Gas Treatment and Improvements for More Than 40 Years at the Hamburg Trimet Smelter

Elmar Sturm[1], Lorenz Struck[2], Anders Sørhuus[3], Sivert Ose[4] and Eivind Holmefjord[5]
1. Former Potroom Manager HAW, Consultant
2. Project Engineer THH- TRIMET Aluminium SE
3. Product Technology Manager
4. Technical Lead development projects
5. Senior Process Engineer
GE power, Centre of Excellence -Aluminium , Oslo, Norway
Corresponding author: anders.sorhuus@ge.com

Abstract

The dry scrubber installed at the Reynolds Aluminium Smelter in Hamburg 1973 by Fläkt marked one of the first alumina injection type dry scrubbers installed world-wide for the capture of HF gas from the aluminium electrolysis process. Even if both companies have changed names and owners since 1973, a successful relationship has continued during more than 40 years of joint development and technology sharing that has resulted in many smaller and larger improvements that are implemented on daily basis, and that will be summarized in the paper including:

- Impurity stripper (1984),
- Pre-reactor (1999/2010),
- Impulse duct development (2004),
- Ongoing first of kind Fume Treatment Center (FTC) Heat Exchanger System (AHEX), AHEX-FTC (2017).

The impurity stripper helps producing high purity metal in the forefront of current efficiency. The pre-reactors have enabled the existing dry scrubber from 1973 to achieve state of the art performance. The impulse duct enables smelters all over the world to operate Gas Treatment Centres (GTCs) with less energy requirements. The ongoing first of kind AHEX-FTC project marks a new beginning for the anode bake furnace fume treatment technology as a first industrial implementation more than 40 years after the first dry scrubber was installed.

Keywords: Gas Treatment Centre (GTC), impurity stripper, impulse duct, Abart, AHEX-FTC

1. Introduction- Improvements over 40 Years- Timeline

Over the past 40 years the aluminium primary smelter located in Hamburg commissioned by Reynolds Aluminium in 1973 have seen several name changes and owners/consortiums such as HAW owned by Alcoa, Amag, Hydro and finally today Trimet. Svenska Fläkt, later ABB, Alstom and today GE was invited to install their first of kind dry scrubber for HF capture and recovery to meet the environmental challenges at the time the smelter was built. The successful application of the dry scrubber gas treatment technology at Hamburg was instrumental for the introduction of this technology that still today dominates the gas treatment of the aluminium electrolysis pot gas worldwide.

The basic principle of dry scrubbing the HF gas on alumina in the injection type dry scrubbers implemented in Hamburg in 1973 is still the preferred basic method for HF pot gas removal and recovery back to the pots. However, over time many innovations and improvements in the dry scrubbing technology has evolved. With each step in dry scrubber technology innovations, the Hamburg smelter has been quick to install upgrades in order to always be in the forefront environmentally, and this remains today with the GE's first of kind AHEX-FTC technology under

construction in Hamburg to achieve the lowest possible emissions, and energy recovery from the anode bake plant.

This paper will summarize the main joint developments and upgrades implemented in Hamburg including the pre-reactor two stage Abart retrofit, impulse duct to reduce the pressure drop, and the impurity stripper installation to remove undesirable elements such as P_2O_5 and Fe from the recycled alumina, and finally the expected results for the AHEX under construction.

2. The Trimet Hamburg Smelter

Figures 1 - 3 show the Trimet Hamburg smelter, the GTC and the impurity stripper. A total of 270 pots in 2 potlines produce 135 000 t Al/year. Each pot has a normal suction of 4900 Nm^3/h, and the pots are equipped with dual position dampers able to increase the suction by 30 % during pot operation. The total gas flow of 1.5 million Nm^3/h is treated in 4 gas treatment plants; SF1, SF2, SF3 and SF4, each with two clean gas stacks located as shown in Figure 2. All four plants are retrofitted with pre-reactors (SF1 and SF2 in 2011, and SF3 and SF4 in 1999/2007.

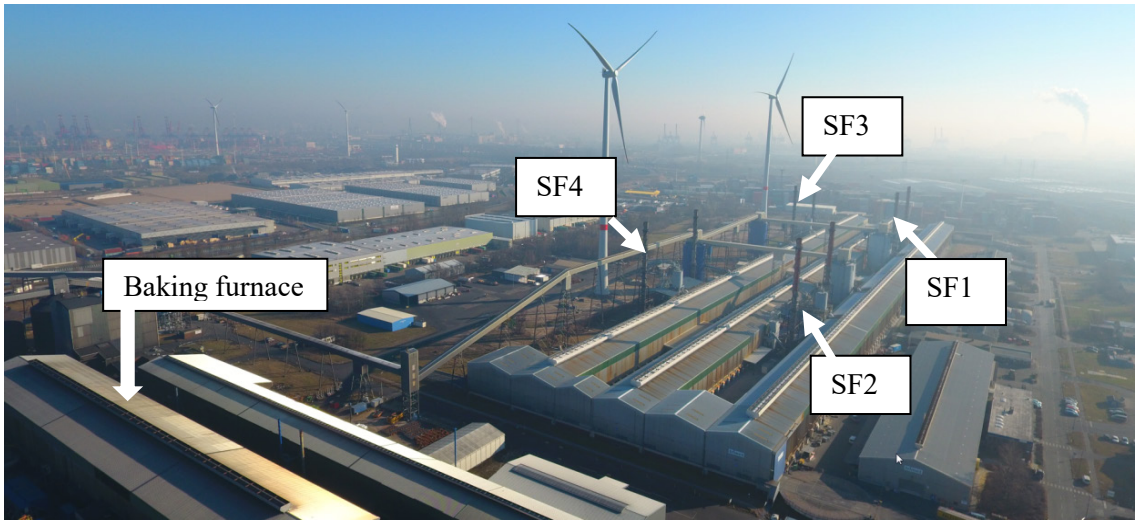

Figure 1. The Trimet smelter.

Figure 2. Gas treatment plant (SF3).

Figure 3. Impurity stripper (SF4).

9. References

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