

Drive & Control profile

Rexroth Brings Servo Precision to Sophisticated Web Converting Machine



Using a Rexroth control system, Summit's web converter is a 20-axis converting machine that takes material compounds and precisely forms them against a substrate to create the final product.

Drive and control system, easy-to-program software help Summit Machine develop a super precise machine for the converting industry

Precision. It's a word defined as "the state or quality of being precise; exactness; and the ability of a measurement to be consistently reproduced." For Summit Machine, Inc. (Shoreview, MN — www.summitmachineinc.com), these qualities are absolutely essential as they engineer, design and build custom web converting

equipment for a variety of industries and applications.

Summit recently built a high-precision servo-driven web converting machine for a leading developer, manufacturer and supplier to the electronics industry. Summit's challenge was to design a machine having a robust, yet

Challenge

Design a precise web converting machine and a robust, flexible control solution without having to program advanced functionality from the ground up

Bosch Rexroth Solution

- SYNAX 200 scalable control system with Electronic Line Shafting capabilities
- IndraDrive digital intelligent servo drives with SERCOS communication
- IndraDyn synchronous servo motors
- Dual IndraControl VEP Windows CE-based operator interfaces
- Expert support and applications knowledge

Results

- Flexible machine with ability to quickly set up configurations for different product recipes
- Reduced programming and debugging time
- Electronic Line Shafting eliminates mechanical components
- Cam profiles allow for variable sheet sizes without die change

flexible control system without the need to program all the advanced functionality from the ground up—a process which could make the machine cost-prohibitive. Summit chose a drive and control solution from Bosch Rexroth to help meet these goals for precision, flexibility and fast programming.

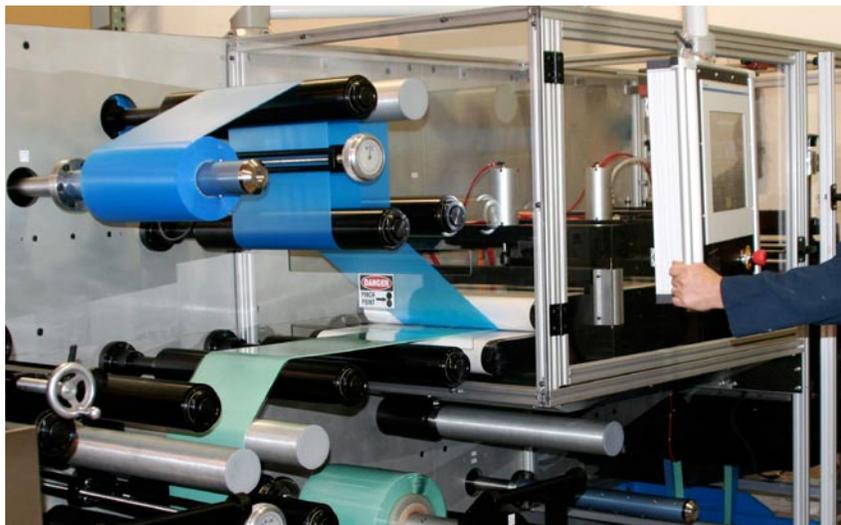
Built-in Functionality from the Ground Up

The web converter Summit designed and built for this application is a 20-axis converting machine that takes material compounds and precisely forms them against a substrate to create the final product, which usually resembles a soft pad and comes out of the machine as a sheet or on a roll.

The machine is composed of two sections with a curing oven in between. The front section has three unwinding spindles and a coating section with one fixed cylinder on the leading edge side and one moveable cylinder on the finishing side that allows the operator to control the gap distance precisely. The backing material unwinds from the spindles and passes through the coating section as product is pumped in between to a given thickness.

The converted web material then passes through the curing oven to the back half of the machine where chill rollers, a main product rewind, and a slitter-sheeter are in place.

As the converted web material is cooled to room temperature using the chill rollers it can either be rewound in a roll-to-roll process,



For flexibility, the machine can be electronically “split” into two machines allowing the coating section to run a roll-to-roll process while the slitting-sheeting section can run a roll-to-sheet process.

or cut into sheets. For the roll-to-roll process the materials go onto a rewind, which can also involve two other rewinds for liner removal if desired.

If the final product is requested in sheet-form, the material passes over the rewind and enters a nip conveyor. The nip conveyor uses two conveyors that are pneumatically loaded together to create a nipping action without crushing or deforming the final product. Afterward, the material goes through a standard shear-cut slitting head and die station. The liner is peeled back and replaced with a new one to eliminate wrinkles, and then run through a precision die cutter so it can be cut into different sizes before moving to an output conveyor.

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Bosch Rexroth Technology—More Flexibility, Less Programming

To help develop the control system, Summit worked with Shawn Nelson from local automation distributor Motion Tech Automation (MTA) (Oakdale, MN—www.motiontech.com), who specified Bosch Rexroth’s SYNAX 200 control platform along with IndraDrive intelligent servo drives using SERCOS communication, IndraDyn servo motors, and two Bosch Rexroth IndraControl VEP operator interfaces.

Specifically designed for the converting industry, Rexroth’s SYNAX 200 is a freely scalable control and drive solution that helped Summit build in flexibility without a lot of time-intensive programming. The SYNAX 200 replaces wear-prone mechanical



Rexroth's SYNAX 200 replaces wear-prone mechanical drive elements with Electronic Line Shafting and uses tightly synchronized digital servo drives and dynamic servo motors running off a standardized control platform.

drive elements with Electronic Line Shafting (ELS) and uses tightly synchronized digital servo drives and dynamic servo motors running off a standardized control platform.

In addition, the system includes numerous IEC61131-3 motion functions such as electric gearing and camming, tension, winding and registration controllers, and standard IEC61131-3 logic functions. Motion control is achieved by parameterizing highly flexible motion profiles, while advanced functions can be programmed in IEC61131-3 language as needed. With Rexroth's built in functionality, Summit could focus on adding other functions to customize the machine for an individual customer. For example, a special function block was used to calculate and download motion

cam profiles to the die axis, allowing the machine to create variable length sheeting from 2 to 24 inches without changing the dual knife cylinder.

"SYNTAX is an excellent solution because we didn't have to write a variety of low-level codes," said Russ Hubrich, Engineering Manager with Summit Machine, Inc. "The software saved us a lot of time and headaches in getting the machine up and running. The SYNAX system has really good application-specific functionality that allowed us to work more efficiently."

Hubrich added that MTA was instrumental in helping to program the machine. "The effectiveness of the software made it easier for MTA to help program the machine, and helped us get it to market very

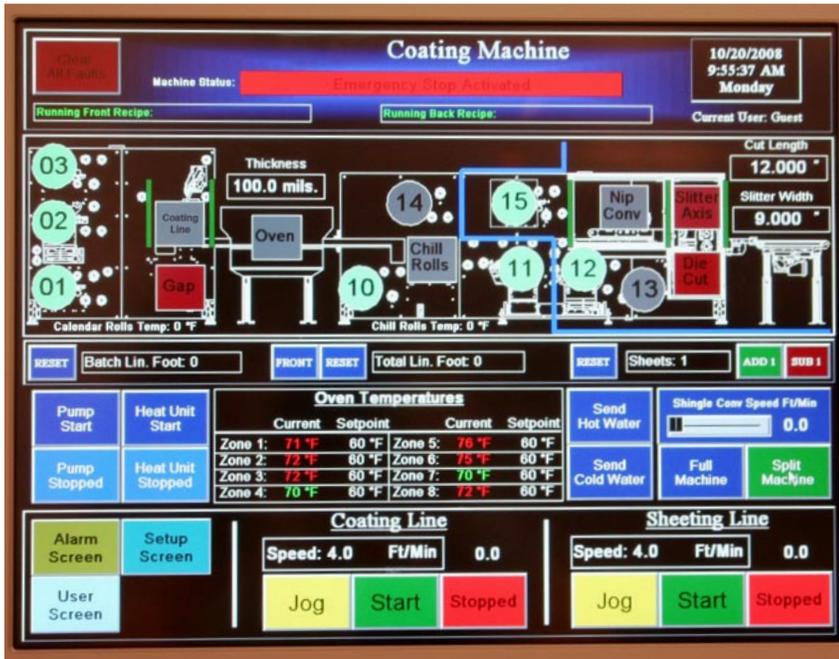
quickly—with a programming and debug time of only three weeks," said Hubrich. "The SYNAX software also provides more flexibility in running the machine in a variety of configurations for different product recipes."

In addition to easier programming, Hubrich said precise control is also crucial to the machine, particularly for the gap control in the rollers. Summit's customer makes hundreds of different sizes, versions, and varieties of product, so adjustment of the machine's rollers must be controlled carefully. Rexroth's [IndraDrive](#) digital intelligent servo drives provided exactly what was needed. The converting portion of the machine is composed of



Using dual loop control, Rexroth's IndraDrives provide tight control of the actuator positions, which allow for minute changes in the gap distance.

two rollers—one fixed and one movable. The movable roller allows for precise control of the gap distance via linear encoder feedback from the roller's motor into the drive. Linear scales also feed directly into the IndraDrive. Using dual loop control, Rexroth's IndraDrives provide tight control of the actuator positions, which allow for minute changes in the gap distance.



Summit uses Rexroth IndraControl VEP operator interfaces with embedded Windows CE systems that provide the power and functionality of a PC, but with flash card technology.

For the machine motors, Summit is using Rexroth [IndraDyn](#) synchronous servo motors which offer complete scalability and compact construction with increased torque density. Hubrich added that MTA helped Summit size the motors appropriately on the machine and matched them to different gear ratios so that they had an optimized system of drives and motors.

Bosch Rexroth also provided two [IndraControl VEP](#) operator interfaces with embedded Windows CE systems, providing the power and functionality of a PC but with flash card technology. Dual HMIs are used to help provide split capabilities so the machine can run as two separate units. The IndraControl VEPs are also beneficial for recipe management, which is important for Summit's

customer because of the variety of products they make. Applications for the machine can be created with Rexroth's WinStudio configuration software and parameters for product changeover can occur with the push of a button.

Short Learning Curve with Rexroth Support

Because they were supporting Summit from the ground up, MTA had to be certain they could deliver an easy-to-use system. Potential roadblocks were avoided due to Bosch Rexroth's quality technical support. According to Hubrich, not only does Rexroth have a systems solution that works well, but they also provide outstanding support.

"Rexroth transferred their knowledge to us very quickly and efficiently so that we could become experts in a short period of time," said Hubrich. "They provided an applications engineer who became our liaison to make it a very successful project. He came out on site and helped train everyone on how to use the application so it went very smoothly."

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