Batch Digester Stainless Steel Overlay "New" Thickness Testing Technique

By: Ronald Lansing, P.E.
Principal Engineer

For the last couple of years we have been using a "new" technique to measure remaining weld overlay on batch digesters. New, unless you remember the old blacksmith method of watching grinder sparks to identify a metal.

The Problem

When doing internal visual inspection of a batch digester, the thickness of the remaining stainless steel is not evident unless it is bleeding rust-brown all the way down your wall. Ultrasound and eddy current test methods have been tried and neither are very reliable at finding the welded interface of the stainless and the carbon steel beneath (plus an inspection crew is expensive!) Thickness of the remaining good stainless steel protective overlay is what you need to know for planning the next re-welding campaign.

Welding Contractor Solution

When preparing to do the re-welding, the contractor will generally need to know how thick the stainless layer is. They will air-arc cut a shallow gouge into the wall, stain the area with copper sulphate and then physically measure the unstained stainless steel layer with a machinist scale.

Maintenance Inspection (a cheaper) Solution

Instead of using the air-arc and stain method, expensive and technical, carefully cut into the stainless using a plunge cut with a grinder. Watch the sparks of the stainless, shorter (white and fewer than carbon steel sparks) as the plunge proceeds. When the sparks change, stop. Measure the plunge cut depth.

This thickness value is a conservative measure of the remaining stainless steel overlay weld thickness. The spark appearance will change when more carbon is present, usually in the diffusion zone of the weld which is present just before the "actual" weld interface. Use this value to estimate the remaining overlay life reduction rate for the stainless alloy of the weld and the aggressiveness of your batch digester load and process parameters.

Figure 1. Air-Arc cut gouge for thickness measurement of the overlay by staining with copper sulfate.

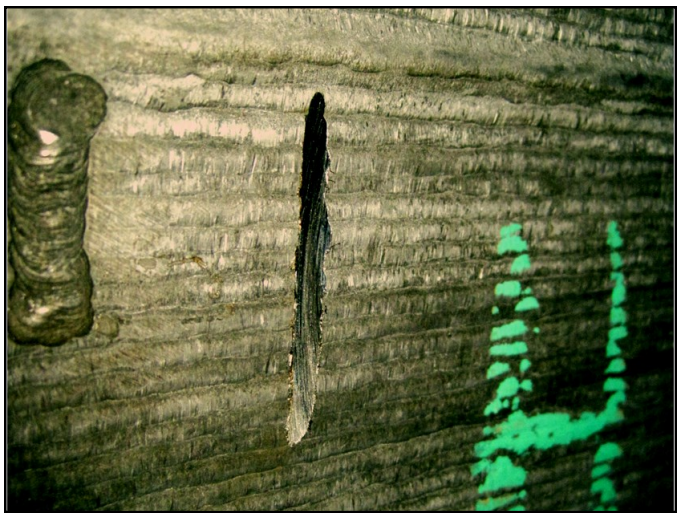

Figure 2. Close-up of a grind method cut. A previously re-welded cut is seen on the left.

Contact the Author:
(503) 706-8124
Ron_Lansing@mmengineering.com