

▶ **Breathable film,  
melt-embossed  
film & laminates**

# Cast Film Lines



One technology,  
all types of hygiene film

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

SML offers highly customised systems 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 also 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.

Anyone familiar with the market knows that only very few companies will take on board. 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, breathability and mechanical properties of the desired films. Our excellent machine concepts and machine direction orientation units (MDO) ensure the 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 bitWise allows the data-based optimisation of production processes.



# Content

Line description ▶ 8



Hygiene products ▶ 10



Extrusion unit ▶ 12



Downstream equipment ▶ 14



Machine-direction orientation (MDO) unit ▶ 18



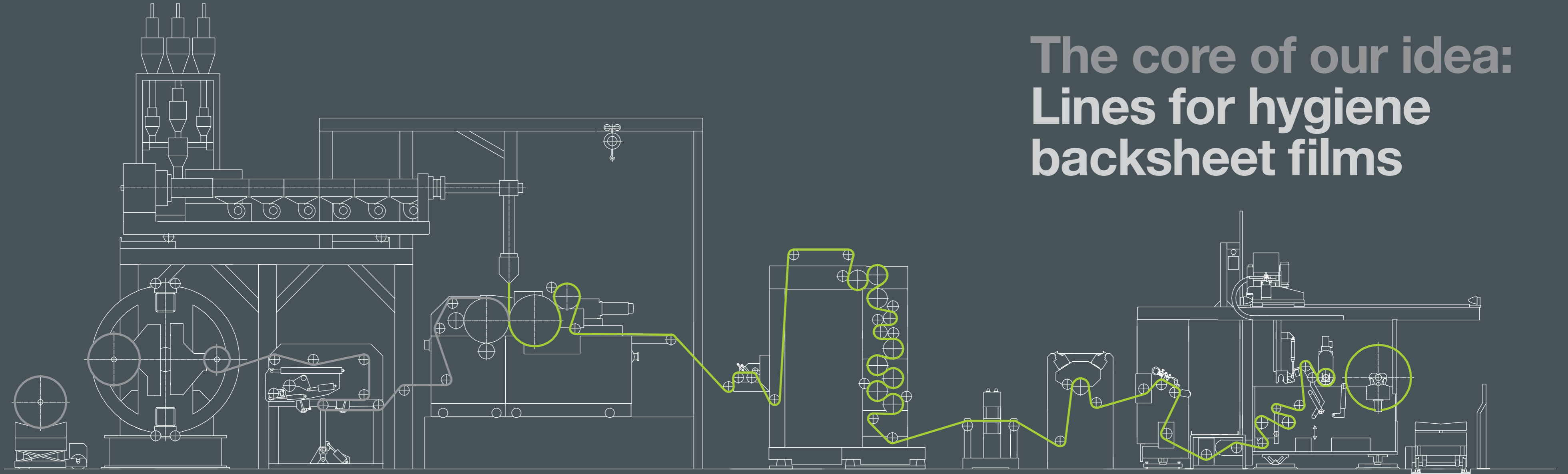
Winding systems ▶ 21

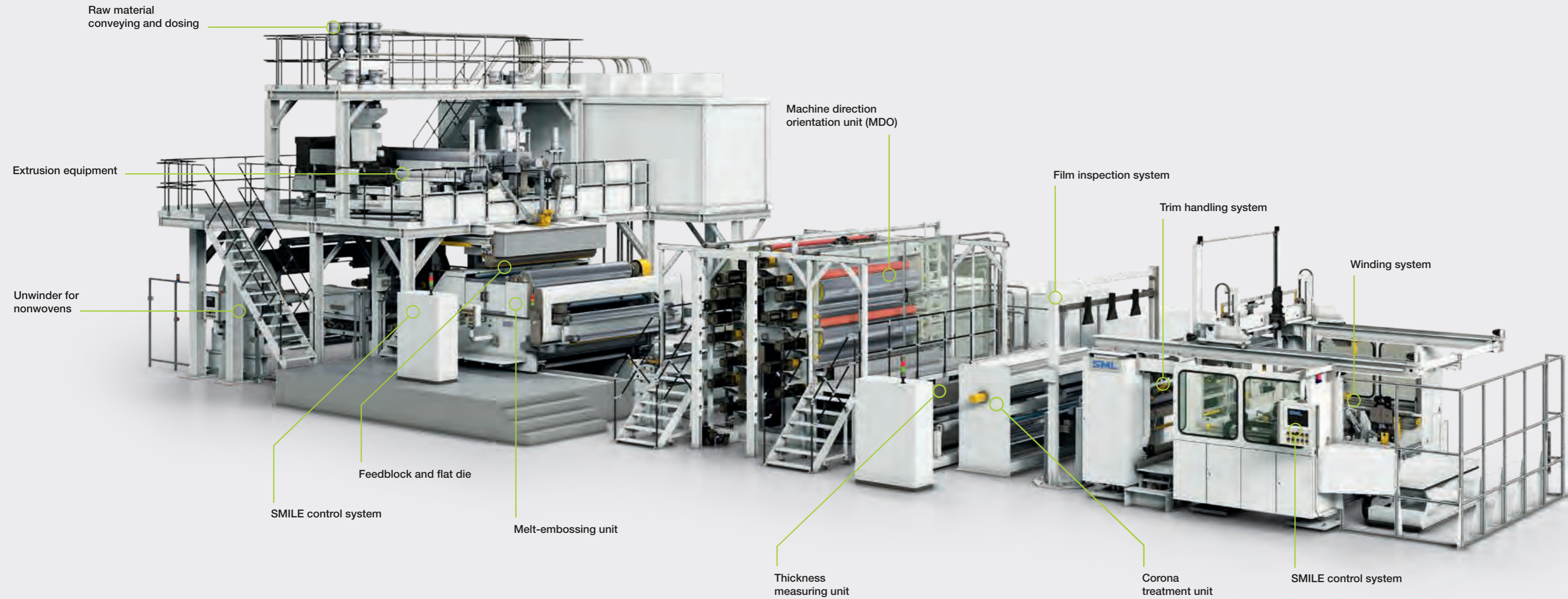


Hygiene  
backsheet,  
agriculture  
and technical  
applications



# The core of our idea: Lines for hygiene backsheet films



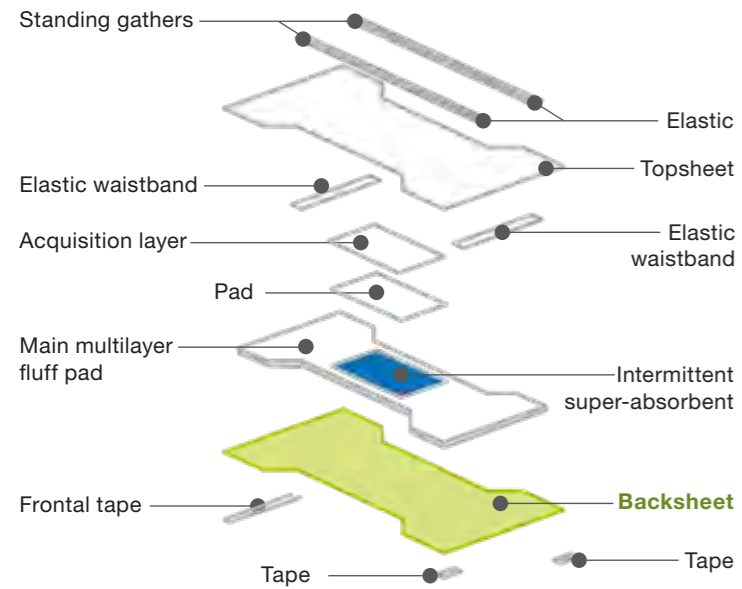


# Overview

# Variety of products



## Total number of main components 8-12



## 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 / Recycling	~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 %

## Classification



## Cloth-like laminate

### Applications

- ▶ Baby diapers
- ▶ Adult diapers
- ▶ Protective clothing
- ▶ Nursing pads

### Structure

PE layer
PP + recycling layer
PE + PP layer
PP nonwoven



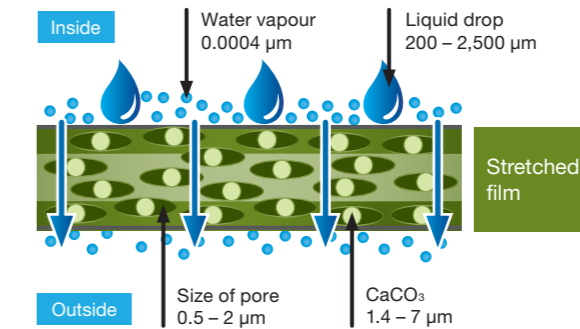
## Breathable film

### Applications

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

### Structure

PE + CaCO <sub>3</sub>
PE + CaCO <sub>3</sub> recycling
PE + CaCO <sub>3</sub>





Dry air drying system

## 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. SML's 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  $\text{CaCO}_3$  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 extremely 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 moisture. This system consists of a minimum of two dryers – one for virgin material and the second for recycled material.



Multilayer extrusion unit

### Feeding and dosing

SML's gravimetric batch blenders and continuous gravimetric feeders guarantee 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 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 properties.

### Your Advantages

- ▶ Armoured screws / bimetallic barrel
- ▶ Special screw design for highly filled films
- ▶ 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 three extruders are needed for cloth-like laminates.

### 5-layer feedblocks for melt-embossed film

In the past, the melt-embossed film had a 3-layer structure. To allow the down-gauging of the film weight and to achieve enhanced film properties, SML generally installs 5-layer feedblocks with three extruders.



Die splitting system

### Efficient variation of the net film width

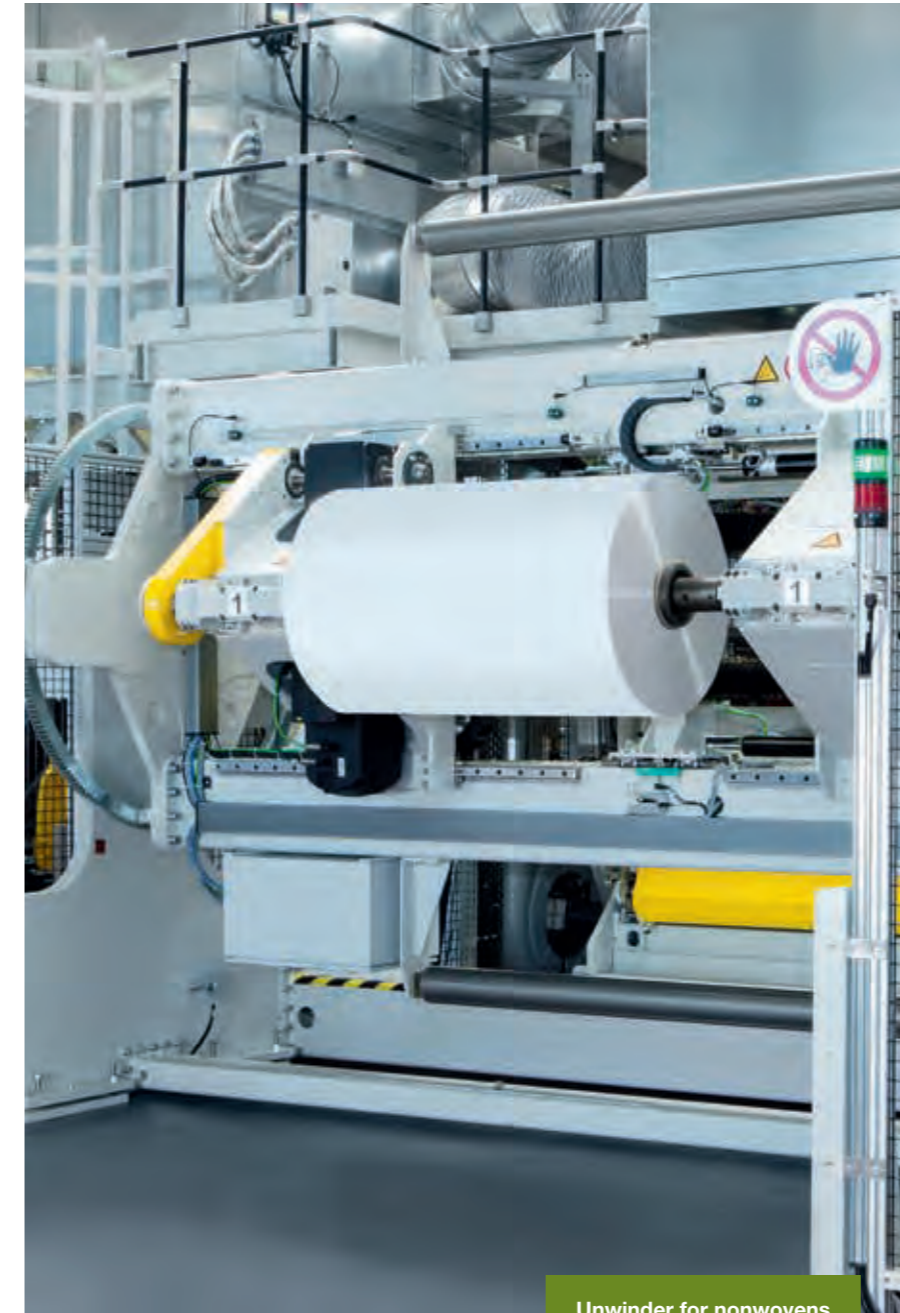
SML's co-extrusion flat dies with a T-shaped channel are capable of incorporating fixed or variable internal deckling systems. This feature facilitates the efficient variation of the net film width. To guarantee an excellent weight profile in the finished film, the flat dies are equipped with an automatic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

### Die splitting system: Easy cleaning

The die splitting system enables quick and safe die opening for cleaning purposes. The die remains in its original position, 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. For loading and unloading, integrated lifting tables are employed, which allow for 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. With a defined splice geometry and position detection, the splice length is 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-embossing unit.

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

## One line for three 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 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

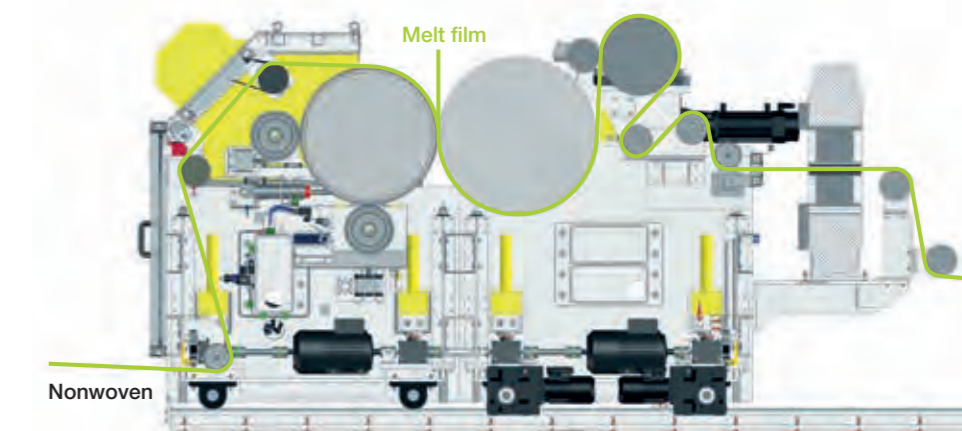
## Accurate film thickness regulation

SML places the thickness gauge unit directly on 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 and 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 accumulated decades of experience in the stretching of films and has designed excellent 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 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

## Corona treatment unit

### Performance on the surface

In order to prepare the films for subsequent offline-printing processes, it is necessary to install a corona treatment unit. The corona treatment units are equipped with an electrically driven, water-cooled treatment roll and a nip roll 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 cut directly at the entrance to the winder. All the edge trims can be re-fed into the main extruder, which ensures the cost efficiency of the production line.



### 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 to the dosing station of the main extruder.

### Flexible recycling unit

The recycling unit offers a high flexibility with regard to the use of recycled pellets on different extruders. In addition, it is the most efficient solution as far as product changes during film production and the re-use of waste and off-spec rolls are concerned. 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

New market developments or specific customer requirements are evaluated in detail. SML then upgrades its winders continuously.

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

### Technological leader

Based on long-standing experience, substantial 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, which is able to resist 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 adjustment 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/m <sup>2</sup>	15 - 70 g/m <sup>2</sup>	10 - 70 g/m <sup>2</sup>
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 <sup>1</sup>	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

<sup>1</sup> Winding core diameter depends on the winder width

## Winder W1300

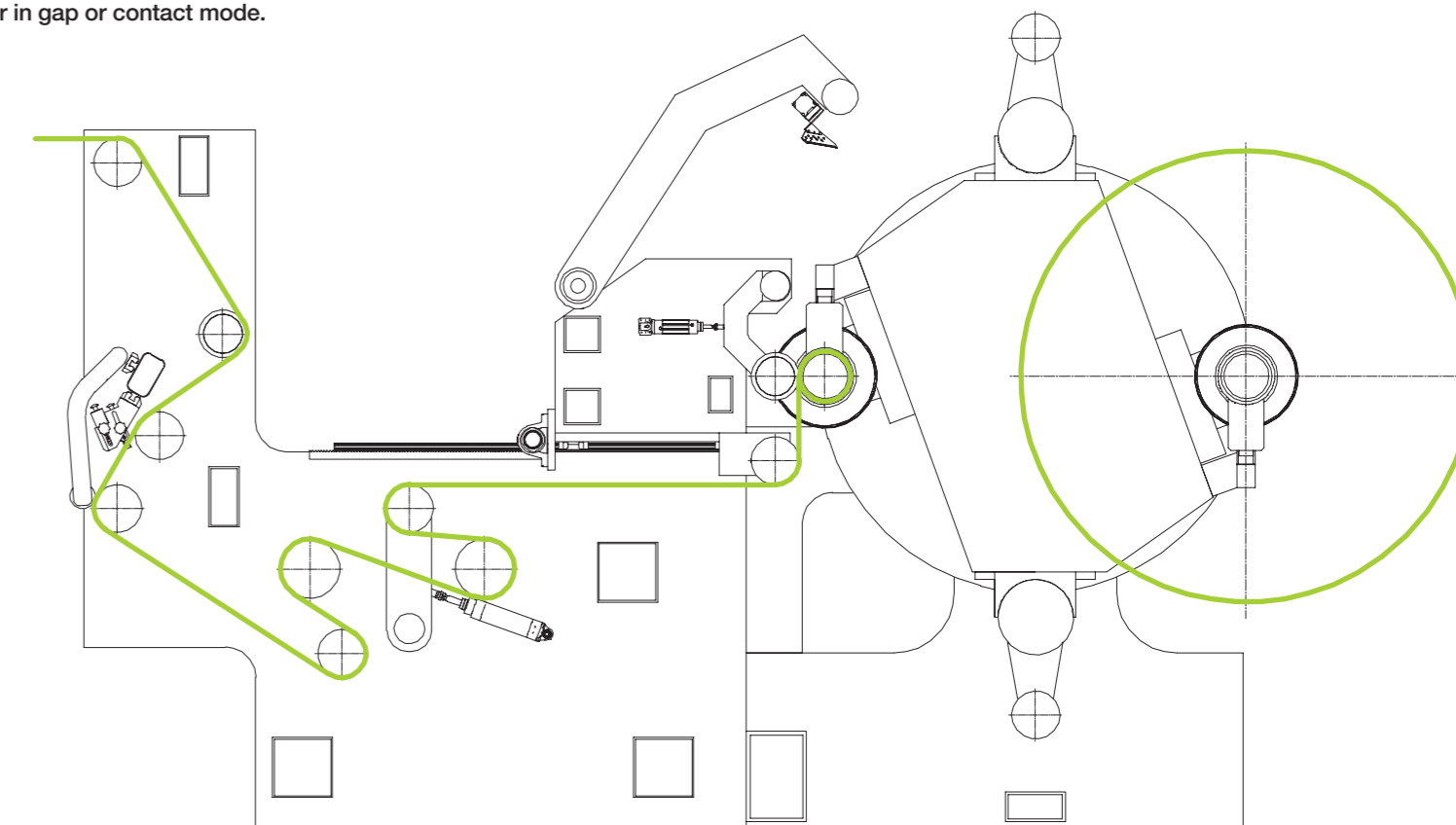
The winder W1300 is a turret winder designed for a maximum roll diameter of 1,500 mm. The maximum winding width is 3,600 mm.

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. The new winding core must be 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 and 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.

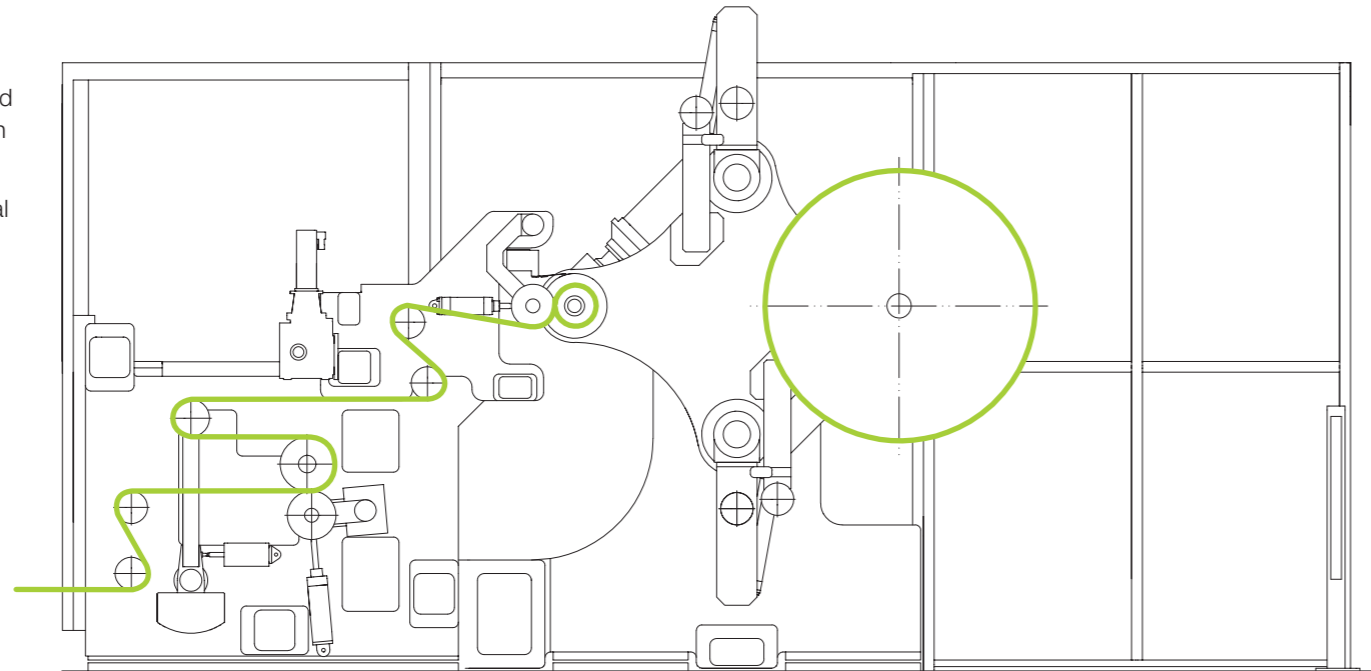
## Winding in both directions

Cross-cutting systems with a twisting knife for smooth roll changes. To meet individual requirements, rolls can be wound in both directions by means of an optional second cutting unit. This design allows for easy roll handling with standard electric forklifts.

The winder can be equipped for single or dual directional winding.

## 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 best winder for your application

The winder W2000 aerofilm is a horizontal sliding winder for the inline-slitting of part rolls to 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, thus guaranteeing a perfect winding quality up to the last layer on the roll.

## No bleed trim cutting

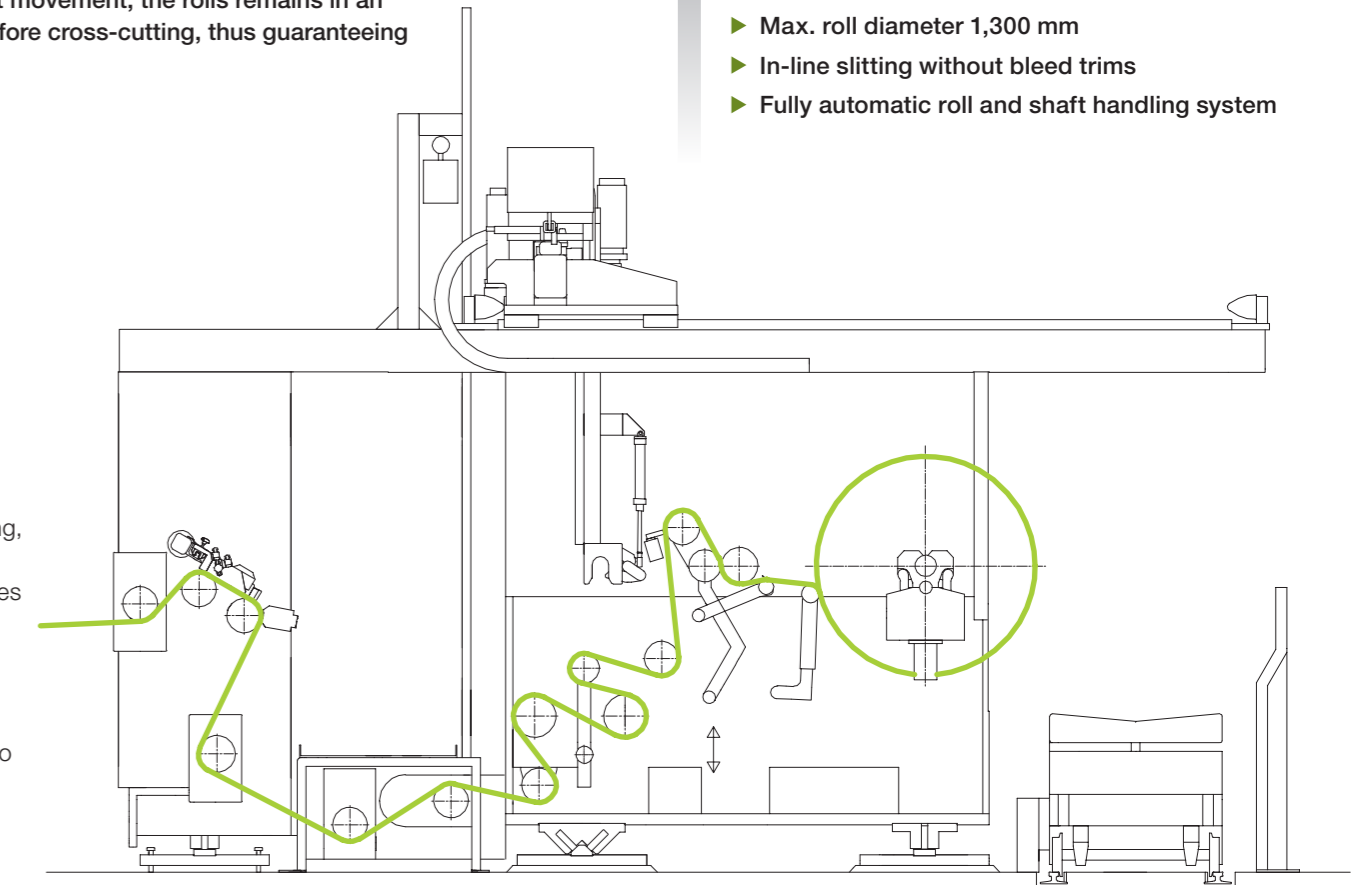
The slitting process is completed without bleed trim cutting, adjustable banana rollers separate the inline slitted rolls. Depending on the product, slitting stations with razorblades or circular knives are integrated at the winder entrance.

## 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 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 who says **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, 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 automatisisation 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. More than 1000 signals come together here, collected by many sensors, transducers, motors and transported via modern Ethernet bus systems.

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.



### 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, customisable assistant for product changes

### Systematic quality control

In close interaction with SML's data collection and analysis system bitWise, 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 bitWise
- ▶ 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 bitWise, SML's customers can **analyse the entire process history** of the hygiene film line with a **single click**, rather than relying on **current snapshots**.

bitWise incorporates decades of experience in automation with the latest technologies in data analytics and provides for 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. BitWise records and visualises this data up to 10 times per second. In addition, each manufactured roll is provided with a QR code that can be identified again. 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 bitWise, 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 with the laboratory results of a finished product roll.

## Always connected, even on the go

BitWise 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 bitWise in their company network via their VPN or a remote desktop solution.



## Optimising quality

BitWise 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

## Maximising output

Recorded, aggregated and visualised data by bitWise helps to raise overall line utilisation and delivers 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

## Minimising production costs

bitWise 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

## 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, bitWise 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, bitWise 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, 85 – 90 % 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

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The image shows a large, modern industrial building with a white facade. The SML logo is prominently displayed on the upper part of the building, rendered in a light blue, three-dimensional font. The building has a long, low profile with a series of windows along its side. In the background, another building with a grid-like facade is visible under a clear sky.

**SML**

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