SML TECH REPORT

Nº40 / 02-2022

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New benchmark in stretch film production:

PowerCast XL with a brand-new triple turret winder

Come and meet us at the K'2022!

Booth: 17 / C42 and C39

▶ DAILY LIVE DEMONSTRATION runs at 11.00 a.m. and 2.00 p.m.

SML's *PowerCast XL* is a unique 4.5 m-wide machine concept, with an output volume of up to 3,400 kg/h of net high quality stretch film, on a floor space of only 240 m². But innovation never stands still: On the *PowerCast XL*, a newly developed winding system now allows the manufacturing of 2" hand rolls at a size of 4.5 m net film width.

"SML's *PowerCast XL* faithfully delivers high volumes and a supreme stretch film quality. From the very start, this line has proven to be a market success. And yet, customers continued to ask for greater flexibility with regard to hand rolls for 2" as well as for 3". To satisfy these demands, SML developed a triple turret version of its best-selling winder, the W4000-4S, especially for the *PowerCast XL*," as Thomas Rauscher Product Manager at SML, explains.

VERSATILITY IN COMBINATION WITH HIGH PRODUCTION CAPACITY: HAND ROLLS, MACHINE ROLLS AND JUMBO ROLLS

"The *PowerCast XL* with the new turret winder W4000-4S3T has yet to meet its match. It is the first winder of its type available on the market. Our new solution allows our customers to also produce 2" hand rolls on a 4.5 m stretch film line – an unbeatable advantage," Thomas Rauscher, reveals. Until now, it was only possible to run 2" hand rolls on lines of up to 3 m width, thus the new development boosts the output of hand rolls by about 50 %. As before, 3" hand rolls, machine rolls and jumbo rolls can also be manufactured, with ease, with this new solution.

LIGHTER CORES OR EVEN CORELESS

Another key feature of the winder W4000-4S3T is the possibility to run thinner cores. When the core thickness is reduced, the CO2 e.g. in stretch film production is minimised in the same way. "Of course, the most sustainable solution would be the production of stretch film completely without cores. And this is something which can also be accomplished with our latest innovation", Thomas Rauscher adds.

Ready to process PIR and PCR resins

POWERCAST AND POWERCAST XL: DEVELOPED FOR MAXIMUM OUTPUTS

SML launched the *PowerCast* brand in 2016 as a 4 m-wide concept. Till this day it is still a very successful addition to SML's other well-known stretch film brands. In 2019 the *PowerCast XL* followed as a 4.5 m-wide pre-configured stretch film line. The new *PowerCast XL* + W4000-4S3T is the latest step forward in SML's *PowerCast* series, successfully uniting maximum output volumes with a higher production flexibility.

WHY *PowerCast XL* + W4000-4S3T ?

- **Output up to 3,400 kg/h net**
- **Compact design - 240 m² floor space**
- **Ø 1,600 mm chill roll – the biggest in this sector**
- **7 or 67 layers**
- **Ready to process PIR and PCR resins**
- **2" hand rolls, 3" hand rolls, machine rolls and jumbo rolls**
- **ThinCore technology**
- **Coreless technology**
- **Modified Edges**

If you would like to know more about our latest developments or have a look at the *PowerCast XL*, don´t miss out on the opportunity to meet us in person at the K'2022!

Editorial

Karl Stöger
Managing Director

Dear Reader,

This year's K-show is soon to open its doors and at the same time the global plastics processing industry is facing some of the greatest challenges ever. The rising costs of energy and the high volatility of the markets have created exceptional circumstances that demand great skill and endurance on our part to successfully maneuver our businesses through these turbulent times. I hope that you are faring well in this difficult environment.

Bad news aside, what is the good news? In all probability, this will not be your monthly electricity bill. Energy and the rising costs of energy are a major concern for all of us. And these days saving energy in extrusion lines is both possible and a must. This report provides information about the technologies available to you from SML to substantially lower your energy costs.

You will find our cover story about our new PowerCast XL stretch film line, which will be in full operation at the K´2022 exhibition, highly impressive. I am sure you will agree that it is mind-blowing how much technical progress has been made since the last K-show three years ago? Without a doubt, this 4.5 m-wide 9-up stretch film line, with a completely new triple turret winder, will attract enormous attention when demonstrated live in the exhibition hall.

A unique advantage in the product portfolio of SML is the fact that we are offering a very comprehensive range in each product group. You will find two examples to prove this statement in the pages which follow. Our CPP film lines are available and delivered in widths from 1 to 6.5 meters and anything in between. And for PET sheet extrusion lines we are offering different kinds of extrusion concepts, such as a single screw extruder, a twin screw extruder or a specialised recycling extruder, either with pre-drying or active venting.

The exhibition time is a perfect opportunity to gather information and compare some of the trailblazing technologies that define our industry. It will be a pleasure to welcome you to our booth and to present our winning solutions to you. We hope to see you soon!

PET sheet production:

Three extrusion concepts – always the optimum solution

We support our customers to find a solution which ideally suits a specific product portfolio.

What is the best extrusion solution for PET sheet production? A simple and straight-forward single-screw extruder as a plug-and-play solution, a twin-screw extrusion system for maximum material flexibility, or a recycling extruder, ideal for processing post-consumer or post-industrial flakes?

There is no general answer to this question, as each of these extrusion concepts has its advantages in different areas of application. To give its customers an optimum solution for their specific requirements, SML is the only premium manufacturer worldwide, that offers all three extrusion concepts.

As a matter of fact, many PET sheet products can be manufactured with any of the common extrusion concepts. However, choosing the optimum extrusion solution substantially contributes to the over-all line performance.

"The extrusion system plays a crucial role in PET sheet manufacturing, as practically all production processes depend on how the raw materials are treated in the extruder. At SML we support our customers comprehensively when it comes to finding a solution which ideally suits a specific product portfolio and the raw materials in use," Max-Phillip Lutz, Product Manager at SML, explains.

So what are the typical characteristics and strengths of the different extrusion concepts in PET production?

ClassicPET – SINGLE SCREW EXTRUSION

SML's single screw extrusion system, ClassicPET, is the best choice if you have a clear focus on manufacturing PET sheet in a wide thickness range, i.e. for thermoforming applications. This extrusion concept stands for constant production stability throughout the production process and it is easy to adjust. Changeover times from one to another sheet type are short. Virgin granules as well as post-industrial and post-consumer PET flakes can be processed up to 100 %.

FlexiPET – TWIN SCREW EXTRUSION

The FlexiPET conical, twin screw extruder concept from SML stands for high energy efficiency. The main application is for flakes, but it also handles virgin granules to some extent. It is the system of choice when using flakes consisting of APET and PETG mixtures. Furthermore, it can be optimised for dusty material streams. The switch-over times from one type of raw material to the other are very short.

RecyPET – RECYCLING EXTRUSION

RecyPET is ideal for the high-volume production of mono-layer sheet, particularly from post-consumer and post-industrial PET flakes. In combination with the well-proven VACUREMA® system, the decontamination and dehumidification process takes place at the reactor pot mounted on the extruder. The iV drop is minimum.

All three line concepts can be supplied with an EFSA/FDA food-approval package.

„Whatever the requirements, SML's PET sheet lines ensure a moderate capital expenditure, high outputs and operational ease," SML Product Manager, Max-Phillip Lutz, concludes.

Hy-roller for ultra-thin PET film:

Polishing roll with adjustable crowning

SML is now offering an alternative type of polishing roll that is particularly well suited to the manufacturing of very thin PET films on wider calendering lines. The key characteristic of SML's new Hy-rollers is the hydraulically adjustable crowning for a perfectly parallel polishing gap.

FORGOTTEN TECHNOLOGY REVIVED AND UPGRADED

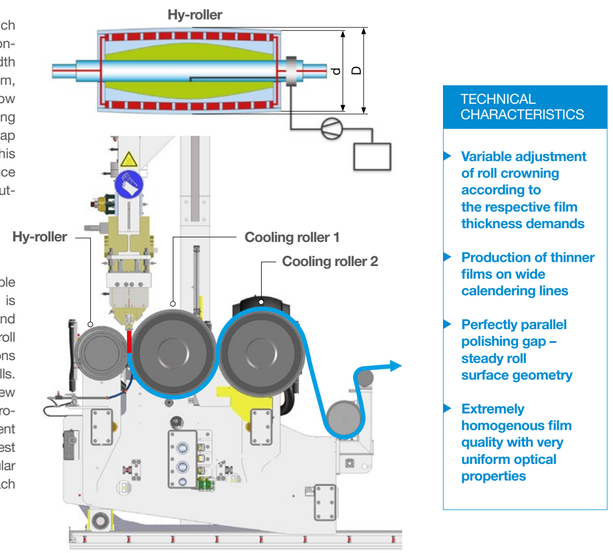
"The technology of hydraulic roll crowning was developed 20 years ago – and then quickly forgotten. Today we are making use of this concept that will bring significant benefits to our customers," Julian Leingartner, the CTO of SML, comments. "It would not be SML, if the original version were adopted without thorough redesign. Instead, we took the basic concept, refined it and added some outstanding features for a maximum performance," Julian Leingartner continues.

THIN CALENDERED FILMS THICKNESSES WITH EXCEPTIONAL QUALITIES

With SML's new Hy-rollers, the variable crowning of the polishing roll is provided by a hydraulic mechanism, which acts on the rolls' outer shell for controlled expansion along the width of the roll. Due to this mechanism, the polishing roll can exactly follow the surface contour of the cooling roll thus providing a constant gap for the film to be calendered. This enables our customers to produce very thin calendered films with outstanding qualitiy.

SIMPLE IN THEORY – DEMANDING IN ENGINEERING

Even though the basic principle of the adjustable roll crowning is relatively simple, the design and manufacture of a fully functional roll required thorough FEM calculations and profound engineering skills. For the manufacturers, SML's new Hy-roller is an opportunity to produce very thin PET film on efficient extra-wide lines with the highest qualities. This can be a particular advantage, when customers attach a high value to downgauging.



TECHNICAL CHARACTERISTICS

- **Variable adjustment of roll crowning according to the respective film thickness demands**
- **Production of thinner films on wide calendering lines**
- **Perfectly parallel polishing gap – steady roll surface geometry**
- **Extremely homogenous film quality with very uniform optical properties**

Why are CPP film lines becoming wider and wider?

The wider the line, the lower the quantity of edge trims in relation to the overall output.

SML is one of the few manufacturers of flat film systems that cater for all widths from 1 m up to 6.5 m. In 2021, SML delivered its first 6.5 m CPP film line with a net output of more than 2,500 kg/h. Simultaneously SML installed a 1 m line for a European raw material manufacturer for tests in real production conditions. Nevertheless, there is a clear market trend towards higher end film widths. So, why are CPP lines becoming wider and wider?

"In general, there are two possibilities to increase the output volume of a line: one is to increase the overall line speed and the second is to increase the width of the end film," Alexander Bruckmüller, Product Manager at SML, explains. "At very high speeds, it can be more difficult to manufacture CPP film with the desired optical properties. At the same time, it also becomes more challenging to reach the corona treatment level for the good printability or metallisation of the film".

FINDING THE OPTIMUM LINE WIDTH

To avoid high-speed related issues, it does make sense to increase the film width of a cast film line to get a higher output. "The optimum ratio between the line speed and the width of the end film depends, of course, on the specific products that the customer is manufacturing. Therefore, a detailed consultation is vital when it comes to choosing the ideal line width for a new project," Alexander Bruckmüller continues.

UNDERSTANDING PHYSICS

When it comes to technological concerns, the manufacturing of extra-wide CPP film lines does not necessitate revolutionary new over-all machine concepts. What is needed is a deep understanding of physics and technical, in-detail adaptions to a number of components. On SML's wider lines, for example, the guiding rollers are made of high-resistance carbon fibre composite materials with a special surface and smooth running bearings. The vacuum box has an optimised design to ensure the film is applied to the chill roll with a high level of flatness. The inner cooling spiral of the chill roll is designed in a special way to guarantee uniform cooling over the roll width as a whole. Finally, the winding system is ready for roll weights of up to 8,000 kg.

COST BENEFITS

High volume production is generally more cost efficient. With regard to wider lines, SML calculates that the power consumption per manufactured film (kW/kg) on a line of 6.5 m is approximately 10 – 15 % less than on a 3 m wide line. Moreover the labour costs in relation to the output are significantly lower with wider lines, as not more staff are required to operate these compared to narrow lines. What's more: The wider the line, the lower the quantity of edge trims in relation to the overall output. And if the edge trim is refed, the ratio between the edge trim and the virgin material is very advantageous. With SML's extra-wide lines it is, of course, also possible to refeed to the main extruder additional edge trims from a primary slitter rewinder.

"In general, we are witnessing a continuing market trend towards high-volume production due to the above mentioned cost benefits. With this and the technical advantages of wider CPP lines in mind, it can make sense to consider a broad investment," SML Product Manager, Alexander Bruckmüller, concludes.

Energy-efficient extrusion

How can we lower energy costs?

Polymer extrusion is an energy-intensive process. In the last decades, many efforts have been directed towards improving the energy efficiency of SML extrusion lines. Especially in times of rising energy prices and a growing environmental awareness, the topic of saving energy is now attracting more attention than ever.

EXTRUDER CONFIGURATION

"A major contribution towards energy savings can be made when configuring an extrusion line. Most of the energy is consumed in the extrusion process when melting the polymer and so the choice of the extruder size and the design is crucial", Hans-Jürgen Luger, Head of Research & Development at SML, clarifies. Extruders are generally efficient when operating with ideal drive and screw configurations. This applies in particular to SML's High Speed Extruders with diameters of 75 mm and 90 mm, which are designed to deliver up to 1,200 kg/h for PP, LDPE, LLDPE and PS. Compared to extruders with a larger diameter, a HSE requires up to 80 % less heating power with the same throughput. Another example is SML's HO-LT extruder for sensitive polymers like EVOH or tie materials, which enables high output rates with low melt temperatures. By using a 35 mm HO-LT extruder instead of a 75 mm standard extruder for EVOH with the same maximum throughput, the specific energy input (SEI) is reduced from 250 Wh/kg to 200 Wh/kg.

FACTORY: EFFICIENT COOLING WATER TREATMENT

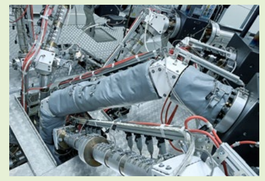
Apart from the heating and melting of the polymer, the cooling process is also something which deserves consideration. Firstly, the water quality in the cooling circuits is crucial to achieve a high cooling efficiency and process reliability. The heat transfer deteriorates as a result of deposits and cooling circuit contamination and, thus, the cooling water temperature has to be lowered to achieve the same cooling capacity. In general, the temperature level required for the cooling water should not be lower as necessary. Secondly, the system for cooling water generation offers the opportunity to save energy. For example, SML uses an advanced system of water wells on the premises, geothermal pumps (which can also be solar-powered) and a rooftop chiller in the headquarters in Redlham. Additionally, heat dissipated from the extrusion lines in operation is used to heat the building in winter.

LINE CONFIGURATION: EFFICIENT REDUCTION OF EDGE TRIMS

Another key-topic is the amount of edge trims ground, refed into the process and re-melted. In principle, the portion of refeeding decreases as the film width of an extrusion line increases. Thus, wide extrusion lines with a larger film width can be assumed to be more efficient. Comparing SML's MiniCast stretch film line (1,500 mm net width) with SML's PowerCast XL line (4,500 mm net width) as exhibited at K'2022, the portion of edge trim is decreased from 27 % to 17 %. This means, that the additional power consumption due to refeeding per kg/h net output of the line is 50 Wh/kg for the PowerCast XL line compared to 90 Wh/kg for the MiniCast.

DECREASING HEAT EMISSIONS

Insulating hot surfaces, which are subject to heat loss due to radiation, is a very effective and inexpensive method to cut energy costs. Furthermore, insulation, for example on melt adapters, can be easily retrofitted. Measurements have shown that the power consumption per 1 m length to maintain the set temperature of an adapter can be decreased from 8 kWh without any insulation to 6 kWh with insulation (- 25 %). SML has also modified the heating/cooling-unit for the extruder barrel in order to reduce radiation losses in the heating mode by up to 30 %.



DETECTING HIDDEN ENERGY CONSUMPTION IN PERIPHERAL EQUIPMENT

Pump drives or blowers frequently operate at full speed, regardless of the line speed and output. By installing frequency converters and modifying the machine control, the drive speeds and, thus, the power required can be adjusted to demand without affecting the output of the line. A further step is to use bit*Wise*, SML's data generation and analysing tool to optimise the machine parameters to exploit the full savings potential.

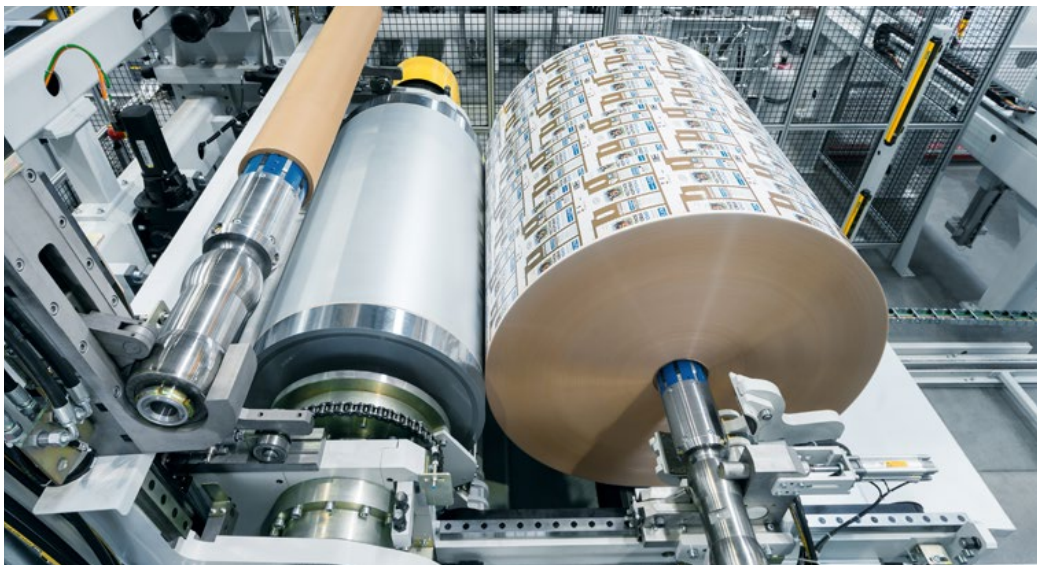
Mario Höllnsteiner,
Product Manager Extrusion Coating & Lamination

Three years after the market-entry:

SML TRIPLEX coating lines for liquid packaging board

In 2019, SML decided to step into the market for cardboard packaging for liquids launching a completely new machine with its aseptic TRIPLEX coating and lamination line. Mario Höllnsteiner is the product manager in charge of the TRIPLEX coating lines. SML TechReport talked to him about customer requirements, the advantages of in-house developed machine control and how well TRIPLEX is accepted in the market today.

Mr. Höllnsteiner: What triggered SML's decision to develop the TRIPLEX line for liquid packaging board?
"On the one hand, we recognised the market's demand for an alternative supplier of extrusion coating lines for liquid packaging board. On the other hand, we realised that the reuqirements suit to our own product range down to the ground. And the third, and probably most important, reason to develop this line was simply that we have the skills to do it better than the competition."



The technical requirements for this type of line are quite demanding…
"Yes, I would even go so far as to say that the construction of extrusion coating lines for liquid packaging board is the supreme discipline in the engineering of extrusion lamination systems. SML has everything that it takes in-house, to further develop this type of highly advanced machinery – above all the technological knowledge."

What are the most striking characteristics of the TRIPLEX coating line?
"A key characteristic, the one that most people first become aware of, is the robust set-up and the strong dimensioning of the line. This guarantees the long lifetimes, especially with regard to the use of heavy cardboard grammages, for which SML's TRIPLEX lines were especially designed."

Which effects does the machine control system have on the line performance and efficiency?
"The length of our TRIPLEX lines, and with it the number of drive systems, requires the rather complex control of the web tension. Since we ourselves developed the machine control system that handles the drives completely on our own, we were able to reduce the times for line ramp-up and ramp-down significantly. This minimises scraps while raising the overall line efficiency."

How have the ongoing discussions about the recyclability of packaging materials affected the development of the TRIPLEX line?
"These discussions, of course, did not end with liquid packaging board although this type of packaging has been well-established in the market for a very long time. Manufacturers are required to substitute the aluminium in liquid cartons with an alternative co-extruded barrier film. We managed to arrange five extruders on one carrier by specially designing the movable extruder carriage. Despite this high number, each of these extruders is freely accessible. At the same time, the arrangement of the extruders helps us to keep the melt pipes relatively short. This in turn is a huge advantage when processing materials which are sensitive to long residence times in the system – like EVOH for example that can replace aluminium."

Finally, in what way has the TRIPLEX series been further developed since it came on the market three years ago, and how are you assessing the decision to step into the market for liquid packaging board from today's perspective?
"First of all let me say that we are, of course, constantly optimising all of our machines. The biggest innovative step in the TRIPLEX series was the increase in line speed. The TRIPLEX line was originally designed for a line-speed of 400 m/min. In the meantime we offer machines with speeds of up to 600 m/min. We took the decision to step into the market for liquid packaging board three years ago and it was most definitely the right call. Today, we have three customers who already placed their trust in SML's lines for liquid packaging board, and there is strong interest from well-known manufacturers and brand owners all over the world."

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Interconnecting systems: The Power of OPC-UA

At K'2022, SML will participate in a VDMA initiative to demonstrate the power of the OPC-UA cross-platform data exchange standard. Using their own smartphones, visitors to the fair will have the unique opportunity to observe some selected real-time production values of a PowerCast XL stretch film line for themselves. The line will be in operation at SML's booth. All they need to do is to scan the QR code to open the Umati web app displayed on the machine.

SML hopes, that initiatives like this will lead to fully standardised interfaces on extrusion lines, that function across company boundaries. Bit*Wise*, SML's in-house developed user-friendly data monitoring and analysing solution is based on the OPC-UA standard.

OPC-UA - a common language for all machines ensures interoperability regardless of platform and manufacturer.

Events 2022

Event	Location	Booth No.	Date
K'2022	Düsseldorf / Germany	Booth 17 / C42	19. – 26.10.2022
Stretch & Shrink Film Conference	New Orleans / USA		30.11. - 01.12.2022
Breathable Films Conference	Berlin / Germany		30.11. - 01.12.2022
Plastindia	Dehli / India		01. - 05.02.2023
ICE Europe	Munich / Germany	Hall 6 / Stand 740	14. - 16.03.2023

Extrusion lines – engineered to perform

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