



ProcessSuite - Pyro®

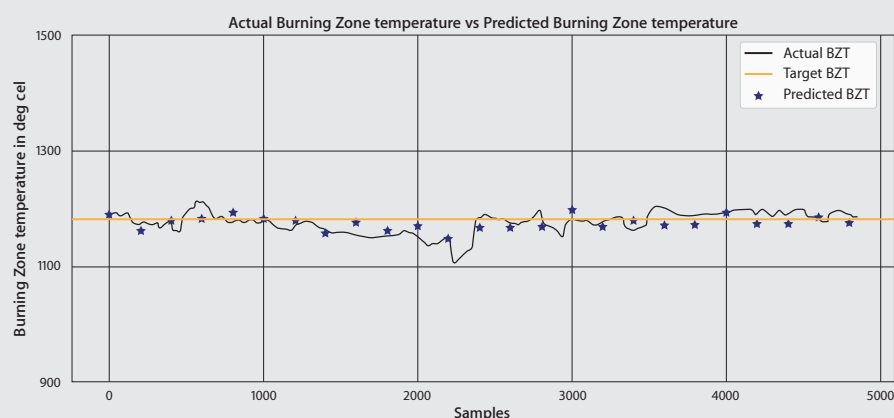
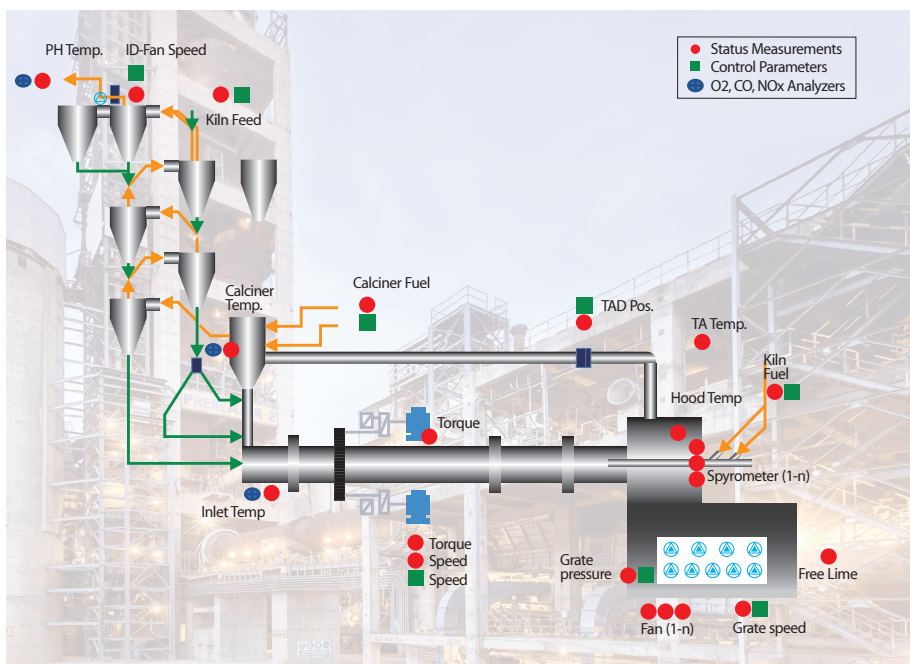
Optimized pyro processes are vital for improving energy efficiency and maintaining consistent clinker quality. Pyro processes are characterized by longer time constants, varying rawmeal characteristics, and non-linear dynamics, making them arduous to control. Furthermore, the inclusion of various alternative fuels for burning makes the process even more complex as the heat value of fuel changes the kiln operation.

ProcessSuite - Pyro® precisely addresses these challenges to deliver a highly optimised and stable preheater, kiln and cooler operation. It improves the clinkerization by optimizing fuel supply for Kiln and Calciner. It optimises cooler airflow and recuperation to maintain desired kiln process conditions.

The ProcessSuite-Pyro® is a highly customizable solution that can suit any existing plant design, having different types of pyro circuits with multiple preheater strings, multiple cyclone stages, various calciner systems, alternate fuel systems, combustion systems, clinker coolers with or without waste heat recovery systems, emission systems, etc.

ProcessSuite-Pyro® integrates with condition monitoring systems, emission measurement systems, refractory management systems, and other sub-systems. It continuously determines the best operating points to stabilize and shift the parameters towards critical limits to:

- Optimize fuel and air intake to improve combustion while managing critical mechanical, electrical and process constraints
- Improve clinker quality by adjusting to variations in rawmeal and fuel characteristics
- Enhance cooling air usage between optimum recuperation and waste heat recovery & power generation
- Balance heat by optimizing the usage of alternate fuels with economical as well as process constraints



Burning Zone Temperature Trend (BZT)

Predicted vs Actual BZT: ProcessSuite helps to predict and shift the BZT close to reference trajectory value with Minimum Std Variations

ProcessSuite-Pyro®
has control
strategies for



Energy Cost Function
Minimizing the **electrical and thermal** energies



Recipe Function
Maximizing **alternate fuel** usage



Production Cost Function
Maximizing the **production rate**



Error Cost Function
Improving the **operational stability** with variations in Raw Material, Fuel, Power etc.,



Multiple Objective Function
Improvisation between maximum heat recuperation and **WHRS** Production

Benefits



Direct



Reduce Energy costs up to 3%



Increase Throughput up to 5%



Reduce Quality variability up to 30%



Increase use of alternative fuels - upto 50%



Reduce emissions - 35% - 45% for Inlet / Stack



Indirect



Improved environmental compliance



Enhanced control combustion atmosphere to optimize fuel economy and ID fan capacity utilization



Better kiln product quality monitoring



Improved Constraint Management - O₂, CO, NO_x, Stage Temperatures, Torque, Heat Inputs and Pressure



Better response to variable feed properties



Increased heat-based balancing for varying fuel characteristics

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