System 9000
Automatic center guiding, spreading, and width control for fabric calender lines.

Simplicity Through Integrated Engineered Solutions

System 9000 is a robust solution for guiding, spreading, and width control for fabric calender trains. It is engineered specifically to provide the best-in-class width control technology for calender lines producing high volume automobile and light truck tire calendered material. Utilizing state-of-the-art linear motion products for center guide and spreader controls, elements are smartly integrated to achieve consistent width control and increased throughput. Practically, the system offers the utmost performance in equipment, time-tested and proven reliability, and the broadest application capability. Operationally, System 9000 offers the simplicity customarily present with Fives North American control systems, a standard sensor for all applications throughout the line, and a completely integrated guiding and spreading control scheme to ensure optimal width control for all fabric materials, weaves, and densities.

We Can Deliver:
- Increased throughput - Consistently maintained specified width.
- Reduced downtime - Replace hydraulics with AC servo controlled electro-mechanical actuators.
- Improved product quality - Better cord distribution uniformity and reduced edge cord deviation.
- Reduced waste - Decreased scrap at splices and execute changeovers faster.
- Decreased variation - Automated fabric spreading and width control.
- Simplify operations - Guide and spreader controls available from multiple operator interfaces.
Fives North American’s technical advancements allow large capacity tire producing plants to automate the fabric center-guiding systems, fabric spreading systems, and edge trimming systems on calender trains to maximize throughput and product uniformity. Our Integrated Engineered Solution for fabric calender trains feature:

- **First Edge Non-contact Detectors** specifically designed to sense low end count fabric (8 EPI) and provide an accurate material edge position.

- **Adjusta-Guide®** fabric center-guiding systems (steering type) for 500 pounds (227 kg) to 5000 pounds (2272 kg) tension zones. Designed for center-guiding fabric in the pre-calender section of the calender train.

- **Patented ZERO-RESET™** control technology offers superior spreading stability, optimal width performance, and an industry standard platform for reliability. ZERO-RESET technology compensates for the variable transport lag or hunting action to achieve stable and accurate (\( \frac{1}{16} ^{\text{th}} \) [1.5 mm]) width control for the tire cord fabric.

- **H6630** controllers for center guides, spreaders, and knife trim positioners offer the latest configurable AC servo drive technology, straight-forward operator interfaces with 7” color touchscreen displays, and networked communications. The H6630 controller provides simplified setup via industrial network communication.

- **H5535** roller screw electro-mechanical actuators with absolute encoder feedback offer the best available mechanical transmission technology, the longest operating life possible, and superior positioning ability. The actuators offer configurable stroke adjustment and electronic end-of-stroke protection. The absolute encoder retains position location information even after power outages to ensure quick start-up time.

- **Cam-Track™** displacement center-guiding systems for 500 pounds (227 kg) to 5000 pounds (2272 kg) tension zones. Designed for minimum stress redistribution of the calendered fabric in the post-calender section of the calender train.

- **SpreadMaster** dual double axle, bowed roll tire cord spreading systems for low tension and high tension applications. The bowed rolls are constructed with universal joints at their center, so that each half operates independently with the H5535 actuators.

---

**PRE-CALENDER SYSTEMS**

1. 2-roll Adjusta-Guide with H6630 center guide control system to assure that tire cord fabric enters the entry accumulator, exits the entry accumulator, and enters the low tension SpreadMaster on machine centerline. Non-contact line scan H3662 sensors provided in ready-to-install O-frame mount.

2. Replace existing fixed, single bowed roll with low tension SpreadMaster (4.5” diameter) tire cord spreading system with H6630 ZERO-RESET control and programmable detector positioning for initial fabric spreading into the entry accumulator or prior to heat drying section.
H5566 dual, independent, high speed electro-mechanical positioning system for customer supplied trim knives. Includes H6630 controller, AC servo motor with absolute encoder, and a sturdy linear rail design to accommodate high loads associated with gum edge trimming.

**CALENDER SYSTEM**

To achieve maximum width control and optimal product quality, a coordinated set of equipment is provided in the high tension calender zone. The system features shrink-down compensation by continuously monitoring the calendered fabric width at the exit of the cooling drums and adjusting fabric width prior to the calender. The system includes:

1. Preliminary Spread Master
2. Final SpreadMaster with first-edge non-contact H3662 sensors on motorized positioner with H6630 ZERO-RESET™ control technology. Includes a dedicated H6630 controller with 12" color touchscreen HMI for complete line management.
3. First-edge H3662 width measurement system located after the cooling drums.
4. Independent edge, three-finger spreader using non-contact H3662 sensors with H6630 ZERO-RESET control technology to ensure edge cord count distribution. Each three-finger has an adjustable cant angle to optimize spreading capability.

**POST-CALENDER SYSTEMS**

13. Cam-Track displacement guide system for center-guiding calendered fabric prior to the exit accumulator and prior to wind-up. H6630 controls and non-contact H3662 sensors in O-frame mount included. The displacement guide system center-guides calendered fabric with a minimum of stress re-distribution.
14. Pre-windup width monitor via first-edge H3662 sensors in O-frame mount. Width measurement displayed at operator interfaces and available via fieldbus communication.
15. Non-contact line scan H3662 sensors with H6630 control for liner let-off stands. Edge guide or center guide method provides smooth and accurate placement of “shop worn” liner material.
System 9000 - The Ultimate in Performance

System 9000 Features

- Ability to enter and store product codes to facilitate rapid change-overs with minimal operator involvement.
- Out-of-spec material at splices and order changes is minimized with automatic return to memory position.
- Multiple graphical touchscreen operator interfaces with health status and alarms provide real-time system feedback to the operator and assures consistent product quality.
- Final calendered product width information available via industrial network.
- Mechanical components designed for simple field installation and maintenance. Cables provided for H5535 actuators and H3662 sensors to reduce field wiring.
- Networked design facilitates easy electrical installation as H6630 controllers are linked via industrial network communication. Eliminates point-to-point field wiring and remote I/O requirements to reduce installation costs.

Control System

System 9000 integrates all center guiding, spreading, and width measurement equipment into a totally networked control scheme managed by a master H6630 controller. Utilizing ZERO-RESET technology to achieve stable and accurate performance, the system assures correct calendered width, minimizes waste at splices and order changes, provides uniform quality material, and optimal wind-up width—all with minimal operator involvement. With several operator interfaces optimally positioned throughout the line, each contains user-friendly HMI screens to offer a logical and practical flow of information and feedback. Due to the dedicated communication network design, each H6630 controller has a unique IP address making status easily visible and facilitates a line E-Stop circuit capability for all devices. An industrial network communication option enables download of product specifications and real time feedback on width data and system status. Implementation typically includes multiple H6630 controllers in close proximity to their application use and to ease installation.

Results Delivered

Customer Testimonial:
"We increased overall product width by 10mm and believe a total of 20mm is attainable while reducing EPI variation. The bottomline throughput and yield improvement is remarkable."

Services

Fives North American recognizes the significant capital expenditure necessary to modernize a fabric calender train. We typically include a broad array of professional services to ensure our clients achieve the highest return on their investment.

- On-site Calender Train Process Assessment
- On-site Project Engineering Kick-off
- Project Management
- Controls Engineering
- Mechanical Engineering
- Installation Supervision
- System Commissioning and Start-up
- Operator Training
- Maintenance and Engineering Training
- System Documentation