Processing Guidlines - Badaflex TPE-S SEBS and SBS Compounds

General Information

This information brochure is intended to give hints and advices to skilled processor about the processing of Badaflex TPE-S compounds based on SEBS or SBS. Due to the huge variety of articles and in the configuration of machine and tooling, this information brochure can only give general advice.

In case of more specific questions, Bada's Application Technicians remain at your disposal:

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Advice for the safe handling and processing of Badaflex TPE-S Compounds can be found in the appropriate material safety data sheet.

Process Support on site – our special service

We would be pleased to support you on site if you have any questions or problems with the processing of new sample materials or in ongoing series applications. We offer our processing support service for this purpose. Together with you we look for the cause to find a solution for you. If you would like to find out more, just contact us at ProcessSupport@bada.de.

Nomenclature

Badaflex TPE-S grades are thermoplastic elastomer compounds based on the Styrene copolymers SEBS and SBS. There are grades available both for injection moulding and extrusion applications.

The Badaflex TPE-S product family consists of a large variety of different grades and modifications.
In general, the nomenclature is bulit up like this:

Badaflex TPE-S XX YYYY [optional designations] colour [optional colour identification number]

Here, XX indicates the Shore hardness (70A means Shore 70A, 40D accordingly Shore 40D).
The number YYYY is a consecutive, four-digit identification number of the grade; no conclusion related material properties can be drawn out of this number.

The further designations bear the following meanings:

LD	low density (low filler content)
2K	adhesion modification for 2 component overmoulding
EL	electrically condustive or dissipative
LM	capable for applications with food contact
FR	flame retardant
FR HF	flame retardant without the use of halogens
UV	stabilisation against ultraviolet light

In special cases, there are some more designations not mentioned above. They are described individually in the technical datasheet.

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Colours are identified by an internal Bada colour code. Again, this is an ordinal numeration. There is no relation to RAL numbers, neither to other colour standards.

In general, Badaflex TPE-S compounds are equipped with processing and mould release agents as well as a basic stabilisation against UV irradtiation and oxidation.

Storage

Badaflex TPE-S can be delivered in different packagings. Common packaging is transparent plastic bags, big bags or octabins.

The shelf life of the TPE granules is 12 months from delivery if storage instructions are observed and the product is stored in the unopened original Badaflex TPE packaging. Store in dry conditions at room temperature (15–30 °C) away from heat sources and direct sunlight!
Contact with nitrogen oxides must be avoided during storage!

Especially the very soft grades (shore hardness < 40A), or the adhesion modified grades (2K- grades) may clump together although anti-blocking additives are used in the manufacturing process of the Badaflex TPE-S grades. The shelf life of these TPE granules is 6 months from delivery if storage instructions are observed and the product is stored in the unopened original Badaflex TPE packaging.

The material should not be stacked with other material on the top.
The pressure applied by loading increases the risk of clumping clearly.

Although there is no acute risk in storing Badaflex TPE-S compounds, all sources of ignition and open flames shall be avoided for safety reasons.

Predrying

Usually, predrying is not required, provided the material has obviously not become wet.

Predrying might be advisable for material which has been stored for almost a year or more, for flame retardant grades (FR), electrically conductive grades (EL), or adhesion modified grades (2K).

Drying temperatures should be 60 – 70 °C, the drying time is 2 to 4 hours.

Extruder and Screw Configuration

Our TPE compounds can easily be extruded, provided that the right process parameters are used. Due to the three-block structure, the flow properties (melt viscosity) are relatively insensitive to temperature changes. However, it responds quickly to changes in shear and/or pressure (applies mainly to materials based on SEBS).

Long extruders with a length/diameter (L/D) ratio of 20:1 or more are preferable and long feed zones are best. The flow paths of the dies should be as short as possible, to prevent the rough surfaces that may arise due to the material solidification process.
Long die adapters should be avoided and both the die and the die adapter should be equipped with heater elements.
The form giving part of the die should be only sufficiently long to provide the required surface finish and product profile. A form giving part which is longer than one cross section or one diameter, may result in

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surface roughness if followup drawing is used to achieve the required cross section.
Significant follow-up drawing from a long form giving part of the die should be avoided, as minor follow-up drawing (10 - 20%) may result in increased strength of the product.

Our TPE compounds are best extruded using screws that have a high compression ratio (3:1) and long, fairly shallow feed zones. Screws with short feed zones may give rise to infeed problems.
Screws with compression ratios of 3.0 - 4.5 are normally preferable. As mentioned earlier, the L/D ratio should be at least 20:1.
The softer compounds generally give a lower output at increased backpressure. The frictional heat is lowest on the softer grades and increases substantially on harder grades. Mixing screws or screws with mixing zones are not necessary for achieving a homogeneous melt.
However, such screws may contribute towards an improvement in extruders with shorter L/D ratios than those mentioned above.

Other Equipment

The most common calibration and take-up units for PP and PVC are also suitable for our TPE compounds based on SEBS. Recalibration is usually unnecessary for the softer grades.
In sheet extrusion, the temperatures of the cooling and polishing rolls should be between 60°C and 80°C. Clean and bright polished rolls and roll temperature control are necessary for minimising sticking, which may sometimes occur with the softer compounds.
The size of extruded products can be adjusted by follow-up drawing/follow-up stretching, this also enables the properties to be modified.

Production Capacity

The extruder capacity is affected by many factors, such as screw design, available motor power, melt temperature, backpressure and heat available.
Our TPE compounds have extrusion rates comparable to other thermoplastics.
The production rate tends to be lower for the softer grades, the rate increases with increasing hardness and rigidity.

Typical Processing Temperatures

The melt temperatures in the extrusion of SEBS compounds are normally 150 - 210°C, but due to the unique saturated olefin intermediate block, process temperatures of up to 260°C are permissible. A temperature profile from the feed zone to the die of 170, 180, 190, 200 and 210°C is suitable as initial setting, and can therefore be adjusted to suit the SEBS grade used and the type of screw. (Lower temperature for the softer compounds). SEBS compounds are easy to process and offer benefits such as high thermal stability, resistance to degradation caused by shear and friction and fast solidification of melts.

A temperature profile along the extruder cylinders, from 150°C at the infeed zone to 205°C at the die, gives the highest output. A reverse temperature profile can be employed if a high degree of homogeneity of the melt is to be achieved or if heavy vibrations should occur. This will give a lower output.

Use of Regrind

In general, the use of regrind is possible. It has to be considered that moisture, dust and other impurities as well as the repeated thermal stress may have a negative influence on the mechanical

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properties.
In coloured grades, the colour can change.
Processing regrind with flame retardant grades (FR, FR HF) is not recommended. The flame retardant properties can be massively deteriorated by the use of regrind.
As a rule, there content of regrind shall be significantly below 20%.
It is the duty of the processor to verify wheter the processing of regrind is in accordance with the requirements and the specification, or not.