Polyurethane: A key contribution to resource and energy efficiency
By insulating buildings with highly efficient polyurethane, we can reduce energy losses. Energy efficiency is one key factor in sustainability, another is resource efficiency, e.g. reducing our consumption of fossil fuels, especially oil, and hence our dependence on this finite – and mostly imported – resource. Covestro addresses the sustainability issue through environmentally friendly solutions to increase energy and resource efficiency, e.g. through improvements in the global cold chain.

Currently more than a third of the world’s food supplies are thrown away because of inadequacies in distribution or storage. Obviously there is room for improvement. A more efficient and economical cold chain would help, and polyurethane products make that possible. The outcome would be economic benefits throughout the food chain, but in particular to farmers in developing countries, and improved living standards for hundreds of millions of people all over the world. Find out more about how polyurethane contributes to resource and energy efficiency in this flyer.
Polyurethane – a positive lifecycle balance

One of the most efficient insulation materials
Polyurethane rigid foam insulates so well because of its low thermal conductivity. The gas enclosed in the foam pores further enhances the insulation performance. For many applications today, the gas is pentane. Its thermal conductivity is half that of air.

Polyurethane’s efficiency as an insulation material also makes thinner insulating layers possible than with other materials. This creates more interior living or working space for a given building area, which is a big advantage when insulating older buildings. Polyurethane is also an extremely durable insulating material since it is moisture-resistant, temperature-resistant and chemically stable, while displaying a high degree of aging resistance.

Last but not least, polyurethane has an outstanding energy balance. When used to insulate a building, polyurethane saves over 70 times more energy during its lifecycle than was needed to manufacture it. In other words, polyurethane-based insulation solutions offer great potential for a more far-reaching implementation of energy efficiency plans like e.g. the EU Energy Efficiency Directive and Energy Performance of Buildings Directive or the U.S. EPA National Action Plan for Energy Efficiency at national level.

Good fire protection performance
There are many misconceptions about polyurethane as an insulation material. One is that it represents a fire hazard. But the facts tell a very different story: polyurethane is thermally stable, does not melt, drip or smolder, and only suffers surface charring. This represents a crucial advantage over other insulators.

Through the inclusion of flame retardants rigid polyurethane foam achieves a low or normal flammability classification in accordance with EU standards. If polyurethane forms an integral part of a façade system, its flammability performance is similar to that of traditional mineral wool insulation material. As a result, the use of polyurethane as a fire-protection barrier is permitted in Germany, for example, whereas polystyrene is not.

Improved cold chains
Improvements in the cold chain that takes food from field to fork would significantly reduce the enormous quantities that end up simply rotting away. Covestro believes that a more efficient and economical cold chain is one of the key issues for sustainable development, particularly in the world’s poorer countries.

Insulation thickness for U-value 0.022 W/(m²·K) – insulation only

<table>
<thead>
<tr>
<th>Insulation Material</th>
<th>Thickness</th>
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<tbody>
<tr>
<td>Polyurethane 100 mm</td>
<td></td>
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<tr>
<td>Expanded polystyrene graphite 133 mm</td>
<td></td>
</tr>
<tr>
<td>Expanded polystyrene 146 mm</td>
<td></td>
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<tr>
<td>Extruded polystyrene 150 mm</td>
<td></td>
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<tr>
<td>Mineral wool 154 mm</td>
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<td>Wood wool 167 mm</td>
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Recycling gains

There’s no better use for oil than to save oil. When oil-based polyurethane is used to insulate buildings and save heating oil, its energy balance is extremely positive in that over 70 times more energy is saved during polyurethane’s lifetime than was used in its manufacturing.

But although polyurethane insulation materials are largely unaffected by the ageing process and can be used to a ripe old age, their recycling is already on the political agenda, as EU 2020 shows. The fact is that polyurethane can be effectively disposed of by incineration. Thermal recycling is a particularly sensible solution since it releases the energy bound up in the polyurethane.

Besides, the uncontaminated remains of polyurethane insulation material can also be used to make highly moisture-resistant pressed panels, e.g. in manufacturing prefabricated dormers, and recycled polyurethane powder as a binder to absorb oil spills.

The diagram below illustrates Covestro’s sustainability approach: Energy-efficient production processes, long-lasting applications and use phases and the development of new options for closed material cycles.

One prime example is a pilot project undertaken by Covestro and RWE in which CO₂ extracted from the flue gas of a brown coal power station is being used in the manufacture of polyurethan raw materials – and ultimately in the production of everyday objects such as mattresses.

Learning from nature:

Up to now, the components used to manufacture plastics were mainly oil-based. By using carbon dioxide instead, it would be possible to reduce our dependence on oil and, at the same time, absorb some of this climate killer.
Covestro not only manufactures the raw materials for polyurethane, it also proactively participates in various energy-efficient building initiatives in which polyurethane products play a key role.

Covestro enables decision-makers to implement sustainable, environmentally friendly and profitable building projects and the goals are clear: save energy, cut greenhouse gas emissions, increase comfort and reduce lifecycle costs.

Together with partners Covestro has already proved what progress can be made in constructing energy-efficient residential, industrial, office and retail buildings in Germany, Belgium, China, India and the USA.

In Germany Covestro is also a member of Innovation City Ruhr, where it is sponsoring the energy-related rehabilitation of a commercial building in Bottrop.

On the EU level Covestro is member of PU Europe and supports the Renovate Europe campaign of EuroACE.

The benefits of polyurethane insulation

- **High insulating performance**
  Of all conventional insulating materials, today polyurethane offers the highest insulating performance.

- **More living space**
  Polyurethane as an insulating material permits a thinner insulating layer than other materials.

- **High aging durability**
  Polyurethane is mechanically durable, moisture resistant, temperature resistant and chemically stable.

- **Great versatility**
  Rigid polyurethane panels can be cut to any size using simple tools.

- **Outstanding energy balance**
  Viewed over its entire life cycle, polyurethane displays an excellent energy balance.

- **Good fire protection performance**
  Polyurethane is thermally stable, does not melt, drip or smolder, and only suffers surface charring.

- **Renovation and new buildings**
  Broad range of applications in these key areas.
Promoting a dialog on resource and energy efficiency

Covestro is keen to talk to politicians and concerned individuals throughout the world. After all, polyurethane not only contributes to resource and energy efficiency but also creates jobs and wealth.

According to ISOPA figures, the European polyurethane industry employs more than 817,000 people and generates a market value of over €125 billion.