

HBCD Replacement by Brominated Butadiene-Styrene Polymer (BrBDS)

Kurt Muender

Plastic Foam Technical Director

Oct. 2013

Who we are



KNAUF INSULATION

Knauf Insulation represents one of the most respected names in insulation worldwide

30 years of experience in the insulation industry and still growing fast

ENERGY EFFICIENCY

Committed to meeting the increasing demand for energy efficiency in new and existing homes, non-residential buildings and industrial applications

> €1.2 BILLION

Strong and steady financial performance with turnover of well in excess of €1.2 billion in 2012

5,000 EMPLOYEES

Over 5,000 employees in more than 35 countries and more than 30 manufacturing sites

A comprehensive product range

MINERAL WOOL

Glass
Mineral
Wool



with **ECOSE**
TECHNOLOGY

Rock
Mineral
Wool



MINERAL WOOL

Blowing
Wool



WOOD WOOL

Heraklith®

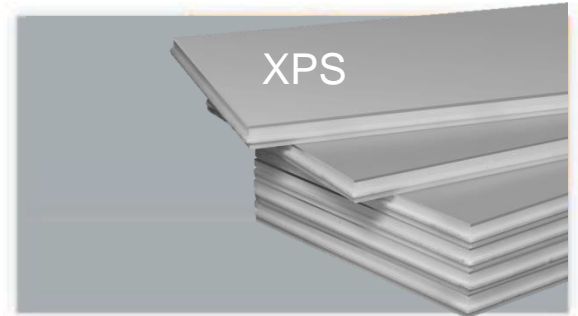


PLASTIC FOAMS

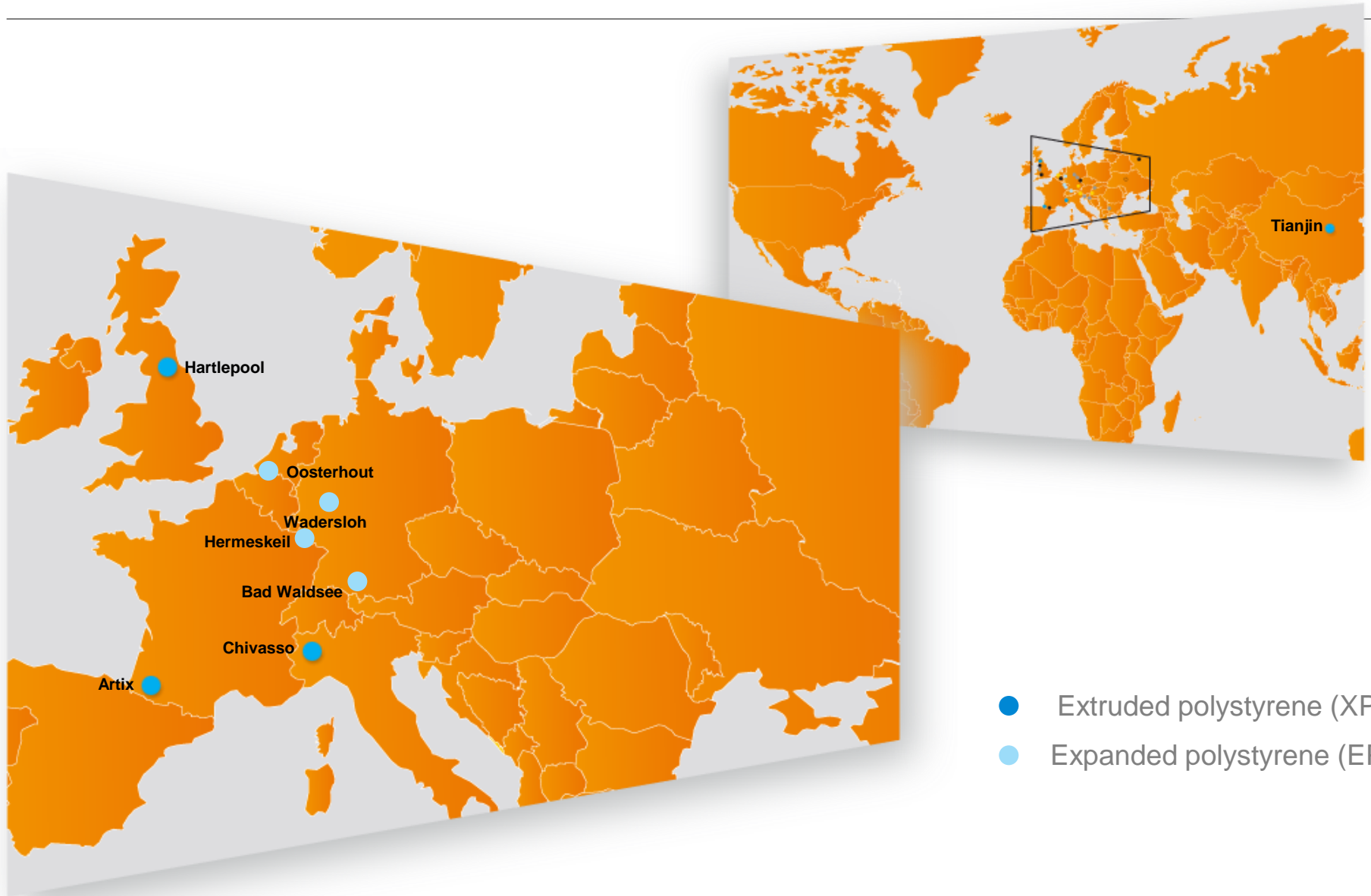
EPS



XPS



Our foam manufacturing facilities



- Extruded polystyrene (XPS)
- Expanded polystyrene (EPS)

Trial of Polymer FR XPS

Basics (XPS)

- Industrial Trails were performed on the following substances
 - Polymer FR (Masterbatch) based on Emerald 3000
- Industrial size Trail
 - Large Twin Screw Extruder (110/400mm)
- Polymer FR content
 - P-FR increase by 12% (w/w) vs. Standard HBCD recipe
 - 50mm product (C02 standard recipe)
- Fire Class test
 - Euroclass E (Product specification)
 - German Application standard B1/B2
 - France Application Standard M1

Test results (XPS) - example

- EN 13501-1 / Euroclass "E"

Flame over 150 mm (YES-NO)	Flamed drops (YES-NO)	Post-Combustion (sec)	Euroclass E (Yes – NO)
no 8cm	No	0	Yes
no 8cm	No	0	Yes
no 11cm	No	4	Yes
no 11cm	YES but after 20"	34	Yes
no 11cm	YES but after 20"	33	Yes
no 12cm	YES but after 20"	13	Yes
Fire corner EU: discrete.			



Result (XPS)

- Industrial size trails shows
 - P-FR solution gives the following results according different requirements in different European countries
 - Euroclass “E”
 - All tested master batches passed the test with a P-FR content around 10% higher compared to HBCD
 - Application Related Requirements
 - B1/B2 (German) – P-FR content around 12-15% higher compared to HBCD most test were passed
 - M1 (France) – not sufficient trails / currently under review

Trial of Polymer FR EPS

Basics (EPS)

- Industrial Trails were performed on the following substances
 - Polystyrene (including Infrared absorbers) manufactured with Emerald 3000 as Flame Retardant

- Industrial size Trail
 - Block manufacturing
 - Shape moulding manufacturing

- Fire Class test
 - Euroclass E (Product specification)
 - German Application standard B1/B2

Result (EPS)

- Fire Behaviour
 - All fire tests (B1/B2/Euroclass E) were passed

- Processing
 - During the steaming process the pressures need to be increased which increases the energy consumption around 8%

- Other Technical specifications
 - Cohesion between beads is 5-10% less compared to standard HBCD based products.
(this decrease can be compensated by adapting the process parameters)
 - Current results shows a slight decrease in compressive strength (CS).
These parameters are currently under review

Conclusion for XPS/EPS

Conclusion XPS/EPS

- Technical performance
 - Technically the Polymeric FR can replace the existing HBCD solution in most applications
- HSE/Sustainability
 - HSE profile is the most promising between all alternative solutions
- Commercially
 - Higher Consumption -> Higher Cost
 - Higher Price -> Higher Cost

Within the current difficult market environment in the European Insulation market in conjunction with the increasing raw material prices, it will be a challenge to absorb the additional cost for the Polymeric FR. Nevertheless Knauf Insulation will start with the Introduction of HBCD free products from begin of 2014, as a part of our product range – mainly in the high end markets.

Thank you !