Power Plant Saves Big with Emerging Surface Preparation and Coating Technologies

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Efficiency is everything when it comes to operating coal milling plants. This is especially true in northern climates where demand for power in winter months requires these plants to operate at near-maximum capacity.

Recently in Denmark, operators of a coal-fired power plant used cutting-edge abrasive blasting and coating technologies to improve efficiency in non-peak-season planned maintenance.

In their search for new efficiencies, the plant operators took a look at the periodic refurbishing of several "wear items" in their coal handling machinery and noted that the procedures used were not the most efficient.

This article describes the selection and use of an alternative maintenance procedure for the repair of coal handling equipment.

How it Works

As coal enters the power plant to be processed for combustion, the highly abrasive material passes at high speeds through separators, grinders, and other large pieces of machinery that contain wear surfaces.

Conventional procedure to refurbish the wear surfaces on these components, required that the power plant must shift fuel sources while these units–some weighing in excess of 10 tons–are taken off line, removed from the building, rolled into a large outdoor tent and grit blasted before welders then fill and grind the pieces back to specifications, and the entire process is reversed.

Photo courtesy of Spangeljet

The separater section of one coal mill being hoisted

Century-Old Company, High-Tech Solution

The power plant operators contacted Jakob-Albertsen, a specialized Danish industrial coatings supply company with more than 100 years experience, for advice. Their timing could not have been better as the company had recently formed a service division devoted to conducting high-tech maintenance in production-dependent environments.

The Jakob-Albertsen team inspected the coal-fired power plant equipment and came up with a plan that could save the operators money and downtime. Instead of removing the plant's various separator parts–including gigantic tops, cones, rings, pipes, and other components–outdoors, they could save time and transport costs by using an alternative abrasive blasting technique which could be carried out in-situ inside the plant, and instead of welding and grinding, the team could apply an advanced composite coating to create a new high-tech wear-resistant finish.

"Dust levels caused by conventional sandblasting are totally unacceptable inside the plant," says Leif Riis, Key Account Manager of Jakob-Albertsen, who proposed the use of abrasive media embedded in a sponge matrix.

With ordinary abrasive blasting, single-component particles are propelled by air at great speeds. Particles colliding with painted surfaces create copious amounts of airborne dust, which may be considered an unacceptable health risk and potentially damaging to nearby equipment. But when blasting with abrasives bonded to sponge (Sponge Media), 99% of

Photo courtesy of Spangeljet

Applying ceramic reinforced epoxy abrasion protection coating to one of 6 outlet pipes

what normally would become airborne dust is trapped within its particles.

With help of actual film footage showing near-dust-free blasting, Riis was able to convince the power plant operators that his team could blast indoors without raising health concerns and damaging nearby machinery.

As soon as the plant operators approved Riis' plan, Jakob-Albertsen's three-man crew sprang into action by blasting the carbon steel alloy machinery surfaces with sponge bonded with 16-grit aluminum oxide recyclable abrasive media.

"Although the removal rate was slightly less than ordinary abrasive blasting, it was inconsequential when considered against the cost and time saved transporting parts and handling only one-tenth the abrasives by recycling along with simplistic site set-up and clean-up," Riis said. "And we still achieved three square metres per hour."

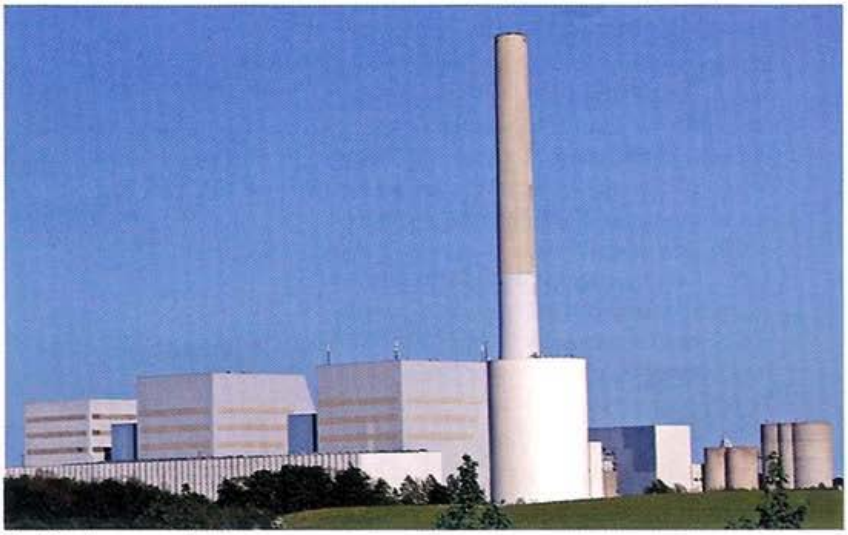
For the subsequent coating application, the coating manufacturer specified that surfaces be thoroughly cleaned of all contaminants to white metal (Sa3) or near white metal (Sa 21/2) and roughened to an angular profile between 75 and 125 microns. This was easily achieved with the sponge abrasive selected.

Tough Ceramic Beads

Providing an alternative to grinding and weld-filling worn out parts is a specialty of Jakob-Albertsen. For this purpose, Riis suggested a two-component ceramic reinforced modified epoxy resin activated by an aliphatic amine curing agent. When applied at 3 mm or more and fully cured (for example, 48 hours at 16°C), the composite creates a wear-resistant surface that often outperforms the original metal, rubber liners, ceramic tiles, or weld overlay, according to the product data sheet.

By showing this composite material had been in service for more than eight years in a similar coal-milling application, Riis was able to satisfy plant operators that the ceramic coating would perform as intended.

After cleaning the blasted surfaces with compressed air and wiping them down with a surface degreaser, the four to five-man coating crew began hand-applying the ceramic epoxy with plastic application implements provided by the manufacturer (the plastic stopping knives used had the necessary flexibility to ensure good lay-up). Since the ambient temperature inside the facility hovered between 17°C and 20°C, the coating's applicators



Coal-fired power station

knew they had approximately one hour of working time. To avoid having to grind smooth the fully cured composite, the crew used specially designed sponges to make the wear surfaces as smooth as possible before the coating hardened.

It took the Jakob-Albertsen team about five days to prepare and coat approximately 20-square-metres of tops, cones, rings, pipes, and other components that comprise each coal mill separator unit.

"We were able to do the job and give new life (to the equipment) by using the composite epoxy coating and dust-free blasting process" said Riis. In addition to helping get the coal processing mill back into service with minimum delay, we helped the power plant save time and money.

The customer was happy with the outcome and Jakob-Albertsen's ambitious maintenance schedule, and they increased the scope of the contract to include all eight coal mills that feed the plant.

Since the old method of refurbishing wear items included a great deal of in-house work—and jettisoning many parts that were considered uneconomical to rebuild—it's extremely difficult to quantify how much time and money the plant saved by employing high-tech methods instead of the old-school routine, concluded Riis.

But to help paint the bigger picture, the power plant operator estimated (based on this project) that savings of approximately $1.7 million (USD) compared with the cost of purchasing new machinery on the eight coal mills, can be made.

It was reported that the company were very satisfied with the time saved by Sponge-Jet blasting and the abrasion protection provided by the composite epoxy material". So satisfied, in fact, that they've invited Riis to visit the energy company's main headquarters to hold seminars on how best to cope with internal abrasion. The goal is to identify other money-saving applications that might utilize the novel abrasive blasting technology and the composite epoxy repair compound.

The abrasive used was Sponge-Jet Silver16 and the ceramic epoxy was ARC 879 from Chesterton, both supplied by Jakob-Albertsen in Denmark.