



The Schaefer Group, Inc.
P.O. Box 1508
Dayton, OH 45401-1508

Phone 937-253-3342
Fax 937-253-2306
www.theschaefergroup.com

The “ranking of ROI” expenditures for aluminum furnaces: or, how to get the biggest “bang for your bucks” from quickest-to-slowest investment recovery.

1. Buying the best furnace designs and most cost effective materials. In your case:
 - a. Central melt furnaces are large. It is difficult cleaning furnaces manually that are larger than 50-to-60,000 pounds hold capacity. Mechanized cleaning (fork truck and hoe) does the best job on larger high headroom furnaces. Most large furnaces have single end clean-out doors that are narrower than the interior furnace width. This makes for hidden, right-angled corners that are difficult to clean. Unacceptable oxide build-ups lead to premature relines and impaired efficiencies.
 - 1) The solution is superior access to the furnace interior through full width double-end doors. The floors should have gentle transition slopes from door opening hearths-to-the-flat portion of the floor (no greater than 35”) so that the furnace can be easily cleaned for “sludge” on the floor.
 - 2) It pays to not go “cheap” on the hot face furnace linings. Modern central melt furnaces have 80-to-90% alumina non-wetting hot face linings. They are easily cleaned (build-ups are easily removed), rugged and will not penetrate at the all important “belly-band” area (molten metal contact area).
 - a) Premium hot face linings pay. We recommend Stellar’s Thermbond Formula 5 and 4 materials.
 - b) If you do use the cheaper hot face linings, a product like 70-to-85% alumina phos-bonded plastic refractory will hold up better in a melter than the same alumina content non-wetting low cement castables.
2. Spend the money to super insulate the furnace linings. New products, such as micro porous silica insulating materials will save a huge amount of “fixed heat loss” energy. If the lining is properly engineered, the all-important “freeze plane” will still occur in non-wetting lining materials. This is a case of your being able to “have your cake and eat it too”. These super insulating products normally add about \$18.00/sq. ft. to the cost of the furnace lining, but they normally provide about a 6-to-12 month ROI.

3. Sow pre-heat hearths are a wise investment. If 50% of the aluminum you melt is new metal (typical of a foundry with a 50/50 yield), and 50% is scrap and returns melted in the charge well, the metal pre-heated for about 30 minutes on the hearth and then pushed into the bath will save 10-to-12% of the normal energy required to melt the metal if it were all cold charged into the bath.
 - a. This method of preheating and charging normally provides about a 20-to-24 month ROI, based on 5,200 hours of melting per year.
4. Circulation of the molten metal within the furnace bath (from the charge well-to-the-thermal head chamber-and-back) has the advantage of saving another 10-to-19% of the energy that it takes to melt the aluminum, reduces melt loss through enhancing more rapid melting and reduces sludging by convectively maintaining a homogenous bath temperature. In recent years great strides have been made in improving molten metal pump efficiency and drastically reducing their need for maintenance.
 - a. Typically, circulation pumps, and the wells into which they are designed, have a 24-to-28 month ROI.

[NOTE: if the first four items above are furnished on a furnace, a fully utilized central melter will now be melting at about 1220 BTU/pound in a SGI radiant roof-fired reverb furnace, and at about 1,320 BTU/pound in a SGI high headroom wall-fired furnace. This is all being accomplished in a wet-bath reverb furnace, which absolutely provides the aluminum foundry the lowest metal melt loss by several percentage points.]

5. Pre-heated combustion air through a regenerative combustion system, added to the features mentioned above, will drive the energy consumption down to 900-to-1050 BTU/pound of aluminum melted in a fully utilized melter. Because of the efficiencies of the first four items above, the added cost of the regenerative combustion system takes about 8,400 hours of full capacity operation per year of \$7.00/MCF natural gas to yield a 60-month ROI. Escalating energy costs can shorten the ROI drastically.