Whitepaper

MOCOM

Alfater XL®

Bellows and boots for vehicle suspension units

Bellows and protective tubes in the chassis are under increasing pressure regarding cost, weight and sustainability. With Alfater XL® MOCOM offers a thermoplastic vulcanizate elastomer (TPV) which combines typical properties of elastomers with the advantages of thermoplastics. Alfater XL® thus represents an economical solution for many technical components, as an alternative to pure rubber.

The versatile properties of Alfater XL® make these materials highly suitable for use in components for flexible vehicle suspensions. Applications include bellows, boots and protective tubes for suspension units in passenger cars, SUVs, light commercial vehicles and trucks.

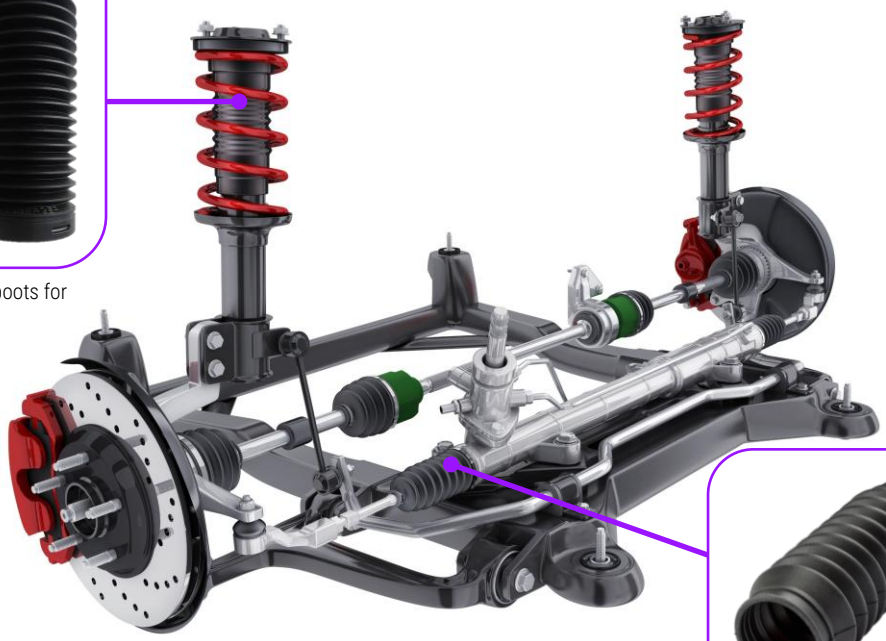
Benefits of TPV in bellows and boots applications at a glance

- **Low density:** Compared to conventional EPDM rubber, Alfater XL® offers a density reduction of 30 % or more in bellows and protective tubes. This significantly reduces the weight per part. In addition, manufacturers can produce more parts per unit of material, making it an attractive option from a cost perspective.
- **Circularity:** The thermoplastic processability of Alfater XL® makes it possible to recycle production waste from the blow molding process (e.g., pinch-off trim) into new production to a certain extent (e.g., 30 %) as regrind. This not only contributes to cost-effective parts manufacturing but also aligns with the principles of a circular economy.
- **Thermoplastic processing:** The thermoplastic processing of Alfater XL® not only enables in-process recycling but also reduces the number of process steps and cycle times in parts manufacturing compared to conventional pure rubber materials.
- **Blow molding:** Alfater XL® can be processed into bellows and protective tubes using all standard blow molding processes. In addition, the material allows easy part marking (e.g., via printing or laser marking).
- **Aging behavior:** Alfater XL® exhibits excellent resistance to typical environmental conditions such as ozone, UV, moisture and dust.
- **Media resistance:** Alfater XL® exhibits good resistance to relevant media (e.g., shock absorber oil).
- **Mechanical properties:** Alfater XL® offers excellent low-temperature flexibility and high (impact) toughness, for example against stone chips and dynamic loads.

Cost savings with Alfater XL®

The low density and reduced weight, the ease of thermoplastic processing and the good in-process recyclability of production waste result in lower overall energy consumption in parts manufacturing. In addition, switching from rubber to TPV enables processors to achieve further efficiency gains.

Dust cover bellows and boots for shock absorbers



Rack and pinion boots

Source: MOCOM

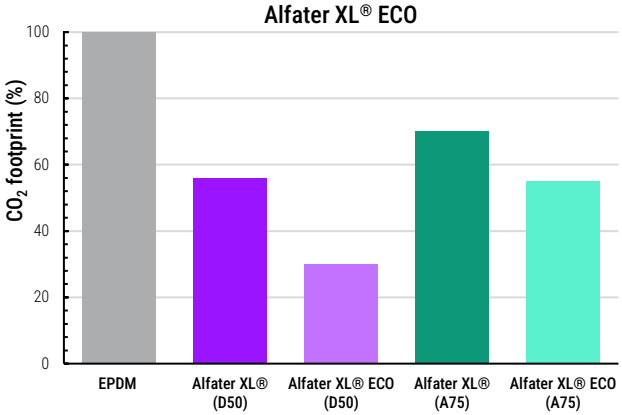
Sustainable TPV solutions for chassis with Alfater XL® ECO

Alfater XL® ECO is a TPV based on ECO feedstocks (e.g., recycled PP). This product line addresses the automotive industry's growing sustainability requirements and combines key sustainability aspects (e.g., reduced Global Warming Potential, GWP) with the proven TPV properties.

Additional benefits of Alfater XL® ECO at a glance

- **High ECO content:** Depending on the hardness, the ECO content of Alfater XL® ECO can be more than 50 % of the total compound.
- **Reduced carbon footprint:** Alfater XL® ECO can further reduce the carbon footprint of bellows and boots. Depending on the hardness, savings of more than 50 % are possible.
- **Approved ECO feedstocks:** The ECO feedstocks used in Alfater XL® ECO are based on PIR (post-industrial recycle) and PCR (post-consumer recycle). All ECO feedstocks comply with relevant regulations such as REACH and RoHS and undergo a comprehensive approval process.
- **Renewable:** Like Alfater XL®, blow molding scrap (e.g., pinch-off trim) from Alfater XL® ECO can also be reintroduced into production process (e.g., 30 %) as regrind. This is currently not possible with pure EPDM rubber, where thermal recovery remains the only available option.

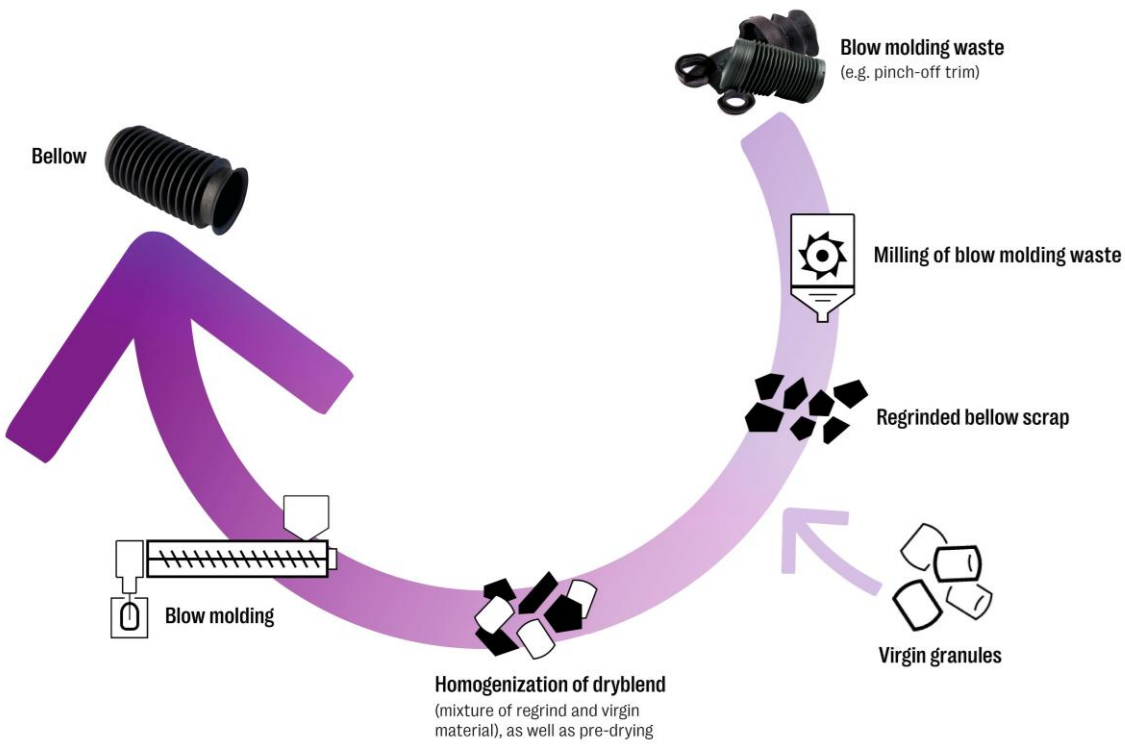
CO_2 savings potential* using Alfater XL® and Alfater XL® ECO



*The carbon footprint is calculated using Sphera (ISO 14040 & 14044); Alfater XL® and Alfater XL® ECO are produced using green electricity (source: MOCOM).

In-process recycling of production waste

Thanks to TPV's excellent thermoplastic processability, production waste from blow molding can be recycled as regrind (e.g., 30 %) into the new manufacturing process without significant loss in the properties of the finished parts. Blow molding waste (e.g., pinch-off trim) can be milled into regrind using standard cutting mills, for example. The regrind should have a particle size as uniform as possible, comparable to that of virgin granules. This promotes good homogenization and metering of the dryblend (mixture of virgin granules and regrind flakes). Pre-drying the regrind is generally recommended to ensure a clean, stable blow molding process while further specific pretreatments are usually not required.



'ce: MOCOM

The recommended regrind content is typically up to 1/3. The actual amount of regrind that can be added to the new blow molding process depends on many factors, such as OEM specifications, the blow-molded part and the blow molding process. In general, blow-molded protective tubes and bellows containing regrind from Alfater XL® and Alfater XL® ECO also meet relevant OEM standards (e.g., from Volkswagen), as the results in the following table show.

Material property comparison: Alfater XL® D50E 2GP00000 BK0002-00 (virgin material vs. mixture of virgin material and regrind)

	Alfater XL® D50E 2GP00000 BK0002-00	
Property (VW 50123)	**Bellow produced from virgin material (100%)**	**Bellow produced from virgin / regrind (80% / 20%)**
Shore hardness (ISO 48-4, 15s)	51 D	51 D
Tensile strength (DIN 53504, S2, 200 mm/min)	31 MPa	29 MPa
Elongation at break (DIN 53504, S2, 200 mm/min)	729 %	710 %
Tear propagation resistance (ISO 34-1A, 100 mm/min)	70 kN/m	59 kN/m
Ozone resistance (PV 3305)	Passed	Passed
Cold elasticity (VW 50123, section 6.5)	Passed	Passed
Heat ageing (DIN 53508, 504 h / 125 °C)		
Change in Shore hardness	-1 point	-2 points
Change in tensile strength	-5 %	-6 %
Change in elongation at break	-6 %	-4 %

Bellow produced from virgin material (100%) – Source: MOCOM

Bellow produced from virgin / regrind (80% / 20%) – Source: MOCOM

MOCOM Compounds GmbH & Co. KG
Mühlenhagen 35 | 20539 Hamburg
T +49 40 999960-399 | sales@mocom.eu
T +49 40 999960-398 | technical@mocom.eu
mocom.eu