



TECHNOLOGY report

SML

EXTRUSION LINES – ENGINEERED TO PERFORM ▶

LENZING | AUSTRIA edition no. 29 1/17



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EDITORIAL



Karl STÖGER
Managing
Director

Ladies and
Gentlemen,

We take great
pleasure in pre-
senting you with
the latest issue

of our half-yearly "Technology Report". Once again our R&D department has gathered together articles on several of its latest projects and various new SML installations, which are setting new records in terms of product quality, speed, width and output. In fact, this edition of "Technology Report" is full of superlatives, but if I may, I would like to summarise just a few of the highlights.

The first of these is the widest CPP line that SML has ever installed. This is a five-extruder, six-layer line with a 5,700mm-wide multi-manifold die and is an absolute first. Moreover, a completely new winder had to be developed for this application in order to cater for roll weights of up to 7t.

The second headliner is our completely new MDO unit, which offers broader film widths at thinner gauges and is designed for production speeds that are twice as fast as the current standard available on the market.

Perfect film and sheet winding has long been an SML speciality and a typical example of the company's winder portfolio is the unique W2000 horizontal sliding winder. This high-end model has been built, sold and installed a 100 times in the past 20 years, and a further article explains the background to this achievement.

Our leadership in the field of stretch film is also worthy of mention. For as our own market research shows, 50 per cent of all the new stretch film capacity installed during the past five years is based on SML equipment. Therefore, it goes without saying that we are most grateful to all of our customers, who have made this sustained success possible.

Yours sincerely,

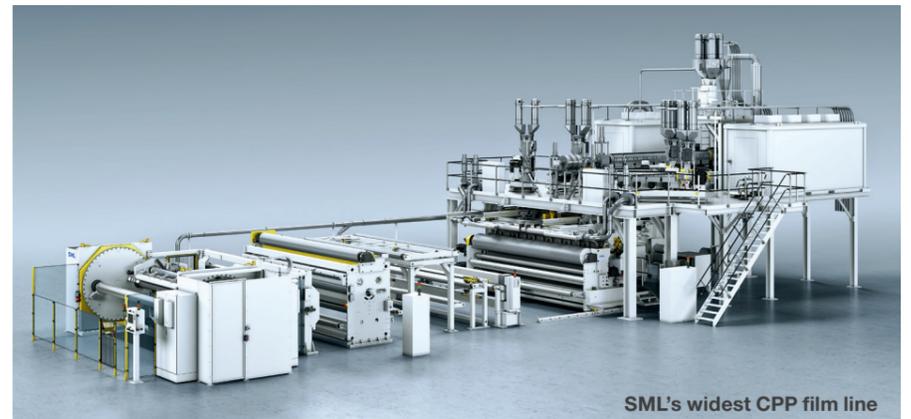
SML starts-up its widest CPP film line

After the launch of the *MasterCast®*, the world's widest stretch wrap film line with an end film width of 6,000mm, SML is to commission its widest-ever CPP film line this year.

With this concept, SML has responded to the market demand for increased film width and line output. Accordingly, the new line, which will mainly produce CPP film for metallising and laminating applications, will have a trimmed final film width of 5,200mm.

Apart from high output, the advantages of such a wide line include the low volume ratio of edge trim as compared to smaller lines and reduced labour costs, owing to the fact that no additional personnel is required. Moreover, the kW/kg power consumption requirement is less. Therefore, this line concept has clearly been developed for the economical production of large quantities.

The maximum gross output of the line is 2,300 kg/h. The extruder group consists of a main 180/33 extruder and four 90/33 co-extruders. In addition to the feedblock, a 3-layer, multi-manifold flat die with a width of 5,700mm is employed, which for the products in question offers the advantage that the functional layers such as a sealing and adhesive layer for metallisation can be closely controlled and very accurate single layer distribution thus results. This high layer distribution accuracy also means that the costs of special raw materials can be reduced.



SML's widest CPP film line

For easy cleaning, the multi-manifold die is mounted on a die splitting unit, which allows all four die parts to be opened and cleaned without removing the die. Moreover, in order to enhance the optical properties, the film is fixed onto the chill roll by means of a double-chamber vacuum box, electrostatic edge pinners and a soft box, which allows chilled air to be blown onto the film.

The first chill roll in the cooling and take-off unit has a diameter of 1,200mm, while the second has a diameter of 600mm. Each of them is separately driven and cooled and SML's proven three-roll design is used for the surface cleaning of the first chill roll. The whole cooling and take-off unit can be moved in both a horizontal and vertical direction and this allows finding the best possible casting position.

The film produced is prepared for metallising or printing by a corona treatment station with a cooled and driven silicon treatment roll. The maximum generator power installed is 60kW and the post-cooling roll is integrated into the treatment station in order to reduce the film web length. The edge trims, which are cut off upstream of the treatment station and a second time on the winder, are returned to the main ex-

truder via a vertical scraptruder. The CPP line is equipped with the new turret winder W6000, which has been specially designed for wide CPP lines with final film widths of between 3,500 and 6,000mm. The winder, which consists of an inlet section and right and left turret units, offers compact dimensions for transport and reduces the installation time required at the customer premises.

A spreader roller and a satellite roller are installed upstream of the winding station, making it possible to influence the air entrapment between the single film layers. The winder can operate in both the contact or gap winding mode. During roll changes, cross-cutting is carried out by an electrically activated flying knife and the film is attached to the new winding pipe electrostatically thereby avoiding the need for adhesive tape and saving manpower. Depending on the final film width, the winder employs 10" or 12" steel winding pipes, the handling of which is facilitated by an overhead crane.

The winder can deal with rolls in diameters of up to 1,300mm and a maximum roll weight of 7,000kg, which corresponds roughly to 60,000m length of 20µm CPP film. The large winding diameter is a critical advantage for the metallising process because on the one hand, it increases the running time and on the other, cuts the metalliser set-up period.

Alexander BRUCKMÜLLER,
Product Manager Cast Film Extrusion & MDO

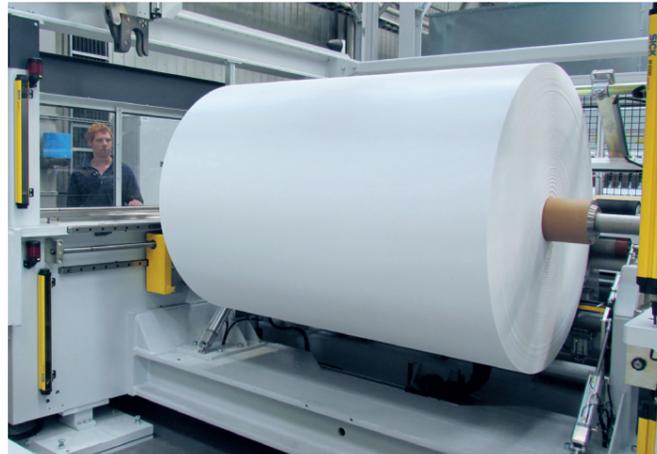
Winder W2000

20-years-old and still going strong!

SML's revolutionary concept for the horizontal sliding winder W2000 with integrated, servo-positioning drive technology was first introduced in 1997. Now, 20 years later, SML is pleased to announce the one hundredth winder W2000 delivery, which shows clearly that owing to its visionary design and continuous updates, the W2000 is still in great demand and despite its age shows no signs of being outdated.

But what makes the winder W2000 so special? Primarily its concept, which involves two winding stations moving entirely independently of one other on solid sidewalls along horizontal sliding rails that are free from backlash. As a result, the winder offers unmatched vibration-free operation.

Both winding stations consist of a chuck head with a winding drive on one sidewall and a clamping fork on the opposite site, and are equipped with precise servo-positioning drives. These have integrated, absolute encoders, which feed back the position with one-tenth of a millimetre accuracy. There is no mechanical connection required between the chuck and the clamping fork on the different sidewalls, as this has been replaced by electronic synchronisation. The active winding station moves back continuously from the contact roller in line with the increasing diameter of the building roll, thereby avoiding any stop-and-go movement and creating straight-edged rolls. This arrangement saves a great deal of space and during a roll change the active winding station approaches the new winding station to a distance of only a few millimetres, which prevents roll tail and telescoping. This is a



Winding of large diameters

major advantage over a turret winder and is the reason, why the W2000 is highly suitable for part-roll winding.

The winder W2000 also possesses a speed control fitted with an ultra-light carbon fibre dancer roll that provides sensitive winding tension control. Moreover, depending upon the version, the winder W2000 XL can produce rolls with diameters of up to 1,300mm. The W2000 employs an infinitely adjustable satellite roller controlled by a servo-positioning drive. This roller alters the angle at which the film approaches the contact roller and exerts a significant influence on both the entrainment of air in the roll and roll hardness, which is extremely important for the perfect winding of post-crystallizing films.

The perfect interaction of the precise positioning drives in the winding stations and the contact roller frame contribute to the flexibility of the winder with regard to the integration of differing cutting units. Customers purchasing the winder W2000

can therefore select from six different cutting devices:

- 1) A stationary knife is used for cast film in the 6 to 180µm range (300µm extended range). The lay-on has no fold-back and the core is prepared by a precise, hot melt spraying unit, which provides a very thin adhesive layer. When the core in the new winding station touches the web, the inserted stationary knife cuts the film web instantaneously with the result that there is practically no, or only a 2mm-tail, and no fold-back. This is a proven system for the production of surface protection film.
- 2) Guillotine cutting with a counterknife is employed for PP, PS and PET thermoforming sheets, which provides a cutting range of 100 to 1,500µm.
- 3) A version with a combination of both above mentioned cutting units is supplied for back sheet films for the photovoltaic industry and top quality polycarbonate films. These cover an extended thickness range of between 15 and 1,500µm.

4) Winders with a twisting knife are supplied for hygiene film lines. The cutting range extends from 8 to 100µm and electrostatic pinning is used for lay-on. This cutting unit has shown itself to be ideal for breathable and melt embossed films.

5) A pneumatically operated chopping knife with a belt cage and guiding air nozzles (cutting range of 15 to 300µm) is available as an alternative for barrier and CPP films.

6) Last but not least, special winders are built for ETFE films. These high-priced-products demand a perfect, right-angled cut edge with no fold-back, as this could have a negative impact on the building roll. This type of winder operates with an accumulator and cuts the clamped film with a flying knife during a web standstill. The core is prepared with an adhesive layer, which is positioned to exactly match the beginning of the cut edge.

Robert PREUNER, R&D Manager

FlexPack demo-line delivers encouraging results

Exactly a year has passed since SML put a **FlexPack**[®] 1800 extrusion coating line into operation at its Lenzing headquarters for the purpose of extensive testing. Therefore, this is an ideal moment to review the trials and successes to date. During the past year, 35 trial runs were completed for cus-

tomers and raw material manufacturers from around the globe. These trials related to both product modifications and direct performance comparisons with existing plant capacity, as well as new product developments. Individual testing with the various clients clearly showed the practically unlimited diversity of the applications

for extrusion coating and laminating. Moreover, trials reflected the divergent demands made upon a production line in connection with the manufacture of food packaging materials, technical laminates, building products, hygiene and medical articles, etc. However, owing to the modular and flexible design of the **FlexPack**[®] system, virtually every test could be completed using the original equipment, although it should be added that certain special products posed fresh challenges, which required additional innovative ideas. Nevertheless, in line with the principle that, **"There is no such thing as impossible!"** solutions for the customer were repeatedly found and over time this led to useful process technology functions, which further enhanced line flexibility.

The DoubleCoat process, for which a patent is pending, met with a particularly positive customer response. In this regard, trial runs were held with respect to the manufacture of new hygiene, medical and building products during which a special focus was placed on a reduction in the thickness of the functional layer and improved composite adhesion. The results achieved largely exceeded customer expectations and as opposed to the products currently on the market, surpassed the stipulated values several times over.

The availability of the test line has also had an extremely positive effect on SML sales in the extrusion coating segment, as its performance convinced numerous customers of the advantages of this type of plant. Consequently, during the last year several new orders for coating lines were concluded and more projects are close to finalisation.

Mario HÖLLNSTEINER,
Product Manager Coating and Laminating



FlexPack extrusion coating and laminating line

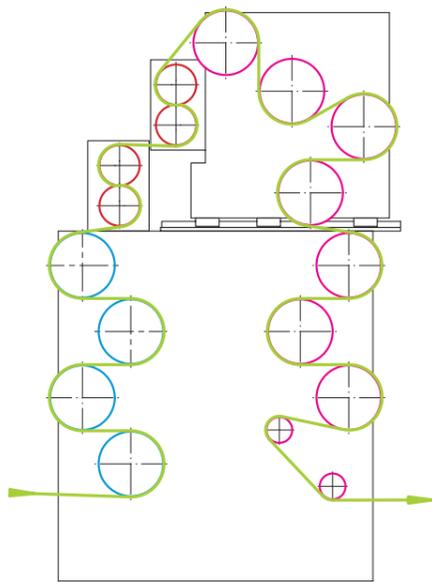
A new MDO boosts productivity

A well-known film manufacturing company and long-term SML customer has recently put its fifth cast film line for breathable diaper films into operation. The key improvement in this latest installation is the newly developed, inline mono-axial direction orientation unit (MDO) with an adjustable stretching gap. The new line produces breathable films for diapers with an MDO unit speed of 500 m/min. A cast film line provides a net breathable film output of approximately 900 kg/h and all the parameters of relevance to diaper film production, including the required shrinkage values, are attained.

The innovative concept of the new MDO unit and its main advantages can be explained as follows:

EASY TO SERVICE

In the past, the rollers of an MDO were arranged vertically from bottom to top, or vice versa. However, with this traditional design the MDO was exceptionally high and sensitive to vibrations. Moreover, the integration of an inline adjustable stretching gap was problematic.



Roller arrangement

In the new MDO, rollers are arranged in the form of an inverted "U". This new layout is particularly advantageous with regard to straightforward roller insertion and removal to the outside of the inverted "U". All of the preheating, stretching, stabilising and cooling rollers can be exchanged very rapidly through rolling out onto an attachable installation device via lockable slits on the stretching unit's perimeter.

Moreover, the rubber nip rollers, which prevent air entering between the steel rollers and the film, can also be substituted speedily by means of a quick lock mechanism.

LOW VIBRATION DESIGN FOR HIGH SPEEDS, BROAD WIDTHS AND THIN FILMS

The diameter of the stretching rollers has been increased to 250mm and the preheating, stabilising and cooling rollers now have diameters of 400mm. These dimensions are suitable for net film widths of up to 4.3m. In addition, the rollers are in-

stalled in solid side frames, which ensure reliable vibration dissemination into the foundations even at high speeds. All in all, the stretching unit is suitable for the production of minimum film thicknesses of 10gsm, which corresponds with the growing trend towards thinner films. The unit's suitability for large widths and high speeds also constitutes an important cost and efficiency factor.

INLINE ADJUSTABLE STRETCHING GAP

The stretching gap can be adjusted inline within a range of between 70 and 350mm by means of a highly precise servo-positioning motor and this constitutes the third important benefit of the new MDO. Experience has shown that the best film characteristics in the case of PP and PE are achieved with a shorter gap, while it is advantageous to use a longer gap for the stretching of PET film.

The ideal gap length, which is dependent upon stretching speed, is the second variable. The mechanical energy generated by stretching induces fine grain crystallinity. Owing to the release of heat, this is an exothermic process and should the energy input become too great at increased stretching speed, this leads to film tearing. However, widening the stretching gap mitigates the tearing effect and permits an increase in line speed.

The practical advantage of this finding is that the ideal product characteristics of a film can be set during test runs at low line speeds. During line run-up to higher speeds the gap is widened, thus maintaining the film properties while reducing the strain in the film and avoiding breakage.

SML COLD STRETCHING MDO

MDO units for hygiene applications have rollers with water tempering units and a maximum permissible temperature of 120°C. This principle is used for PE/PP breathable diaper films and sanitary napkins. For breathable products, the minimum possible film thickness at which the required breathability and necessary load measured in terms of mm water column are attained is of major importance. SML's optimised stretching technology can be used with film weights as low as 10gsm.

SML HOT STRETCHING MDO

The SML hot stretching MDO is equipped with rollers with oil tempering units, which allow roller temperatures of up to 165/180°C. The standard applications for "hot mode" MDOs include label films, label carrier films, PE knitting films, foamed films for cable insulation and decorative ribbons, PP and PET adhesive tape films, films for carrier bag handles and six packs, printable PET and PA lamination films, PET twist films for candy wrappings, and PET films for tin lamination.

The new MDO is capable of handling high stretching forces. This is evidenced by the fact that MOPP and MOPET films (ad-



New MDO unit with an adjustable stretching gap

hesive tape film) with a secondary thickness of 40 to 50µm can be manufactured with longitudinal strengths comparable to those of steel. This is due to a special design in the stretching gap section in which both the V1 holding device and the V2 stretching device use a combination of a steel and a rubber roller that ensures maximum wrap around. This design results in both high retention and tensile

forces, thus reliably preventing slippage of the film in the stretching section.

All in all, stretching using innovative MDO technology facilitates ever-thinner films, while at the same time allowing film lines to achieve increased production speeds and output in combination with large material savings.

Robert PREUNER, R&D Manager

High-performance with high-speed extruders for sheet lines

High-speed extruders (HSE) have proven especially effective for the production of PS and PP sheet for thermoforming.

The flagship of the SML HSE extruder family is the D75 with the 42 L/D process unit and 1,200rpm screw speed.

Our customers employ this extruder at an output level of approx. 1,500 kg/h PP, which naturally implies the use of a high percentage of regrind. A quality-con-

scious Asian customer has opted for an extruder of this design for the third time, thus clearly confirming its performance.

Alternatively, SML is now offering this exceptionally stable running D75 42 L/D process unit for lower capacities with smaller drives and reduced screw speed.

For the even less powerful co-extruders, regrind-proven 37 L/D process units, are used with main drives starting at 115kW.



15 years of SML stretch film lines – from newcomer to market leader

At the very beginning when SML started to supply cast film lines, stretch film constituted an occasional by-product, whereas CPP lines were the majority. Simple machines with three extruders represented the market standard and the predicted trend extended to five layers with four extruders. One of the first custom-built line for stretch film was created by upgrading the multipurpose winder W2000 with a mechanism for preventing the critical speed and thus minimising the vibrations on the 3" shafts during production, which took place at widths of up to 2.5m and a maximum operating speed of 450 m/min.

In the year 2004, the production manager of what in the meantime has become one of SML's biggest European customers stated: **"A stretch film line running at less than 600 m/min is unprofitable!"** Happily, it was possible to answer this requirement through initial edge encapsulation and our optimised winder W2000.



However, not only speed, but also larger widths were needed for high-capacity stretch film production and therefore subsequent years were characterised by successive technological advances:

- 2005 saw the introduction of the winder W3000, a shaftless turret winder. In addition, there was no longer a critical speed and inline production on 2" and 3" cores became possible.
- In the year 2006, the first double-turret winder W4000-2S was built, which was intended mainly for machine rolls and jumbos on 3" cores, but also allowed widths of up to 4,000mm.
- 2007 then witnessed the arrival of the first high-speed extruder for stretch film. A previously unimaginable 900 kg/h of LLDPE out of a 90mm extruder became reality. With their high output, these small extruders allowed a reduction in space requirements and energy consumption. Consequently, in the same year, the first SML 7-layer line with seven extruders was sold.
- A milestone with regard to speed was passed in 2009 by the first 2m-line to reach a production speed of 1,000 m/min. This was attained during demonstration runs at the company and enabled SML to become the first manufacturer to guarantee speeds above 700 m/min during day-to-day operation.
- In 2015, SML was the first company to commission a 6m-wide 12-up **MasterCast®** line turning out an incredible 4,500 kg/h of high-quality machine rolls.

Apart from technological developments, SML also started to perfect and standardise its line concepts for all the widths of market relevance and this resulted in shorter delivery times, improved spare part management and faster start-up procedures for customers. The SML **MiniCast®**, **EcoCompact®**, **SmartCast®**, **PowerCast** and **MasterCast®** trade names for lines with widths ranging from 1.5 to 6m became synonymous in the market for top quality and reliability, and the fruits of this standardisation process were ideally demonstrated by the feedback from the market and the increase in sales following the K-Shows in 2010, 2013 and 2016.



Winder W4000-4S for 2" and 3" cores

In recent years, technological advancement has focused on features that enable customers to differentiate their products from those of the competition:

- The winder W4000-4S for 2" and 3" cores
- Minimum film tail during roll changes
- Thin core technology
- Coreless winding
- Inline modified edges for film reinforcement
- Overlapping, double-turret winders for the production of all standard market film widths

Moreover, as Thomas Rauscher, SML's product manager for stretch film lines, says: **"This progress has not only resulted from our own drive to be ahead of the competition, but equally the desire of our customers and partners to move forward in the market and thus to set new standards in technology and quality."** The new **PowerCast** stretch film line with 13 layers, introduced at the K2016, several machines in nano-layer technology up to 55 layers and last, but not least, the successful launch of the 1.5m-wide **MiniCast®** as a starter model resulted from that strategy.

Since 2013, SML has sold lines for more than 50 per cent of all the new stretch film capacity that went into operation and has

thus reached a formidable market leadership. Therefore at this point, special thanks go to our worldwide customers, who pushed us to this remarkable success.

Martin KALTENECKER, Head of Sales Department

AFP Netherlands orders a new SmartCast® nano-layer stretch film line

Apeldoorn Flexible Packaging B.V. (AFP) in the Netherlands has selected SML as the supplier for its newest nano-layer stretch film line. The machinery, which has been fully customised to meet AFP's technological needs and the space available at its plant, will go into operation by the end of 2017. SML is proud to have become a partner to another world leading player in the high-quality stretch film market, especially as the AFP management has stated: **"Our key reasons for choosing SML were its proven machine technology, flexibility with regard to customer requirements and last, but not least, the impressive live demonstrations at the K2016."**

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EVENTS 2017

EVENT	LOCATION	BOOTH No.	DATE
CHINAPLAS	Guangzhou, China	9.2 / A61	May, 16 - 19
THIN WALL PACKAGING	Chicago, USA		May, 23 - 24
TECHNICAL SEMINAR – LATEST TRENDS IN SHEET EXTRUSION	Moscow, Russia		May, 30
VERPACKUNGSSYMPOSIUM KEMPTEN	Kempten, Germany		September, 21 - 22
T-PLAS	Bangkok, Thailand		September, 20 - 23
PROPAK	Yangon, Myanmar	E9	September, 21 - 23
IRAN PLAST	Teheran, Iran		September, 24 - 27
PLASTIMAGEN	Mexico City, Mexico		November, 7 - 10
THIN WALL PACKAGING	Cologne, Germany		December, 4 - 6

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