



# 挤塑

## EXTRUSION ASIA EDITION

总第20期  
德国出版

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AND WINDING EQUIPMENT

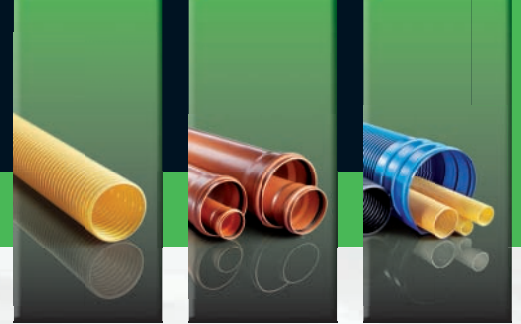


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# Pipe extrusion



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**WEBER**  
*High Performance*  
DS 32 D Series

Once again WEBER set new standards in extrusion technology. The new extruder series DS 32 D, equipped with powerful drive technology and innovative screw technology, provides new impetus for PVC pipe manufacturing.

### Advantages of the *High Performance* DS 32 D series

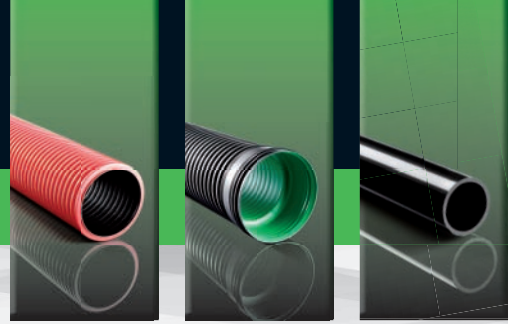
- Compact, robust gearbox technology in WEBER quality
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# Pipe extrusion



NE 7.40

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*Filmextrusion: Technological innovations for the K 2016. Easier operation, more performance, less consumption.*

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明尼苏达州的运动体育场明尼阿波利斯市美国银行体育场成为了美国首座以透明屋顶构造为特色的体育场。操作更容易，性能更强大，耗能更减少

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## 加强发展在中国的业务



2016年10月25日，ILLIG公司和中国地方政府“浙江海宁经济开发区管理委员会”的代表签署了合同，设立客户关系中心及热成型设备及热成型模具展示厅

*On October 25, 2016 ILLIG and representatives of the Chinese local government „Administrative Committee of Zhejiang Haining Economic Development Zone“ signed a contract for setting up a Customer Relation Center with a showroom for thermoforming machines and thermoforming molds*

■ 2016年10月25日，国际领先的热成型专家ILLIG公司和中国地方政府“浙江海宁经济开发区管理委员会”的代表签署了合同，设立客户关系中心及热成型设备及热成型模具展示厅。浙江海宁经济开发区的意图是建立一家塑料加工和供应工业公司。关于作出这一决定的原因，ILLIG公司董事总经理 Karl Schäuble表示：“以海宁为基础，我们将为我们的中国客户提供技术培训，使他们熟悉热成型技术，并且我们将提供现场服务。”按计划，在协议期间，ILLIG中国分支机构的办公室是100%的ILLIG子公司。就杭州和上海两个主要城市之间的物流而言，位于长江三角洲浙江省的海宁的新场地是理想的位置。位于海宁的新客户中心将集中协调ILLIG在中国的设备服务，这里的全体员工将同样负责对客户提供现场服务。当前的这一扩展步骤将使ILLIG公司延续过去几年里在中的中国和在东南亚市场的增长，保持更为持久和稳定的市场地位。

此外，ILLIG同意与浙江万凯新材料有限公司开展合作，这家公司是中国PET领先的生产商之一。

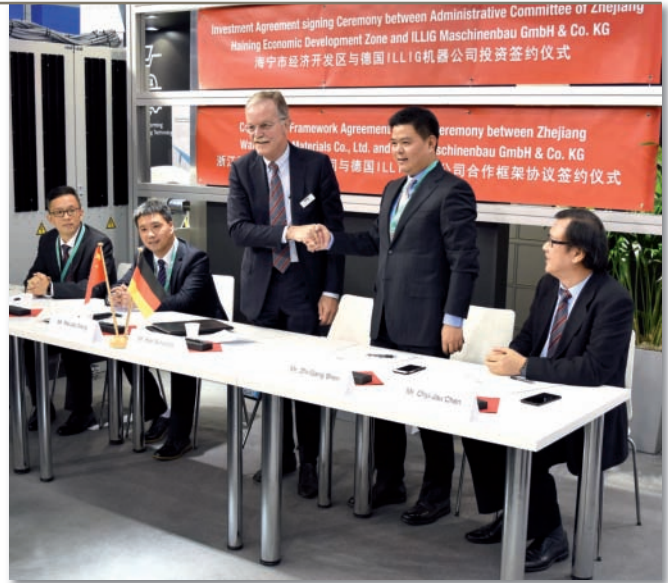
### ■ Presence in China strengthened:

On October 25, 2016, ILLIG, the internationally leading thermoforming specialist, and representatives of the Chinese local government „Administrative Committee of Zhejiang Haining Economic Development Zone“ signed a contract for setting up a Customer Relation Center with a showroom for thermoforming machines and thermoforming molds. The intent of the Zhejiang Haining Economic Development Zone is to establish companies of the plastic processing and supplying industry. „From Haining we will provide technical training for our Chinese customers to make them familiar with the thermoforming technology and we will offer service on site“, indicates Karl Schäuble, ILLIG Managing Director, the reasons for this decision. In the course of the agreement the foundation of the ILLIG China branch office is planned as 100% ILLIG subsidiary. The new Haining site in the Zhejiang province in the Yangtze delta is located ideally when it comes to logistics between the major cities of Hangzhou and Shang-

hai. The new base will centrally coordinate the service for ILLIG machines in China from Haining and the staff there will also be in charge of customer care on site. The current expansion of the location establishes the lasting, stable market position of ILLIG machines during the last years in the growing Chinese market and in Southeast Asia. Further on ILLIG agreed the collaboration with the company Zhejiang Wankai New Materials Co. Ltd., one of the leading Chinese producers of PET.

握手：ILLIG公司董事总经理 Karl Schäuble (左) 和浙江万凯新材料有限公司首席执行官沈志刚先生 (右)

*Handshake: ILLIG Managing Director Karl Schäuble (left) and Mr. Zhi Gang Shen, CEO Zhejiang Wankai New Materials Co. Ltd., (right) (Images: ILLIG)*



► ILLIG Maschinenbau GmbH Co. KG  
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## 全球的行业专家们齐聚中国ICE博览会 (国际纸品胶片及薄膜加工印刷技术、设备及材料博览会)

■ 在2016年11月中国ICE博览会上，戴维斯标准 (Davis-Standard) 公司以商标名 Global Advantage™ 提供的薄膜加工技术和支持已经有了提升。在ICE期间，戴维斯标准突出展示其新型液体涂覆技术和用于加工膜材的高性价比、高效能的加工系统生产线，即商标为 dsX™ 的系列设备。在液体涂敷方面，戴维斯标准开发了新型帘带滑动方式涂布器和五辊硅胶涂布器。两种技术都可以高效率地生产并且易于维护。帘带滑动方式涂布器用于速度高达2800英尺/分 (853米/分) 的单层涂覆，并具有再增添两个附加涂层的可能性。五辊硅胶涂布器可用于100%硅胶、速度高达2400英尺/分 (732米/分) 的场合。这种涂布器为了便于清洁，采用不锈钢制造，并包括了除雾系统。戴维斯标准提供超过50种液体涂覆方法，包括凹版印刷、棒、平缝模头、逆转辊和光棍传墨装置，支持在膜材和标签方面的应用，包括硅胶涂覆产品和特殊涂覆市场。

戴维斯标准商标为 dsX™ 的挤出涂覆生产线以及流延薄膜和吹塑薄膜设备为生产商提供具有优势的价格、性能和交货期。每套系统在进行设计时都按照更长的运行时间、更高的生产效率、更少的耗资来完成，并由戴维斯标准的 7x24小时全球服务网进行支持。 dsX flex-pack™ 商标在全世界都已深受好评，为薄膜加工和包装印刷行业提供了高价值的选择，尤其是对于那些在价格敏感的软包装市场中扩展销售的客户。dsX flex-pack™ 商标的设备配置可以随机应变，这就使得加工商所需要的生产能力和灵活性得到了提升，在面对快速形成的应用市场时，更具有竞争效率。这类应用的例子包括咸味零食和面条包装、牙膏管、小袋包装、个人护理产品、调味品包装、自立袋。

dsX 技术通过其 dsX s-tretch™ 和 dsX flex-film™ 系统支持流延和吹膜应用。dsX s-tretch 是第一条这类型整合了预拉伸能力以替换传统的预拉伸方法特性的流延生产线。生产商可以从更薄的薄膜、更高的生产线速度、降低的消耗以及改善的薄膜强度中获得效益。在吹膜设备方面，dsX flex 薄膜是专为印刷和复合、软包装、整理收缩和制袋、冷拉伸和表面印刷的应用而设计的。可以采用戴维斯标准公司业内领先的风环和喂料螺杆设计，以及不同的宽度和不同尺寸的模式，以适应各不相同的产品。地区的服务团队通过及时发货和安装，



(Image: Davis-Standard)

现成的零备件和迅速的客户服务支持薄膜加工设备，提供售前、售中和售后服务。这些工作包括向戴维斯标准生产线的控制系统提供服务和支持。戴维斯标准是 Circonix 技术的故乡，这种技术有能力支持对数千台现有的已安装的设备进行 PLC ( 可编程控制器 )、驱动和机械系统升级，也包括对非戴维斯标准品牌的设备进行升级。

### ■ Global Converting Expertise at ICE China:

The Global Advantage™ offered by Davis-Standard's converting technology and support services was promoted at ICE China in November 2016. At ICE, Davis-Standard highlighted new liquid coating technology and its line of cost-effective, high productivity processing systems for converting applications – the dsX™ series.

In liquid coating, Davis-Standard developed a new curtain slide coater and five-roll silicone coater. Both technologies are capable of high rates and ease of maintenance. The curtain slide coater applies single layer coatings at rates up to 2800 fpm (853 mpm) with expansion capabilities up to two additional layers. The five-roll silicone coater is capable of applying 100 percent silicone at rates up to 2400 fpm (732 mpm). This coater is constructed of stainless steel for ease of cleanup and includes a mist removal system.

Davis-Standard offers more than 50 liquid coating methods including gravure, rod, slot die, reverse roll and smooth roll transfer, supporting applications in tapes and labels, silicone-coated products and specialty coating markets.

Davis-Standard's dsX™ line of extrusion coating, cast film and blown film equipment offers processors advantages in price, performance and delivery. Each system is engineered for greater up-time, increased productivity and reduced waste, and is backed by Davis-Standard's 24/7 global support network. The dsX flex-pack™ has been especially well received worldwide, offering converters and package printers a high-value option for expanding sales in the price-sensitive flexible packaging market. The dsX flex-pack's adaptable machine configuration gives processors the capabilities and flexibility needed to ramp up and compete effectively for a variety of rapidly emerging application opportunities. Examples of applications include salted snack and noodle bags, toothpaste tubes, sachet packs, personal care products, condiment packs and stand-up pouches.

The dsX technology supports cast and blown film applications with the dsX s-tretch™ and dsX flex-film™ systems. The dsX s-tretch is the first cast



film line of its kind featuring integrated pre-stretch capabilities as an alternative to traditional pre-stretching methods. Processors can take advantage of thinner films, higher line speeds, reduced waste and improved film strength. In blown film, the dsX flex-film is designed for applications in printing and laminating, flexible packaging, collation shrink and bag making, hood shrink and surface print-

ing. Options for Davis-Standard's industry-leading air ring and feedscrew designs are available, as well as different widths and die sizes to accommodate multiple products.

Regional service teams support converting equipment before, during and after the sale with timely delivery and installation, readily available spare parts and prompt customer service. This includes

service and support for Davis-Standard's line of control systems. Davis-Standard is the home to Circonix Technologies, which supports the ability to upgrade PLC, drive and mechanical systems on thousands of existing installations, including non Davis-Standard brands.

► **Davis-Standard, LLC**  
www.davis-standard.com

## 合作

■ 德凯胜 (DSG-CANUSA) 高分子技术公司最近订购了两条戴维斯标准生产的Thermatic®挤出机,用于扩大在中国的导管生产。挤出机于去年夏天安装,用来加工高端热收缩管并供应给汽车、电气/公共设施和电子产品市场。在高竞争度的中国挤出机市场,德凯胜选择戴维斯标准,其原因在于该设备属于世界级水平,并且德凯胜与戴维斯标准苏州子公司相距不远,还由于交货期短,以及按客户需求定制的特色能够满足德凯胜独有的对导管的要求。

管理德凯胜的经理Johnson Zhu指出:“我们喜欢这些设备加工的稳定性以及本地化的技术支持和零配件服务。戴维斯标准在苏州的存在是我们作出决定的关键部分,因为我们可以从本地打电话给他们。Thermatic 设备提供了多种多样的能力和功能,但我们特别喜欢冷却装置和齿轮箱控制系统的技术特性。我们通过质量、技术和服务构建了我们的业务,我们知道这些机器将帮助我们始终如一地生产出高质量的导管。”

生产那些要求苛刻的产品,例如热收缩管,戴维斯标准的Thermatic 挤出机是理想的选择,由于其制造的设备目标是坚固耐用、最少的维护以及平稳地工作。德凯胜生产的导管包括单壁管、双壁管、中厚/厚壁管、特种非聚烯烃管、汽车热收缩管以及编织套管。如同许多戴维斯标准的客户一样,德凯胜对Thermatic喂料螺杆和控制系统的选择范围十分赞赏,这些地方都为未来的扩展提供了可能性。尺寸范围从1 ½到10英寸(40到250mm),长径比从12:1到40:1。

### ■ Co-operation:

DSG-Canusa Polymer Technologies Company recently augmented their tubing

operation in China with the purchase of two Davis-Standard Thermatic® extruders. The extruders, installed last summer, are being used for processing premium heat shrink tubing to support automotive, electrical/utility and electronics markets. In a highly competitive Chinese extruder market, DSG-Canusa chose Davis-

Standard due to world-class machines, the proximity of Davis-Standard's Suzhou subsidiary, a short delivery time, and customized features for DSG's proprietary tubing requirements.

“We like the processing stability of these machines and the local technical support and spare parts services. Davis-Standard's presence in Suzhou was a key part of our decision because we can call on them locally,” said Johnson Zhu, Manager, Engineering for DSG-Canusa. “The Thermatic offers a lot in terms of capabilities and versatility, but we especially like the performance of the cooling device and gearbox control system. We've built our business on quality, technology and service, and we know these machines will help us consistently produce high-quality tubing.”



Davis-Standard's Thermatic extruder is ideal for demanding processes such as heat shrink tubing because it is built for durability, minimal maintenance, and quiet operation. For DSG-Canusa, this tubing includes single wall, dual wall, medium/heavy wall, specialty non-polyolefin, and automotive heat shrink tubing as well as braided sleeves. As with many of Davis-Standard's customers, DSG-Canusa appreciates the Thermatic's range of options for feedscrews and control systems, offering opportunities for future expansion. Sizes range from 1 ½ to 10 inches (40 to 250mm) with L/D's from 12:1 to 40:1.

► **Davis-Standard, LLC**  
www.davis-standard.com  
► **DSG-Canusa Polymer Technologies**  
www.dsgcanusa.com

## 马格公司泰国销售和服务中心

■ 马格公司 (Maag) 是全球领先的齿轮泵、造粒系统、过滤系统和粉碎系统制造商。最近, 马格公司泰国销售和服务中心非常成功地举办了工厂开放活动。将近一百位来宾, 包括来自东南亚各地的加工商和最终用户出席了这一活动, 参观学习了马格产品的最新功能, 以及新近开设的转子式粉碎机车间。这是马格公司及其最近收购的关联公司 Gala 和 Reduction Engineering Scheer 以来在泰国举办的首次综合活动。

马格公司售后和服务中心业务发展副总裁 Thomas Willemsen 说道: “我们对于工厂开放活动出席人数和良好的回应感到十分高兴, 销售和服务中心扩展了服务能力, 以及最近开始提供转子式粉碎机服务, 水下模板大修以及对被高分子材料污染的机械部件进行清洁, 这些都引起了来宾极大的兴趣。”在东南亚, 马格公司现在能够向大量的客户群提供范围广泛的服务, 包括用于拉条造粒机的工具: 高质量转子粉碎机。由于扩张了在东南亚地区的服务足迹, 马格公司更为接近客户, 并可以提供更为快捷的支持。

销售和服务中心位于泰国春武里省, 从2008年起就已开始运营, 新的用于拉条造粒机的转子粉碎机车间于五月一日投产。

在工厂开放日, 来宾们获知了有关可选择的设备信息以及马格公司全方位服务能力方面最新的信息。来宾还看到了两台设备进行的演示, 水下造粒系统设备是为特定目的制造的, 正在进行工艺测试, 这套系统融合了马格和 Gala 的技术成果。客户还看到了用于所有通用转子的拉条造粒机转子粉碎机的性能, 通用造粒机的固定刀片的重磨, 以及大修水下造粒机模板。马格公司已开始向客户提供进一步的服务, 采用最新一代真空热解炉, 对被高分子材料污染的部件和工具进行清洁, 如模头, 泵和换网器部件, 挤出机的螺杆或零件。

总之, 当涉及到泵, 过滤系统以及造粒机时, 马格公司就能体现出其独特的“一站式服务”优势。

销售和服务中心的建筑物内, 建有马格公司全套产品生产线的陈列室, 包括 RE Scheer 公司型号为 25AC 的实验

室级粉碎机, 另外的房间用于备件和库存, 还有用于设备销售和服务的房间。马格泰国销售和服务中心拥有大约12名员工。

### *Interested visitors at Maags Open House in Thailand*



室级粉碎机, 另外的房间用于备件和库存, 还有用于设备销售和服务的房间。马格泰国销售和服务中心拥有大约12名员工。

■ **Thailand Sales & Service Center:** Maag, a leading global manufacturer of gear pumps, pelletizing systems, filtration systems and pulverizers, recently conducted a highly successful open house at its Maag sales and service center in Thailand. Nearly 100 visitors, including processors and end users from throughout Southeast Asia, attended the event and learned about Maag's latest capabilities including the recently opened rotor sharpening workshop. It was the first combined event in Thailand for Maag and its affiliate companies Gala and Reduction Engineering Scheer since Maag's recent acquisitions.

"We are thrilled with the turnout and the positive response at the open house," said Thomas Willemsen, Maag vice president of business development for After Sales and Service Centers. "There was great interest in the expanded service capabilities of the sales and service center with the recent addition of rotor sharpening services, overhaul of underwater die plates, and the cleaning of polymer contaminated machine parts." Maag is now able to offer a broader service portfolio in Southeast Asia, including high-quality rotor sharpening for strand pelletizer tools to a larger customer base. Due to the expansion of its service footprint in Southeast Asia, Maag is positioned closer to its customers and able to offer improved and faster support.

The sales and service center located in Thailand's Chonburi Province site has been in operation since 2008 while the new rotor sharpening workshop for strand pelletizers opened May 1.

At the open house, visitors received the latest information on available equipment plus an overview on Maag's complete service capabilities. They also saw two machine demonstrations and process tests on purpose-built underwater pelletizing systems that combined both Maag and Gala technical knowledge. Customers also saw capabilities for rotor sharpening for all common rotors of strand pelletizers, sharpening of bed knives for common pelletizers, overhaul of die plates of underwater pelletizers. Maag further offers the cleaning of polymer contaminated parts and tools as die's, pumps and screen changer parts, extruder screws or elements with a vacuum pyrolysis oven of the newest generation.

Overall, Maag demonstrated its unique capability as a "one-stop shop" when it comes to service for pumps, filtration systems, and pelletizers.

The sales and service center houses a showroom for Maag's complete line of products, including RE Scheer's Model 25AC lab-scale pulverizer, and additional room for spare parts and inventory, and equipment sales and service. The Thailand sales and service center employs about 12 people.

► **Maag Pump Systems AG**  
www.maag.com

## 第十二届中国国际再生聚酯和PET包装会议及展览

■ 为期两天的2016年再生聚酯和PET包装会议于9月21到23号在中国上海举行，展会汇集和呈现了行业的亮点。聚酯再生行业遭受到了来自低价格原油、低价格全新PET原料以及其它连带效应的压力，尽管如此，280名与会者和来自中国及海外的展览会来宾已经证明了大家仍然保持着对这一行业的兴趣。与2015年相似，PET包装的问题丰富了r-PET原料资源及应用的整个策略群体。

会议的进程中讨论了三个主要的议题：

1. 经济和市场
2. 工艺和设备
3. 加工和应用

会议的论文集或者某个单一的演讲资料都可以直接通过CCFEI (中国化纤信息网) 向Simon Li (simon@cnfiber.com)订购。



### 12th China International Recycled Polyester and PET Packaging Conference & Exhibition:

This summary captures highlights of two days 2016 Recycled Polyester and PET Packaging Conference which took place September 21th to 23th in Shanghai, China. Despite the polyester recycling industry suffers from the pressure of low crude oil and virgin PET prices with all other consequences out of this 280 participants and exhibition visitors from China and abroad demonstrated their on-going interest. Like 2015 the issue PET packaging enriched the whole policy

group of r-PET raw material sources and applications.

The conference program tackled the three main topics

1. economy + market
2. process + equipment
3. processing + application

The proceedings of the conference or even single presentations can be ordered directly from Simon Li of CCFEI (simon@cnfiber.com).

► **Dr. Thiele Polyester Technology**  
www.polyester-technology.com

## 亚洲太平洋地区的机遇在增长

■ 在伦敦举行的巴斯夫亚洲太平洋投资者和分析师圆桌会议上，公司提出了有关在这一地区如何通过建立自身优势确立盈利增长目标的细节。巴斯夫欧洲公司执行董事会成员、负责亚太地区的Sanjeev Gandhi 说道：“我们在亚太地区这个世界最大的化学品生产和消费市场上已经作好了准备。我们正在利用这一地区的成长机遇促进巴斯夫集团的总体成功。”

巴斯夫集团认为，亚洲和太平洋地区国内生产总值和化学品的生产尽管最近有所减缓，但继续超过其它地区。Gandhi. Gandhi继续说道：“中国的增长不如我们原来预期的那样快。我们已经看到亚洲的成熟市场在低速增长，印度和东南亚则略有上扬。某些商品生产线的生产能力过剩为千变万化的商业环境带来了影响。但是，即使在“新常态”下，亚洲和太平洋地区仍然是世界经济增长的动力。我们继续看好对于巴斯夫而言的巨大的潜力，因为基本面并没有改变。”

现在，巴斯夫估计到2020年，亚洲和太平洋地区实际用于化学产品的年

复合增长率 (CAGR) 将为大约5.6%，继续远高于3.7%的世界年平均增长率。

有关Sanjeev Gandhi 所做的主题演讲，以及由巴斯夫的两地区总裁Gops Pillay 和Stephan Kothrade博士所做的讲座，请访问下列网站：  
www.basf.com/RT-Asia-Pacific

### Growth Opportunities in Asia Pacific leveraged:

At the BASF Roundtable Asia Pacific for investors and analysts in London, the company presented details on how it aims to grow profitably in the region by building on its strengths. “We are well positioned in Asia Pacific, the world’s largest market for the production and consumption of chemicals. We are leveraging the growth opportunities of the region to contribute to the overall success of BASF Group,” said Sanjeev Gandhi, member of the Board of Executive Directors of BASF SE and responsible for Asia Pacific.

BASF expects gross domestic product and chemical production in Asia Pacific to continue to outgrow other regions, despite the recent slowdown. “China did not grow as fast as we had assumed. We saw low growth in mature Asian markets. India and South East Asia are picking up slightly. Overcapacities in some commodity product lines have contributed to a changing business environment,” continued Gandhi. “However, even under the ‘new normal,’ Asia Pacific is the growth engine for the world economy. We still see great potential for BASF as the fundamentals have not changed.”

BASF now estimates the compound annual growth rate (CAGR) for real chemical production through 2020 for Asia Pacific at around 5.6%, still well above the world average of 3.7%.

The keynote presentation by Sanjeev Gandhi and the presentations of BASF’s two regional Presidents, Gops Pillay and Dr. Stephan Kothrade can be found at:

► **BASF SE**  
www.basf.com/RT-Asia-Pacific

## 聚碳酸酯树脂行业全球第一

■ 为满足亚洲对于聚碳酸酯的增长的需求，科思创 (Covestro) 位于中国上海的工厂生产这种高技术塑料的生产能力已经增加了一倍，从每年20万吨增加到40万吨。采用当代最新技术和节能工艺的两条新的生产聚碳酸酯树脂世界级产品生产线已经在这里建成。这一举措使得科思创成为了世界最大的这种树脂的生产商。在投产庆典期间，科思创公司聚碳酸酯部门的主管Michelle Jou说道：“在亚洲尤其是在中国，那些重要的工业领域如电子、医疗保健和汽车行业，对聚碳酸酯及以此为基础的解决方案的需求正在增长。通过增加我们在这一地区聚碳酸酯的生产能力，我们能够满足我们客户的需求，并对变化的需求作出更为良好的反应。同时我们优化了我们的服务，保证了可持续的供应和不间断的创新。”

聚碳酸酯有着特别轻的重量，高透明度，极其坚固且易于成形，现代生活中在许多领域应用，从医疗设备到汽车零部件直到智能手机和LED光源。聚碳酸酯树脂还可以和其它物质结合生产最合适的性能均衡的混合物。伴随着这两条新的生产线，上海工厂的混料能力也差不多增加了一倍，这就进一步增强了科思创的能力，可以满足客户对多样化和独特的解决方案的不断增长的需求。

多年来，科思创对上海工厂有着超过三十亿欧元的大量投资，新的产品生产线是这一过程中的最新的基石。今年早些时候，在这里的另一个新的世界级工厂已经开业，每年生产五万吨HDI，这是一种用于涂布和粘合的重要的原料。

科思创管理委员会成员，负责生产和技术的Klaus Schäfer博士说道：“新增加的生产线使上海成为了全世界最大的聚碳酸酯生产中心。这一项目的圆满竣工增强了我们全球的生产布局结构，并证明了科思创对中国市场的持续承诺。”同时，科思创公司通过将工艺用水进行再循环这一技术，突出了其在高效率生产和环境兼容技术方面的领先地位。这些水用来生成氯和氢氧化钠-两种化学品，这两种化学品是生产聚碳酸酯的原料。在科思创，为创新作贡献、可持续技术、产品和应用方案，总是摆在最优先地位的。公司的目标是“让世界成为更加美好的地方。”



上海新的聚碳酸酯树脂设备建成典礼 (从左至右)：来自当地政府的Yao Weihua, Xu Jianmin 和 Ma Jing，科思创负责产品和技术的董事会成员Klaus Schaefer博士，科思创聚碳酸酯部门主管Michelle Jou，科思创上海漕泾工厂主管Roland Stegmueller

*At the inauguration of the new Polycarbonates plant in Shanghai (left to right): Yao Weihua, Xu Jianmin and Ma Jing from the local government, Covestro board member for production and technology Dr. Klaus Schaefer, Michelle Jou, Head of the Polycarbonates segment at Covestro and Roland Stegmueller, Head of Covestro's Caojing site near Shanghai (Image: Covestro)*

### ■ Global number one in polycarbonate resins:

To satisfy growing demand for polycarbonates in Asia, Covestro is doubling production capacities for the high-tech plastic from 200,000 to 400,000 metric tons per year at its site in Shanghai, China. Two new world-scale production lines for polycarbonate resins were inaugurated there, with state-of-the-art technologies and energy saving processes. This thrusts Covestro into becoming the world's largest producer of such resins.

During the inauguration celebration, Michelle Jou, Head of the Polycarbonates segment at Covestro, said: "In Asia and especially China, the demand for polycarbonates and solutions based on it is growing in important industries like electronics, healthcare and automotive. By expanding our polycar-

bonates production capacity in the region, we can adapt and react even better to the changing needs of our customers. And we optimize our service, guaranteeing sustainable supply and relentless innovation."

Especially lightweight, highly transparent, unbreakable and easy to shape, polycarbonates are used in many areas of modern life – from medical devices to automotive parts to smartphones and LED lighting. Polycarbonate resins can also be combined with other substances to produce blends with an optimally balanced set of properties. With the two new production lines, compounding capacities at the Shanghai site have also nearly doubled, further enhancing Covestro's ability to meet the increasing customer requirements for diversified and individual solutions.

The new production lines are the last cornerstone of a multi-year investment program for the Shanghai site with a volume of more than EUR 3 billion. Earlier this year, another new world-scale plant had been opened there producing up to 50,000 metric tons of HDI per year – a crucial raw material used in coatings and adhesives. Dr. Klaus Schäfer, Covestro Management Board member responsible for production and technology, said: “The

addition of the new production lines makes Shanghai the largest production center for polycarbonate resins in the world. The successful completion of this project strengthens our global production network and demonstrates Covestro’s continuous commitment to the Chinese market.”

At the same time, Covestro underscores its leading position in highly efficient and environmentally compatible technology by recycling process water.

It is used to produce chlorine and sodium hydroxide – two chemicals that in turn are needed as raw materials for polycarbonates. Contributing to innovative, sustainable technologies, products and application solutions, is among Covestro’s top priorities – according to the company’s purpose “to make the world a brighter place”.

► **Covestro AG**  
www.covestro.com

## 出口机械设备

■ 意大利SACE（存款基金组织）和Banca MPS（锡耶纳银行）已经完成了一项任务，使意大利中小型企业Plas Mec公司安全地将产品出口到了伊朗。

尤其是SACE与Banca MPS合作，起草信用证，保证了由Plas Mec公司提供给当地化学工业企业的用于塑料的混合机及其它配件的付款。

Plas Mec公司首席财务官Fernanda Marinello发表了声明：“感谢Banca MPS和SACE的支持，为这一宗交易提供了极大的便利，使我们能够安全地收到信用证。尽管这里的客户对我们的机械设备有着极大的兴趣，但直到几个月以前，这个国家还被认为是禁区。我们注意到：特别是在最近一个月里，与这里的联系有了显著的增加，我们对这一市场中期时间内的前景展望有着良好的预期。”

PlasMec建立于1967年，位于意大利瓦雷泽省，是一家生产混合机械的领先的公司，产品可用于PVC、塑料、化学添加剂、色母料、粉末涂料、木塑混合料和特殊原料。当前，其设备95%供出口，已有5600台设备销售给了全世界1700多家客户。

### ■ Machinery exported:

SACE (Cassa depositi e prestiti Group) and Banca Monte Paschi di Siena (Banca MPS) have finalized a transaction that will enable the Italian SME Plas Mec to securely export its machinery to Iran.

Specifically, SACE intervened in concert with Banca MPS in drafting a letter of credit, to guarantee payment of the supply of a mixer for plastics and other accessories by Plas Mec to a local company in the chemical industry.

“Thanks to the assistance of Banca MPS and SACE, this transaction was greatly

facilitated and enabled us to securely collect a credit from a country that, until a few months ago, was considered off limits, although there has always been great interest in our machinery – declared Fernanda Marinello, Chief Financial Officer of Plas Mec – In particular, we remark significant increase in contacts in recent months that offers good future prospects for this market in the medium term.”

Established in 1967 in Varese province, Plas Mec is a leading company in the production of machinery for mixing PVC, plastics, chemical additives, masterbatch, powder coatings, WPC and special materials. It currently exports 95% of its equipment, with more than 5,600 machines sold worldwide and more than 1,700 customers.

► **PLAS MEC S.R.L.**  
www.plasmec.it

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## 中国工厂生产的Keltan® 三元乙丙橡胶 ( EPDM ) 成功地进入市场

■ 中国的Keltan® EPDM工厂阿朗新科 ( ARLANXEO )，采用拥有专利的Keltan ACE™ 技术生产优质产品，有能力满足中国及整个亚洲客户的要求。工厂于2015年成立，预期开始阶段生产全部品种的产品，额定生产能力为每年十六万吨，包括高门尼值和低门尼值的产品。客户已经作出了评估，认可并成功地应用了来自这家工厂的产品。公司研发部门主管Gerard van Doremaele 说道：“Keltan ACE™ 催化剂技术，2013年由ARLANXEO在其位于荷兰Geleen的EPDM生产线首次实施，有着若干技术优势并能够生产出高质量的EPDM产品。起初，公司通过许可证方式从诺瓦化工 ( Nova Chemicals ) 获得了先进的催化剂系统，随后做了进一步开发，并针对EPDM产品进行了特殊订制。在阿朗新科我们利用高通量实验技术和设备，能够快速筛选催化剂配置和从根本上认识我们的催化剂技术。”通过这种在茂金属之后的先进的催化剂技术，阿朗新科能够采用可持续的方式生产全部种类的EPDM。Keltan ACE™ 催化剂技术的优点如下：

- 从低门尼值直到超高的门尼值，包括油扩展级；
- 超快固化级，且ENB水平往往能超过7wt%；
- 使用Keltan®的可控长链分支技术，实现加工工艺和物理特性的平衡；
- 非常清洁的产品，超低催化剂残留和超低氯含量；
- 高质量，从根本上避免凝胶的产生，产品满足苛刻应用要求例如用于汽车海绵。

Keltan® EPDM 弹性体具有非常出色的耐水，耐臭氧，耐紫外线及耐风化特性，在很宽的温度范围内都具有良好的动态特性，以及高水平的耐热性，高水平的适应性和耐用性，以及卓越的电性能。这些优点使得Keltan® EPDM适合于许多种工业用途，包括汽车、建筑和结构、塑料改性、消费品、电缆和电线，以及导管。Keltan® EPDM 有着良好的加工和处理特性，符合全球的安全、健康和环境保护规程。



(Image: ARLANXEO)

### ■ Products from the Keltan® EPDM plant in China successfully introduced in the market:

The Keltan® EPDM plant in China provides ARLANXEO with the ability to serve customers in China and throughout Asia, with premium products based on the proprietary Keltan ACE™ technology. The plant, which started up in 2015 and has a nameplate capacity of 160,000 metric tonnes /year is producing the full range of products as envisaged at start-up, including high and low Mooney grades. Customers have evaluated, approved and successfully applied the products from the plant.

"The Keltan ACE™ catalyst technology, which was first implemented in 2013 by ARLANXEO at its EPDM line in Geleen, the Netherlands, has several technological advantages and results in high quality EPDM products", says Gerard van Doremaele, Head of R&D. "The original Advanced Catalyst system, obtained via a license from Nova Chemicals, has been further developed and especially tailored for EPDM production. At ARLANXEO we make use of High Throughput Experimentation technology and equipment to allow for fast screening of catalyst configuration and fundamental understanding of our catalyst technology." With this post-metallocene advanced catalyst technology ARLANXEO is able to produce in a sustainable fashion the

full EPDM portfolio. Keltan ACE™ catalyst technology leads to:

- Low to ultra-high Mooney grades, including oil extended grades;
- Ultra-fast curing grades with ENB levels well beyond 7wt%;
- Grades using Keltan®'s Controlled Long Chain Branched technology for well-balanced processing and physical properties;
- Very clean grades with ultra-low catalyst residues and chlorine levels;
- High quality, intrinsically gel free produced, grades for demanding applications like automotive sponge.

Keltan® EPDM elastomers are characterized by superior resistance against water, ozone, UV and weathering; good dynamic properties over a wide temperature range, as well as a high level of heat resistance; a high level of flexibility and durability; and excellent electrical properties. These make Keltan® EPDM suitable for many applications in industries spanning automotive, building & construction, plastics modification, consumer goods, cable & wire, and tubes. Keltan® EPDM has good processing and handling properties, and complies with global safety, health and environmental regulations.

➔ ARLANXEO Holding B.V.  
www.arlanxeo.com

## 科莱恩强调为中国的可持续发展需求提供支持

■ 全球领先的特种化学品公司科莱恩将中国作为其第二届可持续发展对话高峰会的关注点。在此次于上海举办高峰会上，科莱恩强调了在中国“新常态”和“十三五规划”的背景下，帮助客户应对大趋势，满足其可持续发展和创新需求的承诺。

逾200名中国客户、经销商、供应商和政府部门代表参加了此次会议的主论坛、专题讨论和分组会议。科莱恩专家和外部专家在会上就中国的可持续发展挑战和绩效提出了各自的真知灼见。当前，中国政府正在积极引导客户和市场采用更加可持续的解决方案。通过提供可持续性的产品和服务，科莱恩将为行业响应环境保护、全球化与城市化、资源和能源这三大全球趋势提供支持。

科莱恩高层代表在会上展示了一系列创新产品，例如：能够减少有害工业排放物的解决方案、能够保障全球食品可持续性供给的肥料生产和作物保护解决方案、农业废弃物转化为生物燃料的解决方案，以及安全环保的建筑防火解决方案等。

此次高峰会还展示了一系列在本地及在全公司范围内开展的环保及社会责任项目，并与与会者互动。例如：向本地客户提供的EcoTain®产品、满足特定可持续性标准的科莱恩产品组合、致力于推进中国教育可持续发展的HOPES社区项目（截至目前，该项目已经使800多名青少年受益）。

近日，执行委员会成员顾培楠（Christian Kohlpaintner）已赴中国任职。此举反映了科莱恩支持中国客户的高度承诺。顾培楠的职责之一是负责领导位于上海的科莱恩一体化园区（OCC）项目团队。科莱恩一体化园区是一个包括了区域总部和全新的区域研发中心的综合性设施，该园区计划于2019年第一季度完工。

执行委员会成员顾培楠评论道：“为了更好地向中国及更广泛地区现有和未来客户提供支持，在中国派驻公司最高执行管理层代表，并有针对性地投资工厂和基础设施对科莱恩而言非常重要。此举反映了我们对所做承诺的高度重视。环境和社会责任是未来取得经济成功的基础。通过提供可持续性增值的产品，我们能够为中国未来发展做出积极的贡献。利用‘可持续发展对话’和‘开放式创新’网站平台

等全球性举措，我们将促进与当地创新者的联系，鼓励与更多相关方的对话和合作，实现可持续的成功。”

■ *Support for China's sustainable development needs emphasized:* Clariant gave center-stage to China's sustainable development at its second Sustainability Dialog Summit. Held in Shanghai, this year's event underlined Clariant's commitment to helping customers respond to the Megatrend-driven sustainability and innovation needs reflected in China's New Normal and 13th Five-Year-Plan.

More than 200 Chinese customers, distributors, suppliers and authorities joined presentations, panel discussions and parallel sessions offering insights from Clariant specialists and external experts on China's sustainability challenges and performance. With the government now actively influencing customers and markets towards more sustainable solutions, Clariant demonstrated its proactive support through products and services linked to three global Megatrends affecting the country and its manufacturing framework: Environmental Protection; Globalization & Urbanization; and Resources & Energy.

Senior management representatives presented innovative products addressing aspects such as the reduction of harmful industrial emissions, fertilizer production and crop protection solutions to sustainably safeguard world food supplies, options to convert agricultural residues into biofuels, and safe, environmentally-compatible fire protection for buildings.

Company-wide and specific local environmental and social responsibility initiatives to support the country's progress were presented to the engaged audience. For example, regional availability of EcoTain® products, Clariant's portfolio screened against specific sustainability criteria, and the dedicated HOPES community program to promote education and sustainable development in China, which has benefitted



## 科莱恩可持续发展对话高峰会

科莱恩强调为中国的可持续发展需求提供支持。（照片：科莱恩）

*Clariant emphasizes support for China's sustainable development needs (Photo: Clariant)*



## Clariant SUSTAINABILITY DIALOG SUMMIT

more than 800 young people to date. The company's high level of commitment to supporting its Chinese customers is reflected in the recent relocation to China of Executive Committee Member Christian Kohlpaintner. As part of his responsibilities, Kohlpaintner is steering the project team behind Clariant's One Clariant Campus in Shanghai, an integrated facility with Regional Headquarters and a new regional R&D center, scheduled for completion in Q1 2019.

Executive Committee member Christian Kohlpaintner, commented: "Having a Chinese presence at top executive management level and targeted investments in plants and infrastructure is very important to Clariant's support for current and future customers in this country and the wider region. It reflects how seriously we take our commitment. Environmental and social responsibility are fundamental to future economic success and by offering products that add value through sustainability, we can make a positive contribution to the future development of China. Through global initiatives like the Sustainability Dialog and our Open Innovation website platform we will foster connections with local innovators and encourage dialog and collaboration to achieve sustainable success."

► **Clariant International Ltd**  
[www.clariant.com/en/Sustainability/Sustainability-Dialog-in-China](http://www.clariant.com/en/Sustainability/Sustainability-Dialog-in-China)

# 薄膜挤出：2016 德国K展上的技术创新 操作更容易，性能更强大，耗能更减少

## *Filmextrusion: Technological innovations for the K 2016 Easier production operation, more performance, less consumption*

**智能化的生产线管理：  
简化的生产线操作以及更高的生产线使用率**

不断地提升速度和产量，更短的交货时间以及对品质日益增长的要求使得运行拉伸薄膜线成为一个高度复杂的业务。薄膜生产商及其操作人员在应对越来越多的挑战之时，同时要保证一个稳定和高效的生产和最高品质的薄膜。

这就是布鲁克纳的“智能生产线管理”(ILM)发挥作用的地方。这是一个集成的解决方案，为布鲁克纳的客户的“智能生产”和“工业4.0”做好准备。这里的重点在于生产线的崭新操作方法，把重点放在工艺角度而不是在传统的机器角度。它是通过增加辅助系统来支持这种崭新的操作理念。

随着“能源监控”已用于监控所有生产线的组件能耗，布鲁克纳公司开发出新的工具和辅助系统用于在线测量和直接影响薄膜的重要参数值，如温度，雾度，分子定向角度或密度和孔隙度。对于薄膜生产带来各种各样的优势：

- 采用调节明显较少的工艺参数来简化生产线操作，直观地指导使用者生产数据清晰和可跟踪
- 有针对性地在线控制薄膜性能以获得稳定的高薄膜质量
- 在出现故障时，通过较短的反应时间来增加生产线的使用率
- 效率、生产力和灵活性通过如“快速产品更换”(关键字：按时交货)或“能源监控”辅助系统得以实现

薄膜生产商将发现在不受环境，时间，气候和天气的状况下，在世界各地更容易地生产出最高质量的薄膜。

### 10.4米工作幅宽的BOPET线

目前生产双向拉伸聚酯薄膜(BOPET)线的成熟工作宽度是8.7米。在2016德国K展上，布鲁克纳机械公司将首次向世界展示生产线幅宽为10.4米的概念。这将满足对BOPET更高生产力的要求。新线的速度可以达到已经验证的515米/分钟速度，产量将增加约20%。薄膜生产商可受益于布鲁克纳机械公司在许多10米工作宽度的成功项目经验，降低特定的生产成本以及能耗，从而获得更好的整体盈利能力。



*Specialty Film Line (Images: Brückner Maschinenbau)*

### **Intelligent Line Management: Simplified line operation and higher line availability**

Continually increasing speed and output with ever shorter delivery times and growing demand for quality make running a film stretching line a highly complex business. Film producers and their operating personnel stand before increasing challenges when it comes to guaranteeing a stable and efficient production with the highest quality film.

This is where Brückner's "Intelligent Line Management" (ILM) comes in. This is an integrated solution which smooths the way for Brückner's customers' "Smart Production" and "Industry 4.0". The focus lies here on a new way of operating lines, putting the emphasis on the process view as opposed to the usual machine view. This new operating concept is supported by an increasing amount of assistant systems.

Along with the "Energy Monitor" which is already used to monitor energy consumption at all line components, Brückner has developed new tools and assistant systems for inline measurements and to directly influence important film values such as temperature, haze, molecular orienteering angle or also density and porosity. For film production this brings a variety of advantages:



### BOPP线：以更高的效率降低运营成本

布鲁克纳新设计的薄膜横拉滑动系统，速度提升超过600米/分钟。在此同时，使用新开发的材料使得减少超过50%的润滑油用量。将新设计与新开发的润滑相结合，是降低生产成本的基础。此外，这些新开发的润滑材料也可用于升级目前高性能的生产线。

新的收卷机系统配合了更高的生产线效率。在未来，布鲁克纳可将收卷机直径从1.55米增加到1.8米使得收卷长度可以增加40%以上。更长的收卷长度意味着更少换卷次数和更少的浪费，从而影响整条线生产力，转换时间和能耗。

- Simplified line operation with significantly fewer process parameters to adjust and intuitive user guidance
- Transparency and traceability of production data
- Targeted inline control of film properties for a consistently high film quality
- Increased line availability through shorter reaction time in case of malfunctions
- Efficiency, productivity and flexibility through assistant systems such as "fast product change" (key word: Just-in-time-delivery) or "energy monitor"

Film producers will find it easier to produce the highest film quality all over the world, independent of surroundings, time, climate and weather conditions.

### BOPET lines with 10.4m working widths

Nowadays the established working width for lines that produce biaxially stretched polyester packaging film (BOPET) is 8.7 m. For the K 2016 Brückner Maschinenbau presented a 10.4 m concept for the first time ever in the world. This will fulfil the demands for higher productivity in BOPET production: The new lines convince with around 20 % more output capacity with the proven speeds of up to 515 m/min. Film producers can hereby profit from Brückner Maschinenbau's experience from many successful projects with over 10 m working widths, from fewer specific production costs as well as reduced energy consumption and therefore better overall profitability.

### BOPP lines: Lower operating costs with higher efficiency

Brückner's newly designed sliding system for transversely stretched film means speed increases from over 600 m/min. At the same time newly developed materials led to a reduction of the lubrication use by more than 50 %. The new design in combination with newly developed lubrication is the basis for lower production costs. Furthermore these newly developed lubrication materials are also available for upgrades on current high-performance lines.

A new winder system caters for higher line efficiency. In the future Brückner lines can take 40 % more winder length by increasing the winder diameter from 1.55 m to 1.8 m. More winder length means fewer roll changes and therefore less waste, which effects productivity, changeover time and energy consumption for the entire line.

### BOPA: Higher yield on simultaneous lines

Brückner has noticed a growing interest in the market for polyamide packaging films and offers a selection of line types. Brückner's LISIM (Linear Motor Simultaneous Stretching) simultaneous stretching process is enjoying an increased demand as BOPA film can be produced in the highest quality and with optimized finishing characteristics. For the K 2016 the company presented LISIM BOPA lines with a working width of 6.6 m, instead of the usual 5.1 m. This increases output by a good 30% and substantially increases productivity.



BOPP Line

### BOPA: 同步拉伸线的更高得率

布鲁克纳已注意到市场对尼龙包装膜日益增长的兴趣，并提供多种类型的生产线。布鲁克纳LISIM（线性电机同步拉伸）同步拉伸工艺正是可以满足生产最高质量和具有优化特性的BOPA薄膜而不断增加的需求。在德国K展上，公司将展示6.6米工作宽度的线性电机同步拉伸（LISIM）BOPA生产线，而不是传统的5.1米。这增加30%的产量并极大地提高了生产力。

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# 薄膜挤出：新型服务驱使薄膜生产跨步向前

## Filmextrusion: New Service offers Drives Film Production forward

在2016年K展上，布鲁克纳的“Servtec”为优化薄膜拉伸生产线提供了更大范围的服务。

### 特殊产品的完整服务包：提升产量

包装膜领域高性能线的投资对老线和小线的竞争力不断加压。新型完整的升级包使膜生产厂家转向高产特殊线成为可能。

这包括所有必要的转换和现代化的方案。根据生产线的目标产品及现实情况，为生产线转换而量身定做。这一服务包也可以安装并集成到非布鲁克纳的生产线！

- 阻隔层袋包：用于透明膜和阻隔膜生产。这种产品避免了进一步的比如复合这样的转换步骤，并采取“一步到位”的工序极大地降低生产成本。与此同时，由此产生的碳排放可以最多降低达75%。

- 消光膜包：用于特殊属性的高质量膜生产。在挤出和模头区域的改造不仅在整个幅宽提高质量，还可以增加产出。

### 提供新型全球服务

#### 备件和生产线审核

新型备件审核服务的一大焦点是优化维修工作，规划备件需求。通过对生产线状况和备件库存的现场检查，规划必要的工作，节省存放数量。此外，生产线审核可以进行业务分类标记，为自身的生产提供不同的视角。

#### 机器状态监测

薄膜生产商对自己的生产线越了解，运行就更有效。新型机器状态监测服务通过内置传感器（例如振动分析，节能



线路检查 / Line Inspection  
(Images: Brückner Servtec)

*Brückner Servtec presented an expanded range of services to optimise film stretching lines at K 2016.*

*Complete packets for special products: Increasing output* Investments in high performance lines for the packaging film field cause further pressure on the competitiveness of older and smaller production lines. New complete upgrade packages make it possible for film producers to convert to the high-yield production of special films.

These contain all the necessary conversion and modernisation measures. The extent of the conversion will be individually tailored, depending on the desired production characteristics and the current condition of the production line. The packets can also be installed and integrated into non-Brückner lines.

- *Barrier packet for the production of transparent and barrier film.* The production avoids further conversion steps like laminating and sinks production costs drastically with its “one-shot-process”. At the same time the carbon footprint is also reduced by up to 75%.

链和剪辑服务 / Chain and Clip Service



Markus Gschwandtner,  
常务董事 / Managing Director Brückner Servtec GmbH

措施等等)实时检测生产线状态。这一系统预先告知潜在的缺陷(预防性维修),可在下一次计划的维修停机期间解决问题。

#### 扩展的链条链夹服务

设在哥伦比亚,斯洛伐克,印度和中国的现有服务中心正在扩大他们的服务范围。现在所有链夹传动系统,无论是单一部件的周期性维护,还是整体翻新,包括淘汰的第三方系统,都可以得到专业的翻新服务。

#### 生产线搬迁和现代化的集成

在今天快速发展的市场中,现有生产线搬迁需求巨大。布鲁克纳技术服务有限公司一步满足您的所有需求:整条生产线搬迁的交钥匙工程,包括生产线的现代化同步升级。现代化升级和搬迁的无缝对接不仅可以节省成本,而且减少搬入生产线至新场地而重新投入生产的时间。

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- *Matt film packet for the production of high quality films with special properties.* Modifications in the extrusion and die areas raise the quality over the entire film width and increase the output at the same time.

#### New worldwide service offers

##### Spare part and line audit

Optimising maintenance work and planning spare parts requirements feature as the focus of the new Spare Part Audit Service. Necessary work can be planned and saving potential shown through on-site surveying of the line's condition and spare parts stock. Furthermore, line audits enable the benchmarking of a business in the industry and offer a differentiated view of one's own production.

##### Machine condition monitoring

The better a film producer knows their line, the more efficiently they can run it. The new machine condition monitoring service monitors the line's condition via built-in sensors (for example for vibrations analysis, energy consumption measurements etc.) round the clock. The system informs in advance about potential weaknesses (preventive maintenance), which can then be eliminated during the next planned maintenance shutdown.

##### Extended chain and clip service

The established service locations in Columbia, Slovakia, India and China are extending their offer. From now for all transport systems, from the cyclic maintenance of single components to a complete overhaul, inclusive selective third-party systems, can be professionally refurbished and serviced.

##### Line relocation and modernising rolled into one

The relocation of existing production lines in today's growing markets is very much in demand. Brückner Servtec offers film producers everything from one source: turnkey relocation of complete production lines including simultaneous modernisation. The seamless integration of the modernising work and the relocation process saves money and reduces the time until production at the new location can recommence.

## 格贝尔艾玛斯在2016 K展为薄膜行业展示过去及未来分切复卷解决方案 Past and Future of Slitting and Winding Solutions for Film Industry

10月19-26日,橡胶和塑料专业人士及企业将齐聚德国杜塞尔多夫K展,展示行业的最新解决方案及最先进的技术。在此次橡塑业全球首屈一指的盛会上,格贝尔艾玛斯将推出其最新的高性能分切复卷机。董事总经理老柯说。新的初次分切机系列适合于特殊的行业用途,例如电容器薄膜,电池隔膜以及用于工业或光学方面的厚膜。新机分为基础机型和具有先进功能及自动化技术的高配机型,宽度为4,000

Between October 19 - 26, plastics and rubber professionals as well as businesses gathered at K 2016, to discover the industry's newest solutions and state-of-the-art technologies. At the world's number one trade fair for plastics and rubber, GOEBEL IMS presented its newest high performing slitter rewinders. The new primary slitter series is suitable for converting special industrial applications such as capacitor films, battery

毫米至7,500 毫米，因此，它具有最大的灵活性，亦可保证最高分切质量。

一台于1939年销售的老式分切复卷机将向公众展示，该机一直服役至今。正如主题“分切复卷之家”所指，格贝尔艾玛斯展示了它在薄膜行业及特殊用途上多年积累的专业知识，并在过去与未来之间架起了一座桥梁，现今的智能型设备极大地提高了效率。凭借莫诺系列和艾特2代型分切机，格贝尔艾玛斯为薄膜分切设定了新标准。所有的分切复卷机都兼具高性能及最新技术。在K展上，格贝尔艾玛斯将推出新设计的莫诺系列分切机，它包括最大宽度9,000毫米的莫诺机型及最大宽度12,000毫米的莫诺巨人机型。这两种机型设计用于分切多种薄膜，从莫诺巨人机型专门分切的BOPP，到BOPET, OPP, CPP, BOPA, BOPS及其它特种薄膜。厚度在0.5至500微米的包装膜，电容器膜，电池隔膜及光学膜都可在莫诺系列分切机上分切，最高速度达1,500米/分钟，即使在最大速度下设备也可平稳地运行，并保证极佳的成品质量。新设计使最大放卷直径高达1,800毫米，复卷直径高达1,550毫米，复卷站的最大负载能力高达5,000公斤。

从2014年起，格贝尔艾玛斯推出的高端分切复卷机艾特2代为高效处理薄膜及软包装材料设定了新标准。该机最大工作宽度为3,600毫米，可分切厚度在2至400毫米之间的材料。在生产过程中，取决于材料的不同，该机最大速度为1,200米/分钟。新款艾特2代是一款通用机型，因其独特的设计理念，该机可进行全面调整及延伸以用于特殊用途，例如，分切光学用途的聚酯薄膜。该机在技术特性上也可进行

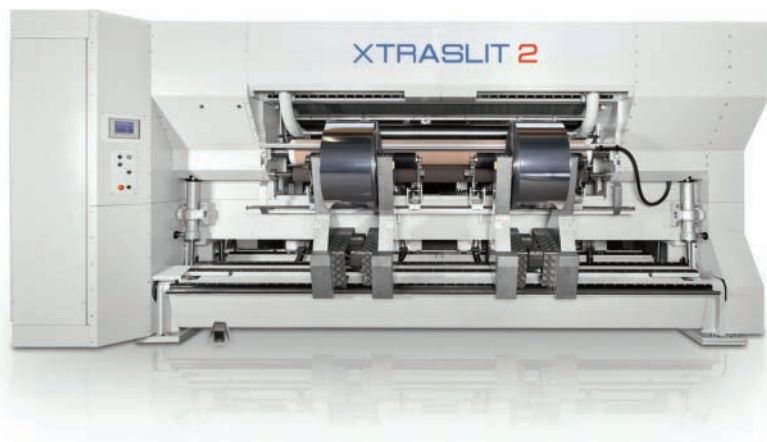


separator films or thick films for industrial or optical applications. Available either as a basic machine or with advanced technical functions and automation technology, the new primary slitter processes widths between 4,000 mm and 7,500 mm and, thus, offers maximum flexibility while guaranteeing highest quality.

A vintage slitter rewinder that was sold in 1939 and was used to produce films until 2016, was shown to the public. True to the motto “The House of Slitting and Winding”, GOEBEL IMS showcased their long-standing expertise in film industry and special applications and created a bridge between past and future, where smart production lines help to increase efficiency. With its MONOSLIT series and the XTRASLIT 2, GOEBEL IMS

sets standards in film converting. All slitter rewinders combine high performance and top quality with cutting-edge technology. At K show, GOEBEL IMS presented the newly designed MONOSLIT series, comprising the MONOSLIT with a working width of up to 9,000 mm and the MONOSLIT GIANT with a 12,000 mm working width. Both slitter rewinders are designed for converting a broad spectrum of films, ranging from BOPP materials for the MONOSLIT GIANT to BOPP, BOPET, OPP, CPP, BOPA, BOPS and other special films. Packaging, capacitor, battery separator and optical films with film thicknesses between 0.5 and 500 µm can be converted with the MONOSLIT series at a speed of up to 1,500 m/min, featuring an extremely smooth run at maximum speed while guaranteeing outstanding quality of the end product. The new design allows for an unwinding diameter of up to 1,800 mm and a rewinding diameter of up to 1,550 mm, with winding stations allowing for a maximum finished roll weight of up to 5,000 kg.

Since 2014, GOEBEL IMS' high-end slitter rewinder XTRASLIT 2 sets new benchmarks in the highly productive processing of films and flexible packaging materials. It is designed for a working width of up to 3,600 mm and can convert material thicknesses between 2 and 400 µm. Throughout the



调整—例如 分切收卷系统—以确保薄膜表面不被划伤，来满足客户的特殊要求，从而得到最大的性能和可持续的价值。

#### GOEBEL IMS

Goebelstr. 21, 64293 Darmstadt, Germany  
www.goebel-ims.com

process, the system permits speeds of up to 1,200 m/min, depending on the material. The newly XTRASLIT 2 is a universal machine and, thanks to its design concept, allows for comprehensive adjustments and extensions for special applications, e.g. polyester films for optical fields. The adaptation of technical features – for example the slitting and winding systems – ensure a scratch-free surface to fulfill customer-specific requirements and provide maximum performance and sustainable value.

## “不限于分切和收卷” „Beyond Slitting and Winding“

■ “不限于分切和收卷”：在K2016展会上，康普公司（KAMPF）将围绕着带状物料的分切和收卷技术展现全方位的服务，并展示出超出核心竞争力“分切和收卷”的扩展的产品组合。作为分切和收卷机械行业领先的制造商 康普公司提出的口号“不限于分切和收卷”，引入新的产品和未来产品的发展以满足市场增长的需求。这些新产品包括下面这些主题：仅举几个例子来说，工业4.0，网络和自动化，提升操作和生产效率的完整而且全新的详细的解决方案，在展台一侧，还进一步展出了型号为Microslit的窄幅分切机。

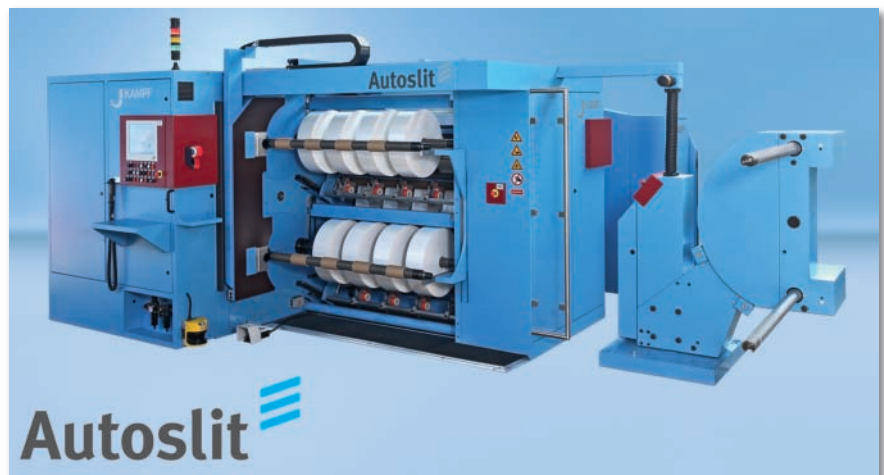
At the K 2016 KAMPF presented a comprehensive range of services around the slitting and winding technology for web-shaped materials and displayed an expanded portfolio which exceeds the core competence “slitting and winding”. Using the slogan “Beyond Slitting and Winding” KAMPF as the leading manufacturer of slitting and winding machinery introduced new products and developments for future production to meet the increasing market demands. These include topics like: industry 4.0, networking and automation, complete and new detailed solutions to improve operation and productivity to name only a few. The narrow width slitting machine type Microslit was presented beside further exhibits.

Kampf Schneid- und Wickeltechnik  
GmbH & Co. KG  
Muehlener Str. 36-42, 51674 Wiehl, DE  
www.kampf.de



窄幅分切机 Microslit  
*The narrow width slitting machine Microslit*

高性能双收卷分切机 turret slitter Autoslit III  
*The high performance dual turret slitter Autoslit III*  
(Photos: Kampf)



Autoslit

# 测量：管材和软管的挤出在严格的控制之中

## Measurement Technology: Extruded Pipe and Hoses under Tight Control

在K2016仲巴赫的展位上，用于生产管材和软管的在线测量和控制系统解决方案，新颖而又智能化，且投资回报率高，一直是备受关注的焦点。

### 测量和控制偏心率和壁厚，从而节省了原料：

通用型高技术超声波系统WALLMASTER 针对测量和监视壁厚这一特定应用提供了解决方案。测量数据处理器带有触摸屏显示，全自动地完成收集数据和质量控制。

将UMAC 扫描器和ODAC直径测量以及缺陷探测器结合在一起，测量和监控范围可以扩大到外径和内径、数据统计、质量过程管控以及与处理器的通讯。

使用仲巴赫WALLMASTER测量和控制系统，制造商可以节省其原料花费。投资回报周期ROI只需要几个月时间。这一系统的使用同样能够显著缩短开机时间。

### 多层复合塑料管材和软管的最佳化测量：

WALLSTARTER 是一种低成本处理器，用于UMAC® 超声波偏心率和壁厚测量装置，专门定制以满足测量和监视多层复合管材和软管的需求。

### 新型超声波扫描器，用于灵活地测量直径：

这种新奇的构造（专利申请中）将会成为展览会的亮点

*Novel and intelligent solutions as well as cost efficient solutions for in-line measurement and control of pipes and hoses have been the focus of Zumbach's exhibition booth at K 2016.*

之一：传感器可以进行独立调节也可以同步调节，只需数秒钟即可调节到最佳的测量位置。扫描器可测量的外径达180mm，代表了完全无接触在线式管材、软管和电缆护套偏心率和壁厚测量巧妙而简单的解决方案。

### 结合了激光和CCD感光元件技术的高端无接触型材和形状的测量

### 在线式测量任何种类的塑料和橡胶型材断面：

仲巴赫PROFILEMASTER 系统代表了在整个制造过程中测量和监视由塑料或橡胶制成的型材和管材尺寸和全部横截面精确而经济的解决方案。所有有关的尺寸如宽度，高度，角度和半径都汇总到一起，形成全部横截面图像。

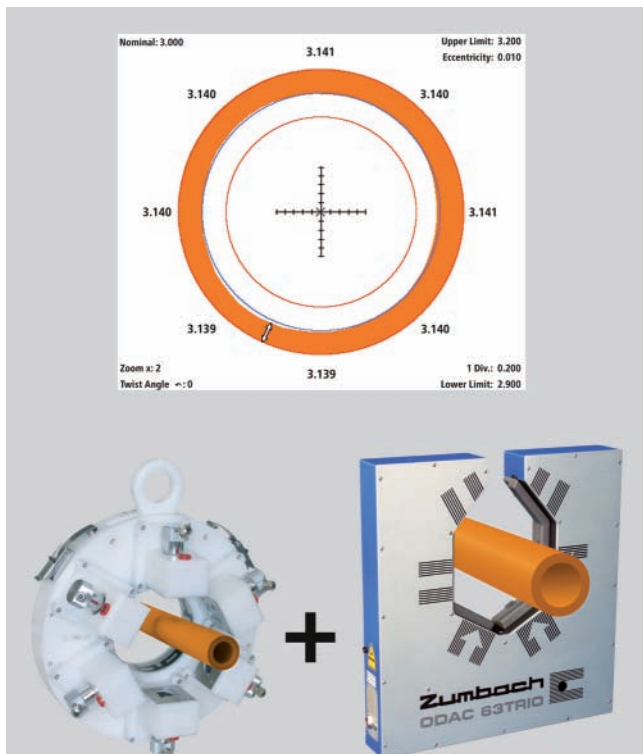
### 线性传感器技术性能价格比高，能够在挤出过程中对直径和椭圆度进行同步多轴测量：

独特的测量技术，适用产品外径可达200mm。

- 新产品生产线带有2套彩色LED光源，能够在每一轴（XY）同步扫描，甚至在产品振动时也能实现无故障测量。
- 安装有外部光线过滤器，防止了测量错误的产生，这类错误迄今为止曾被认为是无法避免的。
- 由于每一轴都采用了不同色彩的照明，甚至对于反光的表面也能获得完美的性能。

### OPC UA：透明的数据管理，简单地监视实时数据

- 仲巴赫采用得到公认的OPC UA标准配备到其强有力的仪器上。采用这种关键技术，就为测量结果提供了方便的、可扩展的和安全的信息交换平台，能够与生产线上的来自于不同制造商的不同系统之间实现数据交换。



WALLMASTER六个点显示超声波偏心度及壁厚测量横断面；左下：UMAC超声波偏心度和壁厚扫描仪；右下：ODAC激光直径扫描仪。/

*WALLMASTER cross section display of a 6 point ultrasonic eccentricity and wall thickness measurement; bottom left: UMAC ultrasonic eccentricity and wall thickness scanner; bottom right: ODAC laser diameter scanner (Image: Zumbach)*

### *Material savings thanks to measurement and control of eccentricity and wall thickness:*

The versatile high-tech ultrasonic system WALLMASTER offers application-specific solutions for measuring and monitoring wall thickness. The measuring data processor with touch-screen display gathers data and QC fully automatically.

In combination with ultrasonic UMAC® scanners and various ODAC® diameter measuring gauges as well as with error detectors, the measuring and monitoring scale can be expanded to outside and inside diameter, statistics, SPC and processor communication.

Using Zumbach's WALLMASTER measurement and control systems, manufacturers can economise their expenditure of raw materials. The ROI is achieved within a few months. The use of these systems also allows reducing considerably the start-up time.

### *Optimized measurement of monolayer synthetic pipes and hoses:*

WALLSTARTER – the low-cost processor solution for UMAC® ultrasonic eccentricity and wall thickness measuring is tailored to the requirements of the measuring and monitoring of monolayer synthetic pipes and hoses.

### *New ultrasonic scanners for flexible diameter adjustment:*

This novel construction (pat. pend.) is going to be one of the exhibition's highlights: the transducers can be either individually or simultaneously adjusted to the best possible measuring position within seconds. The scanners cover an outside diameter up to 180 mm and represent a smart and simple solution for full non-contact, in-line eccentricity and wall thickness measurement of tubes, hoses and cable jackets.

### *High-end Non-contact Profile and Shape Measurement, Combining Laser and CCD Technology*

***In-line cross-section measurement of plastic and rubber profiles of any kind:*** The PROFILEMASTER systems from Zumbach represent an accurate and economical solution for measuring and monitoring dimensions or even the complete cross-section of profiles and pipes made of plastics or rubber – throughout the manufacturing process. All relevant dimensions such as width, height, angle and radii are added together to form the full cross-sectional picture.

***Linear Sensor Technology allows cost effective, synchronous multi-axis Measurement of Diameter and Ovality in Extrusion Processes:*** Unique measurement technology for products up to 200 mm outside diameter:

- A new product line with 2-coloured LED light sources allowing simultaneous scanning in each axis (XY\*) and thus trouble-free measurement even with product vibration.
- Integrated extraneous light filters prevent occurrence of measurement errors that to date seemed unavoidable.
- Perfect performance even with reflective surfaces thanks to the use of different colour lighting for each measurement axis.

***OPC UA: Transparent data management – simple monitoring in real-time:*** ZUMBACH equips its powerful instruments with the recognized OPC UA standard. With this key technology, measurement solutions provide easy, scalable and secure information exchange with different systems in the production line – Platform and manufacturer-independent data exchange.

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## 乐必得推出下一代塑料粉碎机 - 猛龙系列 *Next-Generation Shredders for Plastics*

粉碎技术专家乐必得粉碎机公司 ( Rapid Granulator ) 推出一款新型塑料粉碎机：猛龙系列 ( The Raptor Series )。这些模块化设计装置采用世界首创的“开放式”设计，其他显著设计特点包括一个独特的切割系统、后倾料斗和集成造粒设计。猛龙系列基于70年多年来在粉碎方面积累的知识进行设计，目的是以尽可能低的拥有成本，最大限度地提高生产力。2016年K期间，猛龙系列在乐必得粉碎机的展台展出。

“猛龙系列是一款粉碎机兼造粒机，既拥有粉碎机重型切割技术，又拥有造粒机的特点，同时乐必得“开放式”设计，可使其操作、服务和清洁都非常容易”乐必得全球销售和营销总监Bengt Rimark介绍说。“猛龙系列的研制100%专注于对塑

Size-reduction technology specialist Rapid Granulator is introducing a new family of shredders for plastics: The Raptor Series. These modularly designed units feature a world-first with their “open-hearted” design. Other notable design features include a unique cutting system, tilt-back hopper, and design for integrated granulation. The Raptor Series has been designed using the more than 70 years of accumulated knowledge in size reduction, in order to maximize productivity with a minimum cost of ownership. During K 2016, the Raptor Series was on display at the Rapid Granulator booth.

The Rapid “open hearted” design of the Raptor enables quick and direct access to the shredder rotor and cutter chamber,



猛龙800 – 来自乐必得全新粉碎机系列的“开放式”粉碎机之一。  
(摄影：乐必得粉碎机)

*Raptor 800 – One of the “Open Hearted” shredders from Rapid new shredder series (Image: Rapid)*

料处理机至关重要的每一个细节，简化所有操作并最小化拥有成本。在开发和制造造粒机和粉碎机时，我们会确保量身定做机器，并且可以提供直接来自乐必得的完整回收系统。”

猛龙系列的快速“开放式”设计能快速直接操作粉碎机转子和刀盘隔仓，这极大地简化了清洁和服务过程。通过铰接在侧的前门板，可不受限制地操作安装在门上的转子和筛网。一旦前门板打开，安装在后部的粉碎机料斗可以向后斜。

乐必得猛龙系列具有36种基本架构，以便处理各种客户应用。模块化系统有两种直径和两种宽度（31.5”和53”/800 mm和1.350 mm）。以下两种系统设计 - FlexiPUSH和PowerPUSH，用于将材料推入转子。PowerPUSH具有延长的推杆长度（PowerPUSH-XT），还有三种不同的切割系统：Quad Cut、Claw和Power Wedge。

凭借可便利和快速地完成清洗和维护，全新猛龙系列实现了低拥有成本。该机器停止运行后一分钟内就可以完全打开。一旦开启机器，所有紧固件都可使用气动工具从外部操作。“开放式”设计带来的操作便利性使得任何污染无所遁形。

使用电动操作的千斤顶开启倾斜料斗，单个操作员就可处理筛网和颗粒仓。独特的筛网托架设计，不需要除去螺栓就能移除筛网，并且颗粒仓可轻易滑出。使用同一种工具就可解锁前门板和旋转转子。作为选件，可以装配灯具以提供额外照明。

FlexiPUSH的目的是处理基本应用（包括块料）的气动推杆。它可以处理大型产品，如1200-L IBC（中型散装容器）。液压驱动PowerPUSH最大化输出切碎片材和残膜。切割室配有纹理地板，以减少材料粘附或阻止材料在推杆下排出去的风险，并具有5度的偏移，以便排走液体。

用于一般废塑料的独特QuadCUT切割系统具有一把坚实的刀具，可充分利用四个刀刃。切割系统非常耐用，并具有坚如磐石的夹紧系统将刀具依附在转子上。刀具由耐磨垫圈支持，以便保护转子，防止非塑性材料意外进入切割室。

猛龙粉碎机系列的基底还配有乐必得MCB（矿物复合基底）功能，能吸收操作过程中的应力和振动，并为碎纸机提供一个非常坚实的基础和低重心。

也可以在乐必得DUO概念中配置猛龙系列，即配备直接位于粉碎机输出口下方的落地式造粒机。

drastically simplifying the cleaning and service process. The front door, hinged on the side, provides unrestricted access to the rotor and to the screen, which is mounted in the door. Once the front door is open, the shredder hopper mounted on a rear hinge can be tilted back.

Rapid offers 36 base configurations of the Raptor in order to handle various customer applications. The modular systems feature two diameters and two widths (31.5” and 53”/ 800 mm and 1.350 mm). There are two system designs for pushing material into the rotor – FlexiPUSH and PowerPUSH. The PowerPUSH is available with an extended pusher length (PowerPUSH-XT); there are also three different cutting systems: Quad Cut, Claw, and Power Wedge.

The low cost of ownership of the new Raptor Series is accomplished through the ease and speed with which it can be cleaned and maintained. The machine can be in a completely open position in less than one minute after it has stopped running. Once the machine is open,

all fasteners are accessible from the outside using air driven tools. The access made possible by the “open hearted” designs makes any contamination immediately visible.

The tilting hopper opens with an electrically operated jack, while the screen and granule bin can be handled by a single operator. The screen cradle design does not require the removal of bolts in order to remove the screen, and the granule bin slides out easily. The same tool is used to unlock the front door and to rotate the rotor. As an option, a light can be fitted to provide extra illumination.

The FlexiPUSH is a pneumatically driven pusher and is intended for handling basic applications, including lumpy materials. It can handle large products such as a 1200-L IBC (Intermediate Bulk Container) for example. The hydraulically powered PowerPUSH maximizes output for shredding sheet and film. The cutting chamber features a textured floor to reduce the risk of material adhering or finding its way under the pusher and is offset by 5 degrees to enable liquids to drain away.

The QuadCUT cutting system for general plastic waste features a solid knife that allows the full use of all four cutting edges. The cutting system is extremely durable and has a rock solid clamping system attaching the knife to the rotor. The knives are supported by a sacrificial washer in order to protect the rotor should non-plastic material accidentally enter the cutting chamber.

The base of the Raptor Shredder series is also equipped with the Rapid MCB feature (Mineral Composite Base) which absorbs stress and vibration during operation and gives the shredder a very solid footing and a low center of gravity.

The Raptors can also be configured in the Rapid DUO concept, with a floor-standing granulator located directly beneath the output of the shredder.



## “初次亮相，但十分出色” „Excellence is just the beginning“

Contrex首次参加K展并接待来宾。Contrex将展出其在塑料自动化领域尤其是挤出工程应用方面的最新的发明创造，可应用于管材，型材片材和吹塑薄膜领域。这些创新包括来自四个各具特色类别的产品，包括：冷却环，称重计量，过程控制以及测量和控制。对Contrex来说，K2016同样提供了机会，展现其作为Moretto S.p.A.企业集团新成员资格。

在K展上，Contrex重点推介其Atlantis™ 23T冷却环。Atlantis23T旨在大幅度地减少开机时间，是一种创新型高性能自动化多风道风环，采用分区热调整方式自动而精确地进行厚度调整。采用这一系统可以大幅度降低膜泡整个圆周上的厚度公差并补偿融体流动差异和可能的偏差。在展会上，Contrex还将重点推介称重计量技术开发取得的突破性进展，即新型Gramixo™连续称重批次混料机，可为挤出行业提供具有一流特性的称重计量。建立在经过实践检验的Moretto设计基础上，新型Gramixo产品的特点是采用传统的双闸板活门，配料的批次速度可以达到25毫秒。位于其中心的定量给料器采用倾斜搅拌器，安装在双称重传感器上，提供精密的混合重量，保证了精密称重并具有累加器功能，可提供当前消耗的实时报告和指定报告。

参加K展的来宾还有机会了解到Contrex的产品范围，亲眼目睹Navigator 9000™系统，这是一套用于管理风环、计量系统和闭环热调节的综合系统。这种Navigator单元集中协调所有关系到薄膜膜泡的部件，每个生产参数都由强有力的中心服务器控制和管理，中心服务器利用特殊专利的批次计时系统算法，可以自动地保证在仅仅两分钟内即可开始生产。系统采用15”彩色触摸屏显示器，用户可以看到生产状态以及管理所有生产参数，并进行总的过程控制。

For or the first time Contrex attended and hosted visitors at the K Trade Fair. Contrex showcased its latest innovations in the area of plastic automation specifically engineered for extrusion applications including: tubes, profiles, sheet, and blown film. This is including a cross section of products from across four distinct product families, including: Cooling Rings, Gravimetric Dosing, Process Control, and Measurement & Control. K 2016 also presented the opportunity for Contrex to showcase its new membership as part of the Moretto S.p.A. group of companies.

Displayed at K, Contrex highlighted its Atlantis™ 23T cooling ring. Designed to drastically reduce the time of production startup, Atlantis 23T is an innovative high-efficiency automatic multi-flow air ring with sectoral thermal modulation for accurate and automatic thickness adjustment. With this system it is possible to drastically reduce the thickness tolerances along the entire circumference of the bubble and compensating the channeling of the melt flows and possible misalignment.

During the show Contrex also highlighted breakthrough developments in gravimetric dosing with the announcement of the new Gramixo™, a continuous gravimetric batch blender offering industry first features in gravimetric dosing for extrusion. Building on a proven Moretto design, the new Gramixo features a traditional double-eyelid shutter capable of 25 millisecond batching speed. At the heart of the doser an inclined mixer will be find offering precision mixing weighed on a double load-cell to ensure precision weighing and featuring a totalizer function that provides real-time and on-demand reporting of actual consumption.

Bringing together Contrex's range of



NAVIGATOR 9000

products visitors to K had the opportunity to see first-hand the Navigator 9000™, an integrated system for the management of the cooling ring, dosing system and thermal modulation in a closed loop. The Navigator unit centrally coordinates all the production around the bubble film. Each production parameter is controlled and managed by a powerful central server that utilizes a special proprietary batch timing system algorithm capable of automatically ensuring production starts in only two minutes. Using the included 15" color touch-screen display users are able to view production status as well as manage all of the production parameters for total control of the process.

CONTREX srl.  
www.contrex.it

# 挤出技术：conEX NG挤出机：满足全球性的生产力最大化需求

## Extrusion Technology: conEX NG – Maximum Productivity for Global Demand

在K 2016巴顿菲尔辛辛那提公司展台，观众期待的将不是一个首展产品，而是两个。除新型solEX NG高速单螺杆挤出机系列外，还将展出新型锥形双螺杆挤出机系列，新的conEX NG挤出机。该挤出机系列有三个型号，可满足全球挤出行业当下需求：设备高度灵活性，低成本生产各种不同的高品质产品。

*At the booth of battenfeld-cincinnati, visitors could expect not one, but two premieres this year. In addition to the new solEX NG high-speed single screw extruder series, the machine manufacturer also presented a new conical twin screw extruder series. The conEX NG series, consisting of three models, fulfills all current demands of the global extrusion industry for the flexibility required to produce a wide range of different high-quality products at low cost.*

作为在挤出机领域拥有50多年经验积累的专家，巴顿菲尔辛辛那提深刻了解挤出加工及其应用市场的变化，以至客户的具体需求。新型conEX NG挤出机是巴顿菲尔辛辛那提推出的一款面向全球市场的机型，配置有坚固、结构灵活的驱动装置，并改进了螺杆调温系统。由于螺杆芯部的结构设计相同，可方便地按需配置控温系统，从而满足不同应用市场和终端产品的要求。机器还能满足不断增大的模头背压的要求，能够在高达520 bar的长期加工压力下稳定工作。

为了实现较其经过长期实践验证的前身konos和conEX系列有显著改进，并与竞争厂商的挤出机相比较，巴顿菲尔辛辛那提全新推出conEX NG锥形挤出机系列。



得益于全新加工单元，新的conEX NG系列挤出机提供极高灵活性，及最佳性价比

*Thanks to its new processing unit, the new conEX NG extruder series offers high flexibility as well as an excellent price/performance ratio (Picture: battenfeld-cincinnati)*

As an extruder specialist with more than 50 years of experience, battenfeld-cincinnati is thoroughly familiar with the requirements of the market and the needs of its customers. With the new conEX NG, the machine manufacturer is launching a global machine which offers a robust, mechanically flexible drive train and an improved screw tempering system. Due to the identical mechanical design of the screw core, the latter can easily be adapted to different temperature control systems and consequently to different markets and end products. The machine also caters to the continuously increasing tool back pressures and is able to operate under a permanent process pressure of up to 520 bar.

In order to achieve significant improvements with the

在工艺技术方面全面进行了重新设计，较长的预热区和经过优化的螺杆设计可实现更高的挤出产量。同时，新的几何结构可保证加工过程中机械运动产生的剪切热与输入的热能实现最佳平衡，从而实现PVC类材料的更稳定地加工。新设计还可以减小机器磨损，同时保证仅采用一种螺杆结构即可以加工多种不同的材料混配料。

近年来，挤出加工的众多终端制品几何结构越来越复杂，壁厚则越来越薄，模头需要承受的压力也越来越高。conEX NG挤出机结构坚固，可以承受高达520 bar的模头背压。这一新的锥形双螺杆挤出机还能满足共挤解决方案不断提高的需求。有几种节省空间的款式或底座设计可选。由于改进了高度和倾角调节装置，能够极佳地适应各种共挤加工的标准挤出机需求。

全新设计的conEX NG的其他优点包括极小的占地空间、高性价比，和极低能耗。因此，conEX NG挤出机能够与巴顿菲尔辛那提的多种机器完美匹配，其中包括适用于管材、型材、热成型片材和造粒的各种挤出机。

**battenfeld-cincinnati**

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conEX NG series compared to its own proven konos and conEX predecessor series, but also compared to extruders offered by its competitors, battenfeld-cincinnati has completely re-designed its conical extruders in terms of process technology. A longer pre-heating zone and an optimized screw design provide higher outputs. At the same time, the geometry concept ensures a balance between mechanical energy input over shear and thermal energy input, which increases the bandwidth of PVC-based materials to be processed. This minimizes machine wear and simultaneously ensures that a great variety of material blends can be processed with just one screw configuration. The sturdy mechanical machine structure enables the extruder to handle the high tool back pressures of up to 520 bar resulting from the more and more complex geometries and thinner wall thicknesses of the end products. The conEX NG is also the right answer to the increasing demand for co-extrusion solutions. It is available with several different space saver or pedestal designs and can be optimally adapted to every basic extruder, thanks to improved height and tilt adjustment facilities. Further advantages of the completely revised conEX NG are a reduced footprint, high price performance ratio and lower energy consumption. In this way, conEX NG extruders fit perfectly into the wide range of machinery from battenfeld-cincinnati, in which suitable extruders for pipe, profile, thermoforming sheet and pelletizing applications can always be found.

Read all issues online! [www.extrusion-info.com](http://www.extrusion-info.com)

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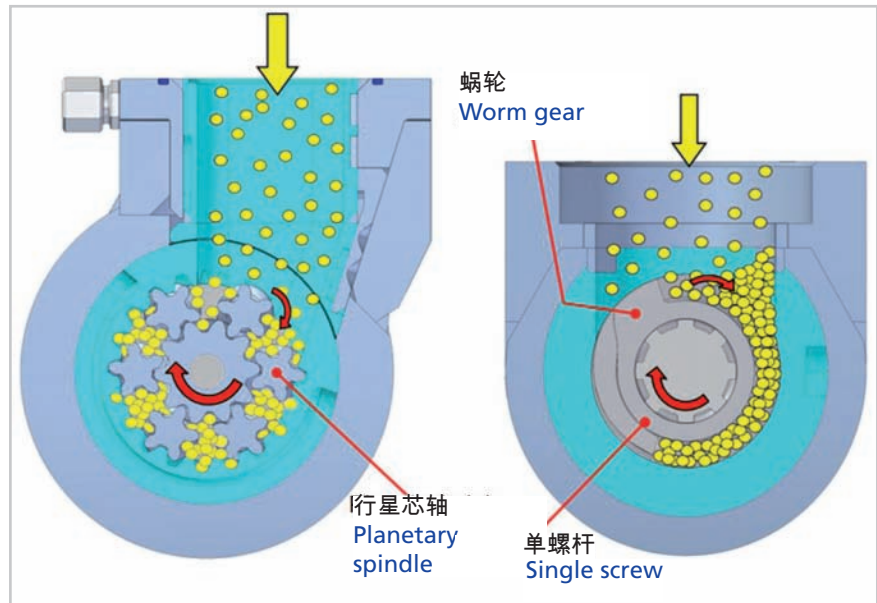
VM Verlag

# 挤出技术：K2016展出世界首创技术!

## Extrusion Technologies: World first K 2016!

恩太思公司 ( ENTEX Rust & Mitschke GmbH ) 是一家德国家族企业，勇于在挤出技术的开发方面再次跃上台阶：行星辊子挤出机 ( PRE ) 是公司的核心产品，已经经历了三次重要的技术开发进程。

*ENTEX Rust & Mitschke GmbH is a german family business, which dared to take another leap in the development of extrusion technology: The planetary roller extruder (PRE), which is the core product of the company, has undergone three significant development steps.*



喂料机构对照原理图:左边是行星辊子挤出机喂料区,右边是单螺杆挤出机喂料区  
*Schematic comparison of feeding mechanisms: The PFS on the left, a single screw on the right*

### 行星喂料区

PRE的喂料区域是与单螺杆相同的传统设计，但新工艺的产生和新的应用场合对新创意提出了要求：行星喂料区 ( PFS ) 是对行星辊系统持续不断地进行开发的又一个里程碑。PFS完美无缺地结合到恩太思公司模块化的结构单元系统中，与单螺杆加料区域有所不同的是，PFS能够满足所有规格产品加工工艺的需求，这是行星辊子挤出机享有盛名的关键因素。这一开发成果的核心，是不需要走弯路，在挤出机的几乎任何位置都能直接将任何原料喂入加工单元。这种特性提供了一种更为精简而有效率的工艺流程，行星辊子挤出机具有下列优势，你可以发挥其潜能：

- 喂料特性得到了改进，特别是对于粘附性的物料

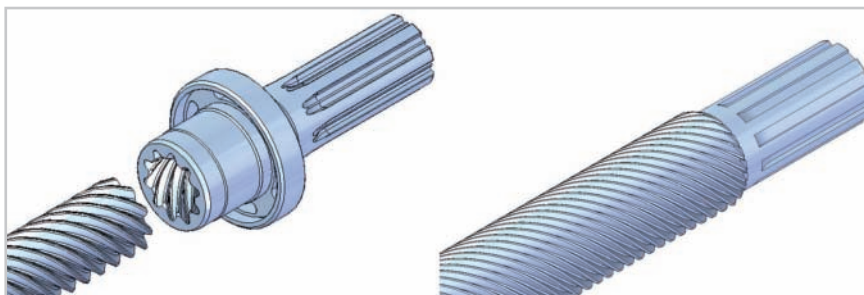
- 良好的自清洁特性和可确定的滞留时间范围
- 由于在行星辊之间直接喂料，从而消除了波动
- 在任何填充程度下都有不受限制的加工能力
- 调和及混合能力强，喂料更为方便
- 辊子种类多样，全都可以使用
- 采用附加的注入模块选件可将固态/液态原料加料融入系统中来

### 新型齿轮箱渐开线内连接套

行星辊子挤出机总是有一些非常规的挤出系统，这就是为什么当预见到非常规的处理方法能够获得更好的结果

时，恩太思公司总是毫不犹豫地采取最正确的方式。按照这一理念，新型齿轮箱内连接套被制造了出来。内连接套的作用是从齿轮箱到加工单元中央芯轴的接口并传递全部扭矩。装配组件已经进行了重新设计，采用的方式为扭矩通过中央芯轴的外啮合自身直接传导。这样，通常承担负载的花键部分现在可以省略。新设计具有如下优点：

- 同样的挤出机，最大扭矩可提升多达30%
- 由于改善了中央主轴的机械传导方式，降低了加工单元部件的磨损。
- 由于这种设计降低了部件的复杂程度，因此易于维护和装配
- 采用模块化滑配式螺杆段，从而增加了灵活性
- 行星喂料段采用了最佳化的驱动理念



新型渐开线齿轮箱内连接套 ( 左 ) 与经典设计比较 ( 右, 内连接套没有显示 )  
*The new involute gearbox spigot (left) in comparison to the classic design (right, spigot not shown)*

所有恩太思挤出机，都装有可更换的齿轮箱内连接套，所以能够方便地升级到新的系统。其它齿轮箱系统，需要逐个检查其升级的可能性。

### 重型系列的挤出

与标准系列行星辊子挤出机相比，重型系列配备了更大的齿轮模数以实现更高的耐久性和更长的维护间隔。采用这一系列的机器，典型地可应用于进行高机械负载加工的部件，例如生产填充率超过80%的橡胶或热塑性塑料。

在过去，仅仅具有高产量的大型生产单元280S和400S型号可以作为重型挤出的型号。由于需求的增加，两个较小的单元将补充到这一产品类别中来：即150S和180S。采用这些单元，现在可以实现采用较小的生产线来生产要求高的产品。自然，这两种新规格的挤出机将同样按照恩太思结构单元系统进行配置，也将具备通常的灵活性。除了采用享有盛名的加工单元以外，行星喂料区和渐开线传动内连接套两者都将同样配备在新的规格中。

### The planetary feeding section

The feeding section of a PRE is traditionally designed as a single screw – but new processes and application scenarios spawn the need for fresh ideas: The planetary feeding section (PFS) is another milestone in the consistent further development of the planetary roller system. The PFS blends in seamlessly into the modular ENTEX building-block system and offers – in contrast to a single screw section – the entire spectrum of processing technology, which is the key aspect for the PRE's well renowned reputation. The core of this development is the possibility to feed any raw material directly

and without detours into the processing unit – at virtually any position of the extruder.

This offers a lean and more efficient process design and enables you to use the PRE's potential via the following advantages:

- Improved feeding behavior, especially for sticky materials
- Good self-cleaning properties and a defined dwell time spectrum
- Elimination of pulsations by directly feeding the material between the planetary rollers
- Unrestricted processing capability at any filling degree
- High tempering and mixing capabilities right from the feeding
- All available roller variations can be used
- Additional injection options along the module for combined solid/liquid raw material feeding are available

### The new involute gearbox spigot

The planetary roller extruder has always been some kind of unconventional extrusion system – that's why ENTEX never hesitates to take unconventional approaches when it seems to be the right way to achieve the best results.

According to this philosophy, a new gearbox spigot was created. It acts as the interface to the central spindle of the processing unit and passes on the entire torque. The assembly has been redesigned in a way that the torque is now induced directly via the central spindle's outer toothing itself. Thus, the splined section, which usually carried the load, can be omitted now. The following ad-

vantages are achieved with the new design:

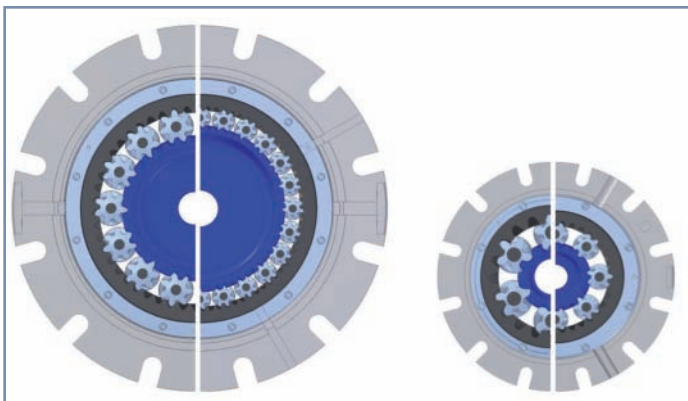
- Maximum torque can be increased up to 30 % on the same extruder
- Lower wear of the processing components due to improved mechanical guidance of the central spindle
- Easier maintenance and assembly due to less complex design
- Increased flexibility due to modular slide-on screw segments
- Optimum drive concept for the use of a planetary feeding section

All ENTEX extruders, which are already equipped with an interchangeable gearbox spigot, can be upgraded easily to the new system. On other gearbox systems, the feasibility must be checked individually.

### The extension of the heavy-duty series

In comparison to the PRE standard series, the heavy-duty series is equipped with a larger toothing modulus in order to achieve a higher durability and longer maintenance intervals. The machines from this series are typically used for applications that impose high mechanical loads on the processing parts – for example the production of rubbers or thermoplastics with filling degrees exceeding 80%.

In the past, only the large production units 280S and 400S for high throughput quantities were available as heavy duty models. Due to increased demand, two smaller units will now supplement the portfolio: the 150S and 180S. With those units, it is now possible to realize smaller production lines for highly demanding products. Naturally, the two new sizes will also be set up in the proven ENTEX building-block system and will provide the usual flexibility. In addition to the well-known units, both the planetary feeding section and the involute transmission spigot will be available for the new sizes, too.



比较：重型400S与400标准系列（左）及150S与150标准系列（右）

In comparison: A heavy-duty 400S against the 400 standard-series (left) and a 150S against the 150 standard-series (right)

# 商品：松原在 2016 杜塞尔多夫K展上展现其战略方向与卓越制造能力

## *Raw Materials: Songwon shares its Strategic Direction & Manufacturing Excellence at K2016*

在 2016 杜塞尔多夫K展上，作为全球第二大聚合物稳定剂制造商以及在全球特种化学品业务领域的重要成员，松原产业株式会社将展示其最新推出的高性能解决方案，并着力呈现其在聚合物行业所做出的努力。

松原产业集团首席执行官 Maurizio Butti 谈到：“通过了解和预测市场需求，我们建立了稳固的客户和供应商关系，并巩固了我们的竞争地位。2016K 展会为我们与客户建立密切关系提供宝贵的机会。松原的成功来源于专注倾听客户的需求，并将这些需求转化为高性能的产品。作为行业领先者，松原正迅速成为首选的添加剂合作伙伴以及新兴市场中领先的供应商。”

### 全球范围内的卓越制造能力——可靠的供应

松原可制造各种物理形态的全系列抗氧化剂和紫外线稳定剂。通过异丁烯自产实现烷基酚的后向整合。公司采用专利技术，以最优异的品质和品质的一致性向客户提供产品，并确保供应可靠性。

松原满足新兴市场需求的战略举措之一是扩展其在全球范围内的制造足迹。自 2006 年起，集团已开始扩大生产能力以应对市场需求。松原以高可靠性和持续供应能力著称，而这项举措使其继续始终如一地发挥这一优势。

松原是一站式系统 (OPS) 的领先供应商。OPS 是一种多组分定制型颗粒状添加剂混合组合包，在洁净无尘的环境中包装好后，即可运输。随着客户不断寻求附加价值和更高效的生产技术，OPS 市场目前正稳定增长。

在过去的几年中，松原也始终专注于巩固其在中国的整体市场地位。通过与合资企业的合作，松原现在在中国拥有两家制造工厂。第一家位于唐山，是具备 8000 公吨产能的向一体化化工厂，为中国市场以及其他主要地区市场提供高品质硫代酯类抗氧化剂。

第二家世界级制造工厂目前正处于施工的末尾阶段，专门用于生产 SONGNOX® 一站式系统。该工厂位于中国东部城市青岛，预计于 2016 年第 3 季度开始全面运行。

### 充分利用专业技术并扩展业务范围

凭借 50 年的行业经验，松原深谙其客户每天所面临的挑战。为始终如一地满足客户在高性能、高品质专用聚合物和削减成本方面的需求，松原尽全力推出一系列全方位解决方案，远超预期标准，打造出了行业内涵盖范围最广、物质形态最多多样化的产品系列之一。松原矢志不渝地提升各项能力，保持行业发展的前瞻性，扩展业务，并专注于开发增长前景优良的全新领域。这些在新领域的投入和努力为公司创

*At the K2016, Songwon Industrial Co., Ltd., the 2nd largest manufacturer of polymer stabilizers in the world, and key global player in the specialty chemicals business showcased its latest high performance solutions while highlighting its commitment to the polymer industry.*

“By understanding and anticipating market needs we have built strong customer and supplier relationships and consolidated our competitive position. K 2016 provided a valuable opportunity for us to closely engage with our customers. Songwon’s success has come from listening closely to them and transforming their needs into high performance products,” says Maurizio Butti, CEO Songwon Industrial Group.

### *Global manufacturing excellence – reliable supply*

Manufacturing a complete portfolio of antioxidants and UV stabilizers in a full range of physical forms, Songwon is fully backward integrated in alkyl phenols and further integrated into isobutylene. Using its proprietary technology, the company delivers the highest levels of quality and consistency together with security of supply.

Songwon’s strategic approach to meeting emerging market requirements includes expanding its global manufacturing footprint. Since 2006, the organization has been increasing its production capacity to correspond to the needs of the markets it serves. This is what makes it possible for Songwon to consistently provide the level of reliability and continuity of supply that it is known for.

Songwon is a leading supplier of One Pack Systems (OPS) – multicomponent, tailor made blends of additives in a pelletized form, packaged in a clean, dust free environment, ready for shipping. The market for OPS is growing steadily as customers search for added value and more efficient production technology.

Over the past few years, Songwon has also focused on strengthening its overall presence in China. With its JV partners, Songwon currently has two manufacturing facilities in China. Fully back integrated with a capacity of 8’000 MT, the first one is located in Tangshan and produces high quality thioester antioxidants for the Chinese market, as well as other key regions. The second world class facility, currently in the final stages of construction is dedicated to the production of SONGNOX® One Pack Systems. Located in the Qingdao area of Eastern China, it is due to be fully operational in Q3/2016.

建更强大、更平衡的业务组合奠定了基础。现今处于优势地位的松原在现有市场中赢得了更多份额，并将其业务扩展至新的市场。

**Songwon Industrial Co., Ltd.**  
Walzmühlestr. 48, 8500 Frauenfeld, Switzerland  
www.songwon.com.

### *Leveraging expertise & expanding business*

With 50 years of industry experience, Songwon understands the challenges its customers face daily. To help them meet the demand for consistent specialty and high-performance, quality polymers while curbing costs, Songwon strives to offer a portfolio of 360° solutions that extend far beyond standard and offers one of the broadest ranges of products and physical forms in the industry.

## 新型自润滑组合料 *New Lubricated Compound*

新型自润滑组合料：特诺尔艾佩斯公司 (Teknor Apex) 发布了一种新的混合料，即用于制作管材接头密封的新型热硫化橡胶 (TPV) 弹性体，其优点是可以采用同样的加工方式获得超出热固性橡胶材料的性能。TPV作为一种成熟的物料，具有更强的自润滑能力，有利于快速插入密封件并减少组装错误。这种混合料将在K2016上展出。

Sarlink® 9156-02用于非承压管和排水管的接头密封，所具有的物理特性几乎与坚实的耐用的管材连接密封混合料 Sarlink® 9156B相同，但新材料Sarlink® 9156-02呈现出自润滑特性，摩擦系数仅为原有的16%。

特诺尔艾佩斯公司热塑弹性体部门销售总经理Stef Hordijk 说道：“新型材料Sarlink® 9156-02大幅度提高的自润滑能力是其巨大的优势，向管件中插入连接密封件是一个机械过程，在这一过程中，自润滑性加快了插入的速度并有利于防止不良品。” 在施工现场采用人工方式连接管材时，带有自润滑密封圈的管件同样有利于管材的插接。通过减小将管材插入管件所需要的力量，自润滑特性有助于防止不正确的装配对连接密封圈的损伤。

管材连接密封件必须能防止来自于管材内部的泄露以及来自于外部的渗透。与Sarlink 9156B相同，新的自润滑组合料显示出了在若干年内最大可能地保持密封性的特点，性能优于橡胶，延长了管道连接密封的工作寿命。密封力是通过应力松弛程度来测量的。与橡胶相比，经过若干年后，两种TPV都呈现出较低的应力松弛水平，尤其是在温度较高的场合。与橡胶相比，两种TPV都可以大幅度提高生产效率，可以通过消除交联步骤，采用标准的热塑设备进行加工和减少废料，以及通过提供双组份的能力来提高生产效率。

A new thermoplastic vulcanizate (TPV) elastomer for pipe seals exhibits the same processing and performance advantages over thermoset rubber as a well-established TPV while providing enhanced lubricity for faster insertion of seals and more error-free assembly, it was announced by Teknor Apex Company, which introduced the compounds at K 2016. For use in seals for non-pressure water and drain pipe, Sarlink® 9156-02 provides physical properties nearly identical to those



可看见密封圈的管件  
*Pipe fitting with seal visible*

of Sarlink 9156B, a workhorse compound for pipe seals, but as a lubricated compound it exhibits a coefficient of friction that is only 16% as high.

“The substantially greater lubricity of new Sarlink 9156-02 is a big advantage for inserting the seals into the fittings – a mechanical process in which lubrication increases speed and helps to prevent rejects,” said Stef Hordijk, general sales manager for the Thermoplastic Elastomer Division of Teknor Apex. “Fittings with lubricated seals also facilitate pipe insertion, which is done by hand at the construction site. By reducing the forces needed for inserting the pipe into the fitting, lubrication helps prevent improper assembly and damage to the seal.”

Like Sarlink 9156B, the new lubricated compound exhibits greater retention of sealing force over a period of years than rubber, prolonging the working lives of pipe seals, which must prevent leakage from within the pipe and seepage from outside. Sealing force is measured by the degree of stress relaxation. Compared with rubber, both TPVs exhibit lower levels of stress relaxation over a period of years, particularly at elevated temperatures.

Both TPVs also make possible substantially greater productivity than rubber by eliminating the crosslinking step, by being processable on standard thermoplastic equipment with much less scrap, and by providing the capability of two-component molding.

**Teknor Apex**  
www.teknorapex.com

# 应用于管材挤出的外径、壁厚、偏心、熔垂 在线测量技术

## Technologies for the Measurement of the Diameter, Wall Thickness, Eccentricity and Sagging during the Hose and Tube Extrusion

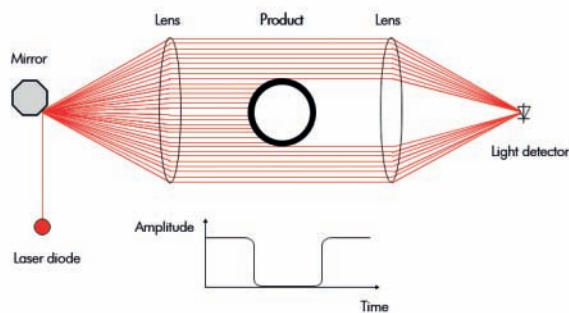


图 1：采用旋转棱镜的扫描式测量  
Image 1: Scanning method with rotating mirror  
(Images: Sikora)

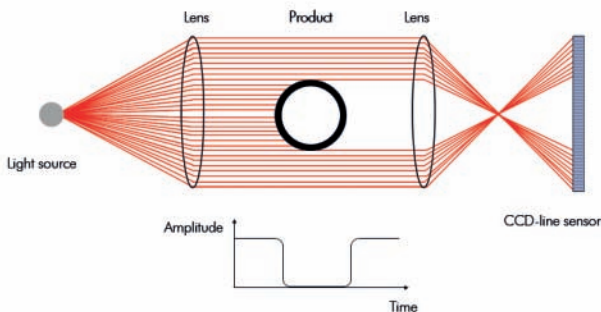


图 2：采用CCD线阵传感技术的扫描式测量  
Image 2: Scanning method without rotating mirror, with  
CCD-line sensor

过去几年里，管材生产企业对测控技术和生产线控制技术积极投入，以达到在线产品质量控制、稳定生产工艺、降低生产成本的目的。如今，在线测量控制仪器已经成为挤出生产线上一个标准配置，这些检测设备应用于挤出生产中产品内/外径、椭圆度、偏心以及熔垂度测量（“熔垂”是指熔体在凝固过程中温度过高而导致的材料下垂）。所使用的测量系统基于不同应用领域也采用不同的技术。以下文章是对传统与创新的测量技术进行概述，从而进一步讨论它们在挤出生产线上应用的优势及局限性。

### 应用于管材外径测量的技术

对于管材产品外径的测量，主要有两种技术：“扫描式测量系统”与“CCD 线阵传感器测量系统”。

Manufacturer of hoses and tubes have been investing intensively in measuring and control technology as well as line control over the last years, aiming for an online quality control, process stability and cost reduction. Nowadays, online measuring devices with a connected control are a standard for extrusion lines. Used test devices include, amongst others, gauge heads that measure the inner and outer diameter, the ovality, eccentricity as well as ideally the sagging (“sagging” of the melt during the solidification at a too high viscosity) of the product during the extrusion process. The used measuring systems are based on varied technologies for different application areas. The following article provides an overview of conventional as well as innovative measuring technologies and discusses the advantages and limits of their usage in extrusion lines.

### Technologies for diameter measurement of hoses and tubes

For the measurement of the product diameter of hoses and tubes, two established techniques are used: the “Scanning System” as well as the “CCD line sensor technology”.

#### „Scanning System“

The scanning method is based on a rotating mirror or a rotating disk, whereby a laser beam scans across the measuring field. In-between the rotating mirror and the light sensor, two lenses are arranged. The first lens diverts the laser beam almost parallel across the measuring field while the second lens directs the light beam onto a light sensitive detector. The product is arranged between these two lenses and disrupts the laser beam, while it is scanned across the measuring field. Therefore, the product diameter is calculated by comparing the time the laser beam needs to pass the whole measuring field with the time the laser needs to scan the complete product surface. In this case, time equals the diameter (Image 1). The measuring rate depends on the rotation speed of the mirror. An increase of the measuring rate is made possible by the use of a polygon mirror. This highlights the problem that the mirror surfaces need the exact same perfect surface finish. Often, an averaging of several measurements is necessary to achieve a reasonable accuracy.

#### „CCD line sensor systems“

There are two measuring methods for the CCD line sensor technology prevalent. The first method is based on a laser be-



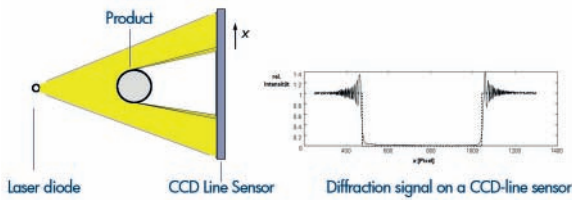


图 3 : CCD 线阵传感器检测原理及衍射分析

*Image 3: CCD line sensor measuring principle and analysis by diffraction analysis without optics and moving parts*

#### “扫描式测量系统”

在旋转棱镜和光电传感器之间有两个平行放置的透镜，激光束通过旋转棱镜对测量区域进行扫描。第一道透镜通过测量区域发出平行光束，而第二道透镜则会将光束折射到光电传感器上。当对被测物体进行扫描的时候，位于两个透镜之间的被测物将对激光束造成阻断。因此，产品外径的测量是通过比较激光束通过整个测量区域以及整个产品表面的时间来计算的。在这种情况下，时间就等于外径（图 1）。检测速率取决于棱镜的旋转速度。棱镜的面越多检测频率越高，这也意味着对棱镜镜面的清洁度有着较高要求。通常需要更多的测量值进行平均，从而得到相对准确的数值。

#### “CCD线阵传感器测量系统”

目前有两种常用的 CCD 线阵传感器技术测量方法。第一种方法是通过使用光学原理（透镜）将激光束聚焦到线阵传感器上。通过被遮挡的阴影区域计算被测物的外径。这种方法的优点是没有机械运动部件，但透镜的成本相对较高。

第二种方法采用高精度 CCD 线阵传感器直接针对激光在物体两侧产生的衍射波纹进行成像，由衍射波纹计算物体外径。其检测速率非常高，只受限于所选的 CCD 传感器。这种方法的优点是无需昂贵的镜片并且没有机械运动部件。

扫描和线阵传感器技术的主要区别是 CCD 线阵传感器技术是完全数字化工作，无需运动部件。因此，其准确性、复检精度及检测速率都更高并且无需校准。采用线阵传感器技术可以使用双轴或是三轴的测量头测量物体的外径。它能够测量从 0.05 到 500 mm，透明和非透明的各种材料的产品外径。此外，还有一些型号可提供高达 5000 次/每轴/每秒的测量，因此，该技术也可用于可靠检测产品的鼓包或凹陷。

#### 用于测量产品外径、壁厚及偏心的技术

对于某些应用领域来说，仅仅测量产品的外径是不够的，管材制造商往往还需要运用检测设备进一步测量产品的壁厚与偏心。此外，除了质量控制和工艺优化之外，对塑料材料的节省和生产成本的降低也是不可或缺的考虑因素。对于管材的壁厚测量来说，传统的技术手段是采用超声波测量技术。该方法适用于单层结构产品的壁厚测量，但是其应用受限于材料性质、塑料温度和耦合介质。现在可以通过 X 射线技术对所有产品参数进行精确的测量，不受环境或材料的影响。

#### 超声波技术

超声技术仅适用于部分管材的在线品质控制。例如，超声波不能穿透复合管中用以隔绝水气的铝层，因此不适用于该类产品的检测。当测量橡胶软管时，超声信号在很大程度上被橡胶的气孔及橡胶材料所吸收，因此他们也不能进行可靠的测量。不仅如此，含有传统编织加强层的多层橡胶软管，由

am that is focused on one line sensor using optics (lenses). By counting the darkened diodes from the shadow image of the object, the diameter is determined. The advantage of this method is the omission of moving parts, but the costs for the lens are high (Image 2).

The second approach is an intelligent method for which a high-resolution CCD line is directly illuminated by a laser and the diameter is calculated from the diffraction fringe. The measuring rate is extremely high and only limited by the chosen CCD line sensor. The advantages of this second method are the omission of the expensive lenses as well as moving parts.

The main difference between scanning and the line sensor technology is that the CCD line sensor technology works solely digitally and does not need moving components. Therefore, accuracy, repeatability and measuring rate are higher and a calibration is not necessary. Gauge heads that work with the line sensor technology measure the diameter in two or three planes. They are capable of measuring opaque as well as transparent products from all kinds of material with a diameter from 0.05 to 500 mm. In addition, some models offer up to 5,000 measurements/per axis/ per second and therefore, as well a reliable detection of lumps and neckdowns.

#### *Technologies for the measurement of diameter, wall thickness and eccentricity*

For applications where a diameter measurement is not sufficient, manufacturers of hoses and tubes use measuring systems that additionally measure the wall thickness and the eccentricity of the products. Thereby, in addition to the quality control and process optimization, the saving of plastic material and cost reduction play an essential role. Conventionally available technologies are, for example, based on ultrasound technology. This method is suitable for the basic measurement of the wall thickness of single layer products but reaches its limits due to its function and dependence on material properties, the plastics temperature and the coupling medium. A precise measurement of all product parameter without the dependence on environmental or material influences is nowadays ensured by the X-ray technology.

#### *Ultrasound technology*

The ultrasound technology is only partly suitable for online quality control of hoses and tubes. For example, the ultrasound is not able to penetrate the aluminum layer that is used as a vapor barrier in composite pipes and is therefore not applicable for this application. Measuring rubber hoses, the ultrasound signals are largely absorbed by the porosity and absorption of the rubber so that they are also not reliably measurable. Furthermore, multi-layer rubber hoses contain typical fabric reinforcements, which divert the ultrasound echo and make a measurement impossible. The ultrasound measurement is usually realized in a water bath as the water is used as a coupling medium for the transmission of the sound. A precise temperature compensation is necessary as the propagation speed of the ultrasound, which is used for the calculation of the eccentricity, depends on temperature and material. This technology requires a calibration. Further, an estimation of the wall thickness is



图 4：安装于管材挤出生产线上的X射线测量系统  
Image 4: X-ray measuring system installed in a hose extrusion line

于会改变超声波的传播方向，因而不适于采用超声波进行检测。超声测量通常通过水浴的方式来实现，因为需要采用水作为传输声音的耦合介质。由于用于计算偏心率的超声波的传播速度取决于温度和材料，因而需要进行精确的温度补偿以获得可靠的测量数值，故该技术的使用过程中校准是必须的。此外，壁厚的估算通常仅可能通过将超声波测量技术与称重系统组合来实现。

#### X 射线测量技术

X射线技术基于影像分析技术，不需要适应材料，并且无需任何耦合介质。由于不受材料温度的影响，因而该X射线测量装置可以直接集成到挤出生产线中而无需其他改造，且无需校准。该系统可以直接安装在挤出机之后（热端测量）或在生产线末端（最终品质控制）。通过采用4点的在线测量，该装置就可以得到被测物体的壁厚、偏心率、内径和外径以及椭圆度的测量值。该系统最多可测量三层不同材料结构的被测物，能够将测量值以数字化和图形化的形式，以管材横断面的方式进行实时显示，为用户对挤出模具进行完美调中提供保障。另外，为能达到最高的效率，该系统还可对生产线速度或挤出机转速进行自动反馈控制，将厚度参数控制在最小值。这样，一方面管材的品质得到了保障，而另一方面，对最小值的控制还能确保材料的最佳消耗。该X射线测量技术适用于直径从0.65到270 mm的产品。对X射线设备安全性的顾虑是不必要的，因为辐射大小并不取决于射线能量高低。实际上，一个人从纽约飞到法兰克福会受到更多的辐射。

#### 应用于大规格管道的测量技术

以上的大规格管道（如在建筑及服务领域）的尺寸测量，上述测量技术也可进行应用。然而，在考虑到功能（超声波）及成本的限制、测量范围及对圆周上的测量点的限制（X射线）、或对于激光技术只能受限于进行外径测量等方面的因素来说，这些技术的应用已经达到它们的极限。目前正在测试用于管材品质控制的另一种技术，该技术采用了太赫兹脉冲，用以激发指向材料的大功率光纤激光，并通过来自内、外边界层的反射回波来确定产品壁厚。然而，用于测量较大壁厚度和高阻尼材料（如PVC）的技术的应用是受限的。此外，所采用的激光器的持久性也是有限的并且成本较高。

typically only possible by combining the ultrasonic technique with an additional gravimetric system.

#### X-ray technology

The X-ray technology is based on an imaging principle. The X-ray technology does not require an adaptation to materials and no coupling medium is needed. The technology is independent of the temperature of the material, what makes it possible to integrate an X-ray measuring device directly into an extrusion line without any additional efforts. A calibration is not necessary. The system is either installed directly after the extruder (hot measurement) or at the end of the line (final quality control). With a 4-point online measurement, the measuring values for the wall thickness, the eccentricity, the inner and outer diameter and the ovality are determined by one device. The system measures up to three different material layers. These measuring values are visualized numerically and graphically in the form of the tube/pipe cross section in real-time and enable the user to perfectly center the extrusion tool. Important for highest efficiency is the automatic control of the line speed or extruder rpm while considering the minimal values. Thus, the quality of the hose is ensured. On the other hand, the control to the minimal values ensures that only the needed material is used. X-ray technology is available for products with a diameter from 0.65 to 270 mm. Concerns on the safety of X-ray devices are arbitrary, as the radiation is because of the low energy of no relevance. Practically, a human is exposed to a much higher radiation on a flight from New York to Frankfurt.

#### Technologies for the measurement of large plastic pipes

For the dimension measurement of large plastic pipes starting at a diameter from 120 mm, as they are found in the building and service area, the above-described technologies can be used. Nevertheless, these technologies reach their limits either functionally (ultrasound) as well as regarding the costs, the limited measuring range and number of measuring points on the circumference (X-ray) or the limitation in the measurement of the diameter only (laser). A further technology for the quality control is currently tested. It uses terahertz pulses, which activate a powerful fiber laser that is aimed at the material. The wall thickness is determined by means of the reflected echoes from the inner and outer boundary layers. The usage of this technology for the measurement of larger wall thicknesses and materials with a high damping, as for example PVC, are however limited. Furthermore, the durability of the laser is limited and the costs are very high.

#### Millimeter waves technology

An innovative, significantly less expensive technology for the dimension measurement and recording of the sagging is the radar technology FMCW (Frequency Modulated Continuous Waves). These systems work within the sub-terahertz range and are already used for some time in the automotive technology for distance measurement. They are based on semiconductor technology, are inexpensive and practically not limited regarding their lifespan. Within the chosen area from 80 to 300 GHz all plastic materials are penetrated with low absorption and thus, the wall thickness is measured. One or two con-

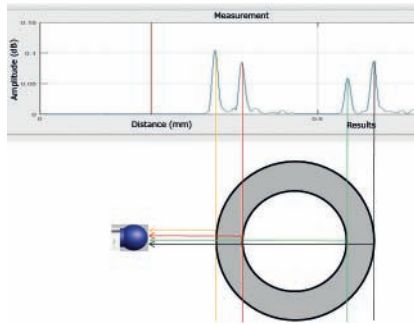


图 5：采用毫米波技术的测量系统，用于反射信号时间差测量物体外径、壁厚和下垂度的毫米波技术

*Image 5: The measuring system based on millimeter waves technology for the determination of the diameter, wall thickness and the sagging based on the time difference analysis of reflected signals*

### 毫米波技术

FMCW（调频连续波）雷达技术是一项用于测量尺寸和记录下垂度的创新型技术，其投入成本更低。此类系统在亚太赫兹范围内工作，并且于汽车工业中用于距离测量已有一段时间。它们采用了半导体技术，价格便宜并且使用寿命长。在 80 至 300 GHz 的选定区域内，塑料材料都能够被穿透，吸收率小，因此可用来测量壁厚。通过采用一个或两个围绕管周连续旋转的收发器，系统同时连续地发送和接收调频毫米波，或者也可以选择采用两个固定收发器进行四点的管材壁厚及内外径测量。当需要围绕管的整个圆周测量其完整壁厚时，可使用旋转测量头；在这种模式下，还可以精确测量材料的下垂。该系统的测量原理是通过由塑料材料前后边界层反射信号的时间差来计算壁厚，测量精度仅数微米，采样速率为每秒 500 次。该毫米波测量技术可适用于直径为 120 至 2,500 mm 的产品，无需耦合介质，不受温度或材料的影响。而且，测量系统对挤出材料具有自适应性，故无需进行校准。通过该技术的应用，为挤出生产线上的调偏及温度控制提供了技术保障，测量数值可用于优化同心度及最小壁厚。

### 总结

随着对管材生产品质要求的提高，通过非破坏性测试（NDT）在挤出时对塑料管进行精确和可靠的品质控制变得非常重要。此外，成本节省及材料的有效使用也是工厂管理的重点。测量和控制系统可在线监测和控制重要的产品参数以确保在控制品质的同时兼顾成本的节省。因此，管材制造商可以从具有不同功能和不同应用的各种技术中选择适当的技术手段以满足自己的需求。

通过激光测量技术可对外径在 0.05 到 500 mm 的物体进行可靠的在线测量。而 X 射线测量系统可测量直径达 270 mm 的产品的壁厚和偏心率。另一种采用创新型毫米波的测量技术可适用于高达 2,500 mm 的大规格管道挤出生产线，该技术适用于精确测量不同材料类型及常规管材的尺寸以及下垂度。因此，在挤出生产线中使用哪种测量技术取决于应用领域和用户对测量和控制技术在品质保障、工艺优化和成本节约方面的要求。

tinuously rotating transceiver continuously send and receive frequency modulated millimeter waves while moving around the tube. As an alternative, a static system measures selectively the wall thickness and outer and inner diameter of a tube with two transceiver at four points. A rotating gauge head is used when the complete measurement of the wall thickness around the whole circumference of the tube is required. In this version, also the sagging is measured and displayed precisely. The measurement uses the time difference of the signals that are reflected by the boundary layers of the front and back site of the plastic material. The measurement is realized with an accuracy of few micrometers and a measuring rate of 500 single measurements per second. The millimeter waves technology measures products with a diameter from 120 to 2,500 mm precisely, around the complete circumference, with no need for coupling medium and is not influenced by the temperature or plastic material. Furthermore, the measuring system adapts the properties of the extruded plastics by itself – a calibration by the user is redundant. Furthermore, the technology provides information for centering the extrusion tool and thermal control of the line. Thereby, the measuring values are used to ensure an optimal concentricity and minimal wall thickness.

### Summary

With the increasing quality requirements at the production of hoses and tubes, the precise and reliable quality control for plastic pipes at the extrusion by a Non-Destructive Testing (NDT) becomes significantly important. Furthermore, an efficient usage of materials for costs savings is in focus of the plant management. Measuring and control systems monitor and control important product parameters continuously. Thereby, hose and tube manufacturers may choose from various technologies with different functions and diverse applications.

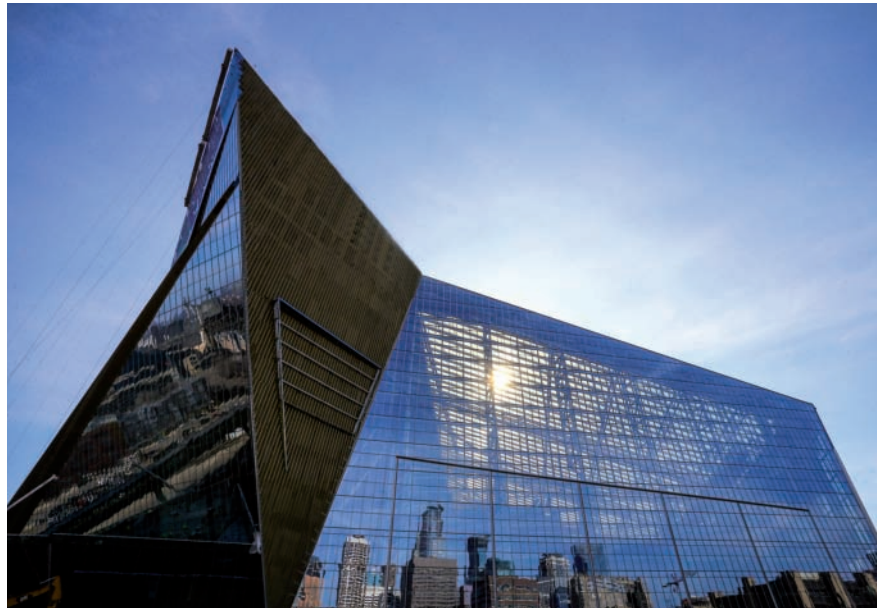
The laser technology offers a reliable online measurement of the diameter from 0.05 to 500 mm. Additionally, X-ray measuring systems measure the wall thickness and eccentricity of products with a diameter up to 270 mm. A further innovative technology, based on millimeter waves, is used for extrusion lines where large plastic pipes up to 2,500 mm are produced. The technology is applicable for different material types and measures common tube dimensions as well as the sagging precisely. Which measuring technology should be used in an extrusion line depends, therefore, on the application area and the requirements of the user regarding measuring and control technology for quality assurance, process optimization and cost savings.

# 明尼苏达州维京人体育场的透明屋顶

## *Film Technology, Raw Materials: Transparent roof for the Minnesota Vikings*

明尼苏达州的运动体育场明尼阿波利斯市美国银行体育场成为了美国首座以透明屋顶构造为特色的体育场。屋顶采用3M公司Dyneon 氟塑料乙烯-四氟乙烯共聚物 ETFE为原料的高性能挤出膜材。根据建筑师的介绍，与建造美国目前最先进的可伸缩的屋顶相比较，膜材屋顶大约要便宜一亿美元。2016年五月，3M公司已被命名为明尼苏达州维京人体育场官方的科学合作伙伴，美国足球俱乐部的主场就在这里。

*The U.S. Bank Stadium in Minneapolis, Minnesota is the first sports stadium in the USA featuring a transparent roof construction with high-performance films extruded from 3M Dyneon Fluoroplastic ETFE. According to the architects, the film roof is around USD 100 million cheaper than the constructions with a retractable roof that are state of the art in the US. In May 2016, 3M has been named the official scientific partner of the Minnesota Vikings, the American Football team based here.*



大约75片三层ETFE薄膜衬垫覆盖整个屋顶，表面积22,000平方米，体育场能容纳六万五千名观众。

*Round about 75 three-layer ETFE film cushions cover the total roof and facade area of 22,000 square metres and the stadium offers space for 65,000 spectators (Copyright Minnesota Vikings)*

在美国的足球赛季，从九月到二月初，室外温度零下30度是常见的。因此，在美国北部，只有封闭式体育场才是唯一的选择。为了至少在夏天创造露天的气氛，以往建筑师们经常使用可伸缩但是却造价昂贵的屋顶。ETFE膜材衬垫技术，已经在欧洲和亚洲得到广泛的使用，在美国，HKS建筑师事务所首次使用于明尼阿波利斯市新建的多功能体育场建筑物，从而建筑费用与伸缩式屋顶相比降低了大约一亿美元。

大约75片三层ETFE膜材衬垫覆盖了全部屋顶区域，表面积达两万二万平方米。这样，美国银行体育场就成为了美国最大的ETFE膜材项目。若干独立的空气填充衬垫长度超过10米，宽度大约3米。顶部的膜材印刷了几何图案，能够散射日光并防止夏天的温室效应。在冬天寒冷的气温下，膜材屋顶能够对内部进行保护。

膜材衬垫采用3M公司的Dyneon ETFE制造，能够让95%的日光通过，但其重量仅有大约玻璃的5%。这样一来，屋顶的支撑钢结构可以特别纤细，并能向所有观众提供最佳的运动场视野。

入口由五个巨大的玻璃门组成，其高度超过30米，在夏天保持开启。Vector Foiltec公司建造了膜材结构并将其联结。这家公司在全世界有14个办公室，其业务领域包含了从构想到支持结构计划和制造衬垫直到其安装的整个范围。薄膜是由Nowofol Kunststoffprodukte公司采用3M Dyneon ETFE材料用挤出方式生产的，这种NOWOFLON® ET 6235Z 薄膜厚度范围可以从80到400微米。Nowofol公司生产各种各样的劳尔（RAL）色系的薄膜和透明薄膜，以及全新开发的红外线吸收特种材料。薄膜符合防火等级B1

(按照DIN 4102)标准,不仅是在美国,对世界各地来说这都是一个重要的标准。建筑师和屋顶策划人员对于大雪负载时巨蛋型屋顶的承载能力给予了特别的关注,因为原先这一建筑物只有一半大小,在2010年12月由于受到超过半米厚的积雪重压而坍塌。ETFC薄膜的抗撕裂强度特性值抗,以及继发撕裂和抗穿刺特性都非常好,空气填充的衬垫很容易应对高度集中的冲击载荷比如冰雹。这种材料在北欧和阿尔卑斯山区的使用已经证明:哪怕是在有暴雪的地区,其性能对冬季是适合的。

非对称的屋顶更多地朝向北方倾斜以应对积雪。薄膜是非常平滑的,由于其表面抗粘附,所以积雪根本很难附着,并会按照几乎是可控制的方式滑落。一场大雨的冲淋足够将屋顶打扫清洁。

Outside temperatures of minus 30 degrees are usual during the American Football season from September to the beginning of February. Therefore, only closed stadiums are the only choice in the north of the USA. In order to create a genuine open-air atmosphere at least in summer, architects have often made use of movable, but expensive roofs in the past. The ETFE film cushion technology, which is already widespread in Europe

and Asia, was used for the first time in the US by the HKS Architects for the construction of the new multi-purpose stadium in Minneapolis, thus lowering the construction costs by around USD 100 million as compared to a retractable roof.

Round about 75 three-layer ETFE film cushions cover the total roof and facade area of 22,000 square metres. The U.S. Bank Stadium is thus the largest ETFE film project in the US. Some of the individually air filled cushions are more than 110 m long and around 3 m wide. The top film is printed with a geometric pattern, which scatters the sunlight and prevents a greenhouse effect in summer. In winter, the film roof protects the interior from the cold outside temperatures.

The film cushions manufactured from 3M Dyneon ETFE allow 95 percent of the daylight to pass through, but their weight is only about five percent that of glass. As a result, the supporting steel structure can be particularly light and slender and offers all spectators an optimum view of the playing field.

The entrance consists of five giant glass doors, which are over 30 m in height and remain open in summer. Vector Foiltec built the film construction that joins onto them. With 14 offices worldwide, Vector

Foiltec covers the entire spectrum from the conception to the support structure planning and from the manufacturing of the cushions to their installation. The films are extruded from 3M Dyneon ETFE by Nowofol Kunststoffprodukte GmbH & Co. KG, NOWOFLON® ET 6235Z films are available in thicknesses from 80 to 400 microns. Nowofol produces the films in a wide range of RAL colours as well as in transparent and, completely new, in an infrared absorbing variant. The films conform to fire protection class B1 (according to DIN 4102), which is an important criterion – not just in the USA. The architects and the roof planners paid particular attention to the load bearing capability under high snow loads, because the roof of the Metrodome, the predecessor building that was only half as large, collapsed in December 2010 under the heavy load of more than half a meter of snow. ETFE films feature very good values for tear strength, resistance to tear propagation and puncture resistance which let the air filled cushions easily cope with highly concentrated impact loads like hail. Their use in northern Europe and the Alps proves their winter compatibility, even in areas with heavy snowfall.

The asymmetric roof is inclined more towards the north in order to fend the snow off. Due to their anti-adhesive surface, the films are so smooth that snow can hardly get a grip at all and slides off – in an almost controlled manner. A heavy rain shower is enough to clean it.

美国银行体育场有着透明的屋顶结构,采用3M Dyneon氟塑料ETFE高性能挤出薄膜

*The US Bank stadium is featuring a transparent roof construction with high-performance films extruded from 3M Dyneon Fluoroplastic ETFE (Copyright Minnesota Vikings)*



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