

PAPI 94

Polymeric MDI

PAPI* 94 polymeric MDI is a polymethylene polyphenylisocyanate that contains MDI. This product's low viscosity, low functionality, increased diphenylmethane diisocyanate content and increased percentage of ortho-para isomers make PAPI 94 polymeric MDI highly versatile. This product also offers delayed gel times, which results in better flow into molds for semi-flexible and integral skin foams.

NOTE: To maintain product quality and easy handling, this product must be stored between 75° to 105°F (24° to 41°C). Shipping and storage temperatures vary with conditions; see Storage section.

Applications

- Coatings
- Adhesives
- Packaging
- Furniture
- Automotive interior foams
- Structural foam

Typical Properties¹

Properties	Typical Value ¹
Average molecular weight	290
"Functionality" ²	2.3
Isocyanate equivalent weight ³	131.5
NCO content by weight, % ³	32.0
Viscosity, cps @ 25°C ³ (77°F)	50
Typical viscosity growth, cps/mo. @ 25°C ⁴ (77°F)	<5
Vapor pressure, mm Hg @ 25°C (77°F)	<10 ⁻⁵
Decomposition point, °C (°F)	230 (446)
Extrapolated boiling point, °C (°F)	330 (626)
Flash point, °C, ASTM D 93 Closed Cup (°F)	>204 (>400)
Acidity, % as HCl ³	0.03
Density, g/ml @ 25°C (lb/gal. @ 77°F)	1.234 (10.2)
Coefficient of thermal expansion, kg/l/1°C	0.0008
Specific heat, gm•cal/gm•°C	0.43
Thermal conductivity, gm•cal/cm•sec•°C	0.0003

¹ Typical Properties; not to be construed as specifications.

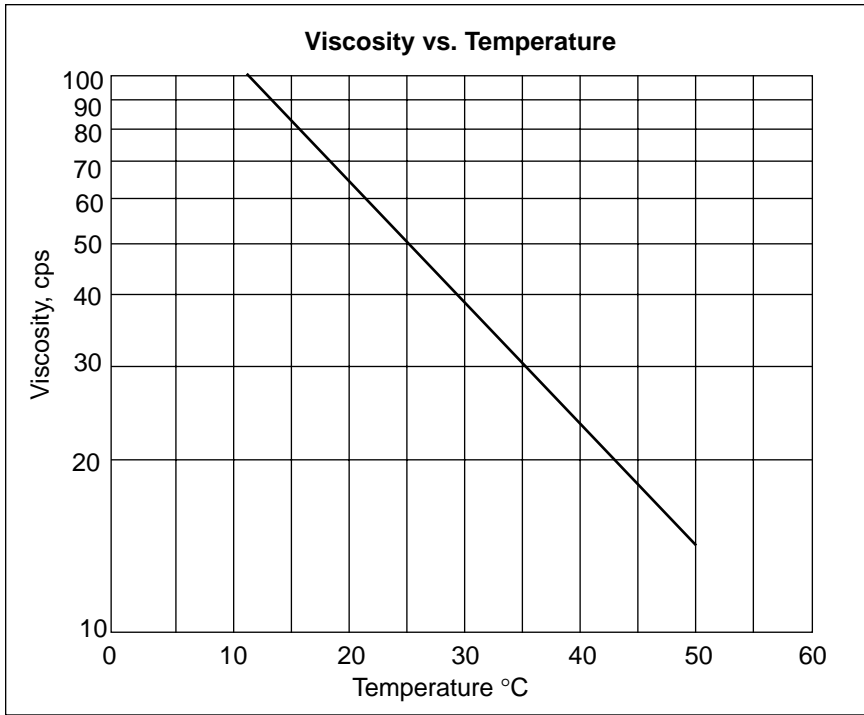
² Typifies expected cross-link densities in end use applications; not to be construed as true functionality.

³ For test procedures, see Technical Bulletin 109-761, "PAPI Polymeric MDI, Test Procedures."

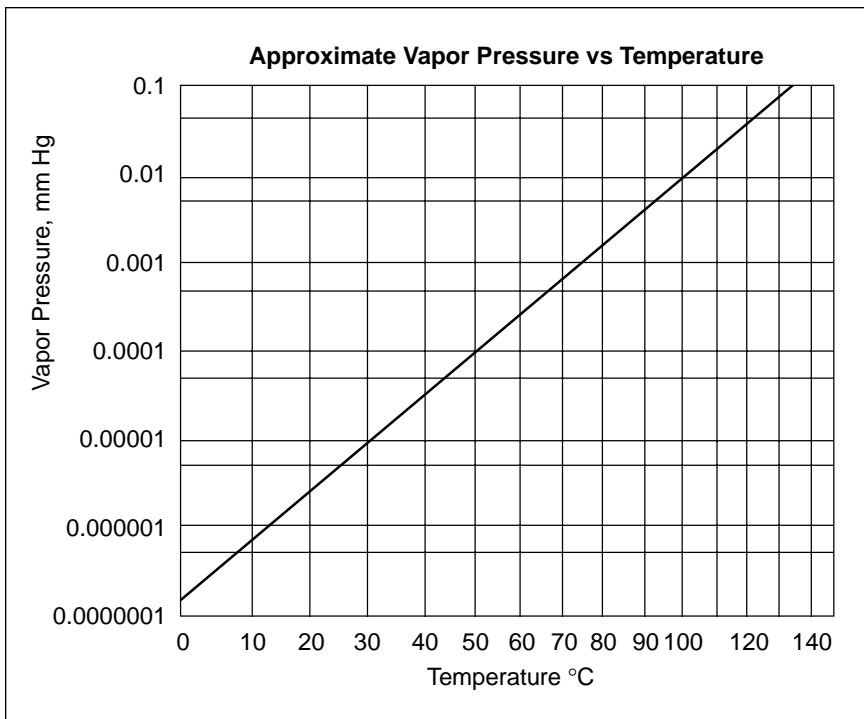
⁴ Under recommended handling conditions.

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Viscosity vs. Temperature¹



Approximate Vapor Pressure vs. Temperature



Safety Considerations

PAPI polymeric MDI products are potentially hazardous materials and require care in handling. All persons who work with these materials must know and follow proper safe handling procedures.

Current Material Safety Data Sheets (MSDS) and additional information about the safe handling, storage and use of these materials are available through your Dow representative. Please request and review the information before handling these materials.

Safety Precautions

First Aid

Polymeric MDI is irritating to the respiratory tract and can cause respiratory and skin sensitization in susceptible individuals. Although vapor pressure is low, there is the possibility that the polymeric MDI may exist in aerosol droplets, which may provide air concentrations that would be hazardous upon single exposure. These effects may be delayed. Decreased ventilatory capacity has been associated with exposure to similar isocyanates; it is possible that exposure to MDI may cause similar impairment of lung function. In case of inhalation exposure, remove to fresh air. Consult medical personnel.

Polymeric MDI may cause eye and skin irritation. Because of its high viscosity, this material may be difficult to remove from the eyes. In case of eye contact, irrigate immediately and continuously with water for at least 15 minutes. Consult medical personnel.

In case of skin contact, wash off material in flowing water or shower. Remove contaminated clothing immediately and launder before reuse. Destroy contaminated shoes and leather items.

The single dose toxicities of polymeric MDI is low. If ingested, do not induce vomiting. Consult medical personnel.

Handling

Workers should wear appropriate eye protection (safety glasses are considered a minimum requirement, and if there is the possibility of exposure to the eyes, it is recommended that chemical goggles be worn) and protective clothing impervious to MDI whenever MDI is used. General or local exhaust ventilation should be provided to control airborne levels below the exposure guidelines. Please review the MSDS for this information.

The vapor pressure of MDI is low at room temperature ($<1 \times 10^{-5}$ mm Hg). However, at temperatures over 104°F (40°C), the vapor pressure increases enough that low functionality MDI products begin to constitute a toxic hazard. Aerosol mists can also be a problem.

Storage

Drums of pure and polymeric MDI must be protected from moisture contamination. Exothermic generation of CO₂ may cause dangerous pressure build-up if contamination occurs.

Store drum under a pad of -40°F (-40°C) dew point nitrogen or if nitrogen is unavailable, a pad of -40°F (-40°C) dew point air may be used. Opened containers should be filled with this inert atmosphere before closing. During drum unloading, the 3/4" vent may be equipped with a dry inert gas breather (maximum of 1 psig pressure) or a moisture free, calcium chloride-filled dryer tube placed in the air bleed opening.

Shipping and storage temperatures for this product are 75° to 105°F (24° to 41°C).

If shipping or storage temperature should fall below 65°F (18°C), some crystallization could result. Unless proper action is taken to re-form the original solution, subsequent dimerization will proceed quickly and will deteriorate the assay of the product.

Melting Instructions

If drum shipments of polymeric or modified MDI products arrive in a crystallized, frozen or fused state, they should be promptly unloaded and heated as soon as possible. Polymeric, pure and modified MDI products that have been frozen will exhibit the same dimerization characteristics as pure MDI. Unless proper action is taken to heat or melt the product, dimerization will proceed rapidly and deteriorate both the clarity and assay of the product.

While several methods for melting frozen or crystallized MDI have been developed, the method of choice should be one in which dimer formation is minimized. This can best be accomplished by rapid, even heating of the drums, as follows.

The preferred method for heating drums is "drum rolling" (usually at 5 rpm on a mechanical drum roller) in atmospheric steam. The principal advantage of this method is that it permits efficient heat transfer – that is, the solid MDI crystals cool the liquefied material so that the contents are not heated much beyond 70°C (158°F), the point at which dimer formation can increase significantly.

Experience has shown that a frozen drum of polymeric, pure and modified MDI, with a temperature between -4° to 32°F (-20° to 0°C) will usually melt completely (i.e., reach 70°C [158°F] in approximately four to five hours). Also, while 70°C (158°F) is significantly higher than the recommended storage and handling temperature, it is necessary to reach this temperature, at least briefly, in order to melt the product both quickly and thoroughly.

Before heating, any opened drums should be reblanketed with dry nitrogen (-40°F [-40°C] dew point) and all drums, previously opened or not, should have bungs tightened securely.

Upon removal from the steam chest, residual heat will usually evaporate free water from the drum head. In any event, the top of the drum should be wiped with a dry cloth.

As can be seen, agitation and even heating is the key to maintaining quality during melting. *Dow does not recommend static melting in hot-air oven or with electric heating apparatus, or by hot-water bath.*

CAUTION: The "drum rolling" procedure should be carefully monitored to prevent bumping, rubbing or other conditions that could puncture or otherwise damage the drums.

Fire

Suitable fire extinguishing agents include water fog, foam, alcohol foam, carbon dioxide or dry chemical powder. Isocyanates will burn but do not ignite easily. In the event of a fire, toxic vapors and decomposed material are likely to be present. All fire fighters should be equipped with protective clothing and a positive pressure, self-contained breathing apparatus. Drums of isocyanate

involved in a fire should be sprayed with water to minimize the risk of rupture. However, water contamination in a closed container or a confined area is to be avoided, due to exothermic CO₂ evolution upon water contamination.

Spills and Disposal

In case of spills, evacuate and ventilate the spill area. Only properly trained and protected personnel should be involved in the spill cleanup and waste disposal operations. Spills can be covered with a commercial absorbent or sand, shoveled into open containers, properly labeled and removed from the work area for decontamination with a suitable decontaminant solution: Formulation 1: sodium carbonate 5-10%; liquid detergent 0.2-2%; water to make 100%. OR Formulation 2: Concentrated ammonia solution 3-8%; liquid detergent 0.2-2%; water to make 100%. If ammonia is used, use good ventilation to prevent vapor exposure. If you have any questions on how to neutralize call The Dow Chemical Company. *All disposal methods of isocyanates must be in compliance with all federal,*

state/provincial and local laws and regulations. Regulations may vary in different locations. The preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destructive device.

For More Information

For additional information about MDI product, consult the *Safe Handling and Storage of MDI-Based Isocyanates* handbook (Form No. 109-01224) from Dow or contact your Dow representative. Also, review the current MSDS for this product.

Customer Notice

Dow encourages its customers to review their applications of Dow products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they were not intended or tested, Dow personnel are willing to assist in dealing with ecological and product safety considerations. Your Dow representative can arrange proper contacts.

For additional information in the U.S. and Canada, call 1-800-441-4DOW (4369).

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