Products for the PVC industry

Innovating reliable solutions for everyday life

Perstorp

WINNING FORMULAS

The elements of success

You need a partner who can see the big picture when it comes to your products, your processes and your customers. Our experience and expertise in the special niches of organic chemistry, process technology and application development are at your service, providing you with a complete chain of solutions to enhance quality and profitability at every step.

Our versatile intermediates, an essential element of your winning formula, are specifically designed to add value and enhance end-product performance. Your solution to meeting the increasing demands for safer, lighter, more durable and environmentally friendly end-user products, begins here.

Innovation in everything we do

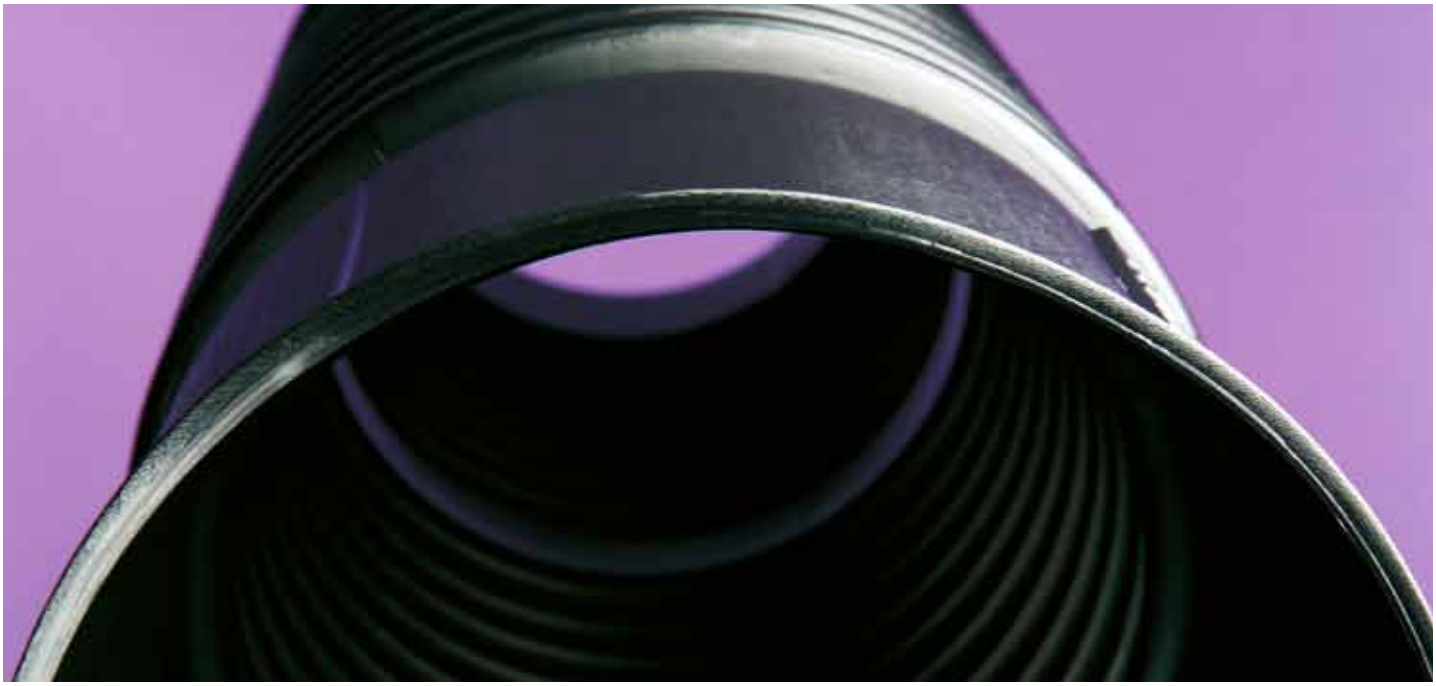
Innovation distinguishes every aspect of our business process. Developing smarter and safer solutions creates real value in new chemical applications. Focused innovation instills leadership and purpose in our business activities, improves internal processes and increases application and product competitiveness.

Delivering our promises globally

Our global presence provides you with reliable solutions and processes, consistent high quality, security of production and supply and delivery with precision. This commitment also means rapid response when product or application support is required and the very best in technical support.

Putting the care into chemicals

We take our responsibilities to heart and are committed to attentive, sustainable business practices. We minimize risks for our customers, our employees and the environment by working proactively to ensure safe products and processes.



Innovating reliable solutions for everyday life

Polyvinyl chloride, most often referred to as PVC, is one of the most cost-effective and easy to use thermoplastics in the world. The polymer properties can easily be tailored to exactly match end-user demands for everything from rigid plastic pipes to flexible plastic bags. Our intermediates for the PVC industry enhance the performance of PVC products and help formulators fine-tune the specific properties required for each application. The wide range of applications include such vastly different areas as flooring, computer keyboards, plasma bags, automotive interiors, sports equipment, pipes, profiles, cables and many more products that make daily life easier, safer and more fun.

We support the PVC industry with the raw materials and specialty chemicals required to ensure quality, flexibility, processing properties and heat resistance and reduce environmental impact. We offer the building blocks for stabilizers that replace lead-based alternatives, making them more environmentally friendly, and that achieve the desired processing properties and heat resistance. Our plasticizers and raw materials for plasticizers enable formulators to produce high quality PVC compounds with the right mechanical properties, flexibility and feel.

We welcome your questions. More detailed information and specifications of each product are available on www.perstorp.com or through your Perstorp sales representative.

Our products for the PVC industry:

Di-Penta (Di-Pentaerythritol)
Hexafunctional micronized polyol with outstanding performance in environmentally friendly lead-free heat stabilizers

Penta mono, Penta tech & Di-TMP
Tetrafunctional micronized polyols for environmentally friendly lead-free heat stabilizers

Liquid Polyols
Tailored solubility for the perfect compatibility in liquid heat stabilizers

TMP (Trimethylolpropane)
Starting polyol for specialty ester plasticizers and for lead-free heat stabilizers

2-EHA (2-Ethylhexanoic Acid)
Acid for specialty esters and for preparing metal salts for lead-free heat stabilizers

Emoltene™ 100
High purity plasticizer that sets the industry standard for quality

Emoltene™ 244
Specialty plasticizer with low color and low viscosity

Precision environmentally friendly stabilizers

PVC compounds are often processed at temperatures that affect physical and chemical properties of the compound through degradation. This is visually observed as discoloration and the longer processing takes the more yellow the compound becomes. Heat stabilizers counteract the degradation and yellowing of PVC compounds. We focus on innovation for sustainable solutions and have developed cutting edge environmentally friendly building blocks for stabilizers that replace harmful lead-based alternatives. We supply products for the raw materials of metal salts and the solid and liquid polyols used as co-heat stabilizers. Perstorp polyols improve early color, color hold and long term heat stability.

Di-Penta – securing the highest performance in lead-free heat stabilizers

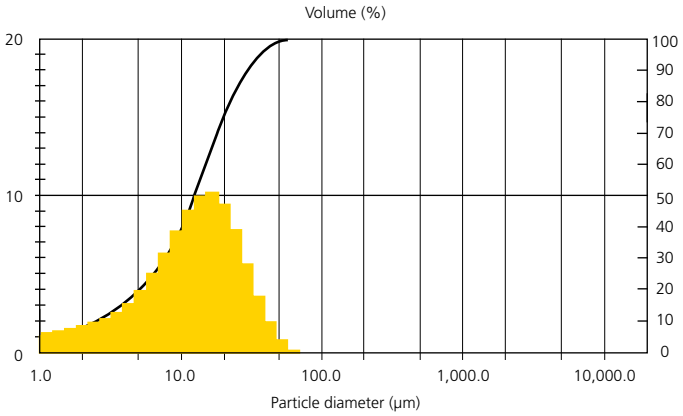
Di-Penta micronized is the solid polyol that offers the highest performance in lead-free heat stabilizers. It offers excellent heat stability over long periods and the moderate melting point improves the compatibility of the polyol with the PVC formulation. This reduces plate-out and therefore ensures a perfectly smooth PVC profile surface. The outstanding performance of Di-Penta micronized offers the ideal balance between high efficiency and low plate-out and has led to a widespread increase in the use of this hexafunctional polyol. In end products that are processed at high temperatures, such as window profiles, pipes and cables especially, heat stabilizers are vital to protecting the products from yellowing and degradation. Di-Penta also has a very low water uptake, which offers another potential benefit to formulators.

Liquid Polyols – tailored for perfect compatibility in liquid heat stabilizers

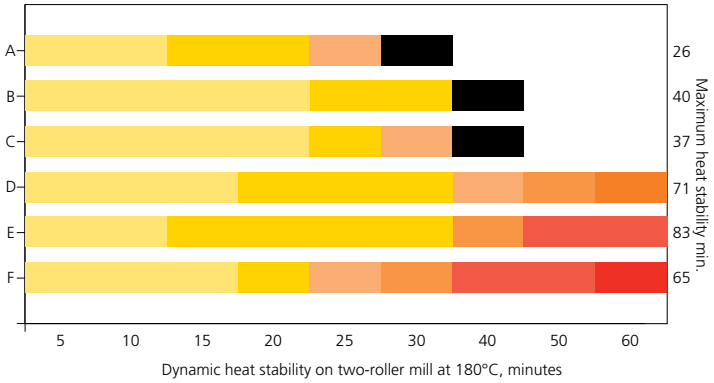
We offer a range of liquid polyols based on Di-Penta, Penta and TMP, high-functionality polyols such as Polyol 4800 and Polyol 4640, to enhance liquid heat stabilizers. The solubility of these liquid polyols can be tailored to give liquid heat stabilizers an excellent combination of compatibility and heat stability. Using liquid polyols is important in the formulation of transparent PVC products since solid particles may cause problems with haze.

Penta mono, Penta tech & Di-TMP – environmentally friendly co-heat stabilizers with ideal properties

These finely micronized solid polyols are used to make excellent all-purpose, lead-free heat stabilizers. Penta mono micronized is particularly valued for the early color, long color retention and good maximum heat stability it lends to PVC formulations. Products such as rigid PVC profiles benefit from these properties. Penta mono micronized and Penta tech micronized are tetrafunctional polyalcohols that are milled to reach carefully defined particle size distribution which secures batch consistency and processing efficiency. Di-TMP micronized is used in applications where low early color retention is important.



Dynamic heat stability of various polyol co-stabilizers in rigid PVC foil formulations



A Without polyol
B Trimethylolpropane 0.3 phr
C Di-Trimethylolpropane micronized 0.3 phr
D Pentaerythritol mono micronized 0.3 phr
E Di-Pentaerythritol micronized 0.3 phr
F Polyol 4800 0.3 phr

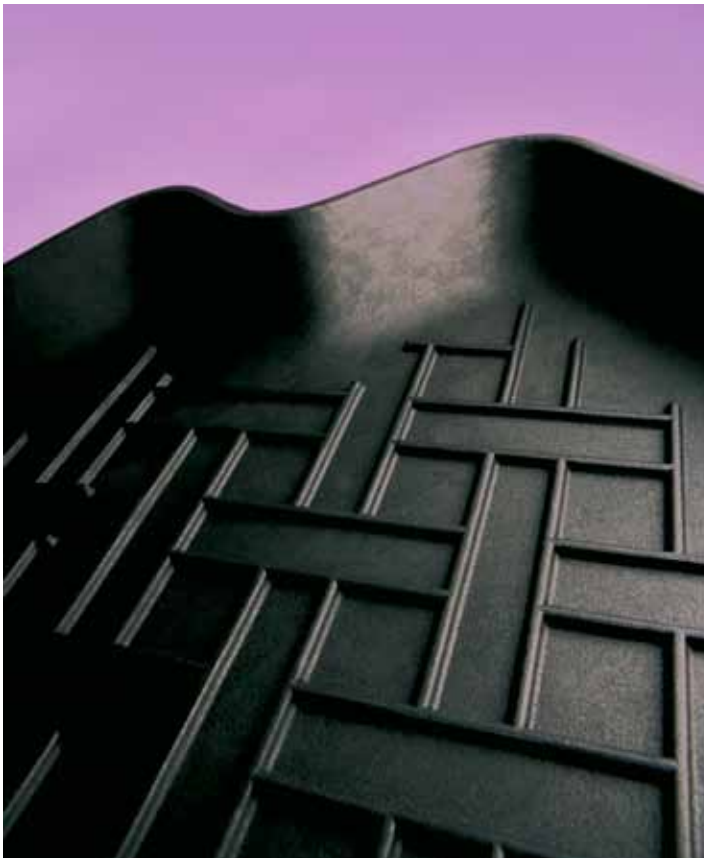
Securing high quality in stabilizers & plasticizers

TMP – producing lead-free heat stabilizers & specialty plasticizers

TMP is a trifunctional solid polyol with primary OH-groups that is ideal for the formulation of both lead-free heat stabilizers and specialty plasticizers. The low melting point of TMP makes it ideal as a co-heat stabilizer in PVC compounds and the formulations also benefit from good early color when TMP is used. As a starting polyol for preparing specialty ester plasticizers TMP offers good heat and hydrolytic stability and has lower toxicity than alternatives. As the global leaders in producing trimethylolpropane we offer you superior supply capacity.

2-EHA – important raw material for plasticizers & metal salt for lead-free heat stabilizers

Our 2-EHA is used as raw material for preparing metal salts for creating environmentally friendly heat stabilizers. It replaces harmful lead-based alternatives and meets strict performance demands. 2-EHA is also an important building block for specialty plasticizers where it helps achieve good lubricity, heat stability and hydrolytic resistance. It also functions as a formulation tool for achieving the right properties such as solubility, volatility and viscosity in the ester.



Pure performance plasticizers

Plasticizers are vital components in PVC compounds that reduce brittleness and improve the flow, processability and flexibility of formulations. Our long history of dependably supplying phthalate-based plasticizers with the highest purity, guarantees your success as a formulator. Our products for PVC plasticizers set the industry standards for quality and we continue to drive technology boundaries forward by developing new plasticizer grades with environmentally friendly profiles that meet market demands for performance. Our current focus is on developing C10-based phthalate plasticizers that are environmentally friendly and secure good technical performance.

Emoltene™ 100 – new generation of plasticizers

This new generation of general purpose plasticizers for PVC is characterized by low viscosity and is highly effective. Emoltene™ 100 performs well in all major PVC applications like cables, flooring, film, coatings and coated fabrics. The low volatility, slow migration and solvent resistance are among the properties that are highly appreciated.

Emoltene™ 244 – specialty plasticizer with low color & low viscosity

This PVC plasticizer is characterized by low viscosity and is highly effective. Emoltene™ 244 offers better cold flex and fusion properties and better tensile strength than other common polyester plasticizers. It is often used in PVC plastisols where its low viscosity helps improve processing. It secures excellent solvent resistance and also has a lower toxicity profile than alternative products.

Product data summary

Solid polyols							
Product	**Appearance**	**Reactive group**	**OH-value mg KOH/g**	**Particle size µm**	**Molecular weight g/mol**	**Melting point (°C)**	**Water content %**
Di-Penta micronized	Solid, micronized	6 hydroxyl	1325	<40	254	222	<0.2
Penta mono micronized	Solid, micronized	4 hydroxyl	1645	<40	136	262	<0.2
Penta tech micronized	Solid, micronized	4 hydroxyl	1645	<40	136	248	<0.2
Di-TMP micronized	Solid, micronized	4 hydroxyl	895	<250	251	111	<0.3
TMP	Solid, crystals	3 hydroxyl	1247	Flakes	135	59	<0.1

Liquid polyols							
Product	**Appearance**	**Reactive group**	**OH-value mg KOH/g**	**Type of µm OH-group**	**Molecular weight g/mol**	**Viscosity mPas (°C)**	**Water content %**
Polyol 4640	Liquid	4 hydroxyl	640	Primary	355	1,100	<0.2
Polyol 4800	Liquid	4 hydroxyl	800	Primary	282	2,200 (23)	<0.2
CTF	Liquid	1 hydroxyl	385	Primary	146	80 (20)	<0.5

Acids							
Product	**Color hazen**	**Reactive group**	**Purity %**	**Acid value mg KOH/g**	**Molecular weight g/mol**	**Viscosity mPas (°C)**	**Water content %**
2-EHA (2-Ethyl Hexanoic Acid)	10	1 COOH	Min 99.5	389	144	7.5 (20)	Max 0.1

Plasticizers							
Product	**Color hazen**	**Ester content %**	**Free alcohol %**	**Acid value mg KOH/g**	**Molecular weight g/mol**	**Viscosity mPas (°C)**	**Water content %**
Emoltene™ 100	25	Min 99.5		Max 0.07	447	123 (20)	Max 0.05
Emoltene™ 244	10	Min 98.5		Max 0.5	286	8 (20)	Max 0.10
Di Ethyl Hexyl Phthalate (DOP)	25	Min 99.7	Max 0.05	Max 0.04	390	78-82 (20)	Max 0.05



Your winning formula

The Perstorp Group, a trusted world leader in specialty chemicals, places focused innovation at your fingertips. Our culture of performance builds on over 125 years of experience and represents a complete chain of solutions in organic chemistry, process technology and application development.

Matched to your business needs, our versatile intermediates enhance the quality, performance and profitability of your products and processes. Present in the aerospace, marine, coatings, chemicals, plastics, engineering and construction industries, they can also be found in automotive, agricultural, food, packaging, textile, paper and electronics applications.

Our chemistry is backed by reliable business practices and a global commitment to responsiveness and flexibility. Capacity and delivery security are ensured through strategic production plants in Asia, Europe and North and South America, as well as sales offices in all major markets. Likewise, we combine product and application assistance with the very best in technical support.

As we look to the future, we strive for the development of safer products and sustainable processes that reduce environmental impact. This principle of innovation and responsibility applies not only to our own business, but also to our work with yours. In fulfilling it, we partner with you to create a winning formula that benefits your business – as well as the people it serves.

Discover your winning formula at **www.perstorp.com**

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