PDA
Process Design & Automation

Co-creating a Smart Future

Manufacturing

Optimizing Throughput at Aluminum Smelting Operation

The Company

The Billiton Group of Companies comprises aluminium smelters, nickel operations, base metal mines, and coal mines. One of Billiton's South African smelters* produces a range of different primary aluminium products that are sold in the South African domestic market. The current strategy for this smelter is to focus production on value-added products where premium to the commodity price can be earned.

The Challenges

When the studs used in the smelting process at this facility need to be repaired, they are sent to the Stud Repair Workshop. Here the studs are shot blasted and inspected to evaluate their condition. After shot blasting, studs that need repair go to a press where they are straightened. The Stud Repair Workshop was not optimizing throughput, so a project was implemented to improve the Workshop's layout. The proposed layout was developed using Arena® simulation software.

The Deliverables

There are certain constraints that have a big impact on the workflow in the Workshop:

1. The tractors delivering the baskets full of studs cannot wait for baskets with repaired studs; instead, the tractor should leave with repaired studs immediately after damaged studs have been delivered. This means that there should always be space to offload a full stud basket, and a repaired stud basket should always be ready.

2. After delivery of a stud basket, the studs must cool down before they can go for shot blasting. The cool down space is a limitation.

3. The press is the main bottleneck in the system. If the press cannot provide the required throughput, the whole system will be affected.

4. The overhead cranes that move the stud baskets around the workshop move on the same beams and sometimes must wait for each other, thus creating another constraint.

Arena® simulation software was used to create a model that tested several different layouts and helped determine whether one or two overhead cranes should be used. The model also determined overhead crane rules for optimum performance, the number of stud baskets that could be repaired per day, and the maximum number of stud baskets that the system would be able to handle if the press were optimized.

The Results

The Arena model illustrated how sensitive the process is to both crane and press performance. The crane rules for optimum performance were established and fixed tasks and areas of responsibility were allocated to each crane. The model showed that two cranes are needed for the process. The model also showed that the required throughput could be achieved if the crane rules were applied as tested and if the press process time were reduced. With these results, the specification for the press could be finalized. The project also contributed to the final cost justification of purchasing the new press.

**Note that the Bayside smelter has been closed in 2014, years after the compilation of this case study.*

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