

Environmental Improvements at Albras through Joint Venture Project

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Abstract



Although the environmental collaboration between Albras and Hydro trace back to 2003 as an environmental audit, the effort was re-enforced in 2013 after obtaining Vale's shares in Albras when Hydro acquired Alunorte. The task then was to assess the Gas Treatment Centres (GTC) capabilities and capacities, which after 2003 were expanded with new technology chambers and ducting resulting in a complex duct layout. The GTCs themselves demonstrated to have more than sufficient capacity to handle and scrub the prescribed amount of gas containing gaseous and particulate fluorides. Lack of balancing, i.e., the distribution of gas suction from each pot, was however identified, resulting in cells with leakages to the environment. A simplified method for obtaining balance was developed so that the operators could maintain this themselves as part of operation. Moreover, the superstructure did not distribute the suction evenly internally, and the ducting from the cells towards the GTC had issues such as abrupt cross-sectional changes and lack of cross sectional area giving high pressure drop and reduced suction capacity. In addition, the alumina feeding system was incapacitated due to malfunctioning fluidisation. By simple actions these issues have been corrected and to some extent implemented at Albras.

Keywords: Gas Treatment Centre, capacity, balancing, gas ducts.

1. Introduction and Background

The Albras Smelter was started up 1985 to 1990 with the existing technology of AP13 and AP14, which at that time were free from technology fee. The suction rate in the former gas suction system was 3 960 Nm³/h per pot. Albras was then expanded in 2000 - 2001, with 96 new cells and current creep combined with a suction rate up to 4 600 Nm³/h, also implemented for all cells. The latest big change came in 2008 when the entire gas suction system and new dry scrubber GTCs were introduced. In Figure 1 the historical beginning and development are shown.



Figure 1. Historical Collage Albras.

In August 2000, Hydro Aluminium carried out a technical audit at Albras. The audit report put emphasis on benchmarking and process operation. The technical audit report further concluded that the emissions from the pot rooms were too high. Based on the recommendations from the technical audit report, an environmental audit was done in March 2003. The environmental audit report determined the status of the plant with respect to efficiency of pot room ventilation, cell hooding, gas collection and ducting, raw material handling and gas scrubbers. A detailed list of suggestions and recommendations were presented in the “Environmental Audit Report for Albras”. This report has later been used as a roadmap for the Environmental efforts carried out in the collaboration between Hydro and Albras.

In 2013 the collaboration work was re-vitalised, due to Hydro’s increased shareholder position. High and increasing fluoride emissions was one of the first focus points for Hydro.

The work group then started a root cause analysis of the emissions, and found the following focal points:

- GTC capacity and status
- Super structure (cell) hooding
 - Suction
 - Distribution of suction
- Main Ducting for gas collection.

It was quickly assessed that the GTC filter capacity on paper should be sufficient for the operation, the cause had to be found elsewhere. By following the process scheme from production source back towards the GTC, the internal flow-distribution was measured for a superstructure that was ready for start-up, and a skewed suction profile towards the suction end was discovered. After this discovery, the task became to remove bottlenecks going from the cell to the GTCs.

2. Gas Treatment Centres (GTCs) Assessment

The Albras smelter consists of 4 potlines. The smelter has a total of 960 cells, and 19 separately operated GTCs. The layout of dry scrubbers in Albras is as shown in Figure 2 below. It is divided into Plantas 1 through 5. Where:

- Planta 1 & 2 is type Fläkt (now GE) of the 1990’s
- Planta 3 is Type ProceAir (now Solios) of 2001
- Planta 5 is Type Alstom (now GE) ABART 600 of 2007

fabric is that the availability of the PTM increases. This because the filling and discharge intervals now fits with the consumption of the cell and the silo volume. However, increasing the Line current will interfere with this balance and some correction must be done in the future.

4. Conclusions

The collaboration between Hydro and Albras, seen from a GTC/ Environmental point of view, has been materialising itself in various implementations. The improvements have been low cost with high impact, preparing Albras for future production increase and better process stability.

The GTCs have been assessed and found sufficient - given that the surrounding facilities are working adequately, i.e. systems such as ducting and raw material feed.

A method to ensure good utilisation of the GTCs, an effective simple method of keeping the suction balanced between the cells, has been invoked, and are giving results.

Internal suction balance of the cells has been defined, and are currently implemented on 62 % of the cells, and the results are demonstrating better hooding.

Potential to increase suction from cells and at the same time save fan energy has been found through optimisation of the electrical insulation part and are currently being implemented on the cells, 6 % up to now.

Experience concerning type of fluidising fabric has been shared. 26 % of the cells are now up-graded, and the alumina silos on these cells are now functioning as intended and should last longer, increase the filling intervals and the availability for the Pot Tending Machines.

5. Further Work

During the collaboration, an external supplier for side covers has been involved, and currently a test batch of covers for 32 cells, 500 covers, has arrived at Albras. These will soon be used in a comparative test, to determine the exact effect.

As Albras aims to have more efficient production. However, the alumina filling of the cells using the pot tending machine now claims to much time, hence a closed automated alumina distribution system is being surveyed.

Moreover, as the production increase, the buffering silos in the GTCs are becoming too small. Work on how to increase the buffer capacity integrated with existing GTCs have commenced.

6. Acknowledgements

Such efforts carried out over time in collaboration between Hydro and Albras results in many people to acknowledge from both present and historically. Without support and contribution from the following, these and future actions would not be possible. Tammy Monteiro Da Costa Antunes, Marcella Fernanda Ferreira, Fernando Rocha De Menezes, Fabio Jardim da Costa, Kurt Jan Nilsson, Pål Vigeleand, Kjell Edgar Sagen, Norunn Hegna, Jose Carlos Saki Jr., Sergio Antonio Costa de Matos, Knut O. Austreid, Thorvald Mellerud, Sven Sundgot, Joao Batista Fialho de Menezes. Thank You All.