



100%
eXtrusion
COATING LINES

EXTRUSION COATING
AND LAMINATING

LINES FOR EXTRUSION COATING AND LAMINATING



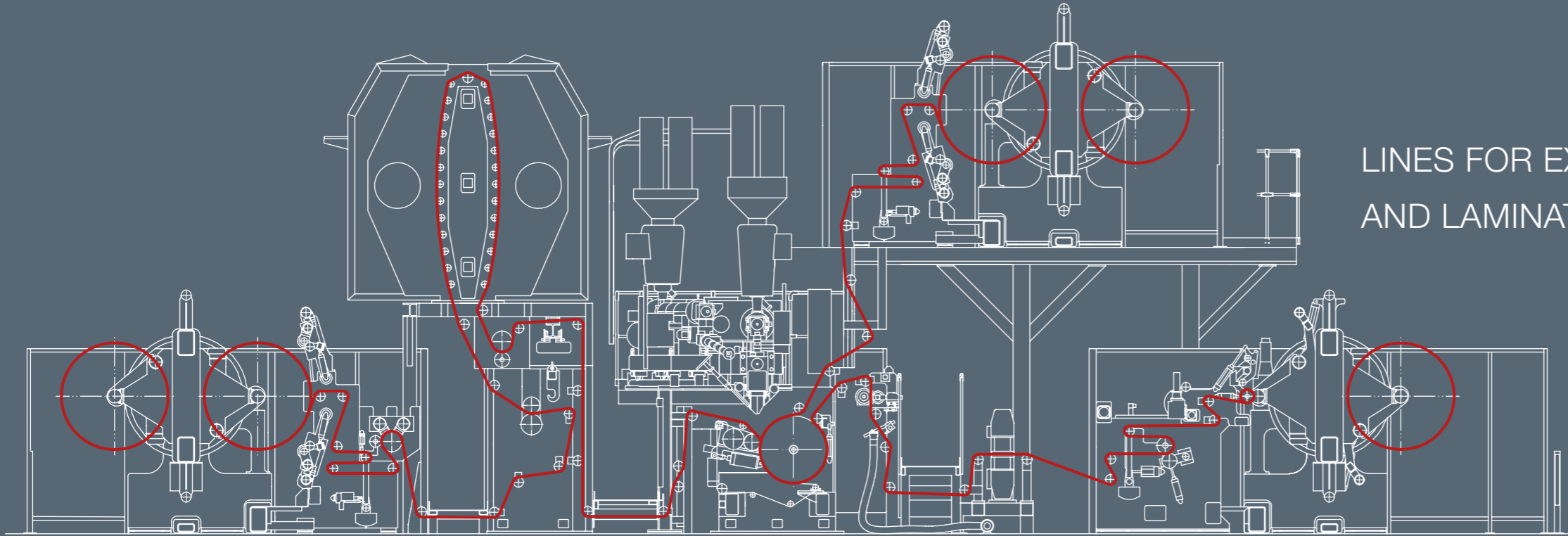
Extrusion coating and laminating solutions developed by SML are characterised by technical precision, reliability and easy operability.

It is SML's human centred approach, in combination with **decades of experience and the constant drive for innovation**, that makes the difference in this complex market segment.

SML provides bespoke all-in solutions for nearly every application. That involves various types of packaging materials for the food industry as well as laminates for hygiene applications, for construction, for the textile industry and for the automotive sector.

A well thought-out design and the ultra-precise interaction of high-performance components enable the creation of extrusion lamination solutions unknown to the market so far. This involves, for example, innovations like extremely thin laminates with an extraordinary breathability or the development of machinery allowing the joining of materials which were considered incompatible.

For SML, extrusion lamination does not merely consist of gluing substrates together. In combination with SML's completely in-house developed machine control, SMILE, extrusion coating and laminating lines from SML empower manufacturers to influence the properties of end products significantly. SML's data generation and analysis tool, bitWise provides entirely new opportunities for data driven decision making with a clear focus on the optimisation of production processes and the final product.

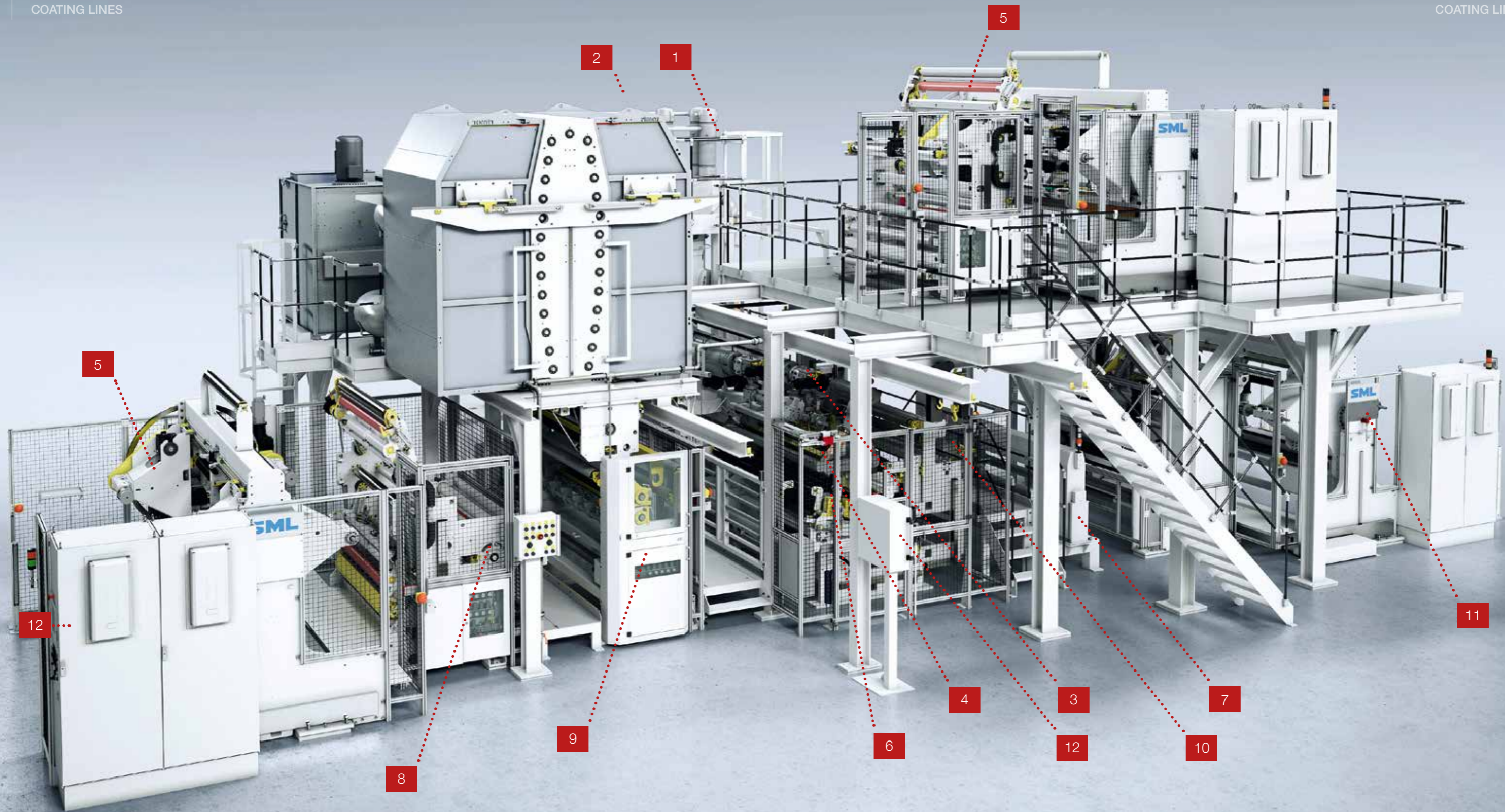


LINES FOR EXTRUSION COATING AND LAMINATING



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EXTRUSION TOOL UNIT ▲

1 Raw material handling and dosing

SML's gravimetric batch blenders and continuous gravimetric feeders guarantee material blending accuracy and a very simple repeatability. Up to six components per extruder can be processed, providing a maximum of flexibility. 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 the exact repeatability of recipes, 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.

Your Advantages

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



ADVANCED HEATING/COOLING SYSTEM ▲

2 Extruder

Extrusion systems developed by SML stand for technical precision, field-tested reliability and constant innovations. It is SML's long-time experience in screw design in combination with state-of-the-art in-house testing facilities, that helps to create outstanding extrusion solutions for any polymer in coating or lamination.

CUSTOMER-SPECIFIC EXTRUDER DESIGN

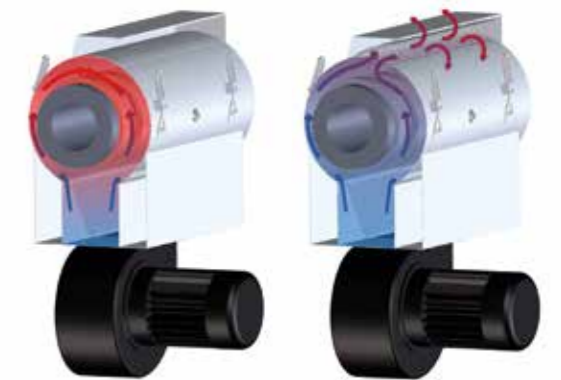
SML offers a customer-specific extruder design for each type of polymer. As a standard, a choice of screw diameters from 45mm to 220mm is available. The L/D ratio can be 28 or 33, whereby 33 is the preferred solution to obtain a high melt temperature and excellent mixing results even at high speeds.

OPTIMISED ENERGY EFFICIENCY

As a rule, the extruders are driven by energy-efficient, low-maintenance, water-cooled AC motors. All extruder barrels are heated using SML's advanced heating system. A flap, which closes through gravity, the escape of warm air from the system and retains the heat in the barrel.

Your Advantages

- ✓ Specific extruder designs for each type of raw material
- ✓ Superior melt quality





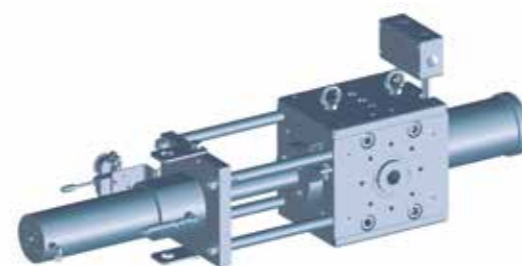
SIMPLE MANUAL FILTER ▲

3 Melt filtration

Effective melt filtration is a crucial issue when it comes to stable production processes and an excellent output quality. For the removal of impurities, such as unmelted or cross-linked particles, SML offers a variety of solutions. Simple manual filters can be used for standard virgin coating grades, while SML usually installs hydraulic, single-piston filters for materials requiring more frequent filter changes. For special applications, i. e. when a substantial share of recycled materials is processed, continuous filtration systems are used.

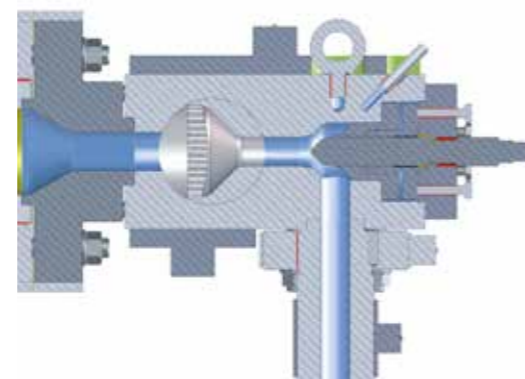
MELT PRESSURE REGULATION VALVE

An adjustable melt pressure valve can be integrated downstream of the filter. This allows the adjustment of extruder backpressure, which can have a beneficial effect on shear rates. Improved mixing results can thus be achieved even with a low output. Using a melt pressure valve also helps to increase the melt temperature to achieve optimised adhesion properties.



Hydraulic filter

The valve can be equipped with an optional AC drive, which allows comfortable extruder back pressure adjustment from the machine control system.



Your Advantages

- ✓ Selection of different melt filtration systems depending on the material processed
- ✓ Adjustable melt pressure valve downstream of the filter
- ✓ Motorised back pressure adjustment



FLAT DIE WITH FUME SUCTION HOOD ▲

4 Tool unit feedback and flat die

SML relies exclusively on respected partners for its feedbacks and flat dies. Multilayer structures require great flexibility with regard to feedback adjustment. Therefore, as a rule, SML utilises variable geometry feedbacks and inserts that can be profiled to optimise the thickness tolerances of the individual layers.

T-CHANNEL DIES WITH INTERNAL AND EXTERNAL DECKLING SYSTEMS

SML offers different die designs in line with the respective application. Extrusion coating systems need to run with various product widths and therefore, die deckling is required. Flat dies with a coat hanger design have good distribution characteristics, but can only be deckled with external decklings. Therefore, in recent years, the trend has been towards T-channel dies with internal and external decklings. The internal deckling consists of individually adjustable blades. This has the positive effect of influencing the edge bead and the neck-in of the melt curtain, which reduces the waste from overcoating. Profile adjustment can either be done with a manual or automatic die control via thermally heated bolts.

Depending on the manufacturer, dies are either chrome or nickel plated. In applications where the extrudate is corrosive, stainless steel may be selected as a base material.



FUME SUCTION AS A STANDARD

SML provides fume suction in all of its extrusion coating lines. As an option, an additional electrostatic filtering system can be equipped with HEPA filters to clean exhaust air, minimising adverse health effects and making over-all production more eco-friendly.

Your Advantages

- ✓ High-end flat dies from respected partners
- ✓ Various types of deckling systems
- ✓ Manual or automatic die bolt control



EXTRUDER CARRIAGE ▲

Extruder carriage

The extrusion units in SML's coating and laminating lines can be easily moved into an offline service position, i. e. to have access for die lip cleaning. SML offers two types of extruder carriages: a floor carriage with infloor rails and a hanging extruder platform. The floor carriage provides perfect access to all of the installed equipment from the top, while a hanging extruder platform offers perfect stiffness for wide coating lines.



Hanging extruder arrangement

RECIPE MANAGEMENT FOR COATING POSITIONS

The extrusion units oscillate cross to line direction during production according to the specific production requirements. As the relative position between the die exit and the point of melt contact with the substrate is an important process parameter that must be altered for different materials, the extruder carriage is adjustable in all three axes. For good repeatability, the actual positions are detected, displayed and stored in recipes.

Your Advantages

- ✓ Floor carriage with infloor rails for optimal access from the top
- ✓ Hanging extruder platform for best stiffness at wide coating lines
- ✓ Oscillating extrusion units for optimised reel profile



5 Unwinding equipment

Precise and reliably working unwinds are an essential part of any extrusion coating process. They guarantee substrate roll changes up to full production speed, preventing down-times and start-up waste. Depending on the structure of the products, a maximum of four unwinders can be installed in parallel in SML's extrusion coating and lamination lines.

SPECIFIC SOLUTIONS FOR EACH TYPE OF SUBSTRATE

SML offers various types of unwinds for every requirement in production and for any type of substrate. These can be:

- Simple double-station unwinds with a manual splicing unit
- Zero-speed splicers with thermo-welding or butt splice
- Fully automatic turret unwinders, shafted or shaftless

SENSITIVE TENSION CONTROL

All SML turret unwinds are equipped with a lightweight dancer roll for sensitive tension control, while the substrate roll is centre-driven by an AC servo motor. During splicing, the new roll is automatically synchronised with the line speed. Splicing is carried out with a driven bump roll and a pneumatically operated chopping knife. With a defined splice geometry and a position detection, the splice length is minimised.

MODULAR SET-UP, OPEN TO EXTENSIONS

All fully automatic turret unwinds are built in a modular design, which allows adding special features to the basic machine, if needed. A second splicing unit for bi-directional unwinding, integrated edge guiding or an optional constant gap device for the smooth unwinding of thin, sensitive aluminium foil, can be installed optionally.

The unwinds in SML's lines for coating and lamination are equipped with a separate control cabinet and their own PLC system. The local control unit of the unwind is 100 % synchronised with SMILE, the comprehensive over-all control system of the line.



Unwind UW 1500 WS

The turret unwind UW 1500 WS is a cost-efficient solution for the fully automatic unwinding of substrates with winding shafts.

It is capable of production speeds up to 350 m/min and can be used for substrates with a maximum roll diameter of 1,200mm. Splicing can be done up to full production speed. For the optimal centring of the substrate roll, winding shafts with a special circular adapter, in combination with sliding safety chucks, are used for core fixation.

The complete unwind is mounted on linear guides. An integrated edge guiding system ensures the correct alignment of the substrate. Therefore, no additional web positioning equipment is required. The design enables easy roll handling with standard electric forklifts.

Your Advantages

- ✓ Fully automatic unwinding with winding shafts
- ✓ Cost efficient solution for roll diameters up to 1,200mm
- ✓ Integrated edge guiding system

with a special
circular adapter



Unwind UW 1500 SL

The turret unwind UW 1500 SL is a shaftless unwinding system with production speeds of up to 450 m/min and for maximum roll diameters of 1,270mm, which can be easily exchanged.

Core clamping is done with mechanically actuated chucking heads of different sizes. Each unwinding position is motorised in the transverse direction. It can be linked to an edge guiding system for the appropriate positioning of the substrate, thus avoiding the need for additional web guiding equipment. Furthermore, this design facilitates easy roll handling with standard electric forklifts.

Your Advantages

- ✓ Fully automatic unwinding for speeds up to 450 m/min
- ✓ Shaftless operation using mechanically actuated chucking heads
- ✓ Easy roll handling with standard electric forklifts

additional web
guiding equipment



Unwind UW 1500 SL-H

The turret unwind UW 1500 SL-H is the right answer for heavy substrates and large roll diameters. It handles widths up to 4,500mm and maximum roll diameters of 1,600mm.

Splicing can be done up to full production speed. Core clamping is shaftless and employs mechanically actuated chucking heads of various sizes. Integrated lifting tables can be utilised for loading and unloading, which brings maximum roll handling flexibility in combination with minimum handling times.

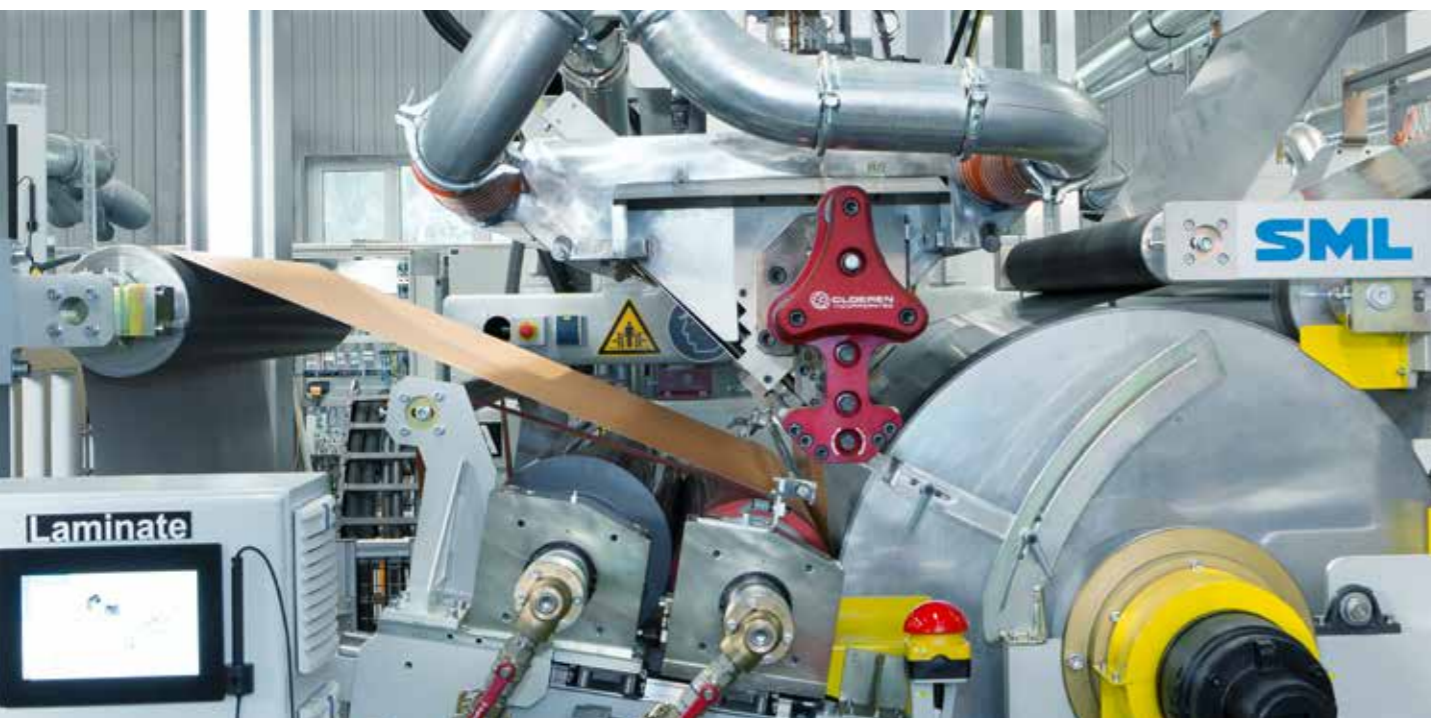
Each unwinding position is motorised in the transverse direction and can be linked to an edge guiding system for the appropriate positioning of the substrate. For that reason, additional web guiding equipment is not necessary.

Your Advantages

- ✓ Designed for heavy substrate rolls and widths up to 4,500mm
- ✓ Shaftless core clamping with mechanically actuated chucking heads
- ✓ Integrated lifting tables for fast and comfortable roll handling

maximum roll
handling flexibility

UNWIND TYPE	Double unwind	UW1500 WS	UW1500 SL	UW1500 SL-H
Maximal mechanical speed	150 m/min	350 m/min	450 m/min	600 m/min
Maximal substrate width	5,200mm	1,800mm	2,400mm	3,500mm
Maximal mechanical diameter	1,500mm	1,200mm	1,270mm	1,600mm
Core clamping	shafted / shaftless	shafted	shaftless	shaftless
Maximal roll weight	4,500kg	1,500kg	2,000kg	4,000kg
Unwinding direction	both	both	both	both
Roll handling	crane	crane / forklift	crane / forklift / lifting table	crane / forklift / lifting table



LAMINATING NIP ▲

6 Laminator

The laminator is the key component of any extrusion coating line, combining all different types of substrates in one single product structure. SML's laminators all have massive side frames which are directly mounted on the floor to ensure vibration-free production.

PRECISE ROLL ARRANGEMENT

A pressing unit, consisting of a rubber roll and a steel supporting roll, is arranged on linear guides to precisely apply a defined pressure to the coating gap between the rubber roll and the chill roll. All of the rolls are equipped with quick change couplings in order to complete roll changes and perform product surface changes in minimum time.

MINIMISED SUBSTRATE WASTE

An endless PTFE tape allows overcoating to minimise substrate waste. An adjustable stripper roll at the outlet of the unit ensures the consistent peel-off of the coated material from the chill roll.

RECIPE MANAGEMENT FOR EXACT REPEATABILITY

All parameters which have a direct impact on product properties, are comfortably adjustable with SML's advanced machine control system, SMILE – i. e. the position of the die or the pressing force or the chill roll temperature. For an exact repeatability, all of the settings of the laminator can be stored in recipes.



laminator with edge trimming station

Your Advantages

- ✓ Massive side frames for vibration-free production
- ✓ Quick release equipment for easy roll changes
- ✓ Waste reduction with PTFE tape attachment



THICKNESS MEASURING UNIT ▲

7 Thickness measurement

As a response to the differing regulations in customer countries and specific product requirements, SML supplies automatic gauging systems with infrared, X-ray or beta ray sensors.

Apart from single-frame solutions with total product measurement, SML also offers multiple frame systems for differential thickness measurements. All frames are synchronised to ensure measurements of the same spot. This is necessary to achieve a constant coating thickness, even when the substrate thickness has variations.

8 Corona treatment unit

A corona treatment unit modifies the surface tension of the product. It can be installed upstream of the substrates, to increase the bonding strength, and downstream to improve printability on the final product. In most of SML's coating lines for coating and laminating, the corona treatment unit is mechanically fully integrated in the unwind side frames. This helps to shorten the web-path and to minimise the total length of the line.

WEB TENSION CONTROL

Depending on the conductivity of the material to be treated, either ceramic or stainless steel electrodes are used. Each station can be driven and fitted with a rubber pressing roll to avoid backside treatment and to separate and control web tension. The control system



CORONA TREATMENT ▲

Your Advantages

- ✓ Automatic gauging systems with infrared, X-ray or beta ray sensors
- ✓ Single-frame solutions with total product measurement
- ✓ Differential measurement system for a constant overall coating weight

of the corona treatment unit is fully integrated in SML's overall machine control system SMILE, making operation extremely comfortable.

Your Advantages

- ✓ Corona treatment unit up- and downstream for specific adhesion properties
- ✓ Fully integrated into the unwind side frames for a short web-path
- ✓ Easy and simple to operate with SML's machine control system, SMILE



PRIMER STATION ▲

9 Primer station

To enhance adhesion, it is possible to apply a liquid primer coating on the pre-treated substrate surface. The primer layer is transferred by a roll coating system with a gravure roll and a closed doctor chamber blade. Compared to conventional smooth roll systems, this method offers the highest precision, increased production speed and less spillage.

IMPROVED ENERGY EFFICIENCY

The liquid is evaporated in a subsequent vertical drier and leaves a thin layer of solids on the surface, as an anchor for further processes. Since drying is an energy-intensive process, SML only

uses highly efficient equipment with adjustable return air and optimised flow speeds. Heating sources can be either electric, gas, oil or steam – depending on customer requirements.

Your Advantages

- ✓ Gravure roll coating system with closed doctor chamber blade
- ✓ Highest precision, production speed and less spillage
- ✓ Energy efficient drying process

10 Trim handling systems

Within SML's extrusion coating lines, the edges of the product are trimmed immediately after the laminator. Most products are wound as a mother roll, but some are slit inline into several part rolls.

For these products which are not suitable for refeeding to the extruder, the cut trim is to be recycled off-line and therefore must be minimised. Precisely adjustable circular knives with driven counter knives give an optimum result.



After cutting, the trims are sucked off and can be cut into small pieces, to minimise the volume required for storing and transportation.

Your Advantages

- ✓ Edge trimming immediately after the laminator
- ✓ Precisely working circular knife system for optimal cutting
- ✓ Waste reduction through minimised edge trims





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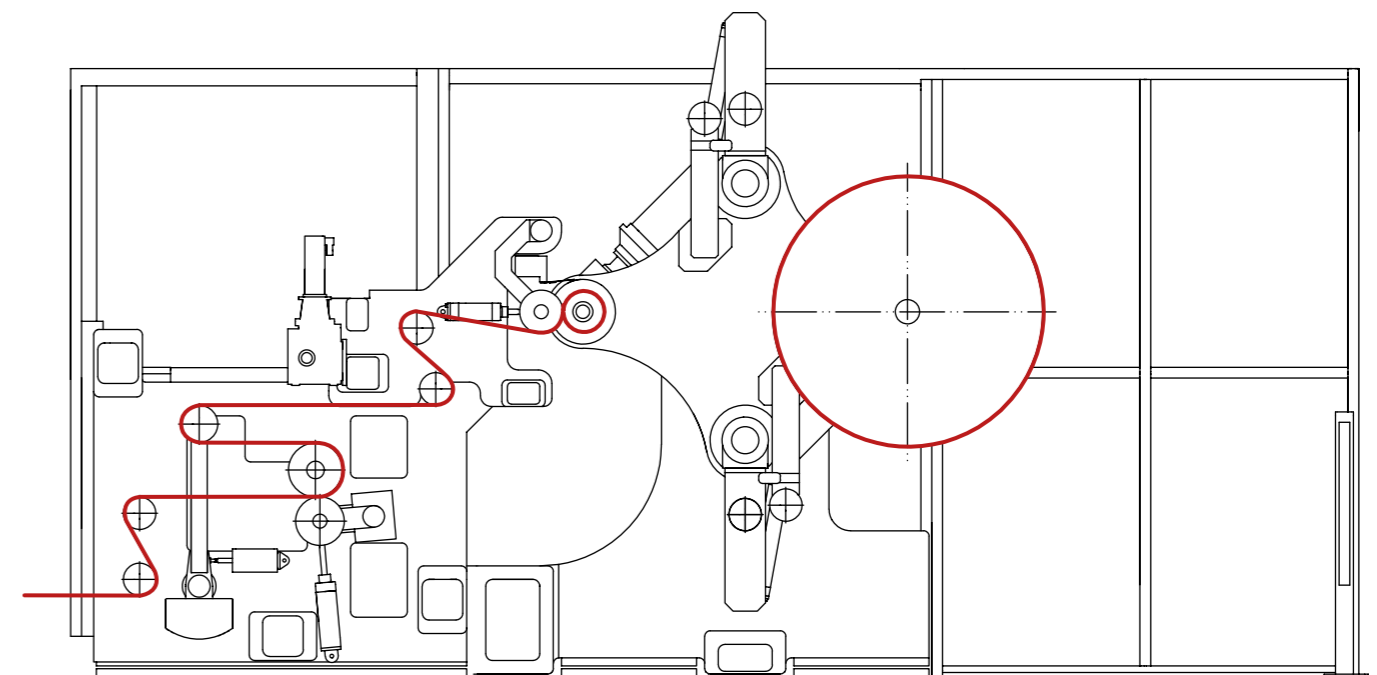
Winding Systems

Over the years, SML has invested enormous amounts of effort in building its own peak performance winders for various applications.

All these winders have a solid, vibration-dampening steel frame construction, that is especially designed to resist the dynamic forces generated at high production speeds. Winders engineered by SML stand for an unequalled precision and for the best operational stability.

The winders in SML's lines for coating and lamination are equipped with a separate control cabinet and their own PLC system. The local control unit of the winder is 100 % synchronised with SMILE, the comprehensive overall control system of the line. Operator convenience is guaranteed by a self-explanatory and easy to operate user interface on a wide touch screen.

100 %
synchronised
with SMILE



Winder W1500 WS

The turret winder W1500 WS is designed for production speeds of up to 350 m/min and can be used for products with a maximum roll diameter of 1,200mm.

Reel change is done at full production speed. Winding shafts with a special circular adapter are used in combination with sliding safety chucks for core fixation.

WINDING IN GAP AND CONTACT MODE

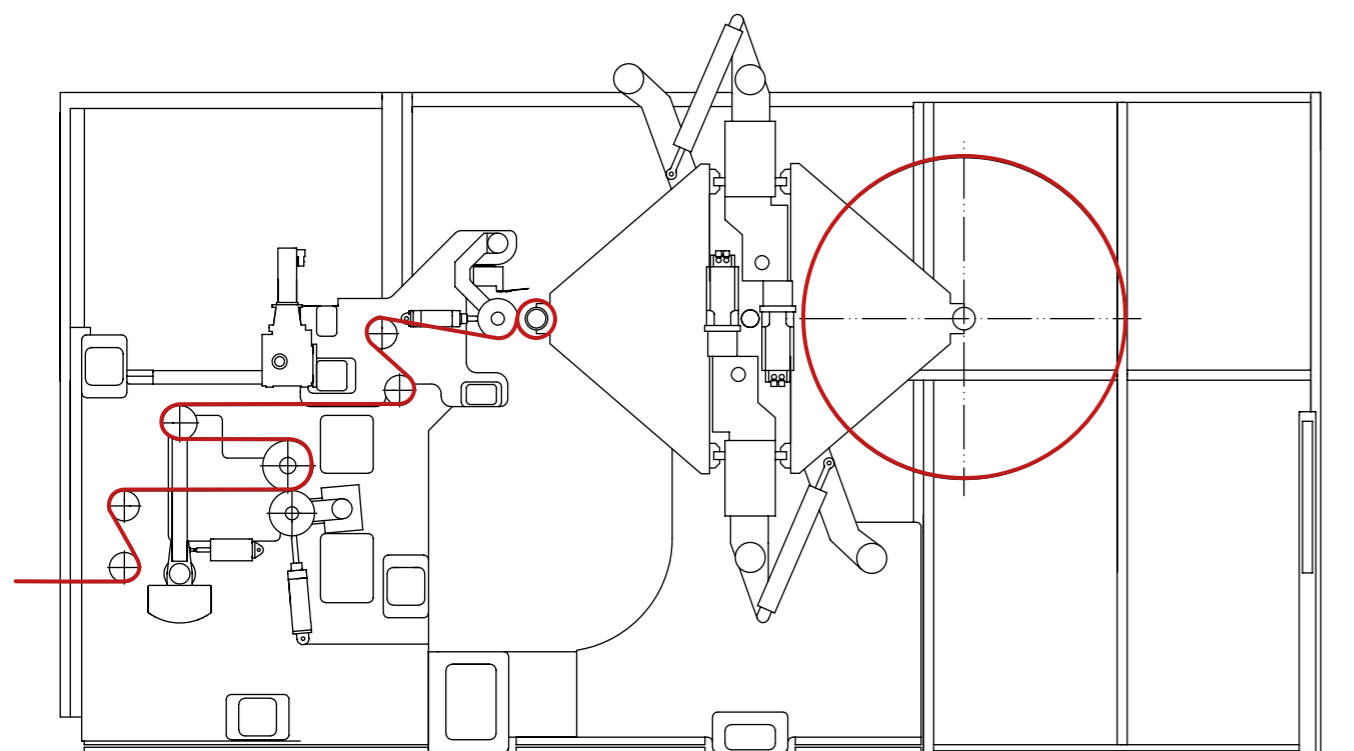
A fixpoint unit at the winder inlet separates the web and winding tension. A lightweight dancer roll controls the winding tension, while the roll is centre driven by an AC servomotor. Winding can be done in the gap or contact mode.

WINDING IN BOTH DIRECTIONS

Cross-cutting systems with flying or chopping knives are available for smooth roll changes. In order to satisfy individual requirements, rolls can be wound in both directions by means of an optional second cutting unit. This design facilitates easy roll handling with standard electric forklifts.

Your Advantages

- ✓ Especially for the production of mother rolls in the medium speed range
- ✓ Cross cutting system with flying or chopping knives
- ✓ Fixpoint to separate the web and winding tension



Winder W1500 SL

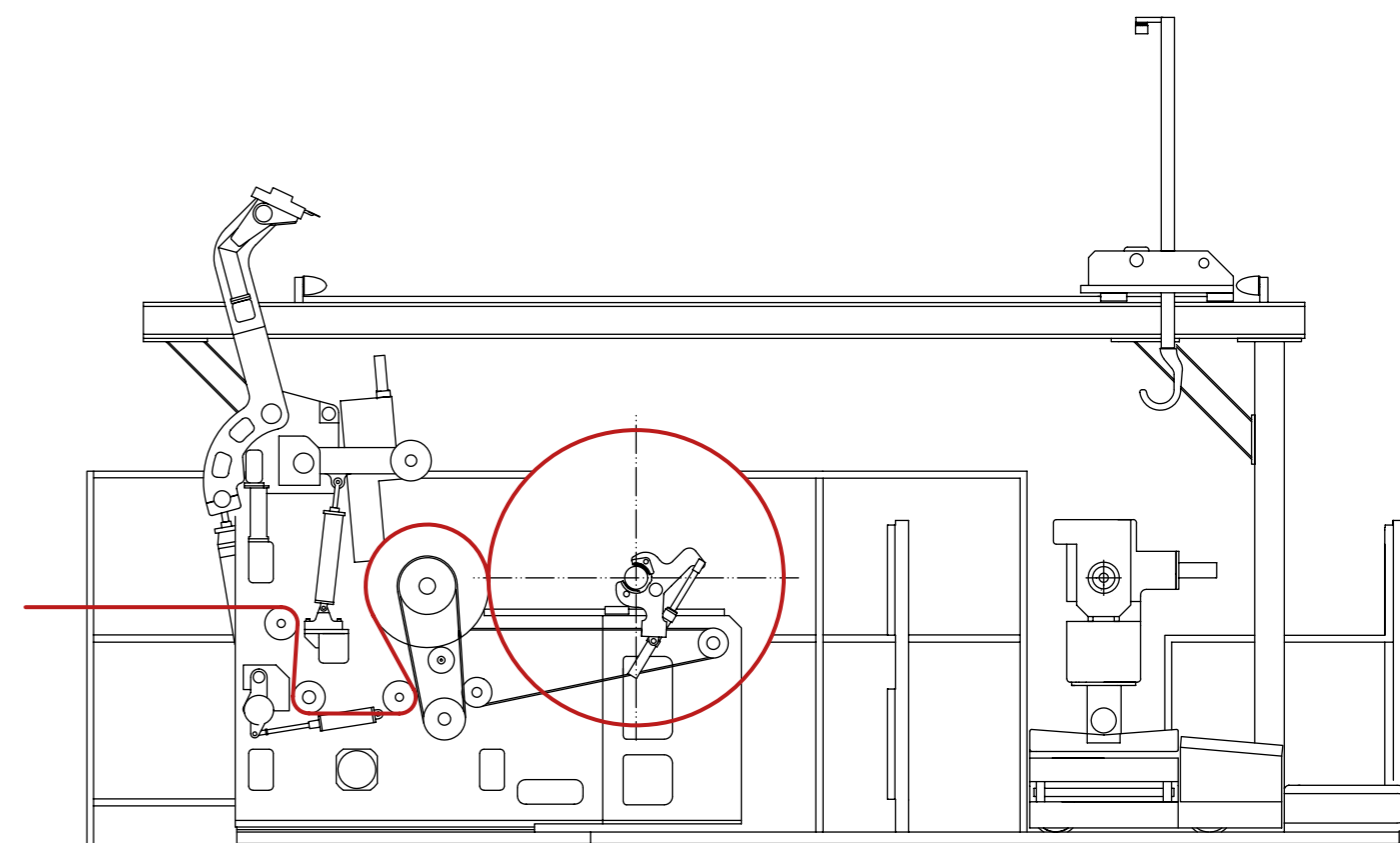
Core clamping is done without a shaft and uses mechanically actuated chucking heads of different sizes, which can be easily exchanged.

The winder can be equipped for single or dual directional winding. With two different cutting systems available, it can be adapted to the respective customer needs.

The turret winder W1500 SL is designed for production speeds of up to 450 m/min and maximum roll diameters of 1,270mm.

Your Advantages

- ✓ Shaftless winding system for higher production speeds
- ✓ Two different cutting systems available
- ✓ Dual direction winding



Winder W1800

SURFACE DRIVEN WINDING TECHNOLOGY

Compared with a turret winder, the winder W1800 is surface driven. The applied power of the contact winder motor does not have to be raised in accordance with increasing roll diameters. This permits a considerable reduction in both the installed motor power and the related energy consumption. For maximum flexibility, the drum winder can also be equipped with a centre drive for the shaft as an option.

CROSS CUTTING WITH CHOPPING OR FLYING KNIFES

Depending on the application, cross-cutting is done using a guillotine or a flying knife. Both versions are equipped with a satellite unit, which orbits the contact roll as a counter support on the winding drum for optimised cutting geometry.

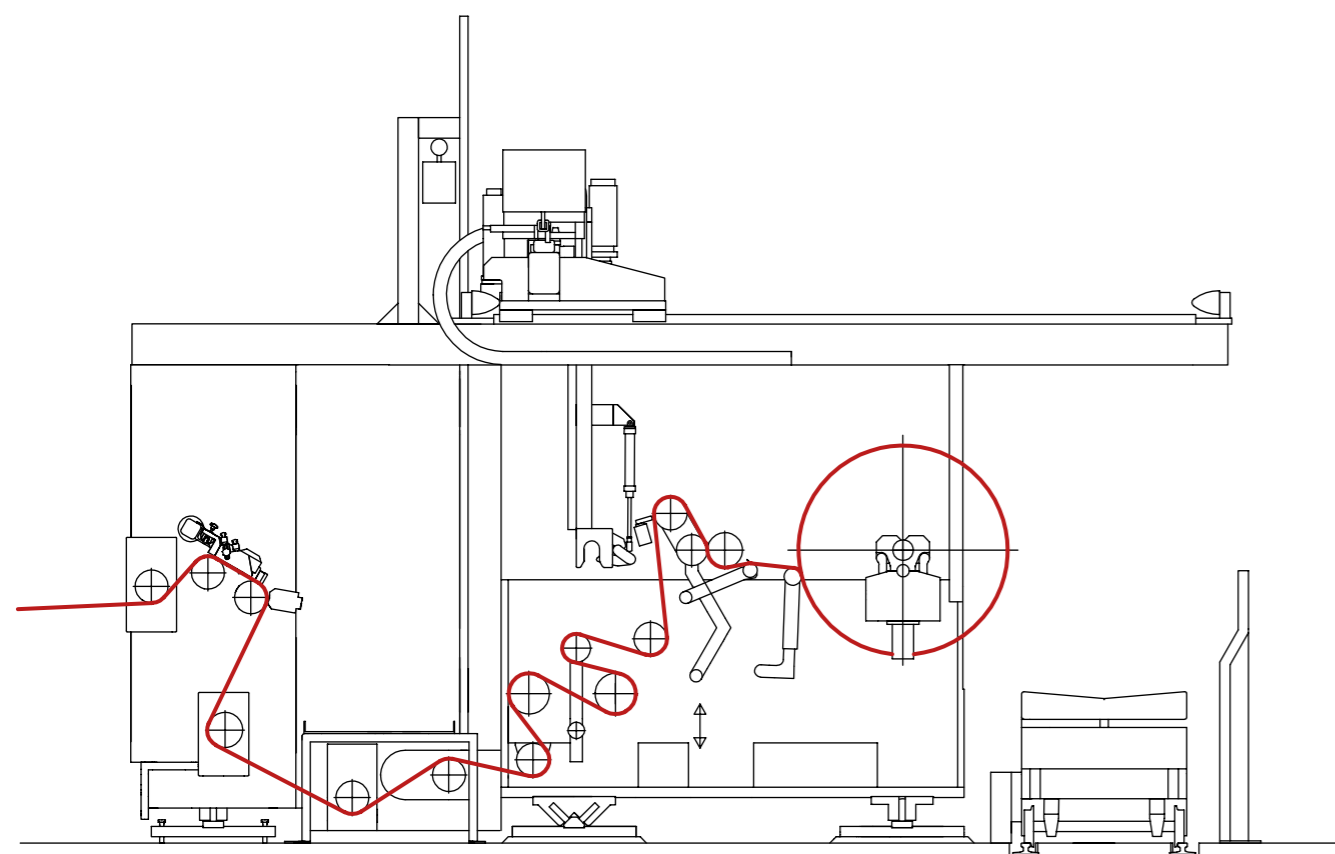
AUTOMATIC SHAFT AND REEL HANDLING SYSTEM

This winder is operated with winding shafts. An automatic shaft and reel handling system is available as an option to ease the handling of heavy rolls and shafts.

The drum winder W1800 is for large widths of up to 4,500mm and maximum roll diameters of 1,800mm.

Your Advantages

- ✓ Designed for heavy product rolls and diameters up to 1,800mm
- ✓ Surface driven, with minimal energy consumption
- ✓ Draw unit to separate the web and winding tension



Winder W2000 robotic

The winder W2000 robotic is the standard horizontal sliding winder for the inline-slitting of rolls.

Owing to the principle of a horizontal winding position movement, the roll 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 designed for the winding of laminates in a wide thickness range. It 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 the air entrapment. A strong guillotine knife is used for cross-cutting. 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

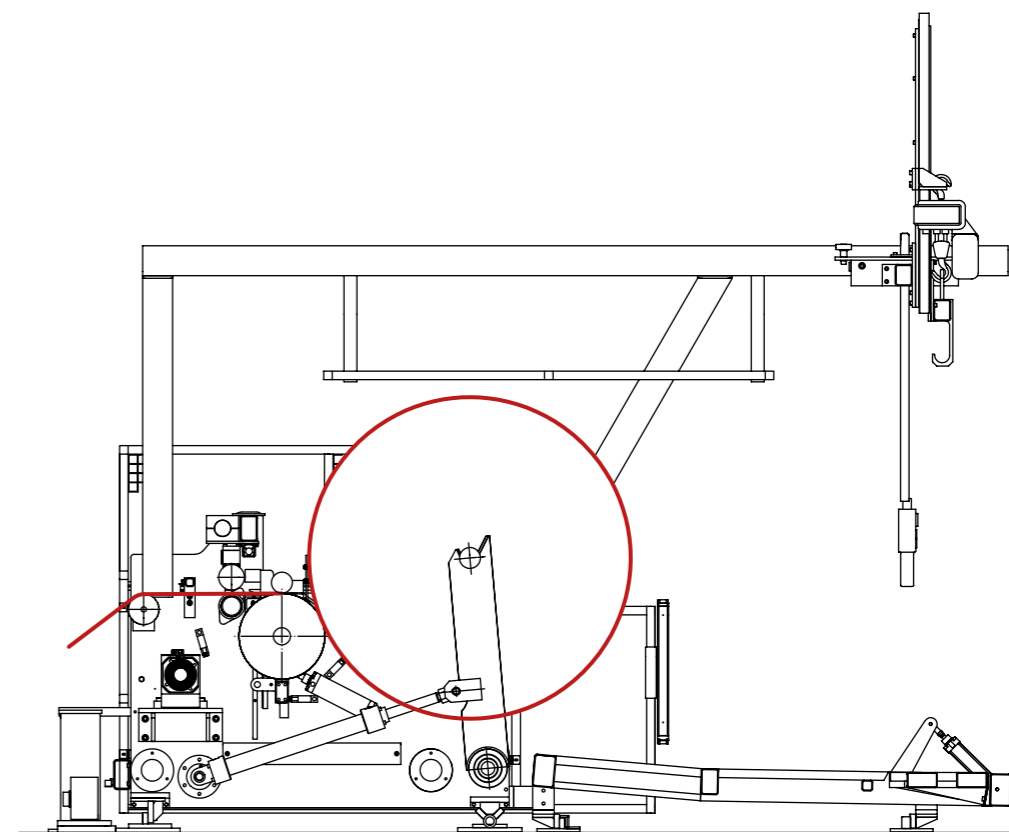
The winder 2000 robotic is optimal for inline slitting, since there is no turret rotation during change-over. The inline-slitting process can be carried out either with or without bleed trims.

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 W100

The W100 is a surface winder and ideal for the winding of big diameter mother rolls.

Compared to all other winding systems, this type of winder requires an extremely low floor space and installed motor power. Nevertheless, it can wind up to 1,500mm diameter rolls with a perfect hardness from the inner core till the outer layer.

FOCUS ON THICK AND REINFORCED PRODUCTS

The strong cross-cutting unit cuts even very thick and reinforced products, such as container bag or reinforced fabrics. The complete winder can be oscillated, which enables the winding of products that tend to create rings or edge build.

SIMPLE AND EFFECTIVE LOADING

The unloading of finished rolls is done with a hydraulic lifting system. After the preparation of the new winding core with a double sided adhesive tape, the feeding of the new winding shaft into the winder can be done with the simple, but very effective loading system without physical stress.

Your Advantages

- ✓ For the winding of big diameter rolls with a perfect hardness
- ✓ Ideal concept for minimal floor space
- ✓ Winder oscillation for products with edge built-ups, as an option

WINDER TYPE	W1500 WS	W1500 SL	W1800	W2000	W100
Maximal mechanical speed	350 m/min	450 m/min	450 m/min	600 m/min	150 m/min
Maximal winding width	1,800mm	2,400mm	4,800mm	2,900mm	2,400mm

Inline slitting	No	No	Yes	Yes	No
Maximal mechanical diameter	1,200mm	1,270mm	1,800mm	980 or 1,500mm	1,500mm
Maximal roll weight	1,500kg	2,000kg	4,000kg	2,500kg	2,500kg
Winding direction	both	both	top wound inside	top inside	top inside

Winding tension	50 - 750N	50 - 750N	50 - 3,500N	30 - 300N	50 - 1,200N
Contact roll pressure	100 - 1,800N	100 - 1,800N	50 - 3,500N	50 - 500N	100 - 3,000N
Roll handling	manual	manual	automatic	fully automatic	semi-automatic





E-CONTAINER ▲

12 SMILE® control system

SMILE is SML's generic machine control and operation concept. It stands for all-encompassing automation, 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 overall 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

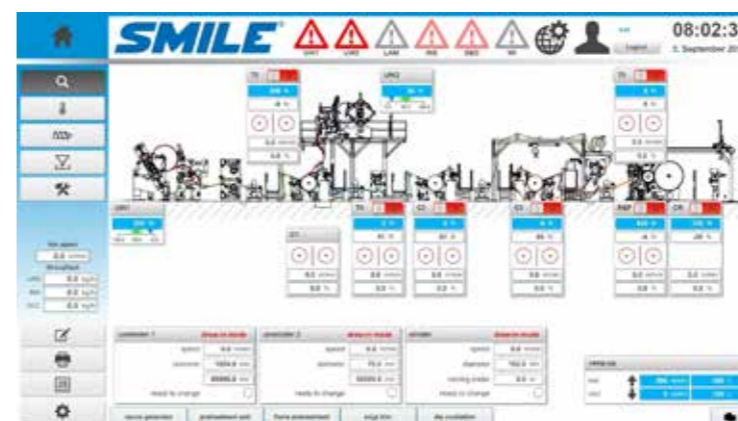
OPTIMISED PRODUCTION EFFICIENCY

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

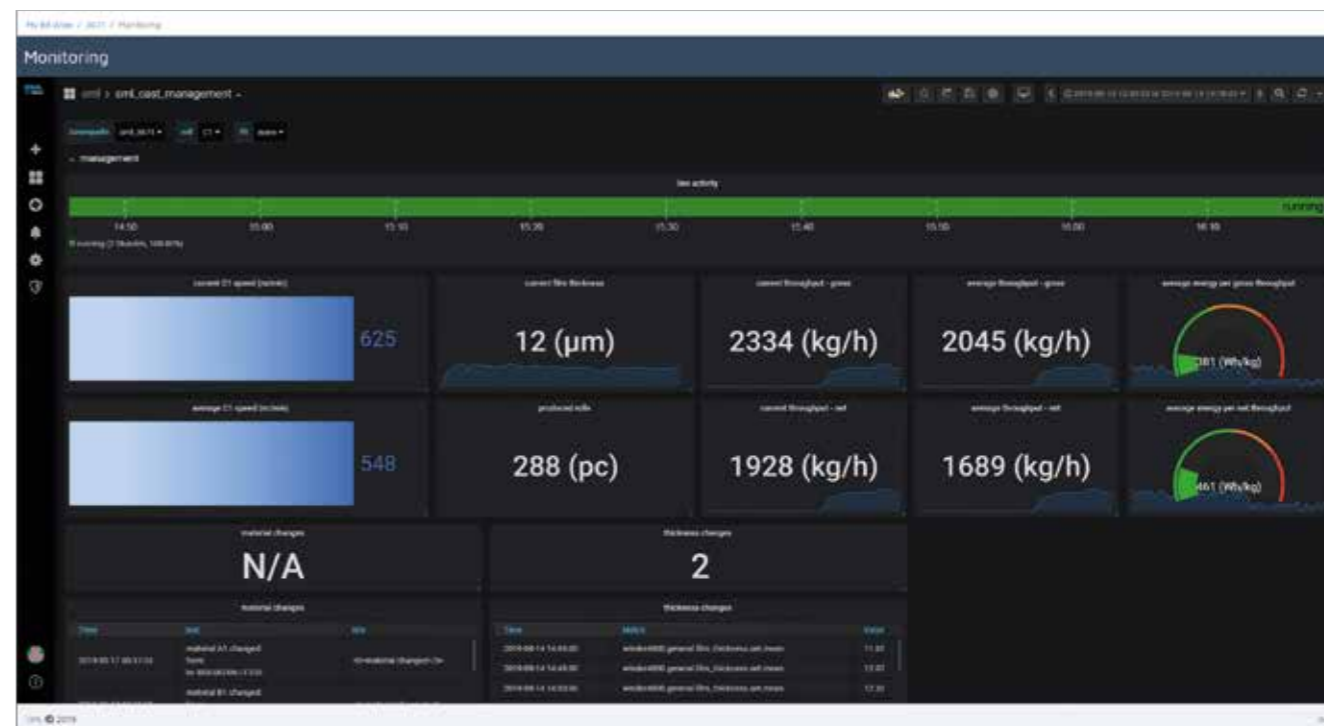
Above all, it is SML's long-standing in-house competence in the field of automation and machine control that provides loads of innovative functions tailored to specific customer requirements. In-house developed, state-of-the-art and dynamic controller systems always allow running the machines at their 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
Shaft:	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

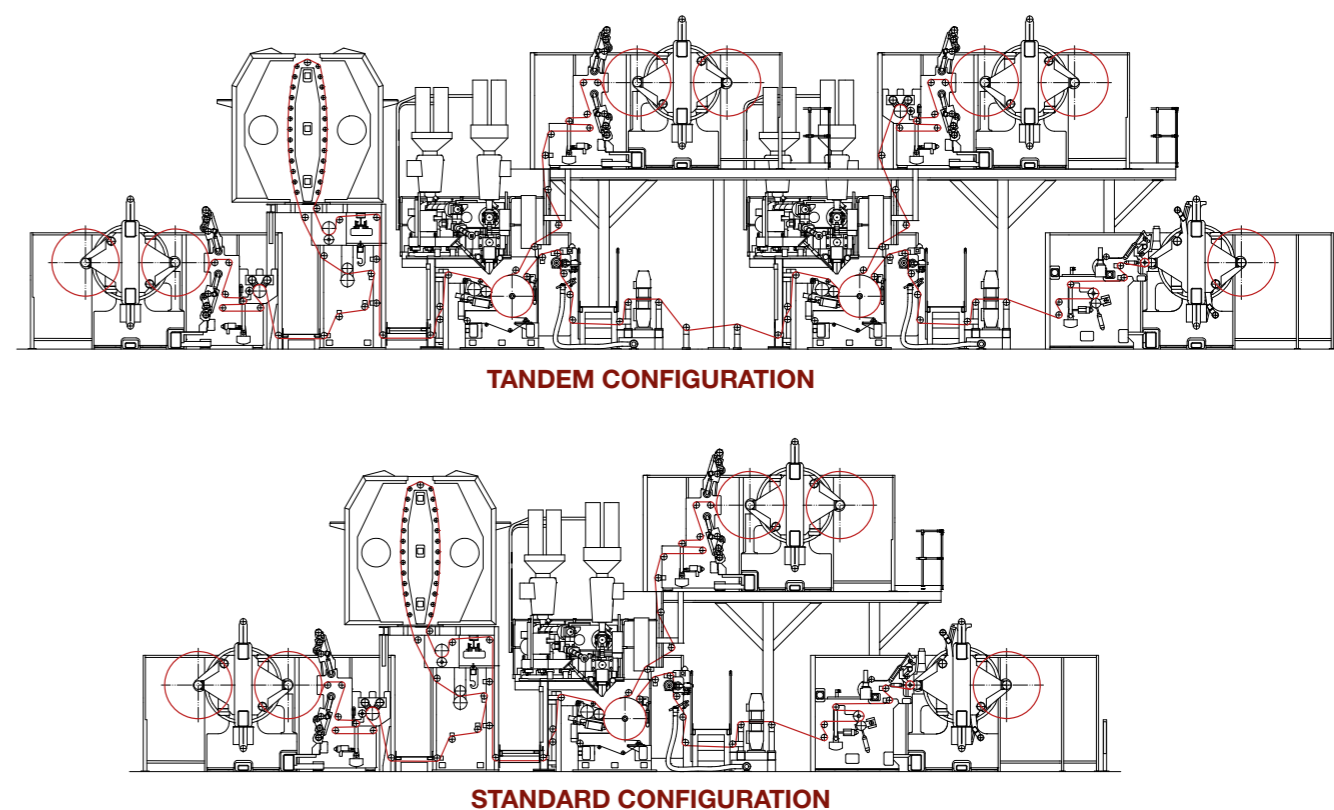
As with most technologies developed by SML, bitWise is highly customisable. bitWise can be retro-fitted to many existing SML extrusion lines optimising production processes, cutting costs, raising the OEE and ROI of existing investments.

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).



FlexPack® – the modular line concept for different configurations



FlexPack®

Extrusion Coating and Laminating Line

The name FlexPack stands for an elaborated, well-proven coating and laminating line concept for a wide range of applications – ranging from flexible packaging to textiles, and from construction to automotive.

MODULAR LINE SET-UP

FlexPack's main characteristic is its compact and modular concept. It guarantees thoroughly safe, cost-effective and user-friendly production while delivering extraordinary product qualities. FlexPack's modular set-up facilitates the subsequent positioning of a second laminator, creating highly complex laminate structures in one single production step. Furthermore, this line concept allows a high degree of customisation to meet the most specific customer requirements.

PROCESSING VARIOUS TYPES OF PRODUCTS

SML's FlexPack lines are typically equipped with automatic turret unwinds and a turret rewind as a standard. They facilitate the processing of various products that contain substrates such as paper, film, aluminium foil, nonwovens and others.

INTUITIVE MACHINE OPERATION

FlexPack's coherent line concept is completed by SML's comprehensive control system SMILE. Developed entirely in-house, SMILE

precisely manages the interaction among each of FlexPack's modules, enabling the smooth processing of the most different materials while considerably boosting the overall-performance of the whole line. According to SML's general human centred approach, SMILE is intuitive and easy to operate.

Substrates	BOPP, BOPET, paper, aluminium foil, metallised film, barrier film, nonwoven, etc.	
Products	flexible packaging, tooth paste tubes, technical applications	
Substrate width	FlexPack 1500	700 – 1,350mm
	FlexPack 1800	800 – 1,650mm
Extrusion materials	LDPE, PP, EAA, EMA, EVA, ionomers....	
Coating weight	9 - 50 g/sqm (depending on the product)	
Coating layers	3-layer (optional 5-layer)	
Maximal line speed	350 m/min winding shafts	
	450 m/min shaftless	

Your Advantages

- ✓ Wide application area – from flexible packaging to applications in the automotive sector
- ✓ Modular and compact line set-up
- ✓ Excellent price/performance ratio

UNWINDING EQUIPMENT

FlexPack's fully automatic turret unwinds offer automatic splicing at full operating speed, for constant production conditions. An optional constant gap device is provided for highly sensitive substrates, such as aluminium foils, allowing a smooth peel-off from the roll.

Maximal substrate diameter	1,270mm
Web tension	30 - 600N
Core fixation	winding shafts (shaftless optional)
Core diameter	3-inch, 6-inch (other dimensions on request)
Unwinding direction	both directions possible

CORONA TREATMENT

A driven, ceramic treatment roll is equipped with a rubberised pressing roll for web tension control. Ceramic electrodes are available for the treatment of conductive and non-conductive substrates.

PRIMER COATING

To increase adhesion, SML offers a gravure roll system with a chamber doctor blade for anchor-coating, when co-extrusion is not sufficient. The vertical dryer has movable hoods for a minimum space requirement. A driven fixpoint roll with a rubberised pressing roll offers exact web tension control. The fixpoint roll can be water-cooled optionally.

EXTRUSION

Extruder carriage with a floor level track-system, motorised 3-axis movement and an adjustable die oscillation function.

- Gravimetric batch dosing system with 4 components (optional 6 components)
- Main extruder: Ø 90/33 L/D
- Side extruder: Ø 60/33 L/D
- Specially designed screws are installed for the polymers used in coating applications
- An advanced heating system on the barrel reduces the energy consumption

TOOL UNIT, FEEDBLOCK AND FLAT DIE

Compact housing with a piston-type manual filter and integrated manual melt pressure regulation valve.

- 3-layer feedblock with variable geometry
- T-die with manual or automatic die bolt adjustment
- EBR-deckling system (adjustable internal and external deckling)
- Removable die splitter for easy die cleaning
- Fume exhaust

COATING UNIT

- Chill roll, Ø 800mm
- Rubberised pressing roll, Ø 200mm
- Steel supporting roll, Ø 250mm
- Quick-change equipment for each roll
- Adjustable stripper roll at the chill roll outlet
- Adjustable PTFE belt attachment for over-coating

THICKNESS MEASURING SYSTEM

Frame with beta sensor for maximum product flexibility. Additional frames for differential thickness measuring as an option.

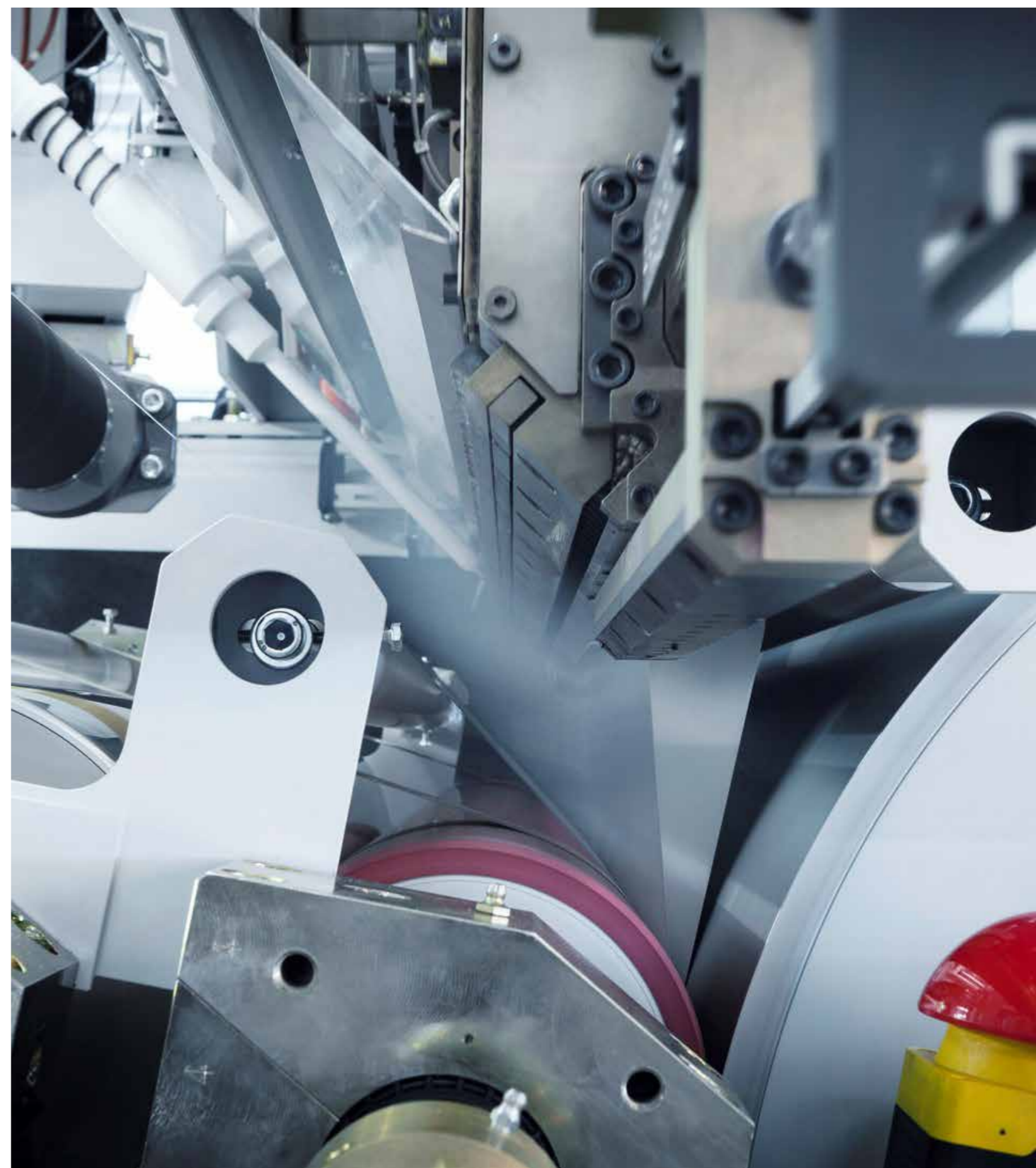
EDGE TRIM HANDLING

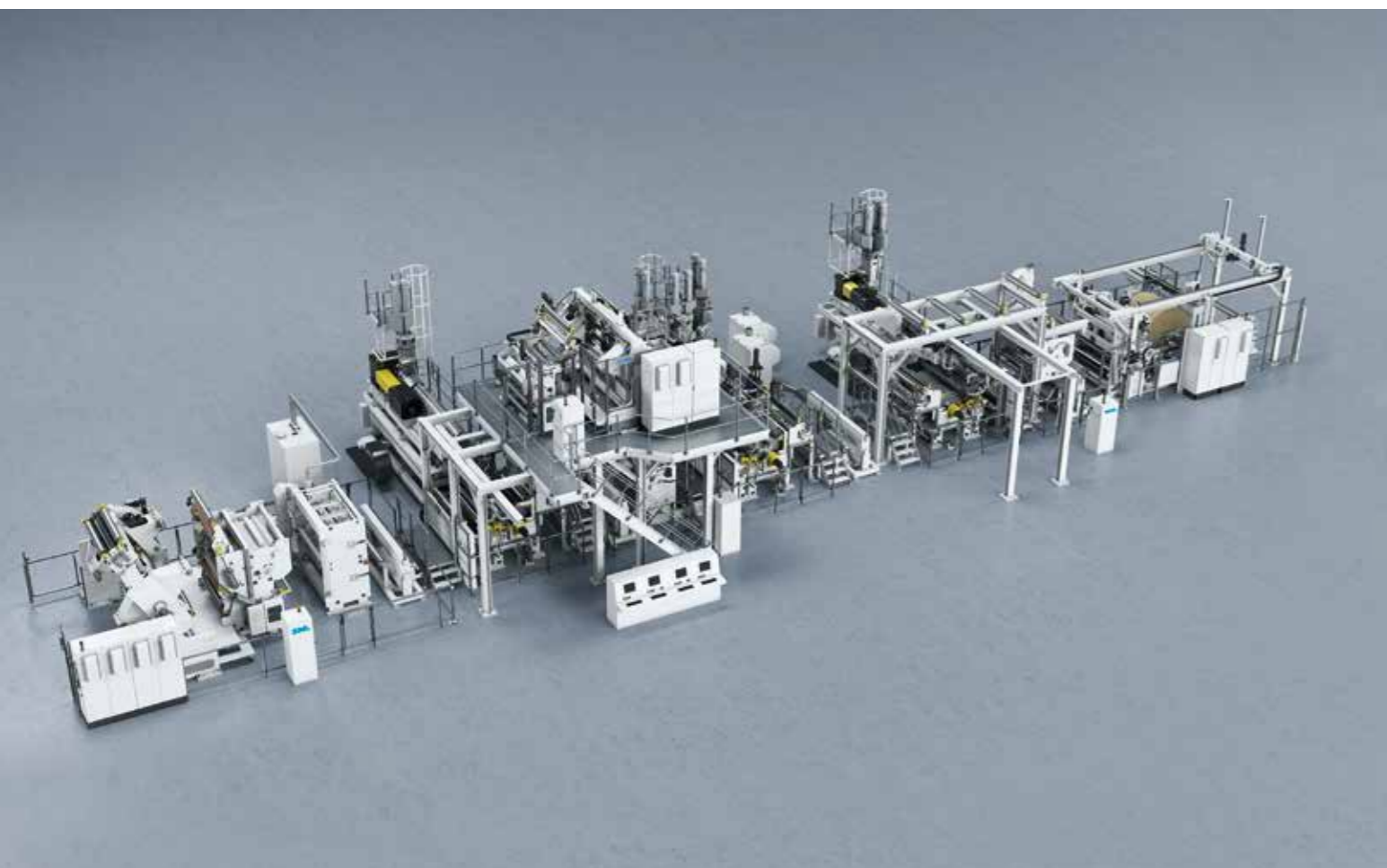
- Shear cut system with circular knives and a driven counter-knife, mounted at the exit of the coating unit.
- Edge trim suction system with blower, Venturi system, pre-cutter and sound absorber.
- Edge trim can either be collected in a big bag or container, or passed to a compactor.

WINDERS

For its FlexPack lines, SML suggests its winders W1500 WS or W1500 SL. These are fully automatic turret winders with a roll change at full operating speed for constant production conditions.

Maximal winding diameter	1,200mm WS (1,270mm SL)
Winding tension	50 - 750N
Core fixation	winding shafts (shaftless optional)
Core diameter	3-inch, 6-inch (other dimensions on request)
Winding direction	both directions possible
Cutting device	flying knife or chopping knife
Winding mode	contact or gap





Triplex

Extrusion Lamination Line

The Triplex extrusion lamination line is a completely new line concept for aseptic board packaging. The line is designed to produce various types of board/aluminium composites in one simple and cost-effective process. The application areas range from classical beverage cartons to pouches.

PROCESSING THIN PAPER AND PAPERBOARD

The Triplex extrusion lamination line strikes a reasonable balance between very sensitive and fast-responding tension control in low tension areas and a robust, long-lasting design for materials like rigid cardboard. In contrast to most other lines in this market segment, SML's Triplex line processes thin paper as well as rigid paperboard at an equally high quality.

PRECISELY CONTROLLED PROCESSES

The standout technical attribute of the new Triplex line is the precise interaction between different machine units, managed by SML's central machine control system, SMILE. SML develops its automation and machine control systems completely in-house. Triplex' state-of-the-art tension control, which communicates between the different PLCs, drives and measuring cells within microseconds, is one of the best examples of SML's capacities in this field.

READY FOR HEAVY LOADS

The general line set-up of the Triplex extrusion lamination line makes waste-free changes of materials easy and fast. SML's fully automatic drum winder, W1800, is fitted with an automatic reel and shaft handling system. It supports the winding of heavy product rolls up to 4 tons.

UNWINDING UNIT #1 (BOARD):

- Fully automatic turret unwind with shaftless operation, bi-directional unwinding
- Maximum reel diameter 1,600mm
- Maximum load, in-floor reel loading trolley 3,500kg

CORONA #1:

- For treating paper from unwind #1
- Single-sided treatment

FLAME TREATMENT:

- For treating board from unwind #1
- Treatment on both sides

UNWINDING UNIT #2:

- Fully automatic turret unwind with shaftless operation for bi-directional winding
- Maximum reel diameter 1,270mm
- Maximum load 2,000kg
- Crane system for reels

CORONA #2:

- For treating aluminium foil from unwind #2
- Single-sided treatment

STATION #1 (LAMINATE):

- Batch dosing system
- Extruder 135/33, max. 750 kg/h
- Hydraulic melt filter and motorised melt pressure valve
- Automatic Cloeren EBR V die with internal and external deckling
- 3-roll laminator with chill roll diameter of 1,000mm

CORONA #3:

- For the treatment of material upstream of laminator #2
- Single-sided treatment

STATION #2 (INSIDE):

- Batch dosing system
- Extruder 90/33, max. 400 kg/h
- Extruder 90/33, max. 400 kg/h
- Extruder 75/33, max. 250 kg/h
- Hydraulic melt filter and motorised melt pressure valve
- 3-layer feedblock with variable geometry
- Automatic Cloeren EBR V die with internal and external deckling
- 3-roll laminator with chill roll diameter of 1,000mm

CORONA #4:

- For treatment of paper upstream of the laminator
- Single-sided treatment

STATION #3 (DECOR):

- Batch dosing system
- Extruder 105/33, max. 500 kg/h
- Hydraulic melt filter and motorised melt pressure valve
- Automatic Cloeren EBR V die with internal and external deckling
- 3-roll laminator with chill roll diameter 1,000mm

EDGE TRIMMING:

- 3-shear cut systems with driven counter-knife for trimming both side edges

THICKNESS MEASURING SYSTEM:

- 4-frame system with Kr85 sensor working in differential measuring mode

WINDING UNIT:

- Fully automatic drum winder W1800
- Unidirectional winding
- Maximum winding diameter 1,800mm
- Maximum load 4,000kg
- Handling system for winding shafts and reels



Your Advantages

- ✓ Antiseptic board packaging of a high quality
- ✓ Optimised product change over - low waste
- ✓ Durable machine design and comfortable operation



DoubleCoat

SML's New and Patented Sequential Coating Process

DoubleCoat is SML's new and patented sequential coating process for the production of extremely thin, breathable products with outstanding product properties. Application areas up to now, are sanitary articles, functional clothing and products for the construction industry.

JOINING OF INCOMPATIBLE MATERIALS

DoubleCoat combines extrusion coating with hot melt lamination. That allows the conjunction of materials which were considered incompatible so far, for example a TPU or TPE coating layer on PP nonwoven spunbonds. A good matching between the substrate, adhesive and extruded membrane is the basis for the creation of products with unequalled features.

THE ADVANTAGES OF THE "DOUBLECOAT" PROCESS AT A GLANCE:

- Reduced coating layer thickness
- Material savings and hence lower costs
- Strong adhesion
- Improved breathability
- High water column
- Enhanced mechanical properties

MINIMISED COATING THICKNESS

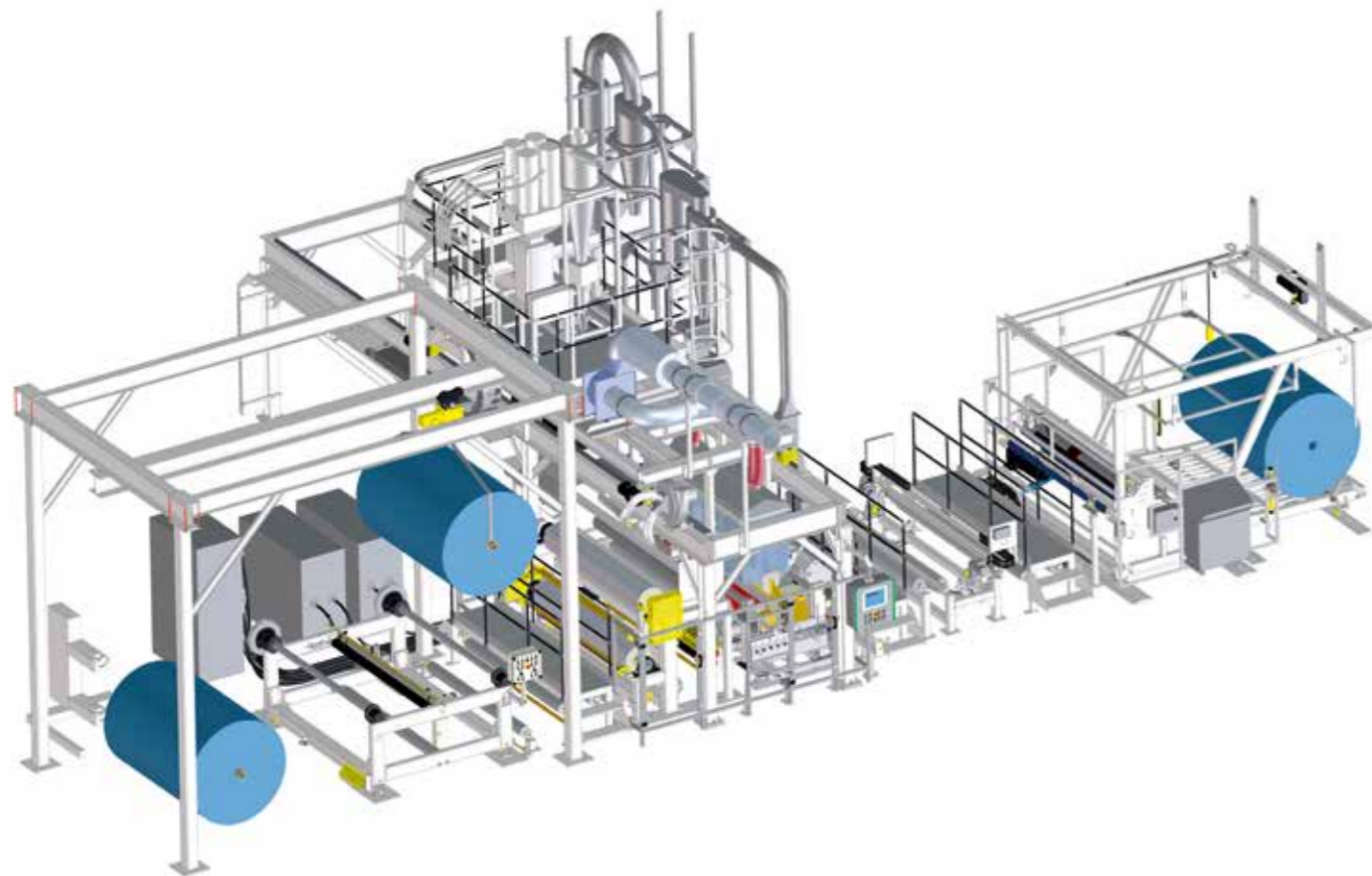
The new method has considerable effects on the thickness of coatings. For TPE on a PP nonwoven, a minimum coating layer thickness of 7µm can be achieved. This corresponds with roughly a mere quarter of the current average for such coatings. An excellent product quality is guaranteed, as the thin coating layer's adhesion to the substrate is perfect and no pinholes occur.

INCREASED PRODUCT BREATHABILITY

Enhanced breathability is a central feature of SML's DoubleCoat technology, as the coating thickness has a significant effect on the water vapour transmission rate (WVTR).

Your Advantages

- ✓ Massive machine frame to withstand high web tensions
- ✓ Well-proven for a wide range of different applications
- ✓ Tailor-made machine configurations



Woven fabric

Woven Fabric Extrusion Coating Lines

SML has gained vast experience in manufacturing coating lines for a variety of fabric types. These lines are especially engineered for rough ambient conditions and well-known for their robust and operator-friendly design. Typical applications include tarpaulins, container liners, big bags, sacks, tents and woven bags laminated with printed BOPP film.

TECHNICAL DATA

Substrates	woven fabric
Maximal flat product width	2,200mm
Maximal tubular product width	2,200mm, single-sided coating
	750mm, double-sided coating
Extrusion materials	LDPE, PP
Coating weight	15 - 80 g/sqm
Maximal operating speed	150 m/min

UNWINDING

Double unwinding units with a semi-automatic splice function.

Maximal substrate diameter	1,500mm
Web tension	700N
Core fixation	winding shafts
Core diameter	4-inches, 6-inches, 8-inches (other dimensions on request)

SUBSTRATE TREATMENT

SML's woven fabric extrusion coating lines are equipped with a corona treatment station with a silicone treatment roll and stainless steel electrodes. An optional cleaning system is available for contaminated substrates. A preheating system with two heating rolls increases the bonding strength during the coating process and flattens out the substrate.



EXTRUSION

A hanging extruder arrangement with an edge trim re-feeding system ensures minimum waste and optimum efficiency. With a continuous melt filter system, downtimes for cleaning are reduced.



COATING UNIT

An integrated reversing triangle facilitates the coating of tubular fabrics on both sides, in a single production step.



PERFORATION UNIT

Residual air can be exhausted by means of a micro-perforation system, which makes subsequent bag filling easier and raises the attainable production speed.

EDGE TRIM

The entire cutting system is mounted on linear guides. An optical sensor detects the edge of the product and tracks the complete cutting process, and as a result only the overcoat is trimmed off. This is fed back directly to the extruder.



WINDER

The recommended winding system for this application is the surface winder W100. It is simple, robust and perfectly suited to the winding of tubular products. To avoid bullhorns, the complete winder W100 can oscillate and be moved off centre for the production of small tubular fabric bags.





Extra wide

Extra Wide Extrusion Coating and Laminating Lines

The coating of wide products has been one of the core competencies of SML for decades. One characteristic all these lines have in common is a very massive machine frame to withstand the high web tensions and to avoid vibrations.

Because the specifications for this type of line are usually quite unique, extra wide coating and laminating lines are completely customised. SML has successfully installed such wide lines for a variety of applications – i.e. products for landfills, green-houses, sun-shades as well as tarpaulins and reel-wraps.

Based on its experience in this field, SML is always ready to develop perfectly fitted machines for very specific requirements.

Your Advantages

- ✓ Massive machine frame to withstand high web tensions
- ✓ Well-proven for a wide range of different applications
- ✓ Tailor-made machine configurations

Substrates	woven fabric, paper, nonwovens, grids, etc.
Products	tarpaulins, steel wrap, wood wrap, roofing membranes, tents, landfill liner, geo membranes, carpets, truck covers, scaffold sheeting, technical laminates, etc.
Product width	up to 5,300mm
Extrusion materials	LDPE, PP, EAA, EMA, EVA, TPE
Coating weight	15 - 80 or 80 - 600 g/sqm, others on request
Extrusion layer	mono or co-extrusion
Maximal operating speed	250 m/min

UNWINDING

For these types of machines, SML can provide either fully automatic turret unwinds for roll changes up to the full operating speed, or semi-automatic double unwinds.

Maximal substrate diameter	1,200mm (optional 1,500mm)
Web tension	up to 1,600N
Core fixation	shaftless or winding shafts
Core diameter	6-inches, 8-inches (other dimensions on request)



SUBSTRATE TREATMENT

Possible treatment methods are corona treatment or flame treatment. Since substrates, such as woven fabrics, are often contaminated with dust, they need to be cleaned before in-line treatment.

EXTRUSION

SML provides high-performance extruders to run at the optimum production speed. For special applications, SML also offers solutions with twin-screw extruders. SML favours hanging extruder arrangements to accommodate wide flat dies, as their stability is much higher.

COATING UNIT

The wider a line gets, the more effort needs to be invested to avoid the bending of the rollers. SML's wide lines are usually fitted with big diameter rollers in combination with calculated bending compensations to achieve a constant pressing nip over the whole product width.

WINDER

Winders for extra wide lines need to be able to handle rolls with big diameters and several tons of weight. SML typically offers drum winders for these types of applications. Inline-slitting for part bobbins is available as an option.



Combinations

Process Combinations and Integrations

It is obvious to combine the substantial know-how derived from these different operations to build up integrated production lines.

Individual substrates, which are required in a laminated structure are often produced using the cast or calendering method. In order to save production costs, SML merges the fabrication of the substrate and the lamination process in one single extrusion lamination line.

Typical examples of this type of combination include production lines for asymmetric PA/PE barrier films and inline PET/PE lamination for sealable PET-trays.

Your Advantages

- ✓ Cutting production costs
- ✓ Streamlining manufacturing processes
- ✓ Integration with machinery from external manufacturers

SML offers high-performance machinery for all major flat die extrusion processes, such as cast film, sheet calendering and extrusion coating.



NOTES:

SML

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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