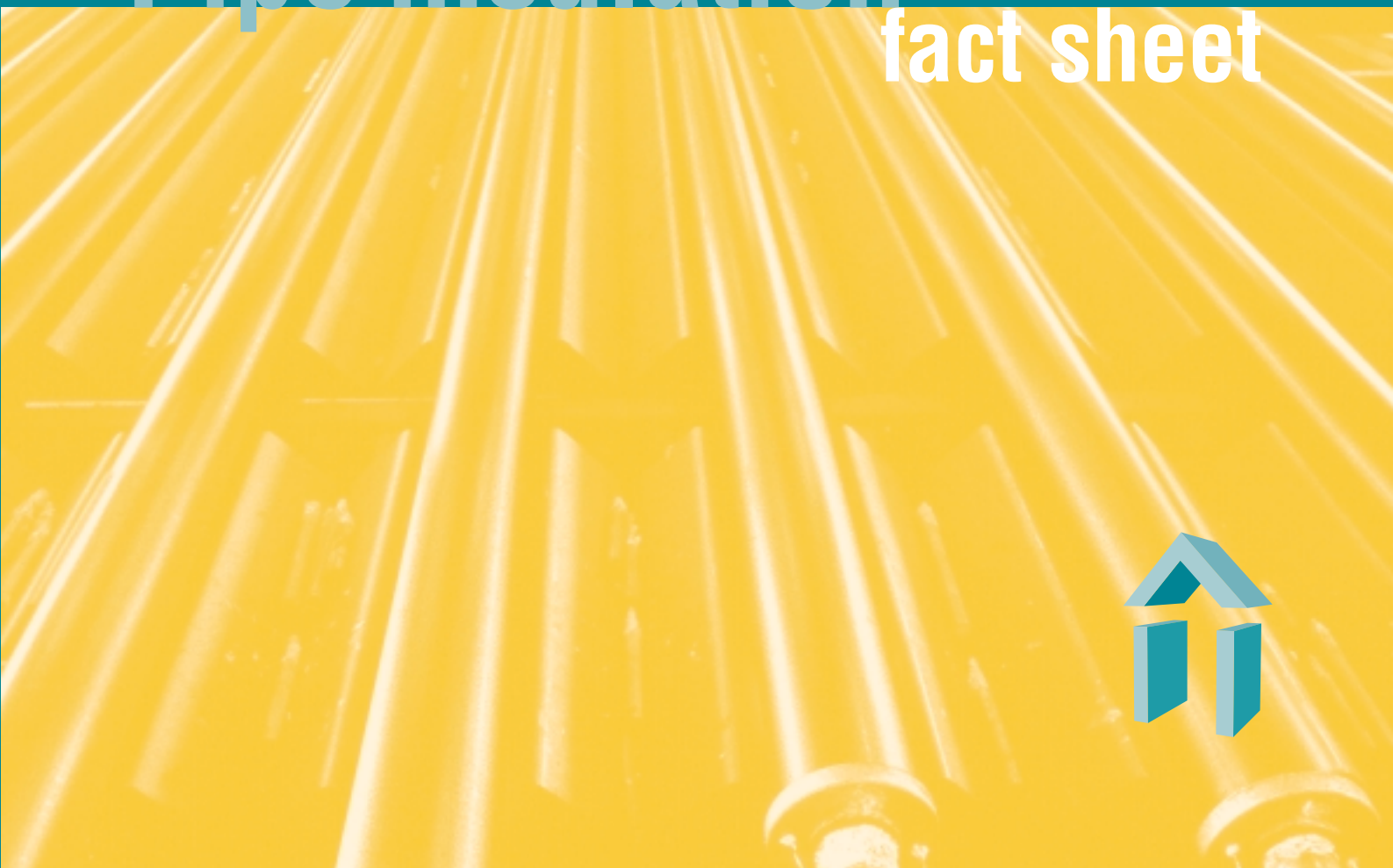
HUNTSMAN
Polyurethanes

Polyurethane foam systems for joints in district heating:
Daltofoam TE 24200/Suprasec 5005, Daltofoam TE 44205/Suprasec 5005
and Daltofoam TE 44214/Suprasec 5005

Pipe insulation fact sheet



INTRODUCTION

Polyurethane systems used in pipe insulation for district heating must fulfil various stringent requirements concerning the foam end properties and processing performance:

- **A low foam thermal conductivity and a good pipe composite heat resistance are important, as network service temperatures up to 130°C, occasionally with peaks up to 140-150°C, are applied in district heating networks.**

- **It is important that the systems have excellent flow properties, which enable the foam to fill narrow cavities. The foam must adhere well to the inner steel pipe and the outer high density polyethylene casing pipe, to provide a strong bond to ensure the long term performance of the pipe composite during service.**

Huntsman Polyurethanes is a major supplier of polyurethane raw materials to this application area. We have developed a series of fully water blown and dual blown systems for the manufacture of pre-insulated pipes and joint. In the present fact sheet joint filling and suitable formulations for joint filling are discussed.

JOINTS IN DISTRICT HEATING NETWORKS

District heating pipes are manufactured in lengths of 6 to 16 metre which are joined together after they are laid down. Whereas the pipes are prefabricated in factories under controlled and optimised conditions, joints are made on site and can therefore be the weakest points in a district heating network.

The joint system for pipes consists of a two-component foam liquid that forms an effective insulation with comparable strength and insulating properties as the prefabricated pipes. The requirements for the polyurethane foam systems are somewhat different as compared to the systems that are used for the pipe production. Although the same base polyol can be used, the reactivity has to be lower, in particular for hand-mixed foams. The free rise density is higher compared to the systems used for discontinuous pipe filling. The quality of the foams is to comply with the European norm EN489.

The quality of the foam highly depends on the right mixing ratio. In order to facilitate mixing and overcome mixing errors, the preparation of the component polyol and isocyanate as pre-portioned foam packages is advantageous. Larger connection series and the connection of bigger diameter pipes should preferably be carried out with on-site foaming machines.

SPECIAL APPLICATION PRECAUTIONS

There are some general precautions that should be followed to ensure successful application of joint systems:

- **The assembly area should be protected against unfavourable weather conditions (wind, moisture, dust etc.). If necessary, a protective tent should be erected above each working area.**
- **Sufficient workspace is a prerequisite for good quality work. When assembling in a trench, it needs to be ensured that the area of pipe joints is easily accessible.**
- **Condenses on the surface and moisture due to weather should be prevented. Care should be taken that there is no condense water in the casing as this would degrade the quality of the foam. The water necessary for the foaming process is already contained in the polyol formulation.**
- **The storage of raw materials has to be done at an adequate temperature, preferably at 20-25°C, the surface temperature of the steel inner pipe and the casing pipe should be between 15 and 40°C.**
- **The steel pipe surface must be free of grease, oil and mill scale.**
- **Careful mixing has to be ensured as this gives a uniform foam quality and therefore a tight joint. The filling density should be sufficiently high to enable the foam to completely fill the pipe within the fibre time. The overall density in the joints should be similar to the density of the pipes.**
- **The reaction of the foam components and the quality of the foam depend on the temperature. If the temperature is low, i.e. below 10°C, the joint, in particular the lower part, should be preheated to 30-40°C with a soft gas flame.**
- **The vent-openings must always be located in the upper area of the hollow to be filled with foam and permanently sealed after foaming.**

PRECAUTIONS FOR COLD TEMPERATURES

Special precautions must be taken at working temperatures below 0°C with regard to handling of pipes and raw material, the cutting and removal of casing and foam insulation. The PE casing is becoming more rigid and more sensitive to maltreatment at low temperatures. Therefore, the casing material must not be exposed to extreme actions such as impact or shocks.

Prior to cutting, the cold casing should be pre-heated to 20-30°C. It must be noticed that the applied heat penetrates slowly through the plastic material. If large wall thickness and diameters are to be pre-heated, a tent and a heating gun should be used.

Adding a catalyst package to the polyol can increase the reactivity of the polyol/isocyanate system.

HCFC-141B/WATER DUAL BLOWN JOINT SYSTEM DALTOFOAM TE 24200/SUPRASEC 5005

The dual blown route is based on the expansion of the polyurethane by partly carbon dioxide from the water/isocyanate reaction and partly a physical blowing agent, HCFC-141b. The use of HCFC-141b, having ozone depletion potential and global warming potential, is restricted in a number of countries and will be phased out in the future. It is advised to check the local legislation before implementing this system in the production.

GENERAL DESCRIPTION

The fully formulated polyol blend Daltofoam TE 24200 comprises polyether polyols, silicone surfactant, catalyst, water and HCFC-141b. It is designed for the production of pipe joint system. Appropriately processed foam based on Daltofoam TE 24200/Suprasec 5005 exhibits excellent long term ageing characteristics.

PRODUCT CHARACTERISTICS

Property	Unit	Daltofoam TE 24200
Appearance	–	pale yellow liquid
Hydroxyl value	mg KOH/g	470
Viscosity at 25°C	mPa.s	675
Density at 25°C	kg/l	1.09
Flash point	°C	>100
Mixing ratio polyol/MDI	pbw	100:160
Reactivity in foam test* – Cream time – String time	 s s	 52 198
Free rise density* (bagfoam)	kg/m^3	50

*** measured at a temperature of 20°C on a laboratory bagfoam**

FULLY WATER BLOWN JOINT SYSTEM DALTOFOAM TE 44205/SUPRASEC 5005 AND DALTOFOAM TE 44214/SUPRASEC 5005

The fully water blown route is based on the expansion of the polyurethane due to formation of carbon dioxide from the water/isocyanate reaction.

GENERAL DESCRIPTION

The fully formulated polyol blends Daltofoam TE 44205 and Daltofoam TE 44214 comprise polyether polyols, silicone surfactant, catalyst and water. They are designed for the production of pipe joint systems. Appropriately processed foams based on Daltofoam TE 44205/Suprasec 5005 and Daltofoam TE 44214/Suprasec 5005 exhibit excellent long term ageing characteristics. The system Daltofoam TE 44214/Suprasec 5005 is particularly designed for the production of pipe joints at low temperatures, e.g. below 0°C.

PRODUCT CHARACTERISTICS

Property	Unit	Daltofoam TE 44205	Daltofoam TE 44214
Appearance	–	pale yellow liquid	pale yellow liquid
Hydroxyl value	mg KOH/g	575	550
Viscosity at 25°C	mPa.s	930	450
Density at 25°C	kg/l	1.08	1.08
Flash point	°C	>100	>100
Mixing ratio polyol/MDI	pbw	100:193	100:188
Reactivity in foam test* – Cream time – String time	 s s	 71 196	 50 112
Free rise density* (bagfoam)	kg/m^3	51	36

*** measured at a temperature of 20°C on a laboratory bagfoam**

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