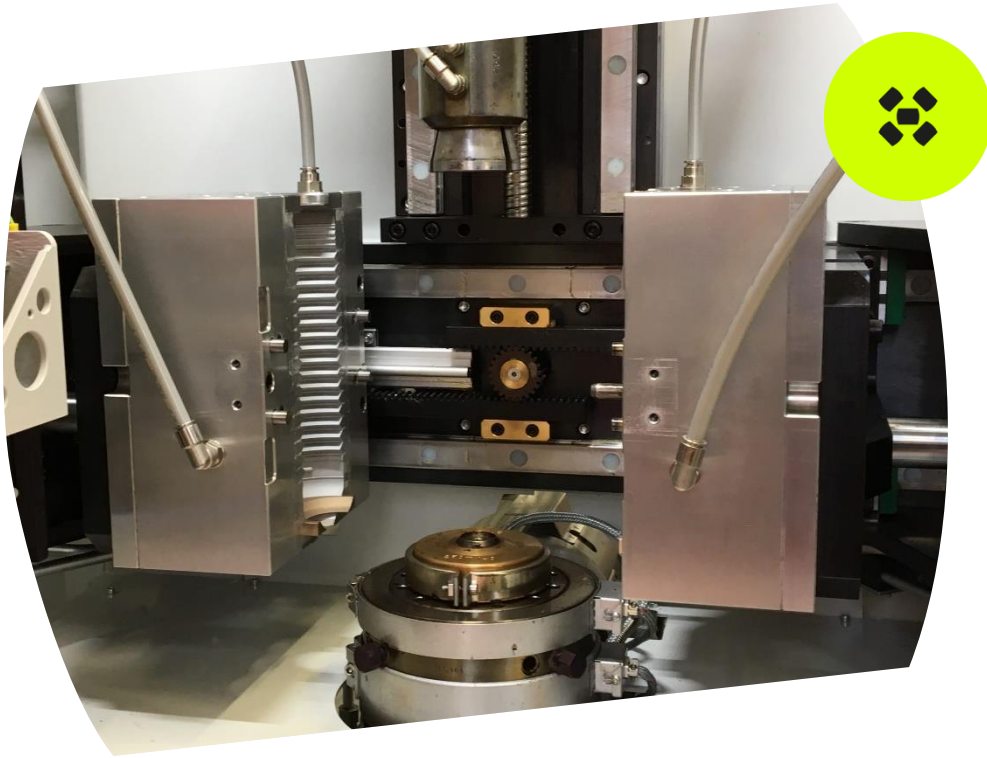




MOCOM

❖ Alfater XL® Processing Guide Pressblower Injection Blow Molding

Alfater XL® is a thermoplastic vulcanizate elastomer (TPV) based on PP and cross-linked EPDM.

The following series are particularly recommended for the Pressblower injection blow molding:

- Alfater XL® I 2GP series
- Alfater XL® E 2GP series
- Alfater XL® ECO 2GP series

Alfater XL® grades with a hardness between Shore A80 and Shore D50 are usually used for the Pressblower injection blow molding.

Pressblower injection blow molding - also known as the OSSBERGER® process - is a special plastics processing technology that is used worldwide for the production of various axle boots, bellows and protective bellows or bumpers.

Pre-drying

Alfater XL® is basically non-hygroscopic. However, pre-drying for 2 - 4 hours at 70 - 80 °C in dry-air (desiccant) dryers is recommended to ensure a stable process and good surface quality of the injection blow molded parts. Open bags should not be stored over a long period of time.

Machinery

In general, all standard Pressblower machines from OSSBERGER® can be used for Pressblower injection blow molding of Alfater XL®. A typical Pressblower machine is the Pressblower DSE 80, which is shown on the following page (Figure 1).



Figure 1: Pressblower injection blow molders - Pressblower DSE 80 from OSSBERGER® (Source: OSSBERGER® GmbH + Co. KG).

Three-zone polyolefin screws are recommended. The L/D ratio of the screw should be $\geq 20:1$, preferably $24:1$. The compression ratio df/dm of the screw should be between $2:1$ and $3:1$. In general, the screw design should allow sufficient shear of the Alfater XL®. Very short and / or low shear screws, such as those used for PVC processing, are not recommended.

Grooved feeding zones will improve axial solid conveying and melting capacity and can also be used for Alfater XL®. However, proper temperature control or cooling of the grooved feeding section is recommended to avoid bridging.

Specific mixing elements at the screw tip can improve homogeneity of the Alfater XL® melt. It is recommended to use a multi-spiral melt distributor for high quality weld lines of the injection blow molded part. The so-called heart-shaped melt distributor is less useful, because this type of distributor can lead to pronounced weld lines, esp. in case of softer Alfater XL® grades. Noticeable weld lines can act as defects in the injection blow molded parts and can reduce the part strength.

Temperature profile

In general, an increasing temperature profile is recommended from the feeding section to the nozzle. The mass or nozzle temperature depends on the Alfater XL® type (hardness and series). A high mass and mold temperature generally result in better surface and weld line quality. The following table contains recommended guide values for the mass and mold temperature. As a starting point for the Pressblower injection blow molding process, it is advised to set medium nozzle and mold temperatures.

Example: Start-up temperatures for an Alfater XL® E 2GP with a hardness of Shore D50

- Mass or nozzle temperature: 220 °C
- Mold temperature: 30 °C

Alfater XL® series	Hardness (Shore)	Mass/nozzle temperature* (°C)	Mold temperature* (°C)
Alfater XL® I 2GP	< A90	190 - 210	20 - 40
	$\geq$ A90	210 - 230	20 - 50
Alfater XL® E 2 GP	< A90	190 - 210	20 - 40
	$\geq$ A90	210 - 230	20 - 50
Alfater XL® ECO 2GP	< A90	190 - 210	20 - 40
	$\geq$ A90	195 - 215	20 - 50

*The temperatures indicated are guide values.

Temperature adjustments may be necessary depending on the Alfater XL® grade and the design of the blow molding part. In general, the Alfater XL® I 2GP grades as well as the Alfater XL® E 2GP grades are characterized by a wide processing window. Harder Alfater XL® grades usually need higher mass or nozzle temperatures.

Particularity of Alfater XL® ECO: Depending on the hardness, the Alfater XL® ECO 2GP series is based on a high amount on PP recylate. As a result, the grades have usually a narrower temperature window in which processing is optimal. Especially harder Alfater XL® ECO 2GP grades (Shore > A90) should be processed at the lower end of the recommended mass or nozzle temperature (see the table above). This will ensure adequate viscosity and melt strength level.

Cycle time and drawing speed

Basically, the Alfater XL® grades can be processed quite easily in the Pressblower injection blow molding. Cycle times of less than 20 s are possible. Furthermore, the good melt stability allows high drawing speeds of the parison of up to 150 mm/s.

Back pressure and screw speed

The back pressure (hydraulic) should be > 5 bar for good homogeneity of the Alfater XL® melt. Depending on the screw diameter, this should result in a back pressure (specific) > 80 bar. The screw speed setting should not be too high in order to avoid excessive shear heating and to achieve good homogeneity of the Alfater XL® melt. As a general rule, a higher screw speed can be used for smaller screw diameters than for large screw diameters. It is more advisable to select a sufficiently high back pressure in combination with a medium screw speed (guideline values: 50 - 200 min⁻¹, depending on the screw diameter and peripheral screw speed).

Cleaning

It is recommended to clean the machine before and after processing of Alfater XL®. PP or PE with a low melt flow rate (e.g., MFR < 5 g/10min) should be used for purging. It is important to remove all PVC and acetal products (e.g., POM) from the machine before processing Alfater XL®. If necessary, the machine has to be cleaned mechanically.

Use of regrind

In principle, production waste from Alfater XL® can be easily recycled and can be used as regrind in a new production in the sense of zero-waste production. The maximum amount of regrind that can be added depends on many factors, e.g., the part design and application. Therefore, the optimal dosage should be defined individually for each process and each injection blow molded part. As a general rule, we recommend to limit the regrind amount to 20 %. It is essential that the regrind is clean and free from any impurities. Grinding or regranulation of the scrap to a particle size comparable to the granule size of the virgin material is recommended. This can minimize separation problems between the regrind and the virgin material. Pre-drying of the recycled material is also recommended. Pre-drying conditions are similar to prime quality, 2 - 4 hours at 70 - 80 °C in a dry-air (desiccant) dryer.

Coloring

Natural-colored Alfater XL® grades can be easily colored. However, the best choice would be a colored Alfater XL® compound as this ensures the highest color consistency and batch-to-batch repeatability. For requests on a colored Alfater XL®, please contact the Technical Service Center of

MOCOM Compounds GmbH & Co. KG or your local sales office or subsidiary of our distribution partners.

As an alternative to a directly colored TPV compound, PP-based color masterbatches can also be used. They usually have good compatibility with the Alfater XL®. When a color masterbatch is used, it is important to ensure that it has sufficient flowability. Typical feeding level of such a batch is 1 - 5 %. However, the optimal dosage can vary depending on the injection blow molded product or application. It is therefore highly recommended to discuss the best feeding level either with the color masterbatch producer or with your local technical contact at MOCOM or your responsible distribution partner.

Sufficient mixing of the Alfater XL® melt with the color masterbatch is necessary to achieve high quality colored products. Mixing can be improved using appropriate Pressblower injection blow molding parameters such as increased back pressure level. In addition, mixing elements such as mixing head or static mixer further improves the dispersion of the color masterbatch.

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