Polyurethanes

Pipe insulation

Over 40 000 km of pipe success
Huntsman is a global manufacturer and marketer of differentiated chemical products that improve the quality of life for people around the world. Following more than 30 acquisitions since 1970, Huntsman Corporation today is a dynamic public company with 11,000 employees in multiple locations worldwide. The company’s 2009 revenues were approximately $8 billion.

The polyurethane division of Huntsman

Huntsman is a global leader in providing MDI based polyurethanes solutions across an extensive range of applications and market sectors. Our aim is to grow the polyurethanes market in partnership with our customers through our innovation, responsiveness and commitment. High performance insulation, comfort, adhesion and protective coatings are just some of the key benefits that our products deliver. The amazing insulating property of polyurethanes can be fine tuned to bring benefit to many different industries due to the versatility of the material. Sandwich panels, pre-insulated pipes, water heaters and refrigerated cabinets are just few of the endless possibilities.
What is Polyurethane?

Polyurethane is produced by reacting two liquid chemicals, an isocyanate and a polyol to form a solid blown matrix. The inclusion of a blowing agent into one of the liquid streams expands the polymer matrix during the change from liquid to solid. Hence, a solid foam is obtained. The chemical reaction is controlled according to the choice of manufacturing process together with a selection of further additives and catalysts. In pre-insulated pipes, rigid polyurethane foam is the material of choice due to the compelling combination of insulation excellence and mechanical properties.

Polyurethane in pipe insulation

- Polyurethane foam has an extremely low thermal conductivity minimizing heat exchange with a minimal layer of insulation
- Polyurethane foams can be fine-tuned to operate in a wide range of temperatures
- Excellent mechanical properties are achieved even with low densities
- Polyurethane insulated parts can be produced in factories or foamed in situ
- Polyurethane foam is compatible with many materials and provides excellent adhesion and long lasting dimensional stability
- Low water and air ingress is a long term guarantee for maintaining the excellent insulating properties throughout the life cycle of the pipeline
- Polyurethane insulated pipelines have minimal total cost of ownership
Moving energy to people

Polyurethane is the sustainable insulation for energy transport

Increased global energy demand calls for substantial investment in environmental friendly supply infrastructures. Polyurethane is the insulant of choice for pipes and tanks in a wide range of industries.

District heating and cooling

District heating and cooling are very efficient systems to provide warm or cold water to both residential, commercial and industrial users. Thanks to optimally scaled plants, primary energies are used to pump heat in the desired direction. Warm or chilled water is the standard medium used in these networks and polyurethane insulation is the key to efficiently bring the energy where it is needed.

Oil and Gas

Many thousands kilometers of pipeline are employed to serve the oil and gas industry on every continent. An intricate network of on shore and off shore transmission pipelines, platforms and tanks stands at the very fundament of a modern energy industry. Polyurethane provides the engineer with the very best material to solve the complex trade-off between operational and capital costs.

Industrial Pipelines

Pipelines are extensively used within chemical parks and plants in order to efficiently move fluids. Insulating these pipelines reduces energy dissipation and saves pumping costs. Petrochemical, pharmaceutical, food, beverages and mining industries are commonly equipped with polyurethane insulated lines.

Cryogenic

Liquefied natural gas is an extremely important and growing source of energy. Its transport is only possible in cryogenic conditions. Polyurethane is widely used to insulate both pipelines and tanks in this field.
Huntsman provides solutions for the insulation of all the elements of a pipeline network

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**Huntsman offers you a wide range of different polyurethane solutions**

- Huntsman designs and produces fully formulated polyol systems containing water, catalysts and surfactants for the continuous and discontinuous production of any element of a pipeline
- Formulated polyol systems can be supplied with or without pre-mixed physical blowing agent
- We offer “state of the art” solutions to any combination of technical requirements, regulation constraints and production set-ups either based on pouring or spraying

*In the European Economic Area, we will only sell products that are REACH compliant.*
Huntsman offers a versatile range of polyurethane solutions for a broad manufacturing window to give your pipelines superior thermal conductivity properties in both discontinuous and continuous production.

- Delivering high temperature resistance up to 165 °C
- Optimized for standardised pipe lengths
- Obtaining low density with low lambda-values for continuous production

**Polyurethane pre-insulated straight pipes and fittings**

**Straight pipes** are pipe-in-pipe systems with an inner pipe that is usually made of steel and they account for the majority of pre-insulated pipe applications. Standard lengths for pipes are 6, 12 and 16 meters and specialty variants of straight pipes include **curved pipes** and **fittings** that allow directional changes of the pipe run.

<table>
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<th>Feature</th>
<th>Description</th>
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<tr>
<td>Low lambda-values</td>
<td>down to 23 mW/m.K (at 50 °C) depending on blowing agent and process settings</td>
</tr>
<tr>
<td>Blowing agents of choice</td>
<td>cyclopentane, HCFC141b* and water</td>
</tr>
<tr>
<td>Low density and homogeneous density distribution</td>
<td>30 years resistance to high temperatures (CCOT) guarantee: 120-165 C°</td>
</tr>
<tr>
<td>Optimized for top filling of 6-16 m pipe range</td>
<td>Easy and efficient handling with selected low viscosity raw materials</td>
</tr>
<tr>
<td>Superior foam flow properties</td>
<td>to provide structural homogeneity and quality consistency in production</td>
</tr>
<tr>
<td>Fire rated pipes with specialty polyol formulations</td>
<td>Superb adhesion to metal and HDPE due to well balanced polymerization</td>
</tr>
<tr>
<td>Application versatility in cold and hot pipelines</td>
<td>EN 253 and EN 448 (fittings) compliant</td>
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</tbody>
</table>

* only available where national regulations permit use

**Production techniques:** Discontinuous and continuous
Huntsman markets polyurethane systems specifically for spray insulation of excellent foam quality, extremely good surface finish and in a minimal amount of spray layers, to be applied for a very broad range of pipe densities.

- Creating extremely even and fine cells for excellent thermal insulation
- Delivering smooth and regular surfaces
- Exhibiting superb curing properties
- Spraying foam layers of up to 100 mm in only 1 spray cycle

**Spray** production is particularly suited for medium to large diameter pipes and regular to heavy weight pipes. Rotating spray insulation of pipes provides economic advantages thanks to the possibilities to use thinner outer casing and improved productivity thanks to shorter set-up times when changing the pipe diameter.

## Polyurethane spray insulation onto a rotating pipe

Huntsman markets polyurethane systems specifically for spray insulation of excellent foam quality, extremely good surface finish and in a minimal amount of spray layers, to be applied for a very broad range of pipe densities.

### Highlights

- **Low lambda-values**, down to 21 mW/m.K (at 23 °C) or 24 mW/m.K (at 50 °C) depending on blowing agent and process settings
- **Blowing agents of choice**: pentane, HCFC141b* and water
- **Very broad density range**: 40-250 kg/m³
- **Excellent adhesion** to any epoxy or polypropylene coated metal, plastic or GRP pipe
- **Smooth and regular surface** allowing easy application of outer jacket
- **High fire rated foams** with specialty polyol formulations
- **Superb curing properties**
- **EN 253 compliant**
- **Foam layers of 100 mm in one spray application**

**Production technique: Spray**

* only available where national regulations permit use
**Polyurethane pre-insulated flexible pipes**

For more than 10 years, Huntsman delivers polyurethane systems to combine the excellent thermal insulation of rigid foam with the high flexibility of these pipes, tailor-made to your specific equipment requirements.

- Guaranteeing very low thermal conductivity due to the extremely fine cell structure
- Tuned for any standard pipe density
- Offering systems specifically for pipelines in the sanitary sector

| Low lambda-values, down to 23 mW/m.K (at 50 ºC) depending on blowing agent and process settings | Blowing agents of choice: pentane and water |
| Competitive density range | Systems for sanitary applications |
| Very low water absorption and permeability | Good dimensional stability |
| Solutions for high and low pressure foaming machines | EN 15632, part 1 and 4 compliant |
| Excellent adhesion to cross-linked polyethylene (PEX), mild steel, soft annealed copper and alu-PEX | |

Production technique: Continuous
Minimized overpacking by free-rise density tuning

Concrete coated pipes systems with quick curing and high compression resistance

Foam application possible to pipes above 100°C without negative impact to foam quality

Ease of mixing due to adapted reactivity and viscosity

Specific systems for low temperatures

EN 489 compliant

Production techniques: Manual and machine mixing

In situ polyurethane insulation for joints

Huntsman markets dedicated systems for filling pipe joints to maintain the insulation level of the pipeline from low to high operating temperatures

- Specific systems for application at low temperature
- Solutions for networks into operation at temperatures above 100 ºC without negatively impacting the foam quality
- A range of systems for the production of open cell foamed joints with negative buoyancy and superior mechanical properties for concrete coated offshore gas pipelines

Straight pipes and fittings are laid down and are then welded to ensure tightness of the inner circuit. Once the inner pipe is joined and welded the operators can place an HDPE jacket around the joint and inject a two components mixture creating an insulating polyurethane layer in situ thus ensuring proper insulation continuity. Systems for joints are sold in pre-portioned packages for manual mixing. Where it is logistically feasible and required by the size and diameter of the pipes, joint systems can be supplied in bigger packages and applied by portable foaming machines. Huntsman markets both those systems.
Moulded polyurethanes scales or shells can be used to insulate pipelines *in situ* or as an *alternative* to in situ joints. Two scales are joined around an existing pipeline and are then fixed and *encapsulated* into a cover that can be made of many different materials but mostly by metal or glass reinforced polyester shells. Shells are conveniently used to retrofit old-fashioned mineral wool or foamed cement insulated pipelines.

**Polyurethane insulation scales**

Huntsman offers products for polyurethane insulation scales as an alternative to joint filling and as a solution for retrofitting older pipelines

- Delivering surface quality and fast operation
- Offering chemical resistant systems, compatible with most solvent based coatings and adhesives, resins and GRP

<table>
<thead>
<tr>
<th>Property</th>
<th>Advantage</th>
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<tbody>
<tr>
<td>Low lambda-values, down to 25 mW/m.K</td>
<td>Quick de-moulding</td>
</tr>
<tr>
<td>(at 50 ºC) depending on blowing agent</td>
<td></td>
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<tr>
<td>and process settings</td>
<td></td>
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<tr>
<td>Very broad temperature resistance</td>
<td>Good dimensional stability and high strength</td>
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<tr>
<td>from -180 ºC to +140 ºC</td>
<td></td>
</tr>
<tr>
<td>Smooth surface and low friability</td>
<td>Easy and efficient handling with</td>
</tr>
<tr>
<td></td>
<td>selected low viscosity raw materials</td>
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<tr>
<td>Very low water absorption and vapour</td>
<td>Self-extinguishing systems available</td>
</tr>
<tr>
<td>permeability</td>
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Production technique: Moulding
Fueling your ambitions!

Huntsman delivers quality and service

The pipe insulation segment of Huntsman has solid roots into the vault of fundamental knowledge inherited from Shell. Huntsman managed to blend the technical skills that made Shell the technological leader in the pipe insulation industry with the organizational agility of a modern polyurethane multinational and became one of the most innovative suppliers of technology and materials. Huntsman wants to turn the fruits of this major technical legacy into fuel for the ambitions of our customers.

We are working on four major challenges for the future of the industry:

- Insulated pipes life cycle extension, focused on lambda-ageing
- Production efficiency improvement
- Thermal insulation improvement
- Further extension of pipe operating conditions

Our scientists and technologists are looking forward to blending the results of these major streams of research into the right recipe to boost our customers’ competitiveness. Two major development centers in Europe and regional technical service cells located close to the main markets provide an extensive network to service the growth of our customers.
We firmly keep in place the core values upon which our company was founded. We are dedicated to giving our customers the finest quality products and service available. Our customers are valued partners and we are privileged to serve their needs. We see service as our key market differentiator. We relentless drive for excellence in customer satisfaction in terms of quality, technical support and on-time in-full deliveries. Huntsman is actively involved in technical committees related to the pipe market in order to help maintaining the quality and consistency of polyurethane pre-insulated pipes.
Building a future of growth

Huntsman is dedicated to sustainable chemistry. We are devoted to use our technical expertise to address the world’s most pressing environmental needs. With Huntsman Polyurethanes we invest in lowering energy consumption and CO₂ emissions through the excellent insulation properties of rigid polyurethane foam. As a large proportion of the world’s fuel is used to either heat or cool, we help reduce global warming by insulating pipelines.

Discover Walk the Talk

Huntsman makes EHS protection an integral part of all stages in their products’ life cycle, from existence to recycling through their Product Stewardship process. We work very closely with our customers, suppliers and others in the supply chain to ensure that everybody understands the EHS issues related to our chemicals and to the polyurethanes products that are made. Towards our customers, we take an active role via Walk the Talk, an initiative from all member companies of ISOPA, which consists of a modular package of recommendations and measures to achieve safety and added value through trouble-free production.
Huntsman Polyurethanes warrants only that its products meet the specifications agreed with the buyer. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications.

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Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Polyurethanes containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent on the manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

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