

Unifuse® 625 Overlay Protects Fluidized-Bed Reactors in TiO₂ Pigment Manufacturing

TiO₂ Manufacturing Process and Materials Problems:

The titanium dioxide (TiO₂) pigment is produced by either chloride or sulfate processes. The chloride process involves forming titanium tetrachloride (TiCl₄), that is oxidized at high temperatures by oxygen to form very fine particles of titanium dioxide. Titanium tetrachloride (TiCl₄) is produced in a fluidized-bed reactor, where chlorine gas (Cl₂) is injected into the combustion bed to react with coke and rutile (natural or synthetic) at about 1650° F (900° C). The reactor vessel is typically constructed with carbon steel. High heat in the combustion zone and the high temperature corrosive environment containing hot chlorine gas and titanium tetrachloride, is the reason the carbon steel vessel is lined with refractories. The refractory keeps the carbon steel vessel cool and prevents the hot corrosive chlorine gas and TiCl₄ gas to reach the carbon steel vessel shell and cause high temperature corrosion attack. However, chlorine gas can permeate through cracks and fissures in the refractory to reach the underneath carbon steel vessel shell. The combination of moisture and chloride condensates combined due to cracks and fissures cause “dew point” corrosion attack of carbon steel by chlorides underneath the refractory. This type of corrosion attack cannot be detected without removing the refractory, resulting in high inspection costs. More importantly, it prolongs the plant shutdown duration decreasing overall productivity.



Figure 1. Unifuse® overlay welding machine performing overlay welding for a vessel. The bottom half of the photograph shows a newly applied overlay on the vessel shell.

Unifuse® Overlay Technology

Unifuse® Technology employs modern automatic overlay welding machines incorporating a Pulse-Spray-Gas-Metal-Arc Welding (PSGMAW) process to deposit a high quality weld metal overlay. The process yields superior quality and restores the vessel integrity and provides the corrosion protection using a Corrosion-Resistant Alloy (CRA). A wide range of CRA's, including austenitic stainless steels, superaustenitic stainless steels, nickel- base alloys, such as INCONEL® and HASTELLOY® alloys, are available for weld overlay applications to provide adequate corrosion protection in various conditions and processing environments. Alloys routinely overlaid include 309L, 316L, 317L, 904L, Monel, 82, 625, 622, C-22, C-276, 59 and C-2000. Figure 1 illustrates an automatic overlay machine in the process of performing overlay welding on the vessel shell.

Unifuse® 625 Overlay Protects Fluidized-Bed Reactor Shells

In order to avoid the inspection “nightmare” and to provide the lasting protection of the reactor shell against dew point corrosion by chlorides and other acid condensates underneath the refractory Unifuse 625 overlay applied to the reactor shell underneath the refractory lining offers an ideal solution.

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