

EXTRUSION INDUSTRIES



Advanced Web
Gauging Solutions



NDC Technologies and the Extrusion Industry

Superior measurement and control technologies
for consistently high product quality



- ▶ Biax Film and Sheet
- ▶ Blown Film
- ▶ Cast Film
- ▶ Sheet and Foam
- ▶ Multi-layer Films
- ▶ Voided Films
- ▶ Microporous Films

Successful extrusion operations demands running at the highest possible line efficiency. This means maximum process uptime, minimum raw material consumption, low rejects plus quality that meets today's stringent requirements. It is vital to squeeze as much yield as possible out of today's high cost resins and produce a flat, uniform, quality product that exceeds the performance expectations from the downstream processes.

Meeting the extrusion measurement challenge: By definition, extrusion products are a diverse family, as are their measurement requirements. This includes thickness, weight and coextrusion layer measurements, as well as speciality measurements such as density of cavitated films or pre-extraction oil content in porous battery separators. NDC's investment in gauging technology provides the exact system solution for these diverse extrusion application requirements. In fact NDC, offers the widest range of web gauging measurements and controls available today.

Infrared Film and Sheet Measurement

Innovative measurements for the extrusion processes

FILMPRO

- ▶ Thickness
- ▶ Basis weight
- ▶ Coextrusion components
- ▶ Oil content

FilmPro™ is NDC's most versatile infrared gauge on the market, measuring clear, pigmented, voided / pearled products, plus tints in total or as stripes. It gauges the true thickness and weight of voided, microporous or breathable films and derived density. FilmPro can measure costly barrier materials, such as Nylon, EVOH or PVDC simultaneously with other polymers such as PE, PP or Ionomer.

An issue confronting the accurate infrared measurement of thin films is called Optical Interference (OI). This can negatively affect the accuracy of infrared film measurement due to reflected light within thin film structures. FilmPro's innovative optical engine improves signal-to-noise, accuracy, web flutter and the effect of optical interference. This high-performance gauge includes an optional Fringe Suppression Optics (FSO) module with an efficient optical engine that is unaffected by film thickness changes and scanner misalignment or run-out.

For biaxially orientated films, FilmPro provides unique direct thickness measurement of clear, filled or voided / pearlescent films. It addresses the issue of measuring the thickness of voided films and materials that exhibit

density variation with its patented optical design, selection of discrete near infrared wavelengths and powerful sensor algorithms that combine to directly measure the true thickness and mass of these films.

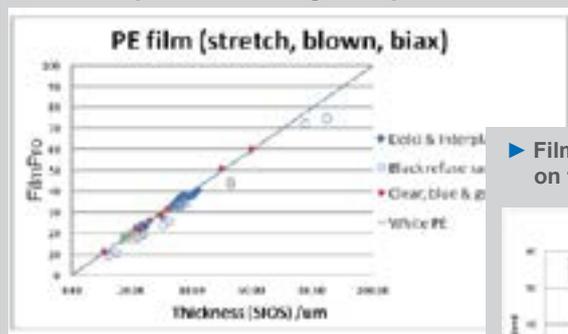
For blown film applications, FilmPro can measure up to six individual product components using a single gauge. These include total film thickness measurement of coextruded products including PET, PP/PE, PS, PVC, EVOH, PMMA, PA and Ionomer. FilmPro can also measure other high-value blown films such as laminating grades, protective films, and agriculture films.

For cast film applications, FilmPro provides superior measurement performance for CPE, CPP, cast stretch film, embossed cast films, barrier films, PVB Windshield / window films, and breathable films. With embossed films, FilmPro can handle most colors except very dark / opaque films, while cast stretch film measurements include clear, tinted colors and black tinted products.

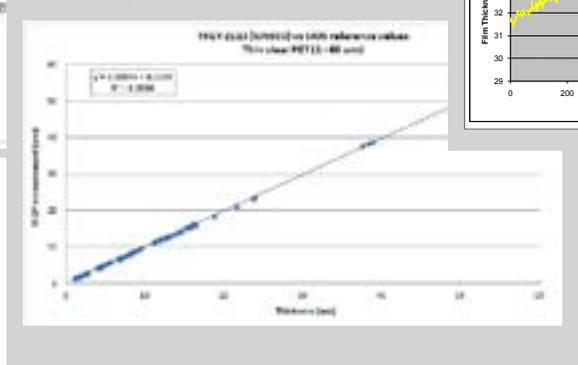
FilmPro can measure organic or water-based coatings on film by simultaneously measuring the substrate thickness and the coating thickness.



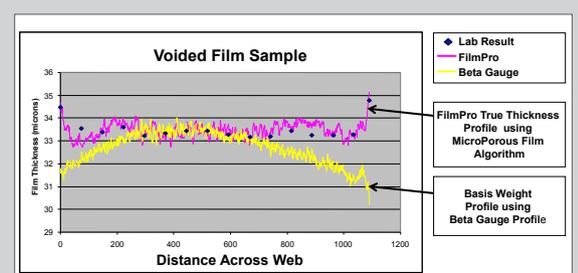
▶ FilmPro measurement performance on colored plastics including black products



▶ FilmPro measurement performance on thin, clear PET



▶ Profile measurement of voided & micro-porous film thickness: NDC's FilmPro vs. Beta



Accurate, Reliable Measurements

A complete choice of sensors

for the sheet and film extrusion processes



► Beta

NDC's Beta transmission gauges feature an ultra high-efficiency detection system and a minimized source activity for safety and performance.

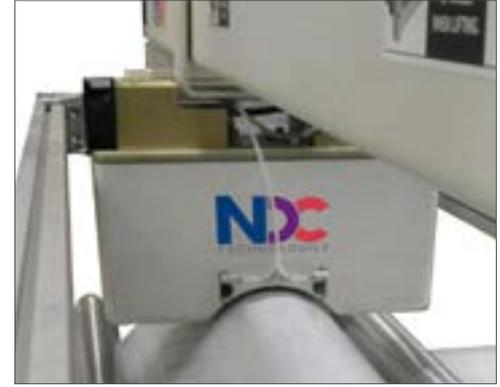
Beta gauges are used to measure extruded sheet, packaging foam and at the cast end of the biax process.



► Gamma Backscatter

NDC's Gamma BackScatter (GBS) gauge family provides a cost-effective thickness measurement. This compact sensor can provide valuable measurements from difficult process locations.

Applications for this gauge typically include blown film, cast film and sheet products.



► OptiMike

The OptiMike OM190 optical micrometer provides direct, single-sided thickness measurement.

The sensor is suitable for measuring extruded sheet and non-metallic thick film products.



► Laser Transmission

NDC's laser gauges measure thickness via a distance triangulation computation of a laser beam .

Laser gauges are typically designed to measure thick extruded sheet products. The thickness measurement range for NDC's single-sided sensor is 50 mm, while the dual-sided range extends to 15 mm.



► X-Ray Transmission

NDC's X-ray transmission sensor's energy source is tuned for optimum product measurement sensitivity to provide precise measurement of basis weight or thickness for nonwoven products.

X-ray transmission gauges typically measure extruded film and sheet products up to 8,000 microns.



► X-Ray Backscatter

The X-ray backscatter sensor's compact footprint permits it to be installed in difficult measurement locations on the process.

The X-ray backscatter sensor is able to operate over a wide thickness range for extruded products up to 25,000 microns.

Proven, Capable Solutions

NDC extrusion industry expertise

...a measurement solution for each application

Machine Direction Control

Machine direction (MD) controls compare the current scan average thickness against the target. The difference is used to supervise either the extruder or line speed (user-selectable) in order to drive the average thickness to the target.

Automatic Target Optimization Control (ATO):

Automatic Target Optimization supervises the average film or sheet thickness to run to the lowest acceptable specification. If the thickness variation is high, the average target will be increased to protect against making under-spec product at any point across the profile. If the sheet is flat, then ATO will ensure that no product is manufactured below the minimum quality limit. The combination of APC and MD control will supervise the thickness target downward to the lowest acceptable limit, resulting in significant raw materials savings while avoiding scrap.

Ratio Control

On coextrusion processes ratio control will insure that all extruders maintain the same relative output to maintain layer ratio balance. This is especially valuable during line speed changes.

Automatic Profile Control (APC)

APC works with extrusion dies to supervise the die bolt heaters and control the lip opening across the web width to create a flat profile. This technology can be applied to blown film, sheet, cast film and biax processes. For the biax application, our Asynchronous Integrated Mass (AIM) algorithm insures that the film and cast scanners are appropriately mapped to provide fast, responsive control to film thickness upsets.

Other System Options

- ▶ FFT (Fast Fourier Transform) analysis
- ▶ SPC quality reporting
- ▶ 3D profile analysis displays

Sensor	Range	Application
FilmPro	Clear BOPP (Thick Film): 12 to 2500 microns (0.5 mils to 100.0 mils) Clear BOPET (Thin Film): 0.5 to 1000 microns (0.02 mils to 40.0 mils)	Biax film Cast film Blown film Clear, cavitated, porous and translucent films Capacitor film Coextrusion components Oil content (Battery separator)
NDC has specialized in infrared measurement technologies. These non-nuclear gauges provide exceptional performance and are ideal for biax and cast film processes		
GBS 101	6,350-26,000 microns	Sheet
GBS 102	1,500-8510 microns	Sheet Cast end biax
GBS103	0-2,000 microns	Sheet Biax Cast Film Blown Film
The GBS Backscatter Gauge is ideally suited for sheet and thick film on narrow processes		
Beta 301	100-5,500 microns	Sheet Cast end biax
Beta 302	15-1,200 microns	Film end biax Cast film Thin sheet
The measurement performance of beta gauges is largely unaffected by product composition, hence their wide acceptance on sheet, cast and biax applications		
OptiMike OM190	150-5,000 microns	Sheet Non-metallic films
OptiMike provides non-nuclear direct thickness measurement and is ideal for sheet applications		
Laser 172, 1 Sided	0-15 mm	Sheet
Laser 170, 2 Sided	0-50 mm	Sheet
Laser gauges are intended for use on thick sheet applications		
XRT 312A	5-8,000 microns	Sheet Biax Cast film
XR3 318	5-25,000 microns	Sheet Biax Cast film
X-Ray sensors offer a non-nuclear alternative with minimal licensing issues and provide measurement across a wide range of extrusion applications		

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 a Technical Center of Excellence at Irwindale, California. 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 aluminum industries, NDC offers advanced solutions to measure the coatings applied to metal surfaces and the non-contact length and speed of products at critical points in the manufacturing process.



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