

Raw Mix Control System

Comprehensive Raw Mix Quality Control

The Process Solutions Raw Mix Control System (RMCS) is a goal seeking optimizer, providing comprehensive control and monitoring of the raw mix process.

RMCS uses three basic steps to enhance the overall quality of the raw mix: monitoring the process, associating quality results with the process, and recommending feeder set points. RMCS efficiently monitors the process by analyzing each raw mix sample. In addition, the raw mix feeders are monitored to ensure that actual feed rates (starvation and flushes) are factored into the control algorithm.

The RMCS control algorithm integrates a fitness calculation which determines an optimal solution. The resulting feeder set-points can be automatically sent to the Process Control System (PCS).

The natural variation in the raw materials' composition is dynamically adjusted for by analyzing the resulting raw mix chemistry and feeder settings.

The user interface of RMCS allows operators to monitor the raw mix process. It effectively shows important aspects including: feeder status, online chemistry, raw material chemistry, feeder settings, and control algorithm calculations.

RMCS can utilize high frequency analyses from pre-mill cross-belt analyzers and/or lower frequency post-mill laboratory grade XRF analyzers.

The configuration of RMCS includes parameters such as material chemistry, targets and weighting, constraints, delays, feeder step sizes, product type profiles, and kiln adjustments.

Typical primary targets include chemistry values such as LSF and C_3S . Secondary targets, such as cost or feeder swing minimalization, can further refine the raw feed when primary targets have been satisfied.

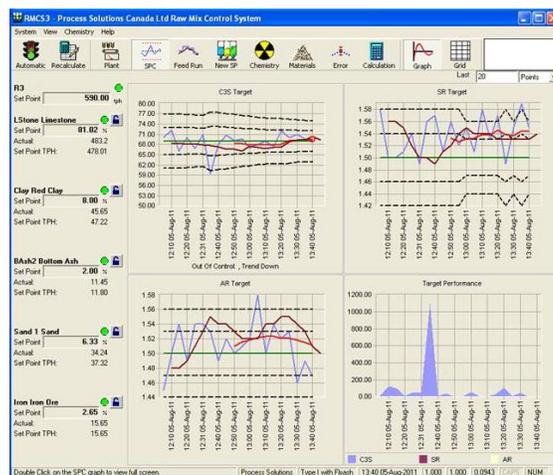
Constraints define limits that cannot be exceeded. They are used to ensure that contaminants, such as mercury or chlorine, are within preset thresholds.

In order to achieve target chemistry in the blend silo (minimal integral error), RMCS calculates feeder set points that cause the chemistry values to frequently cross the target lines with diminishing oscillation. The sizes of set point changes are proportional; for example, if the raw mix analysis is very close to target only minimal changes are made to feeder set points.

Dual Loop Control

The Raw Mix Control System algorithm provides dual control loops. The inner loop adjusts feeder settings, based on frequent input analyses, to ensure that the control values fall within an acceptable range of base values. The outer loop typically obtains analysis from scheduled sample analysis, which occurs less frequently. This outer loop provides drift correction for the inner loop. When the outer loop produces a new analysis, a new set of drift correction values for the inner loop are calculated.

A dual loop control algorithm provides many benefits. The inner loop provides frequent adjustments, ensuring a more consistent raw mix, while the outer loop corrects for drift. The outer loop also provides a redundant data set. Should the inner loop data become unavailable the outer loop's data will be used for adjusting feeder settings.



* Process Solutions Canada Limited Windows applications are tested with current versions of Windows at time of release; however, we do not guarantee full functional compatibility with all Windows versions.



Customized Control

Operators can control the mode in which RMCS integrates with the plant process system. In automatic mode, RMCS can request the feeder changes directly. In manual mode the system still calculates an optimized mix, but only recommends changes to the feeders, requiring an operator to actually change the set-points. Regardless of the running mode used, the process is continually monitored and displayed, using Statistical Process Control (SPC) and trend graphs.

RMCS can operate with direct analysis only, indirect analysis only, or both types of analyses to supply a more comprehensive solution. If RMCS stops receiving results from the online analyzer it will automatically switch over to the off-line analyzer and can notify operators. Notifications can be visual, audio, by email, or by updating a tag a tag in the process system.

Process Control System Interface

To properly track trends with the raw mix feeders, the Raw Mix Control System (RMCS) must be interfaced to the plant process control systems. RMCS integrates easily with most modern control systems. The control system integration provides automated capture of current feeder rates, total mix tonnage rates, and various alarm points like feeder starvation and mill run status. Interfacing to a control system also provides the automatic setting of feeder rates.

Feeder Configuration	
Feeder Name: WPF2	Location: Raw Mill: RM1
Raw Material: High Limestone	Set Point Range: Max Capacity: 165 tph
Moisture: 1 %	Max Set Point: 100 %
Cost: 4.3 \$/t	Min Set Point: 0 %
	Min Capacity: 16 tph
	Allow Zero Set Point: <input checked="" type="checkbox"/>
	Max Step: 100 %
Tag Names (in PCS)	
Read Availability:	321_02_WF_01_RMCS_ON
Read Set Point:	321_02_WF_01_SP
Actual Flow:	321_02_WF_01_ACT
Write Status:	
Write Set Point:	321_02_WF_01_RMCS_SP

Customer Assurance and Support

Process Solutions' background is the Cement Industry. This is important, as it means that we understand the needs, issues and working environment of the industry.

We work with you to design and/or customize your solution, and to install, implement and maintain the necessary hardware and software. This process typically includes on site time to survey the site and confirm requirements before detailed planning and implementation start.

We offer a full 6-month warranty on all of our solutions, and provide customized ongoing maintenance and support agreements. Our Customer Care group carries out on-site installations, and provides full-time Help Desk support.

Most importantly, we aim to establish client partnerships for the long term. We develop an ongoing working relationship that will enable you to get the most from your existing solution(s), and at the same time help us to further develop our portfolio by understanding and satisfying your needs.

System Integration

RMCS can be fully integrated with other Process Solutions' applications, such as the *Pile Management Suite* and *Laboratory Data Management System (LDMS)*.

For More Information

RMCS delivers a powerful process quality assurance tool that analyzes and controls a raw feed system to aid in producing a uniform raw mix. It is a complete turnkey system configured to your specific plant that is available as a purchased licensed system or on a lease basis.

If you have an opportunity to discuss this comprehensive raw mix quality control solution with us, please contact our Quality & Environmental Solutions Manager:

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Visit our web site at www.pscl.com

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