



TECHNOLOGY report

SML

EXTRUSION LINES – ENGINEERED TO PERFORM ▶

LENZING | AUSTRIA edition no. 27 1/16



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EDITORIAL



Karl STÖGER
Managing Director

Dear Reader,

May I begin by stating that the global polymer industry is in good shape and is outperforming the overall world economy by a substantial margin. Since Lehman Brothers declared bankruptcy in 2008, average, global economic expansion has plummeted and failed to return to pre-crisis levels. However, the polymer and plastics processing industry demonstrates a contrary trend. Polymer consumption has been increasing yearly with above-average growth, especially in the packaging industry. With our extrusion lines for film, sheet and lamination we are fortunate enough to serve precisely this expansionary market segment.

Later in the year, the K'2016 will open in Düsseldorf and preparations are already at an advanced stage for what promises to be another record-breaking show. The inventive activities of companies usually reach a highpoint during a "K" year and in this regard SML is no exception. For while we will be showcasing one of the biggest, fastest and smartest stretch film lines ever installed at the "K", the rest of the year will also witness the roll-out of a whole range of specialities and new features.

A fully equipped extrusion coating line including the DoubleCoat process, for which a patent is pending, is already available for trials in our technical centre and next month will see the start-up of a highly innovative PET sheet line with entirely new technical features. In addition, towards the end of 2016, a completely reengineered breathable film line for the hygienic film segment, which includes a revolutionary new MDO unit, will be introduced and this will be followed by a wide web CPP line for ingenious new product structures.

Therefore, stay in contact with us and watch out for our upcoming press releases. I can promise you that the coming months are certain to be exciting.

Yours sincerely,

The *FlexPack*[®] demo line is ready to demonstrate excellent performance



SML recently installed a *FlexPack* extrusion coating and laminating line at its premises in Lenzing. For SML, this line represents a valuable tool for the meeting of customer needs and demonstrates the company's ongoing commitment to the support of product development in the extrusion coating field.

SML did not aim to design a small, multi-purpose line that could do everything to a certain degree, but nothing perfectly. Instead, it was decided to invest in a full-scale production line. The resultant, future-oriented line has the same dimensions and functions as any other of the new *FlexPack* lines operating at our customers' production facilities, and is equipped exclusively with first class components, which guarantee maximum reliability and top quality.

The equipment is located in a separate section of the SML plant, adjacent to conference rooms and a test laboratory. This line can be cordoned off from the rest of the building thus providing secrecy for both customers and their products.

It can handle substrates in the 700 to 1,650mm width range with maximum

production speeds of up to 450 m/min. Substrates can include oriented film, barrier film, paper, aluminium foil and nonwovens, etc. Both unwinds, as well as the rewinder, are of fully automatic turret design and equipped with a shaft-less core clamping system.

A primer coating unit with closed chamber doctor blade system and a 5m-long drying tunnel ensure superior adhesion even on printed products. Moreover, in order to guarantee that sufficient bonding force is also available at high line speeds, it is possible to apply ozone on both sides of the die to accelerate melt curtain oxidation.

A Ø 90mm and a Ø 60mm extruder in combination with a variable 3-layer feedblock and an automatic die with edge bead reduction system facilitate the production of more complex structures.

With a footprint of less than 19m x 14m the line sets new benchmarks in terms of compactness. It might be thought that this design could have a negative influence on operability, but SML has demonstrated the opposite. Practice has shown that such a compact design is even easier to

handle than older systems and that the short web paths have a positive effect on web guidance and the quality produced. The complete line is controlled by a safety PLC, which ensures the highest possible safety standards and provides maximum comfort for the machine operators.

The line can be used for a variety of applications. Typical products are found in the fields of flexible and industrial packaging, along with a number of technical solutions for the building industry. In addition, the line is equipped with our "DoubleCoat" technology for which a patent is pending. This new feature makes it possible to serve completely different markets with breathable products such as surgical drapes for the medical industry, hygienic films and diapers, etc.

Interested customers are welcome to inspect and test the line under real production conditions.

For more detailed information please contact:
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Making of thin gauge PET sheet

The consumption of PET as a packaging material continues to increase. Furthermore, new applications, advanced processing technologies and reformulated material grades have extended the range of its possibilities. This article details the advances in thin gauge sheet manufacturing, for which SML has solutions in the calendering, casting and sleeve touch process areas.

CALENDERING PROCESS

Anyone with experience in the calendering process field knows that producing thin films in the 120 to 180µm range can be quite a challenge. The manufacture of such a thin product requires a very small melt bank, otherwise the material starts to freeze early in the nip, which causes excessive nip pressure and high film orientation. Calendering using a small melt bank demands maximum roll geometry precision with regard to concentricity (very low t.i.r.), and also the ability to maintain a constant and parallel gap between the rolls under nip load. It is a law of nature that any roll will deflect under load and therefore in order to maintain a parallel gap, it is necessary to apply methods that correct roll deflection. At SML, we rely on the proven concept of the SPG roll (Smart Parallel Gap) (Figure 1). This design causes the roll to deflect in a way that is exactly inverse to the deflection of a conventional roll, which in this case is the counter-reacting, middle roll in the roll stack. With its long-term experience in drafting and designing the SPG roll, SML is able to achieve an extremely precise parallel gap during operation by combining a conventional roll with an SPG roll.

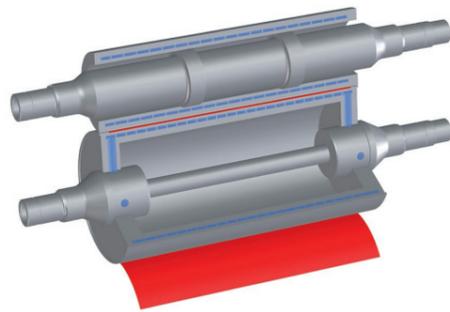


Figure 1: SPG roll

Today, 25 years after its launch in 1991, SPG technology has matured greatly, especially following the introduction of the third generation design concept. The roll is now more precise than ever and owing to this development we can provide machines for the manufacture of still thinner films. The major advantage of the SPG roll is that the effect of different film widths and nip loads is minimal and thus no adjustments are required. Axis crossing is an alternative method of compensating for the deflection of two conventional rolls. However, as the deflection relates to the film width and the nip load, adjustment during production is necessary, which is a major drawback for a machine in which all types of gauges and widths need to be produced.

Manufacturing sheet using a smaller melt bank provides a web with less shrinkage. It also results in less nip force and thus reduced roll deflection, which opens up possibilities for the production of thinner films. Because a small melt bank is almost invisible, it is practical to have another indicator to determine its size. An appropriate method in this regard is measurement

of the nip force between the rolls, as a larger melt bank also generates increased nip force. Determining and recording the nip force as part of the product recipe results in more consistent process settings and enables the early detection of undesired changes in the production process.

CASTING PROCESS

Even thinner films can be produced using the cast process, which is also simpler to operate and can be carried out on calendering equipment with minor adjustments to machine design. As the film is not nipped between rolls, cast film has a different optical appearance, but it does offer the advantage of far lower internal stress than that found in calendered films. The use of an automatic die in combination with a vacuum box and a suitable cooling roll diameter allows 70µm thin film to be produced at speeds of up to 140 m/min.

SLEEVE TOUCH PROCESS

Another alternative with which SML has vast experience is the sleeve touch process in which a flexible chrome plated metal sleeve is used with an elastic calendering roll (Figure 2). This unique technology unites the optical characteristics of calendering with low-stress, casted films in the 70 to 150µm range. However, the increased operating cost of this technology tends to limit its use to high-end products.

WINDING

Automatic winders are a must for producing thin gauge PET film at high line speeds. Therefore, our proven winder W2000 has been upgraded with a new no-fold-back cutting technology for thin



Figure 2: Sleeve-touch process

and stiff films (Figure 3). On the basis of a number of new developments, we have further supplemented our knowledge re-



Figure 3: Winder W2000 with new cutting technology

garding the production of thin gauge sheet using PET. However, this is only one aspect of our PET sheet manufacturing innovations and the next topic to be presented in a future "Technology Report" will be the production of thick gauge PET sheet.

Berthold DRÖGE, Technical Director

MiniCast® – SML's small stretch film line for big flexibility

The newly designed **MiniCast** stretch film line is ready for demonstration and customer trial runs at SML!

MiniCast represents a 1.5m-wide, 3-up machine in a 3-layer or a 5-layer configuration, which is based on highly efficient and standardised components that provide both easy and flexible operation, and maximum performance.

On a minimum floor area of less than 100sqm, the **MiniCast** stretch film line can be equipped with up to four extruders, which facilitate a combined extrusion throughput of 1,050 kg/h. The machine incorporates a single roll casting station with a chill roll diameter of 1,200mm and an optical thickness measuring system.

Customers can select between edge trim refeeding via a scraptruder for fluff, or a re-pelletizing system.

With a single turret version of the well-known winder W4000-4S, the **MiniCast** stretch film line guarantees top quality winding of hand rolls on 2-inch cores, as well as machine and jumbo rolls on 3-inch cores.

It represents the ideal machine for both newcomers to the stretch film business and for established companies needing an additional line for the production of smaller lots and niche items. **MiniCast** stretch film lines are pre-manufactured in lots and are therefore available within short delivery periods at very competitive prices.

Martin KALTENECKER
Head of Sales Department



The quality behind ULTIMATE stretch film

During discussions about the quality of pallet stretch wrap film, the most frequently mentioned feature is “ultimate” stretch, which is also known as the pre-stretch level, or simply the film stretchability. Indeed, it would appear that this parameter defines the quality of “stretch film”. However, although pallet stretch wrap film is a mass-produced commodity, it is nonetheless highly sophisticated for the protection of goods during transportation across the globe. Therefore, it is worth taking a look at its other attributes such as stiffness, puncture resistance, tear resistance, holding force, etc. as well as influences impacting its utilisation. These include maximum wrapping speed and neck-in during wrapping.

Stretchability is not only the best-known film parameter, but also one of the easiest to achieve. Even film made exclusively from C4 material can be stretched by as much as 400 %, as was

already demonstrated at the AML stretch film conference in 2004. The main disadvantage of a pure C4 film is that its other parameters are poor. The film is very soft, lacks puncture and tear resistance, and also has very low holding force.

Film stiffness is a relatively new quality criterion and is mainly employed for applications requiring low stretchability. This applies to goods that do not allow a large degree of shrinkage or the retention of the stretch film, but nevertheless require good holding force on the pallet. High viscosity LLDPE or PP represent a very good addition for improved film stiffness.

High puncture resistance is also significant with regard to goods with sharp edges, or for products of varying size. Punching holes constitute the main risk in this regard, as the film breaks or tears and the packaging become weak. In such cases mLLDPEs, C8, or elastomers improve puncture/tear resistance.

Holding force is extremely important for load security. A soft film with high elongation and no holes or tears is sometimes insufficient to secure the load. The film should have a holding force that correlates to stretchability and this can be achieved by adding specific mLLDPE or even PP.

All these parameters can be measured in the lab and provide a clear overview of the realised film quality. However, additional influences come into play at the wrapping machine. A film can have high stretchability in the lab, but this does not prove that it will be strong enough when the wrapper starts to operate at very high speeds. This may lead to a film break and therefore the wrapper must either be adjusted at the start, or the film formulation has to be modified to meet this demand. In such situations, the use of different materials with specific performance parameters in separate layers is helpful.

The neck-in of the film during wrapping must also be taken into consideration. If the neck-in is very high, the wrapper needs more time and more wraps, which results in an increased number of overlaps and layers. In this case, it is often necessary to balance the pre-stretch and lay-on tension, in order to compensate for the quality of the film used. Usually, the pre-stretch must be adjusted precisely to the applied film and the lay-on tension should not be too high. In rule of thumb terms, the neck-in should be around 10 %.

This article is intended to provide a brief overview of the most important stretch film deviations of attributes and their effects. Should you wish to know more about this topic, or have some specific questions, please do not hesitate to contact us at SML.

Thomas RAUSCHER
Product Manager, Cast Film Extrusion

Cast film lines for hygiene products continue to progress

In recent years, a large number of developments have emerged in the field of cast film lines for hygiene products and the following represents a short summary of these advances.

The first breathable film line that SML delivered in 1999 had a maximum mechanical speed of 250 m/min and production speeds in the 200 m/min range. 30 lines later, we now deliver lines with a maximum mechanical speed of 500 m/min and production speeds of up to 400 m/min. This progress was made possible by continual machine development on the part of SML and the introduction of new materials and compounds.



MDO unit

Owing to the fact that production speeds have increased while film grammages have been reduced, the standard number of extruders has risen to three and five is the typical number of layers employed for both breathable and melt embossed films. The advantages derived from the increased numbers of layers and extruders include the additional possibilities for formulation modifications in order to allow adjustments to the correct film parameters.

SML is able to supply a single line that is capable of producing three different products:

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

It is also possible to initially install a line for the production of melt embossed film and then should the market so require, upgrade the line for the production of breathable film and/or cloth-like laminate.

Owing to continuous developments in the field of winding, SML is now able to offer its winder W2000 model with an adjustable satellite roll for the control of air entrapment between the layers. A maximum roll diameter of 1,300mm is provided by the XL version of the winder W2000. In addition, SML has developed the new winder W5000, which is able to manufacture rolls with a maximum diameter of 1,500mm and operate in both winding directions. Each of these winders can produce inline slit rolls.



winder W5000

The areas of application for products produced on these lines include backsheet for baby diapers, incontinence diapers, panty liners, sanitary napkins, protective clothing, nurse pads, disposable bed inlays for incontinence, disposable change mats and operation underlays.

Apart from cast film lines, SML also offers lines for the printing and lamination of breathable products operating from roll to roll. Together with well-known suppliers, SML provides complete systems for the upgrading of breathable and melt embossed films, which represent an additional possibility for film refinement and increased customer service.

The hygiene film business is still growing, as exemplified by an annual growth rate of approximately 5 to 6 % in the incontinence market. Moreover, annual growth rates of 5.5 % are anticipated in the baby diaper market between 2015 and 2020. China, India, Indonesia, Malaysia, Brazil, Egypt and Turkey are likely to account for some 58 % of the global baby diaper market in 2018.

In one of the coming issues of our “Technology Report”, we will report about our brand new development for breathable film production, the completely new MDO unit.

Alexander BRUCKMÜLLER
Product Manager, Cast Film Extrusion

SML is stepping up its R&D activities

Having joined SML as Technical Director in 2004 after 18 years spent in other sectors of the extrusion machinery industry, I was surprised to find such a large R&D department. However, looking back, it is now clear that this team of highly skilled and dedicated people laid the foundations for SML's current technical and commercial success.

During the intervening 12 years we have grown as a company and more than doubled our sales revenues, while maintaining an R&D team that is adequate for the related tasks. Moreover, just as the company has grown and matured so have the team members, the young engineers of 12 years ago, having become the experienced product managers of today. Indeed, the fruits of their labours, in the shape of advanced extrusion systems, can now be seen serving the needs of our customers in factories across the globe.

SML holds a technological lead and in order to retain and extend it, we are further expanding our R&D capacity. In early 2016, three additional R&D engineers joined the company, two of whom have master's degrees in technology and one a PhD. All three are now engaged on key development projects.

It should be stressed that as well as recruiting from local technical institutes, we also maintain research links with them.



The Johannes Kepler University (JKU) in Linz has a strong plastics processing technology department, the Institute of Polymer Extrusion and Compounding (IPEC), chaired by Professor Juergen Miethlinger (who coincidentally started his career in SML). Collaborative projects with

SML allow IPEC students to gain real world experience of extrusion systems design and testing. For example, using IPEC's state-of-the-art extruder screw simulation software and SML extrusion equipment, students recently compared actual and theoretical screw performance. As well as assisting SML with R&D, such projects also provide useful data for the master theses of future graduates. Later this year the installation of a novel, 9-layer SML sheet line in the IPEC lab will further increase the range of possibilities for joint R&D projects.

As a family-owned company we plan for the long-term and are well aware that in a technology-based industry lasting success

demands constant innovation. Our continued investment in skilled technologists maintains our technical cutting edge and assures customers that when buying machinery from SML, they are certain to obtain state of the art extrusion equipment.

Berthold DROEGE, Technical Director



IPEC receives new sheet roll stack

KARAT LTD trusts in SML spinning lines

Who would have thought, that the first meeting of the representatives from the company KARAT LTD (Ukraine) at the SML booth during the international textile fair ITM in the year 2012 would generate a powerful and rapid impulse for business cooperation development?

As result, in the same year there were concluded two contracts and further these new projects were realized successfully. One year later there was another contract conclusion for delivery of a new Austrofil tricolor spinning line. The project proved successful again and in spite of the crises that erupted in Ukraine and in some neighboring countries the company KARAT LTD, through the active collaboration with business partners like SML, managed not only to keep but also to extend production volumes. At the end of February 2016 there were already two further Austrofil spinning lines on order.

Accordingly, for the last years KARAT LTD became the biggest manufacturer of the BCF yarn in Ukraine and in the neighboring regions, that allowed the company to enhance considerably the manufacturing of the own carpet products and to sell yarns to the other producers not only in the former CIS countries but also in the USA, Indonesia and Europe. With an output reaching 1000 tons per month we can enter with new offers of our products the other international markets.



"It must be noted that a significant role and the special credit for the implementation and development of the business and partner relationship goes to the Representative office of SML Maschinen-gesellschaft mbH in Moscow. Thanks to their support and comprehensive assistance the coherent, timely and successful implementation of all our joint projects has been maintained."

Referring to the results of the last meetings between the managements of SML and KARAT LTD, it can be firmly stated that the partners are not going to stop

their cooperation: there are new projects and further developments ahead.



Alkesandr RUZHYTSKYI
Head of KARAT LTD

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EVENTS 2016

| EVENT | LOCATION | BOOTH No. | DATE |
|----------------------------------|---------------------|-----------|------------------|
| STRETCH & SHRINK FILM CONFERENCE | Cologne, Germany | | April, 26 - 28 |
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