



HIGH TEMPERATURE CYCLIC HEAT OXIDATION TEST FOR PIN STUDS

Problem: One of the most significant contributors to the loss of refractory in cyclone boilers is premature pin stud failure due to hot gas corrosion, erosion and thermal expansion of the pin studs. Stud distortion or disintegration is directly associated with refractory damages and causes further loss of the protective design of the refractory. The typical stud's inability to sufficiently transfer heat through it's base to the tube due to corrosion, wear and heat oxidation, is what ultimately causes the eventual failure of the tube.

Study: A high temperature cyclic heat oxidation test was designed to test traditional pin studs of carbon steel, 430 stainless steel, chromized carbon steel and the new **Tung-Stud**[®] (The Tungsten Alloy Coated Stud). Pin stud samples of each material were placed uniformly into a furnace with excess oxygen and evenly heated to 2000°F and held at this temperature for 2 hours and then cooled to ambient. These test pin studs were put through a total of eight cycles which means the pin studs were held for a total of sixteen hours at 2000°F in an oxidizing environment. Once the test was complete, the samples were removed for examination.

Results: The carbon steel pin stud samples were almost completely disintegrated. The chromized carbon steel pin studs had lost all of it's protective chromium layer and was starting to severely oxidize the carbon steel base material. The 430 stainless steel studs had significant oxide buildup and there was significant exfoliation and had expanded more than 20% in volume. The **Tung-Stud**[®] samples were fully intact with no discernable weight loss or gain.

Extending the service life of refractory in cyclone boilers leads to lower maintenance costs and less down time. The **Tung-Stud**[®] (The Tungsten Alloy Coated Stud) is the best anchor for refractory in cyclone boiler applications.

Testing performed by New Age Fastening Systems, Inc., August 28, 2003
(Test results and photos available upon request)



The most advanced self-shielding series of cored-alloy wires
ever designed for thermal arc spray and welding.