ALUMINUM METAL IS STILL MORE EXPENSIVE THAN ENERGY

The Schaefer Group, Inc

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ARTICLE TAKEAWAYS:

- Controlling the aluminum content in your dross can lead to cost savings
- Recover your own aluminum, reduce scrap, and keep your furnaces clean
- Appoint a metal saving guru to manage the metal you melt

With energy prices scheduled to rise 30% in the next two years, foundries are looking for ways to reduce wasted energy and materials in their manufacturing process.

Foundry managers are looking to the melt room as a place to recover costs. In the past, metal melt loss was a given. Now there's potential for cost savings in the melt room by just controlling the aluminum content in your dross.

This can be accomplished several different ways, with a focus on furnace design and auxiliary equipment that can help you recover some of that metal that used to be shipped out of your plant every month.

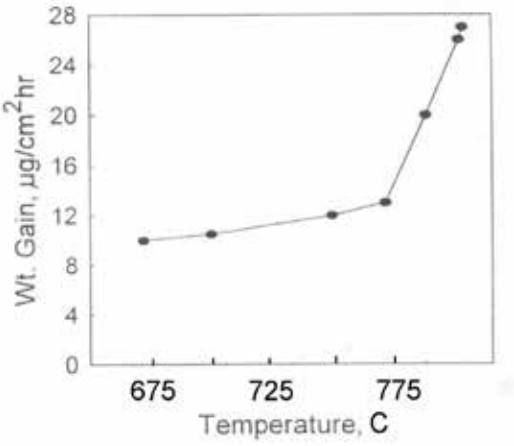
FURNACE TYPE

The furnace type is directly related to the amount of dross you create. Here are some known industry standards:

1. Electric wet bath reverberatory melters lose less than 1% in metal melt loss.
2. Natural gas-fired wet bath reverbs low headroom loses 2-4%
3. Gas-fired high headroom wet bath reverbs lose 4-5%
4. Gas-fired dry hearth furnaces lose 7-12%
5. Tower jet or stack melters lose 5-7%

These results are dependent on what's charged into them to melt and assumes the worst-case scenario. Lightweight scrap materials account for 60% of the load and 40% ingots, and melting all sows or T-bars will reduce metal melt loss.

The driving factor for metal melt loss is the weight to density ratio of what you are melting. Lightweight scrap oxidizes faster and over a greater area than a dense 1,000 pound sow. Unfortunately, we can't change the laws of physics. If you melt aluminum in a combustion-rich atmosphere, it will oxidize and you will lose more metal.



By melting metal under the surface of the bath, you greatly reduce the oxidation process and limit it to only the surface metal in the bath. Batch melting creates more dross than even continuous charging because the metal is up out of the aluminum during the batch charge, so more

metal is exposed to the oxygen and this results in higher metal melt loss. Some furnace companies think designing the burner to have flame impingement on the bath helps the melting process, but it actually increases dross as you severely superheat the metal surface.

Metal and atmospheric temperatures are extremely relevant to dross formations. For every 50 degree rise in metal temperature above 1400 degrees F, you increase dross by 100%

Dross formation increases as thermal head in the furnace increases. Holding furnaces with lower thermal head temperatures produce much less dross. Holding metal in general produces far less doss than melting metal. But when melting using oxy fuel or oxygen enriched burners, be careful where the flame envelope ends. These burners produce super hot flames that can drastically overheat your aluminum and cause an increase in dross formation.

Several aspects of the furnace itself can lend to increased dross. Charge rates, hold to melt ratios and:

- The hourly-rated capacity every 15 minutes
- 8-1 hold to melt ratio
- The temperate of the charge
- The type of charge
- Sludge factor

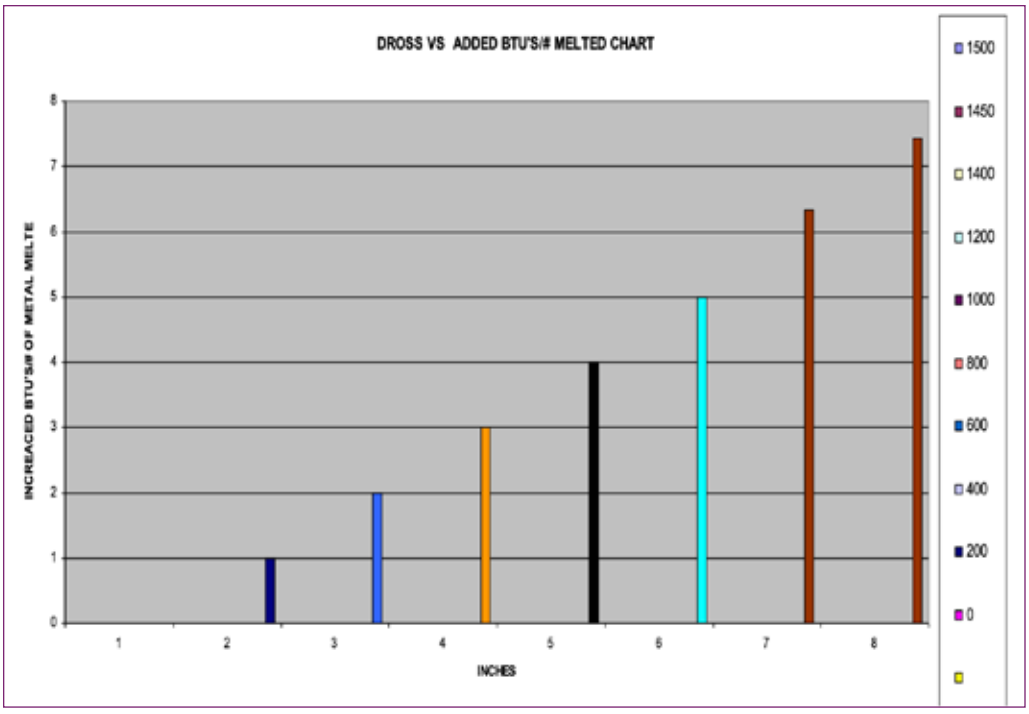
Dross can be managed if you follow some simple industry best practices:

Example #1

12,000,000 BTUs
100,000 SCFH air
12,000 SCFH natural gas

Chamber temperature = 1900 Degrees F out of ratio

Results: lower production, temperature, efficiency, increases maintenance and more dross.



Example #2

12,000,000 BTUs
120,000 SCFH air
12,000 SCFH natural gas

Chamber temperature = 2100 Degrees F stochiometric

Results: higher melt rate, temperature, and efficiency with less Maintenance and less dross.

If aluminum oxide formations are left on the hearth and walls after each cleaning, this will drastically reduce refractory service life. Good furnace maintenance is something only you can control.

Oxide-latent furnaces require more BTUs to melt. Oxide is more dense than refractories and absorbs more heat. The furnace must work harder to do the same job so dross levels increase.

Things to remember when fluxing for metallurgical purposes – cleaning the molten metal:

- Follow the recommendations of the flux manufacturer, but to the conservative side of quantities.
- Metal drossing and wall cleaning
- Premature wall erosion from flux attack
- Flux raises the temperature of what it touches to 3,100 degrees

Splashing metal is the #1 cause of excessive oxide growth. Keeping metal and walls clean reduces oxides growth and dross formations.

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EXCESSIVE SPLASHING CAUSES OXIDE GROWTH!

Recommended Fluxing Procedures

The following is a list of steps for flux application:

1. Apply flux to walls by broadcasting or spraying with a flux gun and use the appropriate flux (either A-128, A-130F or Amlox 109). Close door and heat for approx. 15 min. Step 1 is used only if wall flux is needed to remove build up. If not, go to step 3.

2. Open door, preheat scraping tool, scrape walls to remove build up. If build up is heavy, it will need to be taken off in layers with several applications.

3. After scraping walls, broadcast drossing flux over surface of bath (approx. 1/2 lb./1000 lb. of metal) depending on depth of dross layer.

4. Preheat rake and rabble flux thoroughly.

5. Dross layer should turn cherry red. If so, go to step 7. If dross is black, add a small amount of flux and repeat step 4 or turn on high flame for 5-10 min.

6. Rabble flux again. It should have cherry red dross. If dross is white hot, high flame was on too long. If dross is black, turn high flame back on for 5-10 min.

7. Pull dross to charge well. Rabble the dross in well to recover more metal.

8. Skim well, tapping skimmer to release additional metal while removing.

9. Use proper tools for the job.

10. Clean quickly and carefully.

11. Do a thorough job.

Circulations Effect on Dross

The alloy remains constant throughout the furnace when circulating properly. We recommend 5-7 volume changes an hour. This will keep a uniform temperature in the furnace, which will result in less dross and oxides formed. That's because there is now no superheating of the surface of the metal. The BTU absorbed into the aluminum are distributed into the flow from the circulation and results in much lower surface temperatures (60-90 degrees F).

This is beneficial because:

- You save money of metal and refractory relines
- It's easier to clean a clean furnace
- You save energy because of the density of hard oxide

Auxiliary Equipment

Every foundry secondary or die caster that produces dross should consider all the methods of recovering metal from that dross. There are rotary furnaces for large volumes of dross. For medium producers of dross, there are large dross presses that squeeze the aluminum out while it's still hot and can even pour it back into the furnace while molted, which lowers costs because you don't have to re-melt the metal. The third method is for smaller dross producers or those that want to do it with portable devices at each furnace. Dross stirrers work very well. This concept allows the furnace tender to place the hot dross in this bowl and apply additional flux, then allow the unit to stir the flux into the dross, which further reacts with the aluminum to remove it from the dross.

It doesn't make sense to pay someone else to get the metal out of your dross when you can recover it yourself. You can even pay for the investment in less than 12 months.

There is money to be saved by recovering your own aluminum from the process, reducing scrap, and having cleaner furnaces. This amounts to hundreds of thousands of dollars a year for some foundries, secondaries, and large die casters. Appoint a metal saving guru within your organization to manage the metal you melt and send off for reclamation. This person will pay for themselves many times over.

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

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

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