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Removing the black box around drive systems

Systems to control the electrical drives in a pulp or paper mill (paper machine drives for example) have been in use for a long time. These systems have traditionally been “black boxes” that are never touched unless there is a significant problem. It has been almost impossible to seamlessly integrate drive systems into the standard distributed control system so that they can become part of a mill’s Industrial IoT network.

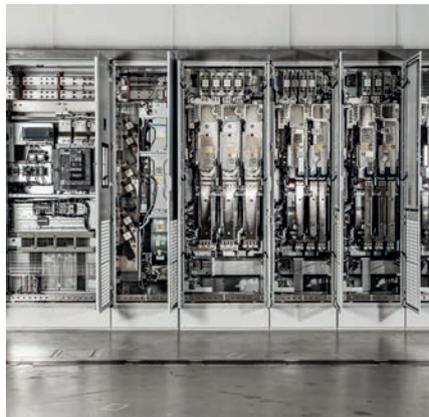
Electric drive systems play an important role in pulp and paper mills: starting up and shutting down motors, controlling the dynamics in response to applied loads, matching the power to suit the motors’ requirements, and protecting the motors from damage.

The traditional drive system has been designed as an electrical “black box” – a device deemed untouchable by mill personnel. Commission it, tune it, and leave it alone until there is a problem. Then, call in outside experts to hook up their diagnostic equipment, speak to each other in a strange technical jargon, and solve the problem. After that, the black box is sealed and the motors start up again.

This is the equivalent of having a separate dashboard in your car just for the engine, and another dashboard for everything else.

COMMON DASHBOARD

Until recently, it was almost impossible to seamlessly integrate the inner workings of the drive system into the operation and maintenance routines for the main distributed control system. We at ANDRITZ have built a common dashboard for control and drive systems, and we accomplished this by opening up the



black box and treating the drive system as a mechatronic unit.

Originally, mechatronics combined the disciplines of mechanics and electronics. But, as the systems have become more complex, the definition has broadened to include computer control, telecommunications, and information technology.

Mechatronics has become a reality in many applications, including drives. Taking advantage of power electronics (inverters), drive systems can do more than just turn an electric motor with variable speed. The capability exists to measure speed, torque, and energy flow within milliseconds – providing useful real-time information to the distributed control sys-

tem. To harness this potential in the drive system requires deep knowledge about inverter technology and the capabilities of the myriad control systems on the market – and then the ability to implement the solution in a customer’s industrial environment. These competencies are well established within ANDRITZ.

PRACTICAL APPLICATIONS

Information from seamlessly integrated drive controls can be very helpful in detecting and analyzing sheet breaks on a paper machine, for example, and are much more reliable than on-machine sensors and detectors that are exposed to moisture, dirt, and vibration. Having an accurate data log once there is a sheet break would also help to analyze the root cause. Another example would be controlling nip closures on a machine based on adaptive diameter compensation. There are many more potential applications – all resulting in faster ramp-ups, less downtime, and less waste.

We can do this thanks to the state-of-the-art power electronics available today, complemented by our own data analytics capabilities. The information will be available in real time where it is needed – including mobile applications and tablets – thanks to its integration into IoT.