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VEF-152

Viscoelastic Flexible Foam

VEF-152 is a 2-part polyurethane foam casting resin system that makes open-cell flexible foam with viscoelastic property with the following attributes for a variety of cushioning and other custom applications.

- The cured foam has a slow recovery after an indentation is made.
- The foam stays flexible at a very lower temperature.
- The component materials are low viscosity liquid at room temperature. The pot-life is above 25 seconds, which allows small amounts to be batched manually.
- The consistency of the foam is easily modified by adjusting the mixing ratios between part-A/B components.

VEF-152 provides a range of foam consistency to be adjusted by varying the mixing ratio between the part-A/ part-B components. The recommended mixing ratio range is between 100:260 and 100:300 = part-A: part-B by weight. A higher part-B ratio makes foam with slower recovery rate and smaller compression deflection.

This set of properties makes VEF-152 a more user-friendly viscoelastic foam formulation material for manufacturers of custom seat cushions and other specialty products.

Technical Data:

Designations

System Code: VEF-152
Part-A Component: MPC-022 (Prepolymer)
Part-B Component: PPC-032 (curative)

<u>Mixing Ratio*</u>	(Part-A)	(Part-B)
Volume Ratio (Firmer):	1.000	3.050
Weight Ratio (Firmer):	1.000	2.600
Volume Ratio (Softer):	1.000	3.519
Weight Ratio (Softer):	1.000	3.000

Note*: The user can change the mixing ratio within a range to vary the consistency of the resulted foam. The recommended range is 100: 260 to 100: 300 = part-A: part-B by weight. Ratios outside of this range may be used for some applications if the processor confirms the material works as desired by testing.

	NCO	OH
Stoichiometry:	1.000	1.420 to 1.639
NCO Index	0.704 to 0.610	

Processing Temperature:

Part-A	Ambient (72 – 82 °F)
Part-B	Ambient (72 – 82 °F)

Mold/Substrate* 72 - 120 °F

Note*: If the mixture is poured on plastics mold or other non-heat-absorbing material, mold may not have to be heated. If the mold is made of steel, aluminum, or other heat-absorbing materials, it is likely that the mold needs to be heated.

Cure Pattern:

Pot life (pour within)	25 seconds
Demolding time	35 - 45 minutes
Complete Cure Cycle:	3 days* at room temperature

Note*: The foam gradually becomes firmer over about 3 days after the batch. The surface tackiness also reduces.

Cured Foam Density

Free Rise Density:	7.5 – 8.0 pounds per cubic foot
Recommended Compression Rate:	5 - 10%

Component Properties

	Prepolymer (Part-A)	Curing Agent (Part-B)
Code Number:	MPC-022	PPC-032
Specific Gravity:	1.204	1.027
Equivalent Weight:	183	335
%NCO	23.0 %	n/a
Viscosity (@72°F)	700 - 1200 cps	800 - 1200cps

Standard Packages:

5-gallon size plastic pails containing 40 pounds of material
55-gallon size steel drums containing 450 pounds of material

Check the video of the rebound rates of the foams made of this formulation at
<https://youtube.com/shorts/1XP5HcrJTm8?feature=share>

Shrinking Problem with Closed-Cell Structure

This material uses a chemical reaction within the formula to create CO₂ (carbon dioxide) gas as the source of foaming. The reaction happens when the material is hot and the gas is created at higher temperature at an expanded volume. As the foam cools after curing, CO₂ gas also cools; as it cools, the volume of gas contracts significantly.

The formulation is designed to open cells to equalize the pressure inside and outside of the foam. However, under some molding conditions the cells may still be closed. If the foam cells are closed, this shrinking CO₂ gas takes the whole foam down and shrinks the foam significantly.

This material may create closed-cell structure at the demolding time specially when the packing density is high. If you have sharp corners in your mold, the area near sharp corner may be have closed-cell. The foam may need to be physically crushed to open foam cells.

After the foam is cured strong enough to demold, remove the molded foam part and use your hand to push the foam down before the foam part starts cooling. As you push the foam, you would feel like pushing down a balloon, and at one point, you start hearing popping sounds from the foam. This opens the cells. The open-cell structure equalizes the air pressures between inside and outside the foam, and prevents the large shrinkage.

The foam part will have some shrinkage after crushing. Test to measure the shrinkage on your part and design your mold to compensate the shrinkage. This material may not be appropriate to mold parts with a high precision requirement.

Other Handling Information

Storage/Handling Information for the Component Materials

Storage:

Part-A (Isocyanate Prepolymer) Component

Part-A component (prepolymer) contains isocyanate component, which is highly sensitive to moisture. If it is left in the open air, part-A will react with atmospheric moisture and will be ruined. This reaction is non-reversible. Soon after opening the container to dispense the content, dry nitrogen gas or argon gas needs to be injected into the container to purge and blanket the headspace. Please consult Northstar Polymers for nitrogen gas set-up information.

For gravity feeding system from a 55-gallon, silica gel or calcium chloride desiccant filter(s) should be installed to the vent-hole of the drum. A valve to inject dry nitrogen gas can be installed instead.

Part-A component (MPC-022) is also sensitive to cold temperature. Although the material is tested for 3 days at 32 °F without freezing, the material may freeze during transportation in cold seasons. If the material is left frozen, the unwanted compound called "dimer" will be created at a high rate. This is not reversible with any reasonable method. When a large amount of dimer is created, this material may not be usable.

In the cold seasons, the material may freeze during transportation. The frozen material must be immediately thawed to avoid permanent damage from freezing. If the material color is opaque with the consistency of thick liquid, gel, waxy, or solid, the material requires immediate thawing. The container should be put into an industrial oven or lab oven at 180 °F until the material temperature is 140 °F or the color of the material is clear brown with smooth liquid consistency. (Our plastic pails are rated for 190 °F maximum temperature. Do not heat pails above 190 °F.) Storing frozen material more than several days at room temperature will cause a permanent damage to the material. Northstar Polymers will not replace or refund the damaged material from cold temperature or mishandling by customer.

Store MPC-022 in airtight containers with their headspace purged with nitrogen or argon gas placed in a dry indoor storage within the temperature range between 72 and 86 °F. The ideal storage temperature is 77 °F. Avoid direct sunlight during storage. Under the correct storage condition, the shelf-life of MPC-022 in the unopened original containers is 6 months.

If a large amount of water mixes with a large amount of isocyanate base materials, the chemical reaction may produce a large amount of CO₂ gas and heat to create a hazardous condition. Keep the storage area free of water.

Under a certain combination of heat, catalyst (basic chemicals), amounts of reactive materials, as well as some other favorable conditions for the reaction, the water (or alcohol/glycol/amine) to isocyanate reaction can reach a dangerous state of accelerated reaction. The accelerated reaction may create a very high temperature condition. The thermal decomposition of isocyanate based material by extremely high temperature or fire can produce toxic gasses and smokes. Please be sure that the containers are stored in dry indoor storage away from source of water. If the steel drums are stored on a concrete floor, store on a skid elevated from the floor to avoid water on the floor corroding drums.

If a leak is found in a drum, please place the drum in such a position that the leaking part is at the highest part of drum so that the content no longer leaks out. Cover the leaking area with dry towel to prevent air from entering. If possible, transfer the material into new container(s) with nitrogen purge. If moisture enters into an isocyanate container from a small leakage, CO₂ gas may be produced to gradually pressurize the container. If pressure built up is suspected, open the bung (or cap) very slowly to release the pressure before you change the drum position.

Part-B (Curative) Component

Part-B component (PPC-032) is hygroscopic. If the material is exposed to the ambient air, it absorbs moisture. Part-B component contaminated by moisture can cause issues with your manufacturing process. Avoid exposure of the material to moisture in air. Keep the lid/cap closed air-tight when stored.

Purging the empty space in the container with dry nitrogen gas, argon gas, or negative-40-degree-dew-point dry air is also recommended to prevent moisture contamination of part-B as well. (However, simply keeping the material in an airtight container may also be sufficient depending on the moisture level of the work place.)

Store it in a dry indoor storage at a room temperature between 72 and 86 °F. Avoid direct sunlight.

Part-B material contains chemical constituents that can separate during the storage. Agitation of the part-B content before dispensing is recommended after it is stored for more than a few days. Separation is more likely to happen when the material is stored at cold temperatures. It is recommended that the part-B material is stirred before dispensing.

Safety:

The component materials are industrial-grade chemicals. Please keep them in a secure place and prevent access from any unauthorized individual. The personnel who handle these materials need to read the Safety Data Sheet (SDS) for detail information on safety and handling of the material. The SDS for each component is sent with the shipment of the material.

When using this material, be sure to operate in a wide-open area with good air movement, or in a well-ventilated area. Wear rubber gloves, long sleeves, and protective eyeglasses to prevent skin/eye contact of the material. When your operation involves heating or spraying of the material, and if you expect the isocyanate content level in the work place atmosphere may become above the threshold regulated by OSHA or by other appropriate working place safety standards, we recommend, in addition to the above, installation of a proper hooded dynamic ventilation system and/or using an appropriate type of respirator (such as a full-face respirator equipped with OSHA approved HEPA filters for particulate and organic vapor) to prevent inhalation of the fume.

Direct contact of polyurethane raw materials to skin/eye, as well as ingestion may lead to health problems. No eating or smoking should be permitted at the working area. The operator should wash hands well with soap and water after handling the materials and follow the other procedures by the Standard Industrial Hygiene Practices. Please refer to the SDS for each component for the detailed health information.

Applications that requires fire-retardant property:

This foam is not fire-retardant foam, and it is not recommended for applications, which require or should be using fire-retardant grade materials. The applications such as automotive interior, building material, and components for some electronic parts often require fire-retardant grade materials by law. It is the user's responsibility to conform to the applicable regulations. We also do not recommend this foam to be used to the applications in which the foam can be exposed to high temperature or near an ignition source.

General Notice:

Tandem Products and/or Northstar Polymers do not guarantee the fitness of their products in any application. All necessary aspects of the materials used in the respective application including but not limited to the physical/mechanical functions, product safety, regulatory compliances, and other issues related to the use of material in the application must be tested and confirmed by the processor, marketer, manufacturer, and/or end-user of the resulted end product.

For any questions, please contact Northstar Polymers.

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