Comau Approach to Industry 4.0

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Made in Comau
Comau specializes in producing advanced industrial automation solutions that integrate products, technologies and services to help companies of all sizes increase plant efficiency while lowering operating costs and optimizing returns.

Comau’s competency stems from over 40 years of field-proven experience and a strong presence within every major industrial country. The comprehensive offering of modular, flexible and highly configurable products is based on open automation principles, and can be tailored to meet the needs of each individual customer.
Personalized Production Demands
New Manufacturing Approach

Customized Production Demands
New Manufacturing Approach

CUSTOMIZED PRODUCTION

• Continuously shortening product life cycles.
• Rapid quantity fluctuation.
• Small batch sizes up to make-to-order production and at the same time a large number of variants.
• High degree of alteration in the part spectrum.
• Raising product quality demand.

Reconfigurable Manufacturing Systems represent the solution with an important contribution from Robotics.
Key Automation Trends

**INVESTMENT OPTIMIZATION**
- Maximize Overall Equipment Effectiveness
- Enhanced Virtual Commissioning
- Minimize Production Cost

**AUTOMATION HIGH DENSITY**
- Minimize Floor Space per Vehicle
- Maximize Machine Modules Reuse
- Minimize Plant Facility Construction Costs

**MATERIAL MANAGEMENT**
- Transportation Cost
- Minimize Path per Kitting
- Minimize man hours/kitting
- Minimize Implementation Time and Cost
- Minimize Non-Value Added Activities

**INTEGRATED PRODUCT-PROCESS**
- Product-Process standard template
- Non-Model Specific Architecture
- Minimize Startup Time
- Advanced Joining Technologies for Dissimilar Materials

**ZERO DEFECTS**
- Minimize Scrap and Rework Costs
- Minimize Defect Rates
Digital Factory Elements: The Big Enabler of the Manufacturing Digital Transformation

Virtual industrialization
- Virtual plants and products to prepare physical production via simulation, verification and physical mapping

Smart Robots & Machines
- Multipurpose «intelligent» robots able to adapt, communicate, and interact with each other and with humans based on remote control

New quality of connectivity
- Connection of digital and real worlds with constant exchange of information between machines, work pieces, systems and human beings

Big data and analytics
- New methods to handle huge amounts of data and tap into the potential of cloud computing

Cyber-physical systems and marketplace
- IT systems built around machines, storage systems and supplies linked up as CPS

Factory efficiency
- Preventive and predictive maintenance; energy efficiency; decentralization and remotization; process reengineering

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Comau Innovation Network
Comau Innovation Pillars

EASY TO USE SOLUTIONS

- Intuitive, easy to understand and easy to use solutions that keep automation simple
- “Plug & Play”: all our new products and solutions inherit an open architecture concept

ADDED VALUE MANUFACTURING SOLUTIONS

- Manufacturing technologies and innovative processes that facilitate flexibility, the use of advanced materials, the achievement of high product performance.

HUMAN ROBOT COLLABORATION

- Symbiotic human-machine relations, which seek a deeper understanding of human behavior and go beyond conventional approaches
Comau Approach to Industry 4.0

EASY TO USE SOLUTIONS

- DIWO – Digital Workplace
- Wearable and Mobile Technologies
- Advanced Robotics
- New generation software applications - consistency with capitalization

ADDED VALUE MANUFACTURING SOLUTION

- Logistic System
  - AGILE1500 Autonomous Guided Intelligent Lean Equipment

HUMAN ROBOT COLLABORATION

- Exoskeleton
- Advanced Use Robotic Arm

DIWO – Digital Workplace

Advanced Robotics

Wearable and Mobile Technologies

New generation software applications - consistency with capitalization

Logistic System

AGILE1500 Autonomous Guided Intelligent Lean Equipment
HUMANufacturing: Our Way To Industry 4.0

We believe that digital manufacturing and the technologies that support it represent the next step toward excellence in automation.

This new Smart Factory paradigm is being driven by breakthrough innovations in products, processes and systems.

- Cloud computing, advanced connectivity networks, mega-processors designed to handle big data
- Improved computational, analytics and business intelligence capabilities
- Additive manufacturing and similar technologies able to bridge digital and physical realms
- HUMANufacturing and the full cooperation between man, with the industrial automation solutions, and the new digital technologies that surround him
**DIWO: Digital Workplaces**

**Why**
- Current practice is based on corrective maintenance, which leads to unpredictable downtime
- Process and product information are not fully correlated
- Process capability and bottleneck analysis are difficult to perform, due to the huge amount of unstructured data

**What**
- Remote collection of operational and quality data from equipment’s, analysis and correlation of data with service operations to predict future malfunctions and process drift.
- Cognitive systems able to improve efficiency and throughput, using the available information

**Value proposition**
- Improved efficiency of existing and new systems
- Direct saving on impacted maintenance cost
- Reduction of breakdowns of equipment’s operations resulting in optimization of Overall Equipment Effectiveness

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Made in Comau
Wearable and Mobile Technologies

Why
• Today factory floor fixed HMI have a low flexibility and mobility

What
• Applications to support assembly and maintenance operators with consumer smartwatch/smartphone/tablet devices and intuitive gesture-voice-based input to perform their daily activities

Value proposition
• Continuous advancements in human machine interface (HMI) technology are driving huge gains in productivity and usability
• Smartwatch gives operators more flexibility when executing and certified assembly task
• Tablet gives maintenance team fast assistance when repairs machines
SMU Sensorized Memory Unit

**What**

- Integrated sensor solutions that combine hardware with data analytics and transmission in an easy to setup and use application for predictive maintenance
- Solid state inertial platform to collect acceleration data from the last joint of the robot

**Why**

- In many cases the equipment are not able to provide specific information to evaluate their condition and avoid failures
- Recognize machine component misalignment, defective bearing, bent need signal analysis (e.g., vibration, torque, ...) properly done
- Control loops on industrial robots are closed through position sensors which are positioned on the motors and there is no feedback from the physical mechanical components

**Value proposition**

- Easy sensorization of existing equipment
- Reduce sensors setup time and cost
- Reduce bandwidth usage for data transmission
- Robot performance closed loop optimization

**EASY TO USE SOLUTIONS**
Advanced Robot Programming

**Why**
- Nowadays robots are programmed manually using either a teach pendant or by means of an off-line programming tool. This “textual” robot programming languages have proven to be difficult for many people to learn, and to use effectively.
- In addition, the robot programming is based on series of position and signal conditions rather than simple to use real human concept of task.

**What**
- Software applications to support task-level and object-level instruction of robot and control systems based on visual “Assembly Plan from Observation” approach where users can interact directly with the part to be assembled.

**Value proposition**
- Reduce programming time of existing and new robot
- No need to learn a robot programming language
AGILE
Autonomous Guided Intelligent Lean Equipment

Why
• Autonomous vehicles are one of the key tools meeting the Factory of the Future’s needs, such as growing demand of flexibility, reconfigurability and minimal use of resources in production systems

What
• An autonomous mobile platform providing modular and wide ranging solutions for logistic applications in manufacturing systems through all process stages
• Step 1 will be a 1.5 ton vehicle (AGILE 1500)

Value proposition
• High performance vehicle (best in class payload / size + speed) with best TCO ratio
• Modular, Scalable, fully Customizable - All navigation systems implementable
• Customer investment protection
**What**
- High speed collaborative robot (110kg payload)
- 6 safety layers for a modular approach
  - Laser scanner, Foam with Proximity sensor and Piezo-resistive sensor, Force sensor on wrist (manual guidance), Vision system

**Why**
- To reach the goal of building an adaptable factory, it is necessary:
  - to avoid fences or other obstacles to a free floor
  - to allow men and robots to work side by side, complementing each other peculiar skills
  - to allow men an easy interaction with robots, correcting their behaviour when necessary and easily teaching them new tasks

**Value proposition**
- Optimization of working process
- Reduction production time
- Reduction of manual processes / working steps

"AURA Advanced Use Robotic Arm"
What

- Wearable passive (non servo assisted) devices to improve manual operations quality and to relieve fatigue
- Wearable active (servo assisted) devices to improve the operator strength and solve ergonomics issues

Why

- The proportion of workers that will require support to improve the quality of work in their activities is increasing because of aging or injuries
- Modern robotics assisting and serving human beings will enter into the “surroundings” of workers activities and thus become an integral part of factory

Value proposition

- Reduction of musculoskeletal disease/injury
- Support of workers during simple and continuous movements, such as grasping control sticks or lifting heavy building materials, reducing equipment investment
e.DO: People Make Robotics

Why
- To help students with their coursework
- To execute simple chores
- To simulate and test a variety of business applications

What
- A unique, “build-it-yourself” 6-axis articulated robot project based on a 100% open-source hardware and software platform that allows users to understand how robotics work from the inside-out and the outside-in
- Backed by community-led expansion
- IoT compliant (multisensor board distributed on every joint)

Value proposition
- Multi-faceted project directed at business, educational and consumer markets

EASY TO USE
SOLUTIONS

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