Upgrade of Fume Treatment Plants 1 and 2 of D18+ Potline in EGA Jebel Ali Smelter

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Abstract

Hydrogen fluoride (HF) emissions from potlines in aluminium smelters are treated in Fume Treatment Plants (FTPs) or Gas Treatment Centers (GTCs). In EGA these installations are called FTPs in Jebel Ali and GTCs in Al Taweelah. Many studies and continuous improvements to increase their efficiency have been made. It is very easy to have high efficiency of new FTP/GTCs but it is an entirely different story to upgrade a more than 35 years old FTP, which was designed for 5 000 Nm^3/h per pot at 163 kA. The aim of this paper is to describe the challenges encountered during the upgrade of FTPs for D18+ potlines in EGA Jebel Ali, which now have to provide 6 000 Nm^3/h per pot at 242 kA. The reasons of high HF emissions during the upgrade will be explored and actions taken to control them will be discussed. These include: designing auxiliary air entry in two locations, temporary mini airlift, optimizing the alumina strategy and optimizing alumina distribution in individual compartments. Recommendations for the control of HF emissions during the upgrade of the old FTPs are given.

Keywords: EGA D18+ potlines, Fume Treatment Plant (FTP), Gas Treatment Center (GTC), HF emissions.

1. Background

1.1. Introduction

In 2015, it was decided to upgrade Potline 1 (PL 1) and Potline 3 (PL 3) FTPs in EGA Jebel Ali to handle amperage increase from 180 to 225 kA. Unfortunately, FTP operation had to overcome several challenges during this upgrade project as follows:

1- High HF emission during upgrade and commissioning,
2- Continuous compartment build up,
3- Secondary system by-pass system (buffer silo and secondary silo filling),
4- Secondary silo filling,
5- Feeding system.

Many actions were taken to overcome the above challenges. However, this paper will focus on one of the main challenges during the upgrade which is the high HF emission.

1.2. Methodology

In this study, the measurement methodology used is Boreal online measurement system and NEO Monitors, Model LaserGas III Portable HF sniffer. Both systems work by sending a laser beam to a receiver on the other end of the device and compare the wave lengths of the sample collected with the reference cells. The difference between the two devices is that the Boreal online system is fixed at the stack and requires no pump while the NEO sniffer is portable and has a pump to pump the collected sample into the device and analyses it.

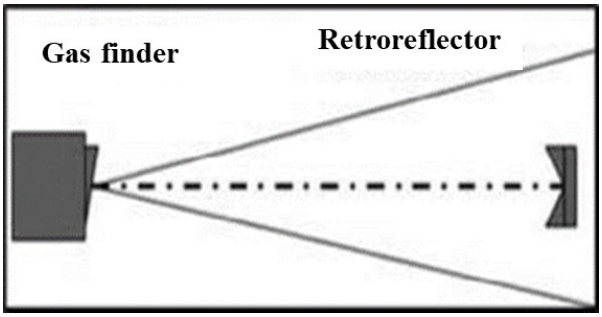

Figure 1. Boreal online measurment system.

2. Control of High HF Emissions during the Modification of the Plant,

To control the high HF emission to below the set target of 7 mg/Nm^3 during the modification of the plant, the following actions were taken:

- False (auxiliary) air entry in 2 locations,
- Temporary mini airlift,
- Optimizing alumina strategy,
- Optimizing the alumina distribution in the individual compartments.

2.1. Auxiliary Air Entry in 2 Locations

It was suggested to introduce auxiliary air entry to dilute the HF emissions by opening two false air flanges at the end of the section. Also, the manhole hatch on the main header was opened to allow more air to cool the gas temperature and therefore, reduce the HF emissions.

The advantage of introducing auxiliary air entry is that the HF emission was reduced by 13.6 % (from 4.19 mg/Nm^3 to 3.62 mg/Nm^3) as can be seen from Figure 2. The drawback of this solution is that the suction rate of the end pots is reduced below the requirement. Therefore, the decision was taken to abandon the auxiliary air entry.

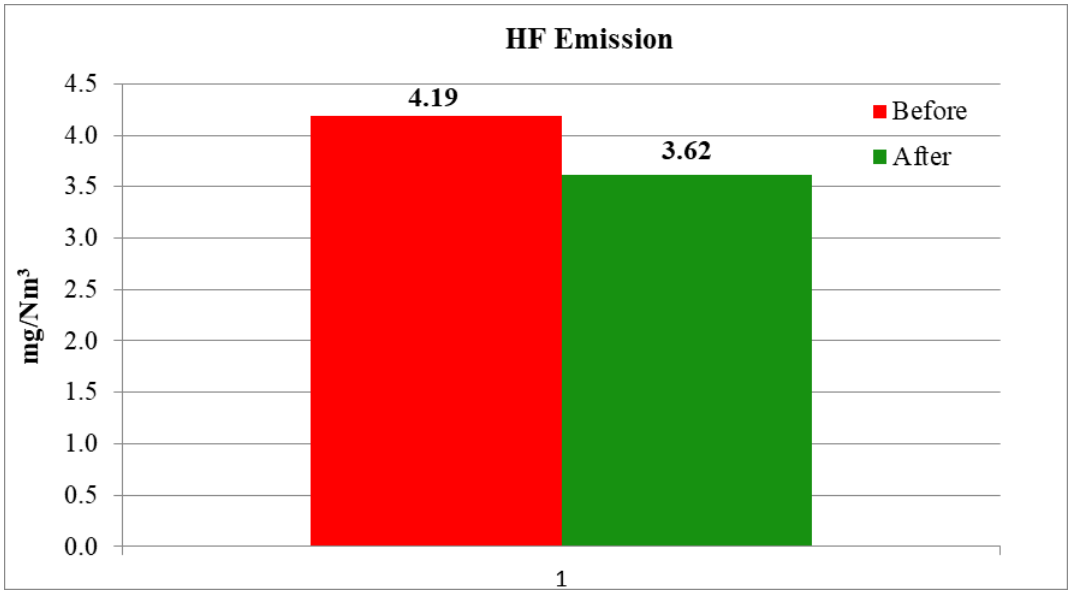

Figure 2. HF emission before and after auxiliary air entry.

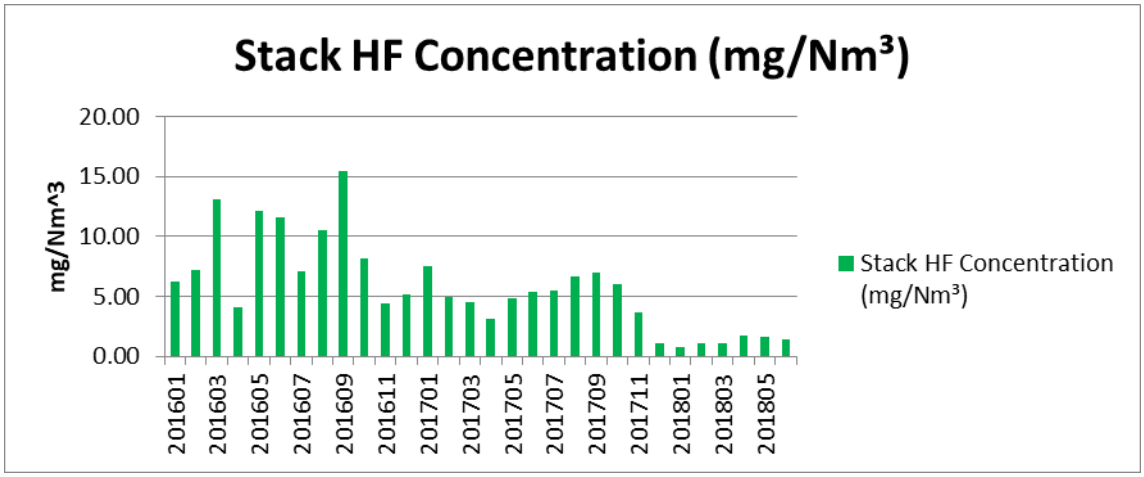

Figure 8. Stack HF emission in EGA- JA from 2016 to 2018.

4. Conclusion

When 50 % of the horizontal reactors in the plant are converted to act as part of the duct, the HF emission will rapidly increase due to the low capability of the plant to treat the gases. The best method to control the HF in the upgrade is to optimize alumina strategy and the alumina flow into the individual compartments.