

# POLYVEST® IN PASSENGER CAR TIRES

SSBR/BR

Performance tests of **POLYVEST® ST-E** in typical silica-reinforced tire tread compounds

## Comparison of silica-reinforced rubber compounds and partial replacement of process oil with POLYVEST® ST

| Substance                  | Reference | + POLYVEST® ST-E 60 | + POLYVEST® ST-E 60 - TDAE |
|----------------------------|-----------|---------------------|----------------------------|
| S-SBR (oil extended)       | 96.3      | 96.3                | 96.3                       |
| BR                         | 30.0      | 30.0                | 30.0                       |
| Silica (ULTRASIL® 7000 GR) | 90.0      | 90.0                | 90.0                       |
| Sulfur-silane (Si 266°)    | 6.53      | 6.53                | 6.53                       |
| POLYVEST® ST-E 60          | -         | 5.0                 | 5.0                        |
| Process oil (TDAE)         | 8.75      | 8.75                | 3.75                       |
| Sulfur                     | 2.0       | 2.0                 | 2.0                        |

Further additives and process aids are included

## Mixing procedure

Mixing Unit: HF Mixing Group GmbH, Type GK 1,5E

### Stage 1 (65 rpm, batchtemp 145-160°C)

- 0.0 - 0.5' polymers
- 0.5 - 1.0' TMQ, 6PPD
- 1.0 - 2.0' 1/2 silica, silane(s), ZnO
- 2.0 - 2.0' lift, clean
- 2.0 - 3.0' a) add CB to POLYVEST® ST  
→ add mixture to the mixer  
b) add 1/2 silica  
c) add remaining chemicals
- 3.0 - 3.0' clean
- 3.0 - 5.0' mix and keep temp. at 145 - 160 °C by adjusting RPM

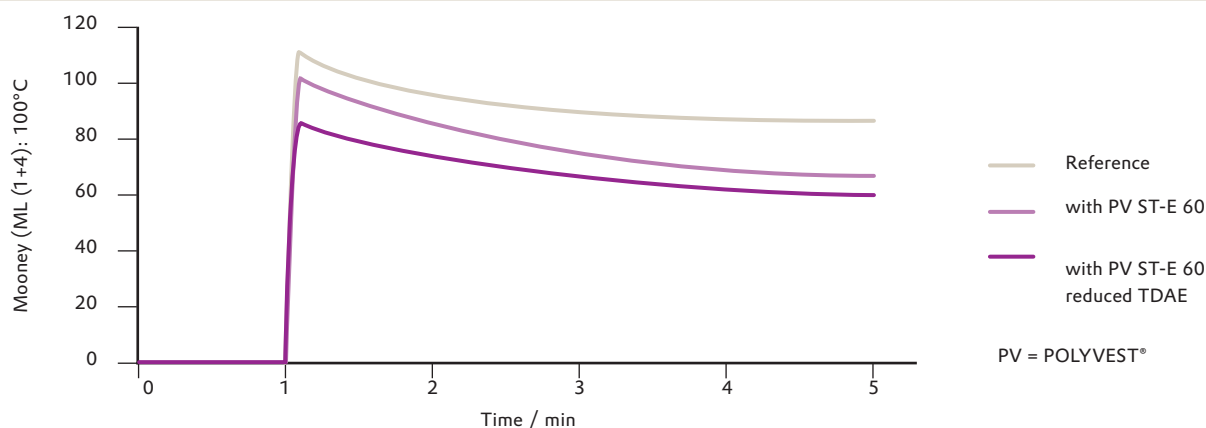
### Stage 2: (batchtemp: 145-160 °C)

- 0.0 - 1.0' 1<sup>st</sup> batch stage
- 1.0 - 3.0' mix and keep temp. at 145-160 °C by adjusting RPM
- 3.0 - 3.0' dump , 45 sec. on open mill (4 mm nip), sheet out

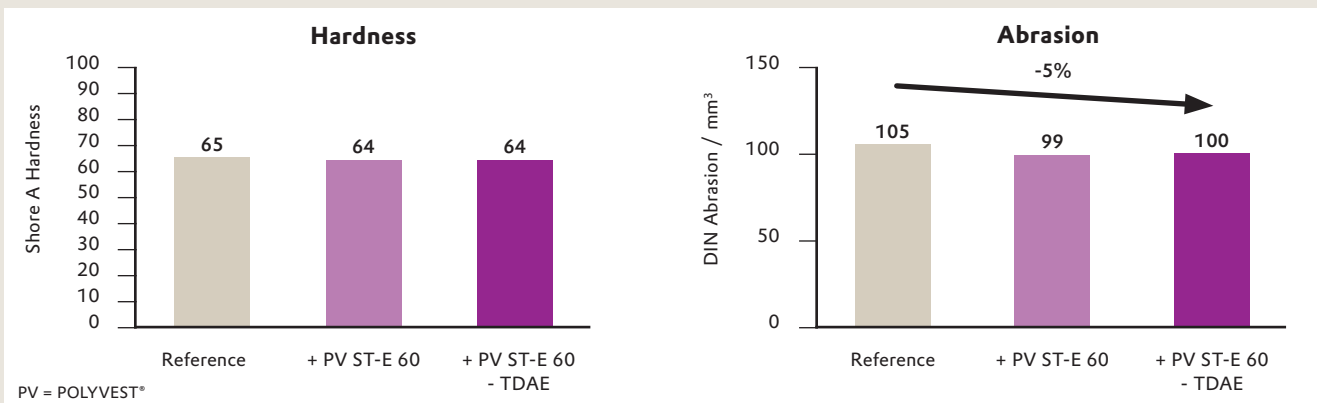
### Stage 3: (batchtemp. 90-110 °C)

- 0.0 - 2.0' 2<sup>nd</sup> batch stage, accelerators, sulfur
- 2.0 - 2.0' dump batch and process on mill during 20 sec. with 3 - 4 mm nip.
- cut 3 x left, 3 x right, roll up and pass through a 3 mm nip 3 x sheet off

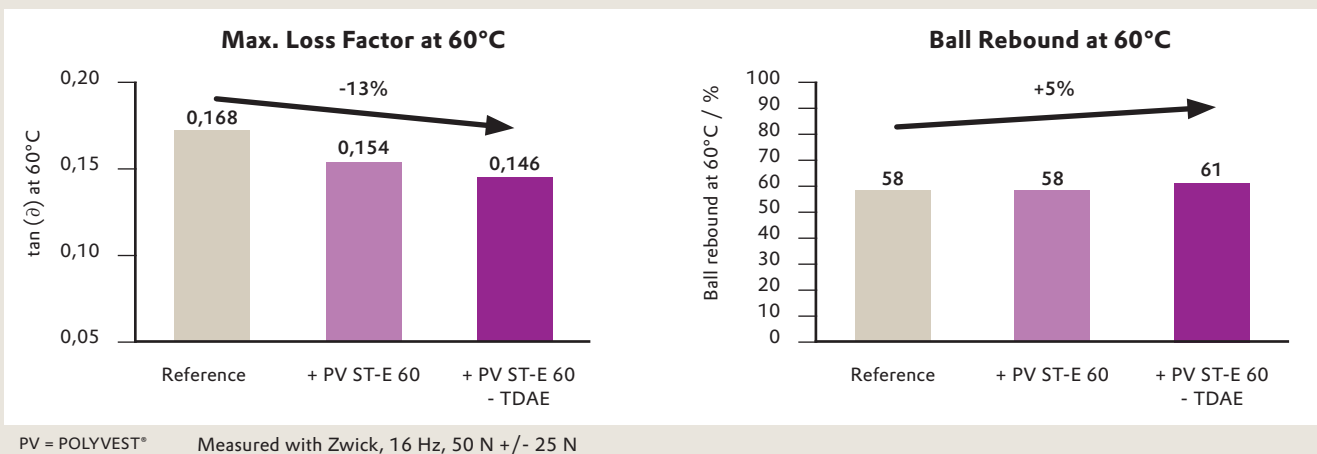
## Improved processing by reduced Mooney viscosity in 1st mixing step



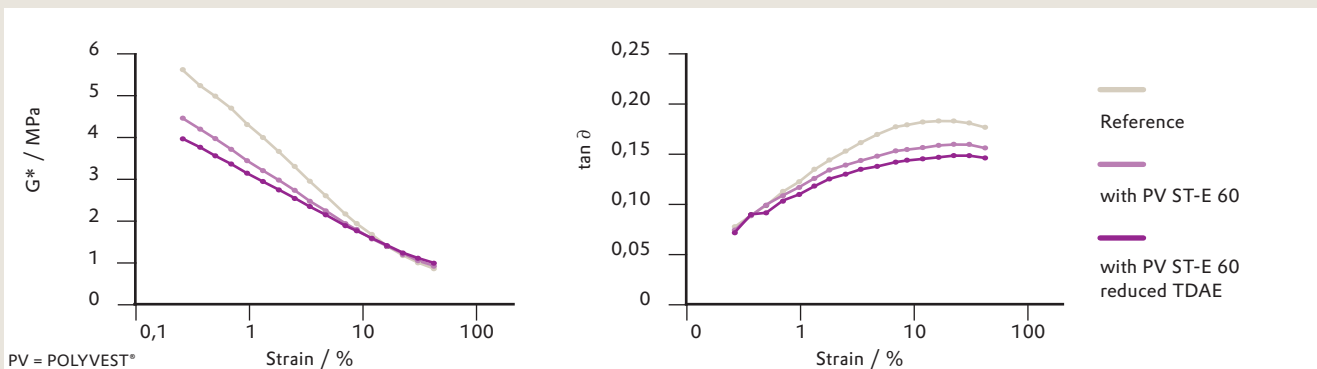
## Higher wear resistance as shown by reduced DIN abrasion at constant Shore A hardness



## Improved fuel efficiency as indicated by reduced loss factor and higher ball rebound



## Reduced Payne effect as shown by RPA strain sweep at 60°C



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