Master Thesis: Design and simulation of softstarter control algorithms to improve an electrical motor's energy efficiency

Background
ABB is a global leader in power and automation technologies that enable industry customers to improve their operation performance while lowering environmental impact with energy efficient products. ABB is present in more than 100 countries located all over the world.

Cewe-Control is a business unit within the low voltage products division of ABB that develop, market, produce and sell world leading control products including softstarters and contactors.

Scope
Modelling and simulation of industrial processes are often used to decrease the development time and improve the performances of the control algorithms. An accurate simulation platform has the main advantage of carrying out rapid system evaluation and testing before and in parallel with the development stage. This feature has a strong impact on the design of new functions and architectures.

The softstarter is a three-phase motor controller that uses anti-parallel connected thyristors in each phase to control the load voltage during a motor start & stop. By regulating the voltage, also the current and the developed electromagnetic torque are controlled. After the soft start, the current is by-passed with a by-pass contactor that is connected in parallel with the thyristors. This kind of AC to reduced AC control process results in a smooth start & stop. The advantages from a mechanical & electro-dynamical viewpoint are many and the motor's overall performance and operating life length is increased.

In applications such as moving walkways, conveyor belts and palletizers, the motor is running at full speed with varying load conditions. When the load drops such as when the moving walkway no longer has any passengers, the amount of electrical power that is transformed into mechanical work is decreased leading to large amounts of energy being wasted and unnecessary extra cost for the operator. The idea behind this thesis project is to investigate how the softstarter should adjust the motor voltage according to the load in order to minimize the energy consumption.

Goal
The outcome of this project is to model and integrate the energy efficiency control function into the softstarter simulation platform. By analysing the simulation results, it should be possible to deduce what the economic benefits are for different applications.

Field of study
We are looking for two electrical engineering students that are well familiar with automatic control, three-phase power systems, power electronics and electrical motors. Working knowledge of Matlab and Simulink is required.

Additional information
Language: English and/or Swedish (fluent in English is required)
Location: Västerås, Scope: 2 x 30 credits (ECTS)
Starting date: Earliest 2011-11-01, Latest 2012-02-01
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