

NEW INNOVATION OF COMPOSITES LEADS POWER PLANT INDUSTRY

The Power industry is using more and more composite materials, especially fiberglass reinforced plastics (FRP), for fluid handling: cooling pipes with sea water, fire ductworks, flue gas desulphurization (FGD) ducts, waster water pipes, ... For all these applications, extended service life and lower operation costs are achieved thanks to the high corrosion resistance of Epoxy Vinyl Ester composites, especially with EPOVIA[®] resins. The case study herebelow shows that composite pipes bring many other advantages as compared to cast iron, coated steel and even stainless steel.

Indeed, the Korean company Hankuk Fiber Glass Co., Ltd. (HFG hereafter) has shown an impressive accomplishment by successfully replacing the ash transfer pipes of power plants, made of cast iron, with composite pipes. They are primarily installed to facilitate transfer of the residual ash, a by product of the of thermoelectric power generation plants, which is diluted to a slurry in water. In the main, most of the pipes are made of cast iron; however, since development of abrasion resistant composite pipes, there has been a significant improvement in durability, economic feasibility and constructability. Cast iron pipes have shortcomings such as gathering rust over time, sometimes being perforated, and having higher cost and a heavier weight than composite pipes. In addition, the insides of pipes become worn by the ash in the course of transfer, leading to the designed lifetime of ash transfer pipes being as short as two years.

The HFG abrasion resistant composite pipes have been installed in various coal fired, electric power plants and constructed for a design life of 2 years, or the same as for the current cast iron pipes. On examining some pipes that have already seen four years of use, some abrasion has been detected as noted in a small reduction in the thickness of the inner layer, however no breakage / perforations have been found, nor any leakage detected. This actual four years of experience suggests that the composite pipe lifetime will be more than two times longer than the what is currently expected from cast iron

pipe. By at least doubling the life expectancy of these pipes, coal fired plants using the abrasion resistant composites piping, can expect significant savings. Laboratory results of Tabor abrasion testing that compared the abrasion resistant composite pipes with the existing cast iron pipes, suggest that composite pipes might be a far better choice than cast iron by a factor of 10 (see chart).

| | Weight loss (mg) |
|--|-------------------------|
| Specifications | < 40 mg |
| HFG abrasion resistant composite pipe (EPOVIA based) | 7 mg - APPROVED |
| Cast iron | 72 mg - REJECTED |

Chart: ASTM D4060 - Abrasion resistance by Taber abrasion (CS-17, 1000 g, 1000 cycles)

HFG has adopted a self-developed continuous filament winding system as its manufacturing process demonstrating high productivity and quality to produce the pipes of 150-3000 mm in diameter. Ash transfer pipes are manufactured by HFG's unique manufacturing system and are comprised of EPOVIA[®] Vinyl Ester resin and abrasion resistant fillers. The pipes mainly installed are 300~350 mm in diameter and 15~20mm in thickness. The inner layer is manufactured by continuous filament winding by mixing vinyl ester resin with abrasion resistant fillers, wound with fiberglass. Problems that may occur, due to abrasion resistant fillers, during this process such as poor fiber-wetting have been solved by the improvement of the resin and the manufacturing process. The outer layer is made of Vinyl ester resin only, passing through a filament winder with fiberglass and then finally cured and cut to length. For the Vinyl ester resin, EPOVIA[®] KAYAK KRF-1001 (a low foam, pre-promoted & high heat and abrasion resistance grade of Bisphenol-A epoxy acrylate resin) recently developed by Cray Valley, was used. Abrasion resistant fillers of alumina/silicone carbide were employed in the system. Cray Valley joined in this technical development and provided the Vinyl Ester resin. A strong technical partnership is linking HFG and Cray Valley, not only for abrasion and corrosion resistant pipes, but also for potable and sewage pipes and other high-end markets.

Based on the successful application of abrasion resistant pipes to small diameter pipes, HFG is extending its application to large diameter abrasion resistant pipes, with continuously increasing orders from various thermoelectric power plants in Korea. Opportunities are also arising in the nuclear power plants industry for sea water handling. Now, the worldwide power industry gets the opportunity to increase the service life of pipes with abrasion and corrosion stresses, and EPOVIA[®] resin is there to help them.

composite.resins@crayvalley.com



You can see composite pipes on the left and rusted iron pipes on the right side.



Pictures available in high definition

About Hankuk Fiber Glass Co., Ltd. (HFG)

HFG is a Korean company established in 1972 and has four affiliates including Hankuk Carbon. HFG is the nation's largest specialized company leading the composite industry and has ceaselessly endeavored to replace various materials with composites. The main business areas in relation to composites developed by the company are: Fibreglass, GRP pipes, UST, LNG tanks, carbon prepreps, train vehicles, trams, non-step buses, aeronautics and the defense industry, all sectors incorporating fundamental materials and high-tech composites. By marking its sales of US\$ 400 million in 2008, HFG has grown more than double in size over the past three years, and is expected to thrive in the fields of non-step buses and train vehicles over the next two or three years. For more information: www.fiber-x.com

About Cray Valley and CCP

Cray Valley and its sister company Cook Composites & Polymers (CCP) combined are the n°1 producer of resin in the world, with manufacturing facilities all around the globe (North and South America, Europe, Africa and Asia-Pacific). As a leading company within the composite business, Cray Valley not only offer vinyl ester resins but also many products such as unsaturated polyester, hybrid resins, gel coats, low profile additives, bonding pastes, tooling solutions, VOC-free cleaning agents and a strong local service to the composite industry. For more information: www.crayvalley.com