

EXTRUSION TECHNOLOGY

Twin screw extruders and systems



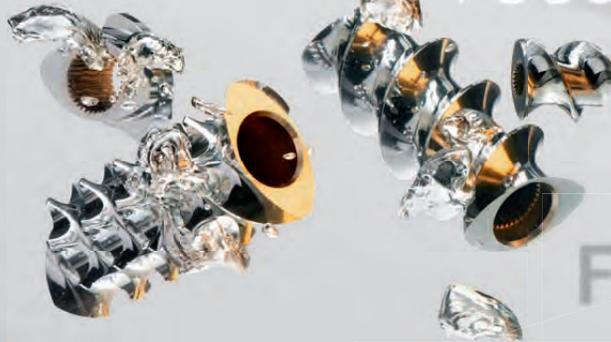
Foaming

Medical devices

Reactive processing

Compounding

Foods



Fibers



Direct extrusion

Fillers

Additives



Film

Nutraceuticals

Devolatilization

Pharmaceuticals

Engineering resins

Polymerization

Profiles

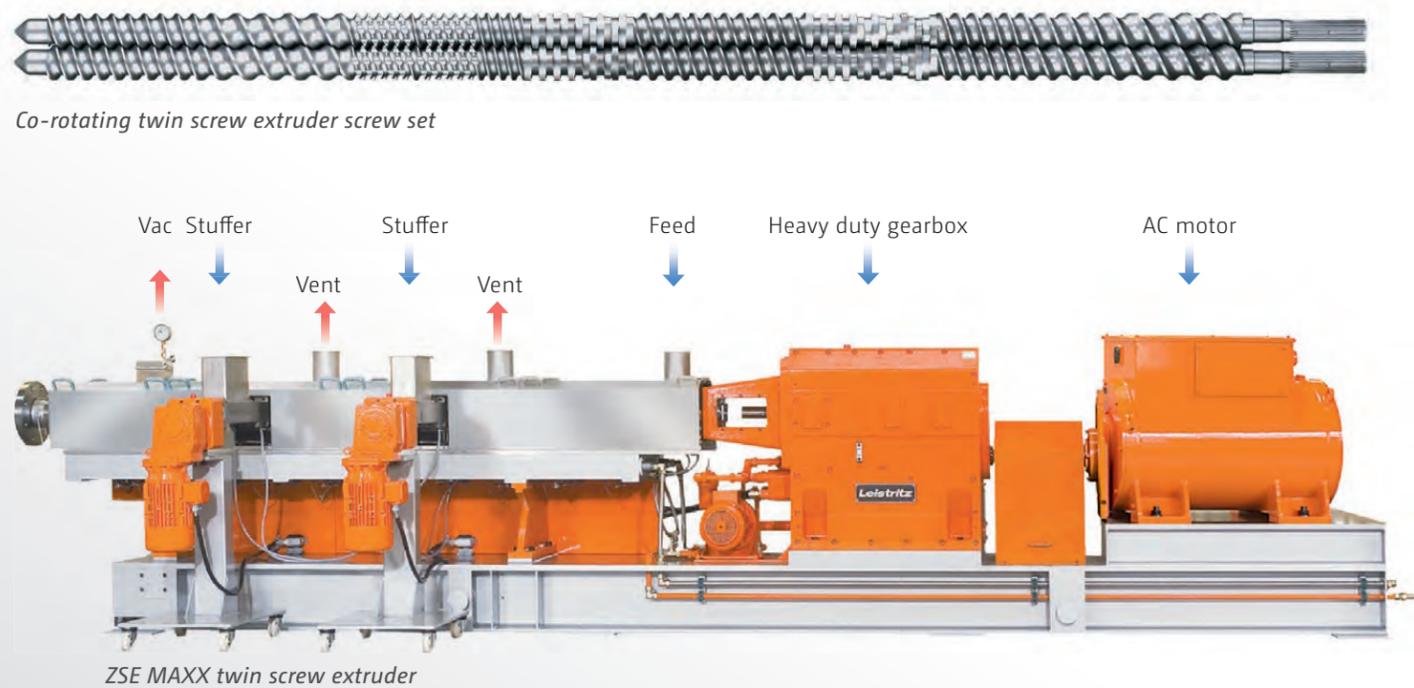
Pelletization

XXPERIENCE COUNTS!

Leistritz Extrusion Technology

Established in 1905, Leistritz is a multi-national company with business units in a number of high technology areas. Leistritz Extrusion designs, manufactures and supplies twin screw extruders and turnkey systems for

the plastics and pharmaceutical industries all around the world. Whether your requirement is a laboratory sample or high-volume production, Leistritz can supply the twin screw extrusion system to meet your needs!



Laboratory scale

High-volume production

Turnkey system

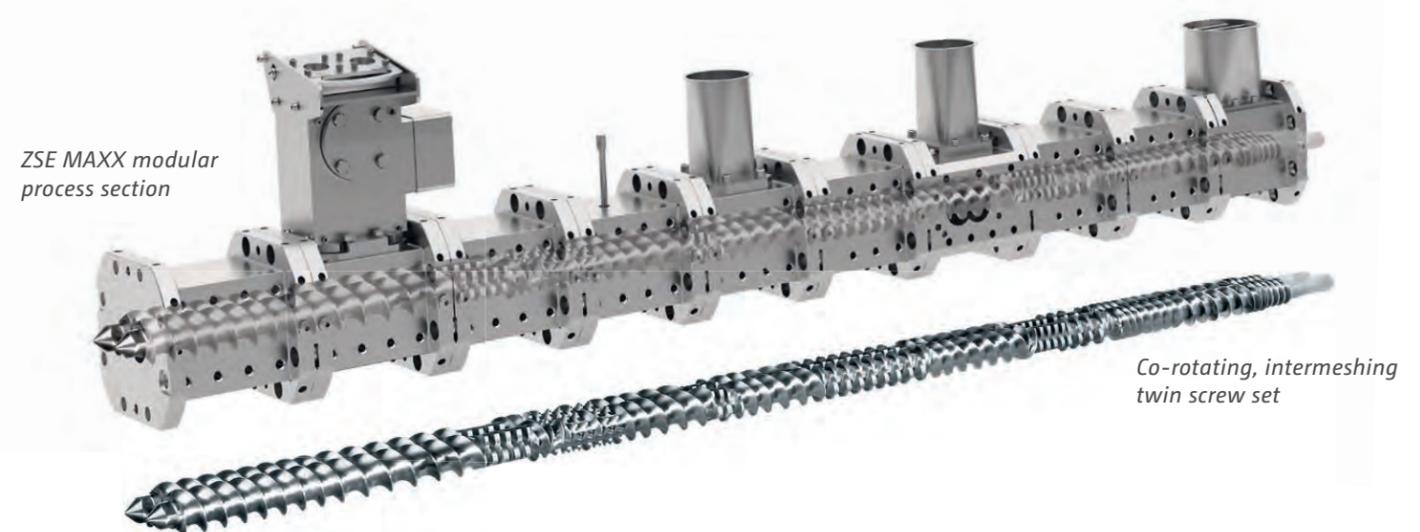
» ZSE MAXX twin screw extruders are used for many processing tasks

TWIN SCREW EXTRUDER DESIGN

Modular barrel and screw system

Co-rotating, intermeshing twin screw extruders (TSEs) continuously mix plastics formulations consisting of pellets, powders and fluids. Barrels are modular and utilize liquid cooling. Screws are segmented and assembled on high torque shafts. Screw designs are shear intensive or passive, based upon the application. Metallurgies are

matched to the process and can be highly corrosive and abrasive resistant. Feeder(s) set the rate to the TSE and a controlled pressure gradient allows materials to be introduced into downstream zones via side stuffers and liquid injection systems.



Modular barrels



Segmented screws



Heavy duty gearing



Modular barrel with insert liner and closures- metallurgies are matched to the process

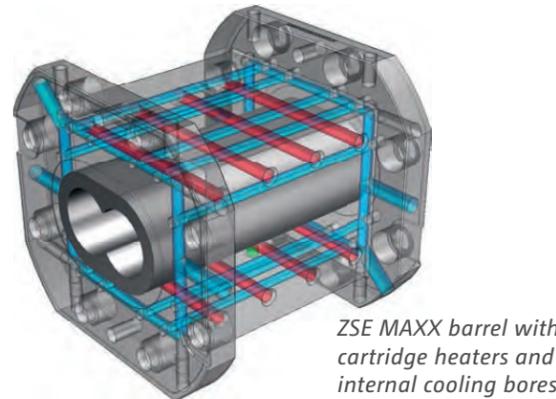
ZSE MAXX SERIES

High free volume and high specific torque

The Leistritz ZSE MAXX twin screw extruder series utilizes an OD/ID (outside diameter/inside diameter) screw ratio of 1.66/1 which facilitates a high free volume in the TSE process section in combination with high torque. The combination of high volume and torque is made possible by an asymmetrical splined shaft design. Barrels use elec-

tric cartridge heaters for increased heating capacities and improved maintenance. Another unique feature of the MAXX series is that each barrel section has two plumbing inlets and outlets for increased coolant flow and better heat transfer capabilities.

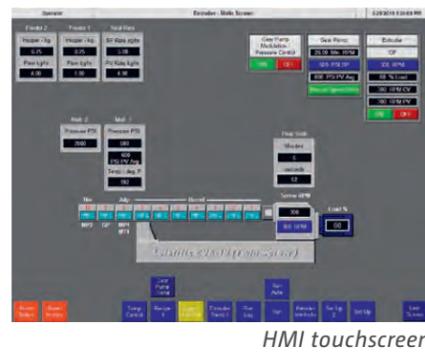
Features



CONTROL ARCHITECTURES

Automation technology

Leistritz offers various control architectures and options. Programmable Logic Controllers (PLCs), Human Machine Interface (HMI) touchscreens, motors and drives are matched to in-house preferences. Systems can be accessed remotely via a VPN access for system diagnostics and upgrades!



Trending
Setpoints

Specific energy

Heat transfer
Volume
Torque

TEST, DON'T GUESS!

Fully equipped process development laboratory

The Leistritz USA process development laboratory includes various sizes of twin screw extruders, more than 40 feeders for pellets, powders and liquids, and a variety of downstream systems. A separate area is available for cleanroom testing. Pelletizing, film, sheet and profile (including co-extrusion tooling) and supercritical liquid injection systems are available.



Remote VPN
Recipe

REMOTE SERVICING

Quick support



Quick and economical service from afar! Safe and encrypted remote access is available via VPN connection for software updates, process and service related troubleshooting.

Spare parts programs: We maintain all the necessary parts at our USA facility to keep you up and running. Consignment arrangements are available upon request.

Training: We offer Twin Screw Workshops that combine classroom training with "hands-on" machine demonstrations. Since 1990 5000+ have attended Leistritz educational programs.

Technical library: Technical literature relating to twin screw extrusion technology is available for download via our website.

Ethernet IP
Security access
Archiving

TWIN SCREW EXTRUDERS

Laboratory scale and pilot plant

There is a reason Leistritz has installed more TSEs at research institutions than anyone else. Integrating these systems is a Leistritz specialty. Whether it's early stage research, formulation testing or pilot scale development, we have a TSE designed for the task. Pelletizing and/or direct extrusion systems are commonly supplied.

Data acquisition
R&D



ZSE 18 with LHLG pelletizer



ZSE 27 HP with gear pump and underwater pelletizer



ZSE 40 MAXX with side stuffer, screen changer, gear pump, diverter and underwater pelletizer

TWIN SCREW EXTRUDERS

Small lot, mid-size and high-volume production applications

All Leistritz TSEs are rated for 24 hr/day industrial scale production and are ideal for small lot specialty compounds, mid-range or high-volume production applications making pellets or parts. Complete systems may be specified, including upstream material handling equipment, dies and downstream systems, all fully integrated. Each system is equipped with remote VPN access for troubleshooting and service.

Compounding



ZSE 50 with air-quench pelletizer

Flexibility of design

Specialty applications



ZSE MAXX compounding plant for highly filled compounds

Reactive extrusion

Devolatilization

MASTERBATCH AND COMPOUNDING

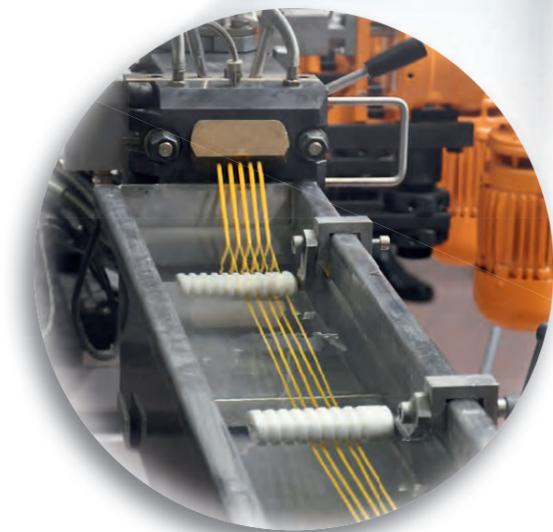
Very good quality of dispersion

Continuous mixing (compounding) of polymers with pigments, fillers, fibers and additives is the most common application for a TSE. Highly-filled formulations and masterbatch production are Leistriz specialties. Pre-mixes that don't segregate are often metered into the TSE. Multiple feed streams typically require loss-in-weight

feeders. Downstream introduction of fillers and fibers often utilize a side stuffer, which is particularly beneficial for shear sensitive materials! Strand, hot face and underwater pelletizers are all commonly integrated into the TSE system.



ZSE 27 MAXX split-feed strand pelletizing system



Color masterbatch is a Leistriz specialty



ZSE 75 MAXX high filler loading system with two side stuffers

Engineering resins

PVCs

Blends and alloys

FRs Fiber filled

Highly filled formulations

Specialty compounds



ZSE 35 MAXX twin screw extruder

Masterbatch

CBAs

High liquid phase

DEVOLATILIZATION & REACTIVE EXTRUSION

TSE systems

Devolatilization (DV) is a process where unreacted monomer, solvent, water or other undesirable volatile contaminants are removed from a polymer melt. Vacuum level, residence time, surface area of the melt pool and surface renewal are all managed to facilitate DV efficiencies. All/most TSEs include the provision for devolatilization – sometimes as a critical factor, and sometimes an after-thought.

Leistritz TSEs may be integrated into reactive extrusion (REX) systems, where a chemical modification and/or polymer synthesis occurs in the TSE. Screw design, temperatures, rate and screw rpms all play a key role in the final product properties.

Multi-stage venting
Monomer



ZSE 18 underwater pelletizing system configured for REX

Devolatilization
Reactive extrusion

POST-REACTOR TSE SYSTEM

Large scale compounding

Leistritz twin screw extruders are utilized in the post-reactor process to compound additives into the polymer. On-line rheological equipment can be integrated to monitor and control the molecular weight of the polymer.



ZSE 180 MAXX post reactor plant



PA
PC
PP
PE
UVs
AOs
Post-reactor

DIRECT EXTRUSION

Films, sheets, fibers

Direct extrusion refers to when raw materials are compounded in a TSE and extruded directly into the final part, bypassing the pelletization step. Why do it? The materials experience one less heat and shear history, which often translates into improved product properties.

And eliminating the second stage single screw operation saves cost. Direct extrusion systems can integrate gear pumps to achieve tight tolerances. Downstream systems are then matched to the specific application.



Gear pump and sheet die



Coex PVB film system



Micro-27 @ 60/1 L/D configured for compounding and foam profile extrusion



ZSE 27 MAXX with gear pump and downstream sheet system



ZSE 135 MAXX biaxial film system

Fibers
 Foamed parts
 Molded parts
 Sheet
 Film
 Filaments
 Profile
 Co-extrusion

PHARMACEUTICAL AND NUTRACEUTICAL

TSEs for various processes

Leistritz manufactures twin screw extruders (TSE) that produce state-of-the-art pharmaceutical dosage forms. Melt extrusion increases the bioavailability of poorly soluble active pharmaceutical ingredients (APIs), and granulation extrusion processes facilitate continuous mixing and drying. For nutraceuticals the TSE is used to mix, cook, dry, condition and increase the nutrient bio-availability.

Entrapped air, moisture and volatiles are efficiently removed via venting in a TSE. A more consistent, repeatable and uniform product is the typical result as compared to batch processes.

Containment systems and validation documentation are commonly integrated into the cGMP system design, and a wide variety of downstream systems are available.

Dissolvable films
Drying
Micro-pellets



ZSE 27 micro-pelletizing system with in-line gauge, pelletizer and classifier



NANO 16 twin screw extruder – can process 50 grams or less

ZSE 18 HP-PH with micro-pelletizing system



Specialty lamination system for transdermal, wound care and films

CHILL ROLL



ZSE 18 HP-PH extruding to the chill roll



ZSE 60 in granulation format

Nano-scale
PAT
Excipients

Melt extrusion
Solubility
APIs
Gel mass

Conditioning
Multi-functional devices
Transdermal
Fibers



ZSE 27 HP-PH pharmaceutical class twin screw extruder



ZSE 27 in granulation format



Twin screw extruder with glove box/containment features

EXTRUSION TECHNOLOGY

Available for you all over the world



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