Automation Control for Slitter-Rewinders

Advantages

- Rockwell Automation Integrated Architecture™ system reduces programming time, improves information flow between components, and brings unmatched flexibility to machine design.
- Drives can be seamlessly integrated to provide speed and tension control, as well as precise positioning control.
- One development environment for control, motion, and drives programming reduces development time and cost.
- Allen-Bradley® PowerFlex® drives provide outstanding torque and speed control.
- Various modes of operation offer flexibility to meet a broad range of rewinding requirements.
- Add-on Instructions (AOIs) can be used to provide tested, and repeatable implementations of the integrated torque, velocity and position requirements included in the unwind, converting, knife positioning and rewind processes.

The Allen-Bradley PowerFlex family of variable speed drives, combined with the Logix control platform, offers precise speed and tension control of the slitter-rewinder application.

Photo courtesy of Catbridge Machinery
www.catbridge.com

Overview

Slitter-rewinders are key components in many converting processes. Most converters purchase raw material in large rolls, apply a process to convert it, then slit and rewind it into rolls appropriate for their customers or for their next process.

Slitter-rewinders can be either in-line with the converting process or off-line whereby the converted product is stored as rolls and the rewinding occurs independently of the primary process. Additional functions, such as inspection, can be incorporated to make the product ready for the consumer or its next process.

The success of this application is judged by the how useful the roll is for the next process. The roll must be wound straight, with clean uniform edges and under proper tension for the next machine or consumer to use. It may look fairly easy, however, winding good, straight, clean rolls is often considered the most difficult application in web handling.

Most successful converters are diversifying their business and need equipment that can handle a variety of products with different characteristics. Differences in width, thickness and elasticity can mean wide differences in the torque requirements and slittability of the product. This adds to the demands on the control system of a successful slitter-rewinder design.

Challenge

Slitting and rewinding is a basic function for most converters. The more flexible the siltter-rewinder machine is, the more jobs a converter can accept and thus become more profitable.

A machine that can deliver the proper torque over a broad range allows the converter to evaluate more substrates and enter more markets. But it is not just the range of torque a machine can deliver. There are some products that respond better to different modes of delivering the torque. For example, there are products that wind better in speed mode with torque trim and some that respond to pure torque control. Often the converter won't know which torque mode works best until it is tried. Therefore a machine that can be configured to operate in several modes is more desirable.

Another factor is the build-up ratio (final diameter divided by core diameter) which affects roll tension. For larger build up ratios, the wound-in tension increases, and could actually damage the roll, so it must be compensated for by reducing the tension of the outer windings. Providing precise tension control over a profile as the roll builds is critical to the operation of the slitter-rewinder.

Precise positioning of the slitting knives is also critical to the success of the slitter-rewinder application. Whether manual or automated, all slitting knives must be located precisely to provide clean accurate edges to the final product.

Finally, as converters are being called upon to deliver smaller and faster production runs, setup and changeover times must be reduced. Machines that are easier to changeover with shorter down times mean a more profitable converting operation.

Solution

The Rockwell Automation Integrated Architecture brings together a powerful multi-disciplined control engine, seamless networking, a scalable visualization platform and the information technologies needed to help machine builders meet and exceed the challenges faced by converters in their slitting and rewinding applications.

Unlike conventional control architectures, the Integrated Architecture provides fully integrated, scalable solutions using a single control platform and a single development environment. This helps machine builders to more efficiently re-use engineering designs to help reduce their Total Cost to Design, Develop and Deliver [SM] a machine and enhance business performance.

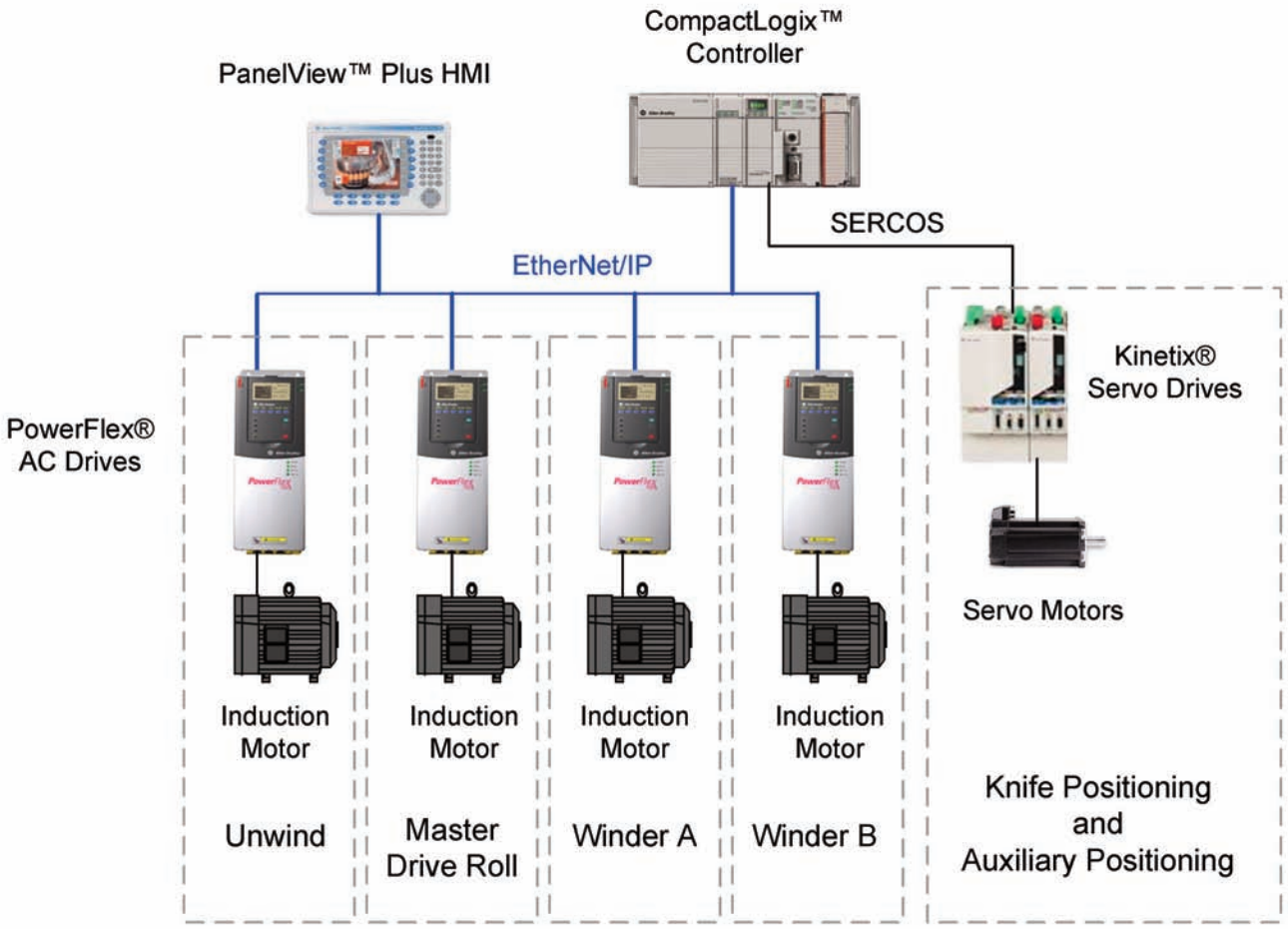
The Allen-Bradley PowerFlex family of variable speed drives, combined with the Logix control platform, offers precise speed and tension control of the slitter-rewinder application. In addition, the Logix platform with Kinetix® integrated motion offers precise motion control of the automated knife positioning system using the Kinetix family of servo drives. System components are programmed with the Rockwell Software RSLogix™ 5000 software.

In addition, some manufacturers are finding that the Kinetix family of servo drives and motors offer an attractive combination of precise motor control and efficient packaging that work well in this application.

For applications that incorporate additional functions, the modularity of the Logix control platform facilitates easy addition of motion axes and drive control. For example a PowerFlex 700S drive with positioning capability can be easily integrated into a slitter-rewinder application that has incorporated inspection capabilities and may need to stop at certain positions for operator inspection.

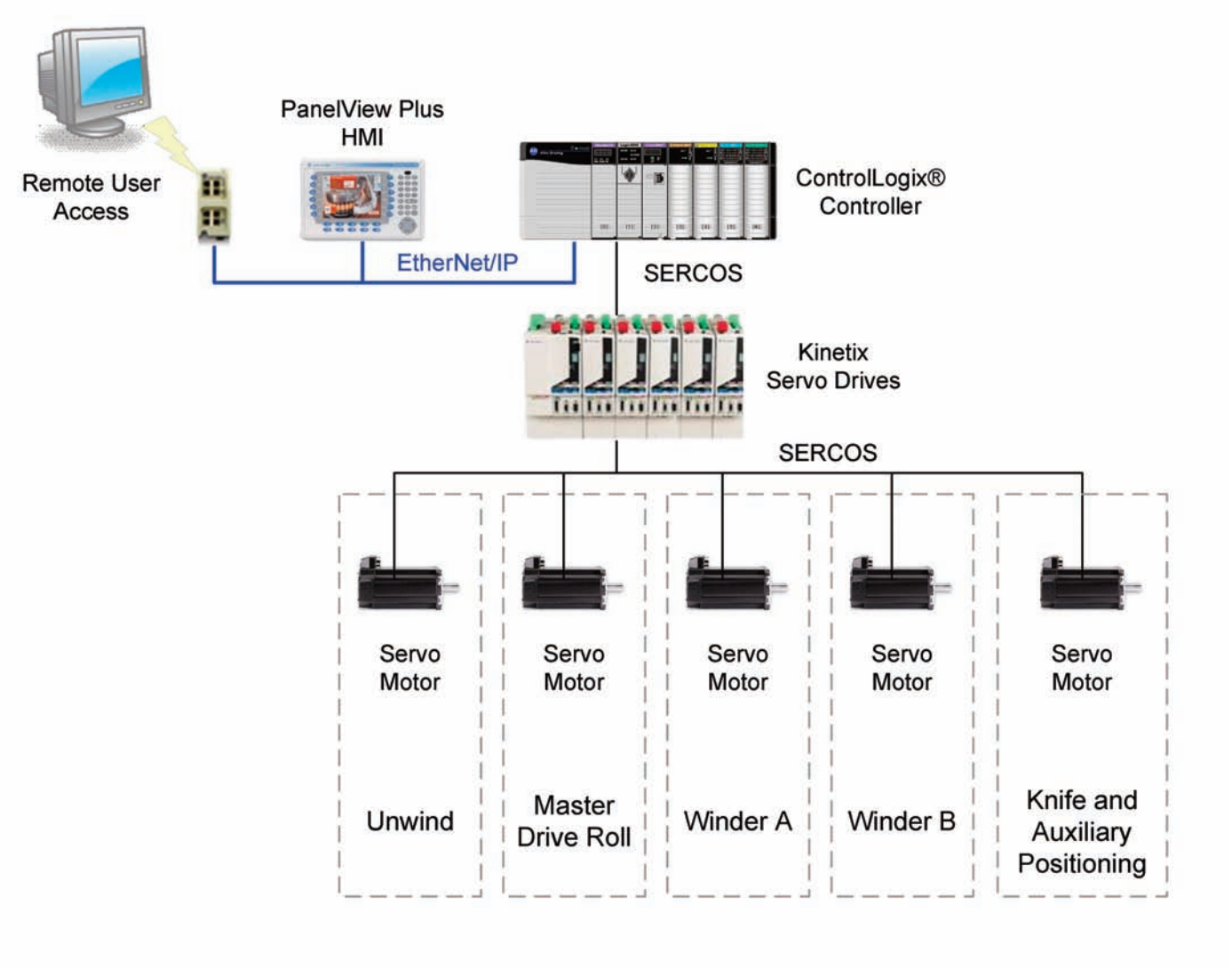
Typical Architecture

Slitter-Rewinder using Variable Frequency Drives



Typical Architecture

Slitter-Rewinder using Servo Control



Rockwell Automation solutions deliver improved production capabilities and reduced total cost of ownership by providing unparalleled functionality, flexibility and scalability. Machine builders can respond more quickly to customer or market demands, reduce maintenance costs and downtime and easily gain access to actionable plant and production information for improved management and decision-making.

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