ABB maintenance turns around plant critical equipment

Minerals Industry
Case Study

Aluminum smelting plant receives system turnaround from on-site ABB Full Service® team.

When ABB formed the maintenance alliance at the Hydro Kurri Kurri aluminum smelting plant, Newcastle, Australia, the ABB Full Service® team was taking over the maintenance for four business units. One of them, the carbon plant, is responsible for manufacturing the anodes that are consumed in the production of aluminium. At that time, the power and free conveyors in the carbon plant were suffering from years of poor maintenance due to design variations, inconsistent parts supply and poor turnaround time. The previous off-site contractor, who had been responsible for carriage repairs, was unable to ramp up the refurbishments, nor achieve the higher quality standards imposed by the ABB Maintenance Alliance Reliability Team.

"The carriage repair project has had great success in targeting the defects on this equipment. We have gone from a position of vulnerability to a position of structure behind our carriage repairs," says Kevin Heame, Production Team Coordinator for the Kurri Kurri aluminum smelter.

Power and free conveyor improvement project

The power and free (P&F) conveyor is responsible for carrying the anodes through the production processes to the bake furnace where the green anodes are converted. When the ABB maintenance alliance started in 2006, the system was in desperate need of repair. The losses in production due to damaged carriages were nearing the point where production would need to stop, since the lost time per shift was approaching the length of time that the shift operated. Performance of the conveyors was as low as 70% of the target minimum, which was the minimum number of carriages on the conveyor to prevent lost time. ABB immediately focused on bringing the carriages back into the system as quickly as possible and increasing the reliability of the entire system.

Within four months, the ABB on-site maintenance team led the plant to:

- Increase productivity by 30%
- Achieve performance target of greenmix and baked chain
- Annual ROI of 84,000%
- Recover four hours of lost time per shift

ABB also developed an in-house refurbishment program, which ensures that stringent quality assurance procedures will be adhered to for years to come.

Identifying a root cause for system failure

A significant problem ABB identified was that operators were removing the carriages from the system whenever they jammed. Once a carriage was removed, it joined the pile of some 200 carriages that were waiting to be refurbished. This inefficient method was addressed by making the carriage removal a maintenance task. ABB developed a troubleshooting guide for the maintenance crew, who would then perform a series of inspections leading to several in-service repairs before the carriage was removed. This procedure not only made addressing the issues more efficient, but it also reduced the annual maintenance costs by $14,000 eliminating unnecessary freight and material handling charges.

Improving the refurbishment program

Once the system inefficiencies were eliminated, ABB took a closer look at the repair process for the carriages. Here issues were identified with throughput, quality of repairs and lead times for parts. The assessment resulted in the set-up of an internal refurbishment program using the on-site work shop, since they had the necessary tools and jigs to perform the repairs efficiently.

ABB Services

Streamlining the repair process

ABB then examined the specific problems occurring with the equipment, so data was captured, compared and the results are shown in Figure 1.

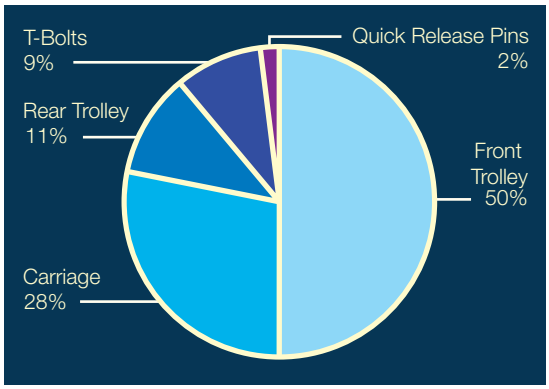

Figure 1. Damage Distribution – P&F Stockpile

An overwhelming 50% of the carriages in the stockpile were due to damage with the front trolley. This information then allowed ABB to focus on specific equipment improvements.

Using this information, a cannibalization program was developed, and over 80 carriages were identified for rapid return to the system by substituting some small and easy to change parts from other damaged carriages thus avoiding the longer standard repair process. Combined with quality assurance checks, the central work shop was able to quickly turn around large numbers of carriages and provide enough work for operations to continue until the shipment of new parts arrive, allowing the complete carriage refurbishments to proceed.

Once the number of working carriages had begun to stabilize, focus shifted to prepare a detailed refurbishment procedure which enabled quality repairs and the implementation of a quality assurance program. The comprehensive document detailed the complete overhaul of the carriages providing tradesmen with a valuable tool to ensure compliance on a daily basis regardless of who was doing the repair.

Figure 2 shows the improvement that was achieved on the two conveyor lines. Starting with both lines well below the minimum target, performance was improved to over the minimum target on both lines for the first time since ABB took over the maintenance. The greenmix part of the plant is where all the raw material batching, mixing and forming occurs, whilst the baked section is where the formed raw ingredients, that is, the output of the greenmix plant are consolidated by baking. ABB's project leader Adam Cooper says, “This has been an excellent example how ABB's tools and system analysis methodologies can help customers like Hydro Kurri Kurri. We were able to develop an innovative solution that resulted in a reliable system and increased productivity for the plant.”

Since the power and free conveyor is a bottle neck piece of equipment that actually runs through the entire carbon plant, the refurbishment of the system has enabled the plant to operate at much higher efficiency than before. This not only promotes safety, but also increases operator morale since they no longer have such a high interaction with defective equipment. This improvement has also enabled the ABB maintenance alliance personnel to spend their time on other equipment, further increasing the reliability and stability of operation of the plant.

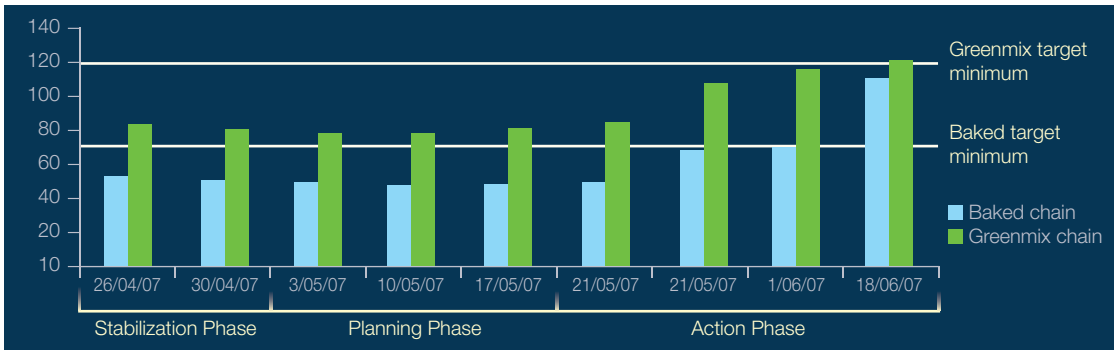

Figure 2. Number of carriages on carbon plant power and free conveyors

The aluminum smelter at Kurri Kurri has been operational since 1969 and is currently owned and operated by Hydro Aluminum, which is a part of the Hydro Aluminum Group. Production capacity of the smelter is currently at 153,000 tons annually.

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