

EQUIPMENT

BY JEROME BACCHETTI

Take another look at FRP

This column often extols the virtues of plastics while scolding the CPI for not using its own products. We've also admitted that, for all its advantages of corrosion resistance, light weight and ease of joining and repairing, plastic isn't stiff enough or strong enough for many applications, and it weakens substantially at higher temperatures. That's where composites of fiber-reinforced plastics come in.

FRP—initials once reserved for fiberglass-reinforced polyester but now encompassing a variety of resins reinforced with a variety of fibers—can provide the advantages of plastic but with added strength, stiffness and temperature resistance.

Admittedly, FRP once was overpromoted and oversold, resulting in equipment failures and a bad reputation. Although the incorrect applications and poor fabrication methods of the past have largely been eliminated, this history of FRP shouldn't be ignored. (To plagiarize a phrase, "To ignore history is to doom yourself to repeat it.")

Tough to specify

Equipment made of FRP is more difficult to evaluate, specify and check than equipment made from steel, plastic and other materials. That's because FRP isn't homogeneous.

Compared to steel, FRP is a more complex material. Steel is homogeneous and its physical performance can be predicted by non-destructive testing and mill certifications. Reams of ASTM and ASME test and fabrication methods are available to help measure quality and predict future performance.

Large FRP equipment, such as tanks, is custom designed, then fabricated by spreading resin between sheets of long-filament reinforcing fiber. Potential fabrication problems include air occlu-



Quality in FRP equipment is difficult to check.

sion, poor wetting of fibers by the resin, and insufficient use of resin to bond the layers and provide a resin-rich surface.

Smaller equipment, such as valves, pumps and agitators, can be compression molded from a mixture of resin and chopped fibers. Mass produced, this type of FRP is more amenable to conventional, non-destructive testing.

Few standard test and fabrication methods exist for FRP, although there are continuing efforts by ASTM, ASME, SPI and others to develop more. RTP-1, an ASME standard published in December 1989 is the first comprehensive guide for fabrication, installation and design of FRP vessels and is expected to be adopted as an ASME code.

Acoustic emission testing, developed in the early 1980s, provides a reasonably reliable non-

destructive test for FRP tanks. But although it can identify problems such as internal delamination, its use is no panacea for quality problems.

The visual inspection

In fact, many fabricators still insist that no instrumental methods can beat a good visual inspection of the finished product by an experienced FRP inspector. The visual inspection can identify air bubbles and other telltale signs of good or poor workmanship. Inspection of fabrication methods can't hurt either.

Since quality is difficult to test, the performance of FRP equipment rides mostly on the skill of the craftsmen and designers who build the tank.

So how do you buy "skill of the craftsmen and designers?" Sounds like an application for a quality program and its companion, supplier partnerships.

Many buyers do use an FRP consultant to help select and evaluate fabricators and then to inspect the finished product. But others just stick with a supplier that has performed well in the past, using the consultant to help with the initial selection and periodic audits.

So when the low cost, high corrosion resistance, light weight, and ease of repair of FRP looks attractive, go for it. Just buy it right. Find a partner!

ASTM = American Society for Testing Materials

ASME = American Society of Mechanical Engineers

SPI = Society of the Plastics Industry

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