

DEFECT PREVENTION WITH A WORLD CLASS MELT SHOP



**The
Schaefer Group, Inc**

RICHIE HUMPHREY
National Sales Manager
THE SCHAEFER GROUP, INC.

ARTICLE TAKEAWAYS:

- Regular maintenance and documentation of your furnaces is key.
- Filter your metal either with a box filter or an inline filter to reduce inclusions
- Filtration has many benefits and should be the first thing you look at to correct inclusions and some hydrogen issues.

One of the best ways to optimize defect prevention is to offer your casting process world-class melt quality. So many companies have lost focus on what is the most important element in the casting process, *the quality of melt they have in the dip well.*

I go into foundries all over the country and see that so many have forgotten how important taking care of the furnaces, fluxing/cleaning the melt and keeping the furnaces sealed are to make a defect-free part.

A world-class melt operation has a very low scrap rate at the casting process because of melt quality and reducing oxides due to the care they take in cleaning the melt/holding furnaces. This is the source or “Head of the Stream” where everything else down-stream is a direct result of what comes out of the “Head of the Stream.” As I have said so many times, it’s hard to make a good part

with bad/dirty metal.

So many foundries today have maintenance responsible for the furnaces and they only show up when there is a problem. Foundries don’t regularly check and follow-up to understand if procedures are being followed. I came from a foundry that put the furnaces first and that was easily recognized in the very low scrap rate at the die casting process. All this effort put into the foundation of the process was greatly seen in the bottom line every year when we sat down to crunch numbers.

The investment in additional employees that will ensure the

furnaces are properly cleaned, cleaned on time and skimmed, is far more cost effective than the dollars that are thrown out the door because of high scrap rates and major furnace repairs almost quarterly or on some occasions, monthly. I see this time and again in my travels.

Here are a few processes you should be following to make a “World Class Melt Shop.”

How does your facility compare?

1. How often do you flux and clean your melt furnaces? I cleaned mine every 12 hours.
2. How often do you flux and clean your dip wells/holders? I cleaned mine every 12 hours.
3. How often do you skim your dipwell/at the casting machine? I skimmed mine once per hour.
4. How often do you check the temperature in your dipwells with a handheld “Certified Calibrated Unit” to confirm your thermocouple in your dipwell is reading correctly? I checked 3 times in a 12-hour shift.
5. How often do you check the temperature in your melt furnace with the same hand held unit? I checked 3 times per shift.
6. If you have a manager of the melting operation, how often do they, as manager, go out and take a look at all the furnaces, open the door, look inside to see if they have been cleaned? I looked at least once per day.

Continued on next page

SIMPLE SOLUTIONS THAT WORK!



Exhibit A: 4-Month-Old Lining Stated: They Cleaned It Every Day.



Exhibit B: Furnace Lining 3 Years Old Cleaned Properly

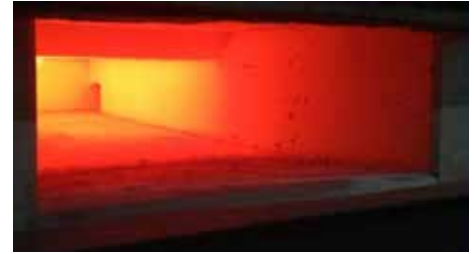


Exhibit C: New Furnace Lining

I posted a sheet at the charge door of the furnace and when the operator cleaned it each shift, they noted the time and signed that it had been cleaned. Since I looked at them daily, I knew by looking at the time it was last cleaned what the furnace should look like when I inspected. What I observed needed to match the timeline of when it was last cleaned, or I would hold the person accountable and resolve that before the furnace could get out of hand. Following these procedures religiously lead to no major furnace repair issues.

Here are three examples of everything I have been discussing.

Exhibit A: The manager took what he was being told by his team as accurate. I called the manager and he walked up to the furnace and opened the door; what he saw made him speechless. This is why a “World Class Melt Shop” has a manager that checks the furnace daily to confirm that processes are being followed. In **Exhibit B and C**, you can see the effects of proper maintenance after 3 years as compared to new.

You are probably saying there is no way we can do this, and this is crazy to work this hard on the metal and furnaces. Well... we did it where I came from and 30 years later, we were still pressed hard to make sure this was done every shift. Why you say? The proof is in the bottom line. Every year we had very low, unrealistic scrap rates to most,

but to us it was normal to look at numbers like that monthly/yearly.

With all this being said, aluminum foundries should rethink the direction they are heading (what is not working) and bring back the melt furnace tenders and melt shop managers.

Additional Ways of Preventing Defects and Providing “World Class Metal” is Filtering Your Metal.

WHY SHOULD I FILTER MY ALUMINUM?

Whether you are a die caster, permanent mold or sand foundry the question is always going to come up... Should I filter the metal, degas or both? So let's put this to bed right now. If you are a foundry and are trying to obtain a specific gravity of, let's say, 2.62, chances are you are going to degas to get you there (depending upon the alloy). If your customer's specifications demand it, then you had better degas.

If your machining end is experiencing hard spots then you need to filter. If your cut castings are showing signs of porosity you may not have to degas. Let me explain. If your dies are vented correctly then well dispersed hydrogen will go out the vents in the die when

the die cast machine slams shut. However, if you have inclusions in your metal you may trap hydrogen in a particular area of the part and that is your porosity issue, not the hydrogen.

In some rare cases where you are in a very high, humid area, then you could end up with a large amount of hydrogen in the metal that filtration may not take care of. If you are casting above 1300 degrees F. (which as a die caster you should never do) you can be absorbing more hydrogen into the metal. If, as a foundry, you are above 1400 degrees F, then you are acting like a wick and really pulling the hydrogen into the metal.

There are several other reasons hydrogen and inclusions can be finding their way into your castings. If you tap metal into a transfer ladle, then pour it into a holding furnace, and then ladle it into the shot hole, you have just committed three very turbulent acts with the molten aluminum. These molten metal pours will pick up more inclusions, and trap more air and hydrogen in the aluminum. This might cause you to have to degas and filter. I have seen companies actually raise the temperature of the metal to get better fluidity into the die on hard to cast parts. If they just tried filtration first, they may not have had to raise the temperature as much, or at all.

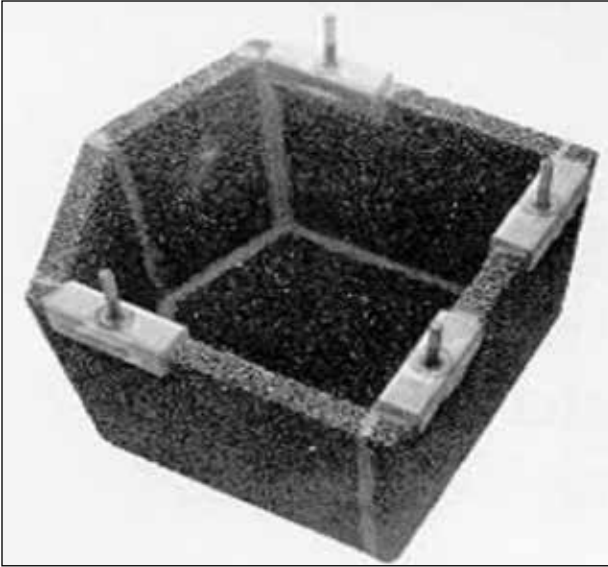


Figure 1:
Grit box filter for a dip well

We feel everyone should filter their metal either with a box filter (**Figure 1**) or an in-line filter (**Figure 2**). With the possible exception of electric melter (and even those if your are returning scrap metal into them or making aircraft quality parts), every furnace made to melt aluminum will produce some inclusions. Furnaces that have flames touching the bath or solids on a hearth will absorb more hydrogen and products of combustion than those furnaces where the flame never touches the bath of aluminum or the scrap, ingots or sows.

Filtration has the following benefits:

1. Filtration increases fluidity, possibly allowing you to reduce your casting temperature, which is better for molds and dies.
2. Helps reduce hydrogen trapped by inclusions.
3. It will reduce hard spot 90% of your inclusions 25 microns or greater and the more clogged the filter becomes the more finite the filtration.
4. If you design the filter into the furnace from the start it can be put in to make it easy to change.



Figure 2:
In-line 8 grit filter for a machine side melter or launder system

5. Filters are good for 1-1.5 million pounds before they clog, depending upon how dirty the metal is coming into them.

6. Inexpensive way of reducing scrap!

Filtration should be one of the first things you look at to correct inclusions and some hydrogen issues. I can think of no better way to prevent defects than to supply your casting process with the most pristine/cleanest metal to run parts in their process.



Contact:
RICHIE HUMPHREY
Richie.Humphrey@theschaefergroup.com



Save time cleaning and extend the life of your refractory lining with the right SGI Flux!



Does your furnace look like this?



Does your drop pan look like this?

The Schaefer Group can provide the proper SGI Flux recommendations for your applications, as well as the techniques and training of your furnace tenders.

SGI Benefits Include:

- Reduced Melt Loss
- Improved Melt Efficiency
- Reduction of Inclusions
- Less Furnace Cleaning Time
- Improved Fluidity
- Lower Hydrogen

Contact a Schaefer Group representative for a complete list of tools available to properly maintain your furnace.



The Schaefer Group, Inc.

PROFITABLY CASTING YOUR BOTTOM LINE!

CALL 937.253.3342

For more information on SGI Flux, Furnaces, Refractory or System Integration & Service Visit:

THECHAEFERGROUP.COM