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Oerlikon Barmag Huitong(Yangzhou)Engineering Co.,Ltd.  
*To be an international renowned integrator  
of polymer engineering*

Enjoy Life!

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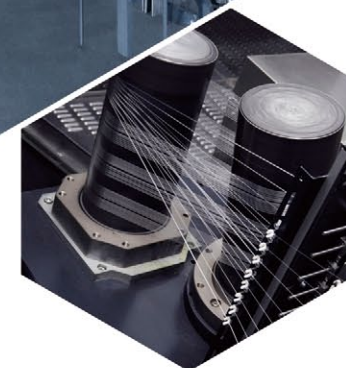
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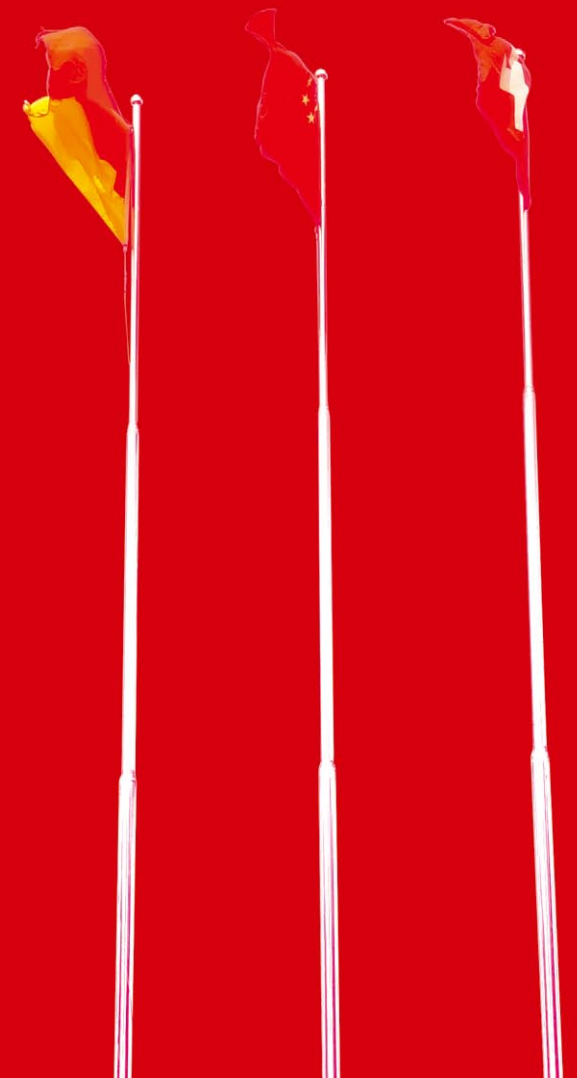
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## **International Polycondensation Engineering Contractor**

Continuous Polycondensation, Batch Polycondensation, Pilot plant,  
energy and consumption saving modification, Bottle-grade PET,  
Film-grade PET/BOPET, PBT, PBS/PBAT and PTT polymers  
engineering







## OBHE: Be With You

Oerlikon Barmag Huitong (Yangzhou) Engineering Co., Ltd, is a joint venture of Oerlikon Barmag and Yangzhou Huitong Chemical Engineering Technique Co., Ltd established from 1st Nov.2015 in Yangzhou, and it is an engineering company which is engaged in business of polycondensation such as Bottle-grade PET, Film-grade PET/BOPET,PBS/PBAT,PBT, PTT etc.

The joint venture of these two companies is not only an alliance between two giants, but also a perfect combination of upstream and downstream. Now the industrial chain of Manmade Fibers Segment in Oerlikon Group has become complete under our slogan “from melt to yarn”, and the global competitive strength of joint venture as well as Oerlikon OMF Segment are significantly enhanced.

Our worldwide and long-standing experience with the engineering of polymer processing solutions gives you a decisive advantage for your business.

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## PET Engineering Technology (PET)

### Continuous Polycondensation (CP)

Until now, 80 more CP production lines have been contracted and built by OBHE, of which the process of 5 reactors, 4 reactors and 2 reactors are adopted, and in which the minimum and maximum capacity of single line can reach 30t/day and 1800t/day respectively. The technology of differential polyester has been applied in CP production by OBHE for the first time, furthermore, the relevant CP plant which is suitable for differential polyester production has been launched successfully, meanwhile, the melt direct spinning is also realized, so that the product quality of differential polyester is significantly improved and the production cost is reduced. Presently many plants are running successfully which including the various kinds of products such as CDP, ECDP, low melting point, fire retardant, water (alkali) soluble, high shrinkage and so on.

### Batch Polycondensation(SCP)

OBHE has been engaged in researching of technology of semi-continuous polyester plant for many years and always occupied the leading position, and various processes have been developed successfully such as 1-stage esterification and 1-stage polycondensation, 2-stages esterification and 1-stage polycondensation, 1-stage esterification and 2-stages polycondensation, so as to satisfy different demands from the market, in which the maximum capacity of single line can reach 150t/day, the market share of all built projects is over 70% and mainly are applied in differential products with high additional values.

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### Bottle-grade PET Applications

Plastic bottles made from PET are commonly used for packaging carbonated soft drinks, tea drinks, mineral water and beer, etc.



### Film-grade PET Applications

PET films are available in a wide variety of types, and they are widely used in various industries, such as magnetic recording, photosensitive material, electronics, electrical insulation, industrial film, packaging and decoration, electronics screen and optical surface protection, etc. due to its outstanding physical and chemical properties, good dimensional stability, transparency and recyclability.



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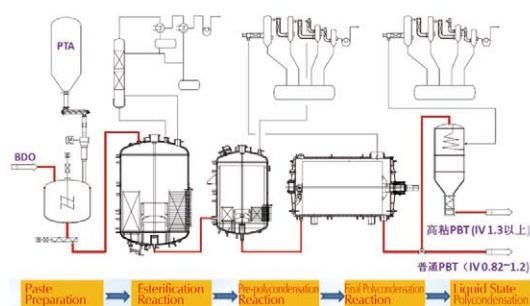
## PBT Engineering Technology (PBT)

PTA method with continuous polycondensation technology is adopted for production of polybutylene terephthalate, the PBT production technology with OBHE characteristics of this plant is developed by our research staff on the basis of absorbing foreign advanced technology and combining with our PET production technology and experience. This plant has advantages of advanced technology, reliable equipment, low investment, low raw and auxiliary material consumption and low energy consumption, and strong competitiveness in the market.

### Technology Characteristics :

- OBHE's unique technology of PTA-BOD slurring and preparing is adopted for slurry preparation with low equipment investment and low operation cost;
- The advanced three-reactor process is adopted for main technological process with short production process, short reaction time and high production efficiency.
- The new column type tower is adopted for process column with low manufacturing cost, high separating efficiency and high BDO recycling rate.

### Process Flow Diagram :



Reactor Heating Unit

### PBT Engineering Plastic Characteristic :

- High Strength
- Good Elasticity
- Fast Crystallization
- Low Melting Point
- Easy Composition
- Recyclable
- No Distortion
- Shape Stability
- Water Absorption

### PBT Polyester Application :



Auto Industry



Communication Electronics



Industrial Plastics



Home Appliances



Spinning Fiber

### THF Market Application :

#### STRONG SOLVENT

- Particularly well-suited for dissolving N-Butylaniline, PVC and PVDC
- Widely used as solvents for coating, printing ink and tape
- Used as reaction solvent in electroplating aluminum solution

#### ORGANIC SYNTHESIS

- Used for manufacturing Tetrahydrothiophene, 1,4-Dichlorobutane, 2,3-Dichlorotetrahydrofuran, gamma-Valerolactone, gamma-Butyrolactone and 2-Pyrrolidone

#### CHEMICAL ADDITIVES

- Polytetramethylene ether glycol (PTMEG) produced by self polymerization can be used for manufacturing specialty rubber, polyester and polyether urethanes elastomers, and elastic polyurethane fiber
- Used as additive for synthesizing styrene-butadiene rubber

#### PHARMACEUTICALS

- Used as raw material for synthesizing carbapentane, rifamycin, progesterone and other hormones

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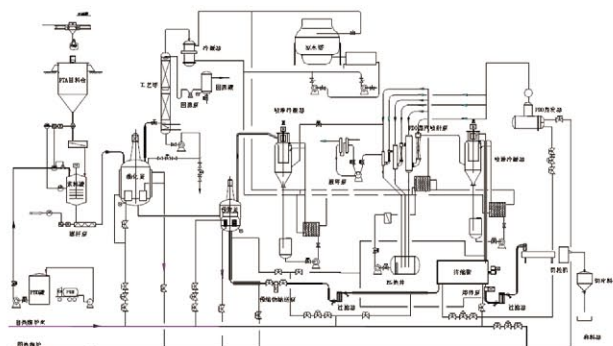
## PTT Engineering Technology (PTT)

PPT(Poly Trimethylene Terephthalate), is the aromatic polymer which made up by PDO and PTA. PTT, PET (Polyethylene terephthalate) and PBT (Polybutylene Terephthalate) are all polyester material. Use PTT polymer as raw material, various kinds of PTT filament and staple fiber can be produced by melt extrusion spinning. The PTT fiber has good usability and processability. Compare with PET and PBT, PTT is high in elasticity, good in continuous printing and dyeing ability, uvioresistant, internal stress resistance, low in hygroscopicity and static, good in biodegradability and cyclic utilization, etc. It is widely used in carpet industry, clothing material, engineering plastic and many other fields. It has been listed as one of the new type fiber in the future.

### Technology Characteristics :

- Main process adopt three reactor technology, simple and less investment;
- High separation efficiency in process tower, easy to control;
- Produce vacuum by using PDO steam ejection, reduced PDO consumption;
- PDO is fully recycled, reduced running cost;
- Liquid phase HTM heating is used for reaction system, heating temperature is well distributed and easy to control;
- Finisher is special designed horizontal type, the PTT melt can form a bigger evaporation area inside the reactor, which can provide a optimum reaction condition.

### Process Flow Diagram :



### PTT Polyester Application :



#### ENGINEERING PLASTIC

PTT polymer is widely used in engineering plastic and filming industries. By controlling polycondensation process, the PTT resin with certain molecular can be made. It has the general performance of engineering plastic, has good electrical property, size stability and excellent insulativity. Meanwhile, the PTT glass transition temperature is higher than PBT, the modulus is also higher than PBT, which is more suitable for injection molding process.



#### FABRICS

All kinds of traditional textile processing methods can all used for producing PTT fiber. Using PTT yarn with certain counts and related knitting density can make PTT high-elastic flexible fabric. Warp, weft or warp and weft stretching PTT elastic fabric can be produced by using suitable thread count weaving. PTT staple fiber can make pure yarn or blending with other fiber. The performance of blended yarn lies on the blend fiber variety and blending fiber ratio. The elastic range can be adjusted for all kinds of PTT fabric. The hand feeling is similar to cotton fabrics and acrylic fabrics. The main application of PTT fabrics nowadays is elastic clothing and sportswear. This kind of clothes is comfortable and soft to wear, which is in accordance with the trend of clothing development. Moreover, the PTT fiber is also suitable for producing carpet since its low static, wear resistance and water absorption feature. Therefore, it is also widely used in new type flooring material field.



#### NON-WOVEN

PTT is widely used in non-woven field. Blending with PET, PA6 or PA66, the non-woven made by needle punched or spunlace method feels soft and high bulk. The SHELL company applies PTT as raw material, producing carpet base cloth by spun-bond process. Moreover, the PTT polymer can be blown under 260 -275°C to produce PTT Meltblown. The unit weight for such meltblown is only 12.2g/cm<sup>2</sup>. It is one kind of thin non-woven fabric. Meanwhile the spundlaid of production is uniform, non-directional and soft hand feeling.

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## PBS/PBAT Engineering Technology ( PBS/PBAT )

Synthetic resin has become the third important material only next to metal and cement, in the context of higher requirements raised by various countries on global environmental protection in the 21st century. Synthetic biodegradable materials and derivatives have become the orientation and keystone of further study on degradable materials.

Fully biodegradable materials include natural macromolecular materials and synthetic macromolecular materials, and synthetic macromolecular materials is prevailing in degradable materials development, because the difficulties in processing of natural macromolecular materials, wherein the aliphatic polyesters have become the current focus of development of degradable plastics, due to its outstanding physical and degradable properties, and desirable cost.

PBAT (short for polybutylene adipate terephthalate) is a biodegradable random copolymer that is developed based on PBS (short for polybutylene succinate) with good film properties. It has excellent flexibility and biodegradability, and can be processed by various methods, such as injection molding, extrusion molding and blow molding, etc. it can be widely used in the fields of sheet, packaging, mulching film, foam, adhesive and so on.

### Technology Characteristics :

- Stable reaction and easy operation of entire plant
- Stable THF recycling with concentration more than 99.95%
- On-line adjustable viscosity.
- On-line adjustable carboxyl end group (not more than 30mol/t)
- Multiple and stable vacuum systems, flexible production of entire plant with rapid product changeovers.
- Low raw materials and utilities consumption

### PBS Polyester Applications :



#### Packing Materials

- Trash bag
- Shopping bag
- Bag
- Label
- Bottle
- Bracket
- Barrier



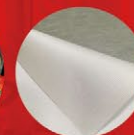
#### Disposable Materials

- Fast food container
- Plastic knife and fork
- Disposable cup



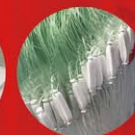
#### Agricultural Materials

- Laminated film
- Seed cultivation belt
- Planting container
- Vegetation net
- Pesticid ecarrier



#### Civil Greening Materials

- Greening pile
- Cloth adhesive
- Lawn sodding net
- Vegetation cover



#### Fishing Materials

- Bait bag
- Buffering product
- Fishing net
- Fishing line
- Fishing belt

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## OBHE PET Polycondensation Plants Key Benefits

Low OPEX

Full supply of value chain

Approved quality

Worldwide Service Network

Experienced execution

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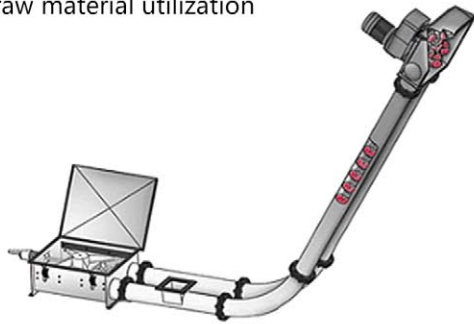


## Low OPEX

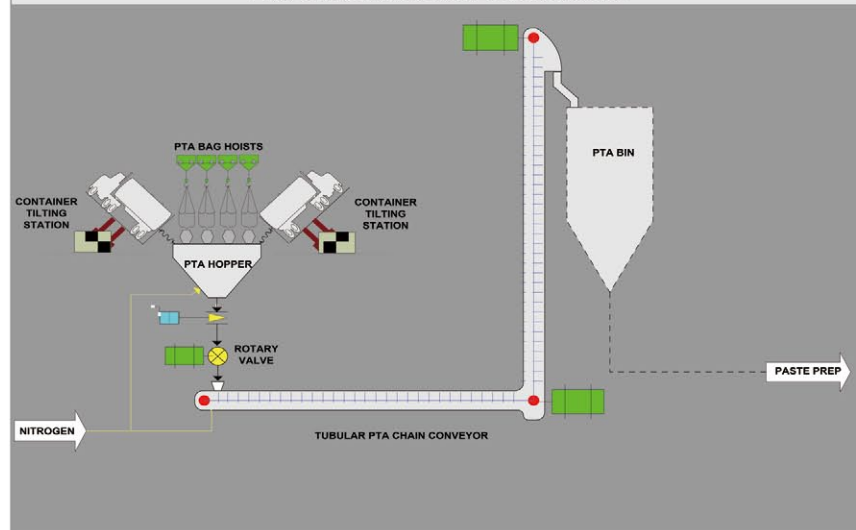
## Low consumption of raw material, energies and utilities

### Chain conveyor for PTA handling

- Less nitrogen and energy consumption compared to pneumatic based systems
- No waste generation and better raw material utilization



### PTA UNLOADING AND CONVEYING



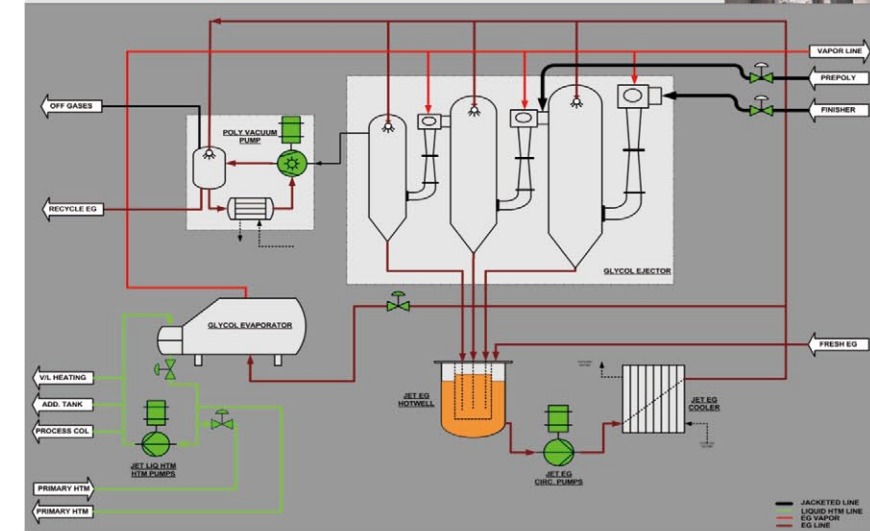
Operating  
Cost is Low

### Vacuum ejector EG driven

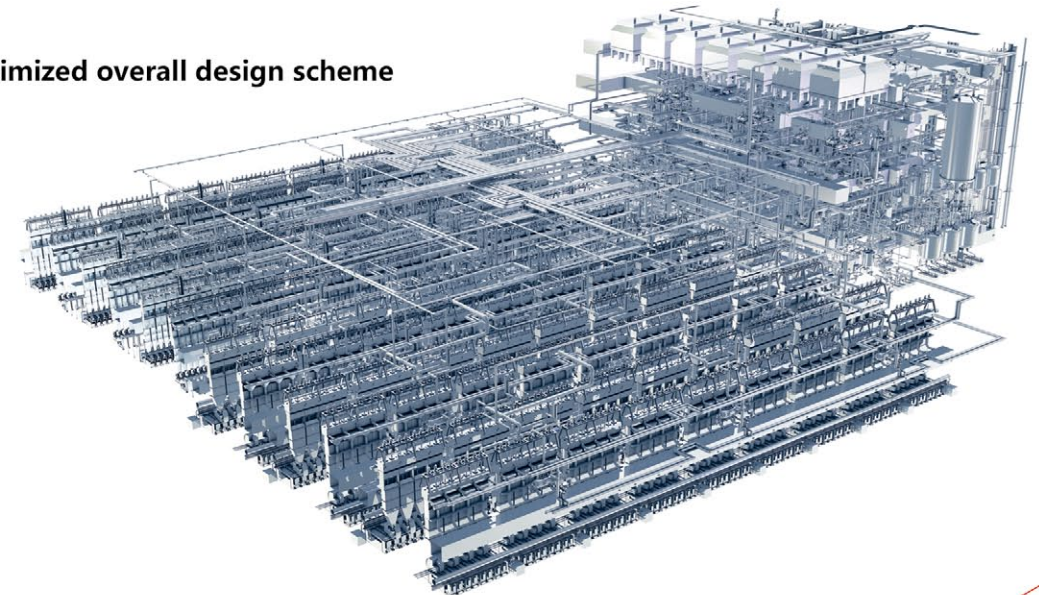
- Less energy consumption compared to steam ejectors
- No waste water generation thus considerable reduction in load of effluent treatment



### VACUUM EJECTOR



### Optimized overall design scheme





**Full  
supply  
of value  
chain**

**Single source technological package**

- Polycondensation plant including all utilities e.g. tank farm, PTA unloading, chips conveying, raw material & auxiliary material and finished product silos, HTM heaters, raw and effluent water treatment, compressed air and nitrogen
  - Melt transfer line to spinning facilities
  - Filament, fiber or nonwoven plants
- Discussion and negotiation with one supplier  
Reduction of interfaces, labour and personal under responsibility of customer  
Perfect matching of components Usage of technological synergies

- all discussions and negotiations are with the same supplier
- reduce interface, labor and personnel, and be responsible for customers
- perfect matching of all special parts
- give full play to technological synergy

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Providing The  
Entire Value Chain

**Single source construction package**

- One custom portion
- Coordinated execution to ensure start-up date and start of production
- Full coordination by experienced people of Oerlikon
- Fast execution due to decentralised engineering and sourcing





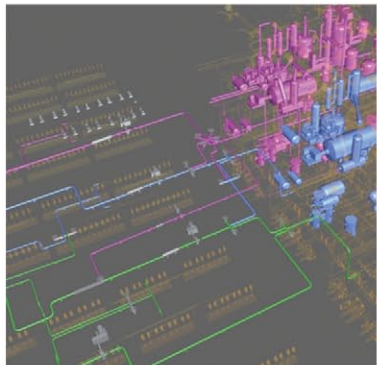
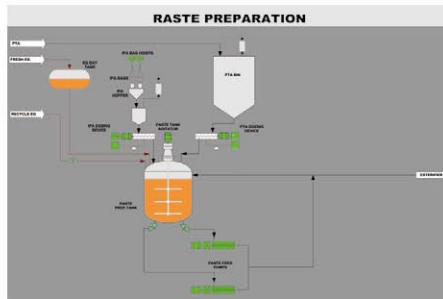
## Approved quality

Supply of equipment of known suppliers best matching to process

Equipment	Source
DSC System	Foxboro / Yokogawa / Emerson
Reactor Agitators	Ekato / Chemineer / Satake
Prepolymer & Polymer Pumps	Maag / Shimadzu / Witte / Barmag
Gear Box	Sumitomo / SEW / Flender
...	...

## High process and component quality

- Coriolis Type PTA dosing system for accurate PTA feeding
- Coriolis Type mass flow meters for MEG and PTA
- Mole ratio monitoring ensures stable and efficient operation

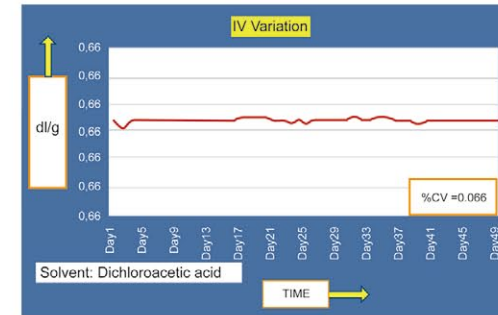


### Minimal IV drop in the polymer distribution lines between polycondensation plant and spinning plant

- Optimum shear rates and temperature distribution
- Optimum residence time and pressure drop
- Optimum design based on several years of experience and proprietary software

Quality  
Ensure

### Very low IV variation in melt/chips created by finisher with appropriate design



- Improved finisher ensures generation of large surface area
- Gentle shear rate minimizes temperature rise and product degradation
- No dead corners
- Very low end-group variation in melt or chips
- Stable process by esterification process with 2-stages (optimum control over residence time and temperatures)

- Safe and environmental friendly system
- Steam driven waste water organic matter separation to reduce the organic load of effluent
- Off gas incineration in HTM plant
- Usage of steam to safe system intrinsically

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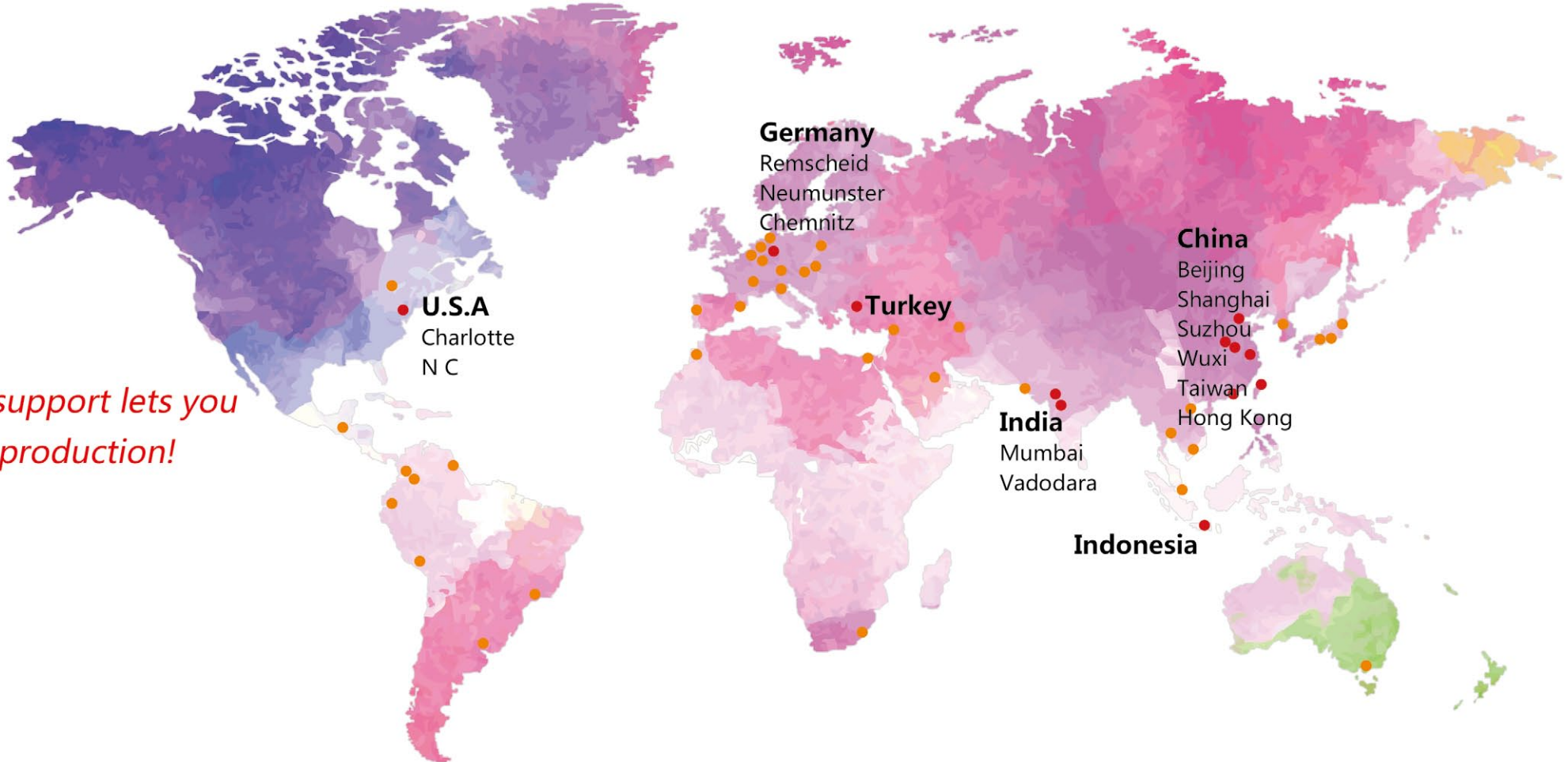




Full service  
Worldwide  
service  
network

Service Network  
Member of Globalink

Our technical support lets you  
focus on your production!



Service stations close to you

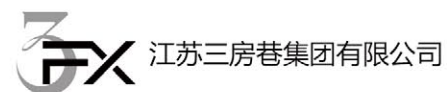
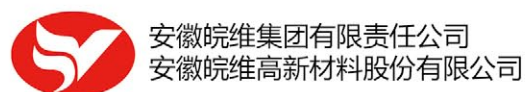
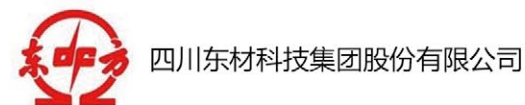


● Main Oerlikon Manmade Fibers Service Network Atations  
● More than 60 Agencies worldwide



Experienced  
execution

## Domestic famous customer



## Aboard famous customer





## Partnering for Performance

Our Customer Services department of Oerlikon Manmade Fibers segment has one allembacing mission: we want to make your production increasingly efficient and productive, and your business increasingly competitive and profitable. To do this, we offer you a close working relationship-Partnering for Performance.

Textile technologies are becoming ever more efficient and flexible, opening up great opportunities to enhance your competitiveness. At the same time, this process accelerates the race in the market. To be able to keep up and react swiftly to a changing market situation, it is important to maintain and expand your technical capabilities and to utilize them properly. To achieve these, we place emphasis on a close, trusting service partnership with you to ensure reliable production and gain a technological edge, to secure your investment and to gurantee success in the future.

Through our partnership we want to increase your operational efficiency to best effect. With this mind, we focus on optimizing your operating and manufacturing processes, your system and logistics management and the acquisition of further skills by our staff. Your success grows with the interplay of all the factors involved. For this we offer you the performance of a technology leader with a unique global service network, along with highly qualified service and engineering experts. We will advise and support you in all phases of your business along the entire value creation chain of fiber production.

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