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## WELCOME TO IMGPLASTEC

IMG Plastec Group supplying in two segments which is EPP, E-TPU foam beads production system and it's complete Know-how and technology.

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*'Group of experts in the production of particle foams over 30 years'*

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## Turn-Key Solution for **E-TPU Foam Beads**

### Production Plant & Technology

New paradigm of E-TPU Beads  
Production System



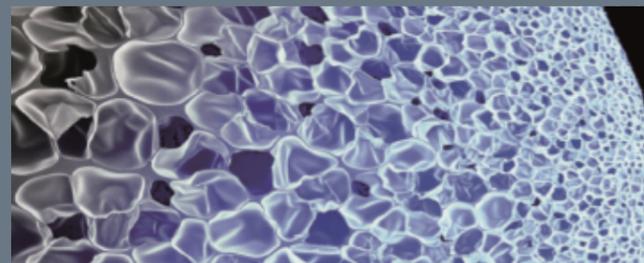
# 1. Introduction of E-TPU

## What is E-TPU?

E-TPU (Expanded Thermal Polyurethane) is produced by expansion of the air. E-TPU beads are ultralight with high resilience, and they can be expanded to 5~10 times bigger than original size. There are numerous cells whose diameter range is from 30 to 300um with a plenty of air inside of the beads. E-TPU is a polyurethane-based thermoplastic elastomer which is widely used for applications requiring high durability because of its excellent mechanical properties such as tensile strength, tear strength, and abrasion resistance.



The size of E-TPU beads is 5~10mm, and bulk density is approximately 110kg ~160kg / m<sup>3</sup>.



Inside of E-TPU beads thousands of air pores can be observed on cells.

## E-TPU Characteristics



**Low density (Ultralight)**



**Great chemical resistance**



**High tensile strength**



**Durability in wide range of temperature**



**Outstanding resilience**



**Eco-friendly material**



**High elasticity**



**High abrasion resistance**



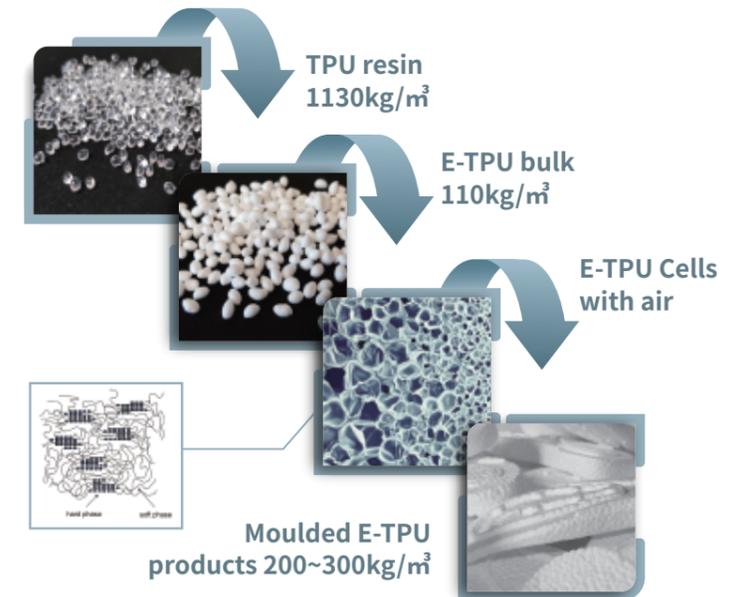
Eco-friendly ETPU materials fully meet the criteria of EU RoHS (a restriction of using harmful components in electronic devices) and other regulations. In addition, ETPU materials are completely recyclable, which is a definite advantage for environment protection.

## E-TPU Elasticity & The Principle

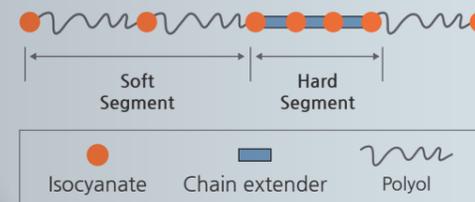
### The Principle of Elasticity of Expanded Thermoplastic Polyurethane

After pre-treatment to foamed granules of ETPU beads by pressure heating, each of TPU (thermoplastic elastomer material) particle expands like popcorn. In this process, the original particles with size of 0.5mm can expand to 10 times bigger, thus turns to E-TPU, an oval and non-crosslinked foamed particle, which contains micro-closed cells that look like "popcorn."

During the expansion process in autoclave, ETPU beads are heated at 150°C, the softening point of TPU. CO<sub>2</sub> blowing agent is impregnated into Soft Segment (SS) which results in expansion of TPU and arrangement of crystal domain of Hard Segment (HS). This is the basic principle of excellent elastic property of E-TPU.



### Segmented Blok Copolymer



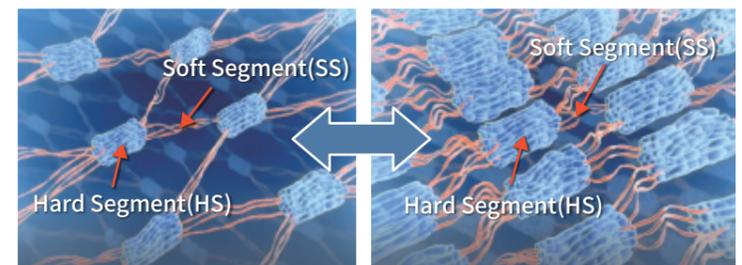
### E-TPU Molecular Structure (nm)

- Multi-block copolymers comprised of alternating Soft Segment (SS) and Hard Segments (HS).
- Incompatibility of Soft Segment and Hard Segment: Multi-block structure of amorphous SS with low fusibility and crystalline HS with high fusibility.

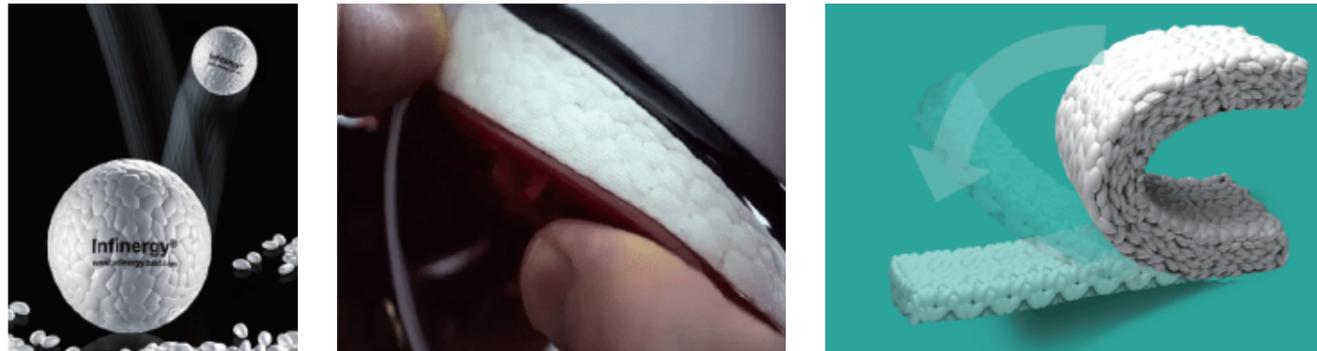
## E-TPU Properties

E-TPU is well-known for its excellent properties such as high elongation, tensile strength, durability and chemical resistance just like as TPU. Especially, during the expansion, the blowing agent is impregnated into Soft Segment (SS) in order to maximize the function of elasticity by making it more flexible. It is a basic principle of improving functional quality of sports shoes.

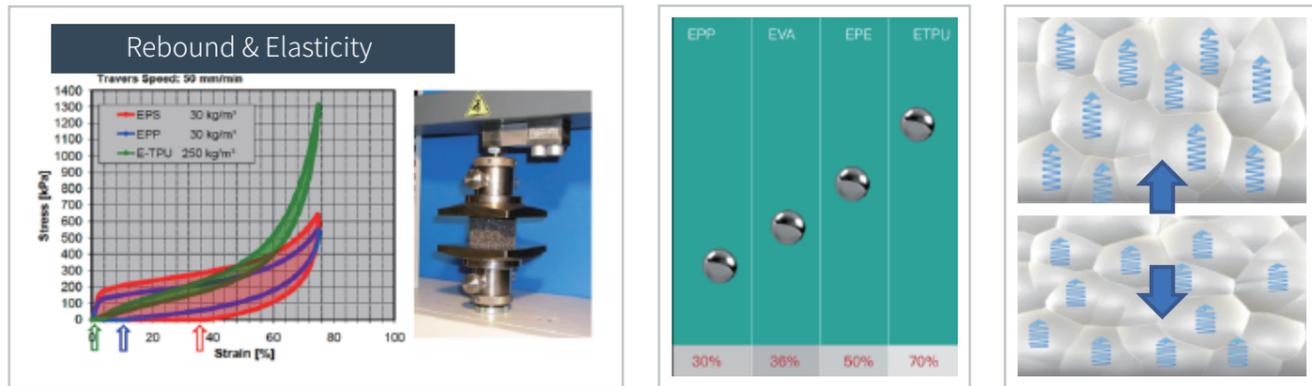
### Orientation and Contraction of Soft Segment (SS)



## E-TPU Properties(Rebound & Elasticity)



E-TPU foam keeps high elasticity and softness properties even in a wide range of temperature. The most outstanding feature is resilience, which makes an innovative progress in production of middle sole of shoes.



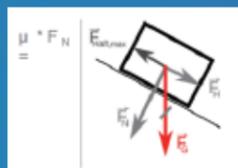
## E-TPU Properties(Cold Resistance & Wear Resistance)

- > Low density (0.15 ~ 0.22g/cm<sup>3</sup>)
- > Excellent resilience (≥60%)
- > High wear resistance (≤79mm<sup>3</sup>)
- > High cold resistance: Still flexible and elastic at -40 °C
- > Durability of folding: (≥100,000 times)
- > Yellowing resistance class 4

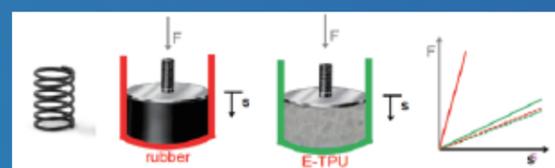


### E-TPU Texture & Characteristics

- > Unique texture like velvet
- > High frictional force like rubber
- > Low wear rate
- > Chemical resistance



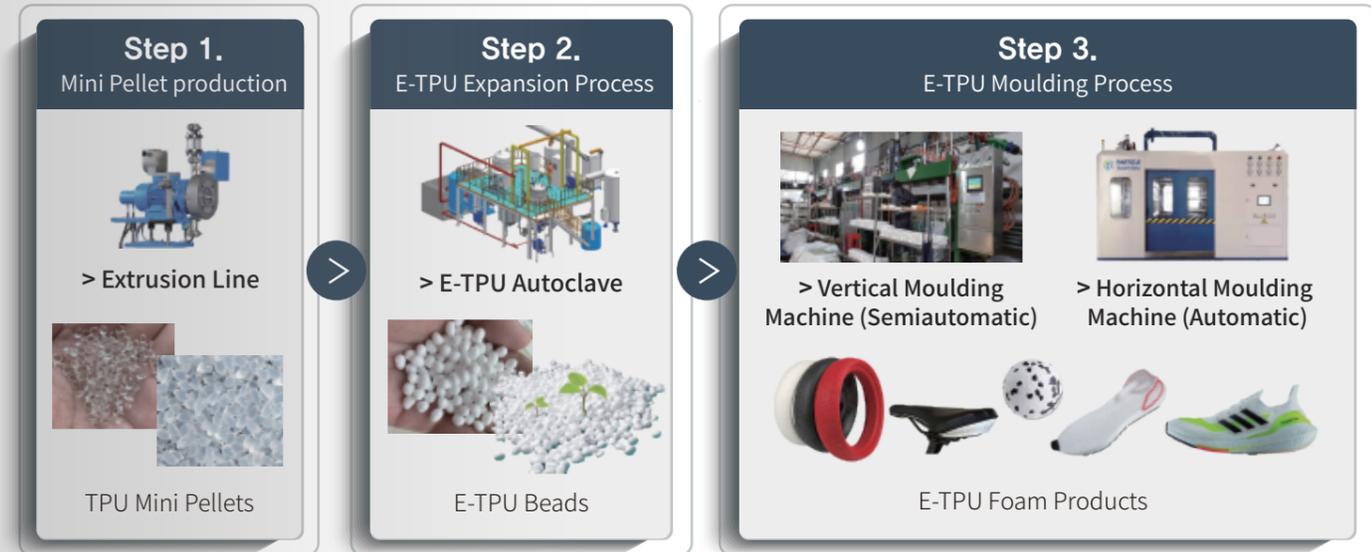
### Spring / Vibration-dissociation



## II . E-TPU Bead Foam Production

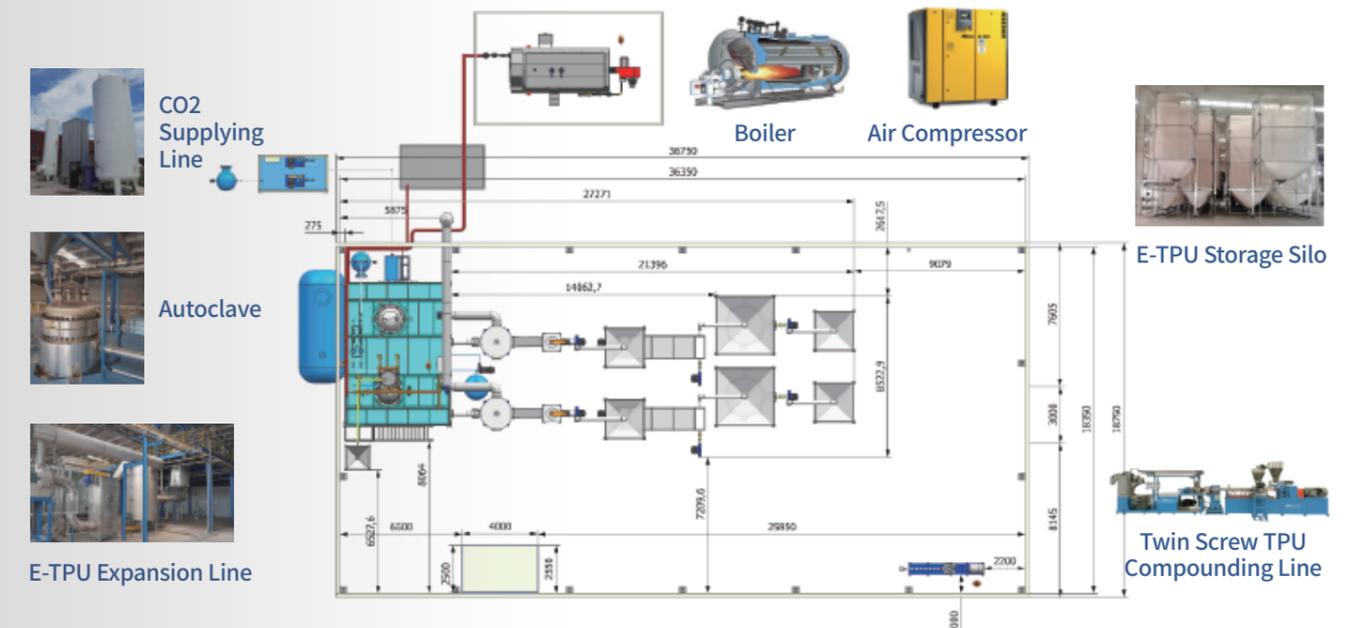
### E-TPU Production

There is 3 step process for E-TPU foam products. It requires both technical expertise and specialized custom equipment for complex manufacturing process.



### E-TPU Bead Production Plant Layout

The basic principle of the plant layout is to design the space available for 2 sets of autoclave and its utilities. Basically, it requires 2 sets of autoclave, and can increase its number if needed. The whole E-TPU bead production plant includes 2 sets of autoclave, related utility systems, main and sub production equipment, which takes up 600m<sup>2</sup> ~ 1,000m<sup>2</sup> in total.



# III. Application of E-TPU

## E-TPU in Various Fields

E-TPU can be used wherever a combination of light weight, good mechanical properties and durability is required.



Not only for shoes but also sports & leisure (paddle, tennis racket, bicycle tires, helmet), car industry (vibration decoupling), mechanic engineering (industrial compressor buffer), and logistics (recyclable tray) etc.

## E-TPU for Shoes

Shoes are essential to keep proper body activities which are very important for our health. It is one step ahead of technology trend to apply E-TPU to the midsole of shoes.



E-TPU Midsole Shoes



Golf shoes



Safety shoes



Sandals



Running Shoes



Snowboard Boots



Insole



## Track & Playground

Outstanding shock absorbing property of E-TPU foam offers a safer and better environment of running track. Due to the protective function of E-TPU, it is widely used in kindergarten or playground for children.



## Toy Balls for Pets

E-TPU toy balls are non-toxic for pets. They are chew proof and durable enough to use for long because of its great elasticity.



## Others



Bicycle Saddle



Airless Tire

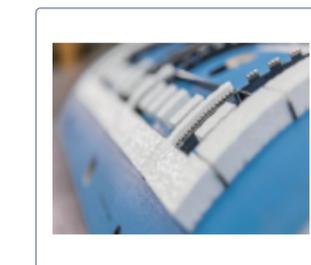
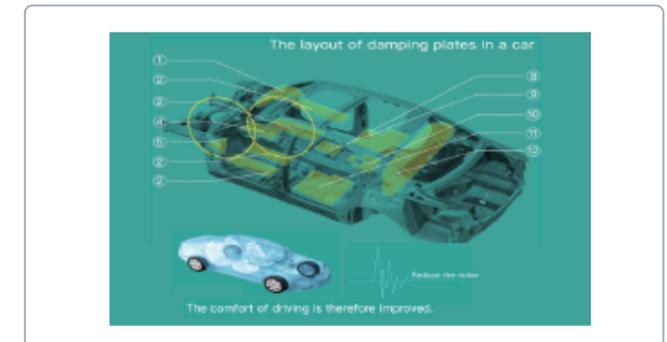
## Furniture & Kid's Products

With high elasticity and resilience, E-TPU absorbs impacts and adjust to our body thus reduces the pressure on the spine but gives comfort for relaxing and deep sleep.



## Automobile Muffler

Muffler for the right-front rear wheel cover, buffering plate in the middle, the front floor, right-rear floor, floor under the rear seat, the left-rear floor, floor under the aisle, floor under the front aisle, left-front rear wheel cover.



Machine Suspension



Gym Floor Mats