Cement Grinding

Continuous and Dynamic Process Optimization
Cement Grinding Overview

The Pavilion8 Cement Grinding Application offers process and quality control independent of system configuration. Whether faced with a traditional ball mill circuit, roller press, vertical mill or combined layout, the Cement Grinding Application, based on multivariable model predictive control (MPC) technology, has the flexibility to meet process and quality control requirements. In all cases, design of the control scheme is based on the specific process layout. The process model utilized for process optimization and enhancement of the controller accuracy is configured via process testing to mathematically define the dynamic relationship between process variables. What results is a control solution that drives the system to known constraints and sustains operation at those limitations. Simultaneously, the solution monitors the results of variable manipulations versus predicted values to provide the highest controller accuracy and robustness when dealing with drifting process values.

Powered by the Pavilion8™ software platform, the Cement Grinding Application also utilizes a Virtual Online Analyzer (VOA)® to predict residue and/or Blaine. Pavilion8 provides closed-loop control to quality targets in real time, thereby boosting control performance to further reduce product variability.

Overall solution includes semi-finish and finish grinding if applicable:

• Semi-finish grinding (roller press) circuit
• Finish grinding (vertical mill or ball mill) circuit

Pavilion Differentiators

The Pavilion8 Cement Grinding Application solution from Rockwell Automation enables continuous and dynamic optimization of the cement grinding process to achieve a number of key operating objectives simultaneously including efficiency, quality, safety, environmental requirements and throughput. The Pavilion8-based model predictive control (MPC) technology takes into account multiple influences simultaneously and enables more rapid response to process changes coordinated across the many operating variables in the cement grinding process. MPC technology provides the manufacturer with some important advantages:

• Our patented model predictive control capabilities increase speed and transition accuracy through type changes.
• The fine tuning required is minimal and is undertaken while the controller is running so that the changes in the dynamic behavior or in the process limits can be determined correctly and rapidly.
• The process models are robust and require little to no further development. Modification is necessary only if there are major changes in the process, e.g., additional feed components.
• Process disturbances (i.e., items affecting the process but not directly controllable) are taken into account by the MPC system. This ensures sustained control accuracy. In a cement grinding circuit, these may be changes in the grindability of clinker or changes in grinding aid composition.
• Applications can be installed in as little as a few weeks depending on control requirements. This allows for a rapid return on investment.
Industry Challenges
In the cyclical cement market, it is of utmost importance to capitalize on market swings. Plants often make large capital investments on new equipment to increase capacity but may miss short-term opportunities to meet demand growth or reduce margin pressure in leaner times.

Cement grinding is an extremely power intensive process and power costs continue to rise in most markets. Manufacturers must operate grinding circuits at peak efficiency levels to maximize cement margin. Efficiencies may degrade due to changes in operating philosophy from shift to shift, changes in clinker grindability or grinding aid composition or loss of internal knowledge resources.

The highest value projects provide a fast and incremental production yield leading to a strong rate of return. These projects provide a sustained return over the life of the investment through ongoing efficiency optimization, resulting in peak performance, regardless of market condition.

Application Benefits
- Increases throughput 2-10%
- Reduces specific power consumption 2-10%
- Reduces transition time for type changes reducing amount of off-spec product 20-30%
- Reduces standard deviation for product residue/Blaine 20-30%
Pavilion8 is a modular software platform and the foundation for Rockwell Automation industry-specific solutions. Leveraging a powerful modeling engine at its core, Pavilion8 includes modules to control, analyze, monitor, visualize, warehouse and integrate that are combined into high-value applications. The Pavilion8 platform is implemented in J2EE and based on a modern Service-Oriented Architecture (SOA). The platform’s scalability, flexibility and ease of integration with existing business and plant infrastructure provide a lower total cost of ownership than alternative technologies.

Rockwell Automation Advanced Process Control

Rockwell Automation Inc. model-based software drives profitability in major industries including Biofuels, Cement, Minerals & Mining, Consumer Products, Chemicals & Petrochemicals and Oil & Gas. Based on the most powerful predictive modeling software in the industry, our solutions improve production processes to facilitate quick response to market demands, continuous reduction of costs, consistent achievement of quality targets and enhanced environmental quality. With a commitment to delivering the highest ROI in the industry, the Rockwell Automation ValueFirst® customer engagement methodology Delivers Predictable Results.

Rockwell Automation, Inc. (NYSE:ROK), the world’s largest company dedicated to industrial automation, makes its customers more productive and the world more sustainable. Throughout the world, our flagship Allen-Bradley® and Rockwell Software® product brands are recognized for innovation and excellence.

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