

We are frequently asked how to protect thermoset FRP composite equipment from ultraviolet (UV) light degradation. We most often hear this question from engineers who have experience with the thermoplastics (PVC, CPVC, polyethylene, polypropylene, etc.).

The answer is simple: You do not need to worry about UV degradation with FRP composite equipment.

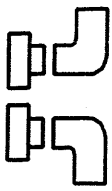
To understand this statement it is necessary to go back to 1971. At that time, the corrosion specialists at Dow Chemical decided to conduct a long-term study on the effects of UV exposure on thermoset reinforced plastic composites.

Two racks of 2" diameter pipes made from various resin systems were assembled and placed at test sites in Dow's Freeport, Texas plant. Both test racks were constructed so the pipes were inclined at a 45-degree angle, with the upper side of the rack facing south. The pipes were then inspected and tested at periodic intervals. At 6 and 12 year intervals, rings were cut from the pipes and subjected to full split D tensile tests.

Visual inspections of the thermosetting resins tested (epoxy, epoxy vinylester, and bis A fumarate polyester) revealed that surface degradation first began on pipes having little or no resin cover on the outer layers of glass. It was also noted that all of the pipes discolored and showed evidence of slight surface bloom after 6 years of exposure. But during the second 6 years this surface degradation apparently protected the FRP laminate because there was no further change in appearance.

The physical properties of the test FRP composite pipes after exposure of 6 and 12 years document that actual UV degradation is minimal, and mostly limited to the pipe surface. (See table below for physical property summary.)

Material	Manufacturer	Original Split D Tensile Strength	Split D Tensile Strength - 6 years	Split D Tensile Strength - 12 years
Epoxy Resin Filament Wound	Chemline	26,800 psi	25,671 psi	24,806 psi
Derakane 411-45 Vinylester Resin Filament Wound	Dow Chemical U.S.A.	34,113 psi	39,411 psi	35,834 psi
Bis A Fumarate Polyester Resin Hand Lay-up	Heil	12,000 psi	9,092 psi	10,195 psi



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Two conclusions can be drawn from these tests. One, UV degradation is not a factor which affects the long-term service life of corrosion resistant FRP composite equipment.

And two, for long-term appearance, FRP equipment can be given a final polymer resin coat, or resin-rich outer surface layer. This can be easily pigmented if color is desired. Or, if the equipment is fully cured and surface preparation requirements are too extensive, an epoxy/polyamide or polyurethane exterior coating can be applied.