ALUMINIUM INSIGHT
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MAJOR REBUILD OF MELTING FURNACE AT KB ALLOYS

SUCCESS FOR TAB'S FIRST USA PROJECT

A recent furnace refractory project at KB Alloys, Wenatchee, Washington, spotlights the improved performance productivity and added value delivered to the customer through the use of superior refractory materials, design, and installation. The project, completed by TAB Refractory, a Division of Pyrotek, in conjunction with the company's USA Aluminium Division, was notably the first for TAB in North America.

During 2008, the KB Alloys Wenatchee plant was experiencing a situation of premature failing with the refractory of its main reverberatory furnace in its central melting facility, crucial to all of the company's downstream metal processing.

Wenatchee plant manager, Chuck Clugston, explains that the A-Reverb is the company's primary furnace for production of a constant supply of molten aluminium to maintain efficient operation of its downstream processes. The backup furnace in situ was not in adequate condition to serve as a long-term primary unit, so it was vital to have A-Reverb back on line in a minimal timeframe—and this was a key consideration in the project.

EXISTING PROBLEMS TO OVERCOME

The furnace had been rebuilt in 2006, involving a structural repair and complete new refractory lining, with the expectation of several years' service. However, in less than 18 months operation the back wall and burner wall refractories were spalling off in laminations over significantly large areas. KBA realized major replacement of wall sections was obviously a minimum, and total replacement likely. Based on their experience and similar references, via Pyrotek's USA Aluminium Division's existing work and contacts with the customer, Pyrotek's TAB Division was invited to examine the furnace and make recommendations regarding the extent of necessary repair.

The key objective was clear—to put A-Reverb back in shape as quickly as possible for reliably supplying molten metal in an energy-efficient manner and with a design and construction to last for up to 10 years.

PYROTEK'S PROPOSAL

From an initial core analysis, onsite inspection and review of the existing refractory condition of the furnace, TAB concluded that the floor and lining were both of inadequate condition and recommended replacement of the entire hearth floor and ramp, as well as the lower and upper sidewalls. TAB proposed that this would deliver the best long-term value and cost-efficient solution for the customer. An attempt to simply repair, the lining with veneers or patches would cost more in the long run. On this basis, a schedule was devised in close consultation with the customer.

SCOPE OF WORK

Pyrotek USA Aluminium Sales Manager, Mark Arnold, and Aluminium Sales Engineer, Dave Wolf, coordinated the project logistics in the USA.

From TAB, Paul Taberham, International Project Director, Warrington, and Ian McKenna, TAB International Projects Manager, Australia, managed the on-site work. Duncan Jones, TAB Technical Director, Warrington, coordinated the refractory design. Chuck Clugston, KB's Wenatchee Plant Manager, was the customer's coordinator.

TAB was to engineer, design and document in CAD a reline to the hearth, sub-hearth, ramp, sill, lower walls, upper walls, burner ports and flue opening of the reverb furnace. The detailed material specification and design involved was agreed

Headquartered in Reading, Pennsylvania, USA, KB Alloys is a global manufacturer of quality specialty products, serving various segments of the metals and manufacturing industry throughout the world, including aerospace, transportation, electronics and commercial products. The company specializes in research and development, and advanced production of master alloys and metallurgical grain refining products for the aluminium process industry, with manufacturing plants in Wenatchee, Washington, and Henderson, Kentucky.

Established in 1950 as the Kawecki Chemical Company, the name KB Alloys has been synonymous worldwide with consistently dependable products.

With its continuous rolled process, the KB Alloys fully integrated production plant in Wenatchee, Washington, is among the most efficient of its type in the world. The plant produces grain refiner rod, a product form developed and patented by KB Alloys in the late 1960s, that remains the industry standard today. The main product line is the well known TIBOR® (titanium boron) aluminium alloy rod.

Major Rebuild of Melting Furnace at KB Alloys - Continued

according to KB's requirements and specifications. The contract also included a full thermal analysis of the furnace every 12 months.

TAB's specialist refractory engineering input included:
- Demolition of old refractory and rebuild of new TAB-designed lining.
- Supply of all refractory castables, bricks, mortars, insulation boards and stainless steel anchorage as required.
- On completion, a 120 hour bake-out.

For this type of furnace TAB strongly recommended a 700 mm deep Thermbond bellyband, for example, 400 mm below and 300 mm above the metal level. This was accepted and fitted to extend the life of the furnace and also to allow laminate patch repairs to be made quickly and efficiently with minimal downtime in the future.

The Pyrotek team acknowledges the tremendous support and cooperation on site from KB's own maintenance team, led by Maintenance Manager, Tom Pickett. KB provided an invaluable working trailer for the project crew, greatly appreciated in the ultra-low working temperatures! KB also provided water for mixing the refractory constable, and 220V and 3-Phase 380V electrical power, along with waste skips, tapping blocks and forklift for disposal of materials.

Starting in December 2008, on a full dayshift, TAB's work on the furnace lining involved four days demolition and 14 days installation, followed by a 5-day bake-out and heat-up. On completion of the reline, the bake-out was closely controlled and monitored on a 24 hr per day basis and the entire project was complete by the start of February 2009.

Paul Taberham working on site at KB Alloys Wenatchee plant

Half way through construction stage

RESULTS

Following the successful commissioning, the energy performance of the furnace was closely and continuously monitored during operation. Here, KB Alloys' Director of Corporate Engineering, Roger Courchée, provides an outline of the energy efficiency data collected in practice to help develop cost comparisons that show advantages achieved through the furnace rebuild.

The Specific Energy Consumption (SEC) of A-Reverb furnace were calculated during 2008 until June (when a switch to 'B' Reverb was forced due to serious lining problems with 'A' Reverb) and compared that with the performance achieved since July of 2009 when a dedicated gas meter was installed. The 2008 calculations are based on known data of monthly molten aluminium production and monthly site gas consumption and an assessment of non-reverb gas consumption during the month.

Finished job showing bake-out stage

The 'Year to Date' SEC for 2008 was shown to be 0.844 kWh per pound of molten aluminium and the figure for 2009 was 0.757 kWh per pound, realizing an improvement of 10.34%.

Roger notes that the improvements in energy performance of the furnace due to the re-lining program were supported by complementary programs of work carried out by KB within the same timescale. This included tuning of the furnace burners by the OEM and recommissioning of the pressure-controlled flue damper system.

Furnace lining after one week of work start-up for ingot casting

Overall, Chuck Clugston reports that KB is pleased and impressed with the detail and precision of the workmanship demonstrated by TAB in the furnace rebuild and also the performance of the furnace to date. He mentions especially the role of TAB demolition crews who came in and tore the failed lining out in extreme cold weather and persevered to meet the target schedule, even despite the double-digit below zero on-site temperatures.

Pyrotek's Mark Arnold stresses that the successful project is a great example of terrific collaboration between the TAB crew, Pyrotek's USA Aluminium Division and the customer—all working as a single team. Congratulations to all involved!

Major Rebuild of Melting Furnace at KB Alloys - Continued

TAB REFRACTORY, A DIVISION OF PYROTEK

Established in 1974, TAB Refractories, based in Warrington, UK, is now one of the world's leading independent high quality refractory design and installation companies. Specialising in the non-ferrous metals industry, TAB is renowned for lining aluminium melting and holding furnaces and has undertaken projects in over 30 different countries with over USD$30 million worth of refractory installation work in the last five years. Against all the odds, TAB's resolute motto remains simply "WLF," Work Like Fanatics!

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