SUSTAINABLE SOLUTIONS FOR MANUFACTURING
AGENDA

- ENERGY: WORLD AT A GLANCE
- WHY eCOMAU?
- CASE STUDIES
- eCOMAU FOR PROCESSES
- eCOMAU FOR BUILDINGS
- eCOMAU FOR CAR DEALERS
- eCOMAU OFFER PORTFOLIO
According to IEA, between 2010 and 2035, world primary demand for energy is expected to increase by 1/3 and energy-related CO2 emissions by 20%

(World Energy Outlook - 2011 Factsheet - International Energy Agency)

The cost of oil import is set to hit record levels in 2012, with OECD spending reaching 2.3% of GDP and each additional $10 increase in the oil price raising by 0.2%
The early drop of nuclear energy will boost the price of energy due to the increased shortage of offer.

The price of energy will raise also because of the expansion of the networks necessary to develop renewable energy.

In the future, the cost of fuel and CO₂ certificates will raise considerably.

A further increase in costs is forecast as a contribute to the renewable energy.

Improving energy efficiency is key to reducing greenhouse gases.

Development of global potential for energy efficiency improvements\(^1\)

European energy consumption and savings potential by 2020\(^2\)

Energy Efficiency is the biggest lever for reducing global greenhouse gases.

EU has significant potential for energy savings, especially in buildings.

Source: 1 Eco-efficiency. Chapter 6 – Environmental performance of constructions

(source Susi Partners)
ENERGY: REASONS FOR CHANGING…

- Rising cost of energy vs expected savings
- Applicable laws and certifications
- Increased alternative power solutions
- Green business ethics
- Marketing opportunity
eCOMAU NETWORK

DETROIT  SÃO PAULO  TURIN  BIELSKO BIAŁA  SHANGHAI
BUSINESS MODEL: ENERGY EFFICIENCY FOR MANUFACTURING

Consulting

IMPROVEMENT OF MANUFACTURING PROCESSES

- Industrial Energy Managers
- Product / Process experts focused on sustainable design, Green-Fit®, LCC Analysis
- Green manufacturing
- Green procurement
- Funding & Incentives

YOUR ENERGY MANAGEMENT IN GOOD HANDS

- Industrial Energy Managers
- Utilities management for every kind of industries

Service

Industrial Energy Managers

Product / Process experts focused on sustainable design, Green-Fit®, LCC Analysis

Green manufacturing

Green procurement

Funding & Incentives

Green Products & Technologies

“PLUG & SAVE” ON PROPRIETARY SOLUTIONS

- **Comau Robotics**: robots equipped with C5G Control Unit
- **Comau Powertrain**: Smart Drive, Urane
- **Comau Body Welding**: Versaroll

NON PROPRIETARY SOLUTIONS

- Buildings (heating, cooling, lightning monitoring systems…)
- Painting systems
- Trigeneration / Cogeneration
CONSULTING FOR INDUSTRIAL PROCESSES

eCOMAU's five steps of energy efficiency consulting process

1. Analysis of data (electricity, compressed air, water, …)
2. Implementation of measuring systems
3. Proposal of energy efficiency actions
4. Simulation
5. Implementation & monitoring of energy efficiency solutions
ENERGY CONSUMPTION MIX...

PER INDUSTRIAL SECTORS
(EU27)

IN AUTOMOTIVE MANUFACTURING

Source: European Environment Agency - 2009

AUTOMOTIVE SECTOR:
- Average Energy Consumption
- Weight Vs Process
eCOMAU FOR THE AUTOMOTIVE INDUSTRY
eCOMAU GREEN-FIT®

**RETROFIT activity** focused on energy saving for all manufacturing automated processes

BW  Machining  Robotics  Painting
CASE STUDIES - PROCESS ENERGY EFFICIENCY

<table>
<thead>
<tr>
<th>CNC</th>
<th>TRANSFER LINES</th>
<th>ROBOTICS</th>
<th>PAINTING LINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITALY &amp; POLAND</td>
<td>ITALY &amp; POLAND</td>
<td>ITALY</td>
<td>ITALY</td>
</tr>
<tr>
<td>238 MACHINING CENTERS</td>
<td>9 TRANSFER LINES</td>
<td>400 C4G ROBOT CONTROLLERS</td>
<td>2 PAINTING LINES</td>
</tr>
<tr>
<td>SD700L SD1000 1GXL 1GZ</td>
<td></td>
<td></td>
<td>3 coat spray booths 1 bumper line</td>
</tr>
</tbody>
</table>

SAVING kWh/year:
- CNC: 68K
- TRANSFER LINES: 264K
- ROBOTICS: 390K
- PAINTING LINES: 5,5mio

ROI:
- CNC: < 2 YEARS
- TRANSFER LINES: < 2 YEARS
- ROBOTICS: > 2 YEARS
- PAINTING LINES: < 2 YEARS
ENERGY SAVING CASE STUDY: MACHINING CENTERS

Process: Machining

Description: Installation of monitoring systems and Green-Fit®

Yearly energy saving equivalent: 1,537,359 kWh (3 shifts)

Reduction of CO₂ emissions: 999,283 Kg

ROI: < 2 years

NB: data refer to 92 COMAU 1GXL machining centers

Machining electrospindle with axes driven by ball screws with horizontal electrospindle
  • single spindle
  • twin spindle center
ENERGY SAVING CASE STUDY: ROBOTICS

Process: Body Welding

Description: Energy recovery on body welding stations (400 Comau C4G robot controllers)

Yearly energy saving equivalent: 389.617 kWh

Reduction of CO₂ emissions: 292.212 Kg

ROI: < 2 years

REP (Robot Energy Package)

- KERS
- Fan control optimization
- Stand-by optimization time
- Shut-off valve management
ENERGY SAVING CASE STUDY: AIR TREATMENT

Process: Painting

Description: Recirculation of hot air in base coat spray booths

Yearly energy saving equivalent: 2,500,000 kWh

Reduction of CO₂ emissions: 1,250,000 Kg

ROI: < 2 years
Process and generation system

Modular energy simulation program that allows to model energy process equipment and renewable energy generation systems (including emerging technologies) in a very flexible way. We use TRNSYS for equipment analysis and sizing, airflow analysis, electric power simulation, solar design, analysis of control schemes, etc.

Building

Dedicated to energy performance simulation for buildings, DesignBuilder can be used to model every kind of building (naturally ventilated, with day lighting control, with advanced solar shading strategies, etc.). It helps estimate a range of environmental performance data such as: energy consumption, internal comfort data and also HVAC component sizes.
**TYPICAL INPUTS:**
1) Thermodynamic input:
   - Design treated airflow
   - Recirculated airflow
   - Design temperature and relative humidity
   - Existing equipment design data
2) Operating profile

**TYPICAL OUTPUTS:**
- Energy consumption estimation for different scenarios
- Energy saving quantification

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Energy consumption for air recirculation

![Bar chart showing energy consumption for different processes before and after recirculation.](chart.png)
eCOMAU SIMULATION ACTIVITIES - BUILDINGS

ENERGY SIMULATION THROUGH DEDICATED SW

- Building energy performance
- Alternative energy generation systems
- Payback calculation

METHODOLOGY:

Definition of the **baseline** and comparison between different scenarios so that the customer is able to choose the appropriate solution
TYPICAL INPUTS

BUILDING GEOMETRY AND LOCATION
- Horizontal area (m²)
- Volume (m³)
- Lateral areas (opaque or transparent)
- Main orientation
- Location

OPERATING PROFILE
- Monthly operative days (d/m)
- Daily operative hours (h/d) + (from … to …)
- Desired internal temperature (°C)
- Average infiltration (l/h) and schedule
- Ventilation rate (m³/h) and schedule

BUILDING ENVELOPE
- Vertical opaque surface transmittance (W/m²K)
- Floor transmittance (W/m²K)
- Roof transmittance (W/m²K)
- Transparent surface transmittance (W/m²K)

PROCESS RELATED DATA
- Temperature (°C)
- Relative humidity (%)
- Volumetric airflow (m³/h)
- Density (kg/m³)
TYPICAL OUTPUTS

- Energy consumption estimation for different scenarios
- Energy saving quantification
- Energy hourly profiles
- Total ventilation energy requirements
- Heat transmission through envelope
- Budget cost estimation
- Preliminary Simple Payback Analysis
Reducing energy costs is a major issue for automobile dealerships. In the U.S., energy is the third-highest overhead expenditure. According to the National Automobile Dealers Association, U.S. dealerships use about 18% more energy per square foot than a typical office building. The best opportunities for saving energy can be found in the areas of highest consumption - lighting and HVAC systems.
TYPICAL ENERGY USE IN A DEALERSHIP (UK data)

<table>
<thead>
<tr>
<th></th>
<th>kWh/Y</th>
<th>Cost/Y (€)</th>
<th>tCO₂/Y</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>291.065</td>
<td>30.000</td>
<td>158.7</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td>452.144</td>
<td>16.000</td>
<td>83.6</td>
</tr>
</tbody>
</table>

Source: the Society of Motor Manufacturers and Traders Ltd.
THE ECODEALERS PROCESS

THE 4 STEPS OF VIRTUOUS PATH

- Reduction of energy demand
- Increase equipment energy efficiency
- Use of renewable energy, where possible
- Reduction of wastage through rational use of energy and water

CORE AND SIDE BENEFITS

- Real estate savings
- Cost monitoring
- Brand image
- Increased walk in (services)
- ISO certification

Energy demand
SERVICE AND OFFER PORTFOLIO

eCOMAU CONSULTING

- Green procurement
- Specifications and offers assessment
- Support for EnMS
- Support on energy topics definition compliant to ISO 50001 and WCM energy pillar.

eCOMAU for HIGH EFFICIENCY CHCP

- Combined heating, cooling and power systems. Feasibility, payback analysis and proposal of technical solutions. In partnership with leading companies, eCOMAU helps integrate high efficiency technologies into processes and production systems.
- Integration of heat recovery and cold production.
CONSULTING

- Green procurement
- Specifications and offer assessment
- Support for EnMS
- Support on defining energy topics compliant to ISO 50001 and WCM energy pillar.

HIGH EFFICIENCY CHCP (Combined heating, cooling and power systems)

- Analysis of feasibility and payback, proposal of technical solutions. In partnership with leading companies, eCOMAU helps integrate high efficiency technologies into processes and production systems.
- Integration of heat recovery and cold production.
PAINTING LINES

- Feasibility study
- Energy assessment
- Evaluation of energy consumption and possible savings based on energetic simulation SW
- Evaluation of costs and simple payback of investments
- Turn key energy saving solutions such as:
  - air re-circulation on spray booths HVAC
  - stand-by control

ROBOTICS (COMAU robots)

Energy Efficiency Solutions: REP (Robot Energy Package)
SERVICE AND OFFER PORTFOLIO

BUILDING and BUILDING AUTOMATION

- Monitoring
- Energy assessment and energy saving solutions, analysis of Best Available Techniques
- Centralized control with Wi-Fi protocol communication for building HVAC and lighting
- Optimization of fluid distribution

eCOMAU PROCESSES MONITORING

- Feasibility and cost evaluation, analysis of best energy monitoring systems applicable to industrial processes
- eCOMAU energy monitoring SW:
  - Powerful reporting/ Built-in calculations
  - Scalability
  - Flexibility
  - Universal connectivity
  - User-friendly interface and reporting