Determining a Customer's Needs to Achieve Objectives & Goals

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ARTICLE TAKEAWAYS:

- Matching capital equipment features to your melting goals
- Common holding and melting furnace advantages

One of the most frequent questions we get asked is, "What is the right furnace for my operation?" While we understand you are making aluminum castings either by die casting, permanent mold, sand castings, tilt pour, investment casting, or lost foam—much more needs to be known to properly support your production facility.

Capital equipment is expensive and needs to be long-lasting, therefore, we really need to understand your goals and objectives (now and for the future) before recommending the type and size of furnace needed.

Setting your goals in priority is critical. Some foundries are setting very high safety goals whereas others are focused on reducing energy costs as their top goal. Once we know your priority, selecting the correct furnace is that much easier. When thinking of your top goals, consider: increased safety, lower up-front costs, higher quality melt, reduced energy costs, metal melt loss and carbon footprint reductions.

After your top goals are established, then we need to understand the objectives by each goal. This will include quantifying either reductions or increases that you are looking for by each of your top goals. For example, if you are looking to reduce your energy costs as your top goal, what reductions are you looking for?

After top goals and objectives are established then your furnace provider will need to understand your melting operation. These questions will guide you:

- **What alloy are you using?**
- **What temperature do you want to melt/hold the molten metal?**
- **Are you melting ingot, sow, t-bar, scrap, or all of these?**
- **What is the size of the material being charged?**
- **Will you be alloying or modifying the metal in any way?**
- **Do you want to melt chips or recover inserts from our parts?**
- **How much space do you have to work with?**
- **Are their any height limitations?**
- **Are there needs for auxiliary automation equipment?**
- **Are there needs for circulation or transfer pumps?**
- **Are there needs for degassing?**
- **Do you want gas, propane, oil, or electric-fired furnaces?**
- **Do you want to look at central melting or in-cell/machine side melter holders?**
- **Understanding your plant layout and any future considerations.**

An experienced furnace company can help you make the best decision that best meets your goals and bottom line. These are just a few of the important questions that need to be answered to assist in determining the correct furnace for your production.

Here is a basic overview of each type of furnace:

Electric Holding & Melting Furnaces

Electric melters and holders have far lower metal loss than a fossil-fueled furnace either at or below 1%. Melting can be accomplished at .20 -.23 kW which equates to approximately 785 Btu per pound and holding in our low energy holders that uses electric immersion elements can be accomplished in the 18-20 Btu per pound range if you convert the electric usage to Btus. We believe with the carbon reduction push that this will be the

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foundry of the future using electric melter holders at the machine to give high-quality inclusion-free aluminum to the machines.

Fuel Fired Stack Melters

This type of furnace is typically used for ingot and scrap melting only. This design is an offshoot of dry hearth as the ingot are loaded into a tall tower (stack) type flue where the stack is supposed to be kept full. At the bottom of the stack is a sloped dry ramp and usually opposing burners firing directly at the stacked-up ingot and scrap. The spent gasses co-mingle with the balance of the ingot and scrap stacked up in the tower. This allows the flue gases to transfer their heat into the load prior to exiting the furnace at a lower temperature than most other types of furnaces resulting in greater utilization of heat energy. The efficiency of these types of furnaces ranges from 900 to 1100 Btu per pound. Even though they hold less than reverbs typically hold they still take up about as much room because of their loading mechanism attached to the stack to carry the scrap and ingot up to the top of the stack and dump it. Stack melters if charged properly will be in 3% melt loss. If lightweight density scrap is charged or the furnace is not charged timely then this can increase to 5-7% or more metal melt loss.

Fuel Fired High Headroom Reverbs

Most reverb furnaces are closed box type furnaces with a bath depth of around 22-30 inches. Many have high side walls and the dimension from the molten bath to the to the underside of the roof is 4 feet or greater. These higher walled furnaces have tall door openings and usually wall fired burners. These burners usually are convective and depending on the type can cause agitation of the metal as they are trying to push the heat into the metal. The efficiency of these types of furnaces ranges from 1700 to 1900 Btu per pound. Many in the extrusion industry use this type of furnace as they have rejected extrusion sections, they need to charge that are bulky. This is commonly known as a batch melter. Most secondaries use these furnaces because of their capability to melt a lot of metal sizes range from 80,000# capacity to 250,000# and more. It is advisable to circulate the metal in these large furnaces to keep the metal more homogenous and the alloying agents in solution.

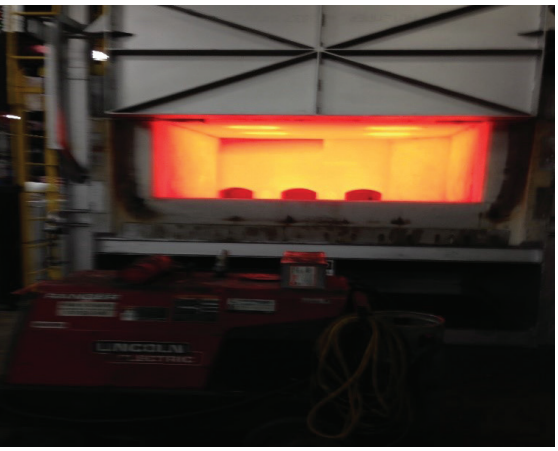
Sometimes these are referred to as Side Well Melting Furnaces taking its name from an external well that either scrap or return parts or gates and risers are charged into. These types of furnaces or versions similar are found in the die casting, foundry, and secondary industry. The external well is an ideal place to charge dirty scrap and thin sections as there is a greatly reduced metal loss when these items are melted by submersion into a molten bath versus being exposed directly to the products of combustion or direct flame impingement. The other benefit is that the coatings and volatiles are burned of in the external well that is hooded and ducted to a baghouse. Further, as most well melters have submerged openings to allow circulation of the hot metal to the well the drosses, oxide and residue from the dirty scrap remain in the well and do not enter the main chamber. The dross and residue are easily skimmed from the well metal surface. The main chamber therefore remains a little cleaner. Most of these units are as well side wall fired and have high side walls. To augment the heat transfer, the use of a molten metal circulation pump greatly increases the efficiency of these types of furnaces. The hot metal from the main chamber is pushed across the cold charge in the well greatly increasing the melt rate.

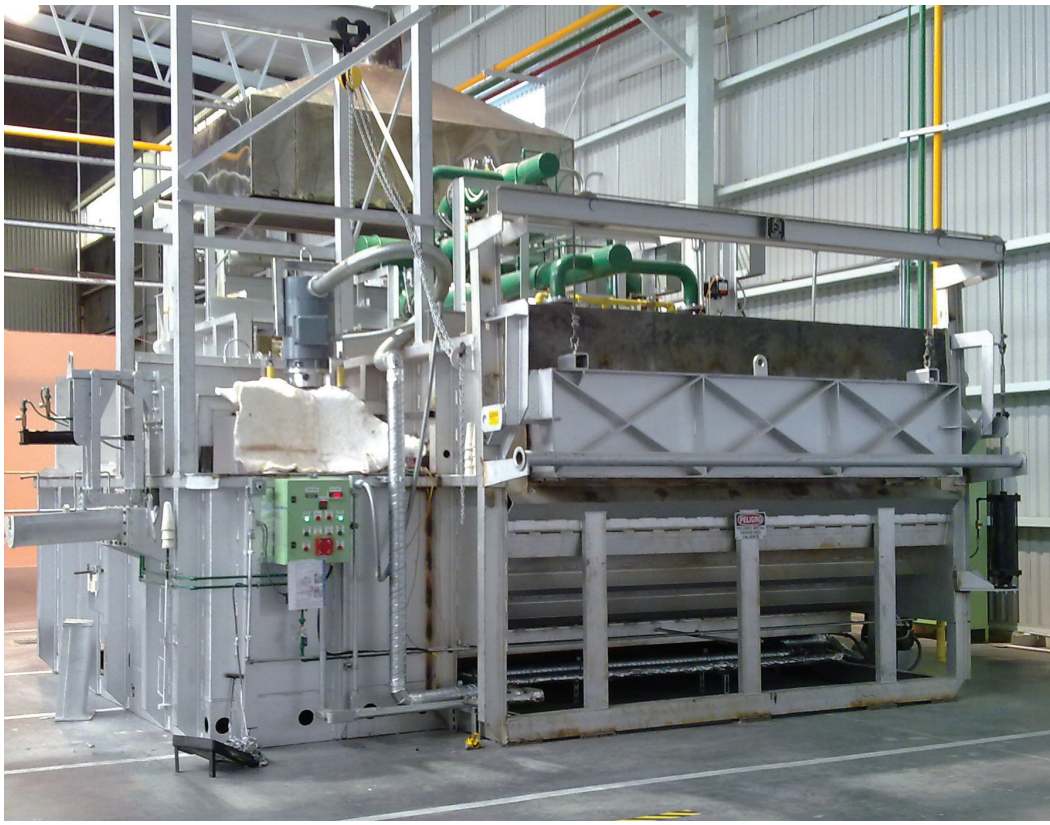
With circulation you can gain about 200 Btus/lb or 1500-1700 Btus/lb melted.

- With Recuperation system added = 1,095 Btu/lb
- With Regenerative burners added = 940 Btu/lb

Fuel Fired Low Headroom Furnace

We have spent many years refining our more efficient type of reverbatory furnace with a lower clearance from the molten bath to the underside of a radiant fired roof. As the majority of all heat





transfer in melting aluminum is accomplished through radiation, we have made this aspect central to our design. Using a series of highly radiant burners evenly distributed in the roof we bring this radiant heat source closer to the bath than other furnace manufacturers. Having the heat source close to the bath greatly increases the efficiency of the Schaefer design. We overcome the obstacle of a lower roof by then having cleaning access to the main chamber at both ends of the furnace. On many furnaces we then add component aspects that some of the other furnaces' types have depending on our customers' particular needs. Many of our units have a pre-heat hearth at one end. This feature allows for sow and ingot loading at one end in a manner without the metal losses that occur in a dry hearth as we draft the waste gasses across the sows minimizing the metal losses. Once they sweat then they are pushed into the hot metal bath where the stored Btus in the aluminum help finish the melting process.

External side wells on units that allow easy charging of returns, gates and risers back into the furnace, combined with a properly sized circulation pump for the greatest available efficiency in well melting. These extra features along with a properly insulated lining can enhance the efficiency from 1230 to 1500 Btu per hour fuel usage when melting and a furnace that provides for minimal metal losses (3-4%).

Fuel Fired Dry Hearth furnaces

This type of furnace is well suited to knock down and melt heavy solids as cold solids absorb heat readily. Solids are loaded onto a dry tapered ramp and many manufactures directly fire at solids like sows or ingot bundles loaded on the sloped ramp. The metal loss from direct impingement of the flame and burner velocities is quite high especially on lighter weight scrap. The efficiency of these type of furnaces ranges from 1800 to 2000 Btu per pound. Because there are two separate chambers (melt and hold) and two separate combustion systems, these tend to cost more than a low headroom reverb melter.

There is significant amount communication that needs to take place to determine which furnace is right for your production. Spending the time to clarify your goals with objectives will help to ensure your furnace will fit the space, and provide years of service meeting your defined production needs.

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