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Fibreglass reinforced plastic is becoming the material of choice

The demand for fibreglass reinforced plastic (FRP) increased significantly in wet flue gas desulphurisation (FGD) processes starting in 2006 when nickel prices increased from U$2.7 / kg to U$6.75 / kg. This price increase continued in 2007 when nickel hit a high of U$10.91 / kg.

With a 30 year reputation for low maintenance and relatively stable cost, FRP has provided power engineers with a reliable, cost effective construction material that can be employed in numerous applications that are corrosive to stainless steel at a price much lower than high alloy clad steel.

Although some other materials suitable for wet FGD processes may be cost competitive with FRP, their use typically results in higher life-cycle costs due to maintenance.

Cost Effective Material

The price of FRP is very competitive with acid brick-lined or rubber-lined carbon steel and much less expensive than alloy clad carbon steel. Total installed cost of field fabricated FRP ranges from U$12.5 to U$15 per square meter in North America. FRP components fabricated in a shop environment can be as little as U$7.5 per square meter. These prices make FRP an attractive choice, but the greatest advantage of FRP, compared to cost-competitive materials, is its lower life-cycle cost.

Used initially for radar domes and boats following the Second World War, the service life of FRP increased with the introduction of epoxy vinyl ester resins. These resins improved chemical resistance and toughness, enhancing the use of FRP and making further inroads into the power and pollution control industries possible. Furthermore, epoxy vinyl ester resins with improved heat resistance have given FRP the ability to withstand temperature upsets that may be encountered in power processes.

Resin improvements and three decades of industry guideline and standards development have significantly improved the quality and reliability of FRP in industrial applications. However, years of experience taught engineers and industry leaders that guidelines and standards alone are not enough to ensure long-term success. Overall success requires that FRP buyers employ best practices in operation, material selection, design, specifications, fabrication, inspection, shipping and installation.

Applications and Case Histories

Power plants have used FRP since the 1970s in piping systems and stack liners for wet FGD processes. The most common use of FRP has been slurry piping in wet FGD systems. Ashland’s Derakane411 epoxy vinyl ester resin and HETRON922 epoxy vinyl ester resin have been used for abrasion-resistant (AR) pipes in more than 150 plant sites dating back to 1972. Other uses by plants include: absorber vessels, ductwork, demister blades, electrostatic precipitators, and stack liners. Stack liners now comprise the largest volume use of FRP. These require fire-retardant resins like HetronFR992 epoxy vinyl ester resin.

Another fast growing use for FRP in power plants is absorber vessel shells and their internal components. The most common absorber vessels made from FRP are known as jet bubbling reactors (JBR). A JBR is part of a limestone slurry FGD process that has all the chemical reactions taking place in one vessel to produce high quality gypsum.

In addition to the highly-corrosive wet FGD process, FRP is making inroads into other power plant applications. One notable application is cooling towers. Cooling towers, once predominantly made of wood, are increasingly being made with FRP as the material of choice. FRP structures have approximately a 50 year lifespan, whereas wood structures

survive only about 25 years. Also, unlike wood, FRP requires little or no maintenance and is not subject to internal deterioration or biological attack. If the right resin is used. FRP can also withstand almost any chemical exposure. Labour costs are also reduced with the use of FRP because structural members can be produced in lengths of 20 meters or more while lumber requires splicing in 6 meter lengths. In addition to cooling towers, the growing list of power applications made from FRP include cable trays, coal conveyor covers, grating, pumps, thickener tanks, and vacuum filters.

In conclusion, FRP made with Derakane resin or Hetron resin is a highly suitable and economically-attractive material of construction for wet FGD applications. Proven performance at a lower cost, especially when compared to that of high nickel alloy-clad carbon steel, makes FRP a material of choice for highly corrosive wet pollution control applications such as absorber towers, ductwork, limestone slurry AR piping, stack liners, and spray headers. In short, FRP has become an excellent option for power companies that value the advantages it provides over other materials.