Storage of UP Resins

Introduction

Unsaturated polyester (UP) resins are reactive materials that can undergo minor changes when stored, like viscosity and gel time drift. Under adverse storage conditions, these changes can result in resins that are no longer within specification. UP resins are sold in various container sizes, ranging from 25 kg pails up to road tankers. This information sheet gives practical advice on the way UP resins should be stored and handled at the convertors production facilities. The storage and handling of flammable liquids is subject to national or local regulations so always ensure that the storage complies with those regulations. Consult your local authorities if in any doubt.

Bulk or semi-bulk transport of UP

For larger users, UP resins and vinyl ester resins are normally delivered in bulk via road tankers, or tank containers to the customers' bulk storage facilities. Recommendations by the supplier concerning delivery, receipt of goods, storage and handling, should always be followed in order to ensure optimum quality and performance of the product. Road tankers for the transport of UP resins, must be manned by properly trained drivers and all equipment must meet the appropriate international rules. The capacity of the road tankers in general is 25 m^3 - 39 m^3. However, the maximum load a road tanker can carry is dependent on the actual national transport regulations.

A road tanker is normally fitted with a pump and / or a compressor that is used for pumping the resin to the storage facility at the customer. Some customers may have their own pumping equipment. The distance between the road tanker and the tank pump connection should preferably be less than five meters. An appropriate and officially approved unloading area or discharging berth should be available when off-loading from a road tanker.

Special precautions must be followed when offloading tankers

Tank installation

Users should appoint a person who is responsible for the service, safety and maintenance of the tank installation. He/she needs to be fully trained according to ADR regulations for handling and receiving hazardous substances.

When building a tank installation, the following recommendations should be followed:

- The capacity of the storage tank should be large enough to accept a full tanker load on top of any remaining contents at the time of delivery.
- All tanks should be placed inside an emergency retaining pit that can hold 110 % of the largest tank capacity.
- The floor of the emergency pit should be liquid tight and sufficiently sloped to prevent minor spillage remaining below the tank.
- The storage tank should be free-draining.
- Pumps must be sited outside the emergency pit.
- The tanks and lines should preferably be constructed from stainless steel. Don't use any alloys containing brass, bronze, copper, galvanized metal or zinc.
- The tank should be equipped with a large manhole on top for inspection, maintenance and cleaning purposes.
- The tank must be equipped with an air vent with a minimum (DN 80) 3 " opening.
- The tank should preferably be equipped with a mechanical propeller stirrer, especially when thixotropic or filled resins are stored.
- The contents of a bulk storage tank should ideally be kept at a temperature between 18 and 25 °C. This means fitting the tank with a heating unit or trace heating, and a cooling unit to ensure year-round operational efficiency.
- The discharge end of the filling line should be situated as low as possible in the tank to avoid the build-up of static electricity.
- The discharge suction line should terminate above the bottom of the filling line so as to maintain a liquid seal inside the tank.

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Quality considerations

In order to maintain the quality of the UP resin during bulk storage, a number of precautions should be followed:

- UP resins are viscous liquids and viscosity depends very much on the temperature. At low temperatures the higher viscosity might lead to flow problems during pumping. But it can also result in impaired wet-out of the reinforcement during laminating, reduced air release and a lower curing speed of the laminate. At high storage temperatures, the resin viscosity will decrease and sagging may occur during lamination. A high resin temperature will also lead to shorter gel time and high curing speed. Resin temperature should therefore be kept between 18 and 25°C.

- Filled resin systems must be slowly stirred to avoid any deposition of the fillers and to keep the resin formulation homogeneous throughout the contents of the tank.

- Pumping and filling of LSE and thixotropic resins can easily lead to foaming in the tank. When the level in the tank lowers, the foam dries and skinning may occur on the tank wall. These skin particles may loosen and cause contamination of the resin. DCPD-based resins are particularly sensitive to skinning.

- For quality reasons the tank should be cleaned internally once a year. This can be done by filling the tank ¾ with water, which is brought to boiling point. The boiling water should be left in the tank for 24 hours - before the tank is emptied and cooled with cold water. Resin residuals can then easily be removed with high pressure cleaning.

Ensure that all safety regulations are followed before any 'man-entry' work is undertaken inside a storage tank.

Unloading a road tanker

Before unloading into a storage tank ensure that:

- The tank can hold the quantity that is to be delivered.
- The road tanker is connected to the correct valve.
- The valve is open and the resin can be pumped into the recipient's tank.
- The tanker is earth connected in a safe way and there is no source of fire or ignition in the area.

Unloading must always be performed according to precise unloading instructions that need to be clearly visible to all concerned.

Emergency retaining pit should hold 110 % of the largest tank capacity.

Good access to the tank storage facility is important and the unloading area must be equipped to collect spillage. A proper absorbent such as vermiculite must be available in sufficient quantity to take up any spillage. Fire extinguishers must also be on-hand and the site equipped with an emergency shower and eye - wash facilities as well as having protective equipment as specified in Material Safety Data Sheet (MSDS).

All pipes and fittings shall be clearly labelled to avoid incorrect pumping. Compressed air must be available, and it is essential that the road tanker, storage tank, pipelines and all equipment are statically earthed.

We recommend that the terminal has a pump for unloading the road tanker, and that the necessary couplings, fittings and hoses are available. The MSDS for the product in question must be readily available, so correct procedures can be followed in case of an accident.

The unloading area needs be clean and orderly and all equipment such as pipe fittings, hoses, couplings maintained in clean condition.

Handling flammable liquids prohibits smoking or the use of open flames in the unloading area.

Storage in pails, drums and 1m³ containers (IBC)

Whenever the resin (or gelcoat, bonding paste, etc) is delivered in smaller containers, the following recommendations should be followed, not only to maintain safety standards but also to maintain the quality of the product.

Due to the low flashpoint of styrene and other monomers, the resins should be packed in antistatic containers. Make sure that all mini bulk containers are antistatic types.

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As soon as material is received it should be placed in a clean and dark storage area (away from direct sunlight), preferably in a properly designed warehouse and following the national regulation as regards: fireproofing and extinguishing systems, electrical installations, and containment contingencies in case of spillages or leaks. The warehouse should be well ventilated to avoid possible accumulation of styrene fumes from the stored materials. It should be air-conditioned to ensure stable temperature (18-25°C is recommended).

If the resin temperature falls below 18°C it should be heated to a minimum of 18°C before use. This can be done in heating cabinets in which two to four drums can be placed at a time. The cabinets can be heated by steam or electricity. Remember that heating a full drum of resin up to operating temperature can take 24 to 48 hours.

Similarly, if the resin temperature is too high, the product will need to be cooled to at least 25ºC and checked for possible quality changes before use.

Products delivered in drums and pails should be stored in the original containers with the lids kept tightly closed. They must be stored upright to prevent leakage and, when stored on a standard pallet, avoid stacking more than three high. For the same reason, mini bulk containers mounted on standard pallets should not be stacked more than three high.

Avoid using resin / gelcoat storage areas for any discharging blending or mixing processes.

One cubic metre Intermediate Bulk Containers (IBCs)

Unloading an Intermediate Bulk Container (IBC)

When unloading an IBC, care should be taken to prevent the build-up of static electricity and loss of material by improper use of the discharge valve. An IBC can be emptied in two ways: by gravity or by using a pump. Follow the guidelines below for the safe discharge of an IBC.

Preparation:

- Check the label and the batch numbers
- Read the material safety data sheet first
- Site the IBC on a stable surface, preferably slightly inclined in such a way that the discharge valve is at the lowest point.
- Make sure that the IBC is properly earth connected
- Wear protective clothing, chemical safety boots, gloves and goggles.

Operation:

- Touch the metal frame of the IBC with bare hands to discharge any static
- Remove the lid of the discharge valve
- Connect the discharge hose or pipe or activate the pump (if appropriate)
- Open the ventilation on the charge opening of the IBC
- Open and close the discharge valve manually, DO NOT USE bars or wrenches
- Clean the valve and remove any remaining resin.

Unloading a drum

Unloading a drum is the same basic operation as described above for the IBC. Full drums should preferably be moved with the aid of a fork-lift truck. We recommend using a dip pump to discharge a drum instead of discharging by gravity. Follow the guidelines as outlined for discharging IBCs. After emptying, leave the drum closed and arrange for empty drums to be collected by a certified drum handling and cleaning company.

Resin delivery options: drums, IBCs and tankers

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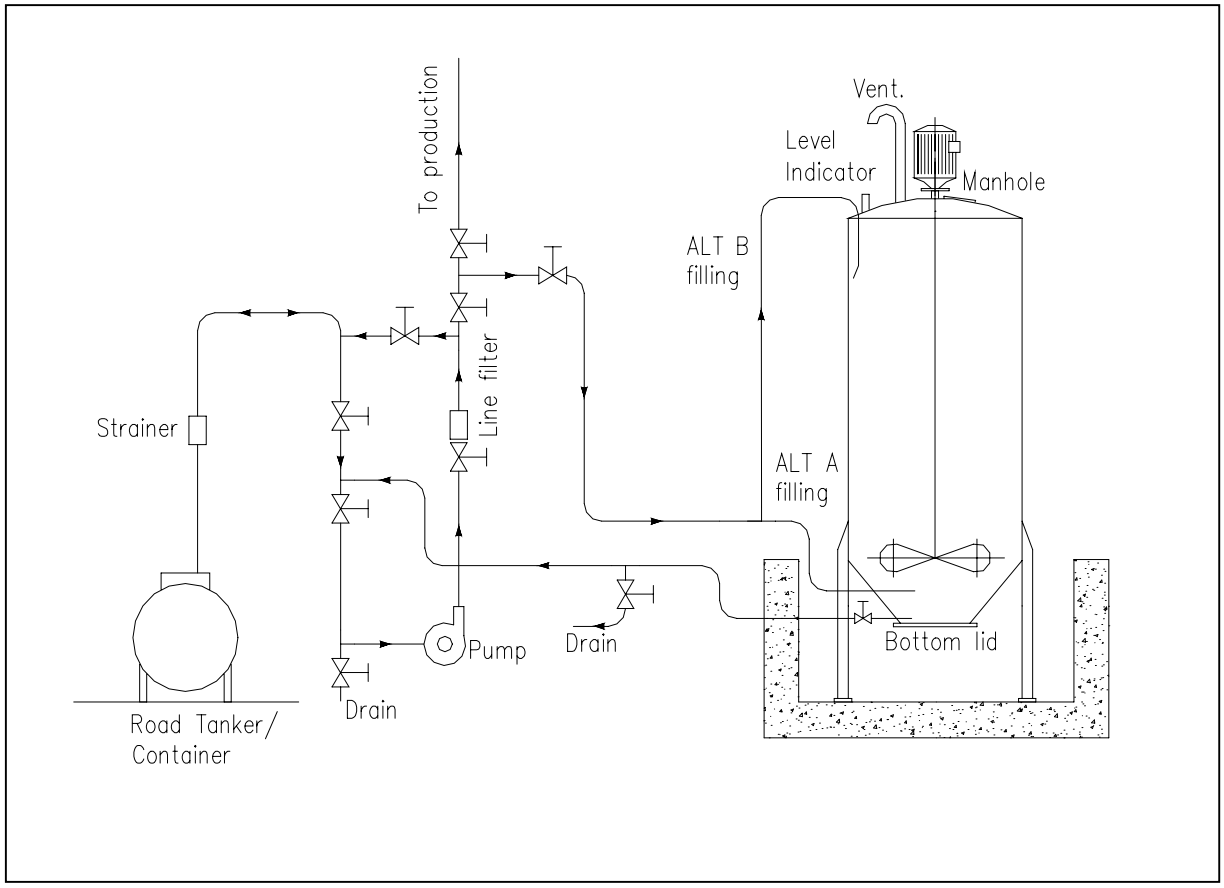

Road tanker and storage tanks pipe lay-out

PlasticsEurope
PlasticsEurope
Avenue E. van Nieuwenhuyse 4
B-1160 Brussels, Belgium
Telephone + 32 2 676 1732
Fax +32 2 675 3935
Email info@plasticseurope.org
www.plasticseurope.org