

SML

EXTRUSION LINES – ENGINEERED TO PERFORM ►

100%
eXtrusion
CAST FILM LINES

LINES FOR CPP / CPE /
CAST-PET / BARRIER AND
MONO-ORIENTED FILM

LINES FOR CPP / CPE / CAST-PET / BARRIER AND MONO-ORIENTED FILM



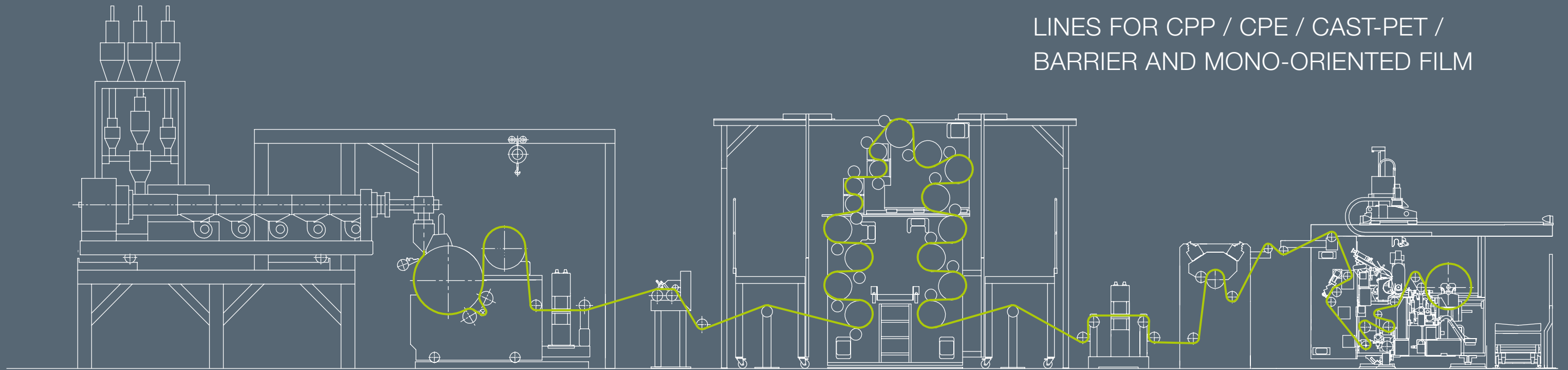
Cast film products are primarily used in the packaging industry for food and consumer goods. However, due to the special properties of cast film, technical products are a rapidly growing area of application.

Beside the huge packaging market, SML cast film lines are in operation for the manufacturing of films used in electronics, lithium-ion batteries, for optical surface protection and for medical and pharmaceutical use.

SML's cast film lines are characterised by **innovative engineering and the constant development of core components**, like the HO-LT extruders for heat-sensitive polymers such as EVOH, further-developed MDO units and new patented winders.

They are comfortably operated and controlled by SML's advanced machine control system SMILE, a software solution that supports complete remote control. SML's digital data generation and analysing tool, bitWise, allows the data-based optimisation of production processes.

Over the years, SML has installed hundreds of cast film lines worldwide. Based on long-standing experience and together with its customers, SML's design teams develop highly **customised cast film lines for the cost-efficient production of high-quality film**. Above all in terms of a high output volume, low gauge tolerances, a high transparency, suitability for metallisation and printability.

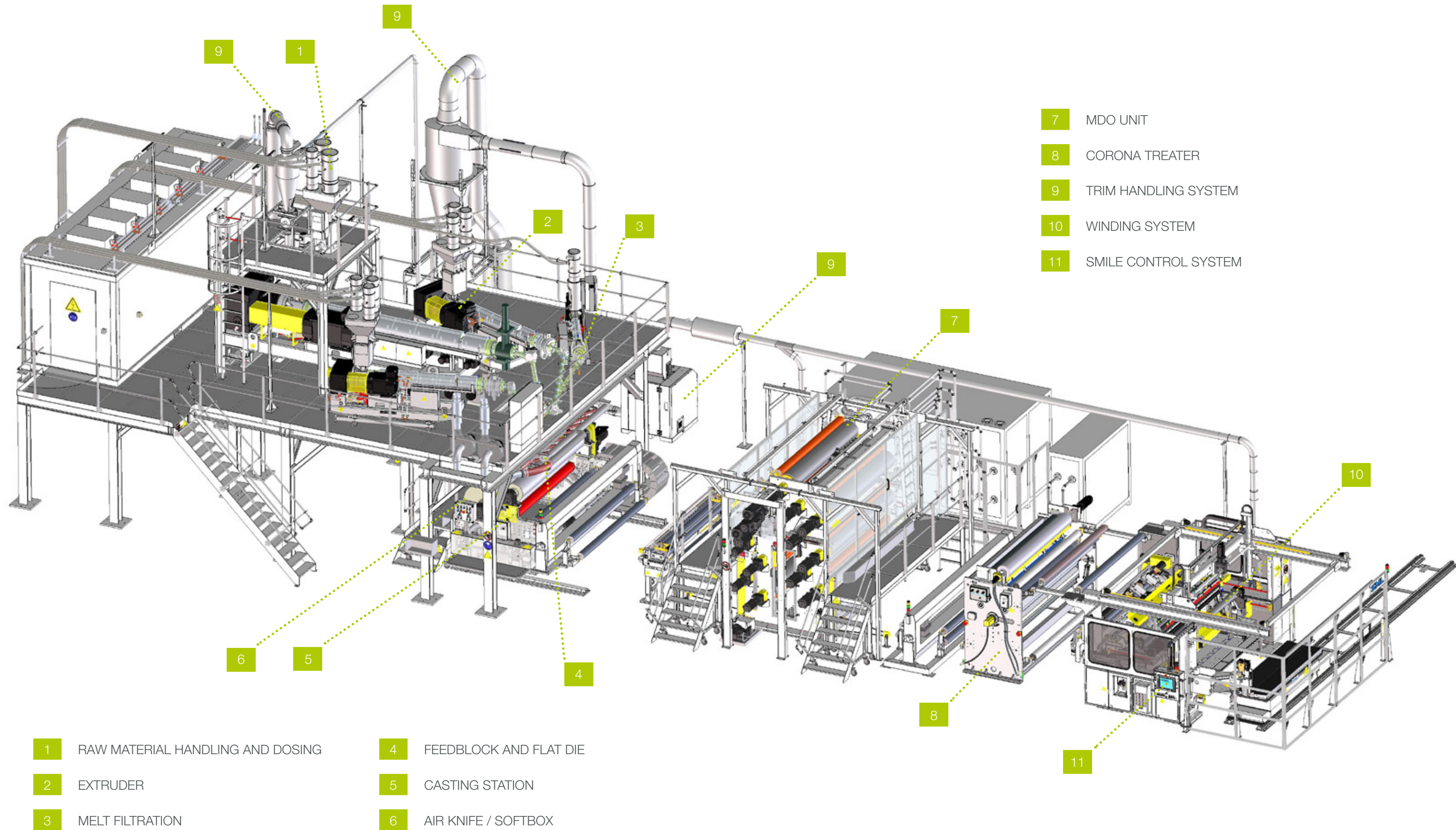


LINES FOR CPP / CPE / CAST-PET /
BARRIER AND MONO-ORIENTED FILM

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MULTILAYER EXTRUSION UNIT ▲

1 Raw material handling and dosing

SML offers a wide range of gravimetric batch blenders and continuous gravimetric feeders, enabling recipes to be run with great accuracy and repeatability. One extruder can be fitted with up to six feeding components, suitable for high-temperature polymer processing when required.



Gravimetric batch dosing system



Continuous gravimetric dosing system

The complete dosing system, as well as all the material supply vacuum pumps, filters and valves are fully integrated in SML's over-all machine control system SMILE.

Your Advantages

- ✓ Highest material blending accuracy and repeatability
- ✓ Ready for high temperature polymer processing
- ✓ Up to six feeding components per one extruder



EXTRUDER 150/33 ▲

2 Extruder

It is the long-standing experience in combination with continuous R&D activities and detail-level innovations, that makes SML an accepted technology leader in the field of extrusion systems. SML extruders for cast film are designed according to the processing requirements for all the relevant polymers used in this market segment.

WIDE CHOICE OF DIFFERENT SCREW DESIGNS

A selection of standard versions with screw diameters from 45 to 220mm is available. As a rule, the extruders with an L/D ratio of 28 or 33 and bimetallic barrels are powered by energy-efficient, low-maintenance, water-cooled AC drives. Depending on the size of the extruder and the processed materials, the screws are available with armoured flights for extended wear resistance.

ENERGY EFFICIENT HEATING SYSTEM

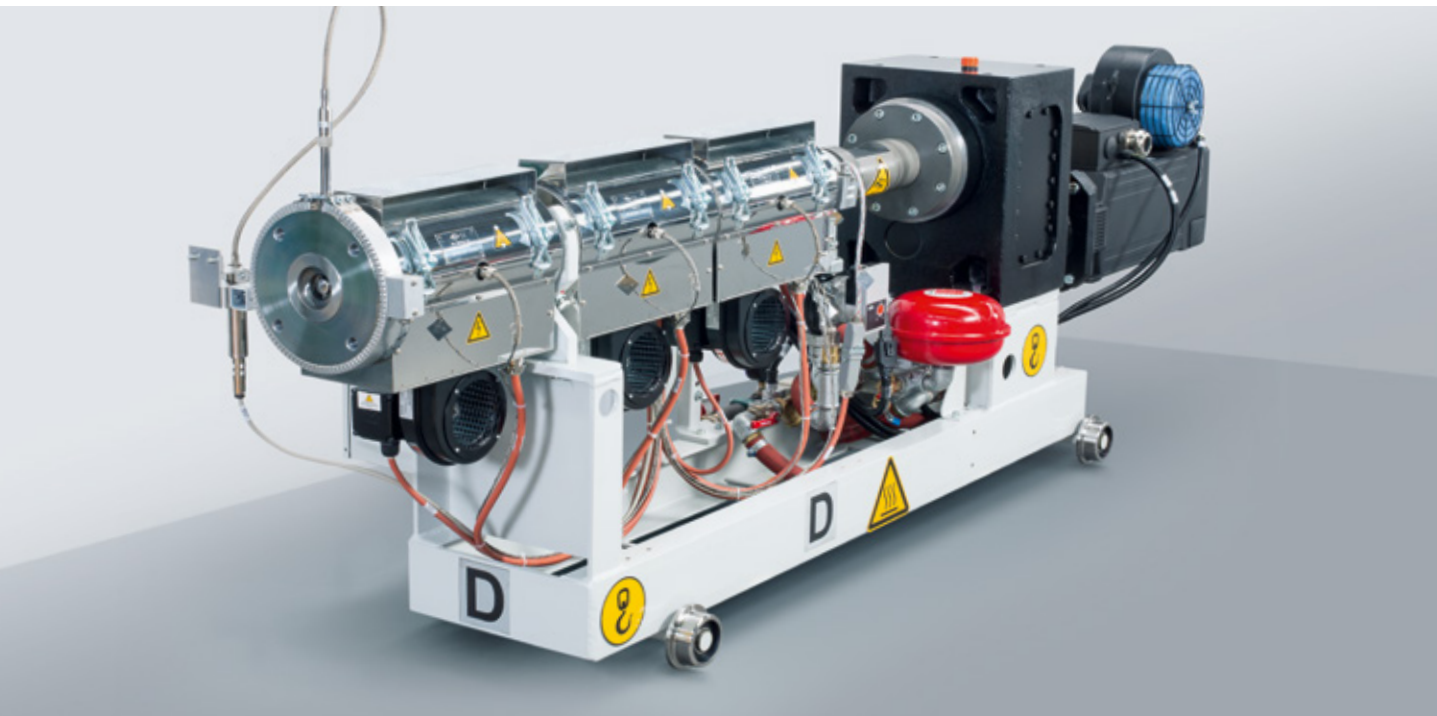
All extruder barrels are heated using the SML advanced heating system. A gravity-closing flap prevents the escape of hot air from the system, thus retaining the heat in the barrel. As an option all of the adapters can be equipped with heat insulation between the extruder and the feedblock.

Your Advantages

- ✓ Screw diameters from 45 to 220mm
- ✓ Energy-efficient, water-cooled AC drives
- ✓ Screws with armoured flights for extended wear resistance

EXTRUDER OUTPUT

	45/28	60/33	75/33	90/33	105/33	120/33	135/33	150/33	180/33	220/33
No. of zones	3	4	5	5	6	6	7	8	10	12
CPP film [kg/h]	80	135	200	300	430	550	640	820	1,050	1,400
CPE film [kg/h]	100	150	230	320	450	570	660	850	1,100	1,500
A-PET film [kg/h]	100	150	230	320	450	570	660	850	1,150	1,600



HO-LT EXTRUDER 35/34 ▲

HO-LT EXTRUDER

This patented extruder is especially designed for the processing of temperature-sensitive polymers such as EVOH or adhesives. It is also used for the thin functional layers in coextruded structures.

HIGH OUTPUT, LOW MELT TEMPERATURE

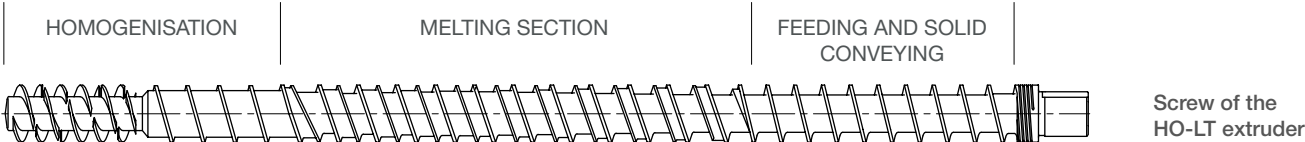
HO-LT stands for “High Output – Low Temperature”. The special screw and barrel configuration enables these machines to plasticise large amounts of polymer at relatively low screw speeds. The result is a very low melt temperature, an extremely stable output and a high pressure generation.

TWO DIFFERENT SIZES

SML offers the HO-LT extruder in two different sizes, which are typical for co-extruders in multilayer lines.

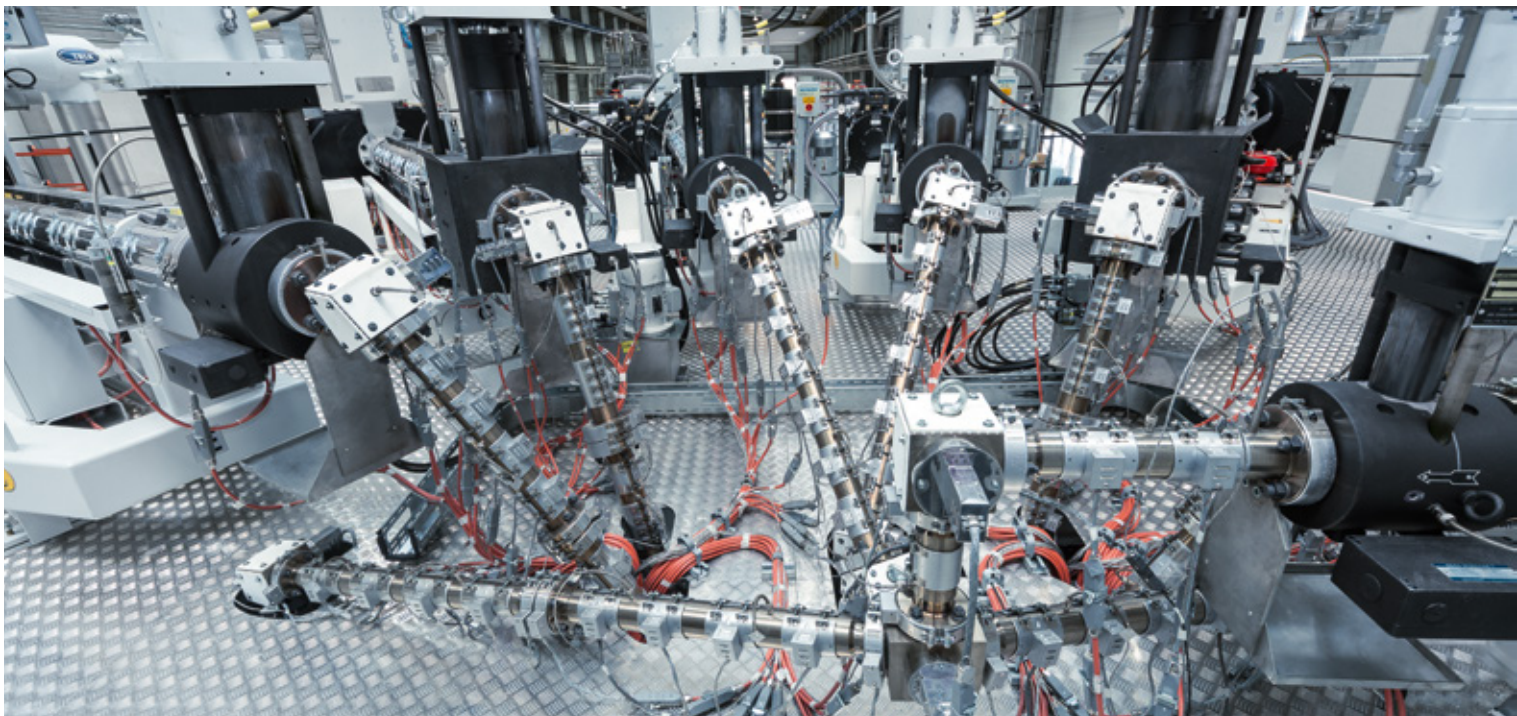
Your Advantages

- ✓ Designed for temperature-sensitive polymers like EVOH or adhesives
- ✓ Widely used for thin functional layers in coextruded structures



EXTRUDER OUTPUT HO-LT EXTRUDERS

		EVOH	Tie	PP	PE	A-PET	PA6
HO-LT 35/34	kg/h	120	110	120	110	110	100
HO-LT 45/35	kg/h	170	140	160	140	170	140



EXTRUSION TOOL UNIT ▲

3 Melt filtration

An effective melt filtration for the removal of impurities, unmelted or cross-linked particles is most important. Usually, SML installs manual or hydraulic single filters in its cast film lines. Disk filters

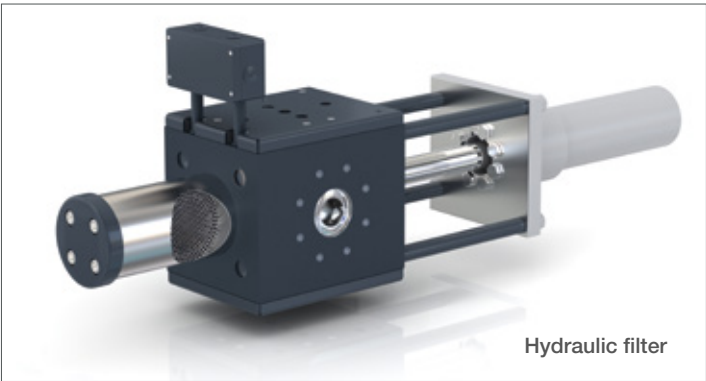
or candle filters are used for applications such as surface protection or medical films, which require the strictest melt quality.



Manual filter



Disc/candle filter



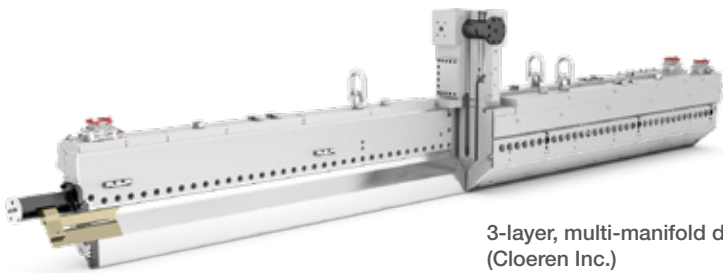
Hydraulic filter



FEEDBLOCK AND DIE ▲

4 Feedblock and flat die

As a leading supplier of cast film lines, SML relies exclusively on respected partners for its feedblocks and flat dies. A 3-layer feedblock with three extruders is standard for the production of CPP film, but there is also market demand for structures with five layers and four respectively five extruders.



3-layer, multi-manifold die (Cloeren Inc.)

UNLIMITED NUMBER OF LAYERS

For barrier films there are no limits in terms of the number of layers. For example, 3-layer structures with three extruders are used for the minimum requirement, while eleven layers with eleven extruders are employed for special high-barrier structures.

VARIABLE GEOMETRY FEEDBLOCKS FOR MULTILAYER STRUCTURES

Multilayer structures require great flexibility with regard to feedblock adjustability. Therefore, SML generally utilises variable geometry feedblocks and inserts that can be profiled to optimise

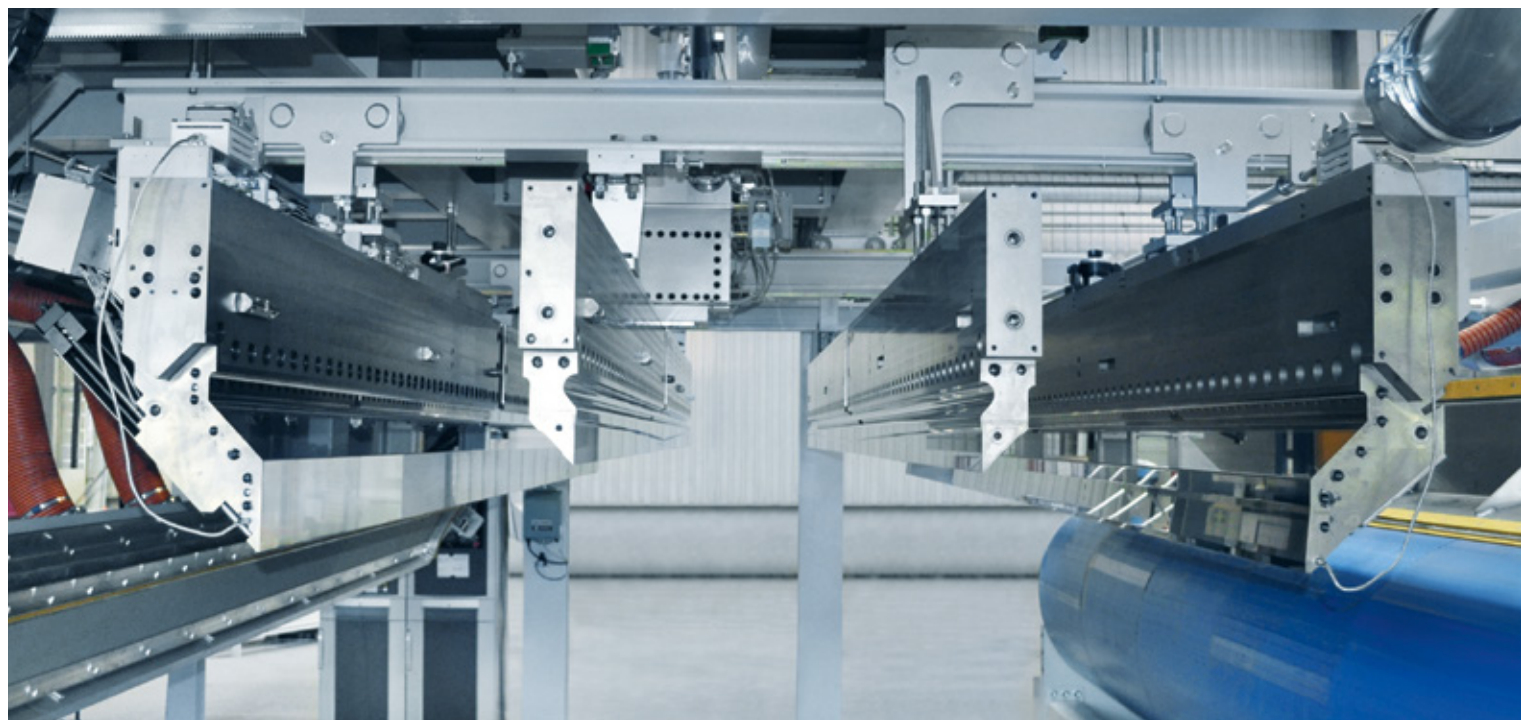
the thickness variations of the single layers. The layer configuration can be changed by changing the selector plug.

EFFICIENT VARIATIONS OF NET FILM WIDTHS

Co-extrusion flat dies with a T-channel shape are able to incorporate fixed or variable internal decking systems, which allows efficient variations of the net film width. Depending on the manufacturer, dies are either chrome or nickel-plated, but in both cases automatic die control via thermal heated bolts is standard.

Your Advantages

- ✓ 3-layer feedblock with three extruders as a standard for CPP films
- ✓ Eleven layers with eleven extruders for special high-barrier structures
- ✓ Co-extrusion flat dies with a T-channel shape



SML DIE SPLITTING SYSTEM ▲

MULTI-MANIFOLD DIES

In order to achieve better performance in terms of the individual layer distribution, multi-manifold dies are sometimes recommended for the structures using polymers with large differences in the melt viscosity or processing temperature.

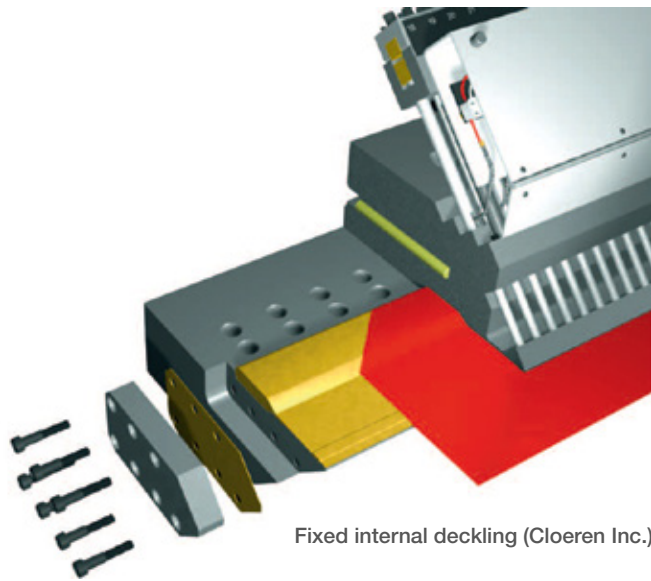
EDGE ENCAPSULATION SYSTEM FOR BARRIER FILM

Encapsulation makes the production of barrier films more economical and reduces the scrap rate significantly. With SML's edge encapsulation system, it is now possible to re-feed the primary edge trim to one of the extruders, because this trim consists entirely of clean encapsulation material (PE or PP) and is not contaminated with any barrier material.

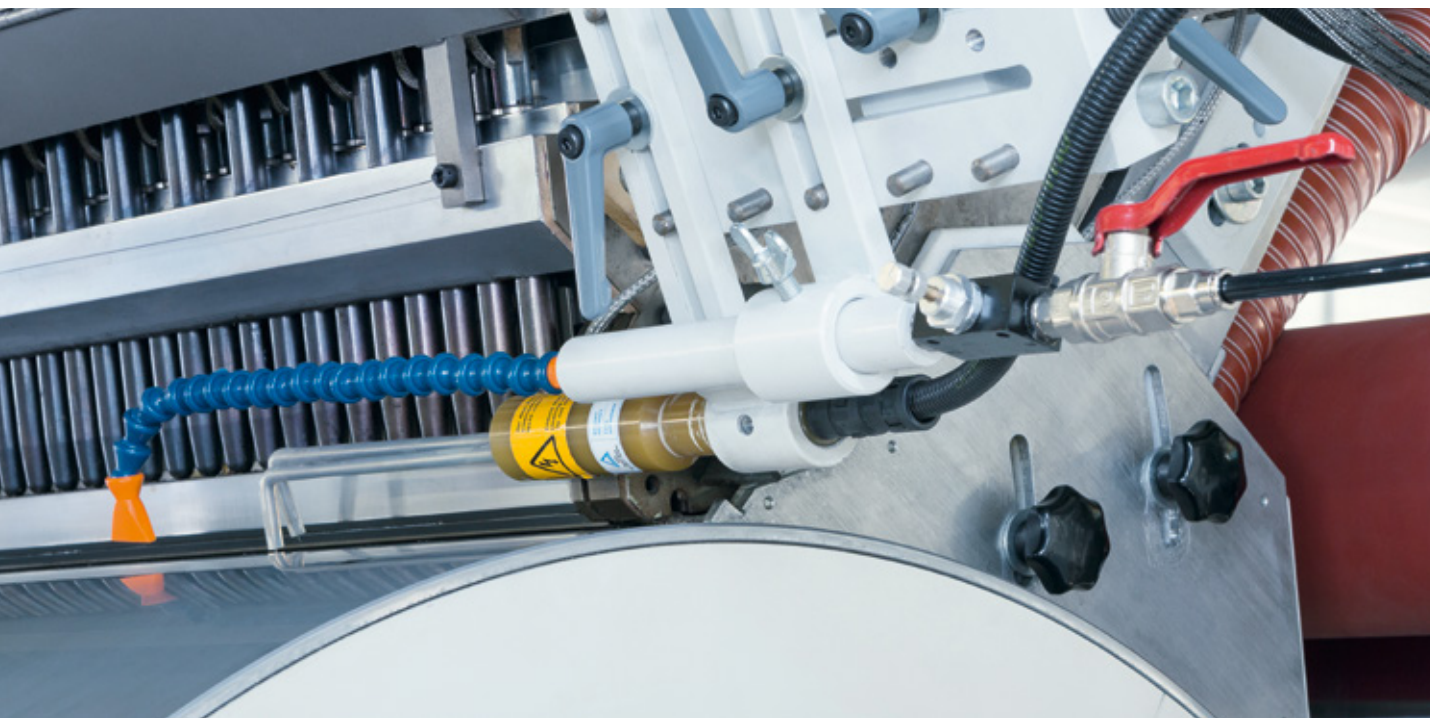
The two encapsulation channels are fed from a separate small extruder directly to the edges of the die.

DIE SPLITTING SYSTEM

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



Fixed internal decking (Cloeren Inc.)



EDGE PINNING SYSTEM ▲

EDGE PINNING

A combined electrostatic and pneumatic pinning system fixes the film to the chill roll surface and reduces the neck-in. The positioning of the film with adjustable static power and air pressure is straightforward and easy. It guarantees precise pinning and therefore solid contact between the film edges and the chill roll.

BI-VACUUM BOX

SML's bi-vacuum box, which is mounted directly on the die body, consists of two chambers. The prechamber extracts the air stream generated by the rotating chill roll, while the main chamber maintains a low air pressure between the extruded film and the chill roll and prevents air entrapment.

The length of the melt curtain can be adjusted before it touches the chill roll. Both chambers are equipped with separate, speed-controlled suction fans.

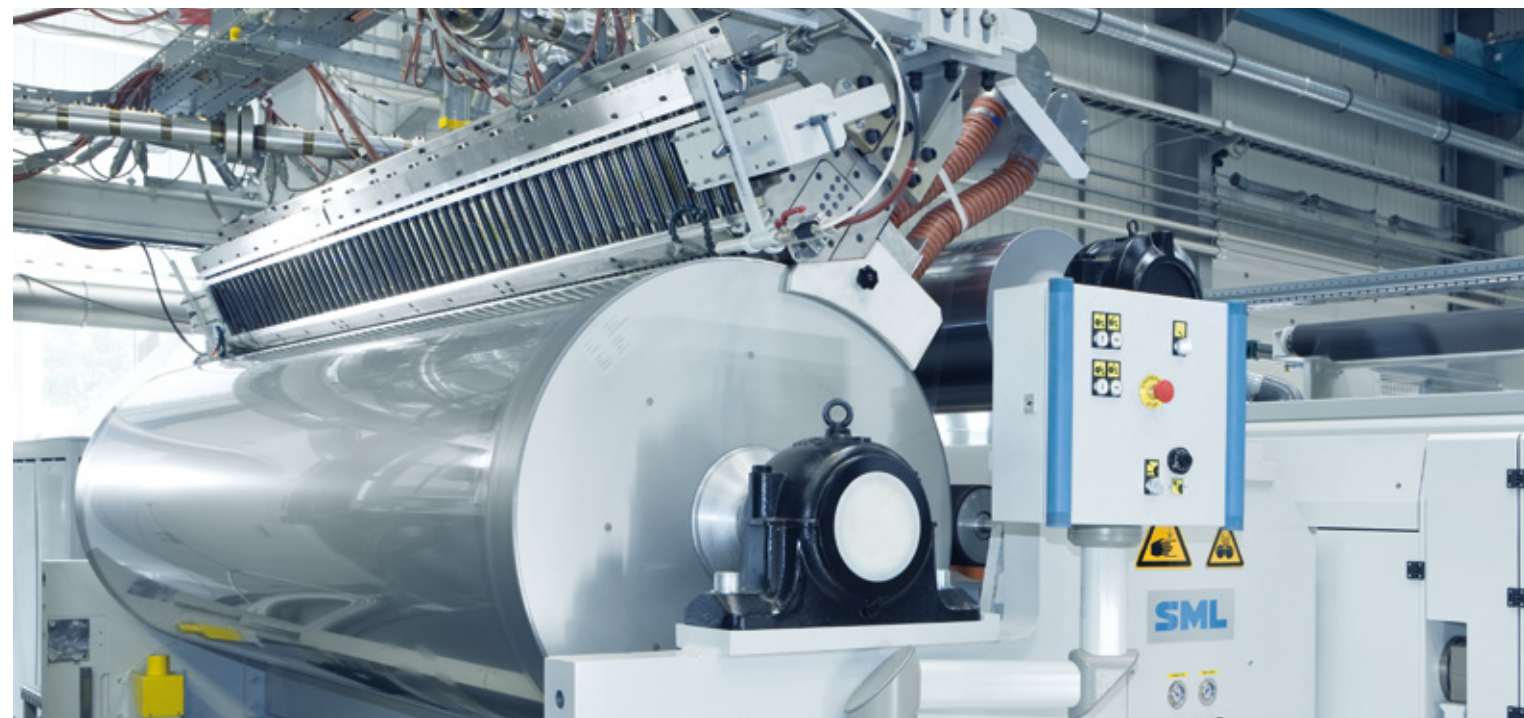
The vacuum box is slidable and mounted on the die splitter. Therefore, it is not necessary to disassemble the vacuum box during die cleaning.

Your Advantages

- ✓ Two-chamber bi-vacuum box
- ✓ Speed controlled suction fans for each chamber
- ✓ Die cleaning without disassembling the box



Bi-vacuum box



CHILL ROLL UNIT ▲

5

Casting station

In interaction with the bi-vacuum box, the air knife or the softbox, of SML's casting station has a significant influence on the final product quality. Parameters such as the position relative to the flat die, chill roll temperatures, and vacuum box or air knife settings have a direct effect on the optical and mechanical properties of the film – such as the haze, transparency, tensile strength or shrinkage.

SPECIFIC CHILL ROLL SURFACES

The first chill roll has an electro-chemically matted and roughened surface that reduces air entrapment and allows the easy release of the film upon exit. The second and the third (optional) chill rolls have polished surfaces. Two chill rolls are sufficient for standard CPP film production, while the third chill roll is needed for the elimination of the curling effect when producing asymmetric barrier films.

SEPARATE TEMPERATURE CONTROL

All the chill rolls are equipped with separate water temperature control systems and accurate speed control drives. Optional heating systems can be installed in the water circuit for polymers such as PA or PET.

CLEANING ROLL FOR MONOMERS

A cleaning roll unit is installed to stop monomers and other deposits from contaminating the first chill roll. The cleaning roll with a smooth rubber surface and the crowning to compensate deflection constantly presses the film against the first chill roll, thus preventing deposits on the entire surface.

HORIZONTAL AND VERTICAL ADJUSTABLE

The complete chill roll unit is adjustable in the horizontal and vertical direction in order to ensure the correct casting position for each product. Electrical drives actuate the movements and the actual position is shown on the control screen unit and stored in the recipe.



THICKNESS MEASURING UNIT ▲

ACCURATE FILM THICKNESS REGULATION

SML places the thickness-gauge unit directly on the chill roll frame 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 most accurate film thickness regulation. In answer to the different regulations in customer countries and specific product needs, SML supplies automatic gauging systems.

EITHER WITH INFRARED, X-RAY OR BETA-RAY SENSORS.

All the guiding rolls in the production line have a cut-resistant surface for a high film grip and a long service life.

Your Advantages

- ✓ Chill roll positioning possible in vertical and horizontal direction
- ✓ Third chill roll for asymmetric barrier films as an option
- ✓ Gauging systems either with infrared, x-ray or beta-ray sensors



AIR KNIFE ▲

6 Air knife / softbox

For the production of thicker film, it is necessary to fix the film additionally onto the first chill roll using either an air knife or a softbox. This also enhances film cooling, which results in better haze and transparency values.

AIR KNIFE

SML's air knife has a specially designed, internal air distribution system and an adjustable lip gap. The internal air distribution system guarantees a constant airflow over the whole width of the air knife. To ensure that no particles are blown onto the film, the air for the air knife is filtered. The blower of the air knife is speed-controlled.

SOFTBOX

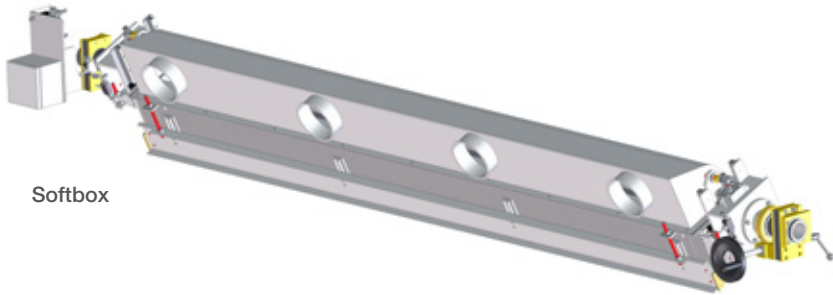
The softbox represents an alternative to the air knife. It offers a gentler air flow and the advantages of a larger area, where the film is attached to the chill roll. Compared to the air knife, softbox handling and adjustment are easier.

OPTIONAL AIR-COOLING AND -HEATING

Both the air knife and the softbox can be equipped with air-cooling or air-heating systems as an option. The softbox and the airknife are slidable and mounted on the die splitter. If these units are not required for production, they can be moved to a parking position which is outside of the operation area.

Your Advantages

- ✓ Air knife with adjustable lip gap
- ✓ Softbox for easier handling
- ✓ Parking position for air knife / softbox outside of operation area



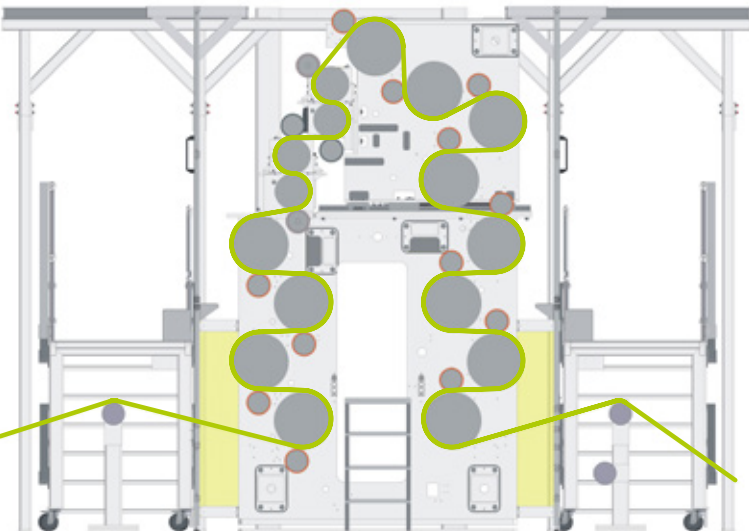
Softbox



MDO UNIT ▲

7 Machine direction orientation (MDO)

For special film applications, SML integrates an inline MDO unit into cast film lines. The monoaxial stretching process makes it possible to adjust film properties such as elongation, tensile strength, shrinkage, stiffness, barrier and optical characteristics. Furthermore, downgauging by stretching still represents a growing trend in the film industry.



MDO unit for breathable film

WIDE RANGE OF APPLICATIONS

SML has accumulated 45 years of experience in film stretching and has created excellent MDO systems for a wide range of products

- Carrier handles
- Self-adhesive tapes
- Tear tapes
- Label film
- Foamed film
- Aging resistant and shrink-optimised PET-film
- Barrier film



MDO UNIT ▲

MODULAR MACHINE SET-UP

MDO units consist of a stable, modular machine frame, including a preheating section, a stretching section and an annealing and cooling section. All the rolls are separately driven and temperature controlled. Well dimensioned film preheating and annealing sections are important with regard to mechanical properties and high production speeds.

SEVERAL OPTIONS AND ADD-ONS

The modular design of the MDO unit allows the addition of preheating or annealing rolls. Nip rolls can also be installed on every roll in order to fix the film and to eliminate air entrapment. The MDO unit is equipped with an adjustable stretching gap, which gives more flexibility regarding the process parameters. For a comfortable line start-up, the unit is tooled with a film feeding chain. SML MDO units are also available for blown film lines or offline stretching processes.



Your Advantages

- ✓ Vast variety of different film properties
- ✓ All rolls separately driven and temperature controlled
- ✓ Film feeding chain for a comfortable line start-up



CORONA TREATMENT ▲

8 Corona treatment unit

A corona treatment unit must be installed in order to prepare the films for subsequent offline printing, metallising or lamination processes.

ONE-SIDE REVERSIBLE VS. DOUBLE-SIDE TREATMENT

Depending on customer requirements, one-side or one-side reversible or double-side treatment stations are employed. The corona unit is equipped with electrically driven, water-cooled treatment rolls and with a nip roll to prevent the backside treatment of the film. For a gentle but effective treatment of the required surface tension, it is important to select the correct number, shape and material of the electrodes in combination with a well-dimensioned generator.



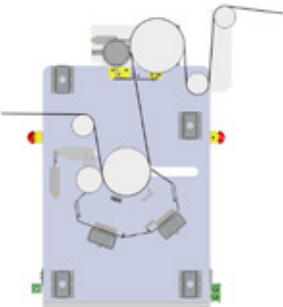
Corona unit

POST-COOLING ROLL FOR ADDITIONAL FILM COOLING

During the corona treatment, the film is heated, whereby the amount of heating energy required is contingent upon the speed, raw material and treatment level. Depending on the design of the treatment station, a driven post-cooling roll with a nip roll for additional film cooling can be installed either directly at the corona station, or at the winder inlet.

Your Advantages

- ✓ Electrically driven, water-cooled treatment rolls
- ✓ Driven post-cooling roll with a nip roll as an option



BLEED TRIM CUTTING ▲

9 Trim handling system

The edges of the film need to be trimmed in front of the corona treatment unit, in order to prevent the backside treatment. A final trim is cut directly at the winder. Depending on the winding system, bleed trims are also removed.



Fluff re-feeding unit

VERTICAL SCRAPTRUDER

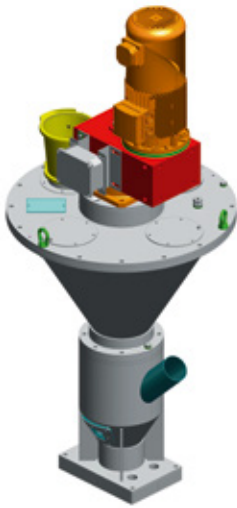
After trimming, the trims are sucked through the grinder of the fluff re-feeding system and then transported to a vertical scraptruder. This feeds the fluff together with virgin material directly into the extruder for the core layer.

ENERGY EFFICIENT FLUFF RE-FEEDING

Fluff re-feeding is a very energy-efficient and material-compatible method, as no additional melting is involved. It results in less thermal stress of the material.

Your Advantages

- ✓ Final trim cut directly at the winder
- ✓ Trim recycling in the extruder for the core layer
- ✓ Fluff re-feeding for less thermal stress in the material



Vertical scraptruder



10

Winding Systems

focused on
film producers
and their
customers

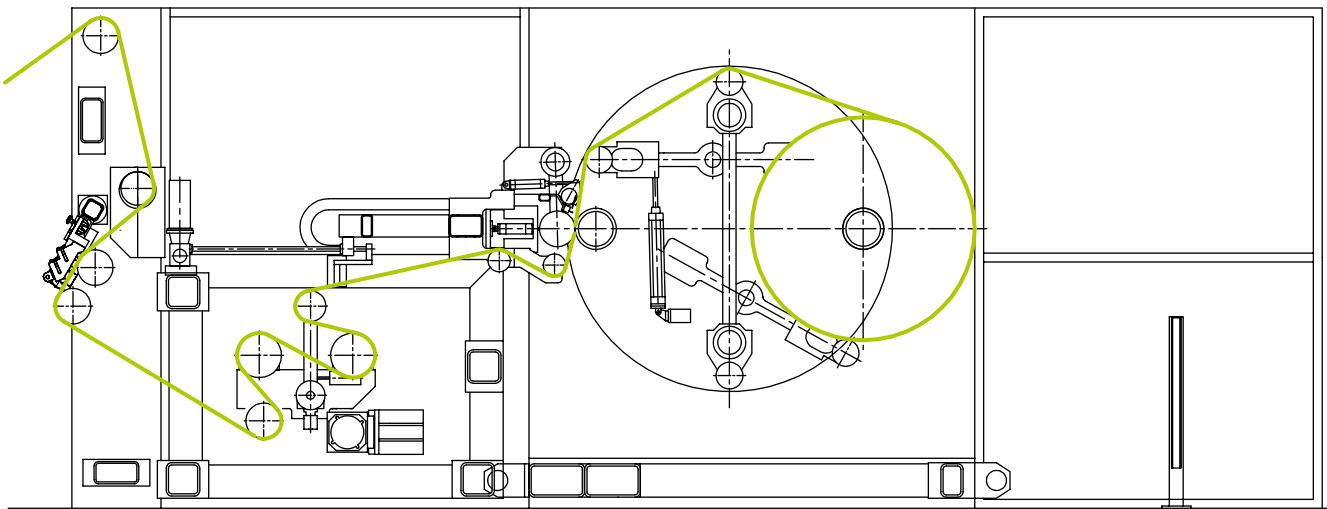
Based on long-standing experience, substantial R&D efforts and constant innovation, SML is the accepted technology leader in the field of windings systems. Every new product, idea or requirement, which is spotted in the market, or is the subject of a customer inquiry, is passed on to SML's R&D department. Following a detailed evaluation, SML then upgrades its winders with corresponding new features.

OPTIMISED FOR HIGH PRODUCTION SPEEDS

SML has created different winding systems focused entirely on the demands of film producers and their customers. All these winders have a solid, vibration-dampening steel frame construction, which is able to resist the dynamic forces generated at high production speeds.

OPERATOR-FRIENDLY CONTROL SYSTEMS

Directly attached to SML's winders is a wide touch screen for winding parameter adjustment and for maintenance work. Additionally, all the winders in SML's cast film lines can be comfortably controlled from the line's central control station with SML's operator-friendly SMILE system.



Winder W1050

The winder W1050 is the basic turret winder for the production of thin cast film mother rolls on 6-inch shafts with a maximum winding diameter of 1,000mm. An ultra-lightweight dancer roll controls film tension, while the shaft is center-driven and the film is wound onto the roll in either a gap or contact mode.

FILM CROSS-CUTTING AS A STANDARD

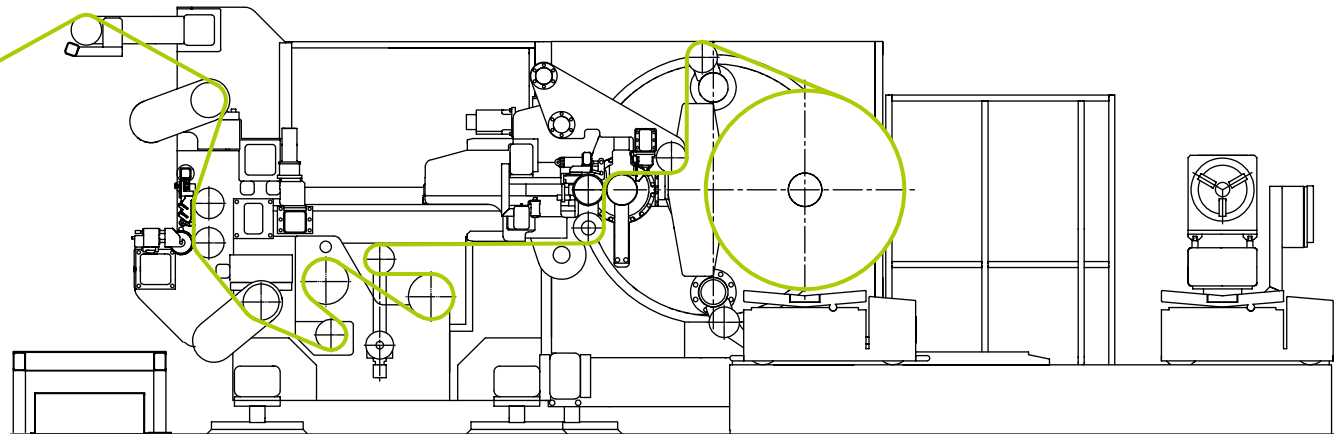
Film cross-cutting is performed by a twisting knife and in standard configuration, the new winding core is prepared with double-sided adhesive tape. As an option, the film can be fixed onto the new winding core by means of electrostatic charging, thus making core preparation unnecessary.

INDEXING WITH AUXILIARY CONTACT ROLLS

During indexing, the incoming film is attached to the surface of the finishing roll by an auxiliary contact roll. The finished roll is removed by a semi-automatic trolley. As an option, this winder W1050 is also available in a shaftless version.

Your Advantages

- ✓ Ideal for thin cast film mother rolls on 6-inch shafts, diameters up to 1,000mm
- ✓ Film tension control with an ultra-lightweight dancer roll
- ✓ Shaftless version as an option



Winder W1200

The winder W1200 is the thin film turret winder for large widths of up to 4,500mm and maximum roll diameters of 1,200mm.

WINDING IN GAP OR CONTACT MODE

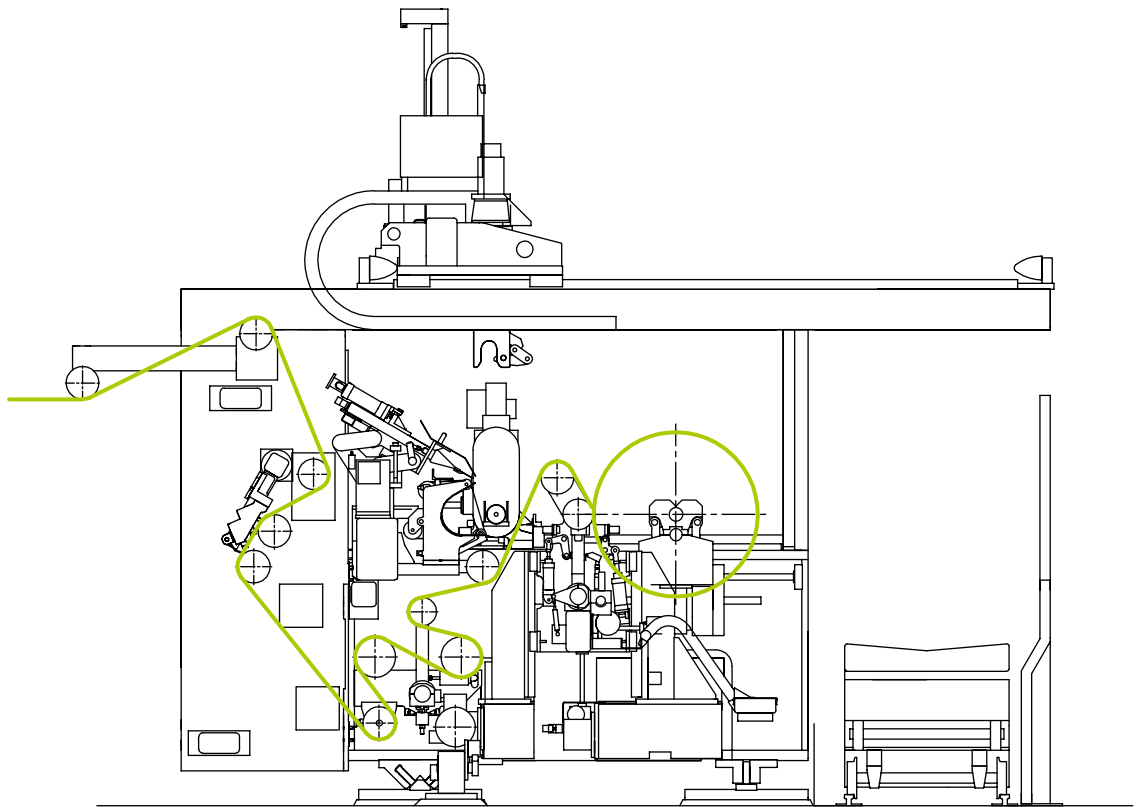
An ultra-lightweight dancer roll controls film tension, while the shaft is center-driven and the film is wound onto the roll in either a gap or contact mode. Film cross-cutting is performed by a twisting knife and as the film is fixed onto the new winding core by means of electrostatic charging, no core preparation is necessary.

OPERATION WITH SHAFTS OR SHAFTLESS

When indexing, the incoming film is attached to the surface of the finishing roll by an auxiliary contact roll. This winder with steel winding tubes can either be operated with winding shafts or without a shaft. A semi-automatic trolley, together with a shaft pulling device, is available as an option for the handling of heavy rolls or shafts.

Your Advantages

- ✓ Thin film turret winder for large widths of up to 4,500mm, roll diameters up to 1,200mm
- ✓ Film cross-cutting with twisting knife
- ✓ Heavy roll handling with semi-automatic trolleys and a shaft pulling device, as an option



Winder W2000

The winder W2000 robotic is the standard horizontal sliding winder for the inline-slitting of part rolls with narrow widths. With over 100 units running in the field, the winder W2000 is the most popular and proven winder for cast film. It is designed for the winding of films in a wide thickness range.

Owing to the principle of a horizontal winding position movement, the roll of this winder remains in an optimum winding position until the very last moment before cross-cutting, thus guaranteeing a perfect winding quality up to the last layer of the roll.

NO CORE PREPARATION NECESSARY

The winder W2000 robotic is equipped with an ultra-lightweight dancer roll for sensitive tension control and can be operated in the gap or contact mode. A satellite roll optimises the entrance angle of the film to the roll, which minimises air entrapment. A strong guillotine knife is used for cross-cutting on the W2000 robotic winder. The film is fixed onto the new winding core with a belt cage and compressed air nozzles. As a result, core preparation is unnecessary.

INLINE-SLITTING WITH RAZOR BLADES OR CIRCULAR KNIVES

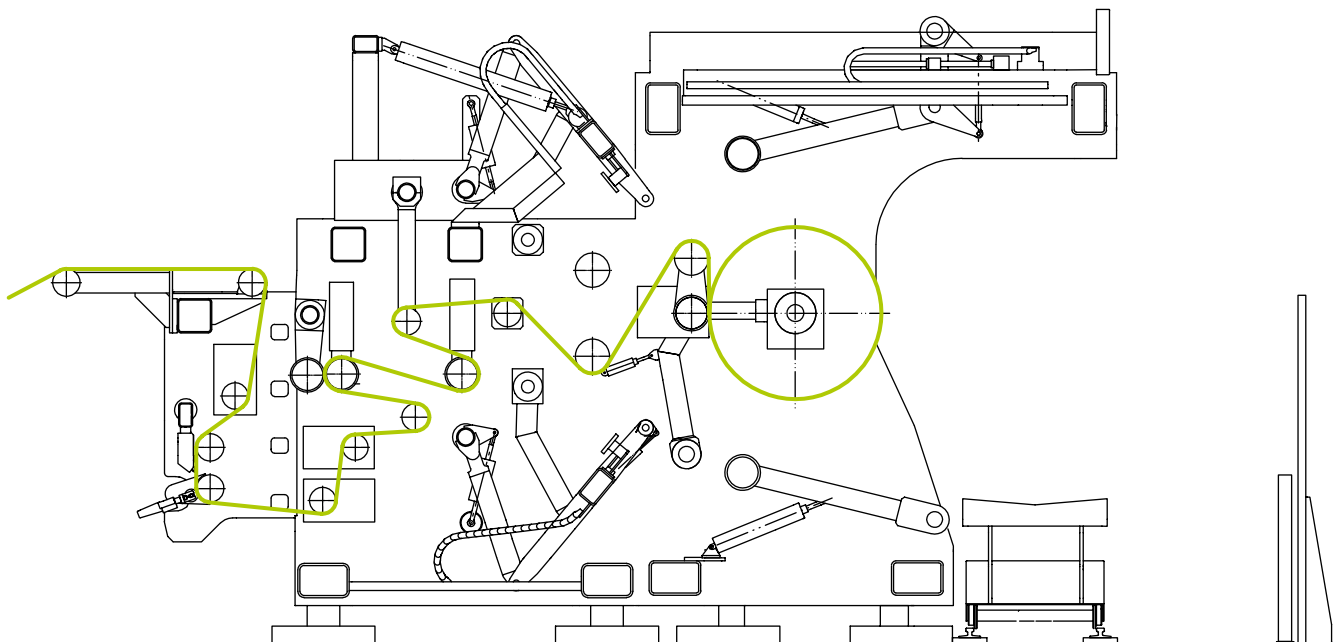
The inline-slitting process can be carried out either with or without bleed trims.

FULLY INTEGRATED ROLL AND SHAFT HANDLING

The finished roll and the winding shaft are transported onto a moveable lifting table by an overhead robot, which pulls the slit rolls from the clamped shaft.

Your Advantages

- ✓ Horizontal sliding winder for inline-slitting
- ✓ Perfect roll quality due to optimised winding position
- ✓ Especially designed for winding in a wide thickness range



Winder W5000

The winder W5000 is a linear turret winder (LTW), which combines the advantages of a horizontal sliding winder and a turret winder.

INDIVIDUALLY MOVEABLE WINDING STATIONS

Prior to cross-cutting, the winder W5000 reduces the free length of the web to a minimum by means of individually moveable winding stations. This is to guarantee a perfect winding quality up to the last layer on the roll.

PERFECT ROLL CHANGES

Before roll changes, the active roll moves horizontally into the centre of the turret, which prevents any further movement while the new shaft is turned into the cutting position by the turret. In addition, as soon as the roll leaves the stationary main contact roll, an auxiliary contact roll guides the film.

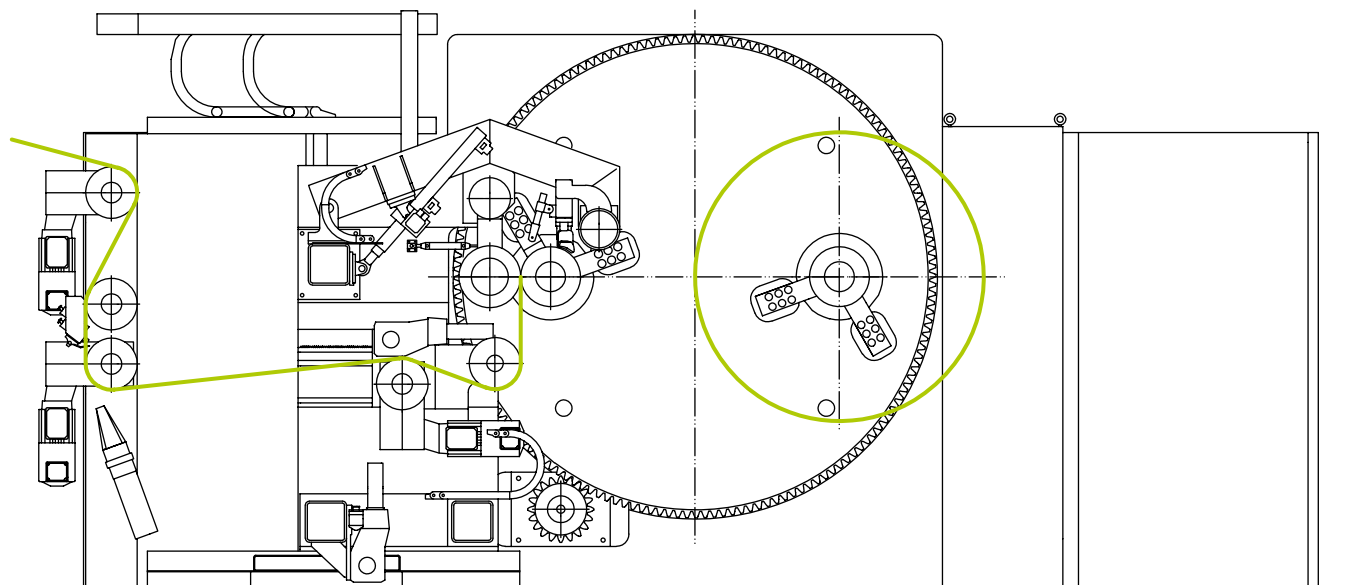
CROSS CUTTING BY FLYING OR TWISTING KNIFES

Depending on the film thickness, the film is cross-cut by a twisting knife, or by a flying knife. The winding shaft constantly remains fixed on one side of the winder, which allows a higher load and less deflection as compared to conventional winding systems.

Inline-slitting can be carried out without bleed trim and depending on the product, slitting stations with razorblades or with circular knives are integrated at the winder entrance. The complete roll handling process is fully integrated in the automatic mode of the winder.

Your Advantages

- ✓ Combining the advantages of horizontal slide winding and turret winding
- ✓ Higher load and less deflection as compared to conventional winding systems
- ✓ Fully integrated, automatic roll handling process



Winder W6000

The winder W6000 is a shaftless turret winder for extra-wide, cast film lines with widths of up to 6,200mm. Typical products are thin CPP or CPE film, mother jumbo rolls wound onto 10- or 12-inch steel winding cores. The winder W6000 can carry loads as heavy as seven tons and provide a range of rolls with diameters of up to 1,300mm.

In line with the trend towards an increase in the largest possible reel diameters on metallisers and slitters, an optional version with a top mechanical winding diameter of 1,500mm is available, which raises roll length to a maximum.

OPTIMISED FOR ELEVATED ROLL DIAMETERS

The winder W6000 is equipped with ultra-light carbon fibre rolls for an optimum performance at elevated speeds and an edge trim cutting unit with a spreader roll is installed at the winder inlet. Further downstream, an adjustable satellite roll matches the entrance angle of the film precisely to that of the film roll, thus minimising air entrapment between the film layers. A spreader roller also keeps the wrinkles on the roll to a minimum. The winder can wind in both a gap and contact mode. The turret unit consists of two massive side frames in which the turning disks with chuck heads and drives are indexed. To avoid vibrations, the disks are guided by strong two-path, ball bearing slewing rings.

Film cross-cutting is carried out using an electro-mechanical operated flying knife. The film is attached to the new steel winding core by an electrostatic system, while a hall crane, to be supplied by the customer, handles the finished rolls. Like all other SML winders, the winder W6000 is equipped with its own control unit.

Your Advantages

- ✓ Horizontal sliding winder for inline-slitting
- ✓ Perfect roll quality due to an optimised winding position
- ✓ Especially designed for winding in a wide thickness range

Winding	winder W1050	winder W1200	winder W2000	winder W5000	winder W6000
Film thickness range	15 - 100µm	15 - 100µm	15 - 300µm	15 - 100µm	15 - 100µm
Maximal mechanical speed	400 m/min	400 m/min	400 m/min	500 m/min	300 m/min
Maximal winding width	2,800mm	4,500mm	3,250mm	4,200mm	6,200mm

Winding shaft/ pipe diameter			3-inch ¹	3-inch ¹	
	6-inch	6-inch	6-inch	6-inch	
		8-inch		8-inch	
				10-inch	10-inch
					12-inch
Max. mechanical diameter ¹	1,000mm	1,200mm	980mm W2000 XL: 1,300mm	1,600mm	1,300mm
Winding direction	top outside	top outside	top inside	both	top outside

Winding tension	10 - 100 N/m	10 - 100 N/m	10 - 100 N/m	10 - 100 N/m	10 - 100 N/m
Contact roll pressure	30 - 100 N/m	30 - 100 N/m	30 - 100 N/m	30 - 100 N/m	30 - 100 N/m

Roll handling	semi-automatic	semi-automatic	automatic	automatic	manual
Oscillation	frame	winder or frame	winder or frame	winder or frame	frame

¹ Depending on end film width and product





E-CONTAINER ▲

11 **SMILE** control system

SMILE is SML's generic machine control and operation concept. It stands for all-encompassing automatisisation, providing machine control systems with the highest usability in combination with outstanding capacities for profound process management and monitoring.

The end-to-end integration of third-party systems, overall line effectiveness, operator-friendliness as well as tailor-made and flexible software solutions are the key elements of SMILE.

SMILE is developed as a whole in-house and is integrated one hundred percent in SML's extrusion lines. It is the highly precise, centralised control and synchronisation of all components in an extrusion system, which is blazing the way to new manufacturing concepts as well as delivering product properties, line efficiency and output volumes.

INTUITIVE MACHINE CONTROL CONCEPT

SMILE is an integral part of SML's coherent and user-friendly over-all line concept; machine control and operation is highly intuitive and self-explanatory:

- 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, less personnel required
- Remote control, remote update and remote service for minimised maintenance-costs, multi-client / multi-user capability

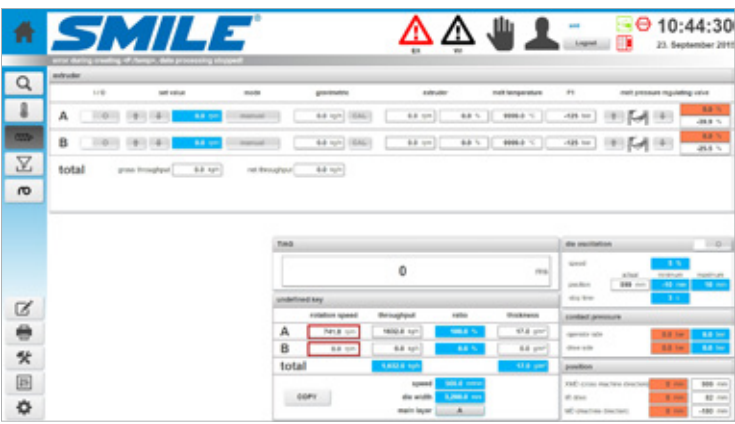
OPTIMISED PRODUCTION EFFICIENCY

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



Control panel



SYSTEMATISED 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 copy production parameters
- Documentation and detailed reporting of production processes
- Automatised alarm functions via e-mail or text message for quick debugging

INTERCONNECTIVITY AND THIRD-PARTY INTEGRATION

SMILE has 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 UPC-UA
- Complete end-to-end process control beyond SML extrusion lines

INTEGRATED ALL-IN-ONE CONCEPT

It is SMILE's all-in-one concept that helps to create completely new types of extrusion solutions, making one single operator-friendly step out of the most complex production processes. The control of temperatures, speeds and pressures on SML extrusion lines is highly centralised. All of the line modules and motors are perfectly interconnected and synchronised with each other.

CENTRAL CONTROL STATION SYSTEM

SMILE's central control station system allows the management of all of the production processes from the wide touch screen attached to the line. As SMILE is web-based, all of the production and maintenance processes can be entirely remote controlled, i.e. 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.

OPEN FOR CUSTOMISATION

Developed in close consistency with the hardware components of SML's extrusion lines, SMILE is highly customisable. It is SML's flexibility that offers a wide range of opportunities if customer-specific solutions are required.

SOFTWARE 100 % DEVELOPED IN-HOUSE

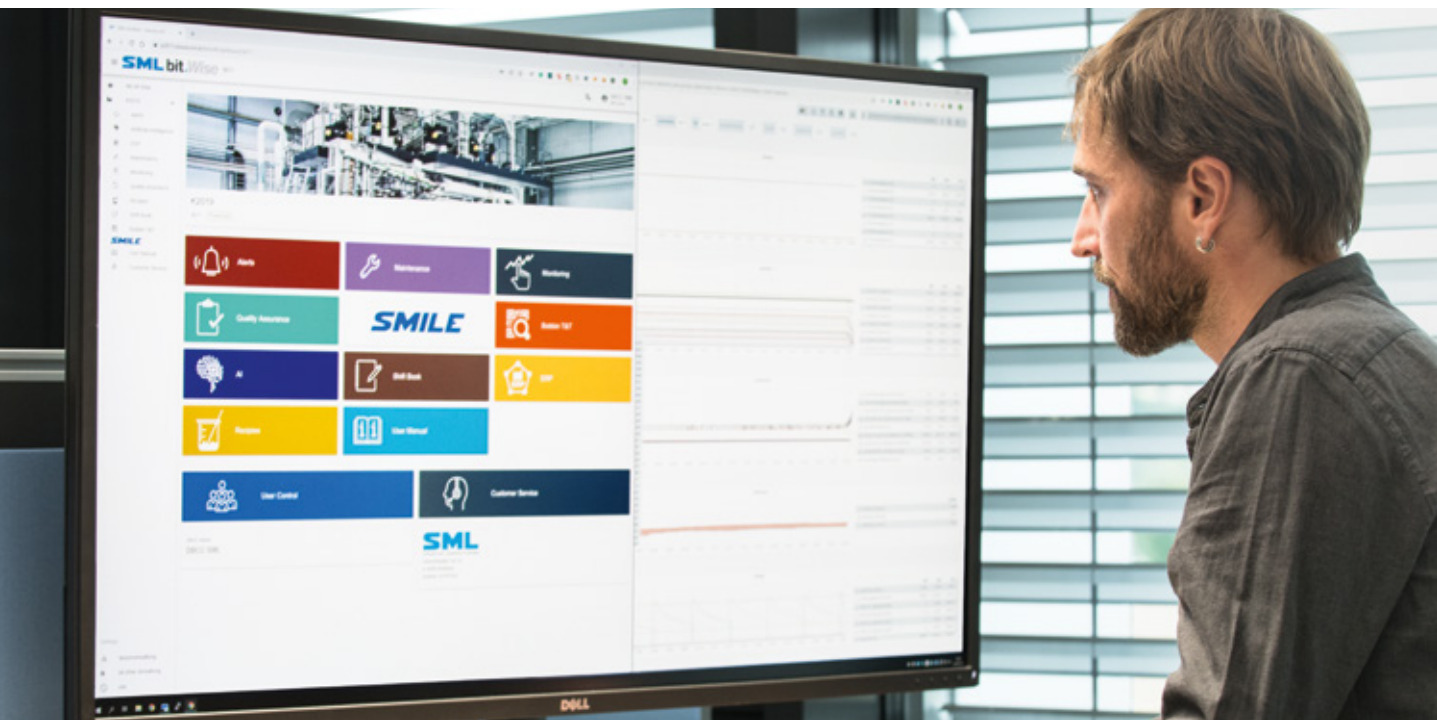
Above all, it is SML's long-standing in-house competence in the field of automatisisation and machine control that provides loads of innovative functions tailored to specific customer requirements. In-house developed, state-of-the-art and dynamic controller systems always allow running the machines at their very best performance-level – considering both economic and environmental aspects. All of SMILE's software solutions are developed by SML technicians. Last but not least, it is SML's concentrated know-how in any aspect of automation, that helps to create the extrusion solutions of tomorrow.

SMILE SOFTWARE FEATURES

- ▶ Central control station system for all production processes
- ▶ Full interconnectivity – global UPC-UA, programmed on HTML5, open interface to other machines and systems
- ▶ Remote access for operators and service teams – worldwide via the internet, from any PC, laptop or most smartphones
- ▶ Multi-client / multi user capability – simultaneous access for different type of users, simple assignment of permissions
- ▶ Highest comfortability – visualisation of all production processes on a wide screen
- ▶ Worldwide possibility of remote update for customisation and technical support

SMILE HARDWARE FEATURES

- ▶ The hardware components of SMILE are supplied by B&R Industrial Automation GmbH, a member of the ABB group, a global leader in automation.



bitWise data analytics

bitWise is SML's digital transformation solution for extrusion lines. It breathes life into the buzzword **"Industry 4.0"**. bitWise provides for a wide range of entirely new opportunities for data driven decisions with a clear focus on the optimisation of production processes and the final product. Completely developed in-house, it incorporates SML's decades of experience in automation with the latest technologies in data analytics and visualisation.

IN-DEPTH PROCESS INSIGHTS

SML extrusion lines are equipped with hundreds of data-generating sensors. Following the principle of **"stop guessing – start knowing"**, bitWise collects, records and visualises this data up to 10 times per second. This gives manufacturers a 360 degree in-depth view of all of the details involved in a production process, both in the present and in the past.

OPTIMISING QUALITY


bitWise is a powerful tool to optimise any aspect of the production process with a direct effect on product quality.

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

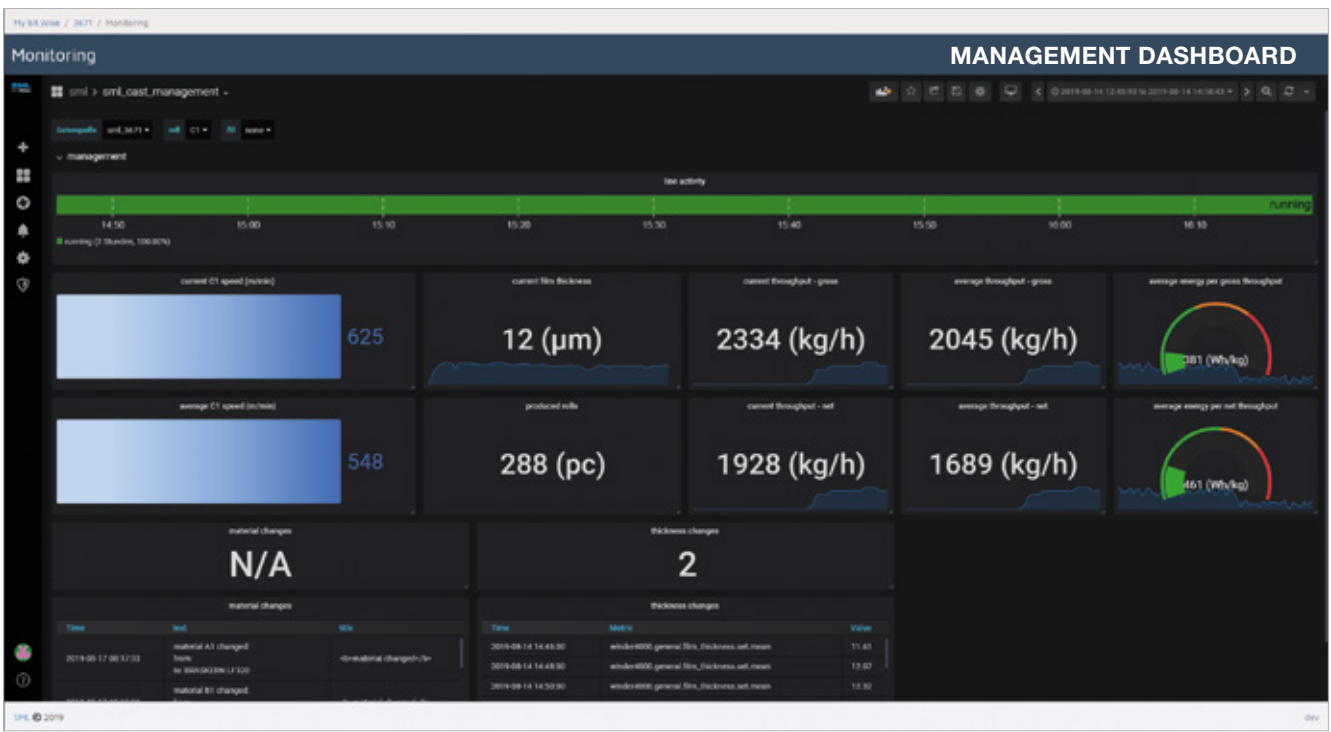


3871
qhObwH

Position:	B4_1
Width:	500
Weight:	17.6
Diameter:	234
Endtime:	10.9.2019, 15:55
Length:	2665
Length difference:	0
Rolls:	4
Order Nr.:	bitWise
Quality:	excess length
Recipe:	12mic_K-Show
Shift:	4
Shift:	KW37
Starttime:	10.9.2019, 15:51
Station:	B
Tags:	show, lab
Thickness:	12.6
Trial:	K-SHOW_12mic
Trigger:	meter

 SHOW METRICS

 GENERATE A REPORT



MAXIMISING OUTPUT

Data recorded, aggregated and visualised by bitWise helps 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

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 of production processes.

- 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

ON-PREMISE SOLUTION

bitWise is a 100 % on-premise solution. Your data stays in your company, on dedicated and secured hardware, no cloud services required.

CUSTOMISATION AND RETRO-FIT

As with most technologies developed by SML, bitWise is highly customisable. bitWise can be retro-fitted to many existing SML extrusion lines optimising production processes, cutting costs, raising the OEE and ROI of existing investments.

OPEN FOR VERTICAL INTEGRATION

Extrusion lines are a key part in a wider production chain. For end-to-end optimisation, bitWise supports data exchange and vertical integration with third-party systems, e.g. Manufacturing Execution Systems (MES), Enterprise Resource Planning (ERP) or Quality Assurance (QA).

HIGHEST QUALITY
PRODUCTS



NOTES:



EXTRUSION LINES – ENGINEERED TO PERFORM ►

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

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 - Moscow Office

Ogorodny proezd, 5
Building 6, office 504
127254 Moscow
Russia
Phone: +7 495 618 8007
Fax: +7 495 619 5961
E-mail: kna@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

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