



Taming **VRM** Wear

Kenneth Ryan, The A.J. Weller Corporation®, USA, provides a case study of a product that offers protection for the louver blade assembly of a vertical roller mill.

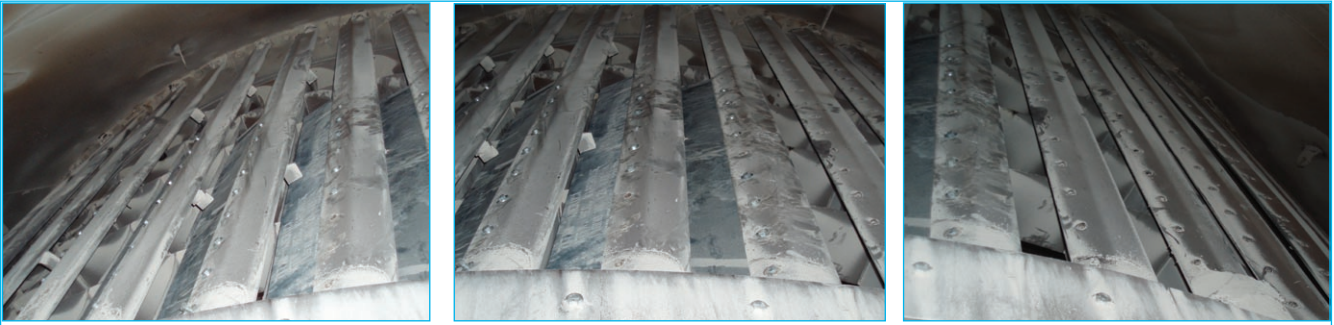
Introduction

The vertical roller mills (VRMs) used in today's cement industry have increased production dramatically. Throughput has reached levels never before thought possible and the market continues to demand more. Plant capacities are stretched to the limit, thus substantially increasing maintenance costs. The demands for a consistent increase in quality are seeing many facilities opting for a higher percentage of fines to be incorporated into their recipe for a quality product.

Louver blade assembly

One of the key components of the VRM is the separator louver blade assembly. Dialing in the angle that will control the blend is critical to the quality of the product. All of the material processed by the mill passes over the blades and through the channels they provide. The blades are subjected to extreme high velocity, pneumatically driven fine particle wear throughout their service life. Monitoring the condition of the blades, or any component inside the mill, requires a maintenance shutdown and a "hands on" inspection of the piece.

Today's mill designs, specifications, and operating parameters are tuned to the demands of production. Maintenance professionals are constantly asked to increase component wear life and limit the downtime required for proper care of the mill. The separator blades often present a challenge. Changes in the fines level affect wear life with every incremental increase.



Cut-away of separator blades in the VRM at Titan America in Medley, FL.

Case study: improved wear life

Cement manufacturers are always on the lookout for advances in wear technology that can improve a plant's efficiency. The A.J. Weller Corporation® has been invited to provide the answers to many of today's high wear applications. The A.J. Weller Corporation® has its world headquarters in Shreveport, Louisiana, with a team of field application specialists positioned throughout the world.

The Weller team was asked to participate in a field study in a plant to improve the separator blade's wear life in a VRM. First, it was necessary to understand the hardness of materials that made up the process stream. Analysing the particle size and shape, and discovering the operating parameters, including tph, temperature, speed, and flow characteristics, are critical to wear life expectancies. Obtaining a history of the modifications made to the blade in both design and material, allows Weller® to match theory with real life results.

The problem

Original equipment blades are typically supplied in commonly available hardened steel. In most cases, the aggregate hardness of the material processed exceeds the hardness of the original blade; this condition is reflected by the rapid failure of the blade due to erosive wear. Maintenance teams then increase the hardness of the material used to fabricate the blade in an effort to stave off failure. Increases in service life are achieved, but unplanned maintenance is still required.

The study invited companies to participate by offering their ideas for a workable solution to extend service life. The plant maintenance team chose three solutions: chromium carbide overlay plate; alumina ceramic tile; and WellerSUPER 600 DS™. The original design called for the louver blade to be supplied 3/8 in. thick, 10 ft. high x 6 in. wide, with a 3/8 in. thick x 2 in. wide wear lip for the reverse side of the trailing edge of the blade. The chromium carbide and ceramic tile solutions were supplied to these specifications.

The solution

By analysing the flow characteristics of the material stream, Weller® was able to modify the design by eliminating the wear lip on the back side of the blade. Weller® determined that the somewhat laminar flow of the stream is naturally interrupted by the blade, altering the flow characteristics. Streamlining the blade would reduce the tendencies for the material stream to form circular eddies that exacerbate wear.

Both the chromium carbide and alumina ceramic solutions called for a composite of these materials to be adhered to a mild steel base. In both cases the actual amount of wear protection offered only amounted to 1/8 in. and the resulting composite surface would continue to have a negative impact on the flow of the process material.

Having addressed the flow problem, Weller® determined the aggregate hardness values of the material being processed. Chromium carbides and alumina ceramic both substantially exceed this hardness value but with the drawbacks described above. Weller® decided that its WellerSUPER 600 DS™ would be best suited for this application.

WellerSUPER 600 DS™ is a "maintenance rated" hardened steel. A proprietary process of micro alloying is used to create a material that has an extremely tight grain structure with a consistent hardness across and throughout the entire plate. Used in the most severe applications, WellerSUPER 600 DS™ offered the specifications the louver blade application demanded: a smooth flat surface; consistent hardness; and a lower finished cost per blade.

The results of the field study supported the company's hypothesis. The wave-like surface of the chromium carbide plate, coupled with the effect of the wear strip on the flow, caused premature failure due to the material swirling and chewing away at its mild steel base. The alumina ceramic tiles could not withstand the attack of the process stream that sheared the tile from its base steel. However, after a six month trial, WellerSUPER 600 DS™ showed little to no wear on any portion of the blade.

The customer has called for a complete retrofit, using WellerSUPER 600 DS™ louver blades with one modification. It was determined during the study that the lower portion of the blade is subjected to the most aggressive wear; therefore each louver blade will be supplied in two vertical sections, allowing the plant maintenance team to rotate the sections top to bottom and reduce replacement costs by 50%.

Conclusion

Working with clients in the cement industry, The A.J. Weller Corporation® will continue to advance the application of new wear technology. The global cement industry's demands for increased production and lower unit cost continue to escalate and will require the use of every resource available to stay competitive. ●