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VEF-121
Viscoelastic Open-Cell Flexible Foam

VEF-121 is polyurethane open-cell flexible foam with viscoelastic property for a variety of cushioning and other custom applications. The cured foam has a very low deflection against a compression force. Foam recovers slowly after load is removed. The foam stays flexible at 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.

VEF-121 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-121 a more user-friendly viscoelastic foam formulation material for manufacturers of specialty products, product designers, and prototype makers.

Technical Data:

Designations

System Code: VEF-121
 Part-A Component: MSA-018 (Prepolymer)
 Part-B Component: PPC-033 (curative)

Mixing Ratio*

	(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 vary the mixing ratio 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*	100 - 120 °F

*Note: If the mixture is poured on plastics mold or other non-heat-absorbing material, mold may not have to be heated.

Cure Pattern:

Pot life (pour within)	25 seconds
Demolding time	35 - 45 minutes at 100 – 120 °F Mold Temperature**
Complete Cure Cycle:	24 hours at room temperature

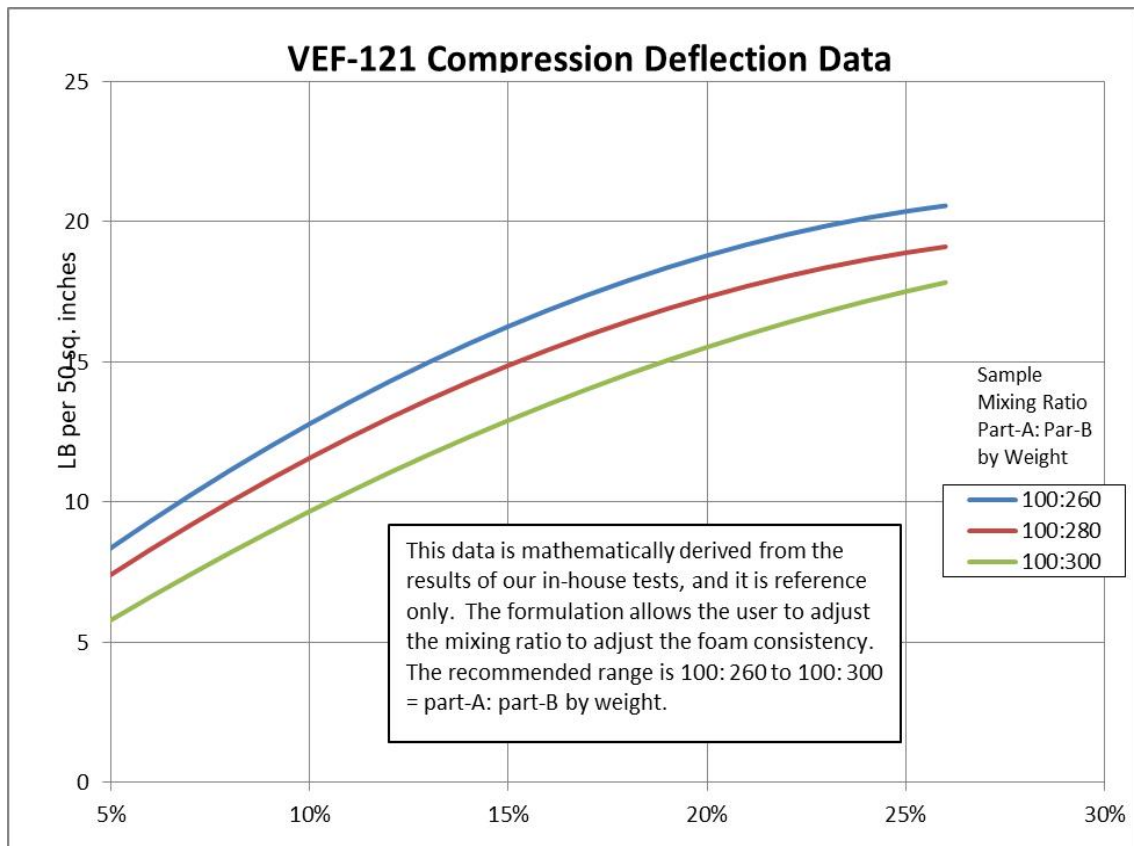
**Note: The molded foam part needs to be physically crushed just after demolded to ensure open-cell structure of the foam. Without this process, closed cells in the foam part will shrink badly as the foam cools off. If the foam deforms too much after crushing, you will need to leave the foam part in mold for a longer time before crushing or use a higher mold temperature.

Cured Foam Density

Free Rise:	6.5 pounds per cubic foot
Compressed Density:	7.1 pounds per cubic foot

Component Properties

	Prepolymer (Part-A)	Curing Agent (Part-B)
Code Number:	MSA-018	PPC-033
Specific Gravity:	1.204	1.027
Equivalent Weight:	183	335
%NCO	23.0 %	n/a
Viscosity (@72°F)	700 - 1200 cps	800 - 1200cps



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. If the foam cells are closed this CO₂ gas takes the whole foam down and shrink the foam; it would shrink like a prune.

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 internal cells to create open-cell structure.

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 to the container to purge and blanket the top space. 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 (MSA-018) is also highly sensitive to cold temperature. The material may freeze just below the typical room temperature range. 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 at 180 °F until the material temperature is 160 °F or the color of the material is clear with smooth liquid consistency. (Our plastic pails are rated for 200 °F maximum temperature. Do not heat it above 200 °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 MSA-018 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 100 °F. The ideal storage temperature is 90 °F. Avoid direct sunlight during storage. Under the correct storage condition, the shelf life of MSA-018 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 large amount 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-033) 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 65 and 90 °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 can be seen in a higher degree when the material is stored at cold temperature.

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 standard, 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 MSDS 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 particular application must be tested and confirmed by the processor, marketer, manufacturer, and/or end-user of the resulted product.

For any questions, please contact Northstar Polymers.

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