

Advances in slag recycling and reuse



**ASSIGN
BUSTER**

INTRODUCTION:

Slag is the unavoidable by product that comes with the production on any metal that is being produced today. This by product that is produced or added as a synthetic slag in the steelmaking process is used to remove undesirable impurities and nonmetallic inclusions by bonding or absorbing them. Slag also serves as a cover to shield metal from the atmosphere and loss of radiant heat. The environmental concerns that have become apparent in the last couple decades have pushed researchers to rethink what this hazardous waste is doing to the environment and how to deal with it. In the past, slag was taken from the blast furnace, basic oxygen furnace (BOF), and electric arc furnace (EAF) and hauled off to a hazardous dump site where millions of tons have accumulated. The major waste by product from steel production is slag at 79. 15% as shown in 1. Steps have been taken all over the world to generate new ways of recycling or to reuse slag material. Advances have made it plausible to separate metallic scrap and lime in the slag. Slag has been considered as an alternative for submerged arc welding flux and even used for construction materials. The slag chemistry is always well thought-out when being used for these different alternatives.

Body

As stated before, slag once was just dumped without any consideration to the effects to the environment. Slag is not just the hazardous waste it once was thought of. Slag contains reusable lime and metallic scrap that can be reused, in addition, being able to completely recycle it will save on cost of fuel, dumping, and transportation. The company STEIN Injection Technology developed a way to separate lime for the scrap and convert it in to usable

wire injection that can once more be used to create clean steel. This process that the company developed consists of two stages that will not form extra waste. The first step allows the slag to cool; upon cooling it is sent into a grinder so the lime can be separated from the ferrous metal that is removed by magnet. The scrap metal is returned to the production line and screened again for usable product. The rest is used for construction material. Following that the recycled lime is mixed with new lime to create the specified lime combination that is low on impurities. At its current state can be injected into a ladle, BOF, or EAF creating a particular grade of steel the consumer requires. 2 show a flow chart of how this recycling procedure works.

Steel slag in powder or granular form is used in construction for concrete and asphalt roads, fertilizer, and cement blocks for harbors to stop the tide. In the concrete industry there is research to develop a cheaper, stronger, and more durable structure. In Portland concrete, the most common type of cement, consist of 90% clinker and with recycling of slag becoming significant it was considered for an alternative. The addition of granular or powder slag increase the properties creating a better performing structure. This is only with the right admixture of the components to give the utmost qualities. From results indicted that when slag is added it decreased the expansion rate 50% compared to the controlled specimens by using a steel slag replacement for a quantity of Portland concrete. The mixtures did show that the strength of the concrete was decreased in early ages of drying; however, this gives control of the hydration process so optimal strength and performance can be obtained.

In the same area of construction is Heat island mitigating paving material that uses fine ground slag in asphalt pavement. This slag pavement is modified to retain water. This reduces the temperature by absorbing water in rainy weather and letting the water evaporate in warmer weather as shown in 3.

When it comes to submerged arc welding (SAW) it is not often that individuals consider the environmental harm from the 2500 tonnes of flux consumed in India alone, or if it is even known. (5) SAW flux is non-biodegradable or renewable; this is a construction material that is brittle and glassy. Recycled steel slag, the material that will not stop being produced as long as there is steelmaking. This is a material that can be a option instead of using SAW flux. For slag to be added to filler wire it has to be processed and modified. The slag is crushed into granular form and alloy additions are added to achieve the equivalent properties that are attained by fresh flux. American Welding Society has requirements that are shown in Table 1 with comparison to different fluxes used in (5). The results of the experiment show that the weld had no visual defects, acceptable mechanical properties, and meet the standards for ASTM. Rewards from using recycled slag instead of fresh slag is a decrease in material cost, which lead to a higher profit margin for a company with cheaper products for the customer. It also leads to a decrease in waste that would originally be presently lying in a land field that can damage the environment.

Conclusion

The advances in steel slag have changed since dumping waste where ever someone saw fit. There are countless possibilities for what steel slag can be

recycled into; from construction material to submerged arc welding flux. Doing this helps the environment, which is just as important as making a profit for a company, probably even more. The environment is suffering everyday and a lot of the ideas that contribute with recycling or the reuse of slag need to be research deeper before it can reach the market. With steel being the #1 recycled product in the United States, this is just another motive that steel slag should be recycled as well. 50 year have past with 50% of steel produced that has been recycled through the steelmaking process is astonishing. (6) This not only helps the world but is economic and is more efficient than using new materials that are being used to make fluxes, filler material, and clinker used in concrete.

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