

Bulk Handling of Paraplex® and Plasthall® Plasticizers

Buying and handling plasticizers in bulk is attractive because the resulting cost per pound is always lower than the cost in drum quantities. Other advantages include reduced handling labor costs and simplicity in distributing raw materials throughout a plant. Certain grades of Paraplex® plasticizers with high viscosity present problems that must be recognized when setting up bulk equipment. Table I lists some typical properties of Hallstar plasticizers. The data should be useful as a guide to handling the listed products, especially the more viscous grades. The discussion of handling methods should also apply to special grades of Paraplex® plasticizers not included in Table I that are offered for use with plastics other than polyvinyl chloride. Some members of this particular group are supplied in organic solvents, however, and therefore require special handling procedures and precautions. Information on these materials is available on request.

Method of Shipment

Bulk shipments are normally made in insulated single- or multi-compartment stainless steel tank trucks with a capacity of 3,000–4,000 gallons. All Paraplex® grades and the monomerics that crystallize above -18°C and are loaded warm so they arrive in a pumpable condition. An adequate supply of steam should be available at the unloading site for connection to the coils of the tank trucks in the event of unusual delay during cold weather. It may also be necessary to heat the exterior of the unloading hoses until flow is started. The maximum recommended pressure for this steam service is 70 p.s.i.g.

Storage Tanks

Paraplex® and Plasthall® plasticizers do not corrode aluminum, steel or stainless steel. Aluminum has the disadvantage of reacting with caustic soda if a caustic solution is needed to clean the tank when changing materials. Stainless steel or stainless-clad steel tanks are the most versatile and provide maximum flexibility for installation. Steel storage tanks are satisfactory if certain precautions are taken. Steel tanks should be sand-blasted and immediately wiped down with clean rags wet with a low-viscosity plasticizer that provides an oil film to protect the cleaned steel before rusting can begin. The material used should be compatible with the product to be stored in the tank.

"Breathing" of the storage tank with changes in temperature and content level may result in condensation of atmospheric moisture. Water would cause corrosion of the steel tank above the liquid level and produce haze in the plasticizer and possible harmful effects on the final product.

An effective safeguard against moisture pickup is to dry the air entering the tank with activated alumina or another desiccant. The Lectordryer Breather BR-10 with color-indicating desiccant is typical of the unit required. The desiccant can be removed periodically and reactivated in an oven. A good desiccant is Color Indicating Activated Alumina, Grade G-6, supplied by the Aluminum Company of America.

Sunken or buried tanks are not practical because of the difficulty in cleaning, inspecting and repairing them. Moreover, a positive head cannot be provided to the suction side of the transfer pump without sinking a pump pit beside the tank.

Agitation of the stored material is not considered absolutely essential but mild agitation prevents possible stratification of the plasticizers and ensures uniformity of the tank contents. Tanks may be provided with Mixing Equipment Co. side-entering Lightnin mixers, Series SE. The stuffing box of this agitator can be repacked without emptying the tank. The mixer manufacturer should be consulted regarding proper size and speed.

Tanks should be equipped with bottom outlets to permit complete draining and should have manholes large enough to allow entry for thorough cleaning of the interior surfaces.

Pumps

In most instances, the carrier tank truck is equipped with a gear pump to transfer the plasticizers into the customer's tank. For transfer within the plant, we recommend a pump similar to the Viking Figure 253 pump, a Type E heavy duty pump of bronze construction with a built-in relief valve or, for better reliability, an electric pressure switch. The pump should be equipped with a V-belt drive and should be mounted below the storage tank with a flooded suction line. The size of the pump, the setting of the relief valve, speed and motor horsepower should be selected to fit the particular installation. The suggestions of the pump manufacturer should be followed in selecting the pump. A strainer should be provided in the suction line of the pump. A strainer similar to Kieley & Mueller Inc., Type 330 with a 12-mesh stainless steel basket is useful. Because of the high viscosity, a strainer at least one size larger than the pump suction may sometimes be needed.

Piping

The piping should be steel and of flanged and welded construction with enough flanged joints to permit removal of the piping for ease in cleaning the lines. Stainless steel Schedule 5 or 10 pipe and fittings are an alternate installation. The cost is greater than steel, but the assurance of clean lines and the increased flexibility may justify the additional expense.

Piping should be 3" minimum, particularly for handling viscous material stored above 27°C. Reducing connections to a 2" pump may be done to avoid the expense of a 3" or 4" pump. All lines should be sloped to facilitate draining and to prevent the accumulation of stagnant pockets of material.

Heating and Insulation

Because of the viscous or crystalline nature of several Paraplex® and Plasthall® plasticizers at low temperatures, storage tanks should be heated to keep the material fluid. This is particularly necessary if the tanks are located outdoors. Because the plasticizer arrives in a heated condition, it may not be necessary to add large quantities of heat but only enough to make up for radiation loss.

We do not recommend internal steam coils or tank outlet heaters because such installations expose the material to unnecessarily high surface temperatures for long periods of time. Additionally, leakage in the coil would cause contamination of the plasticizer with water. We recommend the installation of steam-heated coils mounted on the outside of the tank, blocked 1" away from the tank wall so that heat transfer is through a stagnant air space. Similar storage tank installations at Hallstar have 8.3

square feet of coil surface per 100 square feet of tank surface when the coils are supplied with 70 p.s.i.g. steam.

The externally mounted coil for heating the tank and the tank itself should be insulated with a 2" layer of six-pound density rigid glass fabric coated with a weatherproof finish.

All pipe lines should be steam-traced and insulated. We recommend traces of 1/2" size, blocked at least 1/2" away from the pipe itself to prevent metal-to-metal contact between the steam tracing and the transfer line to eliminate overheating the material in the line. The steam-traced line should be insulated with 2" of rigid glass fiber insulation.

Drum Filling

Processors who fill drums from bulk shipments can take advantage of bulk prices on the Paraplex® and Plasthall® plasticizers, even though no storage tank is available. In such cases, tank trucks can be equipped with unloading hoses and, on request, a nozzle can be supplied to permit drum filling. The only requirement is to have a sufficient stock of empty drums on hand at the unloading site. However, it is important to set up the drum-filling operation as efficiently as possible to avoid incurring demurrage charges by the carrier.

Viscosity Temperature Curves

A comparison of the viscosities of the various Plasthall® and Paraplex® plasticizers at different temperatures can be readily obtained by referring to the curves plotted in the figures. This relationship should be useful in determining pump and motor sizes.

Safety and Health Considerations

Toxicity, Personal Protection and Waste Disposal

The Paraplex® and Plasthall® plasticizers have very low acute oral and dermal toxicities, very low vapor pressures and very high flash points. Therefore, no ill effects are expected under normal conditions of operation and use.

Good ventilation should be provided in work areas to remove vapors. Designs for exhaust ventilation systems are given in *Industrial Ventilation - A Manual of Recommended Practice* published by the American Conference of Governmental Industrial Hygienists and *Fundamentals Governing the Design and Operation of Local Exhaust Systems - Z9.2 1960* published by the American National Standards Institute.

Contact with the eyes may be irritating; after such contact, the eyes must be washed with copious amounts of water for at least 15 min and a physician should be consulted for further treatment if necessary. After contact with the skin, wash thoroughly with soap and water. Induce vomiting after swallowing and call in a physician. While handling these products, workmen should wear impervious gloves and splashproof goggles as safety measures.

Spills should be diked and taken up in sand, vermiculite or other inert solid absorbents and transferred to containers for subsequent disposal as landfill. Clean the floor after spills with a hot aqueous solution (5–10 percent) of trisodium phosphate crystals. If these materials should become involved in a fire, use foam, carbon dioxide, dry chemical or water fog as the extinguishing medium. Note that foam or water fog may produce frothing or spattering with the more viscous products. Containers exposed to fire should be kept cool with water spray. Firefighters may wear a self-contained breathing apparatus, such as the MESA/NIOSH approved mask (Schedule 13).

Material Safety Data Sheets for individual grades of Hallstar plasticizers are available on request. We recommend that processors should obtain similar sheets and information on polyvinyl chloride (PVC) resins and other ingredients of vinyl plastics and compounds from their suppliers.

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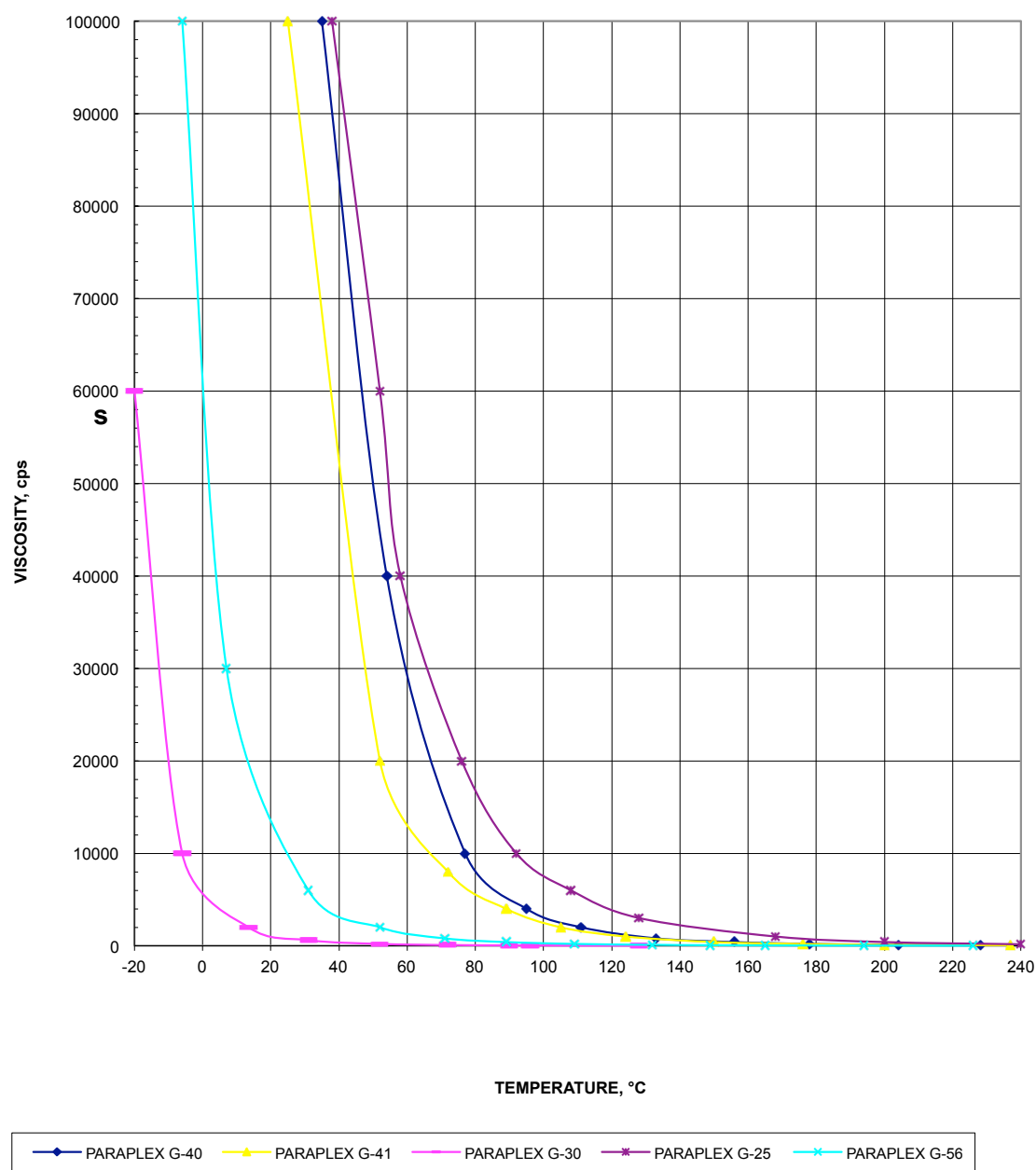
TABLE I - Typical Properties of Paraplex® and Plasthall® Plasticizers

	Approximate Visc. @ 25 °C centipoises	Approximate Specific Gravity	Approximate Freezing Point,** °F (°C)	Suggested Storage Temp. °F
Paraplex®				
G-25	220,000	1.06	59 (15)	*
G-30	1,300	1.10	-20 (-29)	65
G-31	4,800	1.11	-4 (-20)	70
G-40	200,000	1.15	Below 0 (-18)	145
G-41	110,000	1.13	-7 (-22)	130
G-50	2,300	1.08	50 (10)	65
G-51	2,100	1.11	Below -10 (-24)	65
G-54	5,300	1.08	40 (4)	80
G-56	9,200	1.11	14 (-10)	90
G-57	6,200	1.10	30 (-1)	80
G-59	25,400	1.13	45 (7)	100
G-60	350	0.980	41 (5)	90
G-62	550	0.993	41 (4)	90
Paraplex®				
S-73	40	0.927	19 (-8)	>30
DOS	21	0.911	-54 (-48)	>20
DOA	15	0.924	Below -60 (-51)	>20

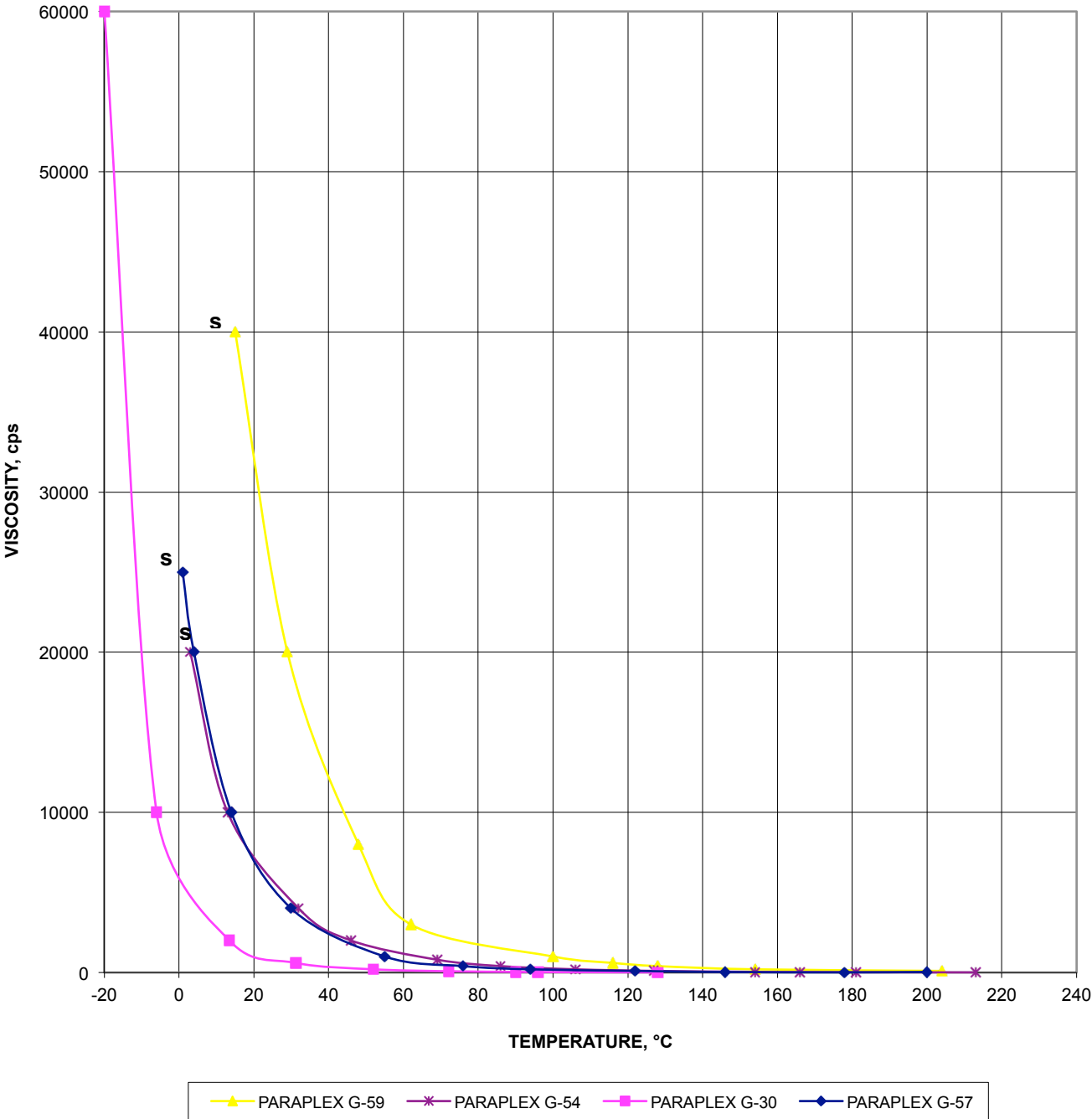
*Because of its extremely high viscosity, Paraplex® G-25 cannot be handled in bulk.

**The freezing or crystallization points of the Paraplex® grades are not sharp definitions, and elevated storage temperatures are recommended to ensure a pumpable viscosity.

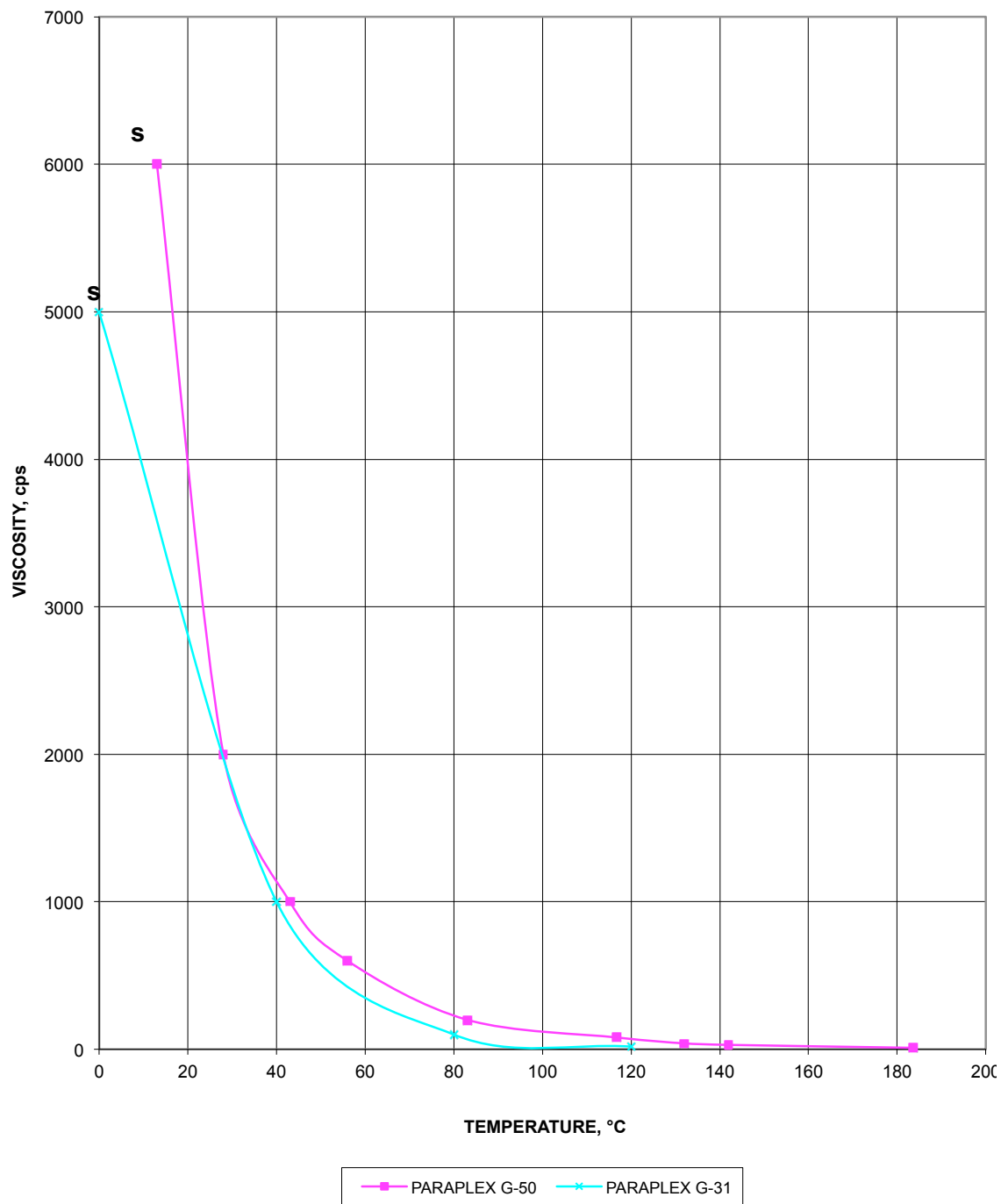
Paraplex® Plasticizers Viscosity vs. Temperature Curves



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