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Welcome to DCI's POWERMELT. We hope this quarterly newsletter will provide helpful information about silicon carbide, its applications, and our company.

Inside this issue:

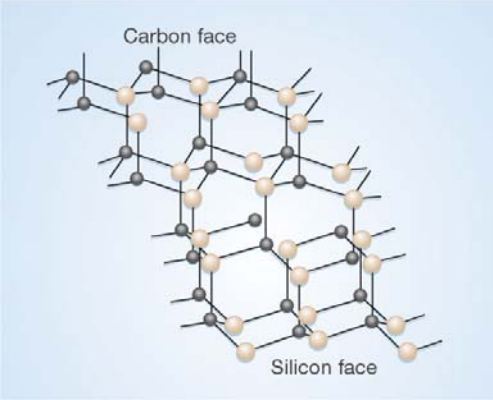
In the next Issue of *POWERMELT* watch for more news about DCI, global supply and demand, and pricing.

POWERMELT

The Use of 90% SiC Grain in the Production of Steel Castings

BY GEORGE D. HALEY, METALLURGICAL CONSULTANT

Silicon carbide can improve the quality of cast steel by lowering the aluminum required for deoxidation. Aluminum is the deoxidizer of choice for the treatment of carbon and low alloy steel castings. If the proper amount is added in an efficient manner, steel castings can be produced that are free of porosity caused by the evolution of carbon monoxide. The current addition practice is to add 2lbs aluminum/NT or 0.10%. This usually results in a 0.08% aluminum in the melt. The 2lb addition is high enough to compensate for some minor increases in oxygen due to operating variables. Research by some foundries has shown that this level of aluminum can, however, cause aluminum nitride (rock candy) defects, clog filters, lower mechanical properties, increase tool wear, slag and other defects. The correct aluminum addition depends on the oxygen content of the steel prior to addition. Ferrosilicon and ferromanganese are not powerful enough deoxidizers to reduce the oxygen content of the melt to a low enough level to allow a reduction in the aluminum.



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DCI Carbon Brick Proves Beneficial

Cupola shops around the United States have proven that DCI's ***POWERMELT*** Carbon brick offers a number of valuable benefits. Each foundry that uses ***POWERMELT*** Carbon brick has found tremendous benefit, but the benefit has been varied from foundry-to-foundry depending on how the charge make up is adjusted.

Pig Iron Savings

A major foundry in the southeastern United States is making the product a standard part of its charge make up based on the tremendous savings they achieved by nearly eliminating the use of pig iron. At this foundry pig iron used to constitute 10% of its metallic charge weight. But because of the graphitic-nature of the ***POWERMELT*** Carbon brick, and the excellent recoveries it provided, they were able to reduce the amount of pig iron in the charge to around 3.5%. And they did this with only one 26 pound brick. The pig that was eliminated was replaced with much less expensive steel and cast.

If pig iron is selling, as reported by *Ryan's Notes*, at $350-400 per metric ton ($318-363 per net ton), and steel is at $272 per net ton the numbers work out well for the melt shop's cost scenario.

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- SiC briquettes for cupola melting
- SiC grain for electric melting
- SiC experts for customer support
- ISO 9001 : 2000 Registered
- Central U.S. location provides 1-2 day truck deliveries
- Rail service available

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Silicon carbide is a more powerful deoxidizer than either silicon or manganese. It consistently reduces the oxygen level of molten steel prior to the aluminum addition below that obtained by manganese and silicon additions. Less aluminum is thus required to avoid the subsequent evolution of carbon monoxide. The problems associated with excess aluminum additions are avoided and casting quality is increased.

Reduction in aluminum additions used for deoxidation from 2lbs to 1½ lbs/NT has been reported to have a noticeable affect on casting quality.

90% silicon carbide grain additions of a minimum of 6lbs/ton are required to effectively reduce the oxygen to the lower levels. The 6lb addition results in an approximate 0.18% silicon increase and a 0.08% carbon increase in the melt. The silicon in the silicon carbide is the deoxidation element and its recovery depends on the amount of oxygen converted to silicon dioxide. If the required silicon carbide addition in the induction furnace is larger than 6lbs, the extra weight can be added earlier in the melt cycle.

Induction furnace practice is to add the silicon carbide grain 5 minutes before tap to a clean bath with medium power on. **Arc furnace** practice requires the addition of the silicon carbide grain to the stream or the ladle as the furnace is tapped. The aluminum is plunged after the ladle is full. For both types of melting it is critical that the silicon carbide be added at least 5 minutes prior to the aluminum addition.

Re-oxidation of the melt is a constant problem when producing steel castings. Exposure to air or steam (green sand) and/or excessive temperature or pouring time can cause carbon monoxide porosity due to re-oxidation – if not properly controlled.

The aluminum content of ferrosilicon can vary from 0.50% to over 2% on some imported material. This can cause problems when large additions are made. Successful reduction of the aluminum content of the steel requires the use of 0.50% aluminum ferrosilicon and/or substantial additions of the aluminum-free silicon carbide.

Using 90% silicon carbide grain as a source of carbon and silicon and as a powerful deoxidizer can improve casting quality. This practice has also shown, in some instances, to be more economical due to the current ferroalloy pricing.

For more information please contact your DCI representative.

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Coke Savings

Three other large cupola shops that are either testing or using the product have reported that they have been able to replace coke with ***POWERMELT*** Carbon brick on a 1:1 ratio. Given the high price and poor quality of foundry coke, especially for those foundries in cold climates where in winter the coke freezes and becomes highly brittle, replacement on a 1:1 ratio is tremendously beneficial. Further, when moisture content of coke is compared to moisture content of ***POWERMELT*** Carbon brick the numbers look even better. And since ***POWERMELT*** Carbon brick is less expensive than coke the foundries that currently use the product are reaping a nice benefit..

Supply

DCI has on-site a very large supply of this graphitic carbon raw material, and it has ongoing access to the source of the head feed. This is important for a couple of reasons. First, the product works as well as it does because it is not made from coke breeze. Rather it is made from graphitic carbon. Second, DCI is most likely the only carbon brick producer to have a stable, long-term supply of graphitic raw materials with which to make the brick.

If you are running a cupola and you would like to test ***POWERMELT*** Carbon brick for yourself, please contact your DCI representative. DCI team contact information is on the lower left of this page of this newsletter.