Storvik´s Casting and Holding Furnace Tending Tools and Best Practices

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Abstract

Storvik has been servicing the aluminium industry globally for many years and has been focusing on identifying and developing improvements and cost saving projects that can benefit all our customers.
One of those very successful projects is our “standardized” cast iron furnace tending tool line-up and standardizing best practices in furnace tending.
Storvik´s development of the tool line-up was done in close cooperation with the end users to ensure the absolute best result and customer satisfaction. Storvik has proven in cooperation with our customers that implementing our tools and best practices generates savings in the following areas: Tooling cost, energy savings, dross handling, furnace maintenance cost, etc. In addition, our tools and best practices greatly reduces HSE issues around the conventional furnace tending, the furnace area is rated to be one of the highest HSE risk area in the Aluminium industry.

Keywords: Cast iron casting and holding furnace tending tools, best practices, process improvements, reduced traffic in furnace area, improved HSE.

1. Introduction

Cast house furnaces can be found in many shapes and sizes within the aluminium industry, they might be using gas as fuel or be electrically heated, but in the end, they all serve the same purpose of re-melting, holding and casting, they also all need basically the same furnace tending.

Metal handling to and within the furnaces basically consists of metal transfer, alloying, stirring and finally skimming of dross from the top of the metal in the furnace, the dross formation is sadly an unavoidable and costly by-product that all cast houses need to deal with. As stated in [1]:

“Aluminum dross is generally valued on a recovery basis, which necessarily involves accurate sampling and evaluation. Since most drosses are a heterogeneous mixture of large lumps, fine oxides, and small pieces of metal, sampling and assaying requires considerable work and experience.

Aluminum dross is a mixture of free metal and nonmetallic substances (e.g., aluminum oxide and salts). Aluminum nitrides and carbides may also be present, as well as metals oxides derived from the molten alloy. The free-metal content of the dross depends on how carefully skimming from the melt was executed, the composition of the molten alloy, the fluxing, and the dross-cooling process.”

Tables 1 and 2, show an example of chemical composition of dross.

Table 1. The range of physical and chemical properties measured [1].

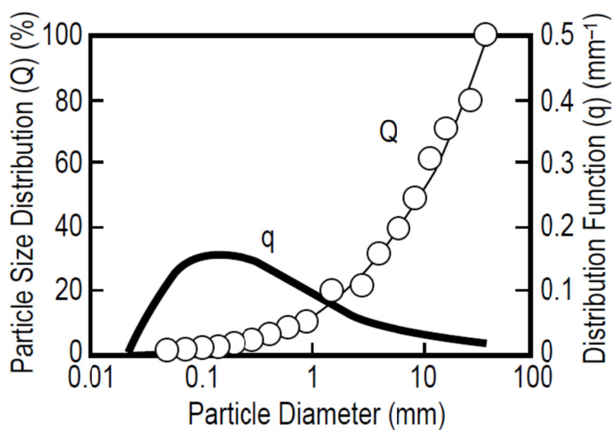
Properties	Granular Dross	Compact Dross
Alloy Content (%)		
Melt	2.44–11.77	1.34–10.03
Recovered Metal	1.03–5.51	0.33–6.80
Distribution(q) (mm^{-1})	0.08 (coarse)–0.452 (fine)	—
Density (t/m^3)	0.828–1.118 (bulk)	2.396–2.528 (apparent)
Metal Content (%)	46.9–69.1	71–93
Lixiviate (pH)	9.52–10.14	9.03–9.48
Salt Content (%)	0.18–6.21	0.01–0.03
Gas Evolution (l/kg dross)	0.25–1.17	No evolution

Table 2. An example of a dross identity card [1].

Bulk density: 0.975 t/m^3, Metal content: 61.8 %, Leaching test: pH: 9.80, Electrical conductivity σ = 0.912 S/m, Salt content: 2.8 %, Gas evolution: 1.7 L/kg dross.

Dross No. 1, Granular	Mg	Si	Cu	Mn	Cr	Fe	Zn	Ti
Melt Specification: AlMg3, 3.3535, DIN 1725[7]								
Maximum	3.60	0.40	0.10	0.50	0.30	0.40	0.20	0.15
Minimum	2.60	0	0	Mn + Cr = 0.6		0	0	0
Melt Composition (Alloying Metals = 3.60%)	2.79	0.12	0.05	0.22	0.03	0.30	0.06	0.03
Composition of Recovered Metal (Alloying Metals = 1.05%)	1.01	0.37	0.09	0.15	0.02	0.29	0.11	0.03

Particle Size Analysis: q = 0.155, medium



Storvik's investments in R&D and improvement projects has been generating many interesting new products for the aluminium industry, just to name a few from the same category as the main focus of this paper. Figure 1, shows samples of the products:

- Tapping tubes with improved design and lifetime
- Furnace spouts with improved design and lifetime
- Moulds with improved design and lifetime
- Tools with improved design and lifetime
- Crucible lining with improved design and lifetime
- Etc.

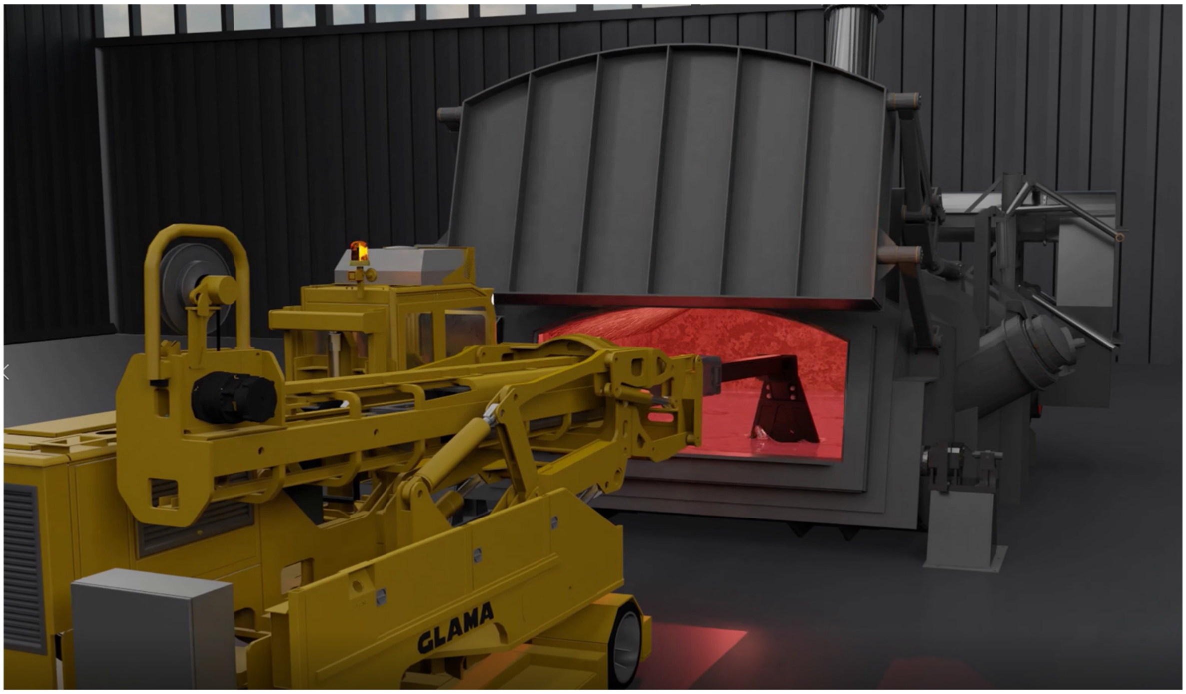


Figure 13. Stirring process with GLAMA (FTV).

9. Conclusions

Customers, which have fully implemented Storvik´s furnace tending tools and best practices, have documented the following:

- Less tooling cost
- Shorter preparation time of furnaces
- Less dross formation
- Less metal in dross
- Energy savings
- No iron contamination from tools*

*Iron contamination from regular mild steel furnace tending tools can be a big problem for some producers as some alloys need to have extremely low iron content, which can be hard to achieve, especially for the aluminium recycling industry which in many cases is already fighting with iron contaminated scrap, too high iron content can also occur in the primary sector in case of unsteady pots in the pot rooms (often happens after power outtake or other electrical interference).

10. Reference

1. O. Manfredi, W. Wuth and I Bohlinger, Characterizing the physical and chemical properties of aluminum dross, *JOM*, November 1997, 48-51.