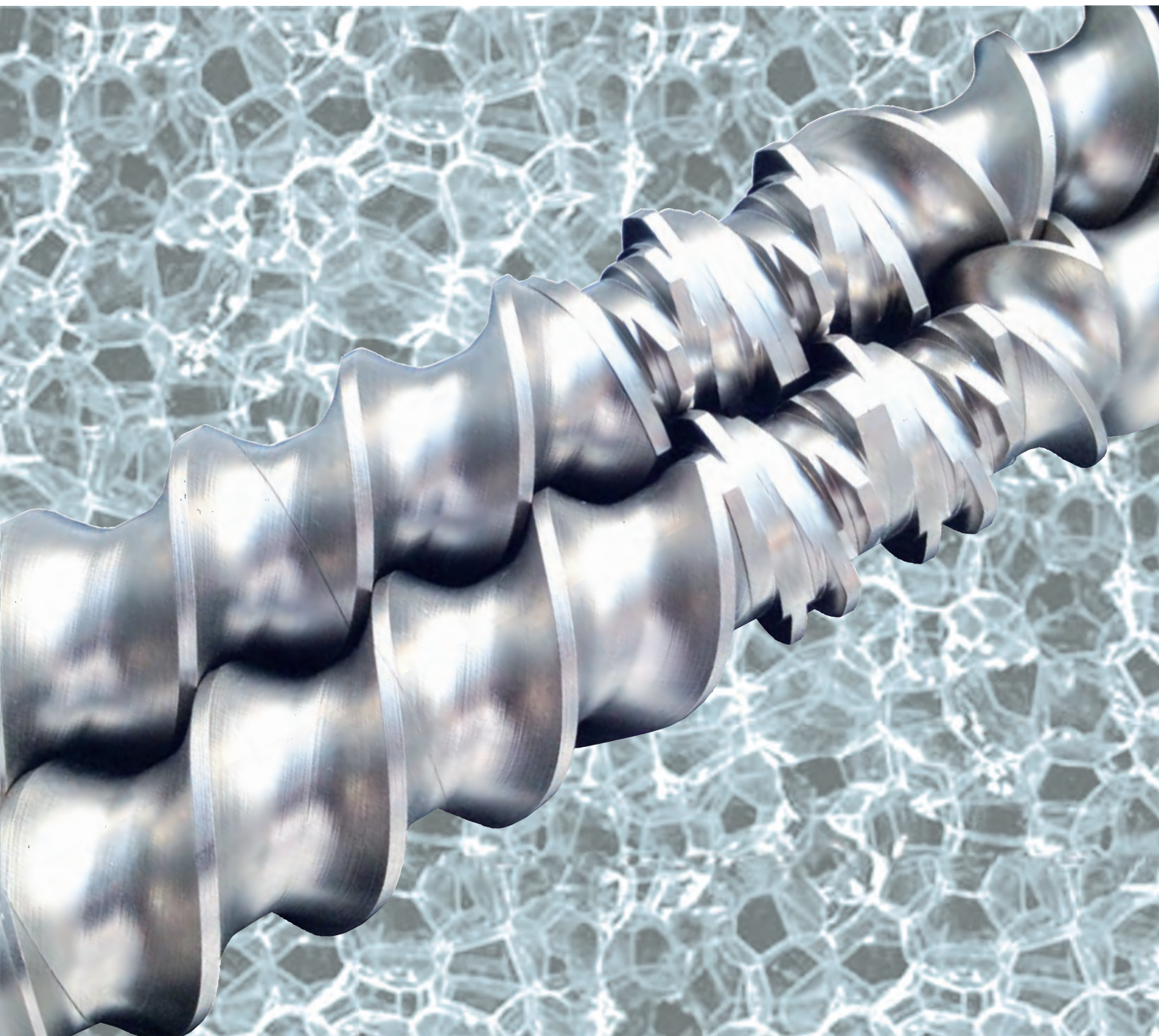


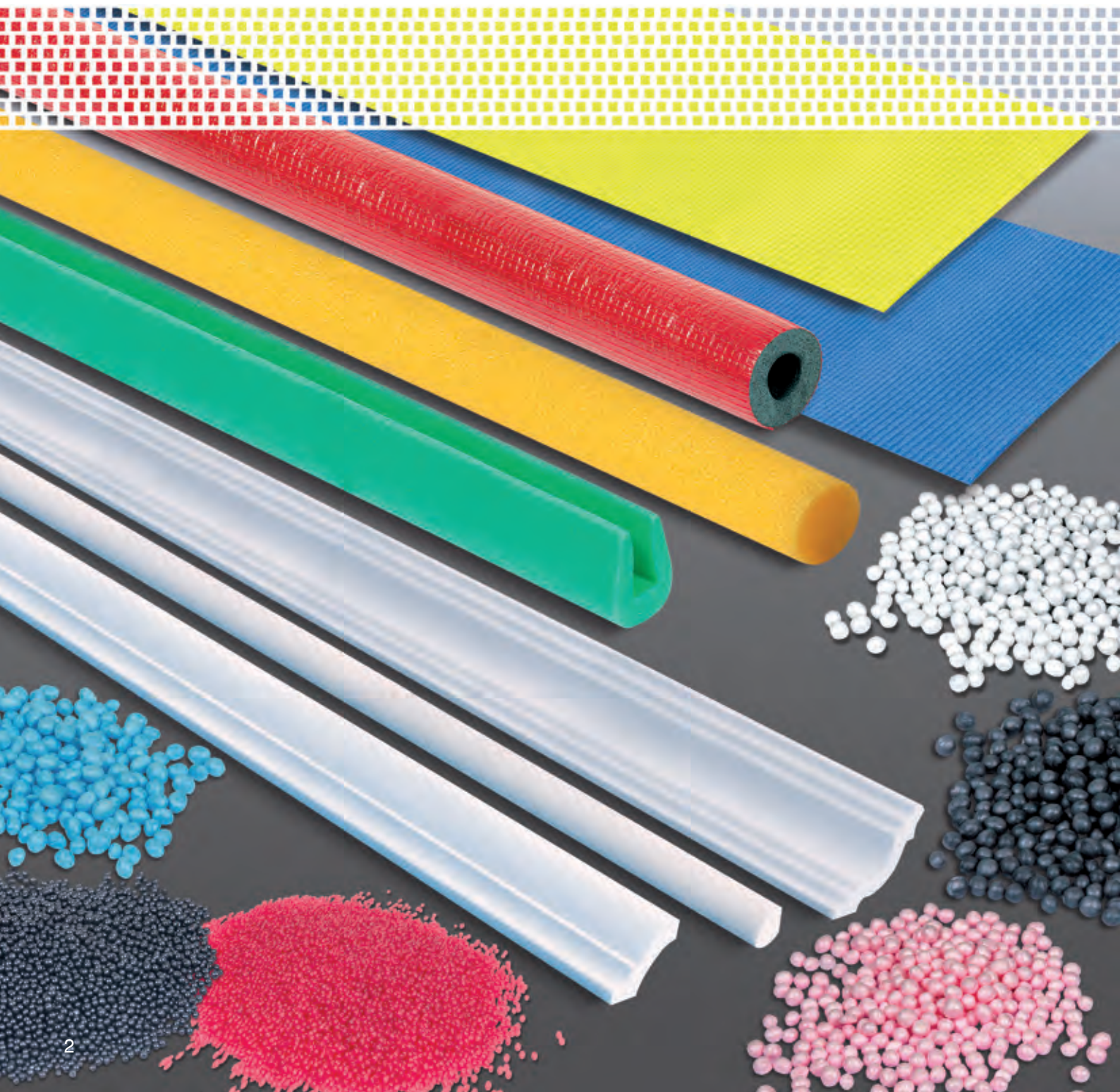
Sulzer aixfotec™ Twin Screw Extrusion
Advanced Foam Technology



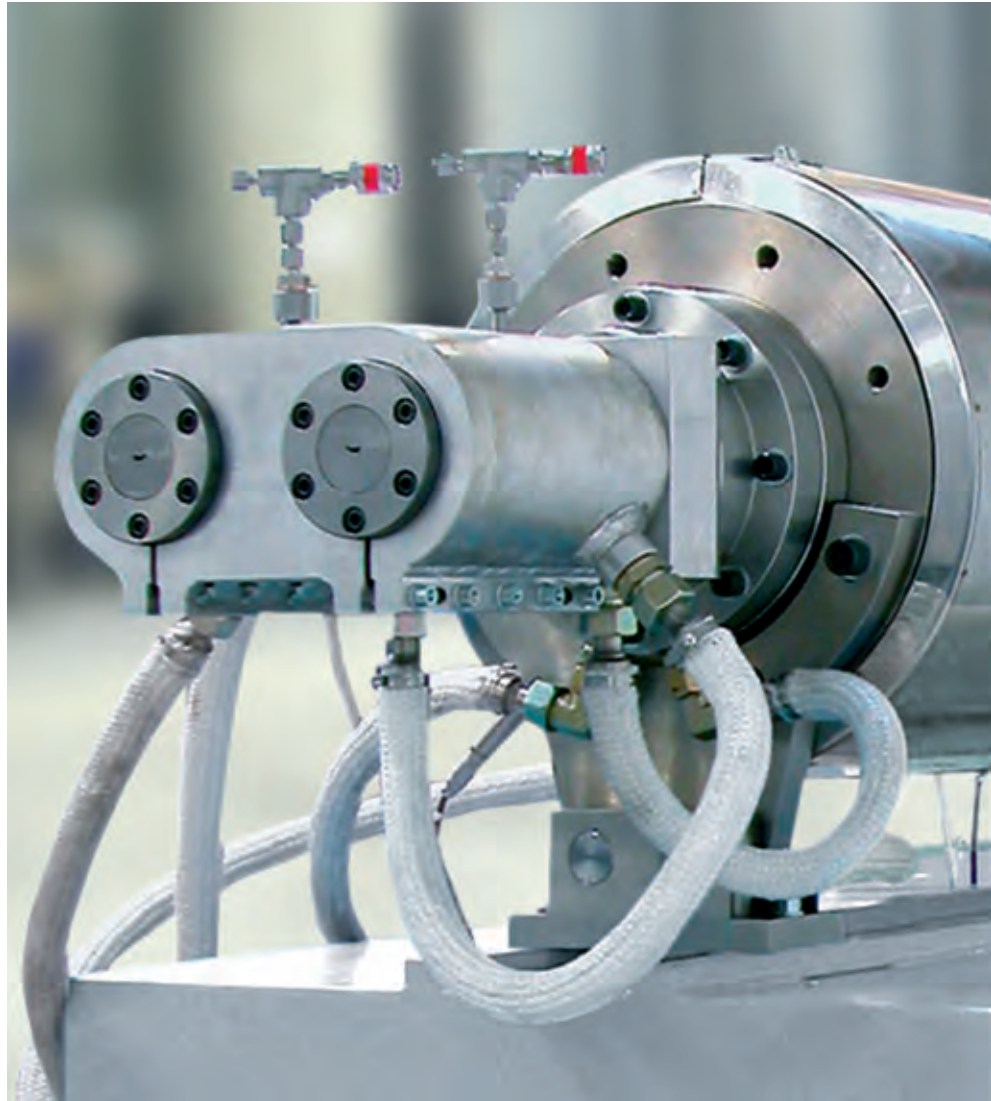
Applications

Advanced Extrusion Systems Thermoplastic Foam Applications

Sulzer aixfotec™ manufactures specialized extrusion lines for polymer foam productions. Development and manufacturing of production lines for the foam industry are our core competencies. Sulzer aixfotec™ industry solutions reflect 30 years of development work in the foam industry.



XPS Foam Profile Extrusion



XPS Foam Profile Extrusion

From decorative products to pipeline insulation extruded polystyrene foam profiles find their applications in diverse fields. Customized die technology allows nearly any modification in product design.

Sulzer aixfotec™ holds all technical and process know how necessary for fast production start-ups reducing time to market to a minimum.

Sulzer aixfotec™ and their OEM suppliers are working under German VDMA standards.

Sulzer aixfotec™ offers a unique set of customer and product specific XPS foam profile production lines for a variety of applications from pilot lines to high volume production systems.

Advanced Extrusion Systems XPS Foam Profiles

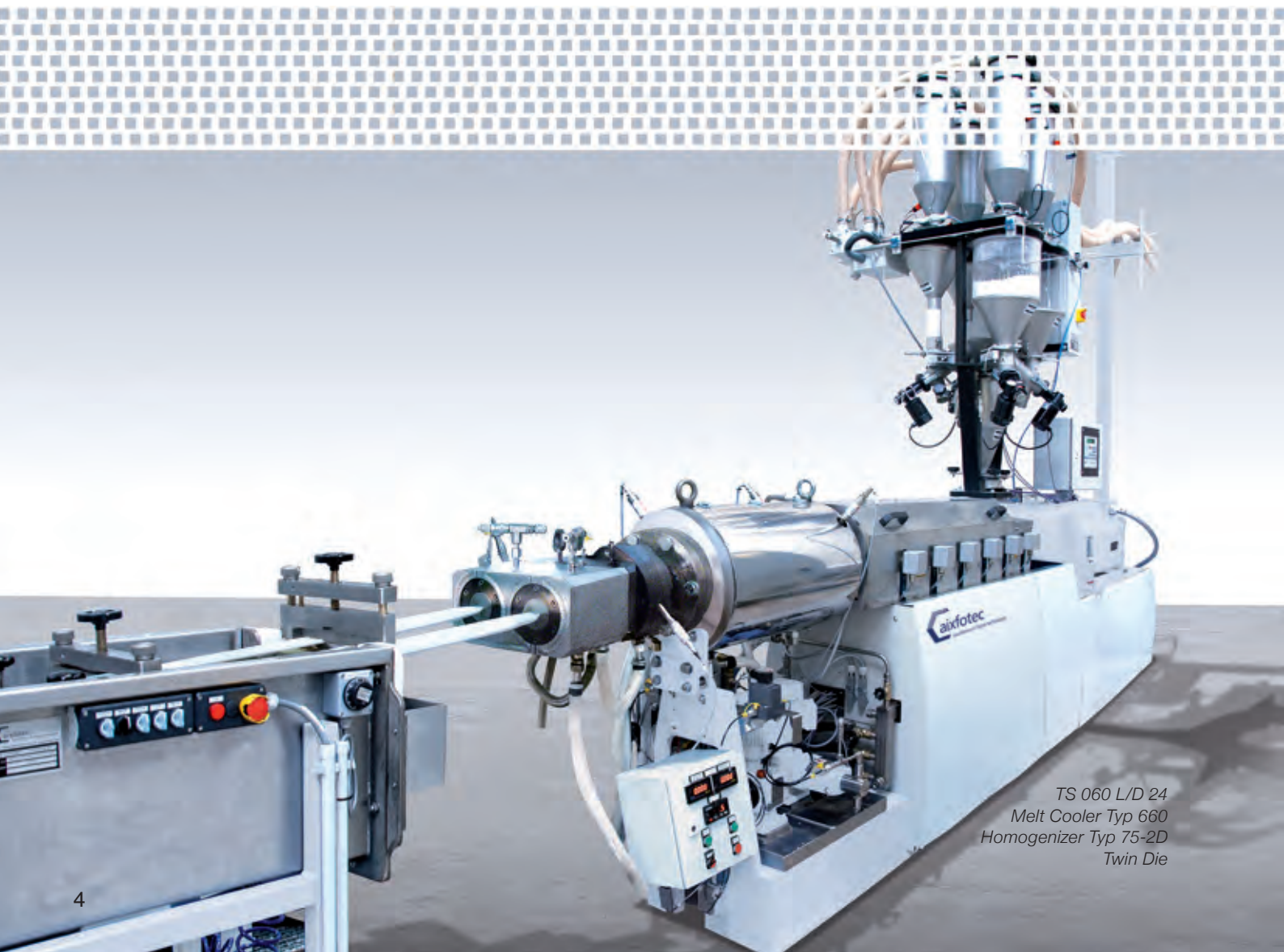
XPS direct gas twin screw extruders are designed according to industry requirements: process stability, reliability and product quality. XPS extrusion lines provide a wide range of densities (60 kg/m^3 - 300 kg/m^3) and output rates.

Twin screw extruder

Advanced twin screw extruder characterized by high efficiency mixing combined with low energy consumption per kg output. High torque screws designed specifically for

foam applications. Data visualization of all machine parameters and set-points. Customized data-log, data-trend and data-archiving. Start/stop security loop involving gravimetric

dosing unit, gas metering/dosing, melt pressure and melt temperature. State of the art melt temperature control based on steering algorithm developed for XPS foam extrusion.



TS 060 L/D 24
Melt Cooler Typ 660
Homogenizer Typ 75-2D
Twin Die



Gas metering and dosing unit



Puller and numerical flying saw unit

Gas metering and dosing unit:

Metering and pumping systems for pentane, propane, butane, N₂ or CO₂ are available.

Gas pump station and metering system are designed to allow large variability in output. Direct gazing technology for lower production costs.

From plant layout, to infrastructure work a full package is provided to our customers!

Die technology

Sulzer aixfotec™ die technology empowers market leaders to reach cutting edge quality, lower density levels and high output. Single die and twin die technology are proven standards.

Niche market applications or optimization of your mass production? We have the right answer!

XPS Profile Calibration

The calibration is installed in the water cooling trough to optimize shaping and for constant profile size.

The better the equipment the higher your return!

Puller and numerical flying saw unit

Puller with long soft PU bands limiting profile deformation combined with a numerical 2 axis flying cutting saw designed for perfect angular cuts at any speed.

Profile length in narrow tolerances without brews ready for packaging!

In-line dryer

Combined suction technology and hot air blowers give an effective drying system.

In-line printing or in-line painting is leading to quality improvements and cost reduction!

Technical Data

Technical Data XPS Profile Extrusion

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 060	60	24	120	47	660 - 860	30 - 120
TS 075	75	24	120	90	860	40 - 150
TS 090	90	24	120	154	1260	60 - 250

*depending on density, polymer and blowing agent



XPS, XPE, XPP, XPET Foam Sheet Extrusion



XPS, XPE, XPP, XPET foam sheet extrusion

Foam sheet extrusion

XPS, XPE and XPP are the most popular foam sheet applications. XPET foam sheets are an emerging application with high potential. Mass markets are found in the following sectors: food, construction, packaging, furniture, bedding and automotive industries. Sulzer aixfotec™ holds all technical and process know how necessary for

fast production start-ups reducing time to market to a minimum. Sulzer aixfotec™ and their OEM suppliers are working under German VDMA standards. Sulzer aixfotec™ offers a unique set of customer and product specific foam sheet production lines for a variety of applications, from pilotlines to high volume production systems.

Advanced Extrusion Systems

XPS, XPE, XPP, XPET Foam Sheets

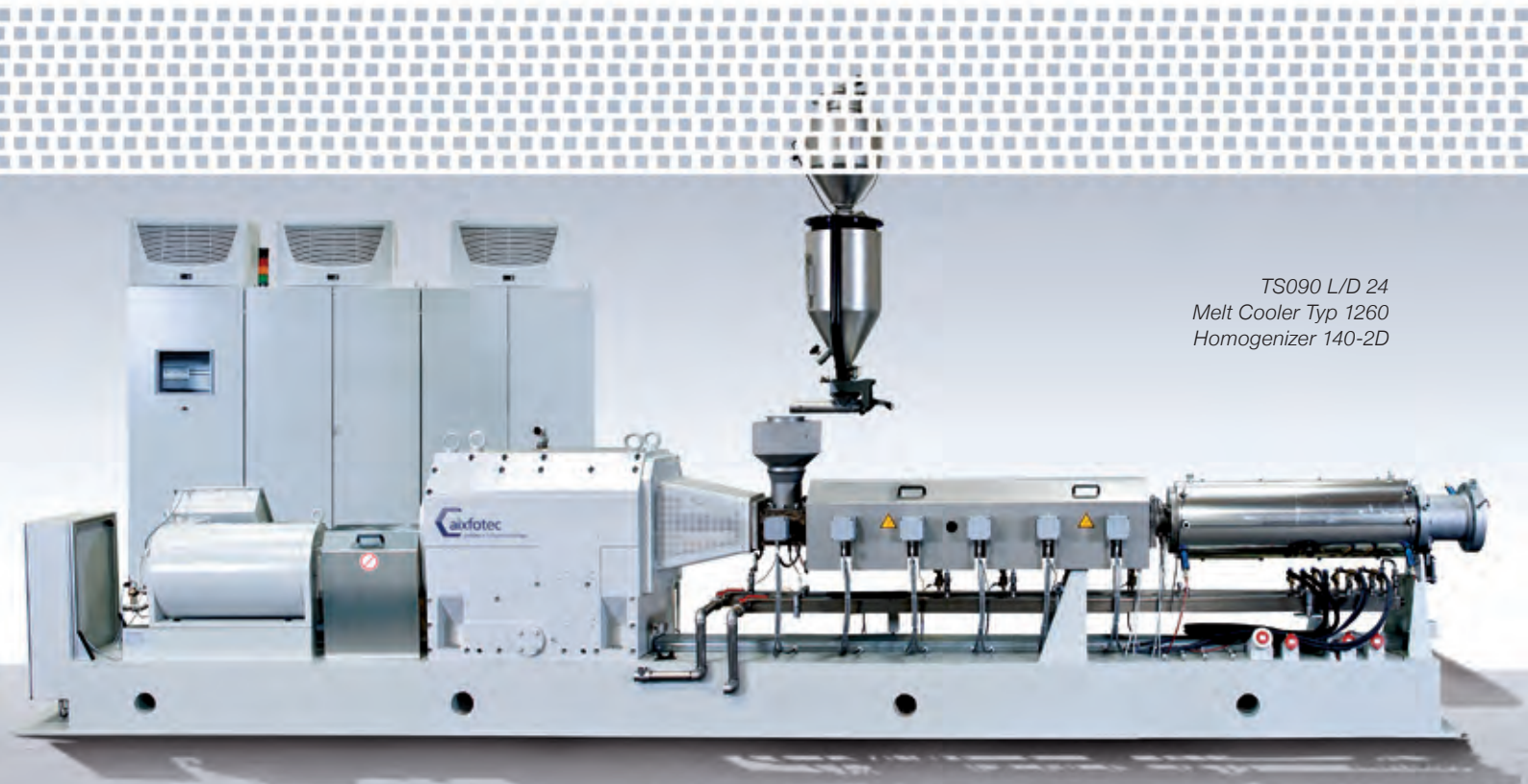
XPS, XPE, XPP and XPET foam sheets can be processed on Sulzer aixfotec™ extrusion lines in a wide range of densities and output rates.

Twin screw extruder

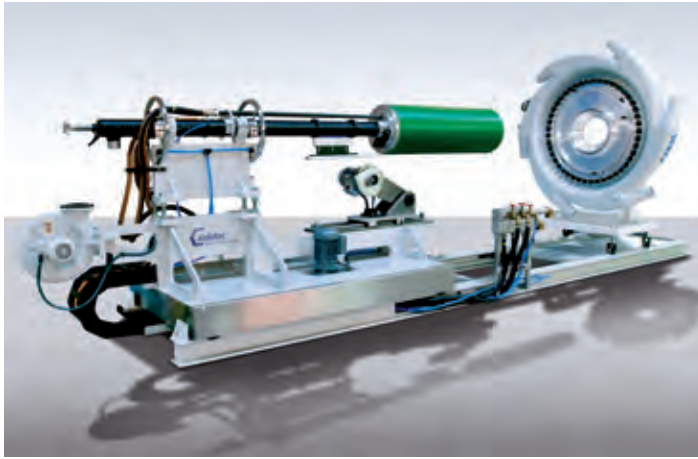
Sulzer aixfotec™ twin screw extruder are characterized by high efficiency mixing combined with low energy consumption per kg output. High torque screws designed specifically for foam applications. Data

visualization of all machine parameters and setpoints. Customized data-log, data-trend and data-archiving. Start and stop security loop involving gravimetric dosing unit, gas metering and

dosing, melt pressure and melt temperature. State of the art melt temperature control based on steering algorithm developed specifically for the extrusion of foam sheets.



*TS090 L/D 24
Melt Cooler Typ 1260
Homogenizer 140-2D*



Adjustable cooling can mandrel

Adjustable cooling can mandrel

Build on moving trolley to allow fine adjustments in distance to the die. Cooling can easy to adjust for changes in sheets width. Integrated blower system.

Melt cooler and homogenizer

A perfect melt temperature is key for high quality in foam production. Melt cooler and homogenizer systems are designed for homogeneous melt streams and process management at any throughput rate. The combined homogenizer and melt cooler units are equipped with oil heating and cooling units. The controller is programmed with cooling algorithm eliminating the risk of undershooting the set point temperature. Lower scarp rate and faster start-ups are the proven benefits of our system!



S-wrap puller

S-wrap puller

With cooled rolls (XPP) or rubber rolls (XPE). Flattening roll to avoid side displacement. High security level.

Technical Data

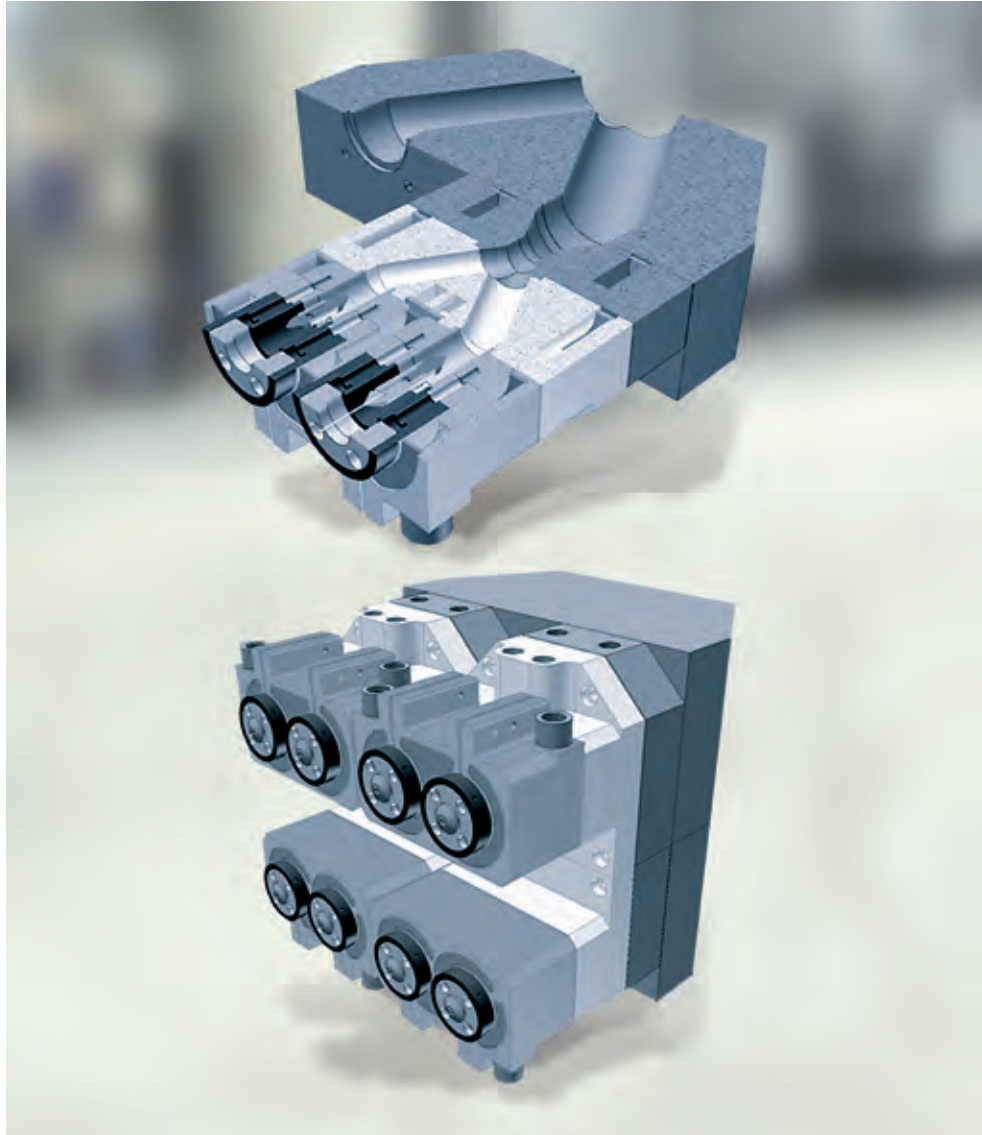
XPS, XPE, XPP, XPET Foam Sheet Extrusion

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 060	60	24	120	47	660 - 860	30 - 120
TS 075	75	24	120	90	860	40 - 150
TS 090	90	24	120	154	1260	60 - 250
TS 120	120	24	120	280	2 x 1260	90 - 500
TS 150	150	24	120	418	2 x 1260	90 - 900

*depending on density, polymer and blowing agent



XPE, XPP Foam Pipes and Profiles



Die technology: single, twin, fourfold or eighfold die outlets

Die technology

Sulzer aixfotec™ die technology empowers market leaders to reach cutting edge quality, lower density levels and high output. Single, twin or multiple die technology are proven standards. Niche market applications or optimization of your mass production?

We have the right answer!

Die changer

The die changer enables quick changes of die profile shape in running production. Lower downtime and simple handling reduces scrap rate and daily complexity in production.

Advanced Extrusion Systems XPE, XPP Foam pipes and profiles

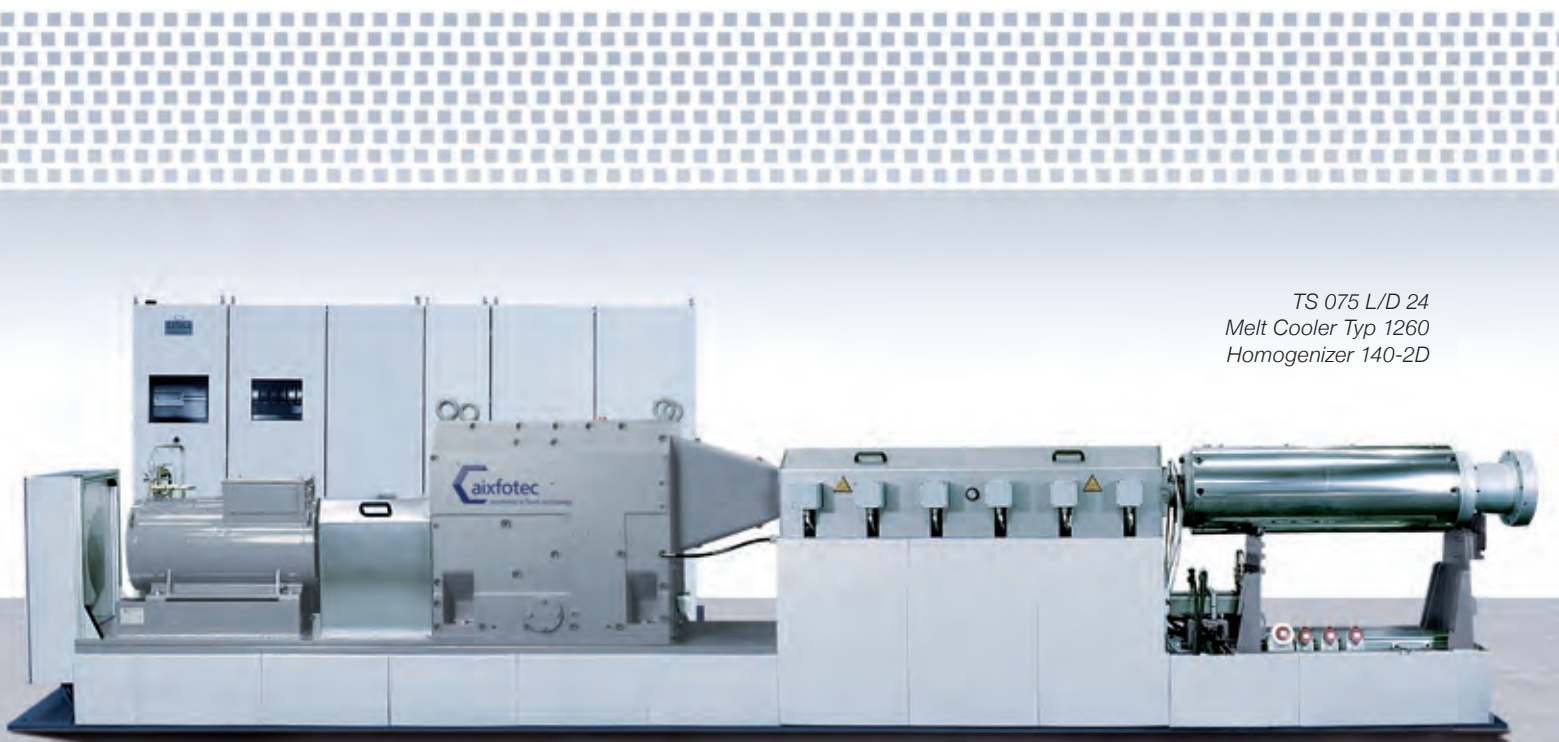
Profiles and pipe insulation are produced in XPE or XPP. Mass markets are found in the following sectors: construction, packaging, furniture, bedding and automotive industries.

Twin screw extruder

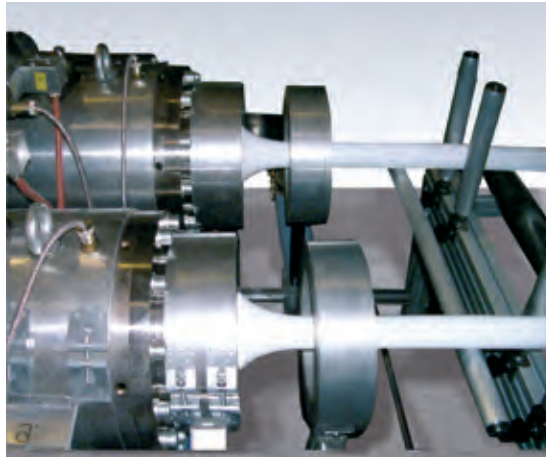
Sulzer aixfotec™ twin screw extruder are characterized by high efficiency mixing combined with low energy consumption per kg output. High torque screws designed specifically for foam applications. Data visualization of all machine parameters and setpoints. Customized data-log, data-trend and data-archiving. Start and stop security loop involving gravimetric dosing unit, gas metering and dosing, melt pressure and melt temperature. State of the art melt temperature control based on

steering algorithm developed specifically for the extrusion of XPE foam profiles and pipe insulation. Sulzer aixfotec™ XPE extrusion systems offer many expansion options (e.g. multi-co-extrusion). Years of experience in development of a variety of proven industrial plant types, tool designs and process technologies reduce implementation risks to a minimum. Our team can support you in developing the industrial solution and process design required by your product concept. Sulzer aixfo-

tec™ holds all technical and process know how necessary for fast production start-ups reducing time to market to a minimum. Sulzer aixfotec™ and their OEM suppliers are working under German VDMA standards. Sulzer aixfotec™ offers a unique set of customer and product specific foam pipe and profile extrusion lines for a variety of applications, from pilot lines to high volume production systems.



*TS 075 L/D 24
Melt Cooler Typ 1260
Homogenizer 140-2D*



Co-extruded foam skinning technology

CO-Extrusion

Co-extrusion systems are increasingly used for a number of technical applications enhancing foam performance or coloring. Inline foam skinning improves product properties and value added. Skinning on pipe insulation to ameliorate UV stability or mechanical properties is only one of a large variety of applications.



Puller and hacksaw unit for XPE foam profiles

Puller and Hacksaw unit

High speed puller with integrated hacksaw. Build in pre slitting unit for pipe insulation. Twin puller bands designed for more than one cut per second. Pipe and profile length in narrow tolerances ready for packaging!

Technical Data

XPE, XPP, Foam Pipes and Profiles Extrusion

Foam Extruder

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 060	60	24	120	47	660 - 860	30 - 120
TS 075	75	24	120	90	860	40 - 150
TS 090	90	24	120	154	1260	60 - 250
TS 120	120	24	120	280	2 x 1260	90 - 500
TS 150	150	24	120	418	2 x 1260	90 - 900

*depending on density, polymer and blowing agent

Co-Extrusion Skinning

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Output
	[mm]	L/D	[rpm]	[kW]	[kg/hr]
SS 045	45	30	450	25	10 - 100





EPS, EPE, EPP, EPET beads extrusion micro pelletizing

Extrusion of direct gazed expandable or expanded beads

One of Sulzer aixfotec™ core competences is the development of extrusion lines for EPS producers. The production of direct gazed expandable polystyrol granules (EPS) by extrusion based processes is worldwide on advance. In comparison to large scale productions based on suspension-technology this process is characterized by its high efficiency

in the production of special applications. The extrusion systems reach outstanding quality levels and allow efficient production of low volume series or specialised products. Sulzer aixfotec™ holds all technical and process know how necessary for fast production start-ups reducing time to market to a minimum.

Advanced Extrusion Systems Expandable and Expanded Beads

Innovative processes as i.e. EPS, EPE, EPP and EPET beads produced by direct gazed extrusion require optimized processing technology.

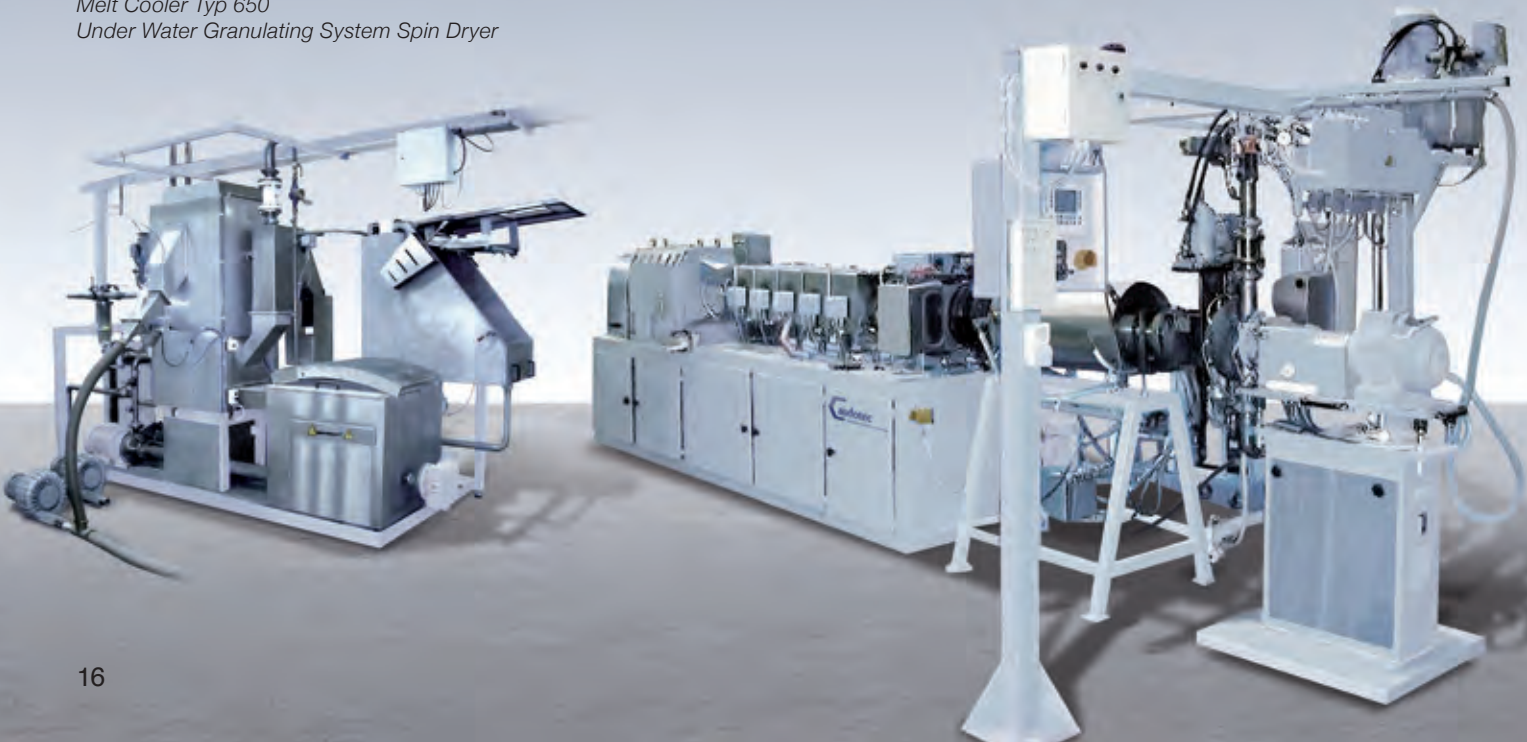
Direct gassing twin screw extruder

Advanced twin screw extruder characterized by high efficiency mixing combined with low energy consumption per kg output. High torque screws. Customized engineering based on process and application properties. Data visualization of all machine parameters and set-points. Customized data-log, data-trend and

data-archiving. Start and stop security loop involving gravimetric dosing unit, gas metering and dosing, melt pressure and melt temperature. State of the art melt temperature control. Designed for small and medium production size. Efficient production of special products. Easy shift between products: lower energy

consumption, reduced maintenance, less space, superior quality, variability on output, can be customized to your needs! The cutting chamber of the under water pelletizer is completely filled with process water. The pelletizer cuts polymer strands into pellets immediately after they have passed the die plate.

*TS 075 L/D 24
Melt Cooler Typ 650
Under Water Granulating System Spin Dryer*





Gas metering and dosing unit and CO₂, Pentane, Butane, Propane...



Under Water Pelletizer and drying system

Centrifugal pellet dryer

The centrifugal pellet dryer separates process water and pellets. Pellets move helically upwards to the top of the dryer and are leaving the dryer continuously through the pellet outlet. Because of the rebound effect and the counter current airflow generated by the exhaust blower the pellet outlet moisture is designed for less than 0.05% depending on the type of polymer and hygroscopy.

Full metal granulating head and knives

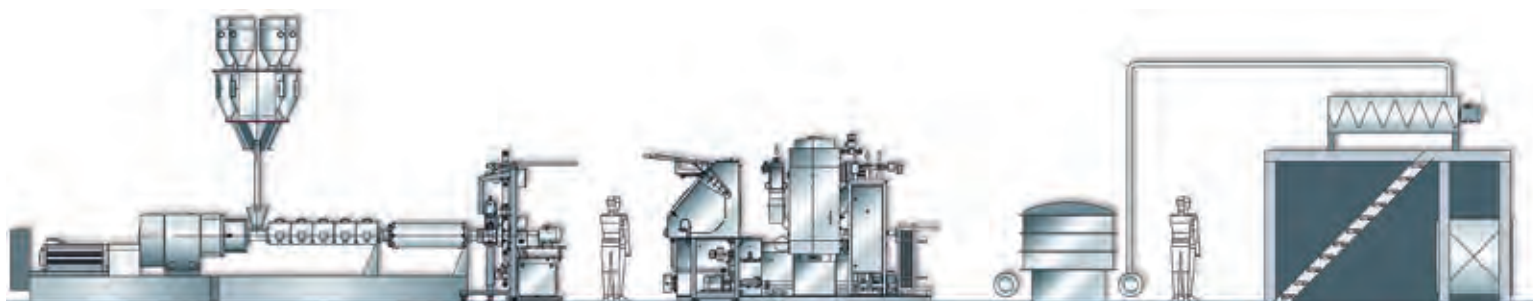
Granulating head and knives designed for long lifecycles. Coating by melted carbide reduces maintenance costs to a minimum. Increased life span and lower wearout. Holes are fabricated by wire erosion for better surface quality. Holes as small as diameter 0,45 mm. Granulating heads oil heated for high quality round shaped beads in a narrow distribution.

Technical Data

EPS, EPP Micro Pellets and Beads Extrusion
 E... polymer of your choice

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 075	75	24 - 52	120 - 450	90	560 - 860	200 - 450
TS 120	120	24 - 52	120 - 450	280	860 - 1260	up to 1500
TS 140	140	24 - 52	120 - 450	846	1260	up to 3000

*depending on polymer, blowing agent, additives and bead sizes



Laboratory Extrusion Systems



Laboratory Extrusion Systems

Laboratory Extrusion Systems

Sulzer aixfotec™ laboratory extrusion lines are widely used to develop foam ability on various polymers, various gases and various foam applications.

Advanced Extrusion Systems Laboratory Extrusion

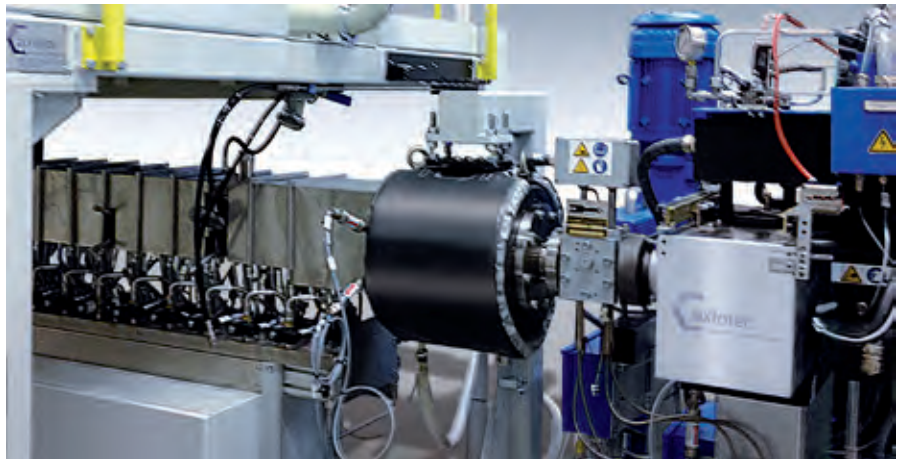
The laboratory foam line has the same processing characteristics as the industrial line. This facilitates upscaling of any process.

The extruder is defined as a co-rotating, intermeshing twin screw with direct gassing option by usage of physical blowing agents. Depending on the targeted processes the processing equipment can be build to run temperatures up to 400°C. As an option the system can be designed to process various gases.

Injection of one or more gasses or a cocktails of gasses is possible. Feeding of powders through side feeder and various different downstream equipment are available depending on the process. Under water pelletizer and dryer systems for expandable or expanded beads (EPS, EPP, E...).

*TS 030 L/D 40
Melt Cooler Typ 360
Under Water Granulating Gravimetric Feeder
MultiGas Dosing and Meetring System*

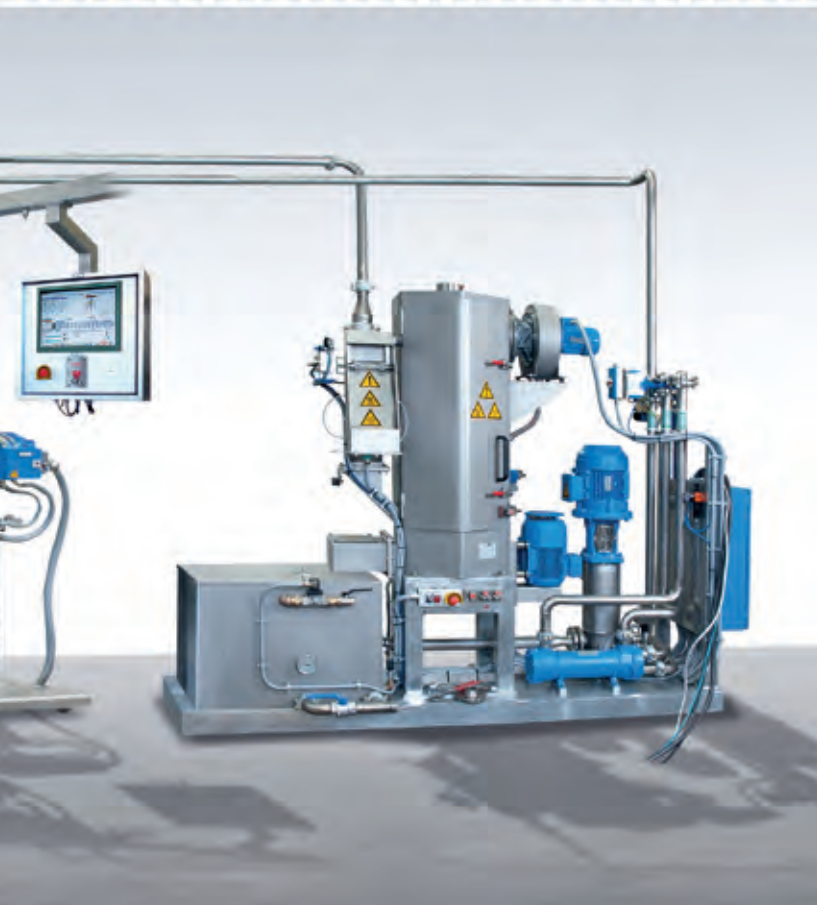
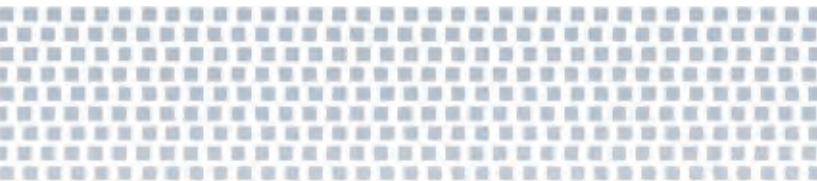




Foam extruder TS 030 with melt cooler typ 360 in laboratory size

For a deeper analysis of the raw material mix a second set of screws to realize lab size master batches can be provided. For foam sheets and profiles an adapter to the die and necessary die technologies with cooling section and puller enable simulations of real production characteristics on laboratory scale.

Output range from 3 kg/hr up to maximum of 30 kg/hr. The laboratory foam line has the same processing characteristics as the industrial line. Therefore the twin screw extruder the relation of min. to max. output is generally a multiple of 10x. This facilitates upscaling of any process.



Technical Data Laboratory Foam Extrusion

Laboratory Foam Extruder

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 020	20	24 - 52	600	7.5	360	1 - 10
TS 030	30	24 - 52	600	13	360	3 - 30
TS 045	45	24 - 52	600	18	360	6 - 60

*output is related to the research field, typ of polymer and blowing agent.

Sulzer aixfotec™ laboratory lines are designed for working temperatures up to 420 °C.

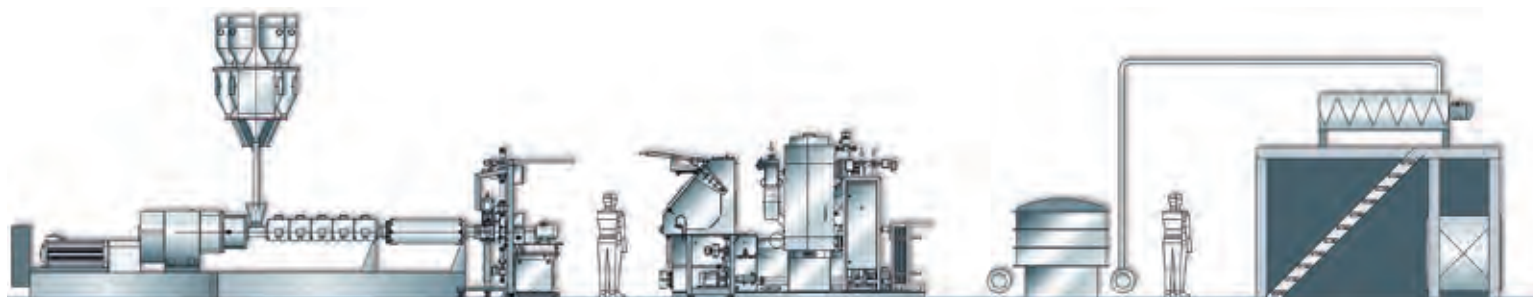
Foam extruders can be equipped with side feeders for powder additives.

Sulzer aixfotec™ provides the ability to equip laboratory extruders with two screw sets: foam and masterbatch.

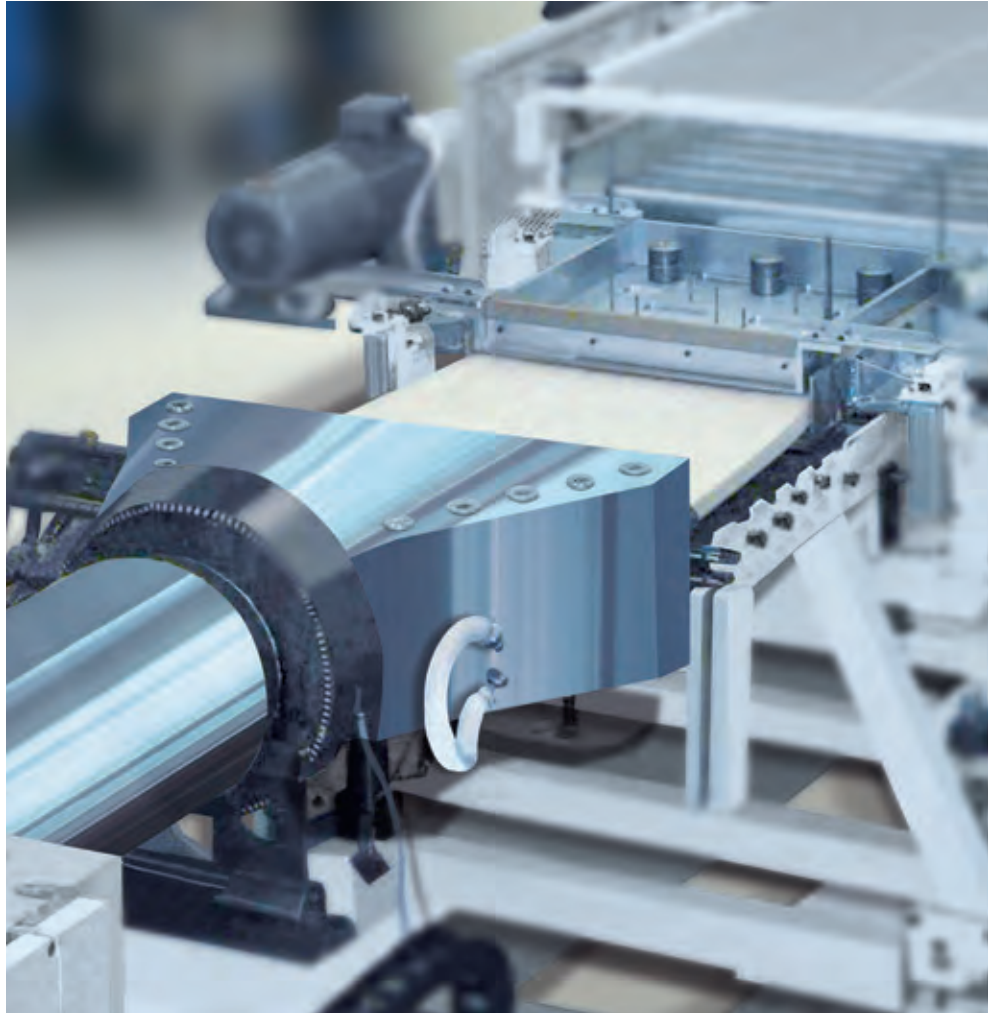
Semi Industrial Foam Extruder

Extruder typ	Screw diameter	Process length	Max screw speed	Max drive power	Melt cooler	Foam output
	[mm]	L/D	[rpm]	[kW]	[mm]	[kg/hr]*
TS 060	60	24 - 52	120 - 600	47	560	250
TS 075	75	24 - 52	120 - 600	90	660	450

*output is related to the research field, typ of polymer and blowing agent.



XPET Board Extrusion



XPET board extrusion

XPET board extruder screws are designed to reduce shear heat and allow to process regrind material. XPET melt cooler systems are designed in modules with separate oil heating and cooling units. Oil tempered strand dies ameliorate melt temperature steering and tempera-

ture gradient between extruder end and die exit. XPET calibrators and post calibrator units lead to an optimized product finish. Gas stations build to process gas cocktails are key developments to reach lower densities and improve product quality.

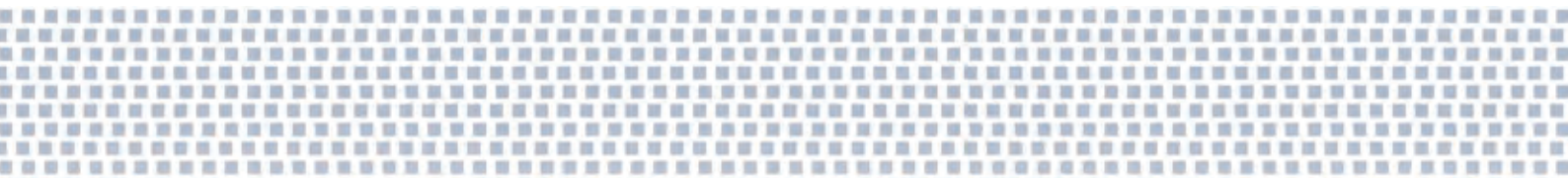
Advanced Extrusion Systems XPET Foam Boards

XPET board extruders are designed to minimize shear heat and to allow processing of PET regrind material.

Twin screw extruder

Advanced twin screw extruder characterized by high efficiency mixing combined with low energy consumption per kg output. High torque screws designed specifically for foam applications. Data visualization of all machine parameters and set-points. Customized data-log, data-trend and

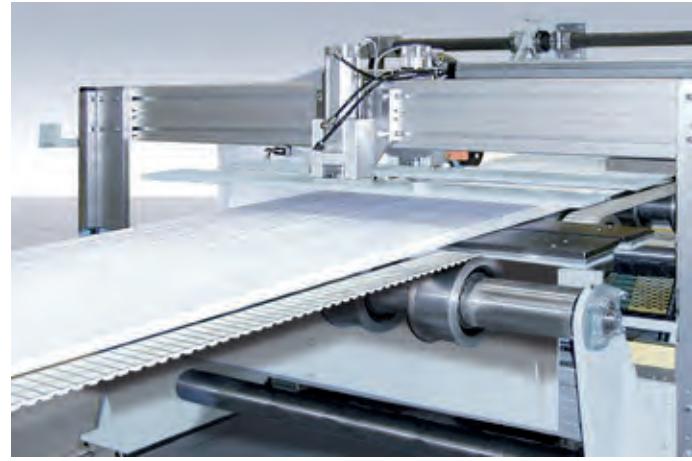
data-archiving. Start/stop security loop involving gravimetric dosing unit, gas metering/dosing, melt pressure and melt temperature. State of the art melt temperature control based on steering algorithm developed for XPET foam board extrusion.



TS 140 L/D 24
Twin Melt Cooler Typ 1260
Homogenizer Typ 175-2D
Plank Die with Strand Die Plate



Gas station for multiple gas cocktails



XPET board extrusion

Modular melt cooler for XPET board extrusion

Controlling and steering melt temperature is key for high quality in XPET foam board production. Modular melt cooler systems split the cooling process in several cooling zones. High volume XPET extrusion systems require temperature control at any throughput rate. The combination of several melt cooler zones each equipped with oil heating and cooling units leads to high precision in temperature steering. Each controller is programmed with cooling algorithm eliminating the risk of undershooting the set point temperature.

Down Stream Equipment

Down stream equipment with integrated cutting, milling and cooling units. I.e.: plank cooling on pater-noster systems if available floor space is an issue.

Please contact us for extruder sizes and output ratios.

Sulzer aixfotec™ services include layout of complete lines, P&ID, detailed infrastructure engineering.

Control System

Central Operating System

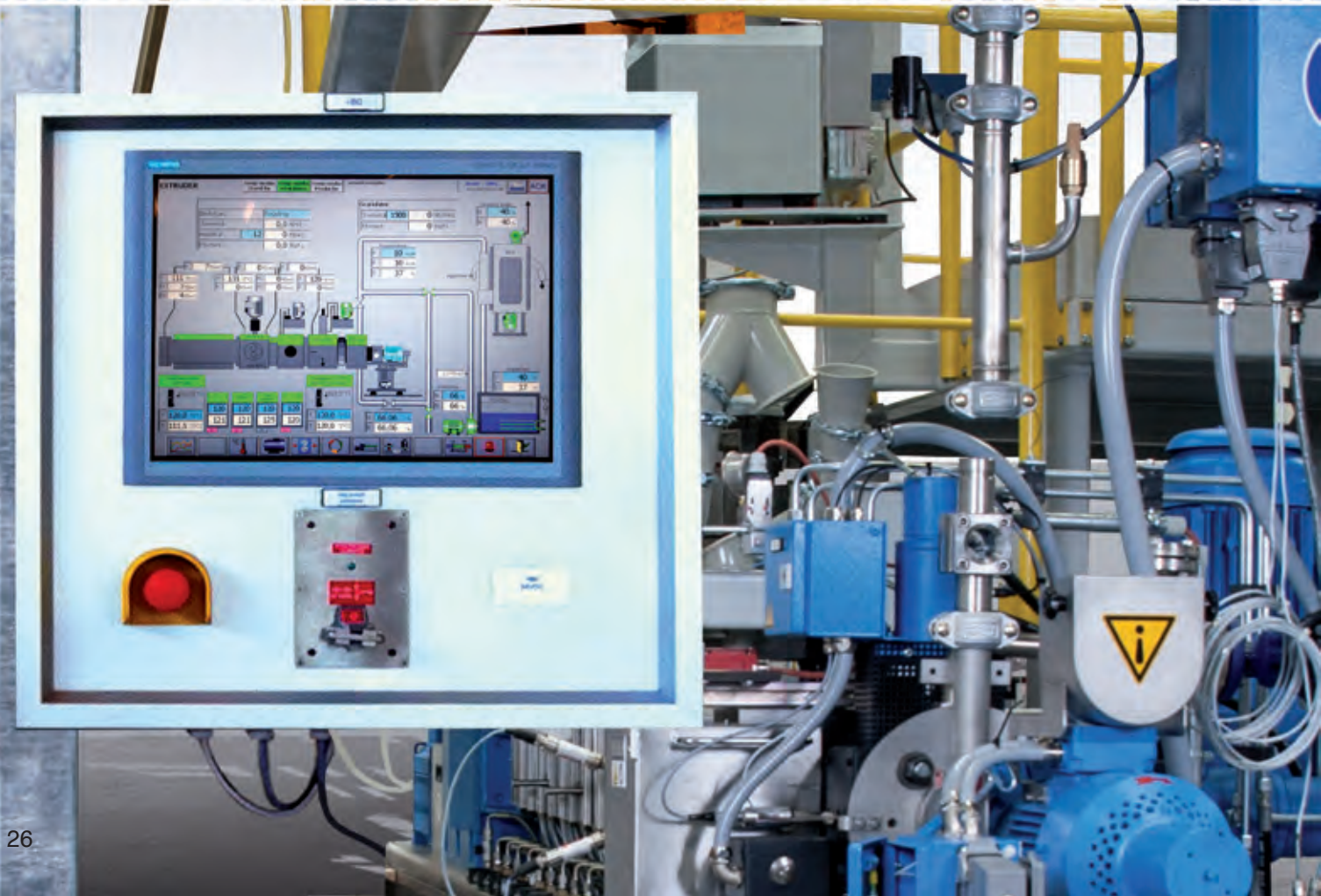
Optimal operation with the right control system

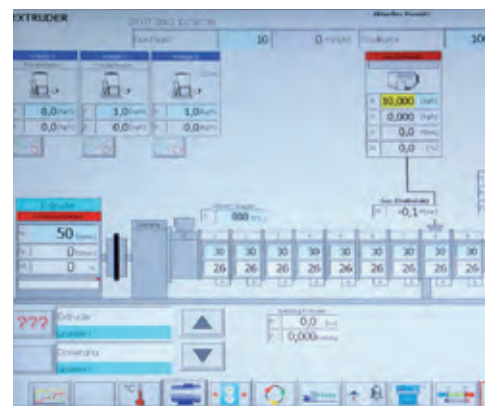
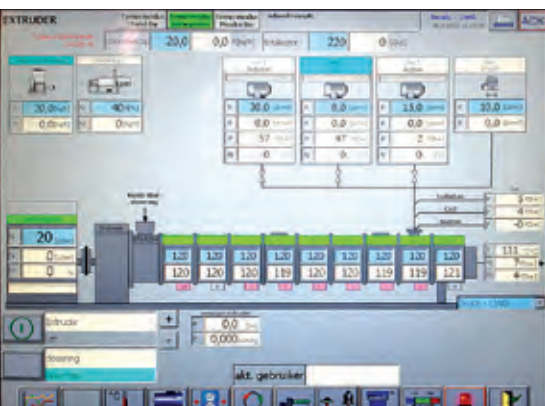
Central operating system to meet specific requirements.

Philosophy

Central operation at one point, almost independent from the complexity of the automated production line. With the integration of all aggregates in

one operating system additional operating terminals are no longer necessary. Consequently errors are minimized.





Central Operating System

Using a central panel the operator has quick access to all line components, parameters and process factors. The reaction to processing situations is essentially accelerated and the workflow is optimized. The central operating system was developed for the operator's demands. This results in easy handling of the complete system along the process chain leading to transparency in the workflow and high availability of the lines.

Production Analysis System

Philosophy: Reproducibility of processes and documentation of processing parameters become more and more important. Continuous analysis and supervision improve control on production processes.

The production analysis system can file the following data types: analogue values (i.e. temperatures, pressures), binary values (events, alarms).

Service Center

Build in modem with 24 hours help desk is a Sulzer aixfotec™ service that reduces down time and production losses to a minimum.

Analysis Tools: Online and historic trend, online and alarm history, production events, reports like shift protocols, parameter values... Batch related recording, statistics, storing of any configuration.

Processes will be filed in a standardised data base.

Smooth communication with other systems can be guaranteed. Open interfaces facilitate integration in the IT structure. Options available to connect to existing MES/ERP systems.

www.sulzer.com

Please check for your local contact

Sulzer Chemtech Ltd, a member of the Sulzer Corporation, with headquarters in Winterthur, Switzerland, is active in the field of process engineering and employs some 4000 persons worldwide.

Sulzer Chemtech is represented in all important industrial countries and sets standards in the field of mass transfer and static mixing with its advanced and economical solutions.

The activity program comprises:

- Process components such as fractionation trays, structured and random packings, liquid and gas distributors, gas-liquid separators, and internals for separation columns
- Engineering services for separation and reaction technology such as conceptual process design, feasibility studies, plant optimizations including process validation in the test center
- Recovery of virtually any solvents used by the pharmaceutical and chemical industry, or difficult separations requiring the combination of special technologies, such as thin film/short-path evaporation, distillation under high vacuum, liquid-liquid extraction, membrane technology or crystallization.
- Complete separation process plants, in particular modular plants (skids)
- Advanced polymerization technology for the production of PLA and EPS
- Tower field services performing tray and packing installation, tower maintenance, welding, and plant turnaround projects
- Mixing and reaction technology with static mixers
- Cartridge-based metering, mixing and dispensing systems, and disposable mixers for reactive multi-component material

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