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Extrusion Equipment

for the Tire Industry

应用于轮胎工业的挤出设备

TROESTER

EXCELLENCE IN EXTRUSION.

Innovations for the Tire Industry

应用于轮胎工业的创新能力

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»We are what we repeatedly do.
Excellence, then, is not an act but a habit.«

Aristotle (Greek Philosopher, 384 - 322 BC)

»我们坚持不懈，
卓越不仅仅是一种表现，而是一种习惯.«

亚里斯多德(希腊哲学家, 公元前384-322)

TROESTER
EXCELLENCE IN EXTRUSION.



Foundation Year 始建于	1892 年
Managing Directors 公司常务董事	Dr. Peter Schmidt (President / 董事长) Dipl.-Ing. Bernd Pielsticker
Staff 员工	approx. 500 employees in administration, mechanical and electrical design, R&D and manufacturing 约500名员工供职于行政, 机械与电气设计, 研发与制造部门
Subsidiary Companies 子公司	TROESTER Machinery, Ltd./USA (美国) TROESTER Machinery (Shanghai) Co., Ltd./PR China (中国)
Representative Offices 办事处	in Russia, India, France 俄罗斯, 印度, 法国
Representations 代理处	in over 40 countries 超过40个国家



Excellence in Extrusion

In 1892, the engineer Paul Troester struck upon the innovative idea of building machines which could process unvulcanised rubber and guttapercha. He thus laid the foundation for a name which is world-renowned and synonymous for technological advancement, quality and outstanding performance in the fields of rubber and plastics processing.

The essential feature of all machines and lines build by TROESTER is their superior process technology. Highly qualified development engineers design efficient extrusion lines with a long service life. The latest production processes for the manufacture of cables, tires, automotive and industrial rubber goods require customized system technology. TROESTER develops efficient machine and equipment control systems which flexibly employ the hardware components of leading manufacturers.

TROESTER developments will continue to set the milestones for rubber and plastics processing in the future. In doing so, we are committed to the growing demands for quality, efficiency and environmental compatibility.

优质的挤出设备

1892年, 工程师保尔·特乐斯特突然萌发了制造用于生产未硫化橡胶与杜仲胶电缆设备的构想。随后, 在橡胶与塑料制造领域, 奠定了以他名字为基础TROESTER工厂。TROESTER因为技术领先, 品质出众而举世闻名。

卓越的橡胶和塑料挤出工艺特性, 是TROESTER制造设备和生产线的突出特点。高素质的研发工程师设计出高效与长服务周期的挤出生产线。最新的产品工艺运用于制造电缆, 轮胎, 自动化与工业橡胶产品, 并满足客户订制系统技术。TROESTER 能够灵活运用硬件系统研发出高效的设备和控制系统, 已位于世界领先地位。

TROESTER的发展将持续在未来的橡胶与塑料制造领域设立里程碑。我们致力于对品质, 高效与环保的日益增长的持续要求。



Lines for Manufacturing Tire Components

Tire manufacturers all over the world rely on TROESTER's Expertise and Experience. Wide ranging innovative and continual technical development have enabled TROESTER to become one of the world-wide leading manufacturers of complete extrusion lines for the production of car and truck tire components.

Compared to the lines made from individual machines, complete tire-component lines from one supplier offer remarkable advantages. During the whole project the customer only has one contact partner, who also coordinates transport, installation and commissioning: TROESTER.

This solution also offers advantages for the finished quality of tires. Car and truck tire components which are produced on TROESTER lines are characterized by high dimensional accuracy as well as extremely small positional tolerances between the individual components.

Even when it comes to the development of new products, TROESTER offers our customers comprehensive know-how and the solid reassurance associated with "Made in Germany".

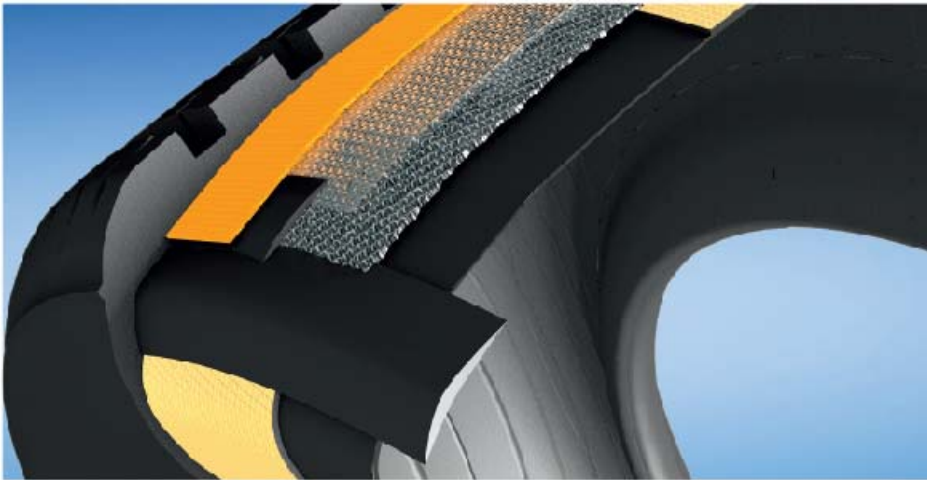
制造轮胎部件生产线

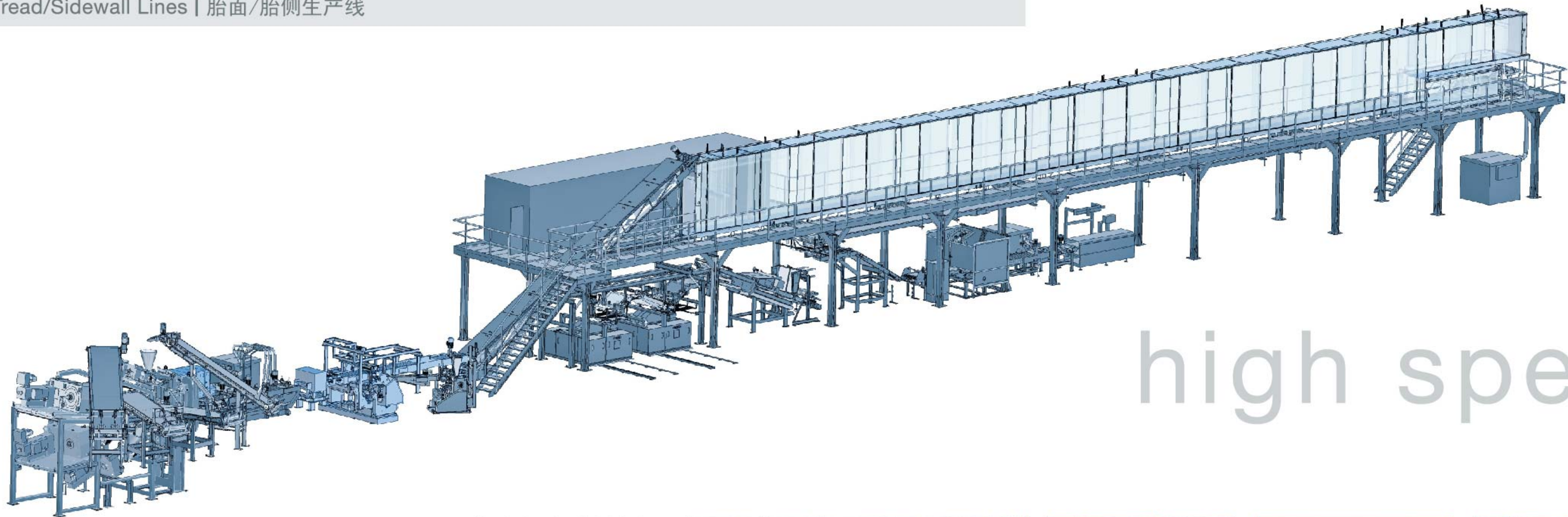
全世界轮胎制造商依靠于TROESTER 的专业技术与经验。广泛创新和持续技术发展使TROESTER成为世界范围内用于轿车胎与卡车胎部件整线挤出线的制造商。

相对于从分散的设备供应商处采购设备而言， 整线采购有着显著的优势。在整个项目运作期间， 客户只有一个联系合作伙伴， 由他负责运输， 安装与调试工作；这就是 TROESTER。

TROESTER也提供用于成品高品质轮胎的解决方案。经由TROESTER生产线制造的轿车胎与卡车胎部件的显著特征是-高尺寸精度与单一部件极小位置公差。

即使有新产品问世， TROESTER提供给我们客户全面的技术诀窍与”德国制造” 坚固的信心保证。





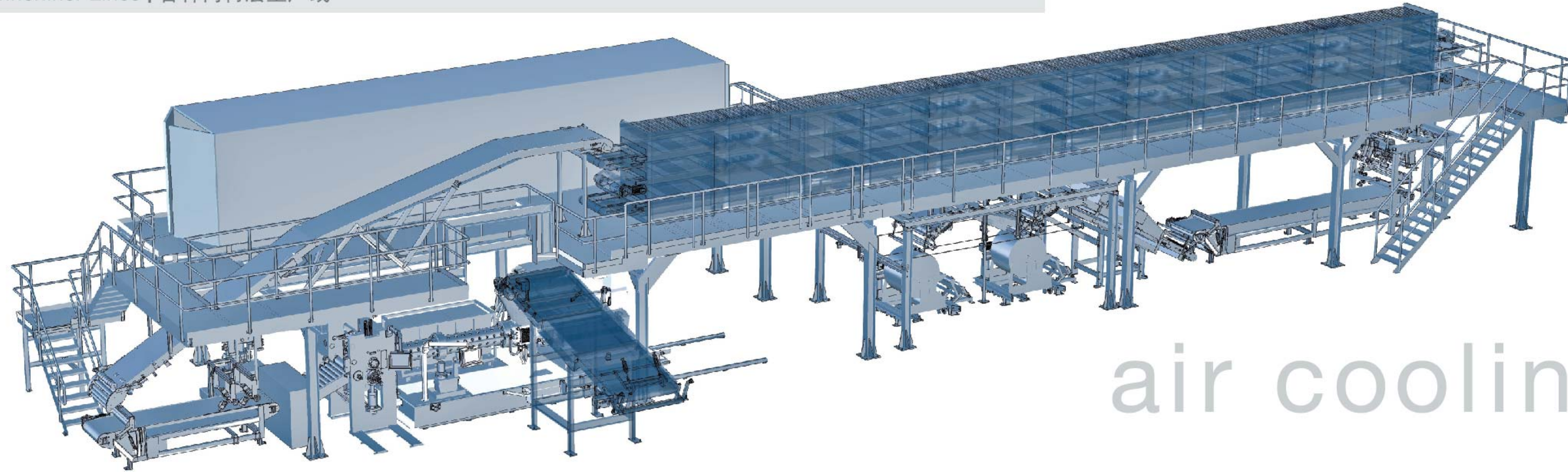
- > High speed Line (50 m/min) for tread and sidewall
高速胎面/胎侧生产线 (线速度50m/min)
- > Take away conveyor with shock cooling for sidewall components
用于胎侧胶部件，带急冷的接取运输带
- > E-house container
集中电控室
- > Special water treatment (ph-value and conductivity)
特殊的水处理装置 (PH值和导电性)
- > Optimized material flow with winders close to the extruder area
卷取装置靠近挤出区域的优化物料流程设计

high speed 高速

Quadruplex unit with slab feeders
Cushion calender
Quadruplex head with 3 extruders
Rotating cross cutter as part of a wind-up system
Cassette wind-up station

带胶片供料装置的四复合挤出机组
胶片压延机
三复合挤出机头
旋转横向裁刀和部分卷取装置
盒式集成化卷取装置





- > Minimized floor space
最小化底层设备布置方案
- > Air Cooling of extruded profiles with optimized cooling efficiency
优化的胶片空气冷却效果
- > High energy efficiency
极高的能源使用效率
- > Cold edge cutting
边料的冷裁切装置
- > Automatic calender sleeve change
压延机型辊套自动更换装置

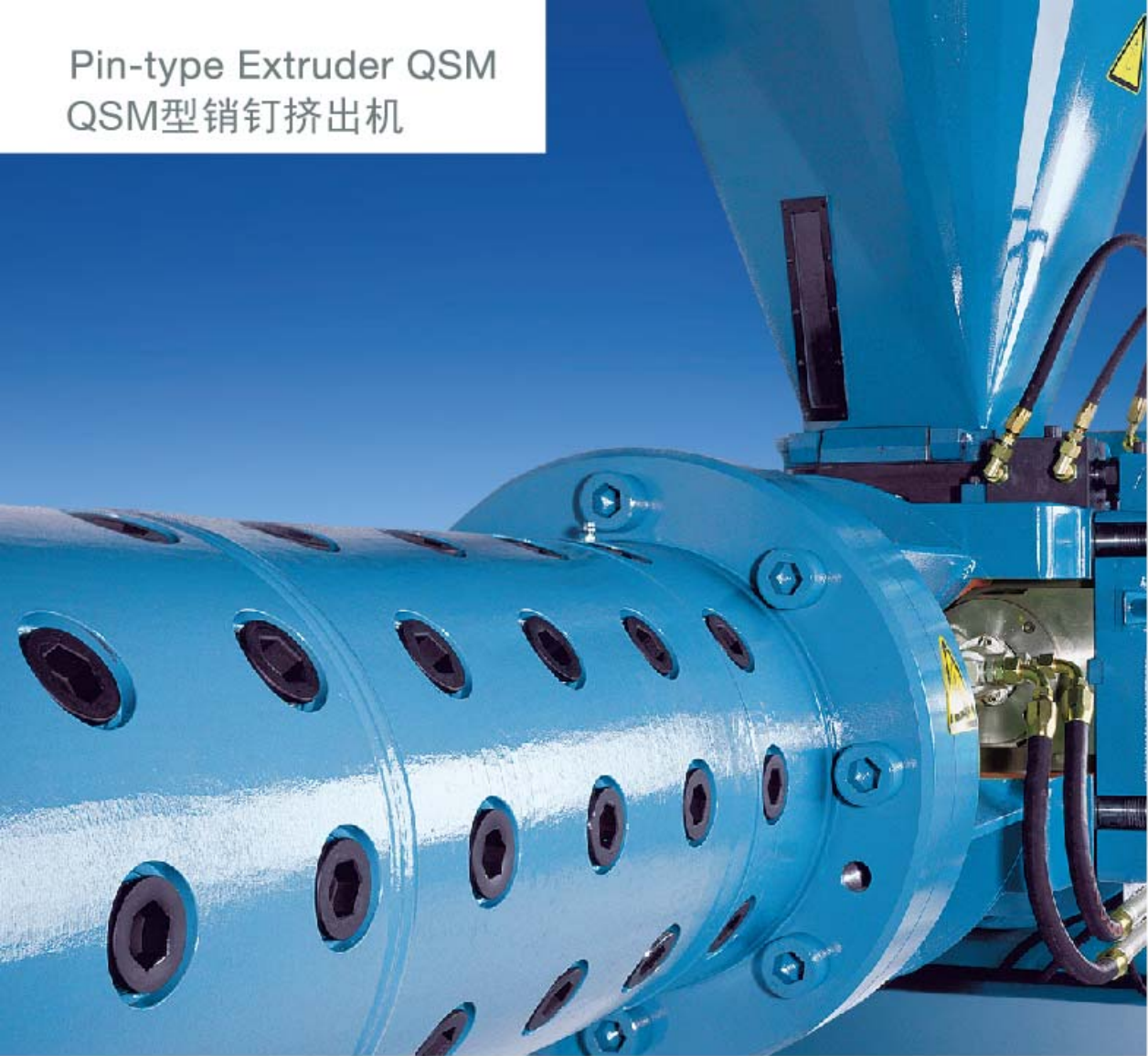
air cooling 空气冷却

Extruder with extrusion head
Air Cooling section
Winding Area
Rotating cross cutter

带挤出机头的挤出机
空气冷却装置
卷取区域
旋转横向裁刀



Pin-type Extruder QSM
QSM型销钉挤出机



销钉挤出机

销钉挤出机技术上是在二十世纪七十年代中期，由TROESTER与合作伙伴共同开发的。随着销钉挤出机技术的不断发展和完善，橡胶客户可以用此类型设备挤出更多种类的橡胶，且不用更换挤出机螺杆，就能得到更好的塑炼效果。

在挤出过程中，从机筒外部插入挤出机内部的销钉，持续不断地将流动的胶料进行分割。这种持续不断的混炼，可以使胶料在较低的温度条件下，得到很好地塑化，并且在其过程中胶料的生热非常均匀。

销钉挤出机的螺杆一般由氮化钢制作而成。如果有需要，在某些情况下，螺杆也会由比较特殊的钢材制成。当需要挤出的胶料含有特别的耐磨成分时，挤出机螺杆的螺棱将会很快被磨损。因此，它需要具有特殊坚硬涂层的螺杆。TROESTER公司就能提供这种特殊涂层的螺杆。

The QSM Extruder

The QSM technology was substantially co-developed, in the mid 1970's, by TROESTER. The continuous development of this technology allowed tire manufacturers to extrude a wide range of rubber compounds, with optimum plasticization, without the need to change the extruder screw.

The QSM pins, which are inserted externally through the barrel wall, continuously divide the stream of rubber compound. This intensive continuous mixing achieves a thermally homogenised and gentle plasticization of the compound at a low temperature.

The screw of a QSM extruder is usually made from nitrided steel. In some cases, where required, special steels are also used. When processing particularly abrasive compounds, that cause excessive wear on the outside flight tips, a special hard coating can be applied. TROESTER also has special screw coatings in it's delivery programme.

The QSM Extruder at a Glance

- > Universal for all rubber compounds
- > High throughput, whilst maintaining optimum product quality
- > 60 – 250 mm screw diameters
- > Self-cleaning
- > Also available as vacuum-version

销钉挤出机一览：

- > 广泛适用于各种橡胶胶料
- > 挤出产量高，产品质量好
- > 螺杆直径范围 60-250 mm
- > 具备自清洁功能
- > 可提供排气式机型

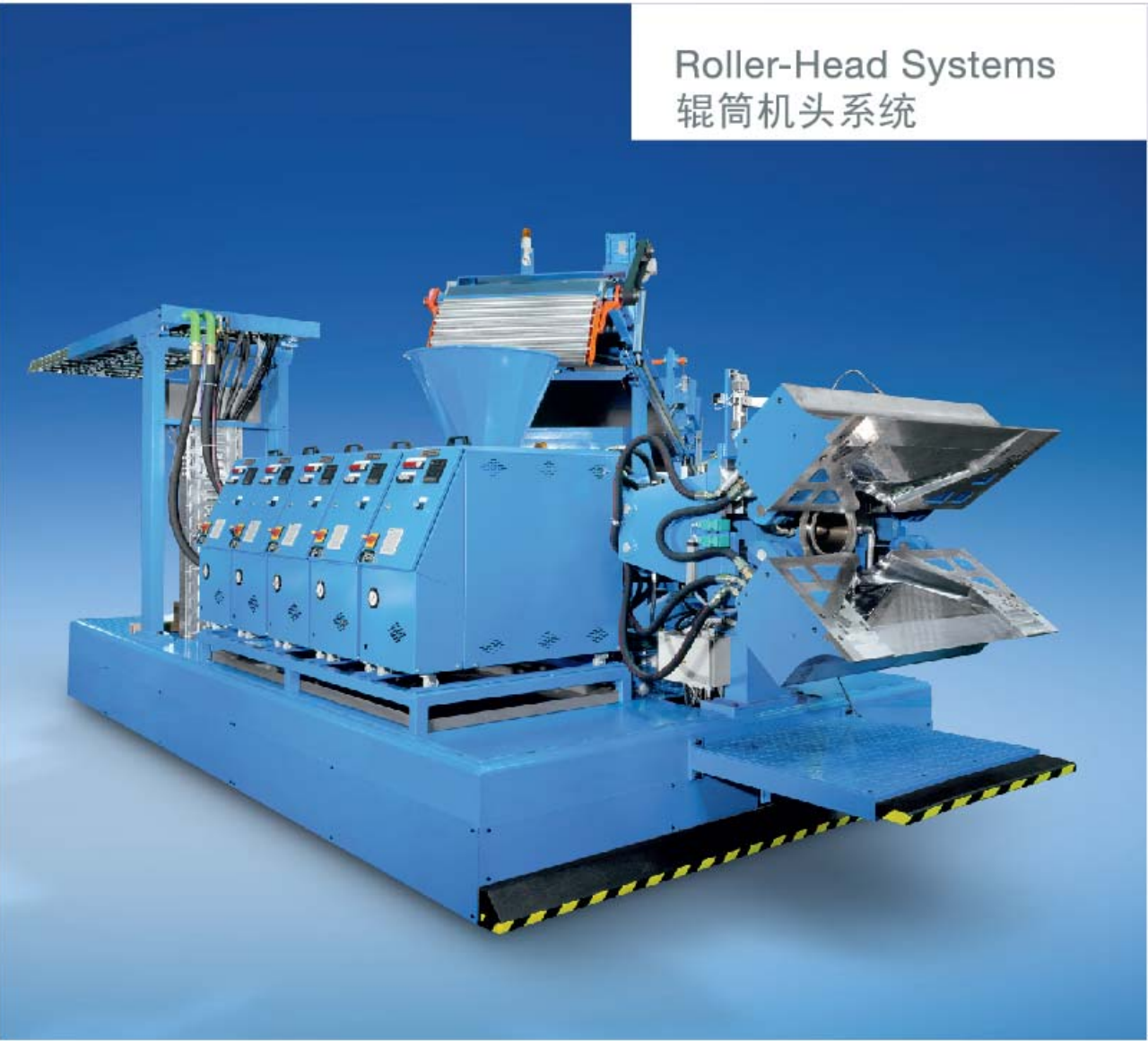


Roller-Head Systems

Roller-Head units are used to produce sheets and strips. The typical tire profiles are inner liner, cushion, squeegee etc. As opposed to multi-roll calenders the rubber compound is fed through the roll gap directly from a wide sheet head. As the required shape has been pre-formed by the sheet head porosity free rubber sheets/profiles can be produced.

Modern Roller-Head systems offer a wide variety of automation and rationalization possibilities as opposed to the conventionally fed calenders. It is to be noted that a Roller-Head system can process virtually any type of rubber compound. Various contours can be produced by changing the profiled roll sleeves on the calender. TROESTER Roller-Head calenders can be fitted with hydraulic roll adjustment. This allows for exact roll positioning and facilitates a range of process technical advantages as well as a high degree of accuracy.

Roller-Head Systems
辊筒机头系统

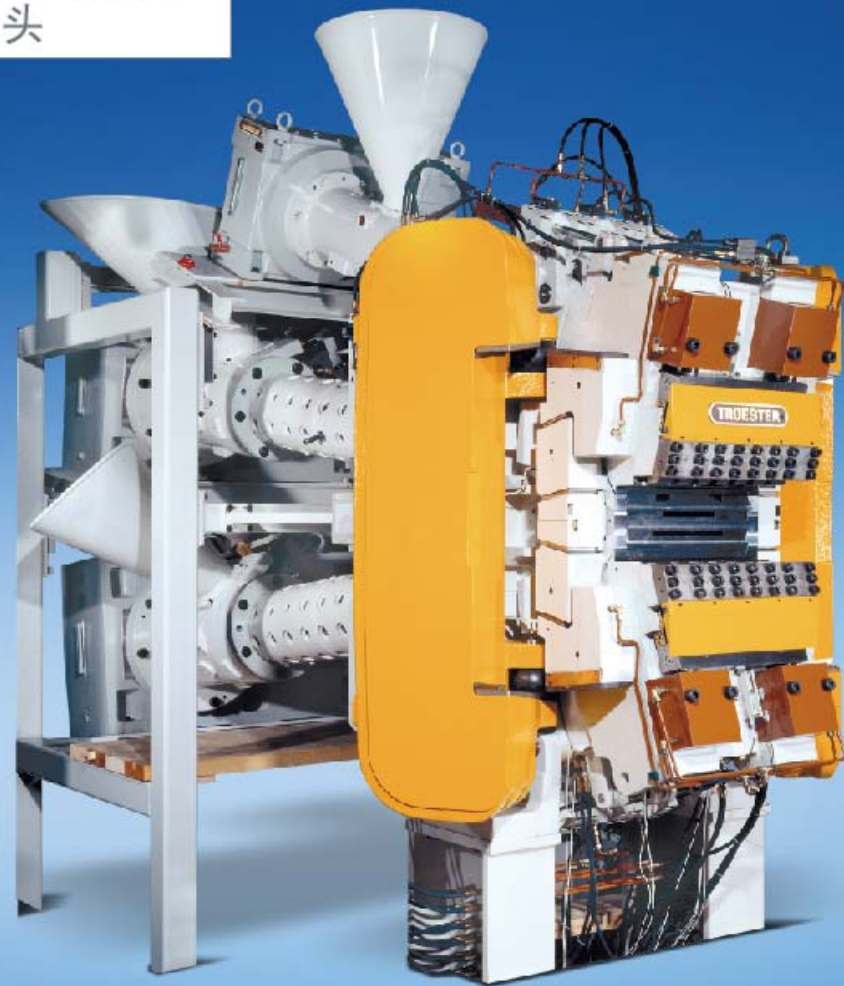


辊筒机头系统

辊筒机头系统被用来生产胶片和胶条。典型的轮胎胶部件有内衬层、缓冲胶片、胶辊等。相对于多辊筒压延机来不同的是，辊筒机头系统的橡胶胶料从宽幅挤出机头挤出后直接喂入压延机辊筒之间的。因为所需要的形状已经过宽幅挤出机头的预成型，所以致密的胶片/型胶部件即可以生产出来。

相对于常规喂料方式的压延机而言，现代的辊筒机头系统在自动化和合理应用方面提供了多种多样的可能性。值得注意的是，事实上辊筒机头系统几乎可以用于任何橡胶胶料的生产中。不同表面形状的胶部件生产可以通过更换压延机辊筒上的型辊套来实现。TROESTER 的辊筒机头系统可以配备液压辊筒调距装置。该装置可以保证辊筒定位的准确性，不仅可以实现技术的先进性，而且可以保证产品在宽幅范围上的极高精度。

Extrusion Heads 挤出机头



C型夹紧机头

Extrusion Heads

TROESTER offers a broad variety of co-extrusion Heads starting from Duplex Heads up to Quintoplex-Systems (4+1) enabling the extrusion of up to 5 different rubber compounds.

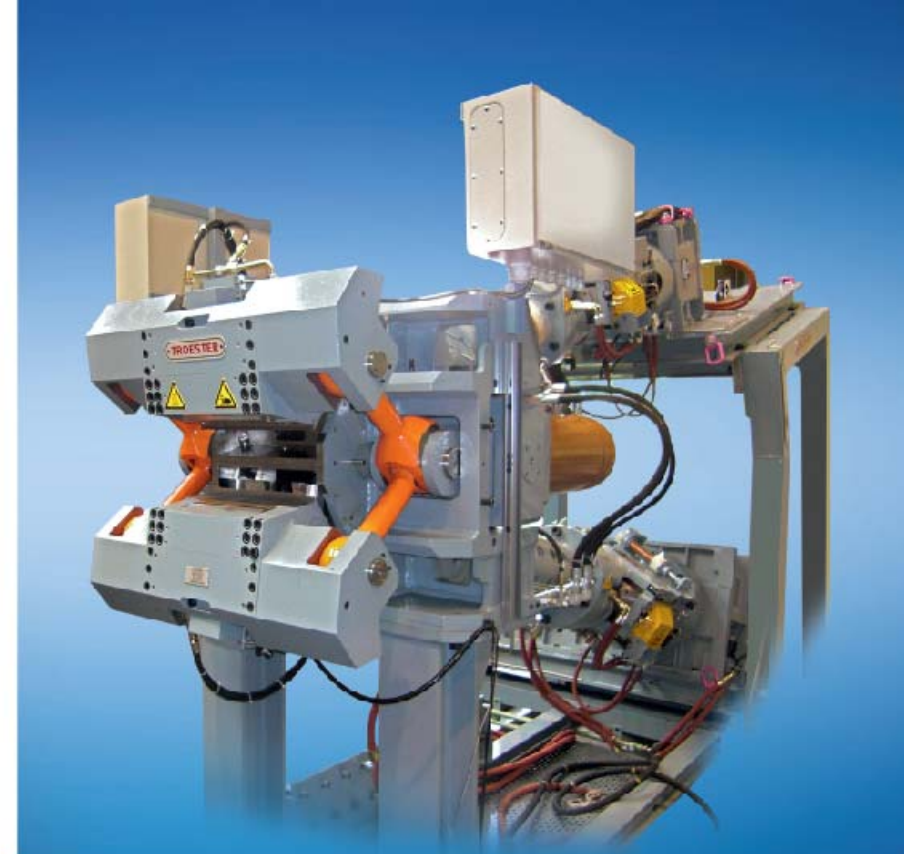
The portfolio includes the C-Clamp Head as well as the patented Hammer-Head and Y-Head. The chosen clamping system depends on the requirements and on the individual production routine of the tire manufacturer.

The flow channels are matched to the customers' individual requirements and their products with the use of Finite Element Flow Simulation. The flow history for the rubber in the head is analysed and adopted in order to achieve a constant swelling behaviour at the head outlet and a uniform flow.

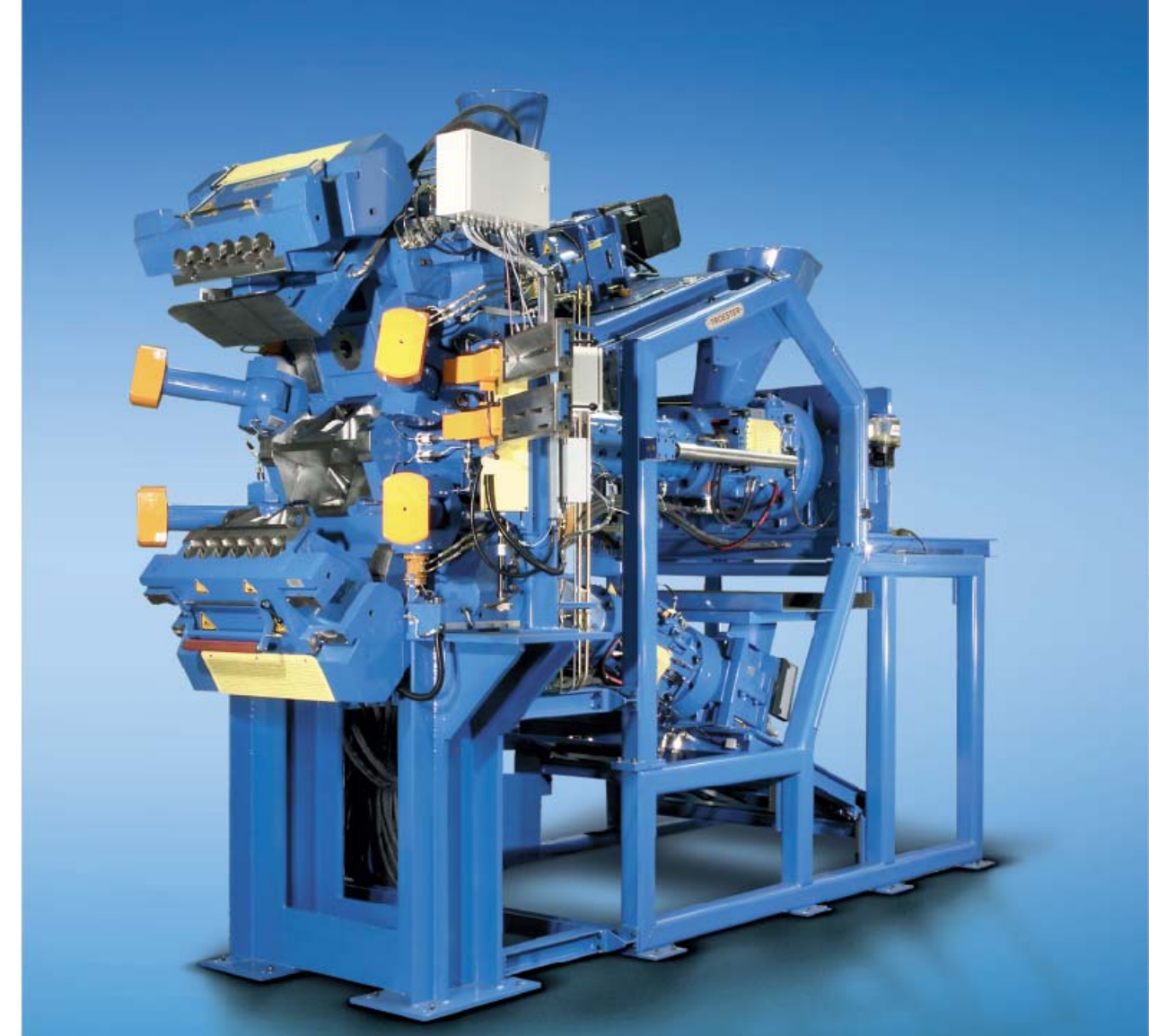
The general goal is a material-independent flow channel design in order to allow an easier design of the subsequent flow-segments.

Besides an appropriate forming of the extrudate, the flow channels are designed with the lowest possible pressure consumption. This helps to reduce the compound temperature at the outlet and to increase the extrusion speed.

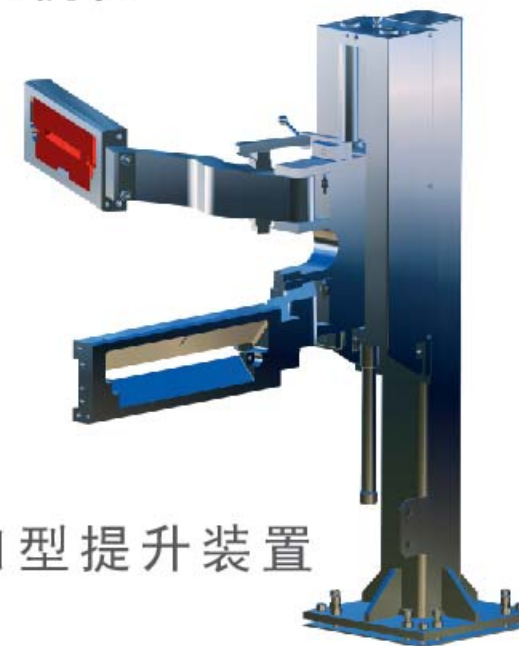
The features as a whole meet the demand of the tire industry for flexible manufacturing equipment to achieve a high productivity of the line at an increased variety of products with the best price/performance ratio.



Y型机头



锤型机头



U型提升装置

挤出机头

TROESTER公司可以提供一系列的复合挤出机头，从两复合挤出机头一直到五复合挤出机头（4+1形式），并可以最多同时挤出5种橡胶胶料。

这一系列的复合挤出机头，包括C型夹紧形式的机头，具有专利权的锤型机头和Y型机头。如何选择机头的夹紧方式，取决于轮胎客户的各自的需求和不同的产品制造工艺。

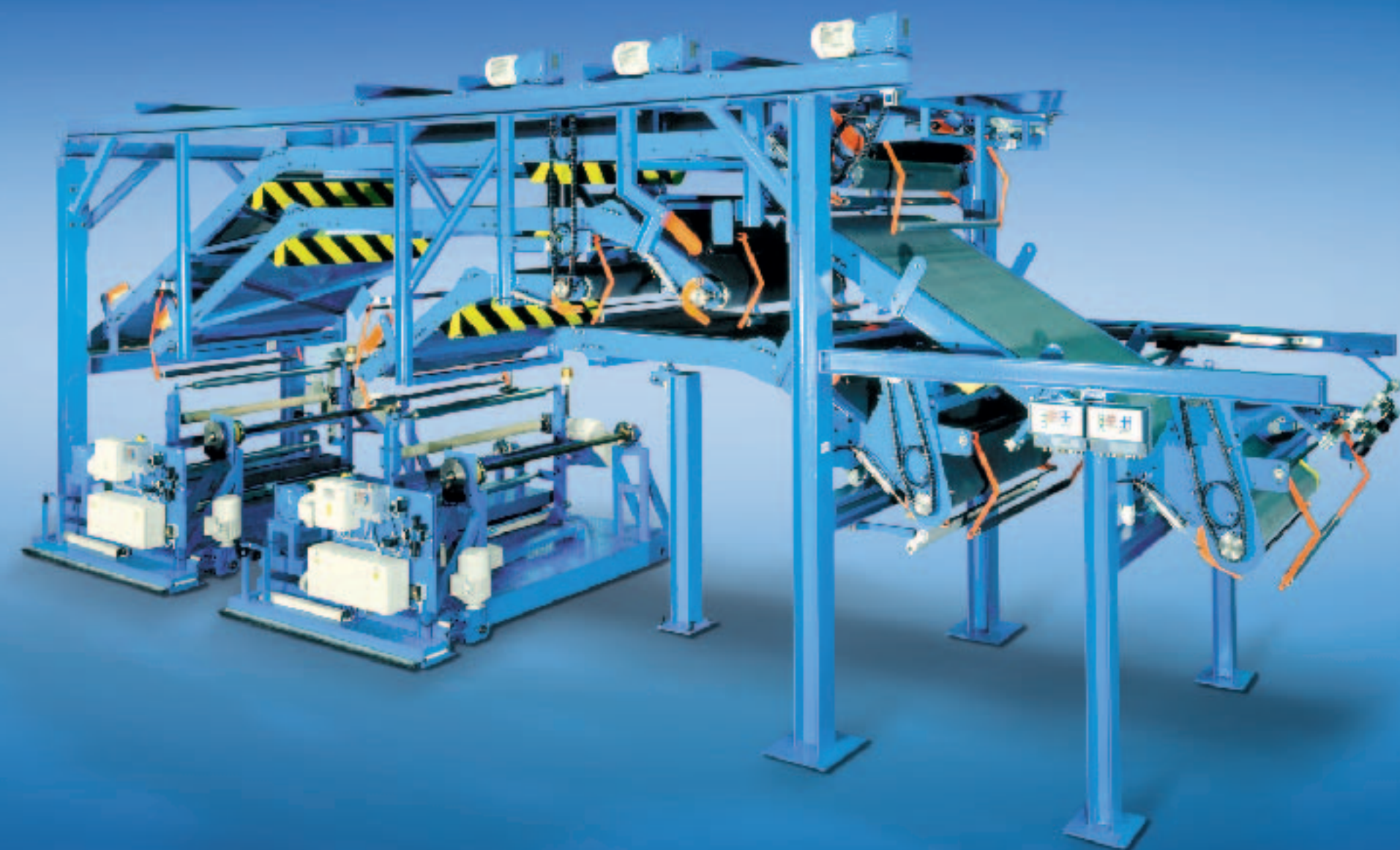
通过分析和调整胶料在机头内的流动状态，可以在机头出口处得到均匀一致的胶料流动和膨胀。也就是说，通过使用有限元流动模拟设计，机头流道形状可以紧密的贴合客户各自不同的产品需求。

总之，采用流动模拟分析的目的在于，使设计者在设计依次不同阶段的机头流道时变得更加容易。从也而使流道的设计与胶料相对地独立。

除了极好的对挤出型材的成型作用以外，经过设计的流道在挤出时，胶料流动压力的损耗可以降低到最低。这有助于提高挤出速度和降低胶料的挤出温度。

在不同挤出部件日益增加的情况下，TROESTER设备所有的这些特点，满足了轮胎工业对生产线设备的柔性化制造的需求。同时，它又可以使生产线保持较高的生产能力，从而使设备的性价比达到最优。

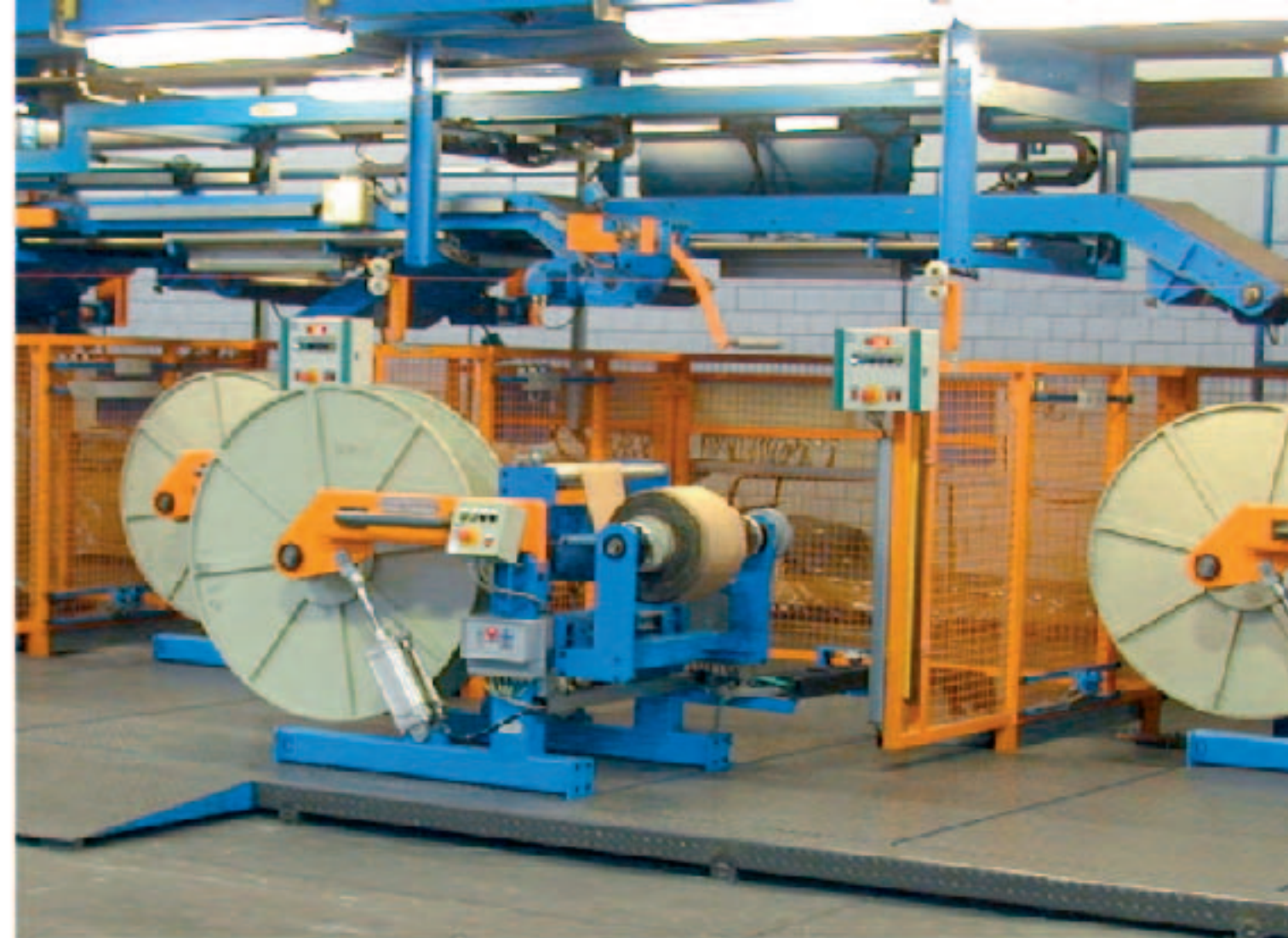
Downstream Equipment 联动线设备



在德国制造的辅线设备

联动线设备是一条出色的挤出生产线不可缺少的组成部分。挤出主机与联动线设备之间的无缝衔接，是生产线在高速生产的情况下，仍具备高性能，显著高精度的保证。

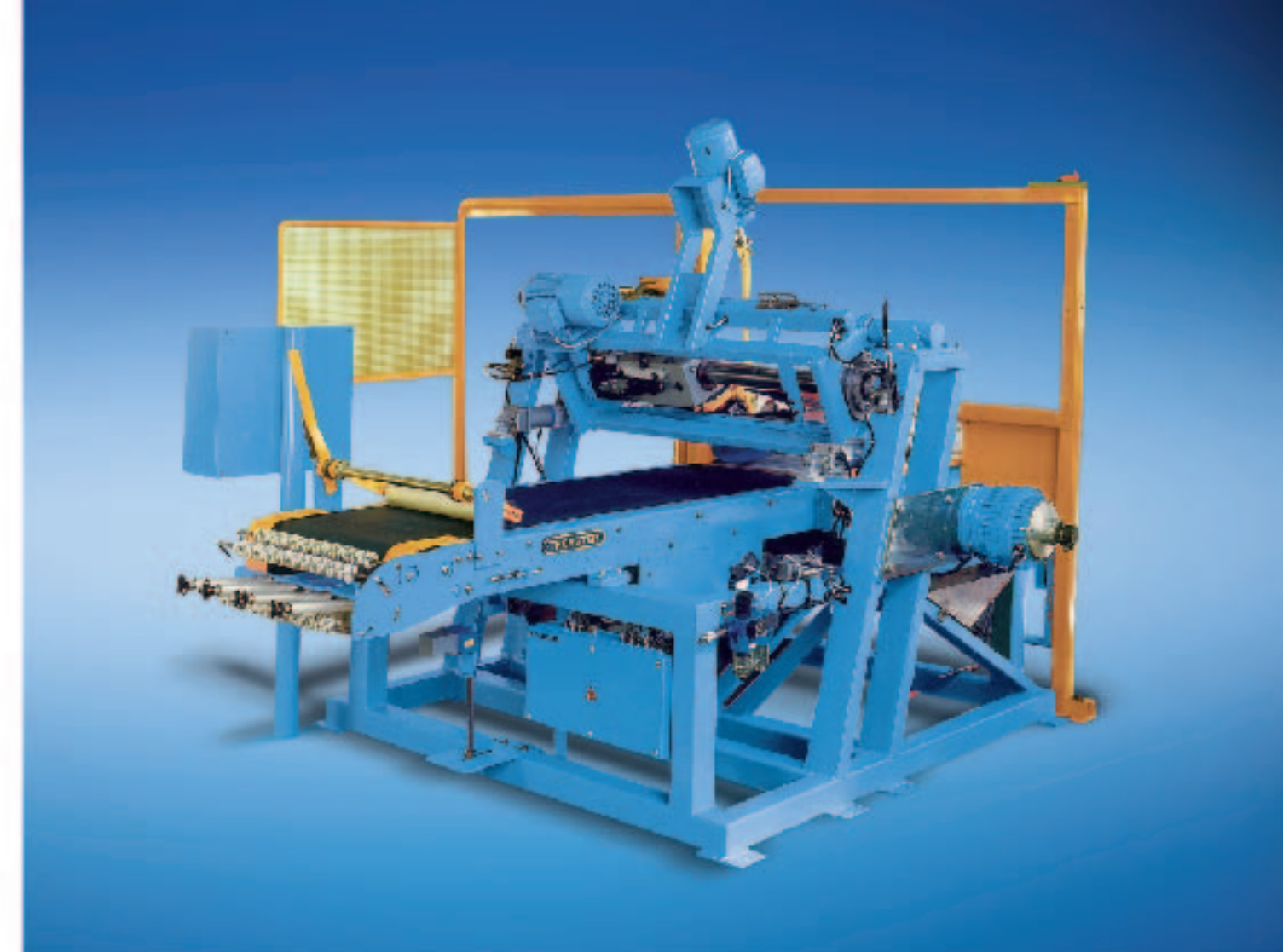
TROESTER公司在定制挤出生产线方面，具有广泛和独特的经验。轮胎客户非常感谢具有特殊技术的TROESTER工程团队，因为他们解决了许多挑战性的技术难题。与我们的客户共同努力，TROESTER公司在橡胶挤出领域作出了一些具有里程碑意义的创新发展。例如，生产线速度，精确度，冷却和卷取技术等等。



Downstream Engineered in Germany

The downstream of an extrusion line is an integral part of a successful extrusion line. The seamless interaction between extrusion unit and subsequent line components assure a high line performance including remarkable product tolerances at high line speed.

TROESTER has a broad and unique experience with tailor made extrusion lines. The more challenging the more thankful tire manufacturers are for the special skills of our engineering team. Together with our customers, we established several milestones in rubber extrusion in regard to line speed, accuracy, cooling and winding technology, etc.



Downstream Equipment Portfolio 联动线设备组合

- Shrinkage system / 胶料收缩系统
- Bottom and/or Edge Cementing / 胶部件底部和/或边部涂胶装置
- Cooling Technology / 胶部件冷却技术
- Auto-Threading / 胶部件自动翻转装置
- Product Assembly / 胶部件贴合装置
- Cross Skiver / 横向裁刀装置
- Tread Cutter / 胶面裁刀
- Winding Technology / 胶部件卷取技术
- Booking Technology / 胶部件摆放技术
- Measuring systems / 胶部件测量系统
- Line Control / 生产线控制系统



Line Control and PLC
生产线控制和PLC



电气控制设备和生产线控制方案

挤出生产线的控制系统像其电气部分的设计一样，是TROESTER设备整体的重要组成部分。挤出主机与联动线协同运转，从而保证产品尺寸在不同阶段的稳定性。根据轮胎客户的各自不同要求和描述，控制系统在TROESTER公司内部经过设计、更新和编程，并且使用优质供应商的最新电气元件组装而成。

典型的生产线控制系统由PLC-PC的架构组成。在功能方面，所有的电气单元，如驱动器、传感器、测量装置、分辨和测量系统均由PLC进行控制。目前，广为人知的带分布式I/O站点的现场总线系统已应用了许多年。这种系统的好处是可以减少客户现场的布线，同时在交货前，可以更加有效的检测设备组的功能。

为了更进一步的发展，TROESTER最近在复合挤出生产线应用了Ethernet系统，而不是典型的现场总线系统。这样，超过80个驱动器、分布式I/O站点、测量装置、PLC和生产线PC可以联接到一起。生产线PC用于可视化的趋势显示、配方处理、较长时间段内的产品和质量控制。对于每一种产品的运行参数，包括质量情况将会被存档。这些产品参数会被汇总统计入评测指标，例如CPK值（statistical process ratio）。除了可以记录较长时间内的产品历史数据外，这些数据也可以用来标识制作的产品。

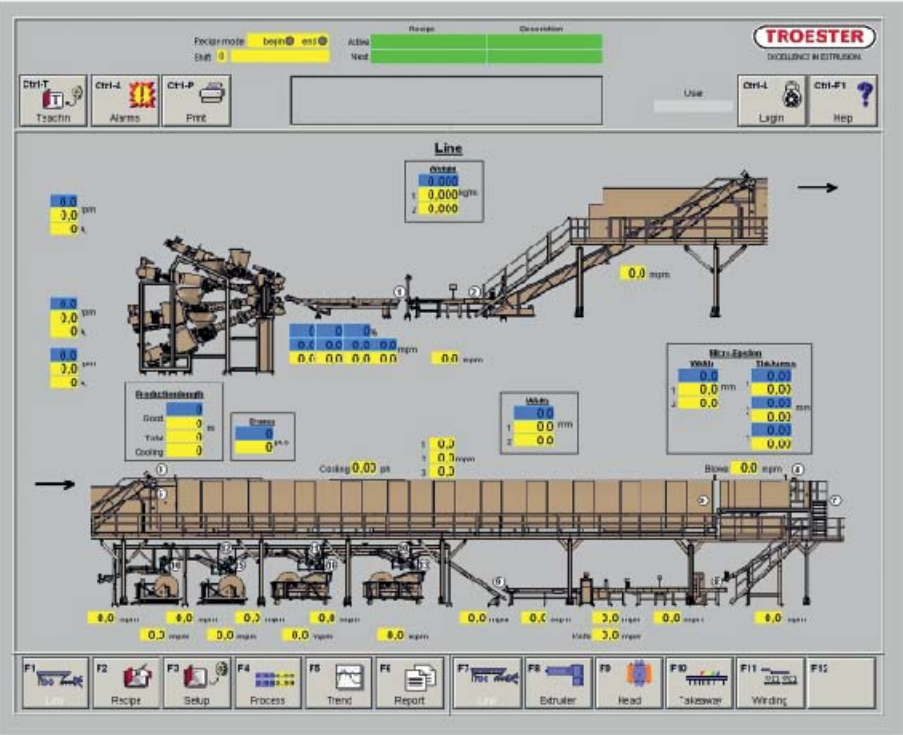
Electrical Equipment and Line Control –
Solutions from One Source

The extrusion line control systems as well as the design of electrical components are significant elements of TROESTER's equipment portfolio. The extrusion unit works with the downstream equipment as a functional unit enabling constant product dimensions in the various production stages. The control is developed, designed and programmed in-house by using the latest available electrical components. Specifications and preferred suppliers are considered according to the individual needs of the tire manufacturer.

Typically the line control consists of a PLC-PC architecture. In the field area all electrical units like drives, sensors, measuring equipment, identification and marking systems are controlled by the PLC. For many years the most well-known field bus systems with distributed I/O stations are used. The advantage is i.e. reduced cabling on customers site and more efficient checking of machine groups before delivery.

As a further development step TROESTER lately installs complex tire production lines by using Ethernet instead of typical field bus systems. More than 80 units like drives, distributed I/O stations, measuring devices, PLCs and Line-PC are linked together.

The Line-PC is used for visualisation and process trending, recipe handling and the long-term production and quality protocol. For each production run the production parameters as well as the quality results will be stored. Such production results are summed up in statistically measured parameters like CPK-values (statistical process ratio). Besides having long-term information about the production history, the data can also be used for labelling the manufactured goods.



There is a tendency towards connecting the Line-PC to the plant network to receive the pre-selected daily production schedule of the line from a host and to provide the production data automatically from the line via network to a plant server. State of the art is a configuration with the PC as a redundant system to ensure that quality documentation and production reports are provided without any lag.

The thorough Ethernet concept supports teleservice up to each end-connected unit. This way TROESTER engineers can support the operators on site in real-time from the Headquarter in Hannover, Germany. Ethernet supports the tendency of merging the company network together with the entire line control.

当今的趋势是将生产线PC与工厂的网络相互关联。生产线PC从工厂的主机接收预先设定的每日生产计划，并将生产的产品数据自动地通过工厂网络反馈到工厂的服务器。目前这项将PC作为缓冲和备份的技术，确保了质量信息和产品报表不会有丝毫的滞后。

完整的Ethernet系统会支持远程服务联接到每个终端联接点。采用这种方式，TROESTER德国总部的工程师可以实现实时地帮助现场操作者。Ethernet系统也支持将整个公司的网络和全部的生产线控制整合在一起的趋势。

Electrical Equipment
电气设备



The container construction allows for an extensive pre-assembly and the pre-acceptance by the manufacturer and thus results in shorter commissioning times on site.

集装箱式电气控制室可允许制造商对电气系统进行最大化的预安装和预检验。这样可以有效的缩短现场的调试时间。

Project Management Support 项目管理支持



Management for Your Success

To achieve all of the customers project goals, TROESTER has a unique project management. Individual projects require individual support as well as the development of distinct technical skills.

The project manager is the customers link to technical and commercial departments. He also has broad engineering know-how and can give quick assistance.

为您的成功管理助力

为了协助客户顺利达到项目目标，TROESTER公司具有专门的项目管理部门。不同的项目除需要不同的项目支持外，也需要专业的技术能力的研发。

项目经理是TROESTER客户联系技术部门和商务部门的纽带。同时，项目经理也具备深厚广博的技术知识和经验，并可以提供快速的有关项目事宜的协助。



TROESTER Machinery Ltd., USA 特乐斯特 美国有限公司

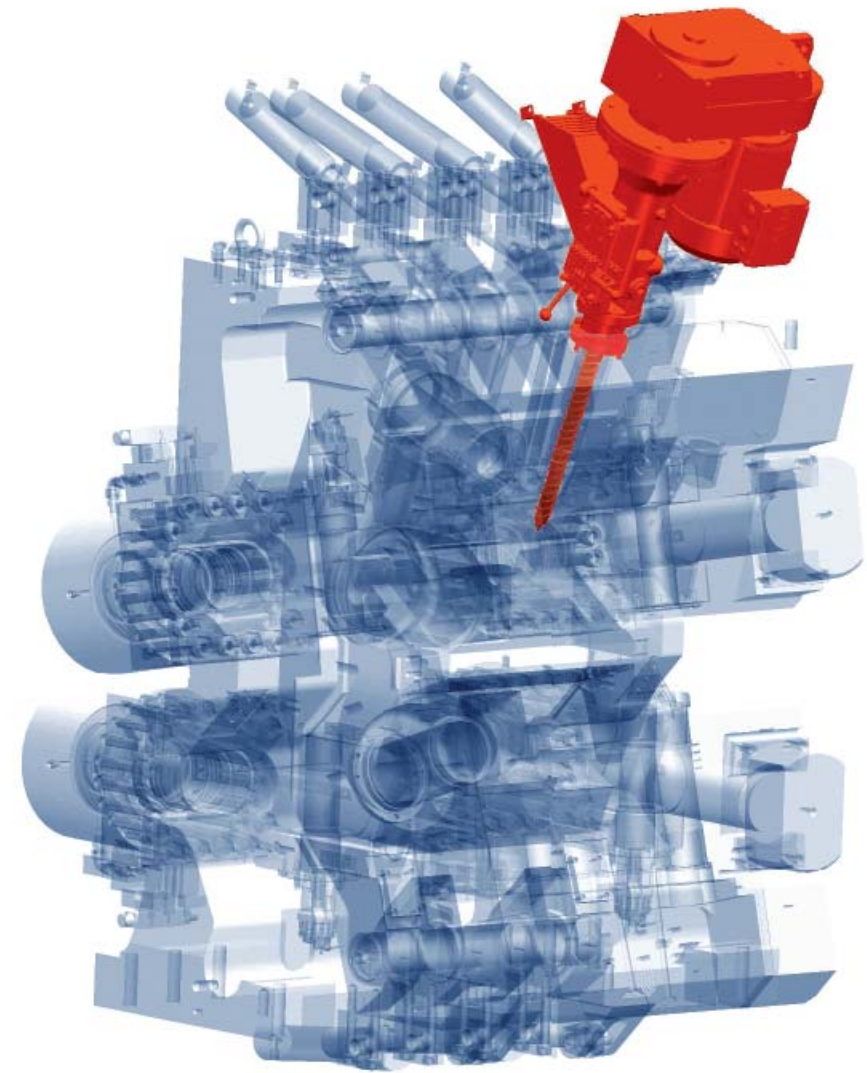


TROESTER Machinery (Shanghai) Co., Ltd. 特乐斯特机械（上海）有限公司

TROESTER World-wide 全球化的TROESTER



TROESTER GmbH & Co. KG, Germany 特乐斯特有限&两合公司，德国



Technology for the Freedom of Tire Design 自由的轮胎设备设计技术

Since silica-compounds have a poor electro-conductivity, today's tire designers apply a thin radial portion of carbon-black-based compound to the tread which avoids the electrostatic build in the tire. 由于白炭黑胶料的不良导电性能，现今的轮胎客户在胎面中增加了径向的窄条黑炭黑胶料的设计，从而避免静电在轮胎中的积累。

For the economical extrusion of the chimney rubber portion, TROESTER developed the new piggy-back extrusion principle »X+1«. 为了更加经济地挤出烟囱型的胎面胶部件，TROESTER公司研发出了新型的背式挤出机头（X+1）

The additional extruder is part of the moveable upper body of the extrusion head:

附加挤出机是挤出机头上部可移动部件的一部分：

- > Compact GS45 rubber extruder /紧凑型一体化GS45挤出机
- > Quick material change /快速胶料更换
- > Simple flow channel and die design /简单流道和口型设计
- > Maximum output performance /最大化出胶量
- > Existing TROESTER heads can be upgraded to the »X+1«-technology. 现有TROESTER挤出机头可以使用X+1技术进行升级



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