Energy efficiency – a driver for competitiveness
Hans-Jochen Banhardt, VP Environmental, Health and Safety
Robert Bosch GmbH
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ZVEI and EHPA Lunch Debate

2013 key figures*

<table>
<thead>
<tr>
<th>Bosch Group</th>
<th>➔ 46.1 billion euros in sales</th>
<th>➔ 281,000 associates</th>
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<tbody>
<tr>
<td>Automotive Technology</td>
<td>➔ One of the world’s largest suppliers of automotive technology</td>
<td>66 % share of sales</td>
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<tr>
<td>Industrial Technology</td>
<td>➔ Leading in drive and control technology, packaging, and process technology</td>
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<tr>
<td>Energy and Building Technology</td>
<td>➔ Leading manufacturer of security technology and global market leader for residential heating systems</td>
<td>34 % share of sales</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>➔ Leading supplier of power tools and accessories</td>
<td>➔ Leading supplier of household appliances</td>
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Bosch internal goals

Reduction of 20 % by 2020 (base year 2007)

- Current and
- Plan improvement vs. 2007 (relative to value added) in %

0 - 2.7 % - 3.5 % - 4.4 % - 11.4 % - 13.2 % - 16.0 % - 20 %

Further decrease by 2020

0 % -10 % -20 % -30 %

2007 2008 2009 2010 2011 2012 2013 2020
## Selected results of potentials

### Energy Efficiency at MAE (unit / kWh)

<table>
<thead>
<tr>
<th>Description</th>
<th>Efficiency</th>
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<tbody>
<tr>
<td>Hydraulic and coolant system GMX 400, EcP: Pumps replaced by Sytronix and Booster</td>
<td>- 66%</td>
</tr>
<tr>
<td>Paint shop Cylinders, LoP1: Saving mode exhaust system, heat recovery</td>
<td>- 80%</td>
</tr>
<tr>
<td>Test bench, HoP2: Converting to 4EE PWM Plugs and optimized programming of plc</td>
<td>- 32%</td>
</tr>
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### Energy Recovery (kWh)

<table>
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<tr>
<th>Description</th>
<th>Efficiency</th>
</tr>
</thead>
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<tr>
<td>Heat treatment, EcP: Heat recovery and usage for cleaning processes</td>
<td>- 54%</td>
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</tbody>
</table>

### Energy Efficiency in Infrastructure (CO₂ in t)

<table>
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<tr>
<th>Description</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP-System, GleP: Heat and power substitution</td>
<td>- 29%</td>
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</tbody>
</table>
Example: New machine
Smart energy mode in a punch press

Original drive solution:
- Breaking energy is wasted
  - Energy consumption: 7.3 kW
  - Peak load: 53 kW

Rexroth 4EE Solution
- „Smart Energy Mode“
- Use of breaking energy for acceleration of next movement
- Reduction of peak load by 50%
- Consumption Ø reduced by 30%
  - Energy consumption: 5.1 kW
  - Peak load: 22 kW

Savings*
- 13,200 kWh/a
- 1,800 €/a

CO₂ elimination**
- 8.1 t/a

* Energy mix, Germany pursuant to GEMIS Version 4.2 in reference year 2004: 0.613 kg CO₂/kWh
* Electricity rate: EUR 0.14/KWh, operation time 6000 h per year
CheP: Optimizing Paint Shop

**Original situation**
- Paint shop with all time running motors for exhaust air and air supply
- High energy demand for heating

Energy consumption
- Electricity: 75,500 kWh/a
- Heating Energy: 250,000 kWh/a

**Rexroth 4EE solution**
- Using direct gas fired heater
- Energy on demand (exhaust air and air supply)
- Heat recovery (exhaust air)

Energy consumption
- Electricity: 41,800 kWh/a
- Heating Energy: 24,000 kWh/a

Energy savings: 259,800 kWh/a
- 17,500 €/a *
- 59 t/a

CO₂-reduction *
- 59 t/a

* electricity 404g/kWh, 0,12€/kWh; gas 202g/kWh, 0,042€/kWh
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Energy-Saving Potential in Commercial Buildings

- **Lighting** 25%
  - LED systems
  - T5–T8 lighting
  - Lighting control systems

- **Space heating, hot water** 18%
  - Gas boiler/oil boiler
  - Pellet and wood chip heating systems
  - Combined heat and power (CHP) plants
  - Local heat networks

- **Process heat** 18%
  - CHP plants
  - Steam boiler systems
  - Gas turbines

- **Cooling** 25%
  - Absorber systems
  - Screw compressors
  - Turbo-compressor systems

- **Compression** 30%
  - Compressors
  - Leak reduction
  - Secondary networks
  - Waste heat recovery

- **Ventilation, air conditioning** 30%
  - Ventilation systems
  - Air conditioning systems
  - Heat and cold recovery

- **Waste heat utilization**
  - ORC processes
  - Distribution networks
  - Waste heat utilization

- **Gas turbines**
  - CCHP systems

- **CCHP systems**
  - Gas turbines
Cologne/Bonn airport: significant cost savings

**Initial situation**
- Temperatures of over 30°C in the terminal during summer

**Our solution**
- Utilization of the intelligent BAOPT ventilation control system
- Operation of AC systems in partial load mode

**Result:**
- Complete deactivation of all 342 circulating air-cooling systems
- Target value of 26°C is maintained
- Payback period: < 1 year

**37% cost savings per year**
Reduction in resource consumption for refrigeration appliances

Measures aimed at improving efficiency include:

- More efficient compressors
- Selective use of vacuum panels
- Improved insulation materials

Refrigerators and freezers per 100 l net volume in 24 h

<table>
<thead>
<tr>
<th>Appliance Type</th>
<th>1999</th>
<th>2014</th>
<th>Reduction</th>
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<tbody>
<tr>
<td>Refrigerator*</td>
<td>0.49 kWh</td>
<td>0.22 kWh</td>
<td>up to -55%</td>
</tr>
<tr>
<td>Freezer*</td>
<td>0.48 kWh</td>
<td>0.15 kWh</td>
<td>up to -69%</td>
</tr>
<tr>
<td>Fridge-freezer*</td>
<td>0.55 kWh</td>
<td>0.14 kWh</td>
<td>up to -75%</td>
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*Comparison between the consumption values, as determined based on the standard program, for one of our 2014 appliances with the similarly determined consumption values for a comparable appliance produced in 1999.

Refrigerator: KIL22AD40, KI22LAD40 (2014)
KIL1540, KI15L40 (1999)
Freezer: GSN58AW41, GS58NAW41 (2014)
GSU3401, GS34U01 (1999)
Fridge-freezer: KGN39X42; KG39NX42 (2014)
KGU3201, KG32U01 (1999)

as of October 2014

Source: BSH
Reduction in resource consumption for washing machines

Measures aimed at improving efficiency include:

- Aqua sensor: saves water and time
- Flow rate sensor: water quantity is precisely regulated
- Load detection: washing time and water consumption are automatically adjusted to load quantity

Washing machines* per kg of laundry (cotton wash 60° C)

*Comparison between the consumption values, as determined based on the standard program, for one of our 2015 appliances with the similarly determined consumption values for a comparable appliance produced in 2000.

WAY287W4, WM14Y7W4 (2015)
WFR2830, WXLS1430 (2000)
as of October 2014

Source: BSH
2030 energy and climate package: Bosch supports trias of binding targets

- Single CO2-target not sufficient
- Obstacles for deployment of energy efficiency and renewable energies require specific targets
- Energy efficiency is a driver for competitiveness of European industry
Thank you!
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Policy Recommendations

2030 Energy and Climate Package

→ COM to propose strong governance process to enforce EU-wide targets
→ Push energy efficiency up to 30% as Juncker was advocating for

Ecodesign and Energylabel Directives

→ Successful instrument that increased market demand for highly innovative and efficient products in transparent market
→ No one-size-fits-all solution: industry potentials have to be triggered by other instruments such as financing models, energy audits

Juncker’s Investment Package

→ Enable swift support for energy efficiency measures