What is TPE?

Thermoplastic Elastomers

Thermoplastic Elastomers (TPE) are raw material that can be processed in all plastic process machines, that have low density and don't need vulcanization even though they are as strong as vulcanized rubber, have functional characteristic like a wide hardness interval, resistant to outdoor medium and heat, recylce, low permanent deformation and colouring which results in high process gain in the plastic sector and low cost of production and investment to the consumer.

TPE's are generally material obtained from a soft phase and a hard phase. Soft phase materials are similar to rubber equipment with flexibility, elasticity and resistance to cold weather conditions and hard phase materials are like thermoplastic equipment resistant to heat and have the characteristic of being processed.

Because of this structure TPE's have similar characteristics to rubber materials like flexibility, elasticity and resistance to weather conditions and they also have similar characteristics to thermoplastic material such as heat resistance, resistance and ability to be processes.

What are the Types of TPE?

According to their structures TPE's are the following types:

- Thermoplastic Vulcanizers (TPV)
- Styrene Block Copolymers (SBS, SEBS)
- Thermoplastic Poliolefin (TPO)
- Thermoplastic Polyurethane (TPU)
- Polyetherblockamide Copolyester

What is TPV?

Thermoplastic Vulcanizer

WHAT IS TPV?
Thermoplastic Vulcanizers (TPV) have taken the place of thermoset rubber in many applications since they entered the market 20 years ago. The TPV's which are of Thermoplastic Elastomers (TPE) class have the characteristic specialities of thermoplasts and elastomers up to a certain degree. As a rule these are systems which consist of two phases, one elastic soft phase (EPDM) and one thermoplastic hard phase (PP). The soft phase determines the flexibility conduct and cold conduct and in return the hard phase determines the heat resistance, strength and process.

TPV (EPDM/PP) Thermoplastic Vulcanizers are obtained by primarily mixing thermoplastic phase (PP) with the rubber phase (EPDM) and after attaining a homogeneous and balanced phase distribution by mixing in vulcanization chemicals following the homogeneous phase. The TPV(EODM/PP) obtained by this method includes characteristics such as the elasticity of EPDM, UV and the ozone resistance, low permanent deformation etc. , and it can also be processed in the plastic injection and extrusion machines.

Fields of Use

Automative Industry: Hose coatings, gaskets, baggage and window gaskets, vibration absorbents, components of firing mechanism

Architecture and Construction: Ceiling and floor decoration, window profiles

Electricity-Electronics: Cable isolation, computers, telecommunication

Others: Elastomeric commodities in the medical and food sector, office equipment, increase resistance in PP and PE plastics.

TPV's Characteristics

Permanent deformations black EPDM's are classified as Class A Elastomers coloured EPDM's are classified as Class B Elastomers. Colour discrimination is not in question in thermoplastics. Upon analyzing the table below it is clearly seen that the desired permanent deformation values are the same for Class B EPDM's and TPV's.

	ELASTOMER CLASS A, B (Black EPDM, Coloured EPDM)			THERMOPLASTICS (TPE- TPV)	
At -25 °C, 22 hours, At %25 deformation	70, 90	80, 90	90, 90	90	-
At 23 °C, 22 hours, At %25 deformation	15, 35	15, 35	15, 35	35	50
At 70 °C, 22 hours, At %25 deformation	-, 50	-, 50	-, 50	50	70
At 100 °C, 22 hours, At %25 deformation	35, -	35, -	35, -	-	-

Hardness: TPV's can be obtained in the required hardness between the intervals like 20 Shore A and 70 Shore D.

UV and Ozone Resistance: TPV's have perfect resistance against UV and Ozone.

Hot-Cold Resistance: TPV's have a heat resistance of -40 and +130 C. Therefore they can be used at a wide range from Siberia to Arab countries.

Colour Choices: Infinite colours can be obtained with TPV's. Therefore they can be produced in all the colours that are in the RAL catalogue.

Recycling: Because TPV's can be reused they are material which do not harm the environment and nature and are friends with green.

Welding Ability: TPV's have the speciality of sticking with heat. They thus enable productions like co-ex or co-injection and positive results are obtained in processes requiring welding.

TPV and EPDM Rubber

Comparison of Performance, Processing and Design

Thermoplastic elastomers are primariy divided into two main groups. The first group consists of block copolymers where the soft and hard phase unites in a macro molecule. The other group forms the elastomer blends where different soft and hard phases mixture as molecules (EPDM/PP). These two groups may be separated in different classes according to their structures.

As block copolymers, polyamides, polyetheresters, polystyrols and polyurethanes can be mentioned. Elastomer blends show difference as alloys which have or which don't have cross parallel chain connection within themselves. In those thermoplastic elastomers which do not have cross connection rubber and thermoplace is

found only as homogeneous mixtures. Because cross connection takes place in Thermoplastic Vulcanizers (TPV) only at the the stage of mixing and becoming an alloy this process is defined as dynamic or vulcanization at place (in situ).

The cross connections obtained by dynamic vulcanization lose their effect when the material reaches the melting heat and cause TPV flow which enables processing with techniques like extrusion, injection similar to traditional thermoplasts. Even without major losses in the basic characteristics of the material they enable processing with many recycles.

When the material becomes final product, that is when it cools, the mentioned cross connections are formed again and show the elastomeric characteristics of thermoset rubbers like EPDM rubbers. This speciality of the TPV's shows the most marked distinction compared to thermoset rubbers.

EPDM rubbers can only be vulcanized once therefore the breaking and loss due to faulty production is much more compared to TPV's. Apart from the easy processing the TPV's show distinction regarding the amount of last product produced per raw material thus increasing the profitability of the producer.

In short, TPV, one of the Thermoplastic Elastomer class equipment is a candidate of being the sparkling star of the plastic sector of this century, can be used with confidence for window and door impermeability instead of thermoset rubbers like EPDM and also presents many advantages to the producers.