

Melting & Holding Basics to Reduce Scrap

By Martin Reeves

What separates the best foundries from the rest?

It's the synergy created by doing all the basics – the “simple” things – right first time. Too often the “simple” things often get missed in the apparent multitude of activities in the modern cast shop.

Making scrap castings is something that none of us want to do, but sometimes we start at the wrong end of the process to correct errors that created the scrap. Do you work backwards from a scrap

casting to find the point of wayward process instead of starting at the beginning and building quality and process control as the foundation? It doesn't matter what is done to the downstream processes – if the metal quality is not correct, then everything else becomes more difficult, costly, and energy consuming.



Analyze melting requirements

The most important step in moving to a more efficient melting operation is a thorough and accurate analysis of your current and future melting needs. Not knowing where you are now makes it impossible to plan a route to a successful future. Quantifiable data is needed to identify the opportunities and potential for improvement.

Energy efficiency is a valid concern and a major cost, but sometimes we only see the obvious and ignore other factors which contribute to the “energy footprint” of a process. It is therefore important to look at optimizing the overall contribution cost of the melting shop. Having the most energy efficient furnace won't help if the metal input quality, metal handling and pouring practices produces scrap that has to be remelted. Not only does this result in extra energy to remelt the scrap, but if you add the energy and processing costs to those scrap castings then it becomes the most expensive charge materials you have!



Improve melt quality to reduce returns and scrap castings

(the most expensive charge materials)

Many foundries will look at Btu per lb of metal melted but not always at the amount of metal melted to get 1 lb out of the door as a good casting.

Poor yields and/or scrap means that the same metal is melted several times; an unnecessary energy cost and reduction in efficiency. Improving the metal quality will reduce metal-related scrap and effectively reduce overall energy consumption.



Keep melting temperatures low

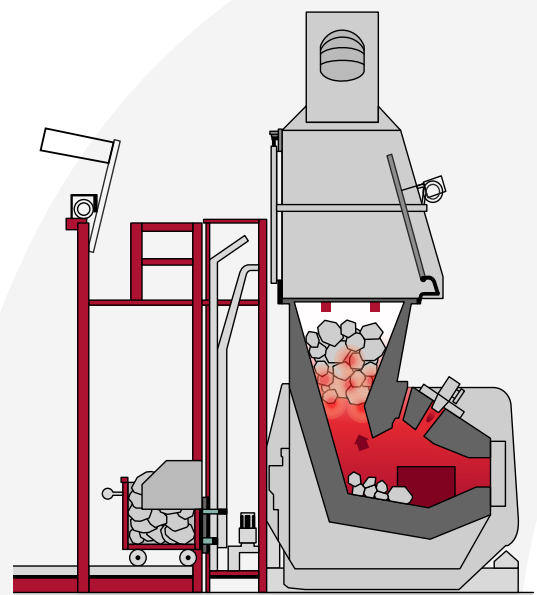
Preheating of the charge using the waste heat and reducing effective melting chamber temperatures is a means of saving energy in melting. But, as importantly, it improves metal quality, reduces dross formation (saving money), and increases refractory life.



Keep holding temperature low

Holding at the lowest temperature doesn't just save energy (aka money) but also improves metal quality. Lower temperatures mean lower hydrogen pick-up and quicker degassing. Even for diecasters, the improvement in metal quality will bring rewards in lower scrap rates.

Determining the right amount of heat is critical and often overlooked. Too little heat into the charge and melting will be slow and energy hungry. Too much heat and excess heat will be lost through exhaust and dross will be created. Energy input needs to match the charge; multiple smaller burners allow heat input to match energy needs while also distributing it evenly across the melt zone.





Keep the charge shaft full

Recuperation provides big savings, therefore keeping the charge shaft full will allow maximum heat recovery. Preheating of charge without melting is also important to bring the charge to a point where all sections are heated through but the surface is not at the point of oxidation. At this point it is possible to “flash” melt quickly with little additional energy input. This results in reduced metal loss through oxidation, no superheating, and lower hydrogen gas content.



Maintenance & Cleaning

Often looked at from a maintenance perspective (but more often due to a breakdown) are the very simple but necessary tasks associated with cleaning and keeping a furnace clean.

- Dirty thermocouples cost money and cause burners to run more.
- When burners run longer for the same bath heat, chamber temperatures are hotter, dross is formed and corundum growth is encouraged.
- A dross layer on the bath prevents efficient heat transfer and more dross formation.
- Making dross is losing metal!
 - It's metal lost, energy and labor consumed, and then it's almost given away!
 - And taking energy and processing costs with it.

Even with today's furnace technology, cleaning furnaces is never a particularly pleasant job. In order to ensure regular cleaning takes place, make the job as easy and quick as possible with furnaces that make cleaning a manageable task. Hard-to-reach corners or special cleaning tools required to clean will hinder the cleaning process. Also look for furnaces that use materials that resist adhesion.

Set a sustainable schedule to keep it clean. Once a cleaning is missed, the desire to do the extra work to return it to its prior clean state evaporates and the furnace will deteriorate quickly.



Furnace Sizing

Correct sizing of the furnace means having a furnace that is sized to accommodate reasonable production increases (and not oversized). This will ensure that melting and holding are optimal while still allowing a buffer of capacity for “catch-up” situations after cleaning and maintenance.

- A furnace that is too big will use additional holding energy.
- A furnace that is too small will be working beyond its capacity.
- An empty shaft means it's only a holding furnace with no recuperation of energy.
- Operating at more than the rated capacity means inconsistencies in control and no opportunities for cleaning and maintenance.
- Charging the optimum ratios of returns and ingot ensures optimum recuperation of energy and consistent metal chemistry and quality.
- Sizing furnaces according to the available charge material is as important as sizing for melt demand.

Get the basics right first!

Like many activities in our lives, there are only a handful of basic skills on which everything else is built. Trying to make complicated moves without having perfected the basic skills will only end in disaster.

Getting the simple things right first is the easiest way to build a scrap-reducing, energy-reducing, and efficient operation. And you may find the complicated answers are no longer needed!