SML

EXTRUSION LINES – ENGINEERED TO PERFORM

Breathable film, melt-embossed film & laminates

Cast Film Lines

www.sml.at

One technology, all types of hygiene film

SML is the market leader in cast film lines for hygiene film applications. For good reason! Let us introduce you to our benchmark setting, flexible systems.

SML offers highly customised machines for three different types of hygiene film: breathable films, melt-embossed films and cloth-like laminates. Due to the modular design of the lines, it is possible to implement “all-in-one” solutions that cover all of these types.

Different products on a single line

Our customers manufacture hygiene backsheet films that are a functional component of baby diapers, sanitary napkins, incontinence pads, changing pads and protective clothing. Many of them use SML’s hygiene lines also to produce niche products for other segments, e.g. mulch films, roofing underlay films or breathable films for technical applications.

At SML we are happy to take on challenges of this kind and to implement special requirements. Decades of experience and R&D activities make it possible.

Highly customised system

Since 1999, SML has developed hygiene film lines in close cooperation with its customers. This involves a number of special requirements in terms of film weight, softness, breathablility and mechanical properties of the desired films. Thanks to our excellent machine concept incl. the machine direction orientation units (MDO), we can ensure highest product quality.

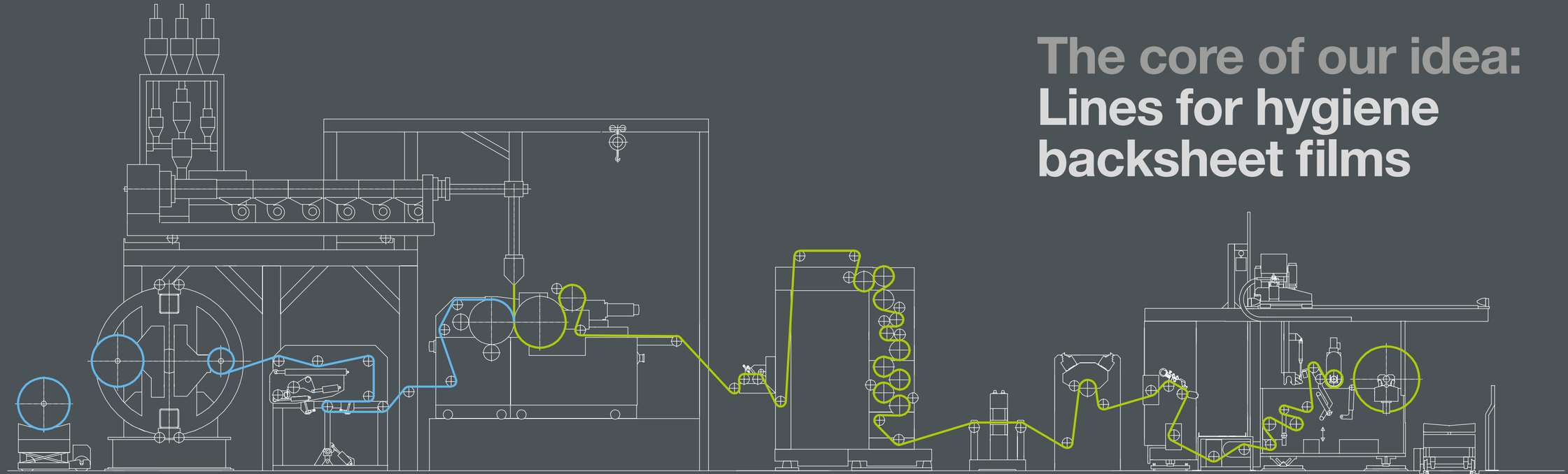
Efficient and easy to operate

All of the lines manufactured by SML are comfortably operated and controlled by SML’s advanced machine control system SMILE. In addition, SML’s data collection and analysing tool bit*W*ise allows the data-based optimisation of your production processes.

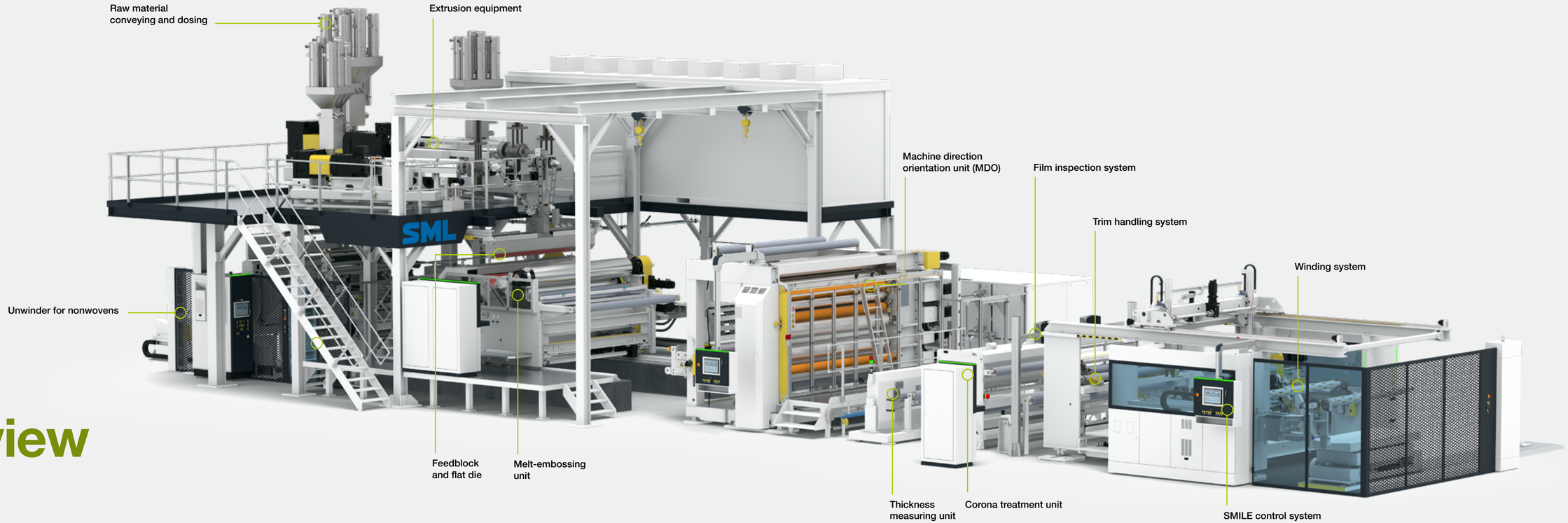
Content

Hygiene backsheet, agriculture and technical applications

The core of our idea:
Lines for hygiene backsheet films

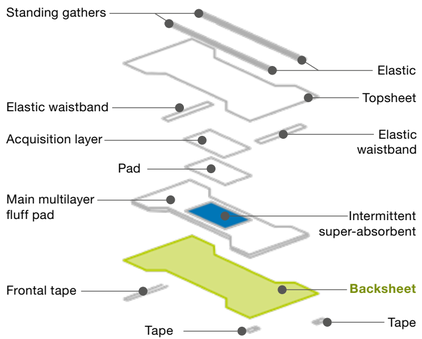


Overview


Raw material conveying and dosing
Extrusion equipment
Machine direction orientation unit (MDO)
Film inspection system
Trim handling system
Winding system
Unwinder for nonwovens
Feedblock and flat die
Melt-embossing unit
Thickness measuring unit
Corona treatment unit
SMILE control system

Variety of products

Structure of baby diaper: 8 - 12 main components



Classification

Cast hygiene film line

- Melt-embossed film
- Breathable film
- Cloth-like laminate

Melt-embossed film

Applications

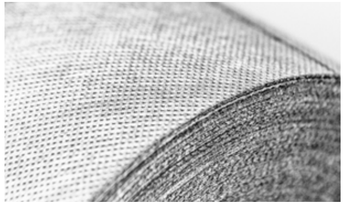
- Baby diapers
- Adult diapers
- Panty liners
- Sanitary napkins
- Protective clothing
- Mulch films

3-layer structure

MDPE / HDPE	~12 %
LLDPE / HDPE / PP / LDPE / Masterbatch / Recyclate	~76 %
MDPE / HDPE	~12 %

5-layer structure

LDPE / HDPE	8 – 12 %
LDPE / LLDPE / MB / Rec.	25 – 35 %
PP / LDPE	15 – 35 %
LDPE / LLDPE / MB / Rec.	25 – 35 %
MDPE / HDPE	8 – 12 %



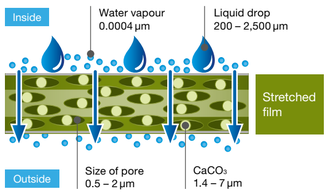
Breathable film

Applications

- Baby diapers
- Adult diapers
- Panty liners
- Sanitary napkins
- Protective clothing

Structure

PE + $CaCO_3$
PE + $CaCO_3$ Recyclate
PE + $CaCO_3$



Cloth-like laminate

Applications

- Baby diapers
- Adult diapers
- Protetective clothing
- Nursing pads

Structure

PE
PP + Recyclate
PE + PP
PP nonwoven

Dry air drying system

Multilayer extrusion unit

Handling with great accuracy

Raw material

Regardless of the application, the most important precondition for good film quality is adequate drying, feeding and dosing of the raw material. The complete dosing system, as well as all the material supply vacuum pumps, filters and valves are fully integrated in the SMILE machine control system. This allows recipes to be run, making changes in production very fast and easy to implement at the operational level. At the same time, waste production is reduced to a minimum.

Drying system

Compounds with a high $CaCO_3$ content are used for breathable hygiene films. The mineral fillers are hygroscopic and must be dried prior to the extrusion process. SML employs economical and extremly energy-efficient dry air systems for this purpose. After drying, the material is fed to the extruders by dehumidified air, which guarantees that the material does not reabsorb any moisture. Each system consists of a minimum of two dryers – one for virgin material and the second one for recycled material.

Feeding and dosing

SML's gravimetric batch blenders and continuous gravimetric feeders guarantee high material blending accuracy and a simple repeatability. If required, they are perfectly suited to high-temperature polymer processing. Up to six components per extruder can be processed, providing a maximum of flexibility.

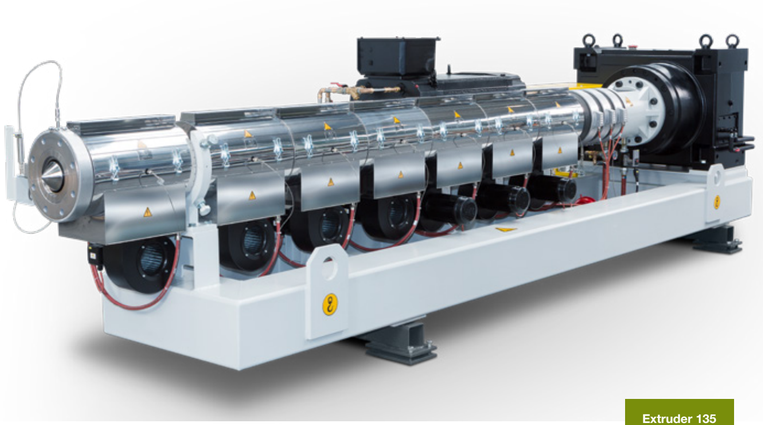
Your Advantages

- **Highest material blending accuracy**
- **Up to six different components per extruder**
- **SMILE control system for fast and efficient product changes**

Why choose anything else when you can take a technological lead

Extrusion equipment

SML manufactures each of its extruders in-house. They are suitable for all the polymers and compounds used in this market. A selection of standard versions is available, with screw diameters ranging from 60 to 150 mm. The extruders with a 33 L/D ratio and bimetallic barrels are powered by energy-efficient, low-maintenance and water-cooled AC motors.



Extruder 135

Increased service life

In SML's hygiene film lines, all the extrusion screws have armoured flights, in order to increase their service life. This is extremely important, due to the high mineral filler content of the compounds used. The screws also have a special design to improve the mixing of the different raw materials used for hygiene products.

Advanced heating systems

All of the extruder barrels are heated by using the SML advanced heating system. A gravity-closing flap prevents the escape of hot air from the system, thus retaining the heat in the barrel.

Effective melt filtration

Melt filtration for the removal of impurities, unmelted or cross-linked particles, is extremely important for outstanding product quality.

Your Advantages

- **Armoured screws / bimetallic barrel**
- **Special screw design for high mineral content**
- **Highly effective melt filtration**

Different options, always perfected to suit your needs

Feedblock and flat die

As the leading supplier of hygiene film lines, SML relies exclusively on respected partners for its feedblocks and flat dies.

In tune with the market

A 3-layer feedblock with two extruders is standard for the production of breathable film, while for cloth-like laminates at least three extruders are needed.

5-layer feedblocks for melt-embossed film

Conventional melt-embossed film consists of a 3-layer structure. In order to reduce film weight and achieve enhanced improved film properties, feedblocks with 5 layers that are fed up by three extruders are installed nowadays.

Die splitting system

Efficient change of the net film width

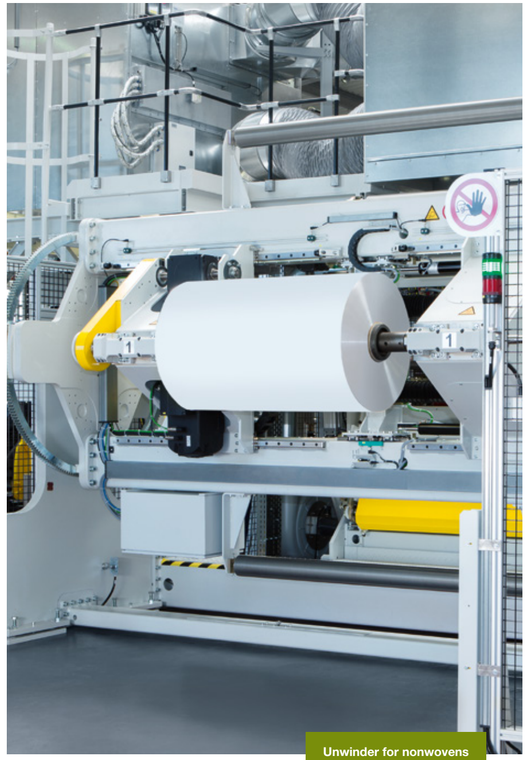
SML's co-extrusion flat dies with a T-shaped channel are capable of incorporating fixed or variable internal deckling systems. This feature facilitates the efficient variation of the net film width. To guarantee an excellent weight profile in the finished film, the flat dies are equipped with an automatic die bolt control system, which automatically adjusts the equal weight profile in combination with the thickness measuring system.

Die splitting system: Easy cleaning

The die splitting system enables a quick and safe die opening for cleaning purposes. The die remains in its original position, while the machine continues to be heated.

Your Advantages

- **Top quality feedblocks and flat dies from reputable partners**
- **Automatic die-control via electrically heated bolts**
- **Advanced die splitting for quick and safe cleaning**



Unwinder for nonwovens

Structures you always wanted

Unwinder for nonwovens

For the production of cloth-like laminates, a fully automatic turret unwinder is integrated in the design of SML's hygiene film lines. It can be used for substrates with a maximum roll diameter of 1,500 mm.

Minimum changeover time for roll handling

Core clamping is done shaftless, with pneumatic, actuated chucking heads, which can be equipped with adaptors for all common core diameters. Integrated lifting tables are used for loading and unloading, which allow maximum flexibility and minimum changeover times for roll handling.

Splicing at full line speed

An ultra-lightweight carbon-fiber dancer roll controls the unwinding tension, while the nonwoven roll is center-driven by an AC servo motor. For the splice, the new roll is automatically synchronised to line speed. Splicing is done with a driven bump roll and a pneumatically operated chopping knife. A defined splice geometry and position detection allows the splice length to be minimised.

Each unwinding position is motor-positioned in the cross direction. To avoid the need for additionally required guiding equipment, it can be linked to an edge guiding system for appropriate positioning.

Your Advantages

- **For substrates with a maximum roll diameter of 1,500 mm**
- **Shaftless core clamping with pneumatic actuated chucking heads**
- **Unwinding position is motor-positioned in the cross direction**

Melt-embossing unit

Apart from the extrusion section, the melt-embossing unit has a significant influence on the final product quality.

SML uses the dry embossing process, which offers numerous benefits in comparison to the wet process.

- No water on the surface of the silicone roll
- Lower embossing pressure => long service life of the silicone roll
- Less maintenance
- No water treatment
- No water sediments in the line and on the product
- Uniformity of the film coefficient of friction (COF)

SML's melt-embossing unit consists of a silicone pressing roll, an embossing roll and a post-cooling roll, which are all equipped with separate water temperature control systems and AC drives. The surface of the silicone pressing roll is contact-cooled by two steel support rolls. The pattern on the embossing roll is imprinted on the film surface and determines the gloss and softness.

Quick-change system for embossing rolls

Both, the embossing and the silicon pressure rolls are equipped with a quick-change system that facilitates fast roll changes for different end product surfaces. The nip pressure between the rolls is individually adjustable on both sides and thus guarantees the uniform embossing of the film across its entire width.

Cloth-like production

Melt-embossing for breathable films

For the production of cloth-like laminates, a nonwoven reel is unwound and coated with an extruded film in the melt-embossing unit. For breathable film production, needed for baby diapers, a softer touch in the film, can be attained with the melt-emobssing unit.

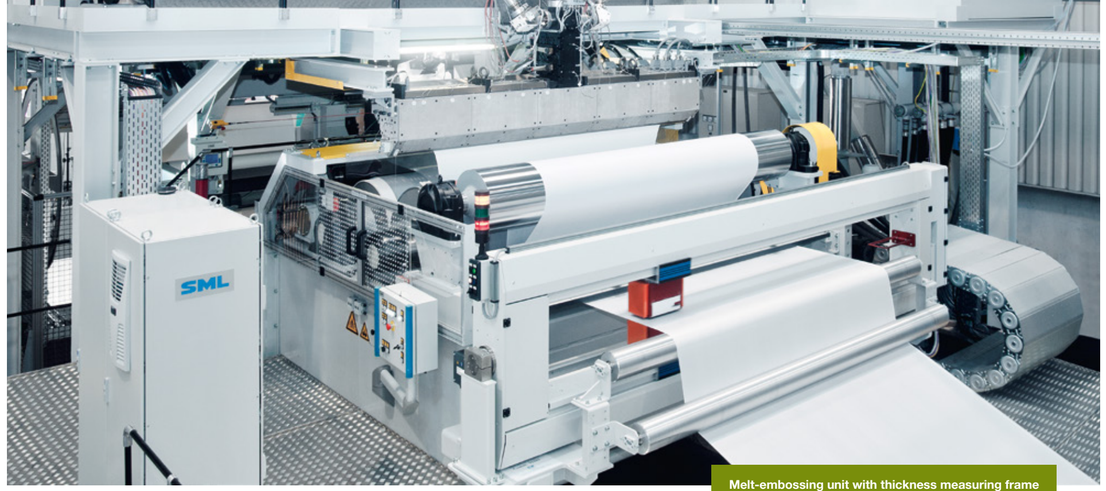
The complete melt-embossing unit can be adjusted both horizontally and vertically. The actual position of the unit is displayed on the control station of the line and stored in the protocol of the SML's SMILE machine control system.

One line for three different types of products

The unique design of SML's melt-embossing unit enables the production of the three main backsheet products for the hygiene industry on the same line.

The advantage of using the melt-embossing unit for the production of breathable film

- Softer and more even film
- Lower gloss
- Higher production speed since the casting position is easier for the operator to set
- Lower stretch ratio for the same water vapour transmission rate-value



Melt-embossing unit with thickness measuring frame

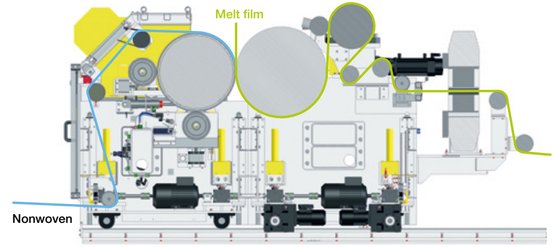
Accurate film thickness regulation

SML places the thickness gauge unit directly after the melt-embossing unit behind the last chill roll, to achieve the shortest possible distance from the extrusion die to the measuring point. This results in minimum space requirements and a very accurate film thickness regulation.

If the line is equipped with a machine direction orientation (MDO) unit, the thickness gauge is placed after the MDO unit. In this case the thickness gauge after the melt-embossing unit can be omitted. SML supplies automatic gauging systems with Beta-ray sensors.

Cut-resistant guiding rolls

After leaving the melt-embossing unit, the film is guided to the winder via cut-resistant guiding rolls with a specially treated surface for a high film grip and long service life.



Melt-embossing unit

How to create breathable film

Machine direction orientation unit (MDO)

SML has decades of experience in film stretching which has led to the optimised design of the MDO units for a wide range of applications. The mono-axial stretching process creates micropores in the film, which makes it breathable. The water column and the water vapour transmission rate (WVTR) can be adjusted by means of the material recipe and the stretching ratio.

The MDO unit for breathable film consists of a solid machine frame that includes:

- Preheating section
- Stretching section
- Annealing and cooling section

Excellent preheating and annealing

In SML's MDO units, all of the rolls are separately driven and temperature-controlled. Excellent film preheating and annealing are fundamentally important with regard to the mechanical and thermal properties of the film. Further, the modular design of the MDO allows the retrofitting of pre-heating or annealing rolls. For a comfortable line start-up, the unit is equipped with an automatic film feeding device.

Your Advantages

- **All of the rolls are separately driven and temperature-controlled**
- **Modular design allows the retrofitting of preheating and annealing rolls**
- **Low shrinkage values of the final product**

MDO unit

Corona treatment

Corona treatment unit

Performance on the surface

In order to prepare the films for subsequent offline-printing, it is necessary to install a corona treatment unit. The corona treatment unit is equipped with an electrically driven, water-cooled treatment roller and a nip roller to avoid the backside-treatment of the film.

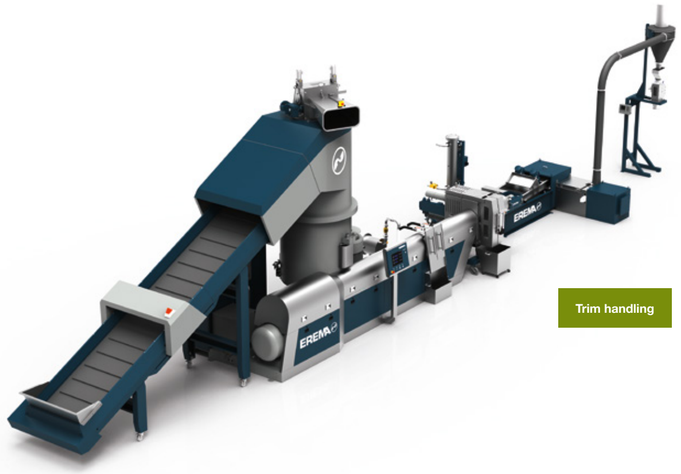
Film inspection system

An optical film inspection system facilitates the quality and process control of all hygiene products. The system is installed directly in front of the winder and consists of an illumination bar and cameras. The measurements of the inspection system are displayed on a separate screen and can be stored for documentation and quality control.

Ensuring economic production

Trim handling system

On SML's hygiene film lines, the edges of the film are first trimmed before the stretching or the corona unit. A final trim is done directly at the entrance to the winder. All the edge trims can be re-fed into the main extruder, which ensures a cost efficient production.



Trim handling

Fan system for moving edge trims

The edge trims are transported to the agglomerator of the recycling unit by a blower system. Afterwards, the recycling unit melts and re-pelletises the edge trims, which are then dried and sucked again into the dosing station of the main extruder.

Flexible recycling unit

The recycling unit offers a great flexibility with regard to the use of recycled pellets on different extruders. In addition, it is the most efficient solution for product changes during film production and the re-use of waste and off-spec rolls. If the line is also designed for breathable film, the recycling unit is equipped with a venting unit at the barrel.

Your Advantages

- **Efficient and eco-friendly edge trim recycling**
- **Straightforward and fast product changes**
- **Zero waste for all products**

Get the best out of your production

Winding systems

At SML new market developments or specific customer requirements are evaluated in detail for upgrading our winders continuously.

For the production of hygienic films and laminates, various winders like turret winders for mother rolls and horizontal sliding winders for inline slitting roll production are offered.

Technological leader

Based on many years of experience, extensive R&D efforts and constant in-detail innovation, SML is the recognised technological leader in the field of winding systems. Every new product, idea or requirement which is spotted in the market or is the subject of a customer inquiry, is passed on to the R&D department. Following a detailed evaluation, SML then upgrades its winders with corresponding new features.

Specific winders for hygiene films

All winders have a solid, vibration-dampening steel frame construction, to withstand the dynamic forces which are generated at high production speeds.

Advanced control system

A wide touch screen is directly attached to SML's winders for the adjust-ment of winding parameters and maintenance work. Additionally, each type of winder on SML's hygiene film lines can be comfortably controlled from the line's central control station with SML's operator-friendly SMILE system.

Find the right winder for your application

Winder type	winder W1300	winder W1500	winder W2000 aerofilm
Film weight range	15 - 70 g/m²	15 - 70 g/m²	10 - 70 g/m²
Maximum mechan. speed	450 m/min	350 m/min	500 m/min
Maximum winding width	3,600 mm	1,950 mm	2,800 mm
Winding core[1]	6 / 8 inch	6 inch	3 or 6 inch
Maximum winding Ø	1,500 mm	1,200 mm	1,300 mm
Winding direction	top outside	top inside or outside	top inside
Winding tension	10 – 100 N/m	10 – 100 N/m	10 – 100 N/m
Contact pressure	30 - 100 N/m	30 - 100 N/m	30 - 100 N/m
Roll handling	manual	manual	automatic
Oscillation	frame	frame	frame or winder

[1] Winding core diameter depends on the winder width

Winder W1300

The winder W1300 is a turret winder designed for a maximum roll diameter of 1,500 mm. The maximum winding width is 3,600 mm.

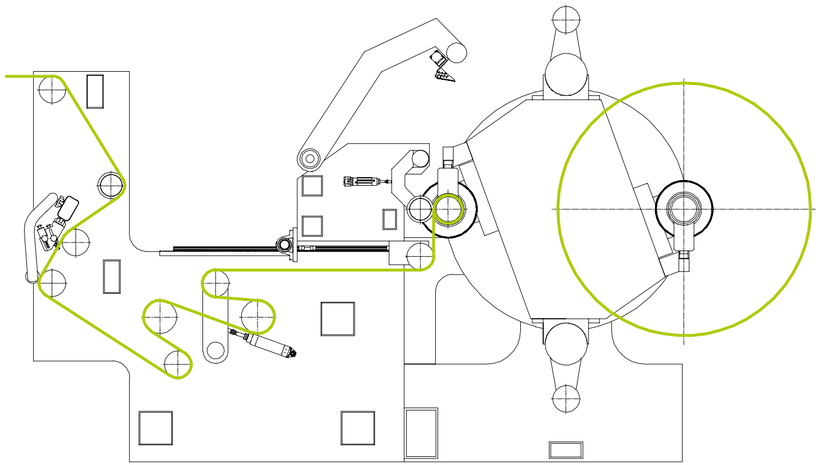
At the inlet of the winder a spreader roll is installed to avoid wrinkles at the integrated edge trim cutting station. An ultra-lightweight dancer roll controls the film tension during winding, while the shaft is center-driven and the film is wound onto the roll either in gap or contact mode.

The film cross-cutting is performed by a twisting knife. For thicker film the winding core is prepared with a double-sided adhesive tape.

For thinner films, there is the possibility to fix the film on the new winding core by means of electrostatic.

Your Advantages

- **Max. roll diameter 1,500 mm**
- **Film tension control with ultra-lightweight dancer roll**



Winder **W1500**

The turret winder W1500 is designed for shaftless winding or winding with shafts for a maximum roll diameter of 1,200 mm and an end film width of maximum 1,950 mm.

Winding in gap or contact mode

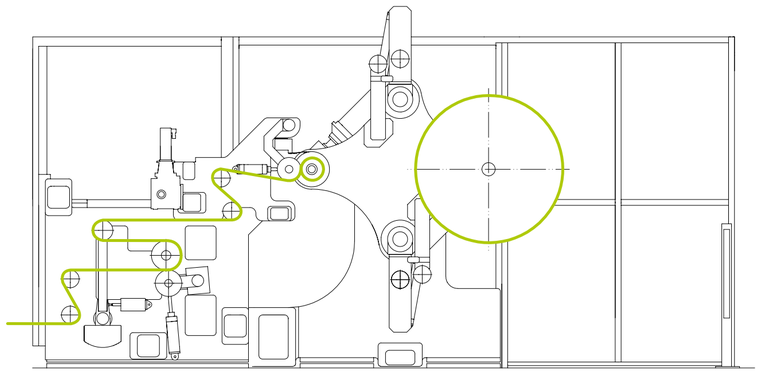
A fixpoint unit at the winder inlet separates the web and winding tension. A lightweight dancer roll controls the winding tension, while the roll is center driven by an AC servomotor.

Winding in both directions

Cross-cutting systems with flying or twisting knives are available for smooth roll changes. To meet individual requirements, the film can be wound in both directions by means of the installation of an optional second cutting unit. This design allows easy roll handling with standard forklifts or hydraulic roll handling systems.

Your Advantages

- **Especially for the production of mother rolls in smaller widths**
- **Fixpoint to separate the web and winding tension**



Winder **W2000 aerofilm**

Especially designed for thin hygiene films.
The winder W2000 is the most popular and proven winder for cast film.

The winder W2000 aerofilm is a horizontal sliding winder for the inline-slitting of part rolls in narrow widths. Owing to the principle of horizontal shaft movement, the rolls remain in an optimum winding position until the very last moment before cross-cutting takes place, thus guaranteeing a perfect winding quality up to the last layer on the roll.

The best winder for your application

The winder W2000 aerofilm is designed especially for the winding of thin hygiene films and laminates. It is equipped with a twisting knife and an ultra-lightweight dancer roller, for sensitive tension control. The film is fixed onto the new winding core by means of electrostatic charging and therefore no core preparation is necessary. A satellite roller optimises the entrance angle between the film and the roller which minimises air entrapment between the layers.

No bleed trim cutting

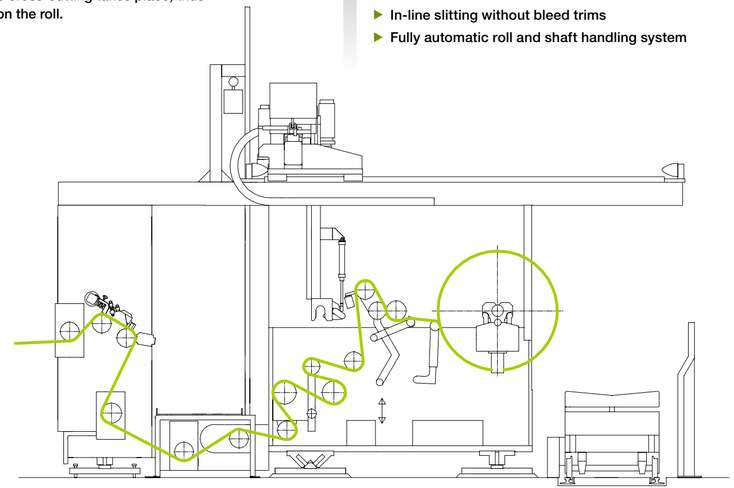
The slitting process is completed without bleed trim cutting, adjustable banana rollers separate the inline slitted rolls. Depending on the product, slitting stations with razorblades or circular knives are integrated at the winder entrance.

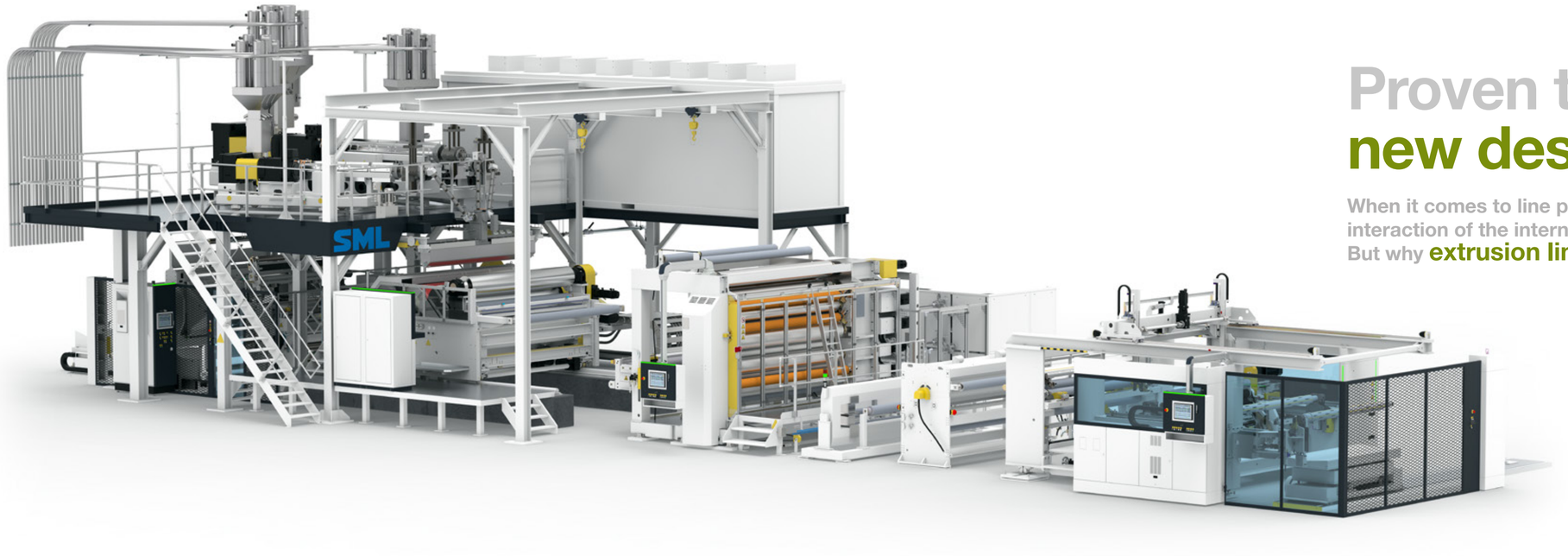
Fully automatic roll and shaft handling

The finished rolls and the winding shaft are transported onto a moveable lifting table by an overhead robot, which pulls the finished rolls from the clamped shaft. The complete roll and shaft handling process is fully integrated in the automatic mode of the winder.

Your Advantages

- **Max. roll diameter 1,300 mm**
- **In-line slitting without bleed trims**
- **Fully automatic roll and shaft handling system**





Proven technology – new design

When it comes to line performance, high quality and precise interaction of the internal components are particularly important. But why **extrusion lines** shouldn't **look great too**?

Technology that makes you smile

SMILE® control system

Not sure if a technology can really make you smile? Now, let the facts about **our ingenious machine** control systems **convince you**.

SMILE is SML's machine control and operation concept, that allows the highly precise synchronisation of all the components in an extrusion system. If an extrusion system is the powerful body, then SMILE is the driving soul that brings that body to life.

100 % developed in-house

The dynamic controller system is entirely developed in-house and has undergone significant further development in recent years. SML's long-standing competence in the field of automatisation and machine control provides loads of innovative and exceptional features.

Centralised all-in-one concept

SMILE's central control station system allows the management of each production process with a wide touch screen attached to the hygiene film line.

These data includes sensory measurements like temperatures, speeds and pressures as well as actuator readings from valves, hydraulics, drives and positions. Thanks to SMILE, all of these components are interconnected and can be perfectly synchronised with each other. This fine-tuning allows customers to run their SML lines at the very best performance level.

E-container

Intuitive machine control

At SML, we believe machine control and operation should be highly intuitive and self-explanatory. SMILE is therefore an integral part of our coherent and user-friendly overall line concept.

- A central control station system for the highest operating comfort and the visualisation of all processes
- Reduced training efforts and error rates at operator level
- Remote control, remote update and remote service (from a PC or even a smartphone)
- The system is fully multi-client and multi-user capable, different types of users can log-in simultaneously

Optimised production efficiency

One key purpose of SMILE is the increase in the Overall Equipment Effectiveness (OEE) through optimised production processes.

- Optimised use of raw materials, preventing waste
- Faster start-up of production
- Minimised times for product change-overs

Systematic quality control

In close interaction with SML's data collection and analysis system bit*W*ise, SMILE is an efficient tool to keep output quality stable and to optimise output properties.

- Formula recipe system to store production parameters
- Documentation and detailed reporting of production processes
- Automatic alarm functions via e-mail or text message for quick debugging

Interconnectivity and third-party integration

SMILE has many open interfaces that allow the web-based data exchange with third-party machines and systems.

- Open to interconnecting with systems like Enterprise Resource Planning (ERP), Quality Assurance (QA) or SML's data analysis tool bit*W*ise
- Based on open standards like HTML5 and OPC-UA, complete end-to-end process control beyond SML extrusion lines

Tailored to specific requirements

SMILE can be tailor-made to client's specific requirements. This is blazing the way to new manufacturing concepts as well as delivering product properties.

Stop guessing, start knowing

with bit.*Wise* data analytics

With bit*W*ise, SML's customers can analyse the entire process history of the hygiene film line with a single click, rather than relying on current snapshots.

Bit*W*ise incorporates decades of experience in automation with the latest technologies in data analytics and provides a wide range of completely new opportunities for data-driven decisions.

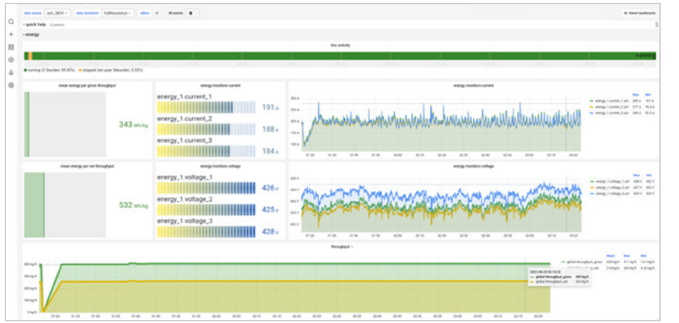
In-depth view of all details

SML's cast film lines are equipped with hundreds of data-generating sensors. Bit*W*ise records and visualises this data up to 10 times per second. In addition, each manufactured roll is provided with a QR code, which serves for identification. Putting everything together, manufacturers get an in-depth view of all the details involved in a production process – both in the present and in the past.

With bit*W*ise, customers can look back at pressures within the system components and check whether there is a correlation with other measured values such as temperature or laboratory results of a finished product roll.

Always connected, even on the go

Bit*W*ise is an 100 % on-premises-solution. This means that the data remains in-house on dedicated hardware, no cloud services are required. Nevertheless, customers can access bit*W*ise in their company network via their VPN or a remote desktop solution.



bit.*Wise*
data analytics

Optimising quality

Bit*W*ise is a powerful tool to precisely optimise any aspect of the production process with a direct effect on product quality.

- Monitoring of all quality-related process parameters, allowing quick corrective action
- Comprehensive tracking and documenting of product quality
- Making quality reproducible

Minimising production costs

Bit*W*ise is the central tool to measure and visualise all production related costs. It forms a strong and reliable basis for the continuous cost-optimisation.

- Detailed monitoring and reporting of energy and raw material consumption
- In-depth optimising, tracking and reporting of Overall Equipment Effectiveness (OEE)
- Full end-to-end cost transparency through third-party integration

Maximising output

Recorded, aggregated and visualised data by bit*W*ise help to raise overall line utilisation and deliver a faster return on investment (ROI).

- Discovering hidden or unused output capacities
- Preventing downtimes by detecting potential problems at an early stage
- Minimising maintenance times through optimised scheduling and structured access to documentation and service support

Open for vertical integration

At SML we understand that cast film lines represent a key part in a wider production chain. For end-to-end optimisation, bit*W*ise therefore supports data exchange and vertical integration with third-party systems such as Manufacturing Execution Systems (MES), Enterprise Resource Planning (ERP) or Quality Assurance (QA). Customers can simply retrieve the data from the system.

Choose your perfect interface

As with most technologies developed by SML, bit*W*ise is highly customisable. The remote system can be retrofitted to all existing SML cast film lines.

Outstanding end-to-end service support.
Reliable assistance - around the globe, at all times.

Always at your disposal.

Our dedicated customer service team offers reliable assistance to ensure the continuous operation of any SML extrusion line at all times. Regardless of how long a system has been in operation, we offer service to every customer.

- Long term experienced SML service technicians
- Support in all ways – via telephone, video call, chat, email and in person
- On-call service from 7 am to 10 pm CET
- Remote maintenance system
- Visual assistance via smart glasses as an option
- SML service technicians on call worldwide
- Quick on-site service

Immediate assistance.

The remote maintenance system, which is available for every SML extrusion line, makes it easier to identify potential problems and provide a quick diagnosis. In order to find solutions, our service team works closely together with other departments at SML. This way, nearly of all malfunctions can be solved remotely.

Our highly-skilled technicians are at your service within 24 hours throughout Europe and within 48 hours in the rest of the world.

Up-to-date knowledge and experience.

Our service team consists of technicians who know SML's extrusion lines inside out, having installed them themselves for many years. In order to keep their know-how up to date, all service employees continue to work regularly in everyday production. Their competence is reflected in the short reaction times to our customers' enquiries.

Visual assistance in real time.

Through the use of smart glasses, our service team can provide real-time assistance worldwide. Whether our customers have technical problems, need help with product changes or maintenance work - they are guided step by step. This service is available for every extrusion line from SML.

Analyses
Development
Pre-tested Performance
Delivery on Time
Service Support
Customer Satisfaction

- **SML - Machinery Far East Sdn Bhd**
  (1029958-P)
  1201 Block B, Menara Amcorp
  No.18 Jalan Persiaran Barat
  46050 Petaling Jaya
  Selangor Darul Ehsan,
  Selangor, Malaysia
  Phone: +60 3 7955 9098
  Fax: +60 3 7955 9981
  E-mail: yen@sml.at

- **SML - Beijing Office**
  Unit 1410, Landmark Tower
  No. 8 North Dongsanhuan Road
  Chaoyang District
  100004 Beijing, P.R. of China
  Phone: +86 10 6590 0946
  Fax: +86 10 6590 0949
  E-mail: sml@sml.bj.cn

- **SML - North America Service Inc.**
  Suite 204
  85 Eastern Avenue
  Gloucester MA 01930
  USA
  Phone: + 1 978 281 0560
  E-mail: jom@sml.at

www.sml.at

Follow Your Instinct – choose SML!

SML - Head Office
SML Maschinengesellschaft mbH
Gewerbepark Ost 32
4846 Redlham, Austria
Phone: +43 7673 90999 0
E-mail: sml@sml.at
www.sml.at