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.
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/m³-300 kg/m³) 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.
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

### XPS Profile Extrusion

<table>
<thead>
<tr>
<th>Extruder typ</th>
<th>Screw diameter [mm]</th>
<th>Process length L/D</th>
<th>Max screw speed [rpm]</th>
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<th>Melt cooler [mm]</th>
<th>Foam output [kg/hr]*</th>
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<tbody>
<tr>
<td>TS 060</td>
<td>60</td>
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<td>660 - 860</td>
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<td>24</td>
<td>120</td>
<td>154</td>
<td>1260</td>
<td>60 - 250</td>
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</table>

*depending on density, polymer and blowing agent
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.
**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 undershoot ing the set point temperature. Lower scarp rate and faster start-ups are the proven benefits of our system!

**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

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<td>24</td>
<td>120</td>
<td>418</td>
<td>2 x 1260</td>
<td>90 - 900</td>
</tr>
</tbody>
</table>

*depending on density, polymer and blowing agent*
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.

Die technology: single, twin, fourfold or eigthfold die outlets
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.

Technology

Twin screw extruder

Sulzer aixfotec™ twin screw extruders 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 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 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-Extrusion

Co-extrusion systems are increas- singly 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 alemiorate UV stability or mechanical properties is only one of a large variety of applications.

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

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*depending on density, polymer and blowing agent

### Co-Extrusion Skinning

<table>
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<tbody>
<tr>
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<td>45</td>
<td>30</td>
<td>450</td>
<td>25</td>
<td>10 - 100</td>
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</table>
Extrusion of direct gazed expendable 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 underwater pelletizer is completely filled with process water. The pelletizer cuts polymer strands into pellets immediately after they have passed the die plate.
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 knifes

Granulating head and knifes 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

<table>
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<tr>
<th>Extruder typ</th>
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<th>Melt cooler [mm]</th>
<th>Foam output [kg/hr] *</th>
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</thead>
<tbody>
<tr>
<td>TS 075</td>
<td>75</td>
<td>24 - 52</td>
<td>120 - 450</td>
<td>90</td>
<td>560 - 860</td>
<td>200 - 450</td>
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<tr>
<td>TS 120</td>
<td>120</td>
<td>24 - 52</td>
<td>120 - 450</td>
<td>280</td>
<td>860 - 1260</td>
<td>up to 1500</td>
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<tr>
<td>TS 140</td>
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<td>24 - 52</td>
<td>120 - 450</td>
<td>846</td>
<td>1260</td>
<td>up to 3000</td>
</tr>
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</table>

*depending on polymer, blowing agent, additives and bead sizes
Sulzer aixfoltec™ 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...).
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 Extruder

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<tr>
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<tr>
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<td>24 - 52</td>
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<td>7.5</td>
<td>360</td>
<td>1 - 10</td>
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<td>360</td>
<td>3 - 30</td>
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<tr>
<td>TS 045</td>
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<td>24 - 52</td>
<td>600</td>
<td>18</td>
<td>360</td>
<td>6 - 60</td>
</tr>
</tbody>
</table>

*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

<table>
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<tr>
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*output is related to the research field, typ of polymer and blowing agent.
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 temperature 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.
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 paternoster 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.
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.
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: Reproducability 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).

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.

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.
Sulzer Chemtech Ltd, a member of the Sulzer Corporation, with headquar-
ters 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 ad-
vanced and economical solutions.

The activity program comprises:
• Process components such as fractionation trays, structured and ran-
dom 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, feasibilities studies, plant optimizations in-
cluding 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, distilla-
tion 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 dis-
posable mixers for reactive multi-component material