



EXTRUSION TECHNOLOGY

Twin screw extruders and systems

XXPERIENCE COUNTS!

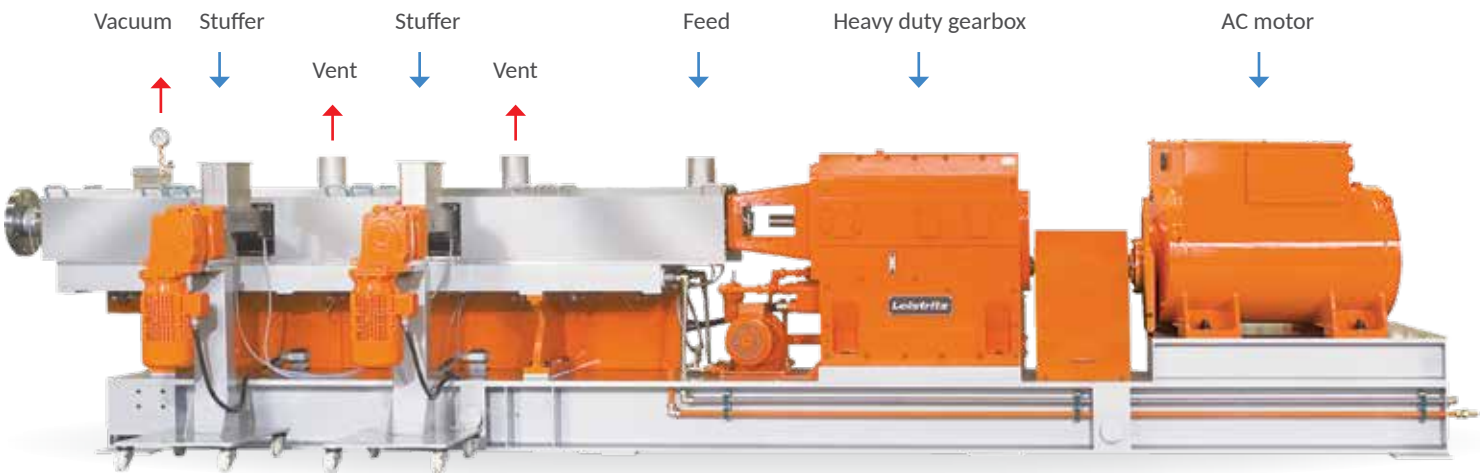
Leistritz Extrusion Technology

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 systems for the plastics and Life Science 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!



Co-rotating twin screw extruder screw set



ZSE MAXX twin screw extruder

Heavy duty gearing
Engineering know-how
Modular barrels

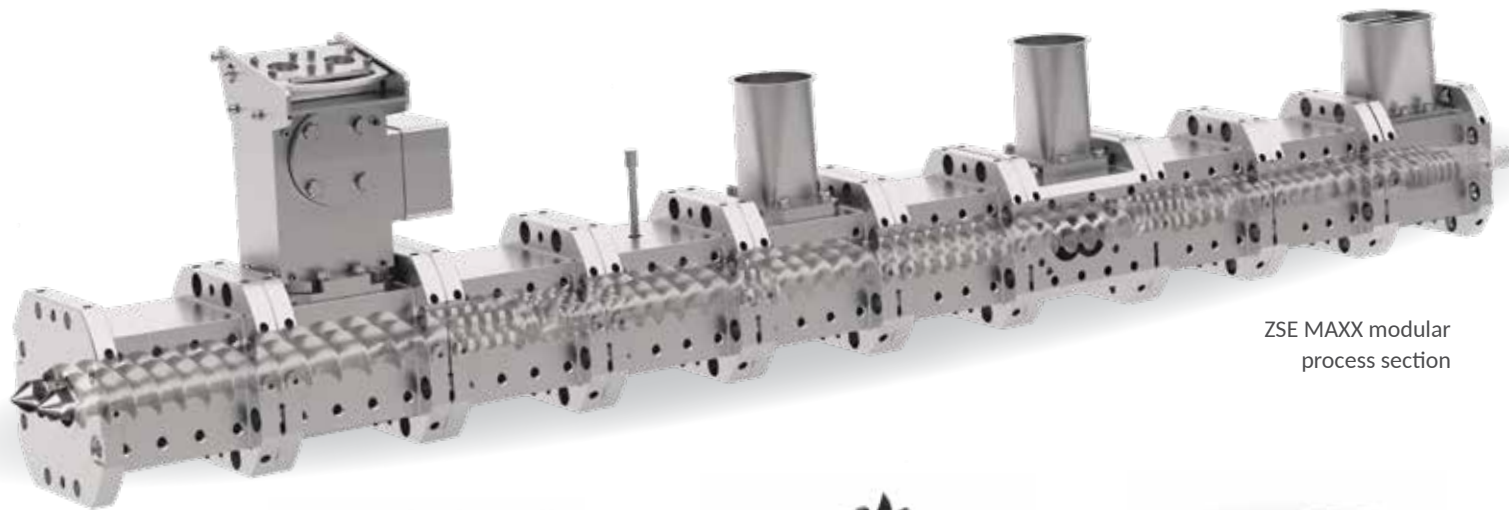
ZSE MAXX twin screw extruders are used for many processing tasks

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.



ZSE MAXX modular process section



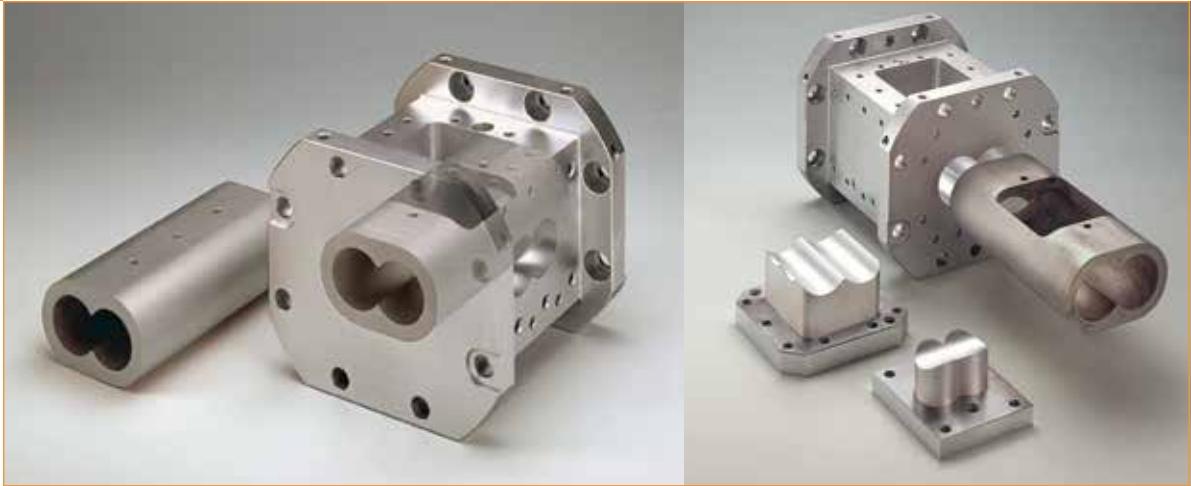
Flighted conveying element



Distributive mixing element



Dispersive mixing element



Modular barrel with insert liner and closures. Metallurgies are matched to the process.

ZSE MAXX SERIES

CONTROL ARCHITECTURES

TEST, DON'T GUESS!

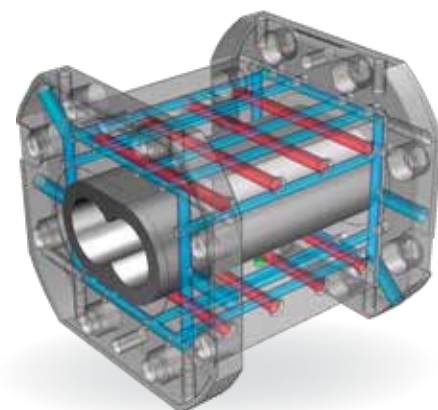
High free volume and high torque

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 electric 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



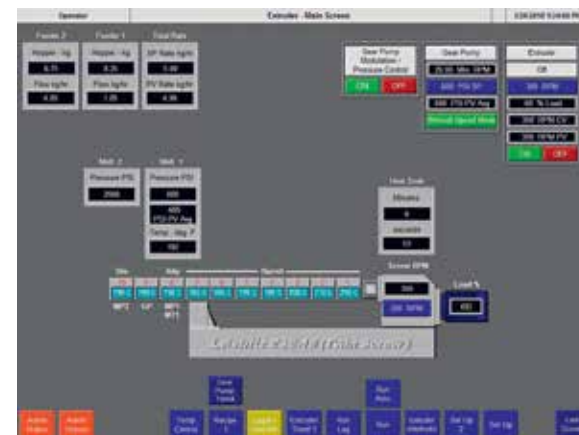
Asymmetrical splined shaft



ZSE MAXX barrel with cartridge heaters and internal cooling bores

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!



HMI touchscreen



ZSE 27 MAXX TSE with side stuffer

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 super-critical liquid injection systems are available.



All ZSE MAXX twin screw extruders are engineered to the application.



Extrusion training is available to match your specific requirements.

- **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.

Security
access

Torque

Engineering resins



Remote Access

Quick support

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

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.



ZSE 18 with air quench pelletizer



ZSE 27 MAXX 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 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.



ZSE 50 MAXX with air-quench pelletizer



ZSE 75 MAXX high filler loading system with two side stuffers



ZSE MAXX PET recycling plant

R&D

Formulation

Flexibility of Design

MASTERBATCH AND COMPOUNDING

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 Leistritz 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



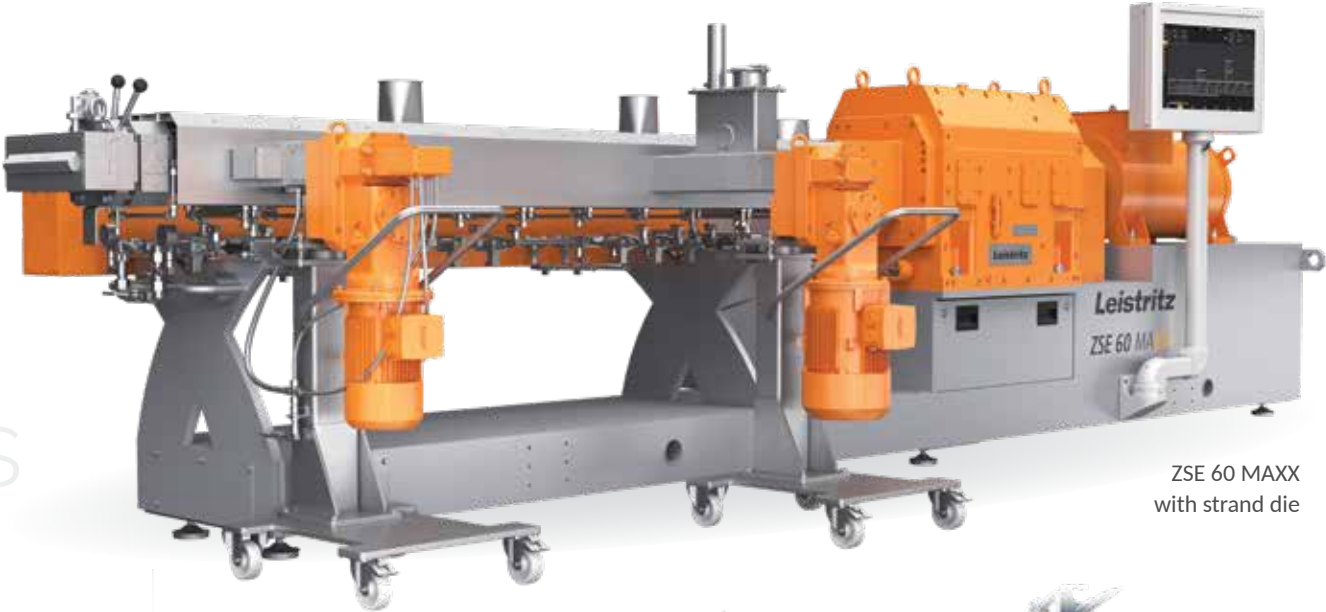
Color masterbatch is a Leistritz specialty

Additives

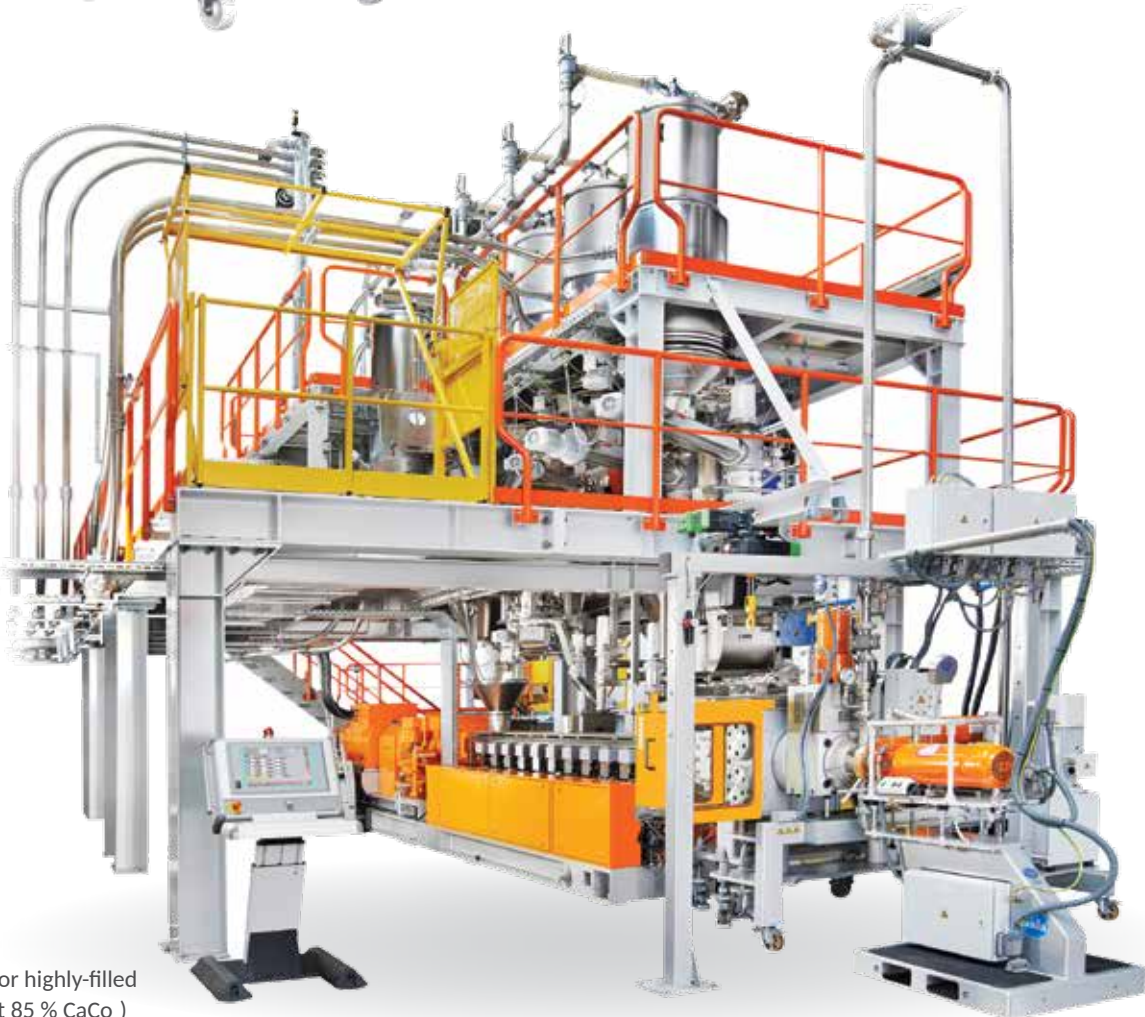
PVCs

Fillers

Masterbatch



ZSE 60 MAXX with strand die



High-tech extrusion line for highly-filled compounds (filler content 85 % CaCo₃)

DEVOLATILIZATION & REACTIVE EXTRUSION

TSE systems

Devolatilization (DV) is a process where 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.



ZSE 18 underwater pelletizing system configured for REX

TPU
PE
Reactive extrusion
Post-reactor

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.



Compounding line with a ZSE 180 MAXX and underwater pelletizing system

Monomer
PP
PA

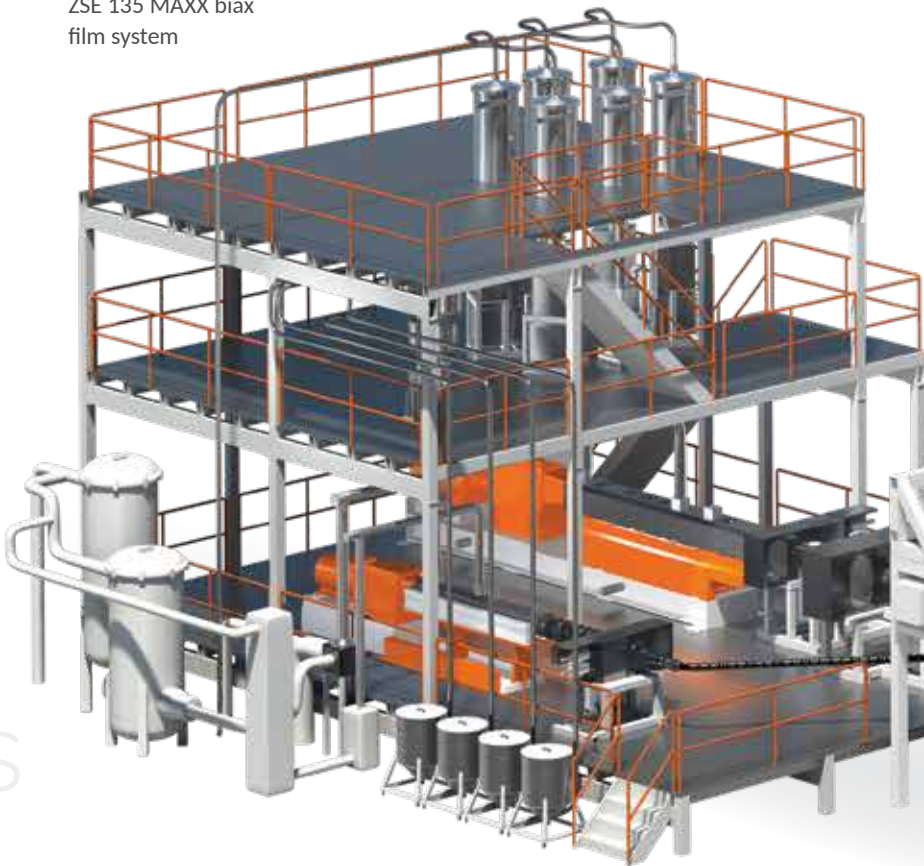
DIRECT EXTRUSION

Films, sheets, fibers

Direct extrusion refers to when raw materials are metered into a TSE and directly extruded 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 extrusion operation saves cost. Direct extrusion systems typically integrate a gear pump to achieve tight tolerances. Downstream systems are matched to the specific application.

1-step extrusion operations make sense!

ZSE 135 MAXX biax film system



ZSE-18 3D filament system



Co-ex

Foamed parts

Sheets

Film

Profile



ZSE 27 MAXX with gear pump and downstream sheet system



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

LIFE-SCIENCE APPLICATIONS

TSEs for various processes

Leistritz manufactures twin screw extruders (TSE) that produce state-of-the-art pharmaceutical and nutraceutical dosage forms. Melt extrusion increases the bioavailability of poorly soluble active pharmaceutical ingredients (APIs). For a variety of Life Science applications the TSE is used to mix, cook, dry, condition and increase the nutrient bioavailability.

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.



ZSE 18 HP-PH with granulation front end

ZSE-16 twin screw extruder – can process 50 grams or less



ZSE 27 HP-PH with micro pelletizing attachment



Specialty lamination system for transdermal, wound care and films



ZSE-18 with containment and pelletizing equipment



ZSE 60 MAXX-HD TSE in Hygienic Design

Transdermal
Nano-scale
Excipients
APIs
PAT

Leistritz Extrusion Technology

At your service. Globally.



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