



Fact Sheet

PiT Navigator Kiln

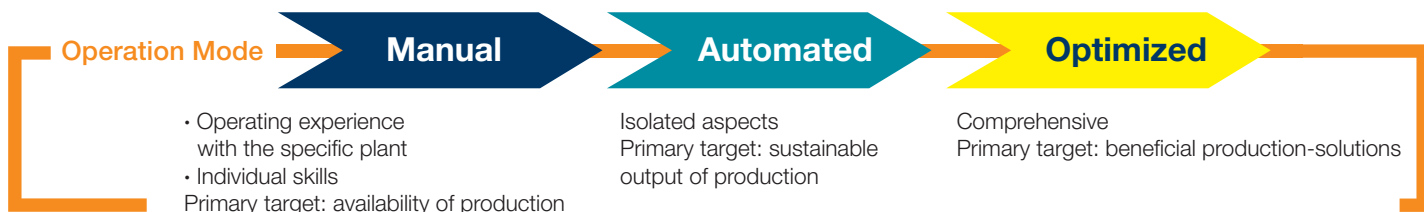
PiT Navigator Kiln is a high level control and optimization system for the clinker production in the cement industry. Based on various Advanced Process Control (APC) methods it defines optimized set-points for the most crucial control parameters of preheater, kiln and cooler, e.g. air supply, fuel and kiln feeds. Different to a traditional expert system it does not only facilitate to ensure stable production but also safeguards defined and desirable plant performance targets, like the reduction of specific thermal heat demand and the increase of alternative fuel rate.

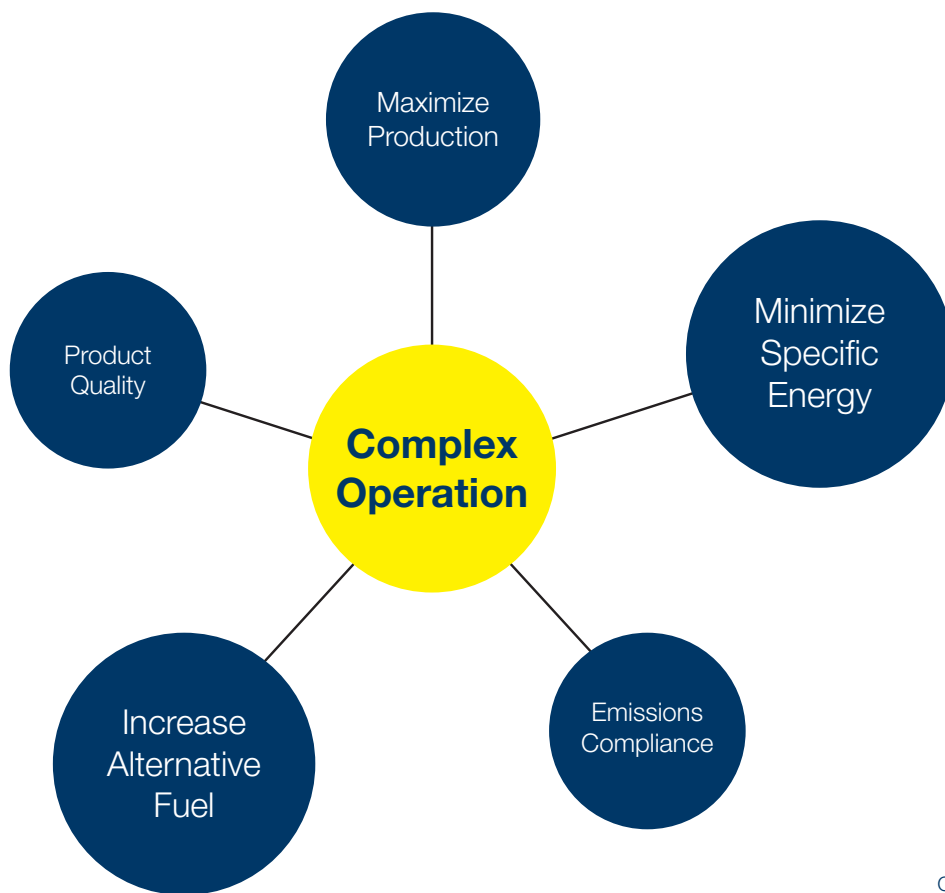
Rationale

Operation of the clinker production in a kiln is a quite complex venture. The response time of the process is very long. This is the main reason why it is virtually impossible to operate the kiln system solely by a control system using conventional control techniques like PID controllers. Thus, existing kiln systems are predominantly operated manually.

However, a variety of often conflicting goals have to continuously be considered by the operations team. The outcome of any manual intervention in terms of process and product quality is difficult to predict. This result in an operation mode that could

be best described as “to walk away safely”. This for sure is not necessarily the optimal approach, specifically if it comes to underlying performance targets, as mentioned above. A sample of latest control techniques, most suitably summarized under the category Advanced Process Control (APC), are able to master systems with long response times as existing in clinker production. The PiT Navigator applies APC to monitor and manage a kiln system continuously and optimizes its operation with regards to specific plant performance targets.





Complexity of operation

The three most outstanding features of PiT Navigator Kiln are:

- Defining optimized set-points for actuators within given boundaries to facilitate plant performance targets.
- Prediction of important quality indicators like CaO in clinker (PiT Predictor) or process values like secondary air temperature that can be used for feed-forward control.
- Applying sophisticated visual techniques to analyze and transform images from the kiln head camera as a key indicator for incineration excellence to be incorporated into the control optimization process.

Typical project outline

Essential to start with is a kick-off meeting on-site to discuss specifics of the implementation as well as project management related topics. Limitations of the plant must be considered in the design of the control system. One of the most important tasks is to mutually define a playground for

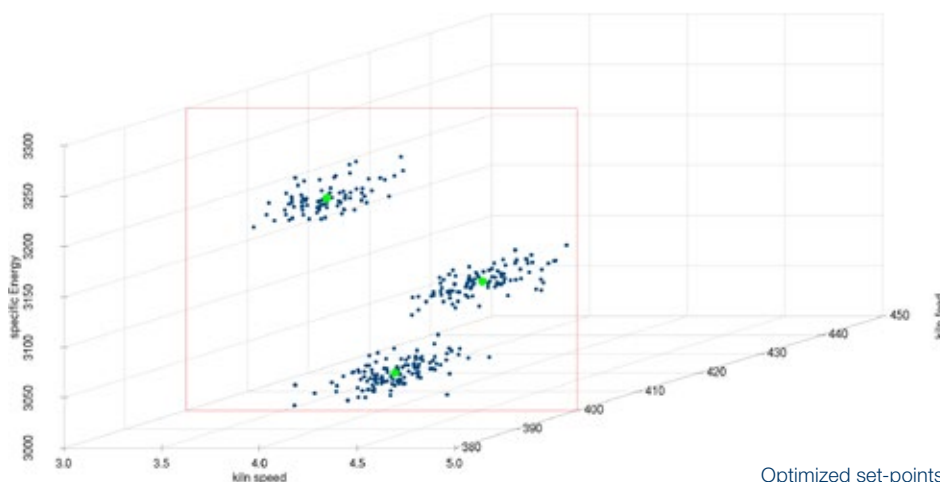
the optimization system consisting of a set of limits for relevant process parameters like maximal CO or maximal kiln load and limits for the use of the selected actuators (e.g. for maximal coal flow rate). Another important task is to agree on the type of process interface and the integration of external set-points in the plant's original control system DCS/PLC. One prerequisite for the installation of PiT Navigator Kiln is a thermography system at the kiln head, preferably the PiT Indicator or alternatively any other compatible device. If necessary this hardware and the PC is delivered to the plant. Meanwhile the basic control system is engineered and implemented. During commissioning the basic control system is improved to leave the plant with a closed-loop running automation system. During the next weeks the system is closely observed and fine-tuned to enhance the process control from a pure automation system to an self-contained optimization system.

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Optimized set-points