



Guide to Product Handling

Dow Elastomer products are available in a wide range of grades to meet the processing and performance needs for a variety of applications and markets and delivered in free-flowing pelletized form. These products include:

- AFFINITY™ Polyolefin Plastomers
- AFFINITY™ GA Polyolefin Elastomers
- ENGAGE™ Polyolefin Elastomers
- INFUSE™ Olefin Block Copolymers
- VERSIFY™ Plastomers and Elastomers
- Some grades of NORDEL™ EPDM, Dow's broad family of ethylene propylene diene monomer polymers

The Importance of Proper Handling

Attention to shipping and storage conditions is important to maintain these products in free-flowing form for use by our customers.

This is especially true of lower density polyolefin elastomers ($< 0.875 \text{ g/cm}^3$) where the shipment or storage temperatures may approach the softening and melting points of the elastomer.

If proper handling procedures have not been followed, there is the possibility that the free-flowing nature of the product may be compromised and the product can "block." Blocking is a condition characterized by the intermeshing of individual product pellets. Some Dow Elastomer products may contain a partitioning agent to help prevent blocking.

Affinity[™]
POLYOLEFIN PLASTOMERS

Affinity[™] **GA**
POLYOLEFIN ELASTOMER

ENGAGE[™]
POLYOLEFIN ELASTOMERS

INFUSE[™]
OLEFIN BLOCK COPOLYMERS

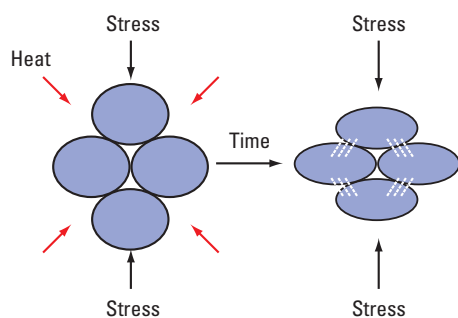
VERSIFY[™]
PLASTOMERS AND ELASTOMERS

NORDEL[™]
E • P • D • M

Material Blocking

Blocking, which is sometimes called “massing,” occurs when the product is subjected to a static load over time. This load can compress the pellets, which maximizes the contact surface area between pellets. The resulting deformation can result in physical interlocking of the pellets and loss of flowability (see Figure 1).

Figure 1: Blocking Mechanism



- Static load deforms pellets over time – occurs faster at elevated temperatures
- Pellets compress, maximizing contact surface area
- Deformation results in an interlocking matrix
- Partitioning agents help minimize (but don't necessarily prevent) this phenomenon

NOTE: Storage temperatures approaching or exceeding the elastomer melting point may result in product fusing.

Blocking occurs more quickly at elevated temperatures – conditions approaching or exceeding the softening or melting points of the material. Subsequent exposure of the material to freezing temperatures

can exacerbate blocking. A particular shipment's susceptibility to blocking can be affected by the load placed on the material, temperature conditions, as well as the time of exposure to load and high temperature. Furthermore, the temperature conditions during unloading operations may affect blocking behavior.

Handling Recommendations

The guidelines in this document can help users avoid problems in the handling and storage of Dow Elastomer resins. For long-term storage, the material should be protected from exposure to elevated temperatures not to exceed 35°C (95°F), with a recommended storage temperature between 10 and 21°C (50 and 70°F).

Bulk Handling

Some of the Dow Elastomer grades can be delivered via bulk transportation. Here are some general guidelines for consideration when handling:

- Design handling systems to ensure that material flows freely, is free of excessive load, and is not exposed to extreme temperatures.
- Flowability can be affected by exposure to temperatures greater than 35°C (95°F); therefore air cooling may be required for transfer operations.
- Prolonged exposure to temperatures below 10°C (50°F) may result in slower discharge rates from silos, railcars, and trucks.
- Dilute phase conveying is the preferred mode of pneumatic conveying of elastomers, although it is possible to convey some higher density grades using dense phase conveying.

Pneumatic transfer systems should be designed with filters to accommodate talc or other partitioning agents used in low density material grades. Also, inlet filters are recommended at the bulk unloading adapters to minimize contamination.

Typical frictional characteristics of conveyed elastomers are greater than conventional higher density polyolefins. This will result in reduced transfer rates at the same conveying pressure.

- Design pneumatic conveying systems so that gas velocity does not exceed 30 meters per second (6,000 ft/min) to avoid pellet degradation and streamer/floss generation.
- If product is transferred to a silo, minimize the inventory time by filling the silos to the level needed for normal operations.
- To minimize the potential effect of static load, always consume material from silos on a “first in, first out” (FIFO) basis. Design silos for mass flow rather than funnel flow to ensure FIFO product consumption. If this is not possible, consider periodic “turning” of silo inventory.

Bags, Supersacks, Octabins, and Boxes

Dow Elastomer products are also supplied in 20-25 kg bags, supersacks, octabins, and boxes (gaylords).

- Observe the general temperature guidelines for handling and storage recommendations noted on page 2. This is usually best accomplished by storing within a warehouse on lowest warehouse racks to avoid high temperatures often found in higher warehouse elevations.
- Do not store outside with exposure to sunlight that could lead to product degradation (especially with NORDEL™ EPDM products).
- Do not double-stack pallets and supersacks, to minimize the potential effect of static load.
- Always consume material on a first in, first out (FIFO) basis.
- See bulk handling recommendations on this page if packaged product is transferred to a bulk silo or conveyed using a bulk handling system.

If You Have a Blocking Problem ...

Blocking is usually not a problem when Dow Elastomer products are handled correctly. However, in the event blocking does occur, follow these steps to resolve the problem:

- First, call your Dow customer service representative for specific recommendations. Provide lot numbers, pictures, and collected samples if possible.
- Inspect the product to confirm that the problem is due to blocking and not melting:
 - Melting – If the product appears to be melted (does not unblock after returning to room temperature and relieving pressure), then it may have been exposed to excessive temperatures and the blocking may be irreversible.
 - Blocking – In contrast, blocked product pellets are not permanently joined together. They can often be returned to a friable (free-flowing) condition after static load is relieved and/or after the product is placed in ambient temperature conditions for a period of time (depends on the severity of the blocking). Contact your Dow representative for more specific recommendations.

Bulk handling options to restore blocked product to its friable state, include:

- Mechanical cleaning of exit chutes.
- Use of a railcar vibrator.
- Removal of friable product from the top of the railcar to relieve load on material sub-layers.
- Transfer of material to in-plant silos, taking care to avoid filling silos to the top and reducing the potential load on the material.

For non-bulk shipments, suggested alternatives include:

- Unstacking bags from pallets to relieve compressive forces.
- Use of conditioned air to transfer the product to avoid introducing moisture or other contamination.
- To further relieve blocking, move the product to an ambient environment (10-25°C [50-77°F]) and allow time for pellet relaxation or accelerate material recovery with gently applied mechanical force.
- Request assistance from Dow technical service personnel as required.

Low Temperature Storage of AFFINITY™ GA Polyolefin Elastomers

AFFINITY™ GA Polyolefin Elastomers can be shipped in big bags or super sacks. There are several important factors Dow recommends that the user consider for storing and conditioning of the bags when exposed to freezing temperatures.

These polymers discharge from the bags at a reasonably high speed under dry conditions. When the pellets are wet and subsequently the water in the bags freezes, the bags need to be conditioned.

Storage Requirements

1. Store all bags in a heated warehouse when possible. As previously noted, the recommended storage temperature is between 10 and 21°C (50 and 70°F).
2. If the bags are stored outdoors, protective measures need to be undertaken to prevent rain water or any other drainage from entering the bags. Tarp or protective heavy-duty polyethylene film should be used to cover the top and sides of the bags to avoid contact with rain water.
3. Do not stack bags.
4. During loading and unloading from any vessel, bags should be protected from water in a similar way to that described in step 2 above.

If the polymers are exposed to temperatures below 0°C (32°F):

1. When bags are stored outdoors or in a warehouse where they are exposed to freezing conditions for more than a day, before using the polymer, bags should be conditioned at ambient temperature. For prolonged exposure to freezing temperatures (more than five days), bags should be brought into a dry environment at room temperature and kept there for a minimum of four days. For exposure to freezing temperatures for less than five days, the room temperature conditioning can be as low as two days but not less.
2. After conditioning but before discharging, the spout should be slightly loosened to drain water, in case some may have seeped in to the bag, until no more water is dripping from the spout.
3. Bags should be ready to use after completing steps 1 and 2.

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