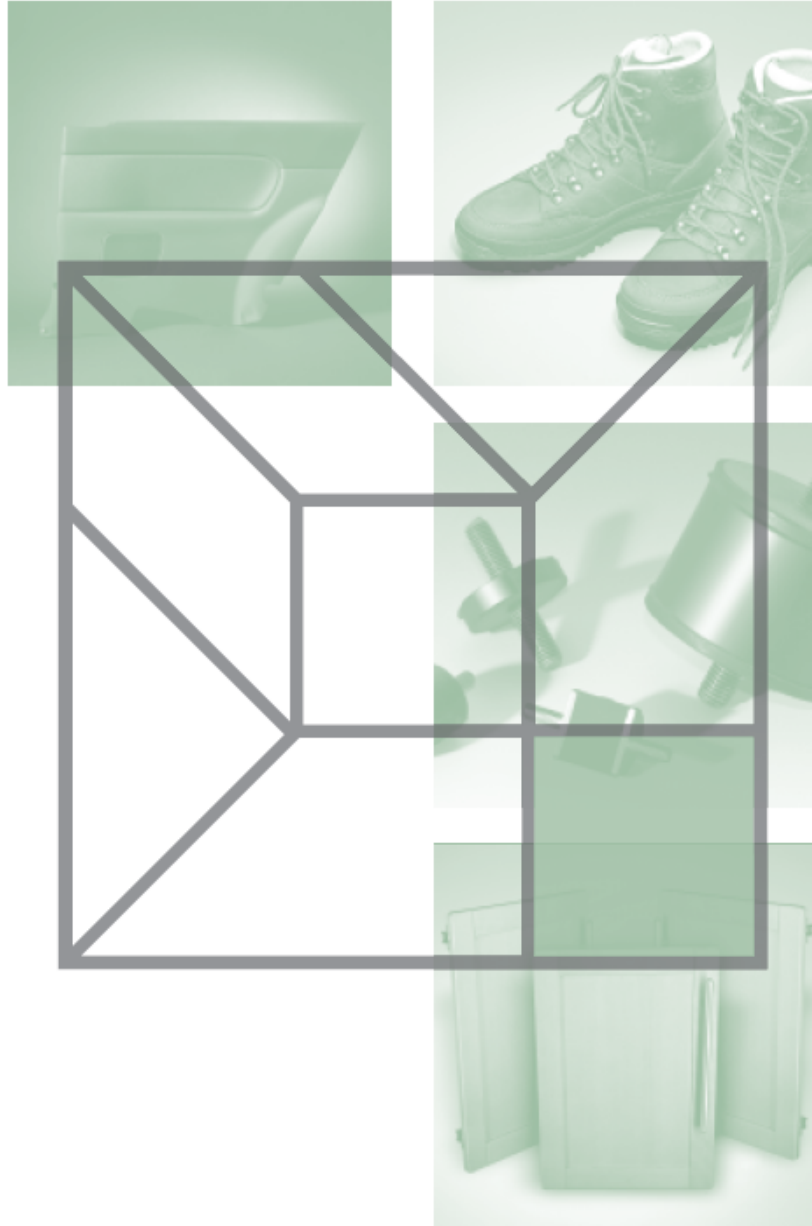


Pergut®
Chlorinated rubber for
high strength in
solventborne adhesive systems



Bayer **MaterialScience**

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1. Pergut Description

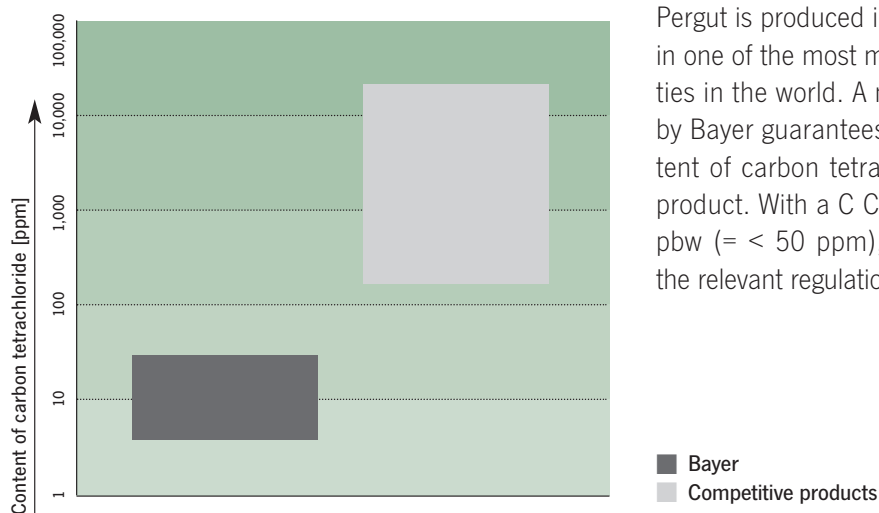


Pergut is the name given to a group of chlorinated polymers in powder form. Besides its many applications as a binder in corrosion control and in the coatings segment, Pergut is frequently used in the adhesives industry.

When added to solventborne contact adhesives, it enhances the strength of the bond. When used as an independent adhesive system, it is suitable for a very broad range of applications as a durable rubber-to-metal adhesive.

2. Pergut Product safety

Fig. 1: Carbon tetrachloride content



Pergut is produced in Dormagen, Germany, in one of the most modern production facilities in the world. A new process developed by Bayer guarantees an extremely low content of carbon tetrachloride (C Cl_4) in the product. With a C Cl_4 content of $< 0.005\%$ pbw (= < 50 ppm), Pergut complies with the relevant regulations worldwide.

3. Pergut range

Fig. 2: Table of adhesive grades

Grade	Viscosity at 23 °C (18% in toluene) [mPas]	C Cl_4 [%]	Color value (18% in toluene)	Toluene [%]
Pergut S 20	20 ± 4	≤ 0.005	≤ 7	≤ 2.5
Pergut S 40	42 ± 9	≤ 0.005	≤ 7	≤ 2.5
Pergut S 90	92 ± 18	≤ 0.005	≤ 7	≤ 2.5
Pergut S 130	150 ± 30	≤ 0.005	≤ 7	≤ 2.5
Pergut S 170	165 ± 35	≤ 0.005	≤ 7	≤ 2.5

Pergut chlorinated rubber contains 64.5 – 67 % chlorine and is sold as a white powder with a density of approx. 1.6 g/cm^3 . The individual grades differ in their molecular weight and therefore also in their viscosity, measured as an 18.5 % solution in toluene. The higher the number of the grade (S 20 – S 170), the higher the molecular weight. The S 20 to S 90 grades are mainly added to solventborne contact adhesives, whereas the high-viscosity grades, S 130 and S 170, are mostly used as adhesive raw materials for rubber-to-metal applications.

4. Pergut Property spectrum

Pergut has excellent chemical resistance to acids, alkalis, water and salt solutions. The Pergut grades are soluble in many solvents and have good compatibility with numerous resins and polymers.

In adhesives, they improve resistance to

- ozone
- mineral oils
- chemicals
- flammability
- weathering.

4.1 Compatibility

One of the advantages of Pergut is its good compatibility with a large number of plasticizers, various resin types, pigments and fillers. There are slight differences between the individual Pergut grades with regard to their compatibility with polymers and solvents. It is therefore essential to check compatibility in the relevant adhesive formulation.

4.2 Plasticizers

The compatibility of Pergut covers numerous plasticizer types such as oleates, stearates, glycolates, laurates, phosphates, phthalates, citrates, sebacates and adipates.

4.3 Resins

Pergut shows good compatibility with rosin, coumarone, acrylic, alkyd and natural resins.

5. Pergut Solubility

Pergut is soluble in most aromatic solvents such as toluene or xylene. It is also soluble in most esters such as ethyl acetate and cyclohexyl acetate, in ketones such as methyl ethyl ketone and in chlorine-containing hydrocarbons.

Pergut is insoluble in alcohols, aliphatic hydrocarbons and terpenes.

Like Baypren[®], it is also possible with Pergut to dissolve the polymers in solvent mixtures consisting of solvents and non-solvents, although the final viscosity will depend very much on the respective solvent combination.

Fig. 3: Solution viscosity of Pergut in various solvents; Pergut S 40, concentration in each case 18.5 %

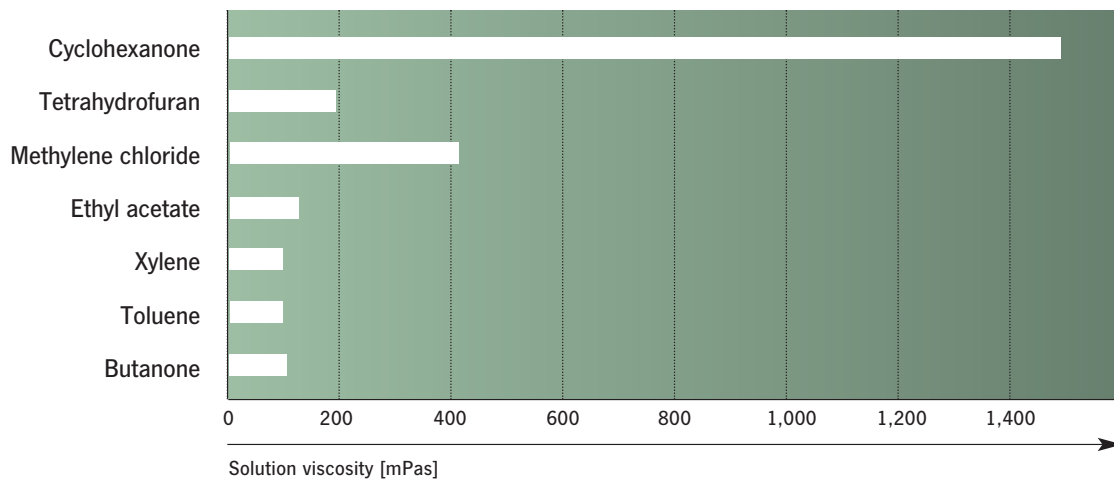
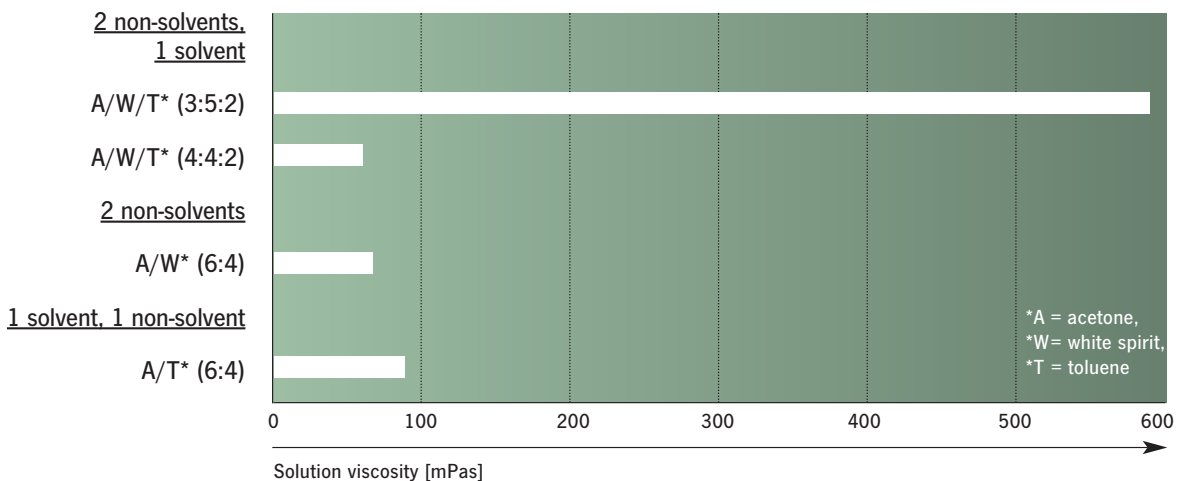


Fig. 4: Solution viscosity of Pergut in solvent mixtures; Pergut S 40, concentration in each case 18.5%



6. Pergut Applications in adhesives

6.1 Use in Baypren adhesives

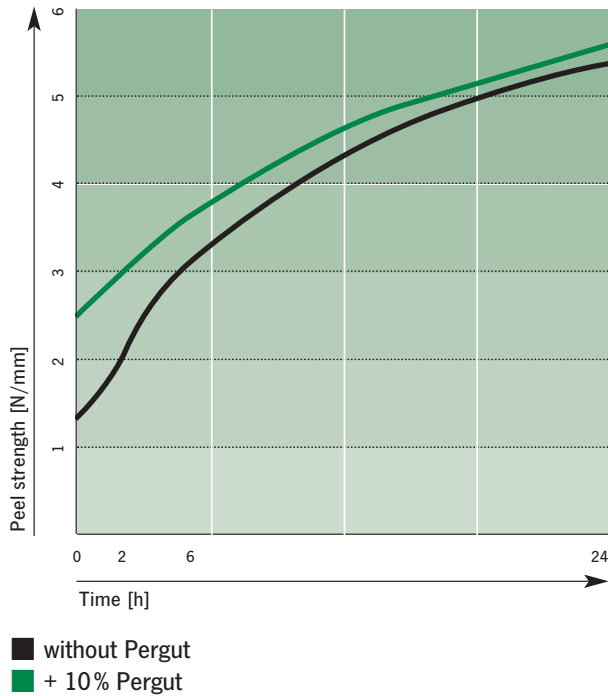
When used in Baypren-based adhesive systems, Pergut increases the initial strength of the bonds, enhances their heat resistance and produces light-colored phase-stable adhesives in resin-free formulations. This is of particular interest for the DIY, shoe and furniture industries.

Apart from this, Pergut is added when elastomers are joined to metals and other materials under vulcanizing conditions. This produces lasting bonds with outstanding resistance to heat and environmental influences. Because of its excellent chemical resistance and good compatibility with other polymers and resins, Pergut is used in numerous adhesive systems.

Example: Baypren contact adhesive with high initial strength

Where low-melting resins are used in the production of Baypren adhesives, it is possible to significantly raise the initial strength through the addition of 5 – 10 parts of Pergut – calculated on the polymer. Generally speaking, Pergut grades of medium solution viscosity (e.g. Pergut S 40 or S 90) are used. Adding Pergut to the adhesive makes it possible, in shoe production for example, to shorten the curing time between bonding the sole and trimming the edges. Another example is the bonding of large plastic sheets or panels in the furniture industry, because an addition of Pergut helps to stop the sheets separating at the edges.

Fig. 5: Effect of Pergut on the initial strength



Initial formulation:

Baypren 320	100 pbw
Rhenofit® D/A	7 pbw
Bayoxide Z aktiv®	4 pbw
Pergut S 40	0/10 pbw
Heat-reactive alkyl phenolic resin	40 pbw
Ethyl acetate	35 pbw
White spirit, boiling range 65/95 °C	70 pbw
Cyclohexane	140 pbw
Methyl ethyl ketone	105 pbw

**Example:
Light-colored phase-stable
Baypren contact adhesive**

The color of Baypren-based adhesives is dictated by the resin. With resin-free formulations, the open time is shorter, particularly in toluene-free adhesive solutions. In such cases, the addition of Pergut can prolong the open time while giving higher initial bond strength. Such resin-free adhesives also have good storage stability and have no “phasing” tendency.

Baypren 328 (Fig. 6) has been developed specifically for this application. It differs from the other standard grades with respect to the faster solubility of the chips, lighter inherent color and better resistance to discoloration.

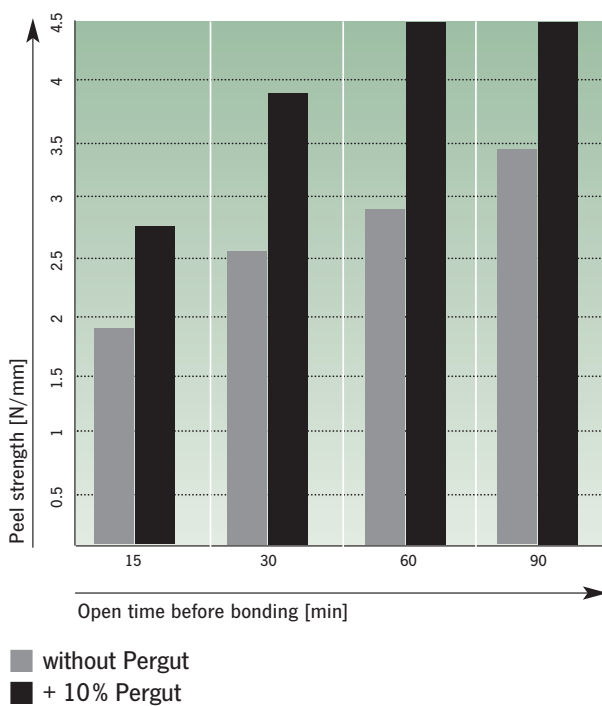
Fig. 6: Baypren 328 solution



Starting formulation:

Baypren 328	100 pbw
Rhenofit D/A	4 pbw
Bayoxide Z aktiv	4 pbw
Pergut S 40	0/10 pbw
Vulkanox® BHT	2 pbw
Ethyl acetate	35 pbw
White spirit, boiling range 65/95°C	70 pbw
Cyclohexane	140 pbw
Methyl ethyl ketone	105 pbw

Fig. 7: Influence of Pergut on the initial strength
Testing material: Nora



Example: Baypren adhesive with optimum cost-to-benefit ratio

Fig. 8: Baypren formulation (test formulation 7007)

Optimization of the cost-to-benefit ratio			
Ingredient	1	2	3 (pbw)
Baypren 320	100		
Baypren 330		100	
Baypren 350			100
Pergut S 40	variable (0/5/10)		
Bayoxide aktiv			4
Rhenofit D/A			4
Vulkanox BKF			2
Ethyl acetate			35
White spirit 65/95 °C			70
Cyclohexane			140
Methyl ethyl ketone			105

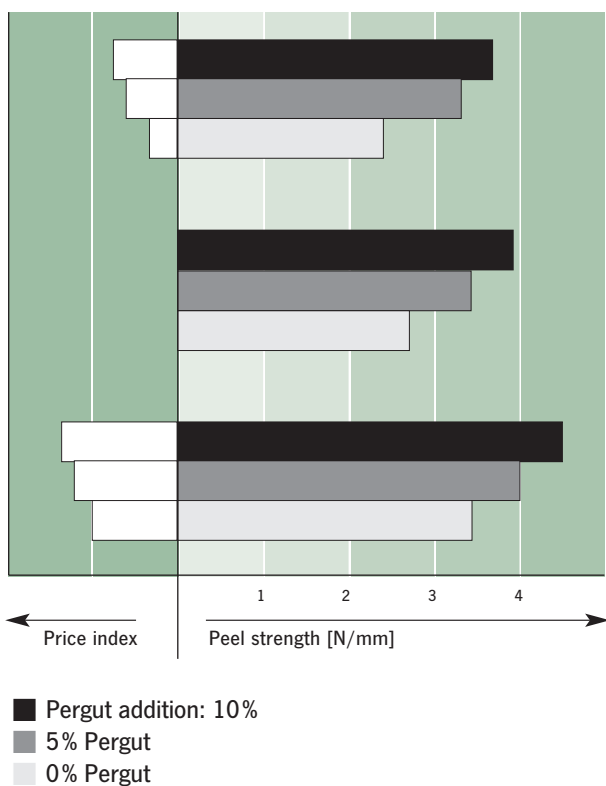
Ever increasing ecological and economic constraints are forcing the adhesives-processing industry to search constantly for ways of finding the ideal compromise between product quality and acceptable economics. As far as Baypren is concerned, we see various possibilities – even in toluene-free formulations – to obtain acceptable properties at lower cost.

The Baypren grades shown in the table on the left (Fig. 8) are all fast-crystallizing types and differ in their polymer viscosity, which rises in the sequence 320, 330, 350. As is to be expected, the same final viscosity of the adhesive can be achieved through lower polymer contents in the same sequence – evident from the lower solids content. This advantage is, however, gained at the cost of a lower overall strength of the bond. This is where the addition of Pergut opens up the possibility of achieving an acceptable level of strength in the bond at a lower price and despite the lower solids content. As shown in Figs. 8 and 9, the combination of high-viscosity Baypren and Pergut (formulation 3c) produces the same initial strength as the standard formulation based on Baypren 320 (formulation 1a).

Fig. 9: Influence of Baypren and Pergut on the costs

Formulation	1a	1b	1c	2a	2b	2c	3a	3b	3c
Baypren	320	320	320	330	330	330	350	350	350
Pergut (pbw)	0	5	10	0	5	10	0	5	10
Solids content (%)	17.1	17.5	17.9	15.4	15.8	16.2	12.1	12.4	12.9
Price index (%)	100	102	105	95	97	98	86	87	89

Fig. 10: Influence of Pergut on the initial strength
 Conditions: open time 90 min, test material: Nora

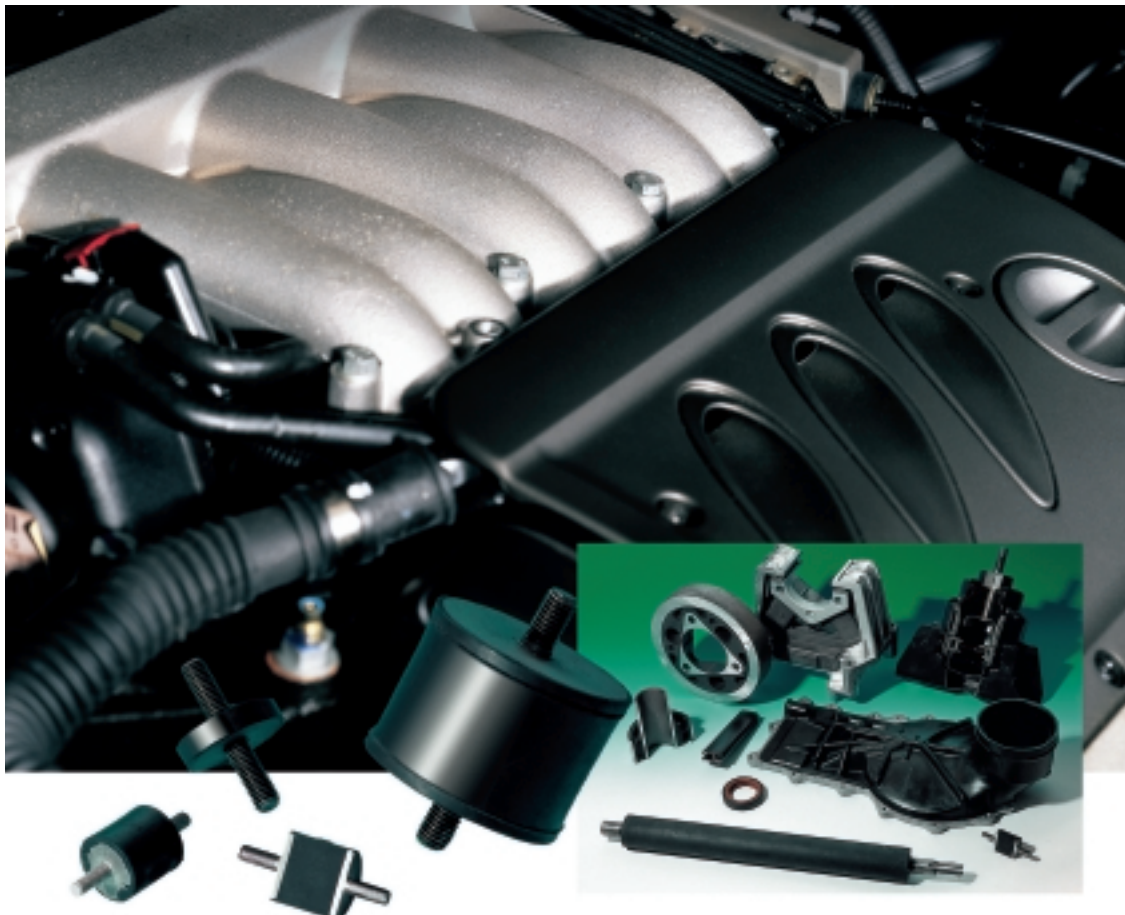


6.2 Pergut Rubber-to-metal bonding

Pergut has for a long time been one of the most popular products for bonding all kinds of different elastomers (e.g. NR, IR, IIR, SBR, EPDM, CR, NBR or CM) to metals such as steel, aluminum, brass etc. The grades used most here are Pergut S 130 and S 170.

The adhesive is applied either as a one-coat or two-coat system – in most cases as two coats. This complies with the high specifications concerning dynamic resistance and corrosion resistance.

Fig. 11: Pergut application: Rubber-to-metal bonding
Rubber rollers, engine bearings, shock absorbers, clutches etc.



7. Pergut

General product information

Form of supply and packaging

Pergut is supplied as a fine white powder in multi-ply paper sacks of 20 kg. The non-returnable pallets contain 30 – 50 sacks.

Storage

Properly stored (10 – 25 °C, dry, protected from direct sunlight), Pergut S 40 has a storage stability of at least 6 months.

Safety

When using Pergut, it is important to read the safety data sheet. When processing the product (dissolving, formulating etc.), effective air extraction must be provided. We recommend wearing gloves and protective goggles, and, when spraying, some sort of respiratory protection.

This distinct approach is the reason why our customers have shown confidence in our company over the years and also forms the basis for Bayer's globally acknowledged expertise in the field of adhesive raw materials. This expertise has been acquired over several decades and is being applied on an international basis. After all we feel obliged to maintain the same high standards of quality all over the world.

In addition to Pergut, there is a wide range of other materials for adhesives:

Baypren®

Baypren grades

Baypren adhesives

Butyl

Butyl grades

Butyl adhesive sealants

Desmocoll®

Desmocoll grades

Baypren is a 2-chlorobutadiene-(1,3) polymer (polychloroprene) produced by the most up-to-date processes.

To enable the widely differing requirements of the adhesives industry to be fully met, the Baypren range consists of grades with different crystallization rates and solution viscosities.

Adhesives based on Baypren are distinguished by their long open times and high initial strength. They are sometimes combined with Desmodur to form two-component adhesives. Baypren adhesives have a very wide range of applications and have become indispensable in the footwear, furniture, construction and automotive industries and for DIY applications.

Butyl is the trade name for copolymers of isobutylene, isoprene and divinyl benzene.

The butyl grades differ in their crosslinking level. They are also available preformulated with filler and plasticizer.

Adhesive sealants based on butyl are noted particularly for their water and gas impermeability, weather stability, ozone resistance and heat stability. They have excellent adhesion to glass, metal and many other materials. They can be mixed with large amounts of fillers and plasticizers and still retain their good elastomeric properties. Vulcanization with peroxide is possible.

They are typically used in building, car production and the electrical industry.

Desmocoll is the trade name for predominantly linear hydroxyl polyester polyurethanes.

Desmocoll grades are manufactured with different solution viscosities, thermoplasticities and crystallization rates to ensure that the wide-ranging requirements of the adhesives industry can be met.

Desmocoll adhesives

Adhesives based on Desmocoll are manufactured by simply dissolving the Desmocoll grade in suitable organic solvents. They have excellent adhesion to a large number of materials and many even adhere to plasticized PVC. The resulting bonds have outstanding resistance to plasticizers. Adhesives based on Desmocoll, mostly in combination with Desmodur, are used principally in the footwear, packaging, automotive, furniture and leather industries and for DIY applications.

Desmodur®

Desmodur is the trade name for polyisocyanates.

Desmodur grades

Desmodur grades differ in their functionality and reactivity. They are supplied in both solventborne and solvent-free forms.

Adhesives with Desmodur

Adhesives crosslinked with Desmodur are distinguished by outstanding bond strength and high heat stability. They have excellent resistance to oil, grease and solvents. Tried-and-tested Desmodur crosslinking agents considerably improve the adhesion of Baypren and Desmocoll to rubber materials. In addition, Desmodur is also used in the manufacture of one- and two-component polyurethane adhesives.

Desmomelt®

Desmomelt adhesive raw materials are linear, heat-activatable polyurethanes with terminal hydroxyl groups in solvent-free, carrier-free form based on crystallizing polyester polyols and aromatic diisocyanates.

Desmomelt grades

Desmomelt is available in granule form for extrusion or direct coating or in powder form for scatter coating and paste dot coating applications.

Desmomelt adhesives

Desmomelt granules are particularly suitable for the production of adhesive film and non-wovens or for direct coating by extrusion. Desmomelt powder has been developed for direct adhesive application by the scatter coating method. Desmomelt-based adhesive

Desmophen®

Desmophen grades

Desmophen adhesives

systems have excellent adhesion to a wide variety of materials, particularly also to plasticized PVC. Desmomelt adhesive systems are used primarily in the footwear, automotive, furniture and bag-making industries.

Desmophen products are polyester or polyether polyols.

Desmophen grades differ in their chemical structure, their functionality and their OH number.

Desmophen is used in combination with Desmodur. The resulting bonds have excellent strength and stability and are therefore ideal for applications in the construction, packaging, automotive and furniture industries. Desmophen polyester polyols are distinguished by their excellent adhesion to a variety of materials, while adhesives based on Desmophen polyether polyols are renowned for their low viscosity and higher stability.

Dispercoll®

Dispercoll grades

Dispercoll adhesives

Dispercoll is the trade name for aqueous dispersions.

There are two distinct groups of Dispercoll products: 1. Dispercoll U contains a high molecular weight hydroxyl polyurethane polymer. 2. Dispercoll C contains a 2-chlorobutadiene-(1,3) polymer.

Adhesives based on Dispercoll U grades are used in the footwear, furniture and automotive industries, where their outstanding adhesion to a large number of materials and high initial strength are such valuable assets.

Dispercoll C adhesives are distinguished by their long open times and high initial strength. They are used in the footwear, construction and furniture industries and in DIY.

Bei weiteren Fragen wenden
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