

Submerged Arc Welding: Re-use of Flux via Crushing

Submerged arc welding (SAW) is the process of welding beneath a bed of granulated flux to protect the weld from atmospheric contamination. Flux may contain manganese oxide, magnesium oxide, silica, and other ingredients that create a powder capable of protecting the weld. An outcome of the extreme welding heat solidifies the flux into a hardened waste known as slag. Waste slag is typically sent to landfill for disposal.

Instead of landfilling this waste slag, the material can be crushed and re-used. To learn more about this process, MnTAP interviewed Daniel Baxter with Harbert's Products, a SAW slag crushing company that serves Minnesota.

MnTAP: How does your slag crushing process work?

Daniel Baxter: We utilize a 100% closed loop crushing system where a customer generating slag waste from submerged arc welding is set up with a program where their flux-slag is reprocessed and sent back to that same customer.

How do you ensure the quality of the returned flux?

After grinding, the flux is filtered and tested. We have a quality assurance manual that follows ISO 9001. We can also test in accordance with the American Welding Society (AWS) or Canadian Standards Association (CSA). Any American Society of Mechanical Engineering (ASME) code testing can be conducted as requested by our customers.

Is there additional testing conducted by your customers?

Sometimes; a Procedure Qualification Record (PQR) is typically required and conducted by our customers. This testing is less extensive than the testing that we do, and the small investment is overcome by the savings associated with landfill avoidance and the reduced price of the crushed flux.

Do your customers typically see a financial benefit?

Cost savings is usually between 50-60% compared to using new flux. Plus, customers eliminate disposal costs and environmental reporting. Roughly two-thirds of the weight of the slag shipped to us is returned as tested, ready to use flux.

What is your service area?

We serve from North and South Dakota, down to Texas, and eastern Canada. We also have a sister company, Allied Flux, in western Canada that handles western United States and western Canada.

How does material transportation work?

Depending on volume, slag and flux can be shipped between one skid to a full truckload based on customer requirements. The price is included with testing and processing all into

one bill. For example, if someone is paying \$1.00 per pound for flux, their all-inclusive price for crushed flux will be roughly \$.40-\$.60 per pound.

What's the best way to get started?

The first step is to give us a call. We will ask for a 55 gallon drum worth of slag for initial testing, which we will return as flux for your initial testing. Once we have verified that the process will work, we will start collecting your slag a truckload at a time. Contact us at 1-800-377-3103 or harberts@recycleflux.com to get started.

MnTAP also interviewed Ron Miller with Foremost Buildings in Jefferson, Wisconsin. His company is currently sending their waste slag to be crushed for re-use as flux within their SAW welding process. Ron was kind enough to provide insight on how the process works at his site.

MnTAP: Can you tell me about your company and what you do?

Ron Miller: We make and sell metal buildings. We manufacture the structure; everything from warehouses to dairy barns, churches, aircraft hangars and four story buildings. What we do is a lot more elaborate than the standard metal building that might come to mind.

Why did you choose to have your waste slag crushed for re-use?

We had two reasons. One was to keep it out of the landfill, and the other was cost. Crushed flux costs about one-third the price of new flux.

How much crushed flux do you use each year, and what are the cost savings that you see?

In 2014, we used 3104 pounds of crushed flux. We pay \$.42 per pound for crushed flux versus \$1.28 for new flux. So, doing a little math, we saved almost \$2700 last year by recycling. And that doesn't even include landfill cost savings.

Do you perform additional testing on the crushed flux?

The testing that we require is performed by Harbert's Products; we mix the flux roughly 50% crushed to 50% new; we don't ever use straight crushed flux. We did find that it is slightly finer grain than the new product, but when mixed with the new flux it works perfectly.

Is there anything else you would like to share?

Harbert's Products is a great company to work with, and we appreciate the cost savings and environmental benefits resulting from our partnership.

Slag is ground up, filtered, and tested to become crushed flux. Crushed flux is mixed with virgin flux to create a cost effective blend being used in industry to create high quality welds. Slag recycling reduces waste sent to landfill by thousands of pounds each year, while saving businesses thousands of dollars on new flux. This is an excellent example of economics and the environment harmonizing to create a great solution for waste SAW slag.