

HOMAG GmbH

Accelerating Control Design Development
for CNC Machinery



speedgoat
real-time simulation and testing



Designing and testing advanced control strategies with PLC programming tools tends to be limited, time-consuming and prone to errors. Integrating a Speedgoat target machine as a PLC bypassing unit to the test setup enabled HOMAG to rapidly and thoroughly test control designs with the plant.

HOMAG is the world's leading provider of high-tech machines and systems for the woodworking industry. Their systems are used to produce furniture, kitchens, windows, doors, staircases, and even complete prefabricated timber-frame buildings.

They offer a range of machines and systems available to customers, extending from individual machines to complete, networked production lines for highly industrialized, yet select furniture production.

Bypass Rapid Prototyping

Adjusting control algorithms to the physical plant in the best possible configuration only using PLCs, requires an almost experimental approach. Therefore, HOMAG engineers had to tune parameters using PLC programming tools manually. This was a slow and error-prone process, thus leading to poor results.

To overcome this error-prone process, HOMAG decided to use a Speedgoat target computer

together with Simulink® and Simulink Real-Time™.

This seamless workflow for both desktop simulation and real-time testing provides powerful functionality for controller optimization, parameter tuning, data analysis, plant simulations, or test automation.

Using a Speedgoat real-time target computer to rapidly improve the control design of a heating unit for their CENTATEQ E-500 CNC machines was essential for HOMAG engineers to establish a setup called Bypass Rapid Prototyping.

In this testing setup, heating control algorithms run in real-time on a Speedgoat target computer, partially bypassing controls otherwise running on a PLC connected to the physical plant.

Furthermore, the Speedgoat target computer was added to the network as an additional EtherCAT slave device to achieve bypassing communication.

In the Bypass Rapid Prototyping setup the PLC continues to act as the master executing the remaining control algorithms.



HOMAG CNC machines such as the CENTATEQ E-500 have been significantly improved by the new edge banding aggregate powerEdge Pro Duo with the optimized heating unit.

Virtual Plant Simulation

HOMAG further leveraged Simulink to create a virtual representation of the heating unit in Simulink. Required data to model system dynamics were derived using the MATLAB System Identification Toolbox™, allowing to construct mathematical models from measured input-output data. Using the simulated control design and plant simulation, HOMAG engineers were then able to further define and tune ideal data sets for stable low jitter controls.

Deployment to PLCs

Eventually, HOMAG engineers deployed the fully optimized control design from Simulink to the PLC using PLC Coder™. To further streamline this process in low-volume production series, the Baseline or the Unit real-time target machine from Speedgoat can also be considered as final production controllers.

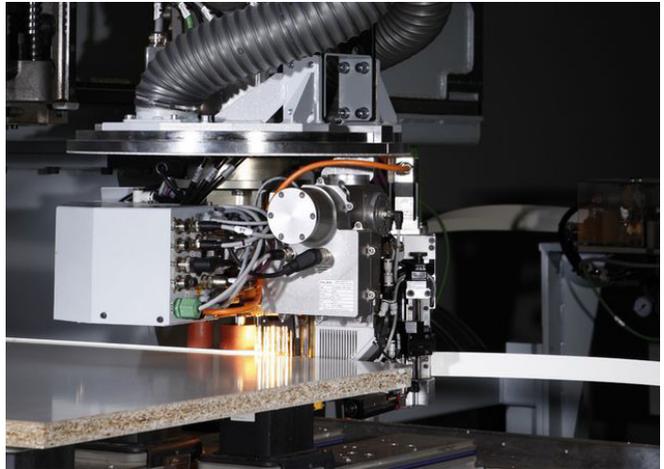
Achievements

HOMAG engineers not only achieved better control performance, but now have an effective process to quickly advance control algorithms using Simulink designs executable on highly efficient prototyping computers and embedded PLCs.

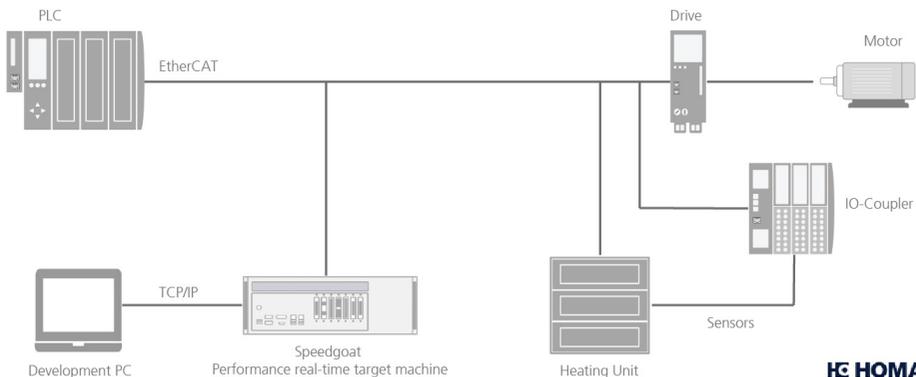
„We’ve been able to design a control algorithm with great performance very quickly. Moreover, automatic code generation enabled us to move directly from design to production code with very few modifications.“



Ludwig Albrecht, Manager Basic R&D, HOMAG GmbH



Test Bench with integrated Speedgoat Target Computer for Bypassing



Utilized Speedgoat products:

- » Performance real-time target machine
- » IO750 EtherCAT Slave module

Utilized MathWorks products:

- » MATLAB®
- » Simulink®
- » MATLAB Coder™
- » Simulink Coder™
- » Simulink Real-Time™
- » System Identification Toolbox™
- » Signal Processing Toolbox™
- » Control System Toolbox™

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