CALENDERING INDUSTRIES

Advanced Web Solutions
NDC’s Calender Solutions:

Engineered to deliver outstanding results from your process

NDC’s Calendering Systems represent reliable measurement and control solutions for vinyl, gum (innerliner), textile (fabric), and wire (steel cord, metallic) calenders. NDC recognizes that each calender requires a system tailored to your requirements to deliver a solution with a clear return on investment. Therefore each NDC Calender System includes the right sensors, scanners, measurements, displays and controls to help customers produce quality products.

Customer Benefits:

► Higher Quality and Productivity: Achieved through accurate measurement and tight control of the process.
► Lower Manufacturing Costs: A flatter sheet to help lower scrap and raw material consumption.
► Improved Process Visibility: Enables operators to make real-time decisions to produce higher quality products more efficiently.

Measurements

► Gum weight
► Gum thickness
► Fabric weight
► Total weight
► Wire balance
► Wire position
► Wire cord count
► Wire edge to 1st cord
► Total thickness
► Product width
► Wind-up weight
► Lump detection
Calender System Configurations

Measurement solutions for the calender processes

<table>
<thead>
<tr>
<th>Calender Type</th>
<th>On-Calender Scanning Measurements</th>
<th>Post Calender Scanning Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight</td>
<td>Thickness</td>
</tr>
<tr>
<td>4-Roll S Wire</td>
<td></td>
<td>2 Laser sensors on rolls 2 and 3</td>
</tr>
<tr>
<td>4-Roll S Textile</td>
<td>1 XRB on roll 3</td>
<td>or 2 Laser sensors on rolls 2 and 3</td>
</tr>
<tr>
<td>3 Roll Tandem Textile</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>2, 3 or 4 Roll Gum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Roll Inverted L</td>
<td>XRB on roll 2</td>
<td>or Laser (Single-sided)</td>
</tr>
<tr>
<td>4 Roll Gum</td>
<td></td>
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</tbody>
</table>
Accurate Measurements and Effective Controls

Equals NDC’s complete strategy for superior results from your process

Intelligent Measurement Technologies

► Beta: NDC’s beta transmission sensors provide accurate, on-line measurement of total thickness or basis weight. They feature a high-efficiency detection system with optimum source activity for each application.

► Single-Sided Laser: NDC’s laser gauges measure thickness via a triangulation computation of a laser beam. This gauge is designed to measure thick calendared products and provides a non-nuclear measurement alternative.

► X-Ray: NDC offers both transmission (XRT) and backscatter (XRB) X-ray sensors. The XRT sensor provides excellent CD resolution for the wire position, spacing and count, while XRB sensors provide a measure of wire balance or on-the-calender gum weight.

► OptiMike: The OptiMike OM190 optical micrometer provides direct, single-sided thickness measurement for vinyl calendared products based on a projecting a beam of light across the apex of the product wrapped over the surface of a precision reference roll.

Control Technologies

► Two or three-zone control for a flat profile
► Delta presets allow for product change-over’s without stopping the line
► Predictive Process Modeling anticipates process behavior by making control moves based on the history of prior outputs before they reach the scanner.

Gap Control

Provides de-coupled roll gap adjustment for the entire calender stack. Optimum performance is provided by a control algorithm that is tuned for different material compounds plus mechanical backlash and stiction.

Cross Axis or Roll Bending Control

The thickness or weight profile measurements supervise either the cross axis or roll bending controls to flatten the web center zone.

Delta Preset Control

Roll gap is preset at the beginning of a run via recipe-based targets. The delta from product code A to B is used to automatically adjust the roll positions.

Sheet Average Control

Average sheet thickness or weight control supervises the gap controls and is decoupled from other controls to avoid interaction and loss of quality.

Calender Controls

Windup Weight Control

Product cooling, stretch or shrinkage between the calender and the winder can result in an offset in the final sheet. The system compensates for these dimensional changes using an algorithm that combines the current product weight, width and speed.

Line Speed Feedforward Control

Speed feedforward control compensates for calender dynamics such as frame stretch during line speed changes.
Rugged, Reliable, Maintainable Scanners

High performance intelligent scanners for fast, accurate measurement

NDC’s AccuTrak scanner supports a multiple sensor payload for complex wire and textile calenders.

NDC’s AccuTrak O-Frame scanner has been engineered for today’s quality requirements. Its rugged design utilizes a head carriage bearing system that provides long-term precise, repeatable alignment and measurement performance.

This intelligent iFrame™ scanner delivers fast, accurate, reliable measurement that is integrated into an intelligent distributed architecture from NDC. Spanning four decades of experience in the industrial measurement and control industry, the AccuTrak O-Frame scanner provides unmatched performance and a low cost of ownership.

The MiniTrak S-Frame Single-Sided scanner provides a rigid, reliable box-beam measurement platform with elegant clean lines.

The MiniTrak S-Frame supports both the backscatter and reflection family of intelligent iSensors™ from NDC. This frame is compact, robust and supports up to two scanning intelligent iSensors. It requires minimal installation space and can provide critical measurements from difficult process locations.

The MiniTrak S-Frame incorporates an intelligent iFrame module that manages the scanner, sensor and control operations for high system integrity plus responsive measurement and control.

A special version of the MiniTrak scanner for Rubber has remote electronics so that the scanner can be mounted directly against the calender roll.

Making Light Work
Company overview

Combining industry-best performance and reliability with a global support structure

NDC Technologies, headquartered in Dayton, Ohio, designs, develops and produces a wide range of process measurement and control instrumentation for a broad scope of manufacturing industries.

NDC has manufacturing facilities in Dayton, Ohio and Maldon, UK, with Technical Centers of Excellence at each of these locations including Irwindale, California and Loncin, Belgium. In addition, there are direct sales and support facilities in China, Japan, France, Germany and Italy. There is also a highly trained network of Sales and Service distribution channels in more than 60 countries around the world.

NDC Technologies is strategically structured to serve the following key industry segments:

► Extrusion and Converting
  NDC provides basis weight, thickness, coat weight and moisture measurement and control systems for a diverse array of applications in the film extrusion and converting industries and also provides solutions for customers in nonwovens and calendering.

► Food and Bulk
  NDC delivers both on-line and at-process analyzers for the measurement of key constituents such as moisture, fat, oil and protein. NDC’s broad spectrum of measurement solutions are used in the food, chemicals, minerals building materials, pharmaceutical and tobacco industries.

► Cable and Tube
  NDC serves the wire, cable, fiber optic, pipe and tube industries with a broad portfolio of on-line and off-line measurement and control solutions for the dimensional monitoring of diameter, ovality, wall thickness, eccentricity, length and speed, and other parameters.

► Metals
  In the steel and aluminium industries, NDC offers advanced solutions for the measurement of thickness, width, flatness, edge shape, coatings, and length and speed of sheet and long casted products.

In line with its policy of continuous improvement, NDC reserves the right to revise or replace its products or services without prior notice. The information contained in this document may not represent the latest specification and is for indicative purposes only.

NDC Technologies is represented in over 60 countries worldwide. www.ndc.com