Energy from industry perspective
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Energy Verbund at a Verbund site

Example: Steam Cycle at a Verbund Site

Steam export

- Sulfuric acid plant
- Acrylic acid plant

Steam consumption

- Adipic acid plant
- Urea/carbamide plant
- Office building

Annual avoidance *
BASF Group 2013:
Primary energy:
1,5 Mio. toe

CO₂ emissions:
3,5 Mio. t CO₂

*Comparison: Conventional power and steam generation in separate plants based on natural gas.
Highly efficient processes: Examples for energy efficiency measures

Continuous improvement in energy efficiency and use of modern energy production processes

- **Saving of thermal energy:**
  - Heat integration
  - Use of waste heat for drying processes
  - Optimized operation of distillation columns

- **Saving of electrical energy:**
  - Use of frequency controlled pumps
  - Energy efficient motors
  - Energy efficient lighting
  - Automation measures

- Reduction of water consumption and avoidance of wastewater.
Small measures count, too

Leakage detection by soapy water
Leakage detection by ultrasound
Limits of Energy Efficiency
Innovation needed

Specific Energy Consumption

Plant today

Existing plant, ideally operated + technical improvements

Energy Management

Strategic Investment

Innovation + Investment

New plant

New process + new plant
Energy Efficiency at BASF by new investments in new plant

- New chemical processes and process technologies
  - L-Menthol
    (BASF Ludwigshafen, 2012)
  - Bio propylene glycol
    (Oleon, Belgium, 2012)
  - Toluene diisocyanate and precursors
    (BASF Ludwigshafen, 2014)
  - Several investments after conceptual changes for drying of products, separation of mixtures etc.
Reduction of greenhouse gas emissions with increased production

Development since 1990
Index 1990 = 100%, BASF Group excl. oil and gas business

- Volume of sales product: +100%
- Absolute greenhouse gas emissions: -48%
- Specific greenhouse gas emissions: -74%
Energy Efficiency at BASF
Organizational Processes

- Strategy & goals defined at Board Level
- People: Organisation, information, involvement
- Detailed know-how from inhouse experts -> Engagement of all employees
- Data: Monitoring/documentation -> Analysis -> Steering
- Implementation of ISO 50001: Energy management systems add formalism, but no new ideas
Energy Efficiency at BASF
Involvement of experts and employees

Opportunities with climate protection products

Prevention of greenhouse gas emissions through the use of BASF products by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>CO₂eq/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>300 million metric tons</td>
</tr>
<tr>
<td>Housing and Construction</td>
<td>246</td>
</tr>
<tr>
<td>Industry</td>
<td>31</td>
</tr>
<tr>
<td>Transport</td>
<td>7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
</tr>
</tbody>
</table>

Examples:
- Insulation materials
- N₂O decomposition catalysts
- Fuel additives
- Nitrification inhibitor
- Products for wind and solar industry

We generated around 9% of our sales in 2013 with climate protection products
Without chemistry energy efficient buildings will be hard to achieve

Source: ICCA 2012
BASF applications for energy efficient buildings – widely used in construction

**Insulation**
- Styrodur® C
- Elastopor®
- Micronal® PCM
- Neopor®
- Ultramid/Ultradur®

**Concrete admixture**
- Glenium®, X-Seed®

**Cool pigments**
- Paliogen®, Sicopal®, Fluoroceram®
High energy savings with insulations

Conventional construction
21 l heating oil per m²/year

Insulated with Neopor®
7 l heating oil per m²/year

Source: BASF; *calculated for a 80 m² apartment
BASF paintings with solar reflective pigments

**FLUOROCERAM® Cool** is a finishing paint that reflects heat for steel or aluminium surfaces

- Reflects heat from buildings
- Contribute to reduction of heat island effects in cities
- Reduce energy costs as less cooling is necessary
- Creates a better indoor climate
- Prolonge the life span of roofs and walls
In April 2012, BASF has launched its new Lifecycle analyzer calculation tool. It provides LCA calculations under the companies Green Sense® Concrete approach. With BASF’s concrete admixtures, significant CO₂-savings can be achieved. Customers are now empowered to verify this claim! 

http://youtu.be/B8Ade9FaDqc
Our show houses proof that it works

Germany
3 Liter House, Ren., Multi storage
Built 2001

Germany
Built 2006

Italy
3 Liter House, New, Multi Family House
Built 2007

Korea:
3 Liter House, New, Office building
Built 2007

UK:
BASF House, New, One Family House
Built 2008

France:
La Clairiere, New, Multi Storage
Built in 2010

Brazil:
CasaE., New, Multi storage
Built in 2007

Germany
1-Liter-House, New, Terrace houses.
Built 2004

France:
Bat. Génération É, Ren., Multi Storage
Built in 2007

Poland:
Private homes, New, One Family Houses
Built since 2007

USA:
Paterson house, New., One family house
Built 2007

Hungary:
Passive House New Office
Built 2008

Argentina.
CasaE. New, One family house.
Built 2010

Launch in 2012
BASF assesses sustainability of own office buildings worldwide

- Analysis of 150 buildings at 50 sites until 2015 as part of BASF’s ambitious sustainability goals
- Evaluation according to a sustainability understanding based on the sustainability definition of the United Nations: balancing economic, environmental and social needs
- Optimization measures consider BASF’s broad sustainable construction product range
- Long-term implementation of a sustainable corporate real estate portfolio management

Striving for a more sustainable corporate real estate portfolio.
Global association involvement for energy efficient buildings

<table>
<thead>
<tr>
<th>New Buildings</th>
<th>Existing Buildings</th>
</tr>
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<tbody>
<tr>
<td>→ &quot;Construction industry stakeholders recognize BASF as a champion for 'sustainability'.&quot;</td>
<td>→ &quot;Focus on renovation as one major driver for Western European construction industry.&quot;</td>
</tr>
</tbody>
</table>
| Regulatory characteristics:  
  - All new buildings will be passive houses in 2021  
  - Standardization of Sustainable Construction | Regulatory characteristics:  
  - EU directive not yet fully implemented  
  - Even energy efficiency mostly uncovered |

**Derived Advocacy Strategy**

*New Buildings*

- Promote green buildings as new high-performance segment.

**Existing Buildings**

- Promote deep renovation as new high-performance segment.

**Elements:**
- Memberships in GB Councils, standardization
- Handbook on Green Building Ratings
- Products in green material catalogues

**Derived Advocacy Strategy**

- WBCSD value chain construction
- Green Deal secondeship
- BDI Gebäude AG, Belg. Passivhouse Platform

**UK Green Deal**
BASF positions on global climate protection policy

Climate protection must be economically efficient and environmentally effective. This can be achieved with a global CO\textsubscript{2} price covering all regions and all industries.

- Unilateral (EU !) climate targets must be balanced by an equally important target on competitiveness/industrial growth.

- Roadmaps show: Industry can further reduce GHG only by less than 1%/year.

- Companies contribute by providing innovative products for a low carbon future, e.g. energy efficiency products for insulation, light-weight transport or renewable energy like wind turbines.