



VESTENAMER®
for the tire industry

Evonik Resource Efficiency GmbH



VESTENAMER in Tire & MRG



VESTENAMER as process additive...

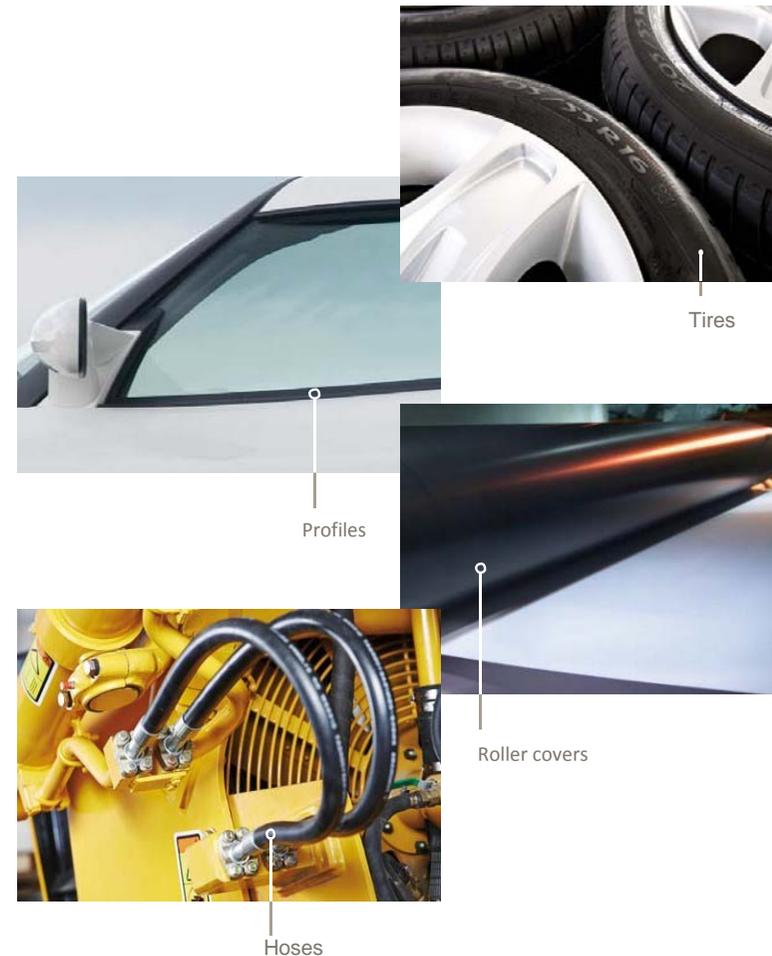
...reduces the viscosity of rubber compounds → facilitates processing and mixing, better incorporation of fillers!

...gives higher Green-strength and dimensional stability → important feature when it comes to precise molding of rubber parts as well as extrusion!

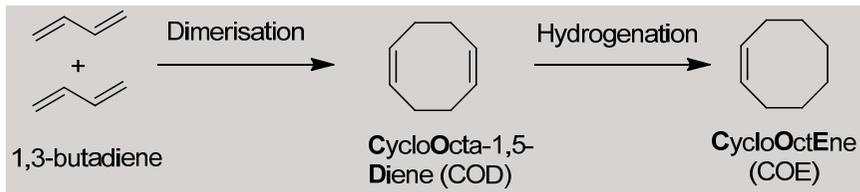
...acts as compatibilizer → Enhances compatibility of otherwise incompatible rubbers, e.g. polar and nonpolar rubbers (i.e. EPDM and NBR)!

...improves the processability of natural rubbers → significantly higher reversion stability especially at high vulcanization temperatures!

...is a reactive additive → participates in the vulcanization process and incorporates in the rubber matrix. No blooming or release over time as often observed with other additives!

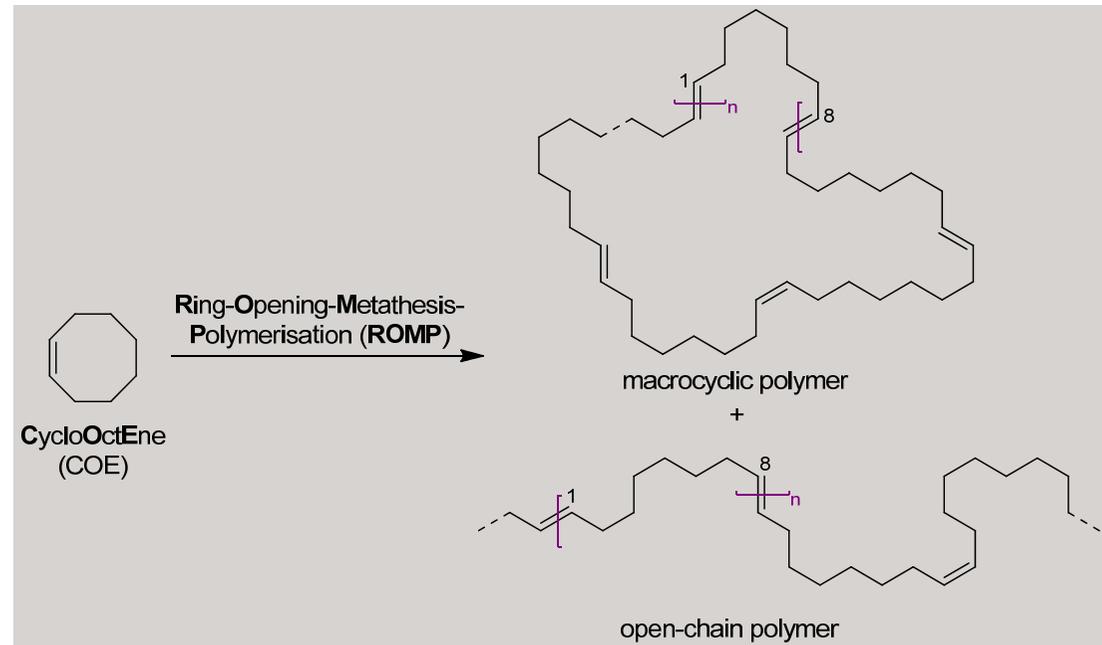


EVONIK's C8-Technology Platform as basis for VESTENAMER®



- Fully backwards integration to butadiene
- Long time process know-how for making C8-rings

- Polymerization *via* ROMP technology gives a unique material
- VESTENAMER® contains a high proportion of macrocyclic polymer
- VESTENAMER® has a high concentration of *trans*-configured double bonds



VESTENAMER®

An outstanding processing aid

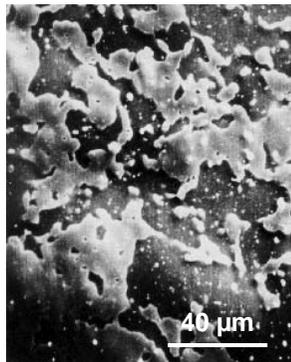


Processing advantages

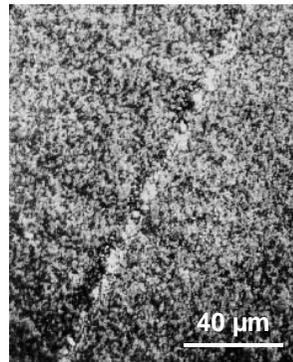
- Reduced Mooney Viscosity (higher flowability)
- Better filler dispersion
- Improved compound homogeneity
- Improved extrudability and surface finish

Compatibility

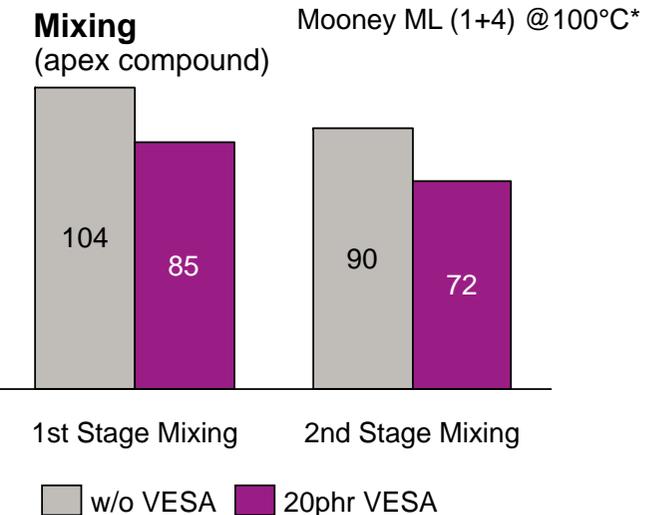
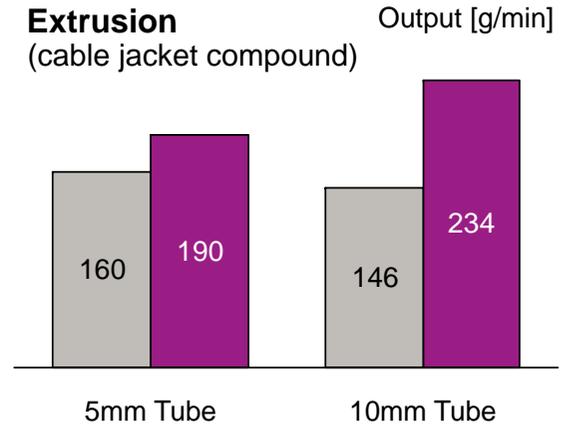
- Enhances compatibility of otherwise incompatible rubbers, e.g. polar and nonpolar rubbers



EPDM / NBR w/o VESA

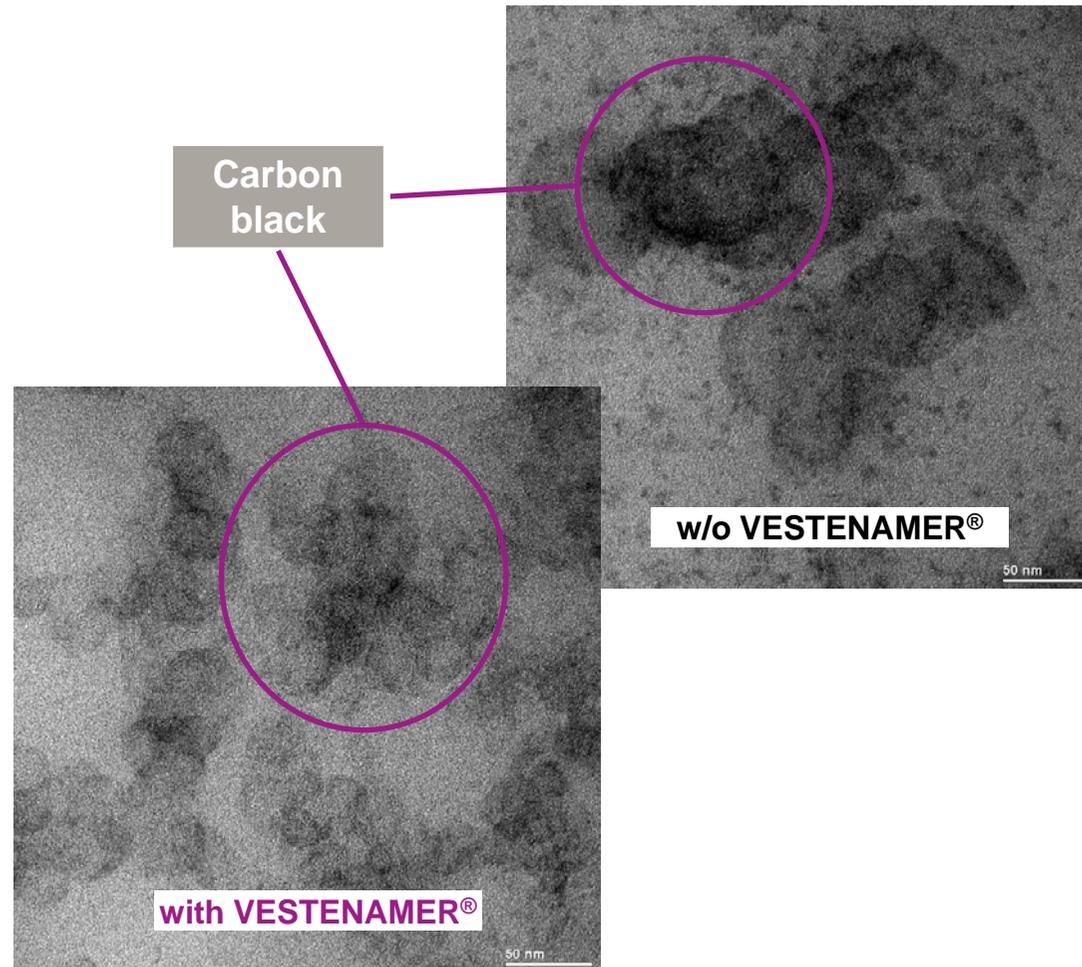


EPDM / NBR 20phr VESA



Processing advantages

- Prevents agglomeration of carbon-black aggregates
- Dispersing agent: Better dispersion of active and non-active fillers
- Improved compound homogeneity
- Flow improver: reduction of Mooney viscosity in compound



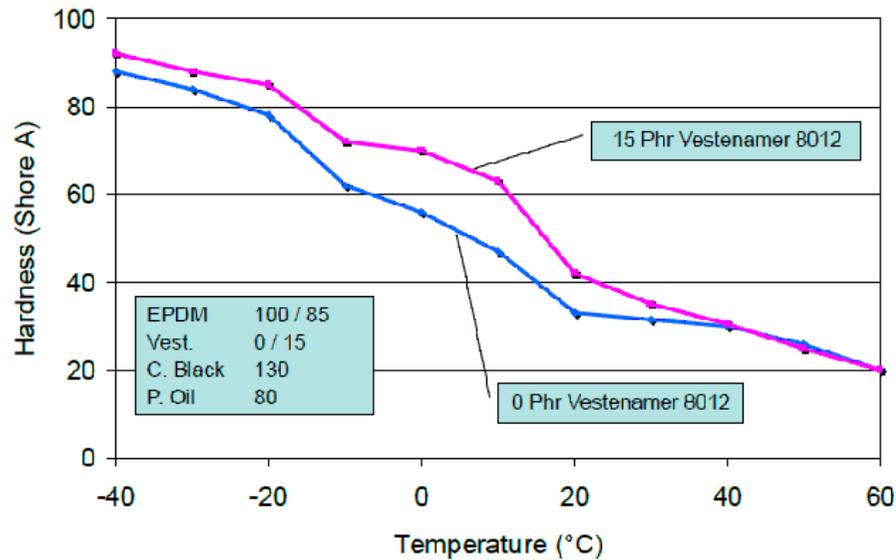
VESTENAMER®

Green strength is the key



dimensional stability of unvulcanized compounds

- High crystallinity below melting point
- Fast recrystallization
- Entanglement of rubber-polymer chains with macrocycles of VESTENAMER®



VESTENAMER®

Versatile use in tire production



Tread/Base

- ✓ with higher silica loading
- ✓ excellent continuous extrusion
- ✓ improvement of abrasion resistance
- ✓ reduced shrinkage

Sidewall/Carcass

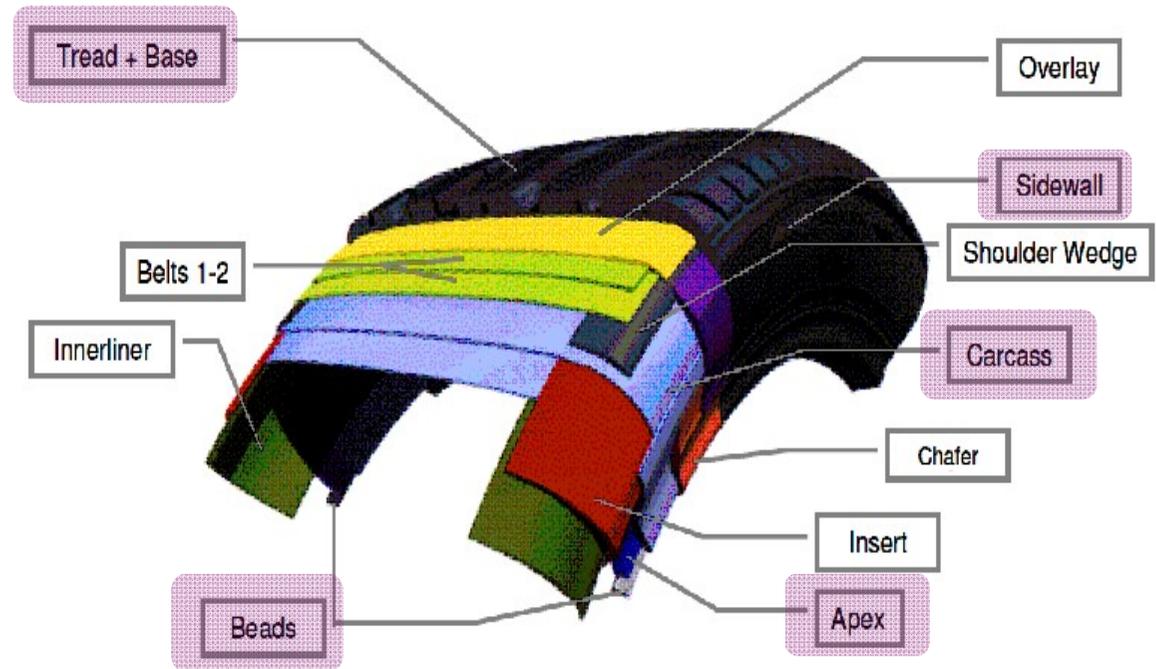
- ✓ higher green strength
- ✓ reduced green tackness

Rim strip

- ✓ higher green strength
- ✓ better unvulcanized dimensional stability
- ✓ better penetration of wire bundle

Bead/Apex

- ✓ higher hardness
- ✓ excellent processability



Most leading tire manufacturers already use VESTENAMER® in some of their compounds!

EVONIK...provides comprehensive solutions for the tire industry



www.rubber-silanes.com/product/rubber-silanes/en/Pages/default.aspx



<http://ultrasil.evonik.com/product/ultrasil/en/Pages/default.aspx>



www.vestenamer.com/product/vestenamer/en/Pages/default.aspx



EVONIK
INDUSTRIES