

**Update on
Fiberglass-Reinforced Plastic (FRP)
Reliability in Wet FGD Applications**

**Don Kelley
Sr. Staff Scientist
Ashland Performance Materials**

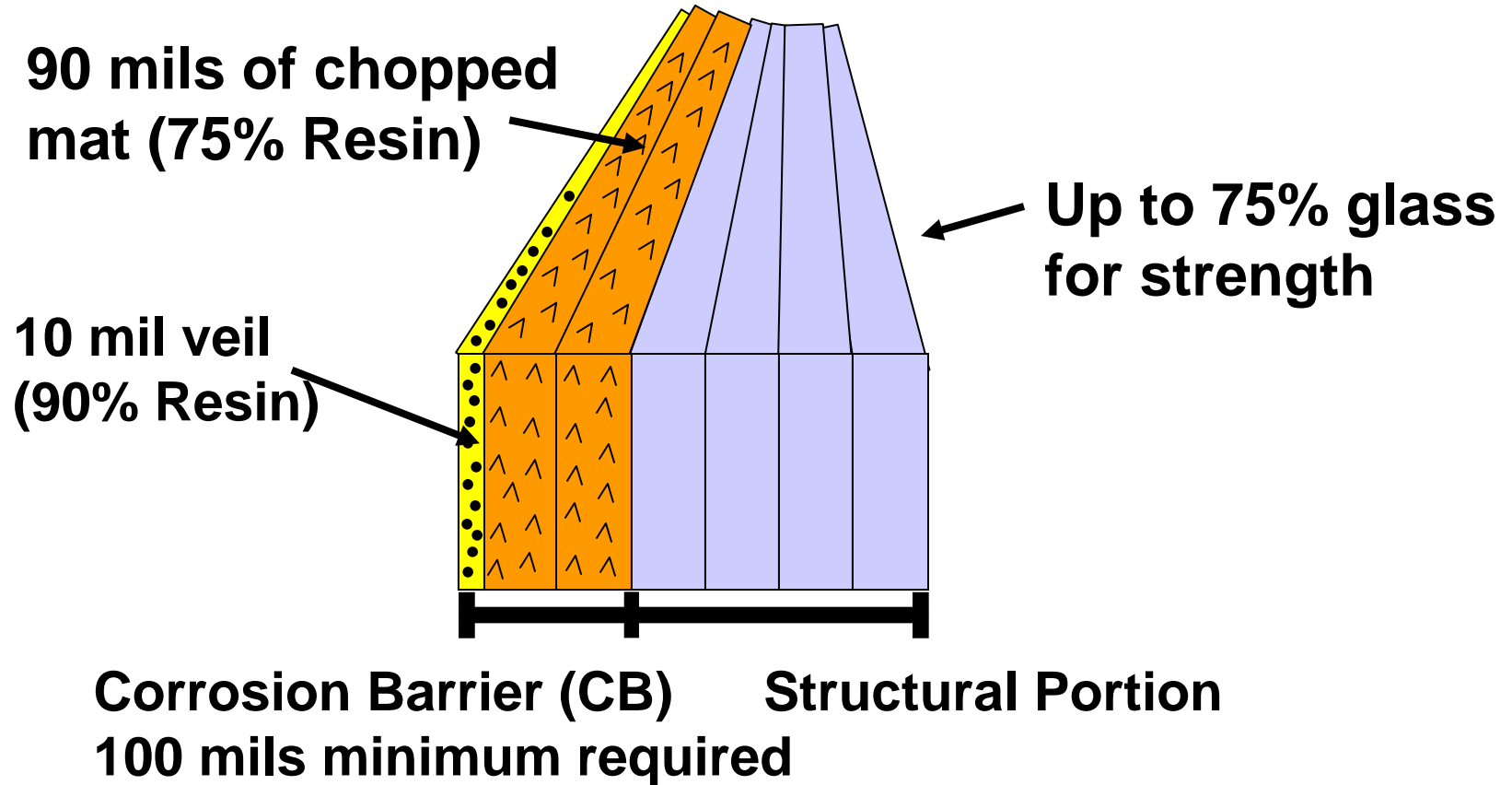
FRP has a long history of success in utility stack liner and ductwork applications

<u>Station/Unit</u>	<u>Year Installed</u>	<u>Current Status</u>
Coronado 1	1979	Good condition, min. maint. req.
Winyah 3	1980	Good condition, min. maint. req.
Coronado 2	1980	Good condition, min. maint. req.
Winyah 4	1981	Good condition, min. maint. req.
Laramie River 3	1982	Good condition, min. maint. req.
Holcomb 1	1983	Good condition, min. maint. req.
Cross 2	1983	Good condition, min. maint. req.
North Valme 2	1985	Good condition, min. maint. req.
Intermountain 1	1986	Good condition, min. maint. req.
Intermountain 2	1986	Good condition, min. maint. req.

As with all materials, FRP has requirements for success

- Proper resin selection and corrosion barrier design to maximize Corrosion resistance to the environment
- Designed by experienced and qualified FRP engineers
- Properly fabricated and installed by knowledgeable and experienced personnel
- Properly maintained by qualified personnel

Corrosion resistant FRP must have a corrosion barrier of a least 100 mils



Advantages of corrosion resistant FRP in wet FGD applications

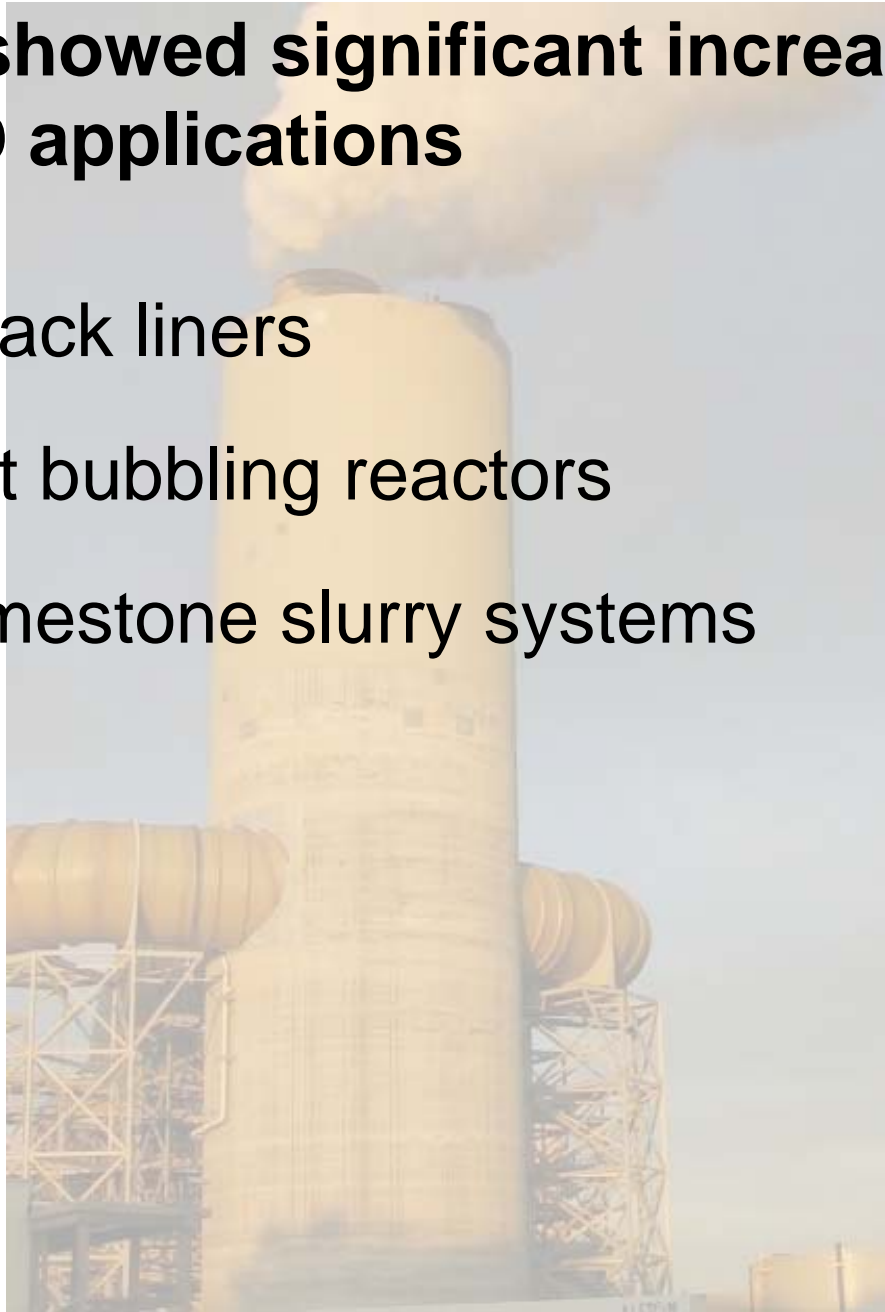
- Significantly less expensive than solid C-276 high nickel alloy
- Less expensive than C-276 clad carbon steel and 2205 stainless steel
- Lower maintenance than acid brick-lined
- Lower life cycle cost than acid brick-lined or stainless steel

FRP scrubber hood (128 x 34 x 32 ft.) saved utility \$4.2 MM compared to C-276



2004-2010 showed significant increase in use of FRP in FGD applications

- 70 FRP stack liners
- 24 FRP jet bubbling reactors
- 75 FRP limestone slurry systems



Large FRP jet bubbling reactor (600MW) successfully operating since 2007



New resin developments

- Clear, easy to inspect, Class I E-84 laminates without the use of antimony
- Derakane[®] 510B-400 epoxy vinyl ester resin
 - 227°F HDT ideal for wet FGD applications
- Hetron[®] FR998-35 epoxy vinyl ester resin
 - 275°F HDT ideal for hotter applications

Conclusions

- FRP has a long history of success in FGD applications
- Proper design, fabrication and maintenance are the keys to success
- New developments in resin technology have made FRP an even more attractive solution