



Glycol Ethers Storage and Handling

Refer to the material Safety Data Sheets and Transportation Equipment data/Emergency response sheet for each DOWANOL* glycol ether and acetate for the most recent storage and handling information for the product.

Storage of Glycol Ethers

The storage of glycol ethers presents no unusual problems. They are very stable organic liquids that have relatively low freezing points. Heated storage is not normally required. The exception is DOWANOL EPh and PPh, which freeze below 55° F (13°C).

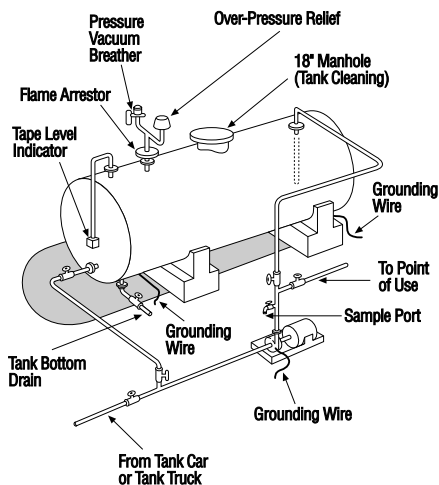
Most glycol ethers do not present a significant flammability hazard at normal storage temperature. They have relatively low vapor pressures. The most volatile glycol ether products are DOWANOL PM, PnP, and PMA which have flash points of 88°F, 118°F, and 108°F respectively.

Storage Tanks: Material and Construction

The storage tanks used for DOWANOL glycol ethers and acetates and blends of DOWANOL products should be constructed of mild steel, carbon steel, or stainless steel. Storage vessels and piping constructed of aluminum and aluminum alloys should be avoided for DOWANOL EB and DM glycol ethers. Plastic tank linings are not recommended, because these materials are often affected by DOWANOL products.

Either vertical or horizontal storage tanks may be used. A vertical tank is more economical to install and occupies less space. However, if future compartmentation of the storage tank is likely, a horizontal tank is easier to modify than a vertical tank. Above-ground storage is always recommended for ease of installation, maintenance, gauging, and piping arrangement. Storage tanks for DOWANOL products should meet the requirements of local, state, and federal regulations and guidelines for chemical storage. Flash points of DOWANOL products range from 90°F for DOWANOL PM to 259°F for TBB. For instance, DOWANOL PM is classified as a flammable liquid according to the Department of Transportation (DOT) regulations, CFR 49. Other DOWANOL products may be classified as flammable or combustible liquids or are not regulated by the DOT. It is important to keep in mind, however, that while some glycol ethers are not regulated by the DOT, all glycol ethers have flammability limits which should be taken into consideration when a flammability hazard is being assessed. (Note: All local fire codes should be consulted when installing storage facilities for DOWANOL products. Also, to avoid the possibility of induced static electricity, which can cause accidental ignition, all tanks, pumps, and transfer lines used for DOWANOL glycol ether products should be fully grounded. Finally, fire hazards can be lessened by maintaining diking and by removing all vegetation around storage tanks.)

Figure 1: Horizontal Storage Tank for DOWANOL Products



To avoid the possibility of induced static electricity, ground all tanks, pumps, and transfer lines used for DOWANOL products, and install a dip line as the product inlet line. Float-type gauges with tape indicators or differential pressure cells work well as level indicators for glycol ethers and acetates.

Pressure vacuum relief valves (PVRV) are recommended for storage tanks containing glycol ethers and acetates because they are hygroscopic. Breathers allow for slight

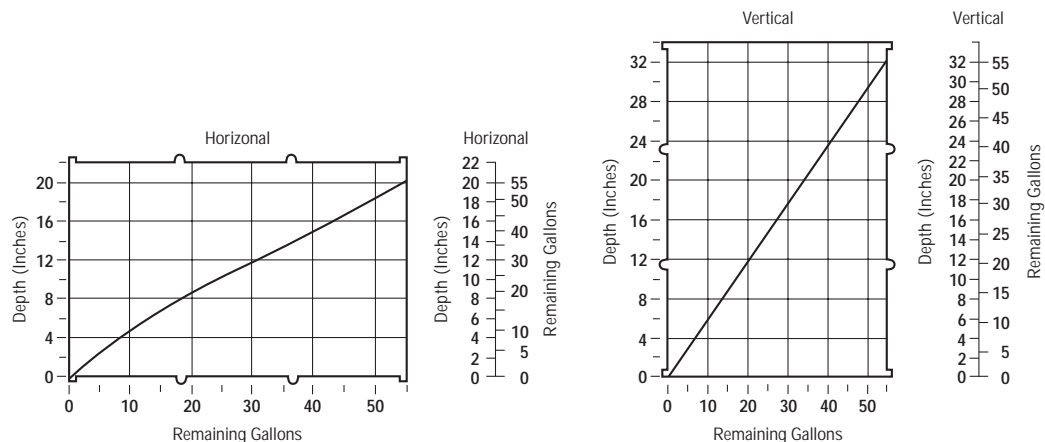
changes in tank pressure, thereby reducing moisture pickup from the outside air. The overpressure relief and the breather should be mounted on a flame arrester. PVRV that contain moisture absorbent drying beds are also available in long term storage. Moisture pickup by glycol ethers and acetates can be further reduced by nitrogen blanketing or padding of the storage tanks. Nitrogen blanketing is recommended for quality and safety reasons.

DRUM RECOMMENDATIONS

DOWANOL glycol ether products may be stored in 55-gallon drums made of mild steel. It is important to remember to replace the drum cap securely after each withdrawal, or the product will gradually pick up moisture from the air.

Avoid drums constructed of galvanized metals that may bring glycol ethers, especially DOWANOL EB or DM, in contact with zinc or tin since metal corrosion and discoloration can result. Zinc is very reactive in contact with some glycol ethers; hydrogen may be produced. Copper and copper alloys, such as bronze and brass, will cause discoloration via decomposition with all glycol ether products.

Figure 2: Determining the Amount of Contents of Partially Filled Drums



Polyethylene and polypropylene storage drums may be used if water contamination of the glycol ether or acetate is not critical. Drums made of these materials can provide adequate shelf life for the product, but they will absorb water through the drum walls. Polyethylene storage drums should be product-dedicated, because glycol ethers and acetates may be retained in the walls of the drums over time. Figure 2 can be used to determine the contents of partially filled drums without removing the drum caps.

Auxiliaries

Pumps, lines, valves, and fittings of steel are adequate for use with DOWANOL products. If rated at the appropriate pressure, polyethylene and polypropylene pipes are adequate; however, DOWANOL products should not be allowed to stand in these pipes. PVC or fiberglass reinforced pipes are not recommended. Avoid equipment constructed of aluminum or aluminum alloys, galvanized metals, and copper or copper alloys. Bronze and brass fittings are acceptable for temporary or minimum contact situations.

Centrifugal pumps work well for storage systems, with packed pumps used for intermittent service and mechanical seals for continuous service.

All equipment must be free of moisture before operation. The chances of product deterioration and/or discoloration are minimized when the equipment, including pumps, lines, valves, fittings, and storage vessels, cleaned thoroughly prior to use.

Glycol ethers and acetates are difficult to contain, due to low viscosities, and prone to leak past defective fittings or packing. Consequently, the installation of all fittings and gaskets should be done carefully. Aqueous graphite suspensions are preferred

for pipe dope on screwed piping, but they work best when all cutting oil has been removed from the threads. Ball valves with plastic seals and seats of Teflon¹ resin are strongly recommended. Butyl rubber or EPDM can be used for gaskets and packing.

Cleaning and Maintenance

Sound maintenance procedures are vital to proper storage and handling of DOWANOL products. Maintaining diking around all DOWANOL product storage tanks and removing all vegetation from the area diminishes fire hazards. The maintenance and prompt repair of the storage tanks and transfer equipment piping and valves is critical for safeguarding the quality of DOWANOL products.

Storage tanks should be thoroughly cleaned and dried before use. They should be equipped with 18-inch manholes and a bottom drain. Good results can be obtained by buffing and steaming the tank, then washing with water and thoroughly air drying. Avoid brushing or otherwise mechanically disturbing the surface of the tank after the tank has been dried.

To minimize the formation of rust, fill the tank as soon as possible after cleaning. If the cleaning is thorough, there will be less chance for discoloration, even upon extended storage.

To minimize air contact and possible moisture pickup after cleaning, the tank may be purged with dry nitrogen prior to filling. The dry nitrogen is then displaced as the tank is filled, and a pad remains on top to help extend product quality.

Strict maintenance schedules for cleaning, service, and replacement of auxiliary equipment used for DOWANOL products should

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be developed. Particular attention should be paid to packings, gaskets, and other components of transfer equipment which may be affected by glycol ether and acetate products.

Product Shelf Life

The quality of DOWANOL products can be affected by storage conditions, temperature, and time. Product deterioration can take the form of lowered pH values and/or color changes.

To safeguard DOWANOL products against this product deterioration, develop product inventory and use policies that put your DOWANOL inventory into production prior to the recommended shelf life limits noted on Table 1.

Safe Handling

Develop, implement, and strictly enforce safe handling procedures and practices for workers in all operations involving DOWANOL products. The viability of your storage and handling program for these products relies on close attention to worker safety issues.

Customers are urged to develop, implement, strictly enforce, monitor, and periodically review and evaluate safe handling procedures and practices in *all* handling and storage operations involving DOWANOL glycol ether products.

The greatest potential hazards in working with glycol ethers and acetates are skin and eye contact and vapor inhalation. Written procedures are highly recommended, detailing how workers should wear the appropriate protective equipment for their tasks and the hazard potential involved.

The Dow Chemical Company can provide information and assistance to help you develop or improve your own DOWANOL glycol ether and acetate safe handling program. Our staff of specialists can help you stay current on a wide variety of stewardship issues, such as worker safety, waste handling and disposal, environmental impact matters, and regulatory compliance. Consult the current Material Safety Data Sheets for more detailed information on the safe handling of DOWANOL products.

The disposal of DOWANOL glycol ethers must be carried out in strict accordance with all local, state, and federal laws and regulations governing the disposal of hazardous chemicals. For information, advice, and/or assistance on the disposal of DOWANOL glycol ethers, contact a local Dow representative or sales office, or write The Dow Chemical Company, Specialty Chemicals Department.

Table 1: Product Shelf Life

Product/Shelf Life	Lot Number System	Conditions of Temperature and Storage	Deterioration Characteristics
DOWANOL PM, DPM, TPM, PnB, DPnB, TPnB, PnP, DPnP, TPnP, EB, DB, DM glycol ether products 18 months – Drums 6 months – Bulk	Standard	Normal conditions – Store below 90°F. Material is hygroscopic; should be in closed containers. Aluminum containers should be avoided.	Lowering of pH – possible rise in color on prolonged standing.
DOWANOL PPh, EPh glycol ether products 18 months – Drums 6 months – Bulk	Standard	Store below 110°F. Aluminum containers should be avoided.	Develops yellow color.

Product Stewardship

The Dow Chemical Company has a fundamental concern for all who make, distribute, and use its product, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the health and environmental information on our products and then take appropriate steps to protect employee and public health and the environment. Our Product Stewardship program rests with each and every individual involved with Dow products from the initial concept and research to the manufacture, sale, distribution, use, and disposal of each product.

Customer Notice

Dow encourages its customers and potential users of Dow products to review their applications of such products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel will assist customers in dealing with ecological and product safety considerations. A Dow salesperson can arrange the proper contacts. Dow product literature, including Material Safety Data Sheets, should be consulted prior to use of Dow products. These may be obtained from a Dow sales representative or sales office.

Suggested Precautions

The following precautionary measures are suggested for operations where contact with DOWANOL PnB or DOWANOL DPnB glycol ethers is likely:

- Wear suitable eye protection, such as chemical workers' goggles (especially when working with DOWANOL PnB) or safety glasses with side shields.
- Practice reasonable care, good house-keeping, and personal cleanliness to avoid skin exposure.
- Avoid prolonged or repeated breathing of vapors of DOWANOL glycol ethers, especially if the material is hot. Also, be sure that adequate ventilation is provided for workers handling or using glycol ethers and acetates. Customers are urged to consult the most recent Material Safety Data Sheets for the current exposure guidelines.
- In the event of upper respiratory irritation, use an air purifying organic vapor respirator.

First Aid Measures

Consult the current Material Safety Data Sheet (MSDS) for the DOWANOL glycol ether product in question for recommendations on procedures for emergency first aid.



Glycol Ethers for Shipping Points

Shipping Points for DOWANOL* Glycol Ethers

	DALPAD* A	DB	DM	EB	EPh	EPh Low Ph	PPh	PPh Low Ph	DM Mil Spec	DPM	PM	PM Elec Gr	TPM	PMA	DB Elec Gr	DPMA	EB Elec Gr	PMA Elec Gr	PnB	DPnB	TPnB	PnP	DPnP	PROGLYDE* DMM
MIDLAND	B P		B P		B P	B P	B P	B P	B					B P		P		P	B P	B P	B	B P	B P	
PLAQUEMINE		B P		B P						B P	B P	P	B P		P		P							B P
POWELL-DUFFERYN BAYONNE		B	B	B						B	B			B										
JOLIET CHANNON	B	B		B	B					B	B		B	B		B			B	B		B		
FREEPORT				B							B			B										
LONGBEACH	B	B		B	B					B	B			B					B	B				
EDISON LINDEN				P	P						P		P	P					P	P				
BEDFORD PARK LAKE RIVER	P	P	P	P	P		P	P		P	P	P	P	P	P			P	P	P	P	P	P	

*MAKE TO ORDER ONLY
B=BULK
P=PACKAGE