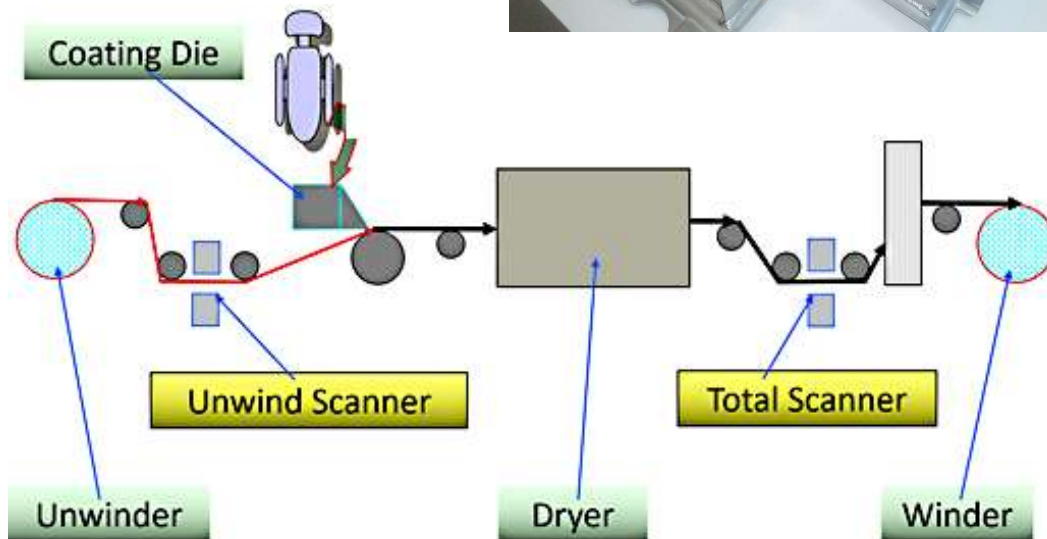
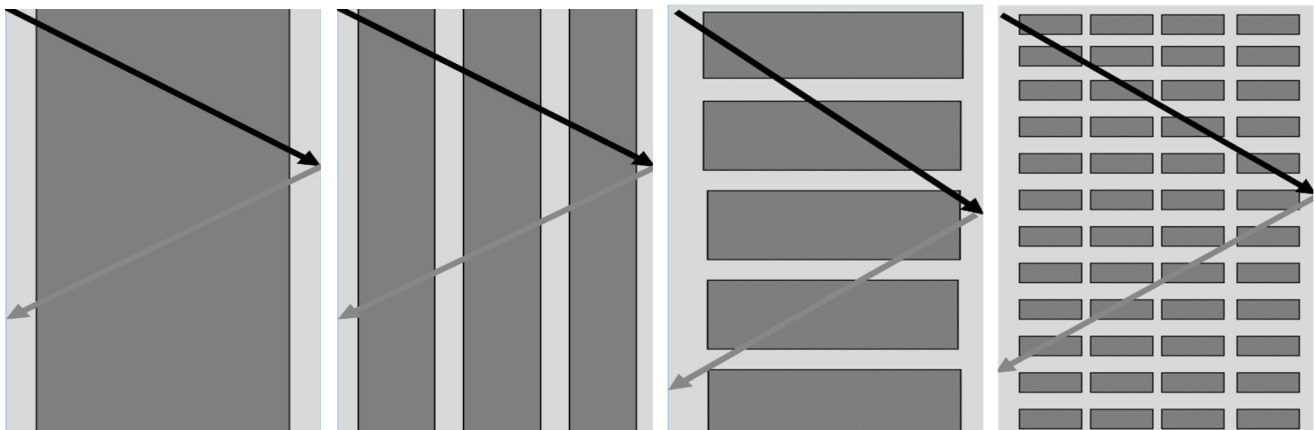


LITHIUM ION BATTERY (LIB) APPLICATION REPORT

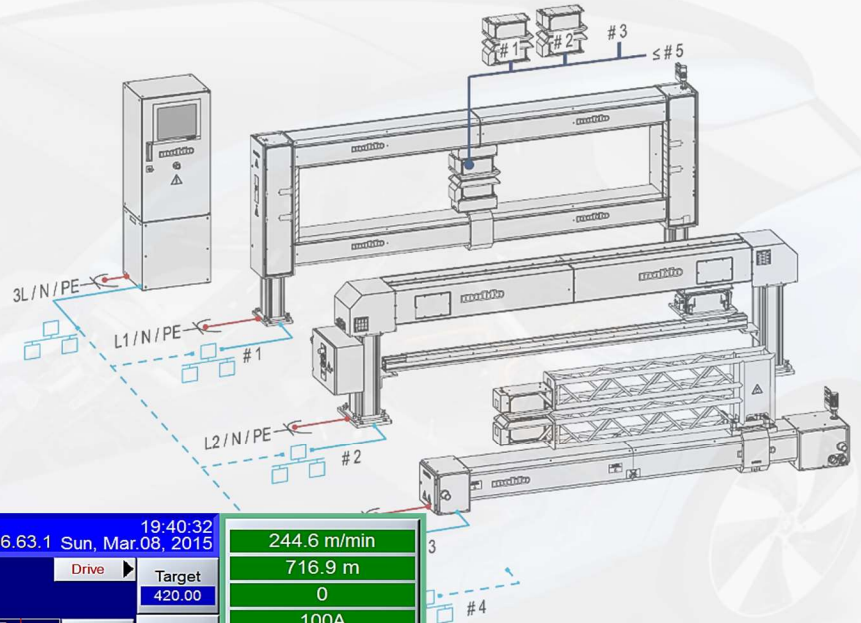
The Lithium Ion Battery market has grown exponentially over the past decade, and Mahlo is proud to have been a part of this growth since the early anode, cathode and battery separator manufacturing lines. These industries have become increasingly more sophisticated resulting in much tighter product specifications and quality standards. Building a better battery starts with better online measurement, and Mahlo's experience and understanding of the LIB industry has allowed us to tailor web gauging systems for the LIB components and processes.



Anode and Cathode Coating Processes unwind Copper and Aluminum foil and coat the electrode using a slot die, doctor blade or screen printing method. The coating can be a full continuous coverage, rows of coated strips or discontinuous patches.



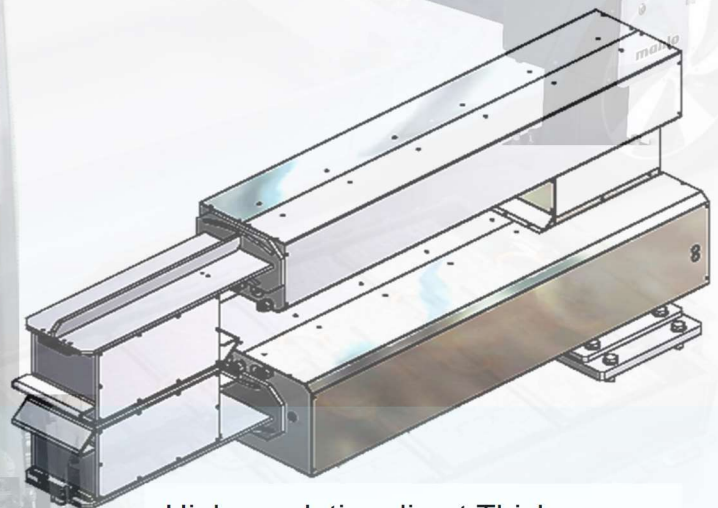
The measurement of the Coating Basis Weight is performed by mass measurements before and after the coater using rugged scanning frames and any of a variety of precise sensors, such as Beta, X-Ray, or other electromagnetic techniques.



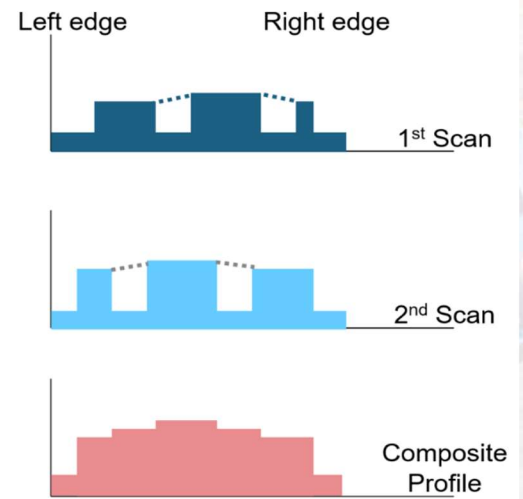
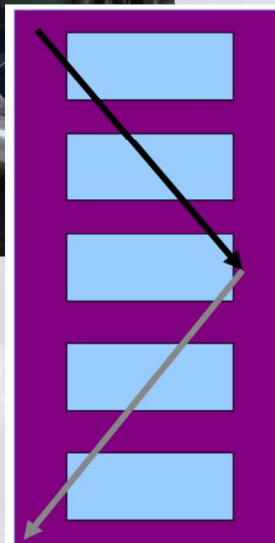
The standard Mahlo Automatic Lane Detection Tool displays only the basis weight, thickness, width and statistical information of each lane without showing the substrate. This allows for a clear and immediate understanding of the coating quality in Real Time!



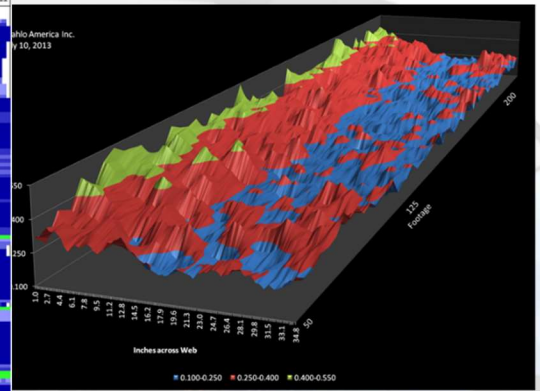
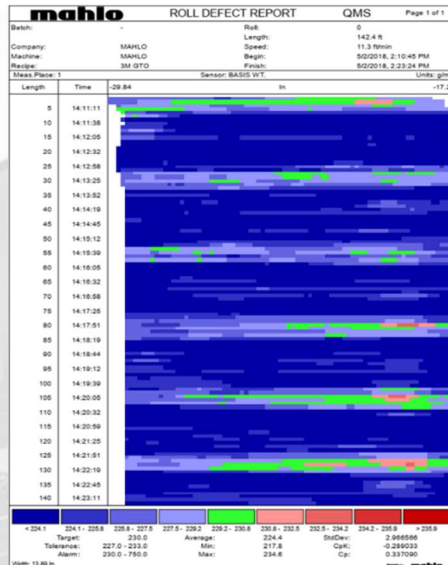
The Patented DFI Beta Transmission Sensors or X-Ray Sensors on compact, industrially rugged and clean-room appropriate O-Frames are used for precise Basis Weight Measurements



High-resolution direct Thickness measurements are made using the non-contact DML Laser Caliper Sensor mounted on the ultra-rigid WebPro-C C-Frame Scanner.

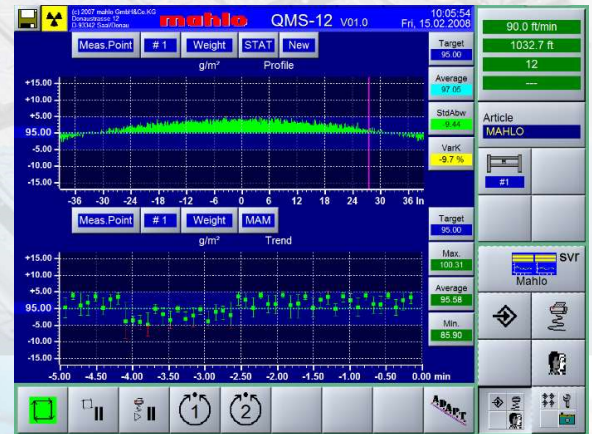


Complete Statistical and Graphical Roll Reporting, and Industry Standard Data Communication Protocols provide credible evidence for every lot, batch and roll. Recipe-driven multi-level tolerance and alarm limits tell the operator at a glance whether his product is in specification.



For the entire gamut of converted products, Mahlo makes a quality control system tailored to your specific application, for your specific measurement and control needs. Fixed, single-sided and dual-sided scanning platforms are available with multiple synchronized scanners measuring tandem coatings, basis weight, moisture, thickness, layers, permeability, etc., plus a myriad of combined calculations are standard for simple narrow webs to wide coating & laminating lines. Automated control integration is possible with our coat weight control capabilities for roll gap, roll skewing, applicator roll speed/ratio, die pump, linespeed and APC (automatic die profile control) to name a few. Sealing / purging for hazardous locations (Class 1, Div. 1) is available.

Utilizing intelligent sensor and scanner techniques, the Mahlo QMS systems measure on-line continuously and with extreme precision and response. The computer interface is Windows 10 IoT based, is fully open and conforms to industrial communications standards. Ease of use and configurability were built in from the ground up and the menus and functions are very easy to understand with a short learning curve.

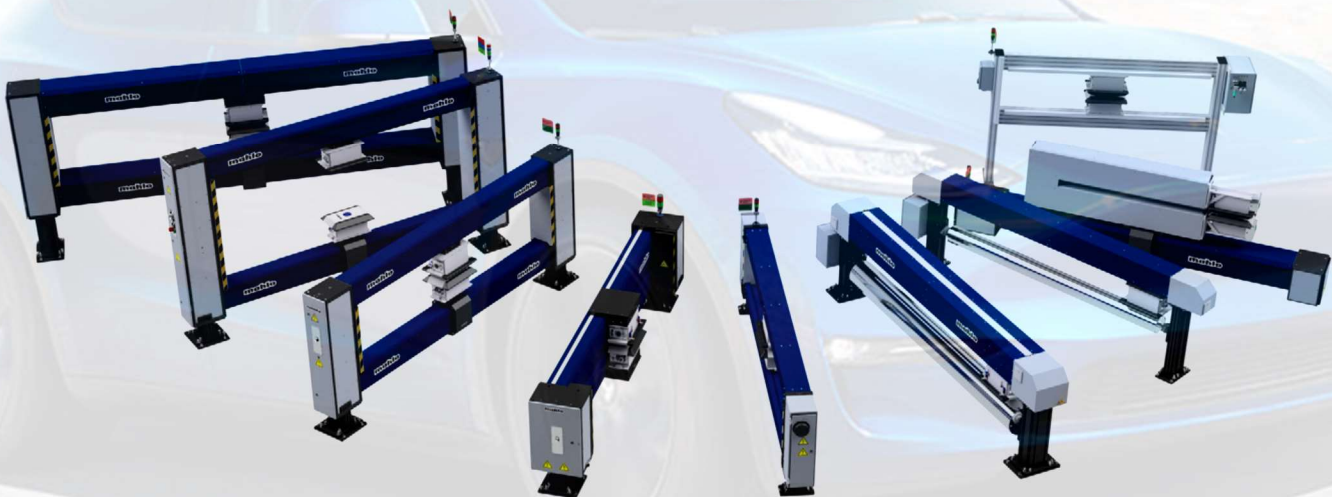
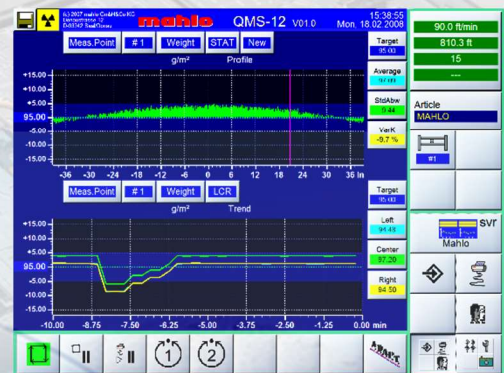
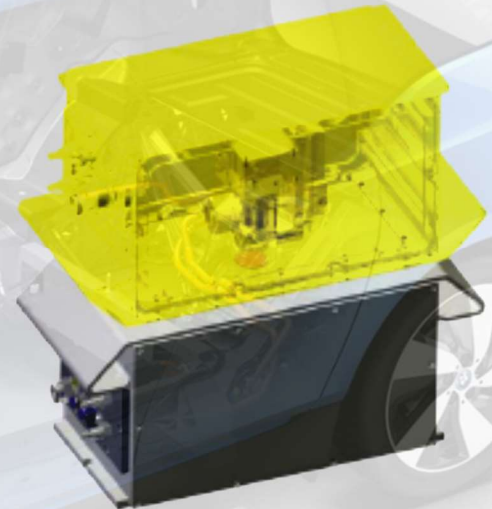


One of the many strengths of the Mahlo system is the family of rugged steel O-Frames. We know that these scanners must traverse back and forth around the clock, 365 days per year for many years. Building tough industrial machinery is a forte of German manufacturing, and Mahlo grew up making large-scale machinery for the textile and carpet industry, and continues to this day. Over-engineered for long, trouble-free life, yet easy to maintain with commercial components, all Mahlo scanners whether single-sided for Infrared, Laser or X-Ray sensor applications, Compact O-Frames for tight spaces or the WebPro-L O-Frame scanner for those wide web applications and a payload of up to five sensors, are built to last.

Mahlo QMS Quality Control System Offerings

Measurements

- **BASIS WEIGHT SENSORS**
 - Spectrometer NIR Sensor
 - Beta Transmission Sensors
 - X-Ray Backscatter Sensor
 - X-Ray Transmission Sensor
 - Infrared Absorption
- **MOISTURE SENSORS**
 - Infrared Absorption
 - Microwave Resonance
- **CALIPER THICKNESS SENSORS**
 - Laser Triangulation (Single- and Dual-Sided)
 - Shadow Caliper
 - White Light Interferometer
- **AIR PERMEABILITY SENSOR**
 - AirPro APM
- **ASH/FILLER SENSOR**
 - Fe⁵⁵ Transmission Sensor



Operator Stations

Stand-Alone	Standard Operator Station
IP Desktop	QMS Visualization IP Desktop
Line Control Station	Integrated into Line Operator Station



Options

Auto Die Control ~ SPC/QC Packages ~ Hazardous Location Applications

About Mahlo

Since 1945, Mahlo has built its reputation based on the design and manufacture of rugged, innovative, cost effective on-line monitoring and control technologies. It is our focus to provide our customers with tailored solutions that offer a quick return on investment and are supported by our experienced and responsive technical support team.

Mahlo is headquartered in Saal, Germany in the heart of Bavaria. We are privately owned by the Mahlo family and take great pride in continuing the tradition of quality-built products based upon German engineering and craftsmanship. Mahlo employs over 270 people worldwide with over 100 sales and service centers in 115 countries.



Mahlo America, located in Spartanburg South Carolina, celebrated its 52nd anniversary in 2020. Our facility, along with a network of sales and service offices through out North America, provide unparalleled customer support and a true commitment to helping our customers improve their manufacturing processes and reduce production costs.

In addition, our U.S. office maintains a comprehensive spare parts inventory and houses a fully operational pilot line with QC laboratory for product testing, sample evaluation, and technical training. The line is capable of processing up to 80" wide webs and is equipped with a full suite of traversing scanners and measurement sensors for detailed evaluation of our on-line web gauging technologies.

Please call us today at (864) 576-6288, or visit us at www.mahloamerica.com.