

New wrap offers remediation alternative

Recently introduced composite repair product combines carbon fibers with epoxy resins to enhance asset integrity.

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Deterioration of components and structures at industrial facilities has caused unscheduled plant shutdowns, personnel safety concerns, and significant impact on operating budgets. However, a new technology is now available that can increase the usable life of components and structures, while significantly reducing the economic burden normally associated with repair or replacement options.

That technology, developed by HydraTech Engineered Products in conjunction with EMS USA, has been introduced into the marketplace under the name of I-WRAP. This product utilizes carbon fibers and high-strength epoxy resins to restore or enhance the structural and/or pressure boundary capacity of plant equipment and assets. The process utilizes the high strength of the carbon

fibers to add additional structural capacity to the existing member. This is accomplished through the superior adhesive bond provided by the epoxy. The design determines the orientation of the fibers to add strength in the direction of static and dynamic-loading conditions. The repairs to the affected items are performed in-place and are completed with small crews during relatively short durations.

In the past, most industrial facilities and oil and gas distribution networks typically shunned the use of composite materials to rehabilitate structures or components. Recently, however, with the testing data of composites and its reduced cost, traditional repairs (direct replacement) are alternatively being wrapped with composites.

Carbon fiber technology

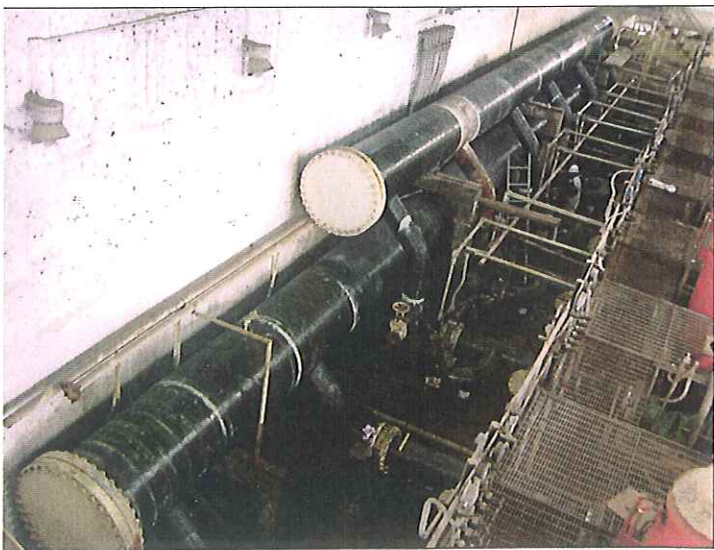
The I-WRAP product is a high-strength epoxy matrix, a fully tested combination of epoxy and an engineered-specified carbon fiber-reinforcing fabric manufactured by HydraTech Engineered Products. The composite performance is derived from the ability of the epoxy to “wet-out” and bond to the carbon fibers forming a true composite matrix. Complete compatibility between the fabric and the epoxy is achieved through the chemical modification of the epoxy in combination with the chemical treatment on the carbon fibers.

By creating a true composite, the system is able to use the per-

formance properties of both components to their full potential. The new wrap uses a carbon fiber fabric that has been specifically designed for pipe repair and is custom woven; this custom-made carbon fiber fabric is oriented to provide reinforcement in a two-plane direction to handle the various loads that is acceptable to the piping. The epoxy delivers a superior adhesive bond. The excellent adhesive properties provided by the epoxy ensure that the structural composite is bonded to the pipe, which makes the wrap ideal for contact-critical applications.

The question many raise is: why use carbon fabric? The answer is very simple – carbon fiber has superior tensile strength and minimal long-term creep compared to other fibers. This provides the strongest repair with the longest design life. With exterior wraps, where the objective is to encapsulate the degraded piping, carbon fiber has proven superior to fiberglass in cyclic and fatigue testing. When you effectively combine the strongest fibers with the performance of epoxies, you get a system with unmatched strength, corrosion resistance, chemical resistance and bonding. Ultimately, you will get a performance-driven repair.

No matter what composite material is utilized to wrap and encapsulate a degraded piping, both qualification and application training are essential. Manufactured materials such as steel are qualified and tested at the facility. Composites are installed in the field and therefore the performance is linked to proper application. Certification, quality control, and procedure adherence is instrumental in a quality composite



installation. The new wrap product is qualified in accordance with ASME Standard Post construction Test (PCC-2) as well as other governing documentation. All installers must complete classroom training and hands-on application training prior to installation in the field.

No down time

Recently on a project conducted in Mexico, the new wrap was the composite of choice on a large oil transfer station where a brine system was critical to plant operation. The piping – carbon steel of various sizes and configurations – had several areas that had severe corrosion, some areas even developed leaks. The traditional repair was to isolate the leak and weld a patch. The new product, having superior exterior corrosion resistance as well as providing structural integrity, was sought due to the ease of installation, no downtime required, and its overall performance record.

The project was first evaluated through various field thickness readings, engineering review of piping configurations, thickness, and materials. Based on this and calculations per ASME PCC-2, an engineered solution was provided to the client and certified applicators completed the installation. For adhesion purposes, the piping was grit-blasted to SSPC/NACE standards to provide a clean, debris-free surface, as well as a surface profile for the mechanical adhesion of the epoxy primer. The applicator, working in sections, then applied the product based on the installation instructions provided. Once this was complete, the supervisor inspected the area for any defects or areas that might require repair prior to moving on.

Over the course of two months, nearly a kilometer of piping was structurally repaired; and it is currently resisting corrosion with no downtime or production loss to the facility. This became a very cost-effective way for the end users to upgrade their system's integrity; and also provided an effective method of preventive maintenance to corrosive piping.

In summary, pipeline companies and

other industrial users will find that the new wrap product offers the following advantages:

- No metal rigging, fabrication, or welding on the job site, bringing a considerable savings;
- A product that is environmentally friendly – i.e., 100% solvent free;
- Performance that outlasts traditional clamps and sleeves;
- Reinforcement of the exterior wall of the pipe to as-new or better condition;
- A variety of configurations that can improve your job site flexibility. ■

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