



Polyurethanes

North America

Shaping Performance and Possibility

Solutions for Construction, Packaging and Recreation Applications



Delivering practical solutions and peace of mind

Reliability, efficiency and versatility – qualities highly valued by today’s rigid foam manufacturers, both in their products and in their supplier relationships. Dow delivers these and more. With more than 60 years of experience serving the construction, packaging and recreation industries, we are well acquainted with the challenges you face each day in producing high-quality, differentiated products while balancing performance, economics and environmental impact. And we never stop innovating to meet today’s and tomorrow’s ever-evolving needs.

Our commitment to your success goes beyond supplying high-quality polyols and isocyanates. Whether you are looking for polyether or amine-initiated polyols, surfactants or polymeric MDI, we can help you find the right material with the performance characteristics you need for

diverse rigid foam applications – from insulated coolers and appliance insulation to pour-in-place or spray-applied foam.

To enable safer transportation and use of our materials, our comprehensive product stewardship program includes first-class training, guidelines, reference materials and professional support. And our technical service representatives are always available to answer a question or work with you to find or develop a solution for a specific challenge or new business opportunity.

Science-Based Solutions – from Design to Delivery

When you work with Dow, you get more than unparalleled expertise in polyurethane chemistry, processes and materials science. Our in-depth knowledge of end-use markets is also a part of the package. We will mobilize our global network of technical service professionals, development scientists, and marketing and sales representatives to help you analyze market intelligence, develop innovative products and troubleshoot issues at your site.

Dow utilizes only responsible, science-based manufacturing practices that safeguard our workplaces, our communities and the environment. And we have accelerated our commitment to sustainable chemistry through new technologies and products.

Choose the Product That’s Right for You

Dow offers a broad portfolio of conventional and high-performance polyols and isocyanate products for a wide variety of construction, packaging and recreation applications, including thermal insulation, energy-efficient structural panels and more.

This guide offers an easy-to-use tool for comparing product features and benefits. Use it to help you select the option that is best for your application. Or talk to your Dow representative about your needs, and together, we can develop a solution that will ensure optimal product performance at the right price.



Polyether Polyols

In response to diverse performance and processing requirements, Dow offers a wide selection of polyether polyols under the VORANOL™ and VORATEC™ trademarks. These products are available as diols, triols and specialty polyols. The variety of functionalities, hydroxyl-termination, building blocks and molecular weights allows for adjustment of compatibility, curing time and mechanical properties of the end product.

Specialty polyols for rigid applications						
Product	Approximate functionality	Hydroxyl number	Average molecular weight	Viscosity at 100°F (cSt)	Water (% max)	Description/benefits
VORANOL™ 280	6.9	280	1,402	1,055	0.08	<ul style="list-style-type: none"> A low-viscosity sucrose-/glycerine-initiated polyether polyol with 24% renewable carbon content useful for partial or all-water-blown, pour-in-place applications Typical applications include insulated garage and entry doors, portable coolers and flotation products, as well as roofing and sheathing laminated products
VORANOL 360	4.7	360	728	1,300	0.1	<ul style="list-style-type: none"> A low-viscosity, sucrose-/glycerine-initiated polyether polyol with 18% renewable carbon content designed for the production of both high- and low-density rigid polyurethane foams Can be used alone or in combination with other polyols or combustion modifiers to achieve desired properties Excellent choice when using HFC-134a, HFC-141b or water for blowing agents Ideal for high-density foams for furniture and decoration and low-density foams such as insulated panels, rail boxcars, portable coolers and pour-in-place insulation
VORANOL 370	6.9	370	1,040	6,500	0.1	<ul style="list-style-type: none"> A sucrose-/glycerine-initiated polyether polyol with 20% renewable carbon content suitable for production of both high- and low-density foams Especially suitable for foam applications requiring a high strength-to-density ratio High degree of crosslinking provides excellent dimensional stability under both humid-aging and dry heat-aging conditions Typical applications include insulated panels, rail boxcars, portable coolers, pour-in-place insulation and polyol blends
VORANOL 446	4.5	446	566	1,820	0.1	<ul style="list-style-type: none"> Ideal for isocyanate prepolymers and rigid foams, this neutralized high functional sucrose-/glycerine-initiated, low viscosity polyether polyol has 22% renewable carbon content, helping to meet sustainability targets Typical applications include appliance insulation, insulated panels, refrigerated transportation vehicles, portable coolers, pour-in-place insulation, marine flotation and polyol blends
VORANOL 470X	3.5	470	417	1,400	0.1	<ul style="list-style-type: none"> A Mannich-based polyol primarily used in spray applied polyurethane foam Inherently reactive polyol that can be easily formulated to produce foams with exceptional dimensional stability and high compressive strength May be blended with polyesters and other extenders to produce spray foam with smooth surface, low friability, very fine uniform cell structure, low k-factor and excellent adhesion to many surfaces
VORANOL 490	4.3	490	460	1,795	0.1	<ul style="list-style-type: none"> A sucrose-/glycerine-initiated polyether polyol with 24% renewable carbon content Typical applications include appliance insulation, insulated panels, refrigerated transportation vehicles, portable coolers, pour-in-place insulation, marine flotation and polyol blends Suitable for both high- and low-density rigid foams May be used alone or in combination with other polyols or combustion modifiers to achieve various degrees of crosslinking Compatible with many different types of isocyanates; may be used to produce foams exhibiting excellent k-factor-to-flowability relationships

Typical properties. Not to be construed as specifications.

Specialty polyols for rigid applications – continued						
Product	Approximate functionality	Hydroxyl number	Average molecular weight	Viscosity at 100°F (cSt)	Water (% max)	Description/benefits
Diols for rigid applications						
VORANOL™ 210	2	112	1,000	70	0.05	<ul style="list-style-type: none"> • Polypropylene glycol-initiated polyol primarily used as a viscosity reducer in rigid foam systems
VORANOL 212	2	94	1,200	92	0.04	<ul style="list-style-type: none"> • Polypropylene glycol-initiated polyol with medium reactivity; may be used as a viscosity reducer in rigid foam systems
Triols for rigid applications						
VORANOL 225	3	673	250	300	0.05	<ul style="list-style-type: none"> • A low-viscosity polyether triol well suited for making prepolymers for one-component rigid polyurethane foam; may also be used as a hydroxyl modifier for rigid foam formulations and semi-rigid packaging foam formulations
VORANOL 232-036N	3	36.5	4,600	400	0.04	<ul style="list-style-type: none"> • A high-reactivity capped polyether triol well suited for prepolymer production • Typical applications include open-cell rigid and semi-rigid foam
VORANOL 271	3	34	4,900	435	0.05	<ul style="list-style-type: none"> • A high-reactivity capped polyether triol well suited for open-cell rigid foam requiring excellent water absorption properties • Typical applications include floral foam and semi-rigid packaging foam
VORANOL 271C	3	34	4,900	435	0.05	<ul style="list-style-type: none"> • A high-reactivity capped polyether triol well suited for open-cell rigid foam • Typical applications include floral foam, open-cell rigid SPF and semi-rigid foam.
VORANOL 272	3	34	4,900	435	0.05	<ul style="list-style-type: none"> • Higher level of EO capping when compared to VORANOL 271 and VORANOL 271C • A high-reactivity capped polyether triol well suited for open-cell rigid foam insulation and for applications requiring excellent water absorption properties • Typical applications include floral foam, rigid and semi-rigid SPF
VORANOL 410	3	56	3,000	230	0.08	<ul style="list-style-type: none"> • A glycerine-initiated polyether polyol that processes easily • May be used to produce semi-rigid foam-in-place packaging foams
VORANOL CP 6001	3	28	6,000	600	0.06	<ul style="list-style-type: none"> • A high-molecular-weight, high-reactivity capped polyether triol well suited for open-cell rigid foam • Typical applications include open-cell SPF and semi-rigid foam
VORATEC™ SD 301	3	156	1,000	112	0.05	<ul style="list-style-type: none"> • A low-viscosity glycerine-initiated polyether triol that processes easily • May be used in rigid foam formulations for a wide variety of insulation and packaging applications

Typical properties. Not to be construed as specifications.



Amine-Initiated Polyols

This line of polyols offers fast curing properties, potential for reduced catalyst loadings and versatility in applications such as rigid castings or rigid adhesives.

Product	Approximate functionality	Hydroxyl number	Average molecular weight	Viscosity at 100°F (cSt)	Water (% max)	Description/benefits
VORANOL™ 202	5	476	590	3,400	0.1	<ul style="list-style-type: none"> • Amine-initiated polyether polyol designed for rigid foam • Equivalent weight and reactivity allow for excellent formulation reactivity control when used in combination with sucrose-based polyols • Well suited for foam applications requiring high strength-to-density ratios and low abrasion levels
VORANOL 220-530	2	530	212	6,000	0.1	<ul style="list-style-type: none"> • Amine-initiated polyether polyol/crosslinker for two-component adhesives, sealants and coatings • Compatible with polybutadiene-based polyols
VORANOL 391	4	391	575	1,285	0.1	<ul style="list-style-type: none"> • A highly reactive aromatic amine-initiated polyether polyol designed for use in pour-in-place applications • Offers good compatibility with isocyanates and improved flow • Enhanced reactivity allows for significant reductions in blowing and gelling catalysts
VORANOL 800	4	800	278	3,550	0.08	<ul style="list-style-type: none"> • Aliphatic amine-initiated autocatalytic polyether polyol that allows for reduced catalyst requirement and improved flow; compressive strength and k factor may also be improved when blended with other polyols • Typical applications include foam core laminate, pour-in-place insulation, spray insulation and packaging

Typical properties. Not to be construed as specifications.

Surfactants

If you are interested in ways to reduce cost without sacrificing performance in your rigid foam applications, Dow has a surfactant that may be used in a variety of rigid polyurethane foams. VORASURF™ surfactants are organic non-blended additives that offer many appealing advantages over alternate surfactant technologies – from lower processing cost – to better insulation performance – to outstanding versatility.

Product	Appearance	Density (lbs/gal)	Specific gravity at 25°C	Viscosity at 100°F (cSt)	Water (% max)	Description/benefits
VORASURF™ 504	Opaque viscous liquid	8.32	1.03	1,600	0.10	<ul style="list-style-type: none"> • Compatible in formulations high in polyester polyol or formulations with polyether polyol; improves foam processing flowability, compressive strength and k-factor aging • When used at typical surfactant levels, can enhance hydrocarbon solubility and stability in a formulated or blended polyol system containing other compatibilizing agents • May be used at higher levels than typical surfactants to act as a liquid hydrocarbon compatibilizing additive; compatible with other commercially available silicone surfactants • Typical applications include foam core laminate, pour-in-place insulation and polyol blends

Typical properties. Not to be construed as specifications.

Isocyanates

Turn to Dow for industry-standard PAPI™ Polymeric and ISONATE™ MDI products in a range of equivalent weights, reactivities and viscosities to help meet specific performance needs. Our product stewardship capabilities include first-class, on-site training on MDI safe handling, use and disposal, as well as ongoing consultation and support from our experienced and knowledgeable team. Technical support and service are available around the clock, helping you ensure a safer operation, make a safer product and contribute to a safer environment.

Product	Approximate functionality	Isocyanate equivalent weight	% NCO by weight	Average molecular weight	Viscosity at 77°F (cSt)	Acidity (% as HCl)	Description/benefits
PAPI™ 27	2.7	134	31.4	340	180	0.03	<ul style="list-style-type: none"> • Polymeric MDI with a narrow molecular weight distribution and high reactivity • Suitable for a full range of low- to high-density semi-rigid foams for insulation and structural applications
PAPI 94	2.3	131.5	32.0	290	50	0.03	<ul style="list-style-type: none"> • Highly versatile polymeric MDI with low viscosity, low functionality, increased diphenylmethane diisocyanate content and increased percentage of ortho-para isomers • May be used to produce various foams, adhesives, coatings, elastomers, sealants and isocyanate prepolymers
PAPI 95	2.3	131.1	32.0	300	74	0.04	<ul style="list-style-type: none"> • Polymeric MDI with optimized viscosity and functionality due to maintaining a high diphenylmethane diisocyanate content and a high percentage of ortho-para isomers • Suitable for use in a full range of low- and high-density semi-rigid foam formulations for intricate parts demanding fast demold time
PAPI 580N	3.0	135.5	30.5	375	745	0.03	<ul style="list-style-type: none"> • Polymeric MDI with high functionality and a relatively high viscosity • May be used in production of continuous flexible faced laminates, laminated panel cores, structural foam, bunstock polyisocyanurate and pour-in-place insulation
PAPI 901	2.3	133	31.6	290	60	0.02	<ul style="list-style-type: none"> • Polymeric MDI with low functionality and low viscosity • May be used to produce semi-flexible, rigid or polyisocyanurate rigid foams
ISONATE™ 50 O,P ¹	2.0	125.6	33.5	125	10	0.003	<ul style="list-style-type: none"> • High ortho-para pure MDI; difunctional product with high purity, low acidity, reproducible reactivity and a low vapor pressure • Designed for use in low-viscosity prepolymers, polyurethane adhesives, sealants, sports flooring and coatings

Typical properties. Not to be construed as specifications.



Silane Modified Polymers

VORASIL™ Silane Modified Polymers are a family of moisture-curable hybrid polymers composed of a polyurethane backbone and silane end groups, allowing adhesive and sealant manufacturers to achieve silicone-like performance without the high-end silicone cost. These novel resins are created with a unique, proprietary process that allows for reproducible, tunable final properties, providing manufacturers with unprecedented freedom of design. Silylation of any selected backbone enables tailoring of hydrophobicity, mechanical performance, UV stability and weatherability.

Product	Secant modulus (psi)	Elongation at break (%)	Tensile strength (psi)	Curing Speed (h)	Viscosity at 25°C (cSt)	Applications
VORASIL™ 602	20-30	275-450	50-85	3-5	18-24	Low-modulus, high-elongation, low-viscosity resin for use in adhesives and sealants for construction and transportation
VORASIL 604	65-100	100-250	100-150	1.5-3.5	8-14	Medium-modulus resin for use in adhesives and sealants for construction and transportation

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Safety Considerations

Most VORANOL™ Polyols generally present no significant hazard in use when simple precautions are followed. However, some VORANOL Polyols may require additional care in handling. Before working with VORANOL Polyols, it is necessary to understand the hazards involved in handling all of the components and to establish and follow safe work procedures. Products based on diisocyanates like MDI (e.g., PAPI™ Polymeric MDI) should always be used in a well-ventilated area with appropriate local exhaust in such a way that the occupational exposure limits (OEL) for these materials are not exceeded.

Products based on MDI are potentially hazardous and require care in handling due to potential health effects associated with diisocyanates. All persons who work with these materials must know and follow proper safe handling procedures. Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) are provided to help customers satisfy their own handling, safety, and disposal needs and those that may be required by locally applicable health and safety regulations. MSDS are updated regularly; therefore, please request and review the most current MSDS before handling or using any product. MSDS, SDS, product literature, and safe handling and storage information for all of these products are available from the nearest Dow sales office and online at www.dow.com.

Customer Notice

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The Dow Chemical Company

United States or Canada

dowpolyurethanes.com

Toll Free

+800 441 4369

1 989 832 1426

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