EGA Pot Feed Systems Challenges and Solutions

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Abstract

Emirates Global Aluminium (EGA) adopted several pot feeding systems (PFS) through the past 44 years. Each system has its advantages and challenges. This paper explores the PFS installed in EGA to provide secondary alumina for production of standard purity (SP) metal, and the challenges with each system. The results of previous trials to overcome these challenges, and to optimize the feeding system to provide consistent feeding are presented. There are eight different PFS currently available in EGA. Each of these systems is categorized as continuous-filling system or time-based filling system. In this paper, all those systems will be compared on the basis of certain criteria and solutions to overcome some of their challenges.

Keywords: Pot feed systems, Consistent alumina feeding, Alumina silo level, Anode effect frequency.

1. Time Base PFS- Crane Filling System

The first pot feed system (PFS) is crane filling system which is time-based. It is one of the oldest types of PFS available in EGA. It works by having two discharge points at the bottom of the secondary silo, one to each potroom. Each discharge point is connected to A and B rooms through an air slide conveying system. The flow of material of the air slide is controlled by a rotary feeder that opens and closes automatically from the control room. Once the semi-rotary feeder opens, the fluidization of the air slide connecting it to the cranes in the potrooms, opens automatically and alumina is filled into the 30-tonne crane, which is shown in Figure 1. This PFS has good tolerance with respect to alumina property changes and relatively high reliability with low maintenance on the Fume Treatment Plant/Gas Treatment Centre (FTP/GTC) side. The crane filling system average availability is 99.93 %, as shown in Figure 2. Despite high availability of this system, it still has a lot of challenges. The major challenges and solutions are summarised in Table 1.

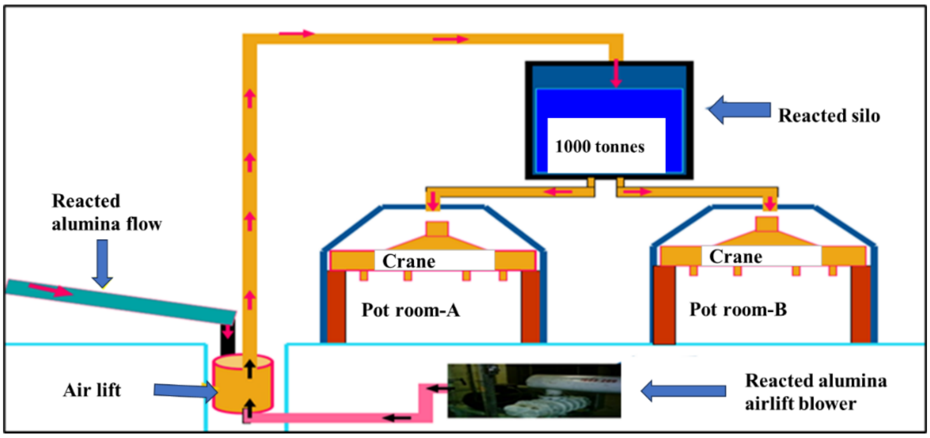

Figure 1. Crane filling general layout.

Table 1. Crane filling challenges and solutions.

Challenges	Solution /Improvement
One of the biggest challenges with this system, which has resulted in tripping the secondary conveying system followed by an unauthorized release of hydrogen fluoride (HF) to the environment, is the unavailability of the crane to supply alumina on time due to busy crane usage in other potline activities, such as anode changing.	To overcome crane unavailability, EGA has created a daily dashboard to identify if it caused by a supply and logistic issue, or by human behaviour in particular shifts, or by other reasons. Once this was put in place, the abnormal emissions reduced slightly as we have addressed the issues on time.
Inconsistent fine alumina discharge from the silo due to filling of cranes simultaneously in the same room.	Introduced an interlock in the system to avoid simultaneous filling.
High quantity of fine alumina discharge when the silo level is low.	Introduced an interlock in the system to restrict the crane filling if the silo is lower than 65 %. (silo capacity is 1000 t).
Mixing of alumina and anode cover recycled material (ACRM) as both silo discharges share the same air slide. Due to the increasing gap in the semi rotary feeder plates, ACRM seeped to the common airslide segment. Refer to Figure 3 for more details.	To solve the issue of alumina mixing with ACRM in the common air slide, the fluidization of the common air slide was adjusted and the semi rotary plats gap has been monitored and corrected quickly if an event takes place.

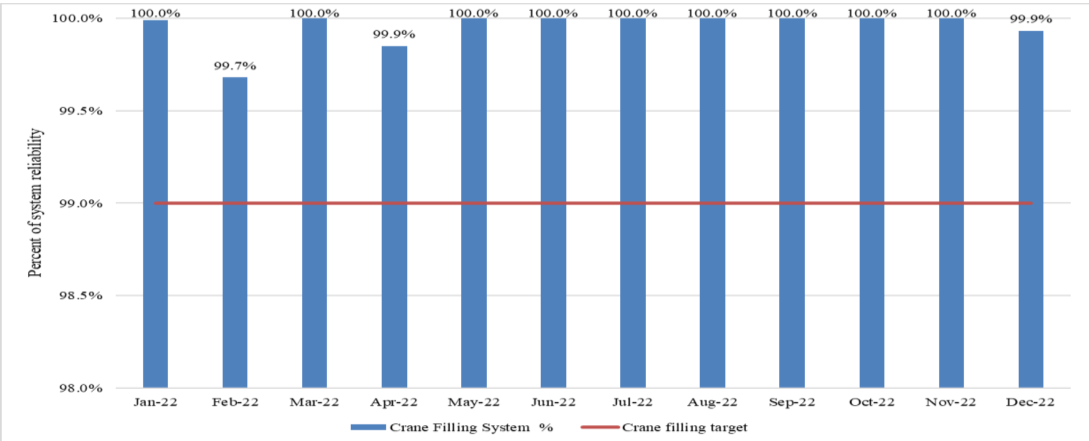

Figure 2. Crane filling system availability.

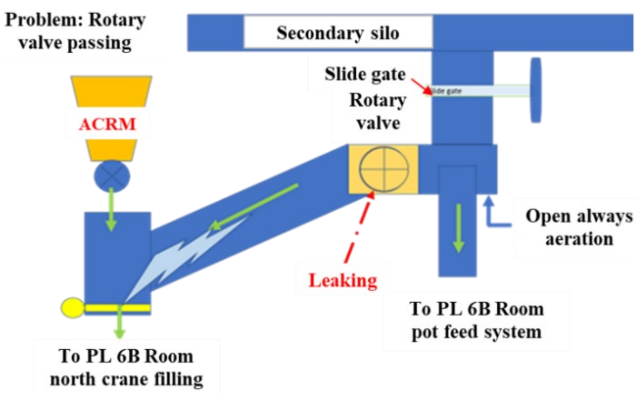

Figure 3. Crane filling system semi rotary feeder leaking ACRM.

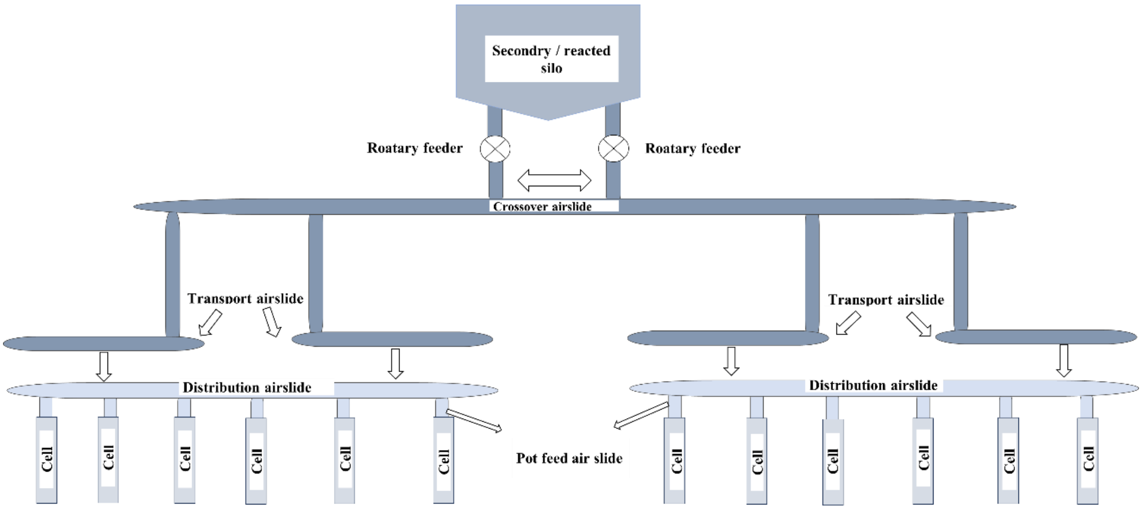

Figure 15. Continuous PFS - System C.

7. Summary

This paper discussed all different PFS systems that EGA has been using throughout the last 40 years. These systems are compared in terms of their resistance to alumina properties change, breakdowns and performance consistency. Based on the previous criteria, the reliability of the different PFS is compared in Figure 16.

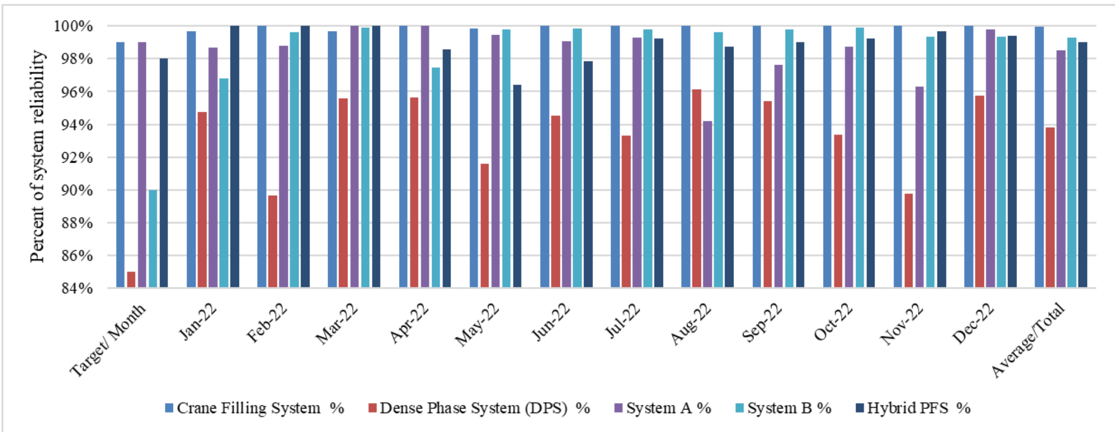

Figure 16. EGA PFS reliability.

8. Conclusions

Based on the presented data, it should be noted that, in general terms, the reliability of the continuous pot feeding systems is higher than the time-based pot feeding systems. Besides the crane filling system, PFS -System C is the most efficient in compressed air consumption and it had only minor issues during commissioning when compared to the other systems. Moreover, PFS - System C is found to be more robust to cope with changes in alumina properties. All-in-all, there are many improvements opportunities that can be adopted in the varies pot feed systems in order to further enhance the efficiency and its reliability.