

Quick and Safe Replacement of an Existing Pot Control System by ALPSYS

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Abstract



Pot control systems are like people: they live, evolve, improve, and eventually grow old. With this comes the need to move onto a new system. This inevitably leads to the crucial questions “Which system is going to work out for us?” but also “How can we perform the switch-over to a new system safely and without affecting operations?”

Throughout the years our activities have encouraged us to build a robust and flexible process that allows us to answer these questions for any smelter running with any sort of pot technology. For us, the ALPSYS team, it is essential to provide a process control solution that fulfills the highest performance and quality standards, while always guaranteeing the safety of the people working on the pots. The transition period from an old to a new process control system is no exception. Such a transition is a very specific project, creating specific risks and challenges. This paper describes the different steps of our process from the first contact with a smelter to the final pot switching over to ALPSYS.

Keywords: Pot control system, ALPSYS, System switchover, Reduction pot supervision system, Safety.

1. Introduction

Rio Tinto has its own pot control system (PCS), named ALPSYS, that is operating potlines for more than 25 years now. It is an integral part of the Aluminium Pechiney pot technology and is one of the key elements in achieving the high performances of today’s pots.

The ALPSYS system is presently installed worldwide on 42 potlines in 22 smelters. The first systems installed approximately 25 years ago are still running and operating with their original pot controllers.

If you are working in one such plant, and your PCS is still working correctly, you know that it will one day need to be replaced by a newer system. This is of course, true whatever the PCS system you are using, whether it is ALPSYS or any other technology.

The process control system is the heart of an aluminum plant. Replacing it could be compared to a heart transplantation. A very difficult situation where you need to replace the thing that is keeping your potline alive. This of course raises legitimate concerns and doubts but at one point in the smelter’s life, this operation must be done.

In 2004 we replaced the PCS system of the Saint-Jean-de-Maurienne smelter in France. It was one of the first replacement projects on a live potline with ALPSYS and, at that time, the method to do this safely and efficiently was not clearly defined. To do this, we developed a method to smoothly pass from the old system to the new one. This being a success, we have kept applying

and improving our method on different technologies including old ALPSYS ones. The goal of this paper is to describe this method.

2. How to Prepare the Change-over of Your Pot Control System?

As previously said, concerns and doubts about replacing your aging PCS by a newer one are perfectly legitimate. If you are considering installing ALPSYS on your potline, you need to ask yourself the following questions.

2.1. What is a Pot Control System?

A pot process control system in an aluminum smelter refers to a computer system that regulates and monitors the operations of all the pots on a potline. The system also supplies important information to the people working on the potline, quickly detecting irregularities, and helping to deal with them. The system plays a crucial role in ensuring efficient and stable pot operations.

The system is generally divided into 3 levels:

- Level 0 corresponds to all physical equipment: sensors, pot controller cabinet (called PCC), safety equipment installed in the potline. Generally, there is one set for each pot (in green in Figure 1).
- Level 1 corresponds to the software and hardware relevant to the process real time acquisition control and command. With ALPSYS, you can have one set per pot or one set for two pots (in blue in Figure 1).
- Level 2 corresponds to the software and hardware relevant to the pot and potline supervision and management application, servers and workstations, networking and communications between the equipment and the software of all systems with which it relates (in red in Figure 1).

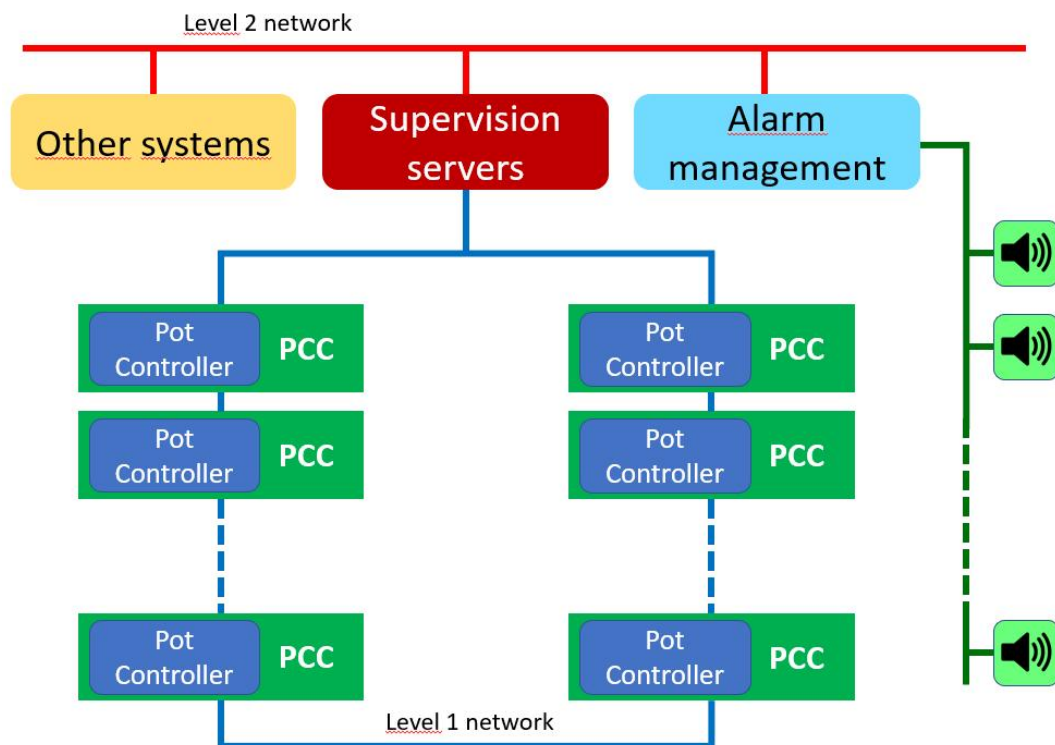


Figure 1. Architecture of a PCS.

- Spare equipment must be available and ready in the event of a breakdown (pot controller, cables, power supply, etc.).
- A team of electricians from the smelter is available and ready to react.

To deal with more unusual events:

- A team of experts with extensive knowledge in reduction, process control systems and IT are on site to assist during the whole duration of the switch-over. The experts are there to monitor the activity and react to any detected abnormality. They are also available to answer questions and assist the smelter's personnel.
- In case of any significant issue happening, a rollback is always possible. It can be done at any time during the change-over to reinstall old equipment if newly installed equipment is failing, and the problem cannot be solved without avoiding a risk. A precise rollback procedure is prepared and tested. This procedure is to be understood by everyone.

After the installation is finished a warranty period starts. During this time the smelter can raise questions and have any issues corrected. The warranty period is followed by a maintenance contract that will warranty follow-up over time for the smelter.

4. Conclusions

Replacing a pot process control system safely and without disturbing the operations is a challenge that any smelter will face at one point. To successfully meet this challenge, the full commitment of both the provider and the site are paramount throughout the project.

This said, accurately identifying the scope of the project and performing the preparation activities are most important and must be performed with the highest quality standards. Communication is another key factor; with the right people, no action is difficult, the coordination between all the teams is the key to success.

5. References

1. Pierre Marcellin, Antoine Garnier, Protection against open circuit in ALPSYS pot control system, *Proceedings of 39th International ICSOBA Conference Virtual Conference*, 22-24 November, 2021, Paper AL24, *Travaux* 50, 877-888.