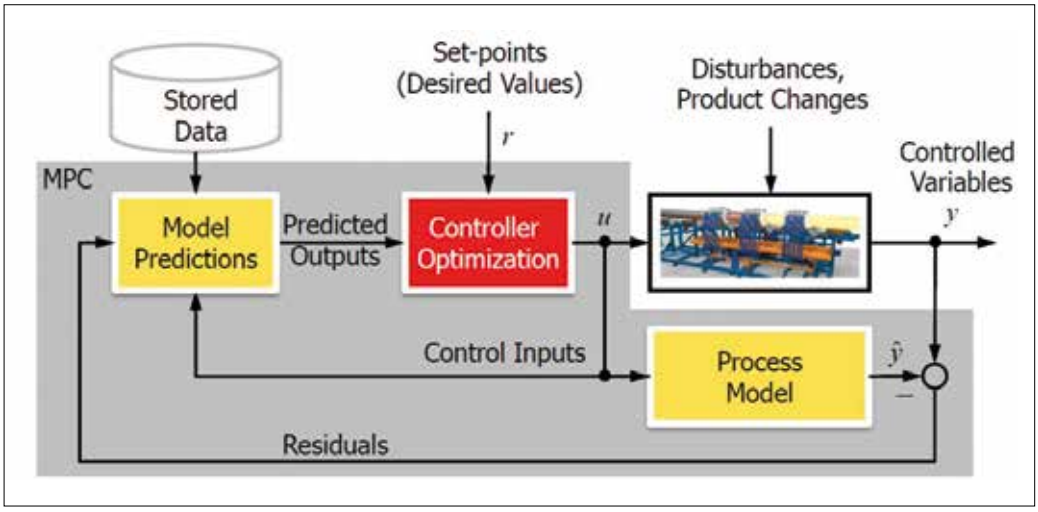
KBD Engineering GmbH

Controlled heat treatment: smart, robust and completely model-based

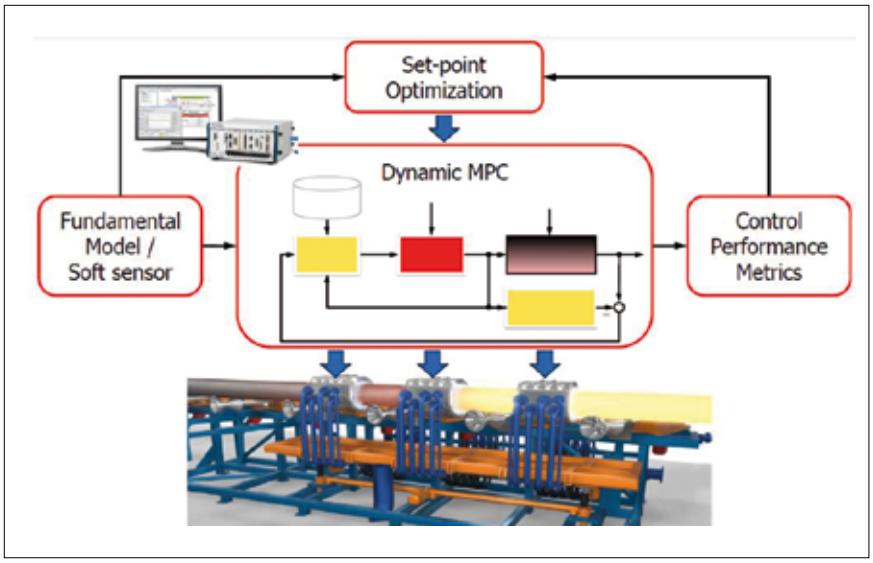
KBD Engineering GmbH is a specialist for design, development and manufacturing of automated equipment and special machines for thermal treatment systems and ancillary equipment for inductive heat treatment of metallic components, since 2003. To make heat-treatment processes as efficient as possible and the achieved product quality as high as possible, modern control technology, i.e. model-predictive control (MPC), is required. Decisive advantages are precise parameterizations of set-up processes, such as temperature trajectory and air/water distribution, and the possibility to immediately detect and control online any deviation of product-quality characteristics along the whole length of the processed piece. KBD MPC technology, developed in cooperation with ASINCO GmbH – a specialist for design and development of advanced control solutions for industrial control – continuously assesses the current and predicted process behavior, compares operational data to their desired values,



Basic Structure of Dynamic MPC

and computes new control targets to minimize in-process variability and maximize process performance and efficiency.

KBD Engineering believes that it pays to continually develop and apply new technologies and solutions that deliver more precise control of long product features and thus contribute to higher product quality, productivity and resource efficiency. Also, KBD is committed to supply user-friendly and flexible automation solutions for heat treatment plants. MPC-based solutions require accurate modeling of the process, to be able to precisely predict its future behavior. KBD MPC technology is completely based on fundamental, i.e. physical, models in combination with data-based adaptive techniques, to ensure accurate predictions. The model, included as integrated part of the control structure, enables MPC to respond quickly to changing process targets and disturbances for the full spectrum of the processed products. The basic principle of



KBD MPC Solution for Optimal Quenching

MPC is to predict the system output over a time horizon based on past and current values and on proposed optimum future control actions. These actions are calculated by the optimizer while taking into account the cost function (control performance metric), in which respect the future tracking error as well as the constraints are considered. The optimization problem is solved at every sampling instant. Depending on the concrete process structure and control problem, additional algorithms to adapt the model parameter are used, leading to a robust MPC system.

In today's customer-driven environments, manufacturers are increasing product portfolios and embracing mass customization. As a result, suppliers are faced with more product transitions and in-process variability that should be handled by the control system. Unlike conventional solutions, KBD Engineering offers dynamic MPC technology that

- Includes dynamic and steady-state optimization;
- Takes into account the multivariable nature of the heat-treatment processes, with large time constants and substantial time delays;
- Explicitly incorporates constraints at every sampling instant, including hard limits, soft or "fuzzy" constraints, desired value targets, maximization or minimization of selected variables and rate of change constraints;
- Estimates and visualizes non-measured variables, such as inter-stage temperature distributions ("soft-sensors");
- Provides the operator with a reliable algorithm, enabling transparent online tuning by displaying the future outputs predicted by the internal model;
- Guarantees consistent product quality over the whole length of each processed piece, for instance, in terms of homogeneity in temperature and mechanical properties;

By opting for KBD Engineering heat-treatment and MPC solutions, manufacturers can benefit from high-precision quality control, resulting in competitive advantages, such as faster start-up, less down-time and lower maintenance requirements, higher productivity and efficiency.

Meet us at
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Düsseldorf
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