Tanks, Vessels & Scrubbers
Design Considerations

Composites USA
A Critical Process Systems Company

Reinforced Plastic Tanks Composites USA has always offered high quality corrosion resistant equipment for the chemical process industries. With the acquisition of equipment, files and key manufacturing personnel from Jones & Hunt in 1995, this historical base now stretches back to the early 1950's.

Filament wound or premium corrosion resistant contact molded tanks for simple storage or complex manufacturing vessels can be sourced with Composites USA with complete confidence. Your process requirements will be met with state of the art engineering, world-class execution, and unbeatable value.

Composites USA vessel design starts with an analysis of the operating environment. The solution being stored or processed, along with the solution temperature, normally determines the resin system to be used. The remaining environmental design parameters such as capacity, vacuum or pressure, wind load, seismic forces, corrosion allowances, as well as any loads imposed by agitation, platforms, or any other reason, are then analyzed to provide the most cost effective laminate design and fabrication method.

Following are some guidelines to help you better understand the capabilities of fiberglass vessels and how a Composites USA fiberglass vessel helps guarantee success for your project:

Engineering:

Well established engineering relationships have been computerized by Composites USA to aid in the evaluation of many alternative designs. Our proprietary cylindrical laminate analysis which includes RTP-1 strength and strain calculations has been used for items as routine as water storage tanks and as esoteric as rocket motor casings for NASA. With this tool, the effect of substituting or modifying any component in a laminate is immediately apparent. Predicted laminate properties can immediately be verified in the Composites USA laboratory which includes test apparatus for tensile strength, flexural strength and modulus and others.

Composites USA has also computerized most of the other key parameters to be evaluated in modern fiberglass vessel design. The basis for most of these models is the requirements of the ASME RTP-1 design rules for fiberglass vessels. These parameters include, among others, proper design for wind, seismic and vacuum loads, lift and hold down lugs, and nozzle flanges. Partial examples of these can be seen in the surrounding graphics.

Corrosion Resistance:

The key to cost effective vessel design is a thorough understanding of the operating environment. Composites USA can provide fiberglass vessels with various thermosetting resins such as modified polyesters, vinyl esters, epoxy and furans (furfural alcohols). For extremely aggressive environments where none of the above will suffice, Composites USA can offer dual laminate construction with a variety of thermoplastic liners. See our section on dual laminates for more on this exciting manufacturing technique.

To help determine the best solution for your specific conditions, Composites USA can survey the combined experiences of our own company and Jones & Hunt, as well as draw on the resources of the technical staffs of the world's largest thermoset resin producers. See the chart in the material selection portion of this binder for some general guidance for selecting among the various resin classes.

Temperature Limitations:

Upper use temperature for fiberglass vessels varies significantly depending on the resin and solution being processed. General limitations of 150°-170°F for isophthalic polyesters and 200°-220°F for vinyl esters can be made for a number of systems, but there are many reported uses of fiberglass vessels at temperatures approaching 300°F as well. Specific recommendations can be made upon request.

Wall Thicknesses:

Required wall thickness for the vessel design conditions are routinely calculated using industry (ASME RTP-1, ASTM, NBS PS 15-69, etc.) guidelines for factors of safety on a case by case basis, incorporating the vessel geometry, liquid specific gravity, design pressure/ vacuum, temperature, wind and seismic information. To this resulting wall thickness is added any additional thickness desired for corrosion or erosion losses, or any other superimposed loads.

Pressure or Vacuum:

Composites USA routinely design vessels for either internal or external pressure (above or below ground). Although the use of ASME dish heads usually provides the most efficient design, engineering and constructing vessels for these applications with flat, cone or dished heads is possible. For external pressure (vacuum) tanks it is quite common to provide external stiffening ribs for the shell sections.

As with atmospheric pressure design rectangular vessels, designs for internal or external pressure can be accommodated using Composites USA proprietary computer modeling programs.

Dual Containment:

Several construction methods for dual containment tank construction have been developed to address various local regulatory criteria for containment vessel surge volume and instrumentation requirements. These vessels can be supplied with or without required leak detection systems.

Ease of Use:

All Composites USA vessels are virtually maintenance free. All vessels are corrosion resistant inside and out, resisting chemical attack either from direct inside contact or from spills or fumes on the outside. Vessels are available with either natural resin coloration, or with a pigmented topcoat. All vessels are given a resin rich, external shop coating, eliminating the need for painting.

Field Installation:

With a weight of approximately 1/3 that of a comparable steel tank, Composites USA fiberglass tanks are easily installed in much less time with less costly equipment. For oversized vessels with shipping restrictions, Composites USA field installation is available for shop prefabricated vessel sections.