

**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.*















**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.

## Polyurethane pre-insulated straight pipes and fittings

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

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

Production techniques: Discontinuous and continuous

\* only available where national regulations permit use



**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

- 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

	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/m <sup>3</sup>	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





**Flexible** pipes are pipe-in-pipe systems with inner service pipes produced from flexible materials such as cross-linked polyethylene (PEX), thin-walled steel, soft annealed copper or **alu-PEX**. The product is popular with contractors because of its ease of handling and cost-saving. Flexible pipes can be laid down in narrow trenches and can be bend to circumvent obstacles. Sections up to several hundred meters can be uncoiled reducing the need for expensive weldings and numerous joints. Flow and return pipes can be fitted into a shared outer casing pipe. This process requires the use of **special polyurethane systems** to achieve the combination of **high flexibility** and **excellent thermal resistance**.

## 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 °C) 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









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.

## 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 °C 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

 <p>Minimized overpacking by free-rise density tuning</p>	<p>Concrete coated pipes systems with quick curing and high compression resistance</p> 
 <p>Foam application possible to pipes above 100 C° without negative impact to foam quality</p>	<p>Ease of mixing due to adapted reactivity and viscosity</p> 
 <p>Specific systems for low temperatures</p>	<p>EN 489 compliant</p> 

Production techniques: Manual and machine mixing



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

	<p>Low lambda-values, down to 25 mW/m.K (at 50 °C) depending on blowing agent and process settings</p>	<p>Quick de-moulding</p>	
	<p>Very broad temperature resistance from -180 °C to +140 °C</p>	<p>Good dimensional stability and high strength</p>	
	<p>Smooth surface and low friability</p>	<p>Easy and efficient handling with selected low viscosity raw materials</p>	
	<p>Very low water absorption and vapour permeability</p>	<p>Self-extinguishing systems available</p>	

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 relentlessly 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.



## OPERATIONS

- ISO 9001 certified quality system
- Focus on continual improvement
- All-round Supply Chain and Customer Service experts
- Flexible, make-to-order capability
- Highly automated processes and B2B connections
- Tank telemetry

## TRANSPORT

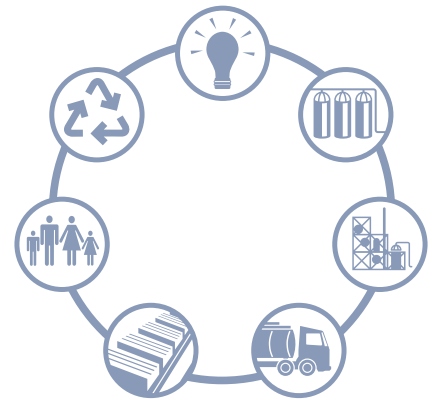
- Best-in-class logistic service providers
- ISOPA trained drivers
- Sustainable transport solutions
- Continued logistics network development

## SUPPORT

- 24/7 emergency response
- Risk based supply chain concepts and advice
- B2B and portal solutions with customers
- Dedicated customer service approach across Europe in more than 17 working languages
- After sales support

## STORAGE

- Strategic bulk storage set-up
- Dynamic warehouse capability
- Highly efficient filling operations



## 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 CO<sub>2</sub> 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.





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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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