Poly Processing Company

Comparison Study

FRP VS. Rotomolded Plastic Tanks
For Chemical Storage Applications

Storage tanks used in the chemical industry come in a wide array of models and types. These include fiberglass tanks (FRP) and several varieties of polyethylene (PE) tanks. Both of these tank materials offer unique advantages over the wide range of important tank properties which include chemical compatibility, impact resistance, weatherability, cost, high temperature performance, pressurized applications, stress crack resistance, environmental friendliness, etc. In light of this wide diversity of performance characteristics, a comparative study of the benefits and features of each of these materials, especially in the storage of harsh chemicals, is appropriate.

Chemical Resistance: The selection criteria for the material from which the storage tank will be manufactured is, of course, dependent on the liquid being stored. FRP is the material of choice for the storage of hydrocarbon-based or petroleum-based chemicals, such as gasoline or kerosene.

When the liquid being stored is an oxidizer, such as Sodium Hypochlorite or Sulfuric Acid, FRP has its limitations and drawbacks. Polyethylene tanks, especially cross linked Polyethylene tanks (XLPE) with an oxidation resistant liner material, provide superior chemical resistivity to oxidizing chemicals. Unlike FRP tanks, they have no chemical attack points, which readily combine chemically with the stored chemical. Furthermore, as the XLPE tanks have no reinforcement, there is no interface between the resin and the glass fiber, a location in all fiberglass tanks that is an inherently weak area and is highly susceptible to chemical attack.

A major problem with the storage of oxidizing chemicals is the potential increase in the corrosive nature, chemical attack, or these liquids when they become contaminated. Unlike PE tanks, FRP tanks are susceptible to leaching of minor resin components by the action of these oxidative liquids. This contamination can have a direct effect on the final quality of the FRP tank. Delamination or cracking at the microscopic level, additional points of weakness or attack, can occur thus affecting the overall performance on the tank. PE tanks, especially XLPE with an oxidation resistant liner, do not delaminate nor do they have the tendency to crack at the micro level.

Mechanical Properties: FRP tanks tend to be stiffer than their plastic counterparts. This in turn allows the tanks to have decreased thickness for the same application, which makes them lighter. However, this benefit does not come without a price. The resistance to impact damage in FRP tanks are much less than PE tanks.

The serious problem with impact damage in FRP tanks is made even worst by common variations in the manufacturing process. For instance, failure to maintain uniform thickness, failure to regard ambient conditions/dew point, failure to apply each layer within specified processing window, improper cure, use of partialy-curred resins,

and use of incompatible resin and fiber glass (sizing). These improper techniques can cause the tank to delaminate and crack, which in turn compromises the mechanical properties, especially strength, stiffness and impact resistance of the FRP tank. It's interesting to note that the highest percentage of damage that occurs in FRP tanks is during loading/unloading from the manufacturer to the end use site.

Scratch Resistance: The scratch resistance of a tank is critical in high-end applications. The scratched areas are potential weak points that affect or compromise the overall performance of a tank. Plastic tanks such as PE tanks have a higher scratch resistance when compared to FRP tanks, that is, if they are scratched, the potential negative results are much less. The concern with FRP tanks is that when they are scratched they will delaminate because of infusion of the liquid along the fiberglass surfaces. As indicated earlier, any delimitation in the fiber glass layers creates a weak point that compromises the overall mechanical properties of the tank, as well as, make it more susceptible to chemical attack from external environmental conditions.

Design Flexibility: The FRP process provides greater flexibility in the larger size and higher capacity (16,000 Gallons and higher), tank-manufacturing arena. Nevertheless, this process is limited when options such as molded-in fittings, ribs and stiffening design features, and non-conventional tank designs with undercuts are being considered. The rotomolding manufacturing process is inherently flexible due to its no pressure free material flow characteristics. This allows users to tailor make their tanks to fit the application. To illustrate this point further, fittings in FRP tank applications cannot be created during the winding/lay-up of the tank. Furthermore, the fittings must be a dissimilar material, which limits the applications since they cannot be metal due to corrosion issues. This also adds cost to the final product.

Weatherability: Both polyethylene as well as FRP materials have excellent weatherability properties when properly designed. This is due to the excellent UV (ultra violet) inhibitors and oxidation inhibitors compounded into the material by the resin manufacturers. Both materials will perform well under very harsh environmental conditions. One benefit of polyethylene over FRP is that black polyethylene chemical storage tanks offer better UV protection than just about any other type of aboveground storage tank because of the carbon black used in the black polyethylene resin -- the most efficient of the UV protectant additives. Carbon black works as an absorber and therefore extends the life of the UV inhibitor in the resin. This gives the polyethylene chemical storage tank greater propensity for long and useful life.

Quality Assurance/Manufacturing Reliability: Producing a high quality product that meets the design intent of the end user is a goal all successful manufacturers strive for. This is seen in their quality assurance practices and procedures, and how they interact with the customers needs and requirements. This is true for both FRP and plastic tank manufacturers. Poly Processing takes great pride in its high quality products and customer loyal base. Being an ISO 9001 certified company brings a

dedicated well-trained workforce that is committed to quality and continuously enhancing the value of our product lines. Poly Processing with its strategic alliances with leading industry experts and resin manufacturers, is given the opportunity to provide innovative solutions that meet the customers wants and needs.

The FRP manufacturing process is conceptually simple, especially for hand/gun lay-up operations. However, it is quite difficult to maintain tight quality standards when using these lay-up manufacturing methods. The manufacturing of the FRP tanks is improved by the use of filament winding a much more automated and reliable manufacturing method. However, even with filament wounding the number of variables in FRP manufacture (resin, additives, fiberglass type, fiberglass sizing, etc.) are vastly more complicated than with PE rotomolding. Note that, because of the relatively long manufacturing times required to filament wind a tank with integral ends (that is with the ends of the tank wound onto the tank body), a common practice is to wind the cylindrical body and attach the ends afterwards. The ends would typically be made by had lay-up. This procedure results in undesirable seams. Rotomolding has far fewer variables, which results in better quality monitoring and control.

We appreciate your time and hope that we have given you a little insight into why we believe our products are the best solution for your chemical storage requirements. If we can be of further assistance or if you would like us to visit your facility in the near future, please do not hesitate to contact us.