



CONSTRUCTION REQUIREMENTS FOR SODIUM HYPOCHLORITE SERVICE

Sodium Hypochlorite is one of the most aggressive chemical environments handled in Fiberglass Reinforced Plastic (FRP) Equipment. Resin selection, cure system, surfacing veil materials, and laminate construction details are critical elements that determine service life. Similarly, all are meaningless without the expertise, consistency, and quality assurance of an experienced and qualified equipment manufacturer.

Justin Tanks has built Sodium Hypochlorite equipment for over 45 years. Our expertise and experience with success, as well as failures, in the evolution of material selection and laminate construction criteria makes us a uniquely qualified authority on construction of Sodium Hypochlorite equipment that works . . . for a long time!

Following are specific criteria that must be rigidly adhered to in order to achieve and assure long term performance.

Refer also to the "Typical Specifications for FRP Tanks", for general requirements not specifically modified or called out herein.

1 MATERIALS

1.1 Resin - The resin used shall be a commercial grade, premium, corrosion resistant vinyl ester that has been evaluated in a laminate by test in accordance with ASTM C-581 in Sodium Hypochlorite service comparable to the intended service and recommended for this service by the resin manufacturer.

The tank manufacturer shall strictly adhere to the resin manufacturer's recommendations for surface veil materials, resin cure systems, and post cure requirements.

1.1.1 The resin shall contain no pigments, dyes, colorants, or fillers except as follows:

1.1.1.1 A Thixotropic agent that does not interfere with visual inspection of laminate quality may only be added for viscosity control in resins that are not to be used in the inner corrosion barrier, interior layers, interior secondary layers, and interior top coats.

1.1.1.2 Resin pastes used to fill crevices may contain Thixotropic agents provided that all such areas are subsequently covered with a full corrosion-resistant barrier laminate.

1.1.1.3 A pigmented exterior gel coat must be provided on any tank to be installed outdoors to reduce ultraviolet decomposition of the Sodium Hypochlorite. *Note: It is the responsibility of the specifier to identify outdoor installations.*

1.1.1.4 Ultraviolet absorbers shall be added to the exterior surface for improved weather resistance on indoor tanks as well since tanks may be outdoors during construction and installation periods.

1.2 Reinforcement

1.2.1 Chopped Strand Mat - Chopped strand mat shall be constructed from commercial grade E-type glass strands bonded together using a binder. The strands should be treated with a sizing that is chemically compatible with the resin system used.

1.2.2 Continuous Roving - Continuous roving shall be a commercial-grade of E-type glass fiber with a sizing that is chemically compatible with the resin system used.

Continuous roving for chopping in spray-up process shall be principally silane finished with as little chrome compounds as practical to achieve chopper performance while maintaining visual laminate clarity requirements.

1.2.3 Woven Roving - Woven roving shall be in accordance with ASTM Specification.

Note: Based on Justin's experience with most premium corrosion-resistant resins and their inherent cure characteristics and shop handling qualities, we suggest the following for Sodium Hypochlorite service.

- Derakane 411 - BPO/DMA cured inner corrosion barrier with 2 ply synthetic surface veil (Nexus-Burlington Industries)
- Hetron 922 - BPO/DMA cured inner corrosion barrier with 2 ply synthetic surface veil (Nexus-Burlington Industries)

The laminate construction section that follows is premised on the resin system suggestions above.

2 LAMINATE CONSTRUCTION REQUIREMENTS

2.1 Structural Tank - The laminate comprising the structural tank (bottom, cylindrical shell, top head) shall consist of a corrosion-resistant barrier comprised of an inner surface, interior layer, and a structural layer.

2.1.1 Inner Surface - The inner surface exposed to the chemical environment shall be a resin rich 0.015 to 0.030 inches thick, reinforced with 2 ply of synthetic fiber surface mat such-as Nexus (Burlington Industries) or approved equal.

2.1.2 Interior Layer - The inner surface layer exposed to the corrosive environment shall be followed with a layer composed of resin, reinforced only with noncontiguous glass-fiber strands applied to a minimum thickness of 0.100 inches. The combined thickness of the inner surface and interior layer shall be 0.115 to 0.130 inches and in no case less than 0.110 inches.

2.1.2.1 Glass content of the inner surface and interior layer combined shall be 27% \pm 5% by weight.

2.1.2.2 Resin used in these layers shall be Derakane 411 or Hetron 922 incorporating a BPO/DMA cure system as recommended by the manufacturer.

2.1.2.3 The degree of cure, after post cure (see Section 4) shall be such as to exhibit a Barcol hardness on the inner surface of at least 90% of the resin manufacturer's minimum specified hardness for the cured laminate with a synthetic surface mat.

2.1.3 Structural layer:

2.1.3.1 Filament Wound Structural Layer - Subsequent reinforcement shall be continuous-strand roving in accordance with 1.2.2, that in combination in 2.1.1 & 2.1.2 is needed to satisfy the design requirements. Glass content of this filament-wound structural layer shall be 50 to 80% by weight. Only those constructions evaluated for design properties shall be used.

2.1.3.2 Contact Molded Structural Layer - Subsequent reinforcement shall be comprised of 1.5 oz/ft² chopped strand mat or equivalent weight of chopped roving, or shall be comprised of chopped strand mat or chopped roving and such additional number of alternating plies of 24 oz/yd² woven roving to a thickness as required to meet the physical properties that are used for the design. Each successive ply or pass of reinforcement shall be well rolled prior to the application of additional reinforcement. Where woven rovings are used, chopped strand glass reinforcement shall be used as alternating and final layers. All woven roving and chopped strand shall be overlapped. Laps in subsequent layers shall be staggered at least 2.25 inches from laps in the preceding layer.

2.1.3.3 Resin used in the structural layer shall be the same as used in the inner surface and interior layers except that the BPO/DMA cure system is not required. Other generic types of resin such as Isophthalics or general-purpose resins shall not be used.

3 FITTINGS AND MANWAYS

3.1 Manways - All closed top tanks shall be provided with a minimum 24 inch diameter flanged manway with bolted cover. All tanks with a straight shell height greater than 12 feet shall be provided with a minimum 24-inch diameter flanged side manway with bolted cover. Bolted manways shall be provided with 1/8 inch thick full-face EPDM gaskets and zinc plated bolting.

Manway stub flange and cover shall be hand lay-up construction with the inner surface and interior layer using the BPO/DMA cured resin system.

3.2 Flanged Nozzles - All flanged nozzles shall be of hand lay-up construction with the pipe stub molded integrally with the pipe flange. Compression molded or cemented on flanges is prohibited. The resin used for the inner surface and interior layer of flanged stubs shall be the BPO/DMA cured resin system. Nozzles 4 inch diameter and smaller shall be gusseted conically or with four (4) 3/8 inch thick plate gussets.

Plate gussets shall be suitably laminated to the flange back side, hub, pipe neck, and tank wall.

3.3 Installation of all manways and flanged nozzles shall be the flush-type per ASTM D3299 or D4097. Penetrating-type installation is not recommended in Sodium Hypochlorite service. Nozzles less than 1½" diameter should not be used.

3.4 All interior overlays of nozzles, manways, and other internal accessories shall incorporate the BPO/DMA cured resin system.

3.5 Threaded Fittings - Threaded fittings shall not be used in Sodium Hypochlorite service.

4 POST CURE

4.1 The completed tank shall be post cured with dry heat in accordance with the resin manufacturer's recommendations. Any internal repairs or rework must be completed prior to post curing. If repairs are made following post cure, an additional post cure cycle is required.

TIPS FOR LONGER SERVICE LIFE

1. Maintain storage temperature below the decomposition point for the Hypochlorite solution being stored (generally below 125°F).
2. Avoid ultraviolet exposure, which tends to decompose Hypochlorite. Install tanks indoors or specify a pigmented exterior gel coat to reduce ultraviolet exposure potential.
3. Maintain the pH above 10. pH levels below 10 are a possible indication of decomposition of the Hypochlorite.
4. If generating Hypochlorite in the tank:
 - ▶ Control pH at above 10.
 - ▶ Do not over chlorinate. (Total chlorination should not exceed 15%)
 - ▶ Control temperatures below 125°F.
5. If decomposition of the Hypochlorite stored is suspected:
 - ▶ Empty the tank as quickly as practical through normal usage. If normal consumption will not empty the tank in 30 to 60 days, arrangements should be made to empty the tank.
 - ▶ Rinse the tank thoroughly.
 - ▶ Inspect the interior through the manway, (or by getting inside - when it's safe) for evidence of attack, such as loss of gloss, discoloration, mud cracking, or build-up of yellowish residue.
 - ▶ Consult the manufacturer or the resin supplier.

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