



TRANSPORTATION & STORAGE OF DISPERSIONS



Forms of delivery

The packaging of polymer dispersions depends on quantity to be shipped and on the viscosity of the product. All our packagings conform to national and international transport regulations. Polymer dispersions can be supplied in bulk or packaged in IBCs = intermediate bulk containers, a.k.a. totes, or in drums.

Bulk goods

Bulk shipment comprises deliveries in road tankers (tanker trucks), in tank containers (tanktainers), and in flexitanks (flexi bags).

Our bulk transports are usually carried out in specially insulated tanktainers. Split-bulk deliveries (i.e. smaller bulk quantities and/or different products in the same delivery) from our broad product portfolio are possible.

An alternative to tanktainers / road tankers is the use of flexi bags: A flexible multi-layer polymer bag is placed in a standard 20 ft. shipping container (20' DV container) and secured by an additional bulkhead.

Introduction

Polymer dispersions (alternatively known as polymer emulsions, polymer latexes or polymer latices) consist of extremely fine polymer particles dispersed in an aqueous medium. Due to this, additional aspects have to be considered as compared to solvent-based binders. This brochure is intended to inform our customers on delivery options, the design of tanks and pipes, ways of storage and handling, and prevention of microbiological contamination. Following this advice serves to maintain the material composition, the product quality, and the physical stability of the polymer dispersions.

The consistently high quality of Celanese polymer dispersions is ensured by a quality management system that complies with DIN EN ISO 9001:2025

Packaged goods

We deliver all packaged goods as IBCs (standard size one cubic meter), or open top drums on ISPM 15 compliant Euro-pallets. Standard for shipping drums it is up to 5 drums per pallet. Availability of packaged products has to be checked individually.

IBCs can be stacked 3 levels high; drums can be double stacked (2 levels high).

During the cold period Celanese may have to use thermo trucks and/or flexible thermo covers in order to assure goods do not get affected by cold temperatures. The choice between the two alternatives depends mainly on transit time and weather conditions.

goods, is assured provided the product is stored in its unopened container, hygienically, at temperatures between 5 and 35 °C, avoiding frost and direct sunlight. Bulk goods are not expected to be stored for several months; conditions in storage tanks are outside our control. Advice for tank storage is given below.

For information on individual products, please consult the corresponding technical data sheets, which are usually online in the Literature and Multimedia section, searching on our website (celanese.com/products/mowilith) for the corresponding product name.

Despite our high manufacturing standards, the best possible quality checks, carefully picked packaging systems and care during transport, external factors can sometimes cause quality changes which are beyond our control during longer storage times.

Stability and principles for storage

Celanese polymer dispersions should be used within the general minimum shelf life. This shelf life, for most of our products six months from shipping date for packaged





There are several conditions (e.g. optimum storage temperature and prevention of water loss) that influence how the maximum quality level is maintained over a long period of time, particularly in bulk storage tanks.

In addition, the presence (or avoiding) of microbes may affect the stability of polymer dispersions. Therefore almost all our polymer dispersions contain some initial biocides (as in-can preservatives) to impede attack by microorganisms during transport and storage. For more information please see section "Prevention of and Protection against Contamination by Microorganisms".

Customers are advised to check the product quality periodically before use, especially when the product approaches the minimum shelf life. Prior to sampling, and before using, please make sure the lot has been homogenized. Products kept past the six month date may still be useable, but it is strongly recommended that the material be sampled and tested to ensure product quality before use in a commercial operation. However, Celanese will not be held responsible for the quality of polymer dispersions stored longer than the minimum shelf life.

A few polymer dispersions, particularly those suitable for glass fiber products, tend to separate into layers of lower and higher concentration and/or form sediment when stored for a longer time. Please compare our special information leaflet "Guidelines and Recommendations for Shipping and Storage of Emulsion Polymers for Glass Fiber Applications", available on request.

As polymer dispersions are designed to form films on substrates, this property also can cause formation of skins or lumps during transport and storage. Main factors fostering the formation of skins and lumps are

- the difference in temperature between the wall of the container and its content.
- temperature and humidity of the environment.
- the physical properties of the packaging.

An important safeguard is to keep containers tightly closed and to open them only for short periods. Storage tanks generally are vented to the atmosphere for breathing due to filling, emptying, thermal expansion and contraction. Depending on the solid content of the polymer dispersion, and on prevailing humidity and temperature, local loss of moisture may occur, causing formation of skin. To combat this, the tank may be equipped with an agitator that is switched on periodically – especially after material has been taken out. Humidification of the air entering by the vent is another possibility. Usually a water filled syphon is used, with the water containing a preservative.

Skin formation in the storage tank will not present quality issues as long as the tank is cleaned as recommended and a certain tank level is maintained. If the tank level drops too far, the skin can fall off the wall or collapse to the bottom of the tank. This has to be taken into account for not routinely cleaning as well as for sieving the product taken from the tank.

High temperatures and frequent and/or abrupt temperature changes (harsh day/night temperature cycles) can accelerate skin formation and have to be avoided.

Recommendations for the transporting and storing

We would like to give the following additional recommendations for transporting and storing Polymer Dispersions:

- Polymer dispersions are usually sensitive to cold temperatures: Never allow them to freeze and store them hygienically at a temperature between 5° and 35° C, Keep the storage temperature as constant as possible, avoiding frost and direct sunlight. Also keep the difference in temperature between the content of a container or drum and the ambient air as small as possible; the polymer dispersion product can then be stored longer and more reliably.
- Avoid warming only one side of containers or drums by exposing them to heat sources, warm air streams, or sunlight, as this fosters skin formation.
- Always transport drums in an upright position. Never roll them in order to avoid foam-formation, and do not store them horizontally. It is good practice to keep drums on the pallet they are delivered with, and to move them with a fork lift.
- Never leave drums or containers open but seal them tight. Tanks are only vented for maintaining appropriate pressure; manholes on feed tanks are kept closed. This will not only help to avoid formation of skin and lumps but also to maintain good microbiological quality of the product. For bulk storage, regular stirring is common practice. Please consider adding a suitable preservative in all these cases.

- When crusts, lumps or skins form, clean off such dispersion adhering to the lid and/or wall of the drum. In such case, please consider to verify the micro-biological quality of the polymer dispersion.
- To remove any skins or lumps that could have been formed during longer storage of the polymer dispersion (due to its film forming nature), a filtration or sieve process is recommended before further processing. However, be sure to avoid excessive shear-forces. Feel free to contact our Application Technology Experts for advice.
- Always use polymer dispersions according to the FiFo principle "first in – first out".

Our application and production specialists are available to advise you on technical and product-specific issues.





Bulk storage tanks could be filled from the top or from the bottom. If filling is done from the top, foaming can be reduced by using a curved pipe fitting that feeds the polymer dispersion directly onto the container wall above the maximum fill level.

If filling is done from the bottom, we recommend using a suitable pump, avoiding excessive shear forces. Filling from the bottom by air pressure carries the risk that air surges into the polymer dispersion causing foam and grit.

If the tank is overfilled, we recommend checking and cleaning the vent and/or safety valve; otherwise they can clog by dried polymer.

Depending on their design, storage tanks can be drained with compressed air or using suitable mechanical pumps.

Evaporation of water

Evaporation of water from polymer dispersions should be prevented during storage, since this can lead to higher viscosity, thickening, and skin formation.

Evaporation can be controlled by:

- Ensuring a constant and homogeneous temperature for the storage tanks.
- Ensuring a high relative humidity by installing a vent system in which air entering the tank is moistened. The water used for humidification should contain a biocide.
- Spraying a small quantity of water mixed with a suitable preservative into the air space to moisten it especially before filling an unused storage tank.

These measures are especially important for storage of polymer dispersions that have a strong tendency to form films and if the ambient air is relatively dry.

Storage in tanks

Depending on the consumption pattern, delivery in bulk and storage in tanks may be advantageous. Please note that there may be local/national regulations on bulk storage tanks with regard to permits, overfill protection, secondary containment, etc.; operating/cleaning such tanks will also affect your waste water management. Tanks have to be designed to withstand the pressure possible during operations; otherwise they need safety valves etc. against overpressure and underpressure.

Tank Installation

Vertical (upright) cylindrical storage tanks (see e.g. DIN 28021 and 6618) are superior to horizontal storage tanks. The product surface area relative to the atmosphere inside of tank is smaller, resulting in reduced skinning. Moreover, they are easier to drain completely, especially if they are of the slope bottom, dish bottom or cone bottom type. The bottom outlet should have a nominal width of at least 100 mm (i.e. \geq DN 100).

When planning a bulk storage facility, one should provide means of access for inside cleaning and inspection.

For bulk storage regular stirring is good practice.

For installation of bulk storage tanks, exposure to frost and heat sources including direct sunlight needs to be avoided. For outdoor tanks, insulation will be required. Depending on weather conditions heating or cooling might be necessary additionally to thermal insulation.

It is advantageous to install the bulk storage tanks as near as possible to the unloading area. Distance and height difference put a limit on unloading by pressurized air and also need to be taken into account for the specifications of an unloading pump.



Mechanical pumps

Pumping from a vessel or container creates underpressure unless sufficient air can get in.

The choice of pump type depends on the susceptibility of the specific polymer dispersion to shearing.

According to our experience, the following pump types are low in shearing and consequently particularly suitable:

- Diaphragm pumps, either driven by pressured air or by electrical motor.
- Progressive cavity pumps (e.g. Mohno-Pumps).
- Lobe pumps or sine pumps.
- Hose (peristaltic) pumps.

Gear and centrifugal pumps are not suitable.

Conveyance of Polymer Dispersions

Although in some cases it is possible to transfer polymer dispersions by gravity alone, they usually need to be conveyed with the aid of pumps or pressurized air.

Strainers (basket filters) made of stainless steel can be used to protect pumps, flow meters, etc.

It is important that the design pressure of the entire equipment, including tanks, piping and pumps is not exceeded.

Determining the Required Feed Pressure

The required feed pressure depends on pressure drop and static height difference and is a function of the following parameters:

- Viscosity of the polymer dispersion.
- Maximum flow rate.
- Pipe data (diameter, length, course, number of valves in line, filters, etc.).



Pipe systems

The required pipe diameters depend on pressure drop resulting from the viscosity of the polymer dispersions, the flow rate, the flow pressure and the pipe course. To transfer bulk quantities in a reasonable time the pipelines should not be smaller than 80 mm in diameter (DN80).

If the pipe is not filled with polymer dispersions it is common practice to empty it as completely as possible, to rinse it with potable water and to dry the pipeline or, alternatively, to fill the pipe with potable water completely in order to prevent fouling. In this case, prior to further use, the pipe has to be drained completely.

For the design of pipework, we recommend that these rules are followed as far as possible:

- Short distances.
- As few valves as possible in pipe line to keep pressure drop low.
- As few curves and bows as possible to keep pressure drop low. The pipe bows should have a bend radius of at least five times their diameter (see DIN 10253-4 Tab. A1).
- Avoid siphons.
- Provide a sufficient slope to ensure that pipes are completely drained.
- Avoid dead ends.

Valves

Ball valves, slide-gate valves, and butterfly valves are suitable.

Filters/strainers

Bag filters and basket filters are suitable for filtering polymer dispersions. The filter size depends on the maximum throughput and the viscosity of the polymer dispersions. The mesh width depends on the purpose: straining for crude particles caused by skinning, fine filtration depending on how the product is used. In our experience it is often advantageous to use automatic filters with integrated grit removal.

Some types of pumps (see manuals) require safeguards against running dry. To prevent deadheading the pump, a relief valve should be installed downstream of the pump before any shutoff device.

A regular inspection of safety devices is strongly recommended due to the risk of fouling and clogging.

Because of the risk of fouling and blocking, pumps should always be filled with product or potable water. Drained pumps should be rinsed with potable water.

Compressed air

The vessel or container that is to be emptied by compressed air has to be designed for the pressure used. If the pressure can get higher than the maximum allowable operating pressure, an adequately sized safety valve is required. Using compressed air for transfer, rather than pumps, is advantageous because this reduces shearing. The compressed air used must be clean and free of oil and preferably has high relative humidity to prevent skinning or/and fouling.

- Do not use pressurized air to empty IBCs or drums, as these containers are not pressure-resistant.

Material requirements

Although polymer dispersions have no particular chemical reactivity, some materials are not advisable for prolonged contact: Some plastics can be affected by some components in the polymer dispersion; some metals are sensitive to high chloride content in special polymer dispersion grades. Some metals, on the other hand, affect the quality of the dispersion.

Use of the following materials can be recommended:

Storage tanks

- Stainless steel AISI/SAE grades SS316L or SS316Ti (EN Steel Numbers 1.4404 or 1.4571) or SS304 (Steel No. 1.4541). For polymer dispersions containing chloride \geq 100 ppm we do not recommend the use of SS304 (1.4541).
- Unalloyed steel with a solvent- and plasticizer-resistant coating (epoxide or phenol resin), alternatively with polypropylene (PP) or polyethylene (PE) liner.
- Glass-fiber reinforced plastic (GRP) with protective coating or a PP or PE liner.
- Polypropylene/polyethylene.

Tanks made of PE, PP or GRP are less expensive. But they can be damaged by high pressure water cleaning ($>$ 100 bars). This also applies to liners. Pipes, Fittings, Valves, and Meters

- Stainless steel grades such as SS316 L, 316 Ti (EN Steel Numbers 1.4401, 1.4404, 1.4435, or 1.4571) or SS304 (Steel No. 1.4301, 1.4306). For polymer dispersions containing chloride \geq 100 ppm we do not recommend the use of SS304 (1.4541).
- Glass fiber reinforced plastic with protective coating or a liner (PP or PE).
- Polypropylene/polyethylene.

Pumps

- Stainless steel (EN Steel No. 1.4308, 1.4404, 1.4408, 1.4571 or 1.4581).
- Ductile cast iron EN-GJS-400-18-LT (formerly GGG 40.3 as by DIN 1693) or cast steel with solvent- and plasticizer-resistant liner (e.g. PFA).
- Polypropylene.

Gaskets

For piping as well as for storage tank: we recommend gaskets made of PTFE or stainless steel coated with a PTFE layer. Gaskets made of fluorinated elastomers are not recommended.

Hoses

A wide range of material is suitable; we recommend rubber and thermoplastics hoses according to DIN EN 12115.

Reception of shipments

We kindly ask our customers to

- verify that the tanktainer has indeed been fully unloaded prior to departure of the truck. Any complaint concerning weight differences should be checked already with the carrier still present on the customer site.
- make sure of correct labeling on packaged goods (including flexi bags) received, and to check for any damages or leakages and the correctness of the quantity delivered, while the carrier is still on site.

Unloading of bulk shipments

Bulk shipment comprises deliveries in road tankers (tanker trucks), in tank containers (tanktainers), and in flexitanks (flexi bags).

It is advisable to check the quality of the product prior to unloading. The procedure for taking samples at the tanktainer and responsibility for providing clean unloading hoses must be clarified on a case-to-case basis.

Tanktainers, Trucks

All our tanktainers are equipped with stainless steel valves (DN 80) and unloading hoses (ca. 6 m). The product is usually unloaded with the aid of pressurized air (max 2 bars), compressor provided by our carrier.

The driver is responsible for the on-board equipment and operates the valves at the tanktainer.

If customers prefer to use their own equipment (hoses, pumps, compressed air), they assume responsibility for the unloading procedure. Connecting the customer's hoses to the tanktainer is done jointly by their personnel and the driver.

If the customer provides pressurized air, the driver has to verify that maximum allowable operating pressure of the tanktainer is not exceeded.

Under any circumstance, the customer has to supervise the unloading procedure, including correct connection of hoses and following tank level(s) during unloading.

Particularly for higher viscous products, it is advantageous if the positioning of the tanktainer and the slope of the unloading area places the outlet of the tanktainer (compartment) as low as possible, to aid draining.

Flexi Bags

Flexi bags are to be unloaded by pump, which is to be provided by the customer.

Precaution: Only open a single door of the container, the second door has to be locked to secure the load inside. Before unloading, make sure the bulkhead securing the flexible bag is in place, fixed and undamaged.



Storage tanks may only be entered after thoroughly executed ventilation (see below under "Cleaning"). In any case of doubt measuring the CO concentration is necessary.

The material safety data sheets available for each individual grade contain relevant information regarding safety for handling polymer dispersions, dealing with accidents and also referring to some legal requirements. Please also consult your regional/national authorities for additional regulations concerning storage, processing and use.

Accidental release measures: Use care as contaminated surfaces may not only be sticky, but also slippery. Avoid contact with the skin and the eyes. Do not allow material to contaminate ground water system. Do not flush into surface water. Do not flush into public sewer system unless this is explicitly permitted. If surface water or public sewers are affected, inform the appropriate authority. In case of spilled polymer dispersions, soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust) and store the waste in suitable, closed containers for disposal. Contaminated equipment (brushes, rags) should be cleaned immediately with water. Dispose of waste in accordance with local regulations.

Safety

Due to the high water content the polymer dispersions are not flammable. Therefore no special protective measures against fire are required.

Layers of dried polymer might burn in case of ignition source and oxygen supply. Water spray is the preferred method for extinguishing a fire of dried polymer film. Fire fighters should use a self-contained breathing apparatus.

Polymer dispersions may contain hazardous volatile ingredients, e.g. film-forming (coalescing) agents and plasticizers, as well as traces of residual monomers, which could accumulate in the unvented headspace of drums, containers or storage tanks.

Drums and containers should be opened in ventilated areas. Ventilation of the tank is necessary before entering it. When flanges are opened, the affected area should be ventilated. Do not breathe vapor.

During longer storage small amounts of carbon monoxide may form. To the best of our knowledge, no OEL (Occupational Exposure Limit) is exceeded during the intended use.



Each of our polymer dispersion grades is covered by two information sheets:

- **Technical data sheet**

These can be obtained from the following address:
Celanese Services Germany GmbH, D-65843 Sulzbach, Germany
Phone: +49 69 45009 2162,
Mowilith.info@celanese.com
celanese.com/emulsion-polymers/

- **Safety data sheet**

These can be obtained from the following address:
Celanese Services Germany GmbH, D-65843 Sulzbach, Germany
Phone: +49 69 45009 0
Or www.celanese.com/en/sds-search

For some products, also a regulatory data sheet is available which can be obtained from PS-Emulsions@celanese.com

Prevention of and protection against contamination by microorganisms

Preliminary Remarks

Over the last few decades, polymer dispersions have increasingly replaced solvent-containing systems. However, their benefits – among them greater environmental compatibility and reduced workplace hazards – are offset by the major drawback that they are much more susceptible to contamination by microorganisms such as bacteria, yeasts and fungi. Decomposable organic compounds dissolved in the aqueous part (e.g. protective colloids, surface-active compounds, polymers) are nutrients for many microorganisms. Bacteria, yeasts and fungi are present everywhere in our environment and are essential parts of the natural biological cycle. They reproduce at an astounding fast rate, some of them perform extraordinary metabolic processes, and they have the ability to continually adapt to new living conditions.

The danger of contamination with microorganisms is thus system-related and always exists to some extent. Especially during the warmer summer months, polymer dispersions can be spoiled quickly by microorganisms.

Deterioration can be prevented by suitable plant hygiene, and an appropriate antimicrobial treatment, i.e. preservation for storage and transport [see literature 3)].

Only all of these measures in combination can prevent final products from being adversely affected. The storage temperature is critical; microorganism growth is much more rapid above 20° C, and can drastically reduce the shelf life.

Therefore almost all our polymer dispersions contain some initial biocides to impede attack by microorganisms during transport and storage. Most users of our products will add suitable preservatives to prevent microbiological contamination of their formulated products.

However, it is not sufficient simply to add an effective preservative to the polymer dispersion or formulated product. The overall production and processing process, from raw materials via storage to transport and commissioning of the final product based on our polymer dispersion, like e.g. a paint or an adhesive, has to be monitored to avoid microbiological infections.

In times of strict regulatory constraints, increasing environmental awareness and sensitivity of consumers maintaining a good microbiological product quality may become a challenge: optimum microbial control involves finding an acceptable compromise between these opposing requirements.

As the initial protection for transport and storage gradually declines over the course of time as a result of chemical reactions and depending on the microbiological circumstances, it is therefore essential for the user to monitor the biocide content subsequently and to add eventually biocides – not just to reliably protect polymer dispersions against attack from microorganisms during long-term storage, but also during further processing.

We recommend that you develop, for each application, an effective antimicrobial treatment concept together with your preservative supplier.

In case of bio-contamination of a polymer dispersion or a downstream product, a sanitization with a special biocidal product with disinfectant properties may be possible. We recommend discussing options with your preservative supplier.

Cleaning

To the greatest possible extent, microbes must be prevented from gaining access to the polymer dispersion and downstream products via storage containers, fitting and pipes. The hoses and pumps for emptying tank trucks must be kept clean and dry at all times and rinsed with water immediately after use, unless they are kept constantly filled with the product. Storage tanks should be cleaned regularly to avoid the formation of biofilms. The frequency depends on various factors but cleaning twice a year is common practice. We recommend the following procedure for this:

After tanks and pipes have been emptied, rinse them out with drinking water. High pressure water cleaning (water jetting) by hand-held spray gun or lance is recommended for cleaning steel tanks. Please obtain advice and training by a competent manufacturer, if your own personnel are to do the jetting.

Bear in mind that plastic tanks can be damaged by high pressure water jetting (see Tanks).

After spraying, scrape off manually any remaining residues using plastic or stainless steel spatulas. However, please take care to avoid damaging the tank's surface. Increased surface roughness can foster skin formation and even microbial growth.

For work inside the tank please check your local safety regulations for "confined space". Do not enter the tank until

- Lock out/Tag out procedures have been performed for liquids, for gases other than air, and for energies (e.g. agitator motor and radioactive level meters).
- the tank has been vented thoroughly with uncontaminated air.
- the tank atmosphere has been tested for oxygen content and hazardous gases/vapors (see next page).

The results of the latter measure may necessitate the use of self-contained breathing apparatus.

For normal personal protective equipment against contact with the polymer dispersion see section 8 of the MSDS. Additional measures may be required depending on the situation (e.g. entry from bottom or top) and the actual task that is performed (e.g. jetting).

If a person enters a tank, a safety attendant has to be outside.

It should be mentioned that bacterial contamination may generate hydrogen sulfide. Hydrogen sulfide is a toxic gas that quickly incapacitates the sense of smell; therefore, odor is not a reliable indication of the presence of hydrogen sulfide.

In addition, during longer storage, small amounts of carbon monoxide may form from polymer dispersions. To the best of our knowledge, no OEL (occupational exposure limit) is exceeded during the intended use. In any case of doubt a measurement of the CO concentration is necessary.



Disinfection

After thorough mechanical cleaning, it is advisable to disinfect the tank and pipes, particularly when bacterial growth has been a problem.

It is common practice to disinfect tanks and pipes with alkaline hypochlorite solution and letting the solution act for several hours.

Afterwards a thorough rinsing with clean water (drinking water) is necessary.

Other possibilities for disinfecting tanks and pipes are to use diluted H₂O₂ / acetic acid solution. Stainless steel equipment may also be sterilized using hot steam.

We recommend that you discuss cleaning, as it may increase volume and constituents (total solids, chemical oxygen demand COD etc.), and also waste water from the disinfecting process with the relevant authorities and/or sewerage service in connection with your waste water permit.

Literature

- 1) Celanese Webpage Literature and Multimedia section: celanese.com/products/mowilith; celanese.com/products/vinamul
- 2) Celanese Emulsions Information "Guidelines and Recommendations for Shipping and Storage of Emulsion Polymers for Glass Fiber Applications"
- 3) Leitfaden Hygiene in der Produktion (TKPV Merkblatt 4), Industrieverband Klebstoffe e.V., Düsseldorf. English version: "Guideline Hygiene during Production". Published online: klebstoffe.com/wp-content/uploads/2023/10/TKPV-MB-04-Hygieneleitfaden-2016-03-29-Layout-2023.pdf



EMULSION POLYMERS
celanese.com

Contact information

Celanese Services Germany GmbH
Am Unysis-Park 1
65843 Sulzbach
Germany
tel. +49 69 45009 2162
Emulsion.polymers@celanese.com
celanese.com

Copyright © 2025 Celanese or its affiliates. All rights reserved.

Celanese®, registered C-ball design and all other trademarks identified herein with the®, TM, SM, unless otherwise noted, are trademarks of Celanese or its affiliates.

This publication was printed based on Celanese's present state of knowledge, and Celanese undertakes no obligation to update it. Because conditions of product use are outside Celanese's control, Celanese makes no warranties, express or implied, and assumes no liability in connection with any use of this information. Nothing herein is intended as a license to operate under or a recommendation to infringe any patents.

EMUL-003-EmulsionsTransportation-Bro-EMEA-0125