

Modeling High-Speed Stepper Motors

Gebr. Klöcker GmbH

Gebr. Klöcker GmbH is a traditional, independent and typically medium-sized company with its head office and production site in Borken, Germany and a second production site in Bandung, Indonesia. In 2011 the Klöcker had its 165th anniversary. The company is best known for its tools and components for the weaving industry.

The Klöcker Propeller Leno® is a hollow shaft stepper motor with an on-board motion controller and power electronics. The unit is equipped with a CAN-Bus connection making it extremely suited for the use in high-speed weaving machines.



Goal

Typical operation requires a Propeller Leno unit to rotate 180 degrees (start and stop) with up to 40 movements per second. In order to keep up with the increasing speeds of weaving machines, Klöcker needed help. In an Euregio funded project carried out by the Dutch company Controllab and the German company ABmaxx UG, a research project was started, to investigate how stepper motors can run ultra-fast without losing steps.

Project

Stepper motors are traditionally driven step by step, with sufficient time between steps to damp out vibrations. Controllab created a dynamic model of the power electronics, stepper motor and load. With this model investigations were done on how to do steps more quickly without losing control. In joint cooperation with the company ABmaxx, the results were used to develop an algorithm to iteratively minimize the stepping time. With this algorithm Klöcker was able to increase the performance of the Propeller Leno. Moreover, the algorithm is generic and automatic, allowing Klöcker to tune all types of stepper motors.

Results

With this increased performance, Klöcker is able to service the weaving industry for years more. It is expected that this new technology will also find its way in the Mechatronics market.