

Heating under control

safe temperature

New approach to temperature controlling making extrusion lines safer

SML is setting new standards for the safe processing of critical raw materials on extrusion lines. The newly-developed 'safe temperature' control module monitors the temperature twice in each of a line's relevant heating zones. If two measured values differ too much from each other or a critical temperature limit is exceeded, the heaters are safely disconnected from the power supply and the relevant extrusion unit is automatically flushed using a non-critical polymer. This significantly reduces the danger of harmful gases being released.

Processing halogenous raw materials in extruders is not without risk of danger. Even in conventional production processes at regular processing temperatures, corrosive or toxic gases are often released when substances such as PVC, PVDF, PTFE, FEP, ETFE and ECTFE are used. These are generally kept at a safe level by fume extraction.

The situation can become problematic when excessive temperatures are reached; for instance, if a heating defect or an unwanted production stoppage occurs. If raw materials remain in an extrusion line for too long, a critical mass of dangerous fumes can develop. These then either escape via the feed section, during the course of the system downtime or, at the latest, when the system restarts.

AUTOMATIC FLUSHING AND DETECTION OF HOT SPOTS

On the newly-introduced 'safe temperature' module, the temperature is monitored twice in each of the extrusion line's relevant heating zones and is then processed to the safety PLC or system control unit. The line's heating is safely disconnected from the power supply if there is a sensor failure, if the two sensors' measurements differ too much from one another or if a pre-defined maximum temperature is exceeded. In addition, the respective extruder is automatically flushed using a non-critical polymer. This temperature-

SML developed a new control module that detects critical hot spots

monitoring technology, newly developed by SML, performs at level PL-d as per EN ISO 13849-1.

The 'safe temperature' module also allows the extrusion line's control unit to detect if a thermocouple is not physically present in the heating zone at the start of production or if it pops out during the production process. In addition, customers can use the new module's heating current monitoring system to prevent the danger of hot spots forming within a given zone. SML offers the 'safe temperature' module as an option on new lines.



Extrusion lines – engineered to perform

Editorial

Karl Stöger
Managing Director



Dear Reader,

The growing use of plastics in packaging has helped our industry enjoy high growth rates over the past decade. New products have increasingly facilitated more effective protection of goods and offered superior convenience to the consumer. Will the success story of plastics film and sheet as a prime packaging material continue? The current discussion about plastic waste pollution cannot be ignored, and as a consequence we need to ask ourselves, can plastic hold its share in the packaging market?

We at SML believe, yes, it can. Though there are risks on the horizon, no other material offers the overall performance of plastics. The consumer has grown fond of proper packaging solutions and does not want to go back to the yesteryears. Certainly there is a lot we can do to make packaging more recyclable and to prevent improper disposal. Driven by the visions of our customers as well as by our own commitment to make products more ecological and non-polluting, we are constantly working to find the best answers for sustainable use of eco-friendly plastic products. Let us take the recent criticism in the media seriously and positively. Dealing with the problems and eliminating possible disadvantages will help our industry to come out stronger from this discussion.

In this context, inside this edition of TechReport you will find articles covering the scope of our R&D work and stories about the associated benefits our customers are able to gain from the developed technologies. Please enjoy reading it and feel free to get in touch with us for more information.

Yours sincerely,

Karl Stöger

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Industry 4.0

benefits from a modular bit.Wise architecture

SML extrusion lines enable our customers around the globe to produce a broad and nearly infinite range of products. Industry 4.0 or the Internet of Things (IoT) are recognised as synonyms for numerous approaches to optimisation and for increasing the quality of general value-added processes in manufacturing operations. SML's answer to coping with questions, demands and future challenges in this sector goes by the name of bit.Wise.

» Doing things right «

EFFICIENCY

€ ¥ £ \$ ₹

The overall basis for this is to obtain machine sensor data (e.g. temperatures, energy consumption, torques, etc.) that enable us to build virtual models of machines and their behaviour. The goal is to use these models for automated calibration of parameters, predictive maintenance, control and decision support.

The central innovation of bit.Wise is that different systems in the enterprise can be connected with SML machines using newly established interfaces (e.g. procurement of spare parts, transfer of recipes, etc.). These systems rely on data provided by the machine, like Enterprise Resource Planning (ERP), Production Planning (PP) and Manufacturing Execution Systems (MES). An electronic transfer to the machine saves time and facilitates production scheduling, execution and the management of recipes.

A Tracking & Tracing (T&T) service has already been implemented: product quality can be traced from a simple quick response (QR) code scan to the specific machine parameters. This is only one aspect of several functions for quality assurance (QA).

Figure 1 shows the relation of bit.Wise in respect to operational levels of the "automation pyramid", which was proposed

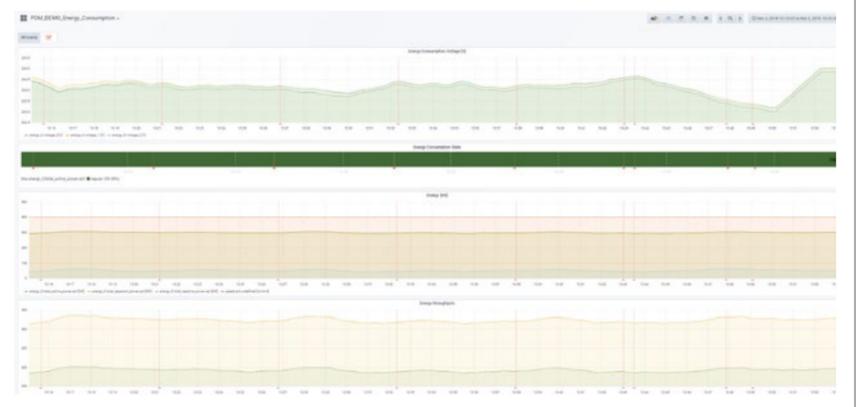
» Doing the right things «

EFFECTIVITY

» Decision Support «

in the international standard IEC 62264. Sensor data is gathered at field level, while the tried and trusted, PLC-based SML SMILE® control system handles the tasks at control level. Data and parameters are gathered, stored and visualised by bit.Wise (see figure 2). Supervisory control and data acquisition (SCADA) at execution level acts as a platform for a bidirectional data exchange with the higher levels, planning and enterprise.

Figure 2



In general, bit.Wise generates added value for all task-related organisational levels in a manufacturing company:

1. EXECUTION LEVEL,
2. PLANNING LEVEL, AND
3. ENTERPRISE LEVEL

Related problems targeted here include:

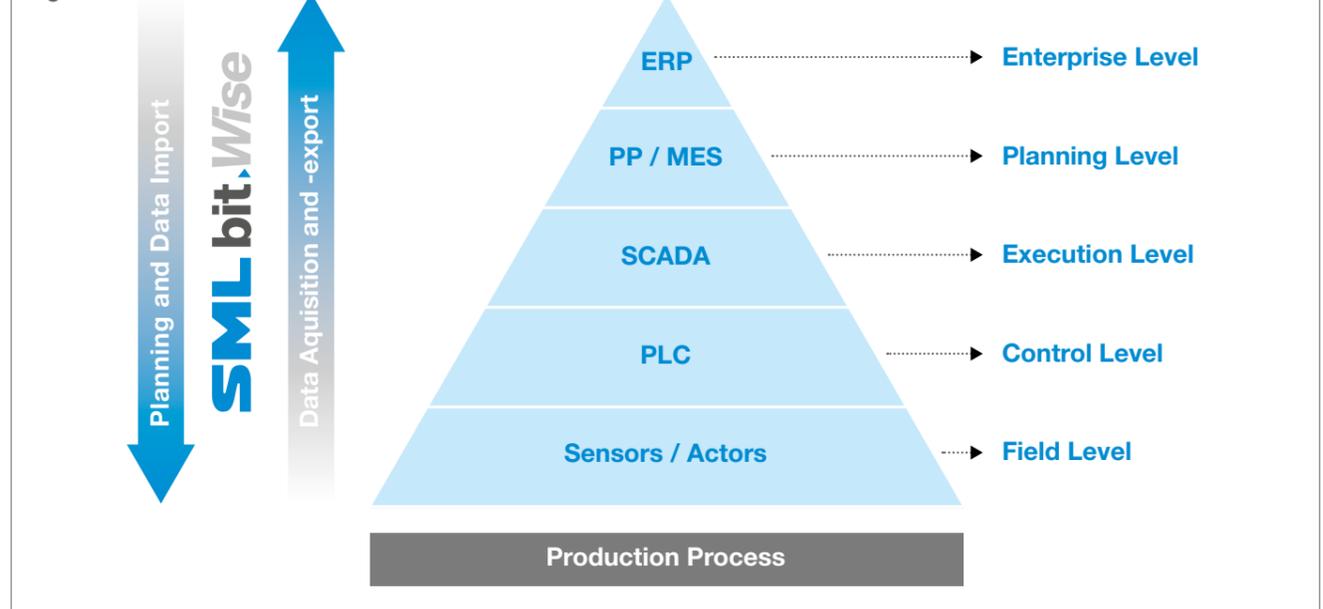
1. INTEGRATION AND DATA EXCHANGE (ERP, PP, MES)
2. QUALITY MANAGEMENT (T&T)
3. PROCESS INSIGHT AND OPTIMISATION

We implement all of this by deploying a modular SML bit.Wise software architecture which is successively extended to include new features and modules. Customer service becomes easier on both sides, while service quality increases.

Innovation around the product through digital business competence

Machine data helps to optimise machine design and monitor energy and raw materials consumed on a shift or order basis. We also expect considerable impacts on R&D – as "bit.Wise solves challenges – bit by bit".

Figure 1



Most advanced PP/EVOH barrier sheet line handed over to VISY Thailand

The timeline was challenging, as were the technical requirements. In less than 15 months, SML set up one of the world's largest and most technically advanced multi-layer PP/EVOH barrier sheet lines at VISY Packaging Thailand. Among the most outstanding technical innovations on the new line is the first-time integration of four HSEs (high speed extruders), interacting with three special HO-LT (high-output low-temperature) extruders and SML's most powerful horizontal roll-stack.

"From the very beginning, the timeline was demanding and the technical specifications challenging. Yet, in less than 15 months, the line has become a reality and has already produced over 500 tonnes of useable roll-stock", said Victor Barr of VISY Food Plastics Asia, after the world's largest multi-layer PP/EVOH barrier sheet line started operation in mid-2018 at VISY's plant in Province Rayong, Thailand. In addition to introducing significant technical innovations, the set-up of the new line by SML's project team ran com-

pletely smoothly and, most important, without any delays.

HIGH-SPEED EXTRUDER TECHNOLOGY BOOSTS PRODUCTION VOLUMES SIGNIFICANTLY

The newly installed line at VISY Packaging Thailand incorporates two different extruder concepts. It is the first multi-layer PP/EVOH barrier sheet line on which SML has integrated its newest high-speed extruder technology to increase production rates. There are four SML HSEs in active

operation on the line to support the extrusion of polyolefin intermediate and outer layers.

There are also three HO-LT extruders in operation for the extrusion of EVOH barrier films. These take the heat-sensitive characteristics of EVOH into consideration and can fully cope with the high melt throughput of seven extruders. The extruders on VISY's barrier sheet line are operated with SML's most powerful horizontal roll stack with a total of nine cooling rolls.

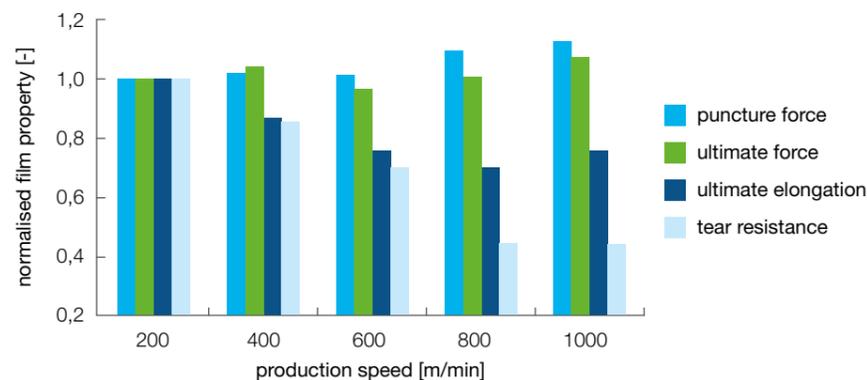
Extrusion lines – engineered to perform

Speed vs. Quality?

How a higher production speed is influencing the performance of stretch film

There is a clear industry trend towards stretch film lines with augmented production speed, that raises the following question: Which influence has an increased production speed on the technical performance of stretch film? To find reliable answers, SML set up a test series in partnership with a German university and a brand-name material supplier.

“To get more output from a stretch film line, a manufacturer usually has two options – to go wider or to run faster”, says Thomas Rauscher, Product Manager Cast Film Extrusion at SML. In recent years, many manufacturers have decided on the latter option – and demanded stretch film lines with higher speed. To fundamentally investigate the relationship between higher production speed and stretch film performance, SML set up a test series in partnership with a German university and a brand-name material supplier.



TESTING FILM PERFORMANCE AT DIFFERENT PRODUCTION SPEEDS

The key target of that project was to analyse the cast stretch film performance at different production speeds. “We wanted to find out if a stretch film that is produced at 800 m/min has the same properties as a film produced at 400 m/min or even at 1,000 m/min. And if there were differ-

ences between the properties, we wanted to know how high they were”, explains Thomas Rauscher.

INITIAL RESULTS: STRONGER FILMS WITH LESS ELASTICITY

During the trials, the following properties were examined: puncture force – the force required to pierce through the film with a

sharp pin; ultimate force – the force required to break the film; ultimate elongation – the resulting strain at break; and tear resistance – the time a small tear takes to propagate.



Puncture force – the force required to pierce through the film with a sharp pin

Generally, the test results demonstrate that some film properties increase while others decrease as production speed changes. The initial results from the trials show that stretch films become stronger at higher production speeds. This is accompanied by a higher puncture force and a higher ultimate force. At the same time, the films achieve less elasticity since the film tears at a lower elongation value and it takes less time for a small hole to propagate.

Comprehensive results from the test series are available on request.

Evolution

A small history of SML's mono-axial direction orientation units

It started like many success stories: the formation of SML's Mono-axial Direction Orientation units (MDO) for films and tapes was the answer to a challenge. Back in the 1960s, SML was a division of Lenzing AG, the world's largest producer of man-made fibres. In those days, synthetic fibres were packed in jute fabrics, which caused problems as jute contaminated the synthetic fibres. To find a solution, engineers in Lenzing, Austria, created a completely new packaging system. And as genuine pioneers in that field, they developed the machinery for the new packing materials themselves. This was the origin of MDO.



SML looks back on 50 years of experience in producing high-end mono-axial direction orientation units

In the late 1960s, tape fabric, which was additionally protected with film, replaced jute fabrics as high-strength packaging material for fibres and bales produced at Lenzing AG. This type of packaging material was an absolute innovation – as was the technology for its production. The new fabric consisted of approximately 30µm thick mono-axially oriented wrap and weft tapes, made out of high-density polyethylene (HDPE) or polypropylene (PP). The range of machinery which had to be developed to produce the new high-strength plas-

tics included blown film extruders and mono-axial stretching units, cutting machines and tape winders for weft tapes as well as auxiliary loom equipment for split weaving including unwinds and knife cutting bars.

CONSTANT INNOVATIONS BASED ON R&D AND 50 YEARS OF EXPERIENCE

The newly developed packaging materials became a tremendous success, and soon both films and the film producing machinery were not only used in-house

at Lenzing but also sold outside to the world market. By investing heavily in R&D from the start, MDO units were constantly improved. As an example, the in-line thermo-lamination process of mono-axially oriented PE film with a sealable PE film was developed and patented in Lenzing.

Today, SML looks back on 50 years of experience in producing high-end mono-axial direction orientation units, which now are an integral part of SML cast film lines for

breathable diaper hygiene films and membranes for battery production. Additionally, SML's MDO units are also used for the production of shrink labels, twist candy wrap, PET and PP adhesive tape films, PP tear tapes, PE cable insulation films and as a substitute for BOPP and BOPET films.

NEW GENERATION OF MDOs

SML's latest generation of MDO units with online adjustable stretching gaps allow the easy adaptation to diverse raw materials and varying production speeds. In addition, for applications providing film strengths in excess of 350 N/mm², which is approximately the strength of steel, SML developed rigid stretching rollers that avoid bending under load. This new

MDO unit has proven its performance for hygiene film production with a maximum production speed of 550 m/min at a line width of up to 4.2m.

SML has been an independent company since 1995. Today, its product range includes multifilament lines, sheet lines, extrusion coating lines and cast film lines. But the starting point for its global success was the creation of MDO technology – an idea so successful, that it was copied by several companies around the world.

One year in operation: Indonesian manufacturer PT Panverta on SML's widest-ever CPP film line

Setting new standards in terms of high production volumes

In 2017, SML introduced its widest-ever CPP film line with a trimmed final film width of 5,200mm. This new five-extruder, six-layer line with a 5,700mm wide multi-manifold die is setting new standards in terms of high production volumes and low unit costs. After one year in operation at PT Panverta in Indonesia, it is time to see how one of SML's cast film extrusion lines is performing under real conditions.

Indonesia's PT Panverta Cakrakenca was the first CPP film manufacturer worldwide to install SML's wide CPP film line at its site in East Java province in 2017. Following the general market trends, one of PT Panverta's main reasons for setting up the new 5,200mm line was to increase output while significantly



SML wide CPP film line at PT Panverta

decreasing the production costs per unit. Compared to smaller lines, a 5,200mm wide CPP film line has a considerably lower ratio of edge trims. Labour costs per unit are also lower, as the 5,200mm line does not require additional personnel to produce higher volumes. And also in terms of power consumption (kW/kg), the new 5,200mm line clearly beats smaller CPP film machinery.

HIGH QUALITY STANDARDS FOR DECADES

Founded in 1989 and producing CPP film since 1991, PT Panverta has kept very high standards in terms of product quality for decades. It is considered one of South East Asia's most forward-thinking manufacturers of cast polypropylene and linear low density polyethylene film for flexible packaging material.

Two of Panverta's six CPP film lines are now from SML. In 2003 SML installed a 3,000 mm line, and in 2017 the new 5,200mm line. "We are happy with the performance of both SML CPP machines and look forward to continuing our relationship with SML", says Agus Hariono from PT Panverta, one year after the extra-wide CPP film line was installed.

NEW CONFIGURATION FOR HIGHER VOLUMES

SML's 5,200mm CPP film line is capable of producing very large

quantities of film for lamination, metallisation packaging, and special barrier film. Equipped with five extruders, the maximum gross output of this line is 2,300 kg/h. A completely new winder was developed to cater for roll weights up to 7 tons. The large winding diameter of 1,300mm offers huge benefits in the metallising process, as it increases running times while reducing the metalliser set-up times.

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New SML headquarters: structural work completed

Construction work is progressing fast at SML's new headquarters in Redlham, Upper Austria.



After completing structural work in good time, the focus is now on the completion of interior. In spring 2019, SML will relocate the whole company to its new buildings. As the 9-hectare site is clearly designed for expansion, the enlarged location will provide sufficient space for the growing demand for SML extrusion lines.

Events 2019

| Event | Location | Booth No. | Date |
|----------------------------------|----------------------------|-----------|--------------------------|
| ARABPLAST | Dubai, V.A.E. | 6C112 | January, 5 - 8 |
| INTERPLASTICA | Moscow, Russia | 8.1B38 | January, 29 - February 1 |
| ICE EUROPE | Munich, Germany | A6/554 | March, 12 - 14 |
| PROPAK AFRICA | Johannesburg, South Africa | | March, 12 - 15 |
| KOPLAS | Goyang, Korea | | March, 12 - 16 |
| STRETCH & SHRINK FILM CONFERENCE | Barcelona, Spain | | April, 8 - 10 |
| CHINAPLAS | Guangzhou, China | 9.2A61 | May, 21 - 24 |
| PLASTICOS BRASIL | Sao Paulo, Brasil | | May, 25 - 29 |
| ITMA | Barcelona, Spain | H7-C122 | June, 20 - 26 |