiding	Level of risk (where applicable)	Actual situations Solutions adopted for reducing the risks	Legislative / regulatory references	Resp. Dept.	Quotation: Severity	Quotation: Frequence	Quotation: Possibility of Avoiding	Level of risk (where applicable)
		Feeding Conveyor (inside robot cell) Hazard of human walking/standing on the conveyor belt	Crushing	Inner feeding Conveyor	Preactivation for cycle start	A human operator, can walk/stand on the conveyor belt, avoiding the laser scanner to detect him during the cycle	Serious irreversible damage	S2	F1	P1	OK	The conveyor has an heigh > 1000mm from floor therefore considered as impassable from regulation.	ISO EN 12100 ISO EN 10218-1 ISO EN 10218-2 ISO EN 619		S2	F2	P1	OK
		Operator standing on the pallet, without being detected from the actual laser scanner	Crushing	Pallettizing area	Preactivation for cycle start	Human operator can potentially stand on the pallet while restarting the cycle This practise is absolutely against the standard procedure designed for the automated system [NOT NORMALLY EVALUATED ON RISK ANALYSIS]	Serious irreversible damage	S2	F1	P1	NOK	Introduced a additional pre-restore procedure for the operator to be able to insure that there's no human presence inside the hazardous area. This forces the restore to happen in 3 steps: 1) pre restore of the cell's safety (close to pallettizing area) 2)key insertion/switching on the outside control panel (within a defined timing) 3) button press for restore the safety	ISO EN 13849-1 ISO EN 13849-2 ISO EN 13218-2		S1	F2	P1	OK
		Human operator entering in the station without following any Standard Of Procedures given	Crushing	Robotic Cell	Production	Distance of the cell entrance from the working area of the robot that could lead to an accident while an operators enters into the station	Serious irreversible damage	S2	F1	P2	NOK	Insert the laser scanner to detects any intrusion of an operator in the cell. The distances between the doors and the operative area of the robot are enought to grant a stoppage of the mechanism before human could interact with it	ISO EN 10218-1 ISO EN 10218-2 ISO EN 13855		S2	F1	P1	OK
		Residual zones wherein a human can hide inside the cell	crushing	Robotic Cell	production	There are some position, not detected by the laser scanner, which could be used	Serious irreversible damage	S2	F1	P2	NOK	Install physical barriers to avoid any position to be used by operator to hide inside the non monitorized areas.	ISO EN 114120 ISO EN 12100 ISO EN 13857		S2	F1	P1	OK

Some possible issues

Understanding of real customer needs

In every project, the most common mistake is to **miss the real understanding of the Customer's needs**.

This misunderstanding, leads normally to an **over-engineering** of the solution which traslates in an Unjustified high price of the solution

Define roles and expectations with the integration partners

After a detailed engineering of the solution, is a **MUST to clearly define the roles between Comau & the partner.**

Normally the **unbalance split of responsibilities** and an **incorrect understanding** of the solution, leads to additional costs not identified during the costing of the system

Roles & Responsibilities | One Example

COMAU

- Project owner
- Relation with Customer
- Design of the solution
- Project Management
- Site Management

SYSTEM INTEGRATOR & PARTNER

- Manufacturing of non-standard equipments
- Commissioning & Programming

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Comau Academy at a glance

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Summer School
Project & People Management

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One Day Working Experience

COMPANIES & PROFESSIONALS

Executive Master
Manufacturing Automation & Digital Transformation

Workshop
Industry 4.0

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Project Management Catalog

Professional Training
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