

58.93 The Con-operation: Removing cobalt and resorcinol from adhesion mixtures

Steel-cord adhesion mixtures are commonly used in tires and other applications such as hoses or conveyor belts. In such mixtures, state-of-the-art technology uses systems containing cobalt salts as catalysts or co-accelerators and adhesion promotors, as well as resorcinol resins to achieve desired mechanical properties.

As both cobalt and cobalt salts, on one hand, and resorcinol, or resorcinol-based resins on the other hand, are deemed to be problematic from an environmental safety and health (ESH) point of view, it is worthwhile finding a solution to reduce - or even eliminate - such critical substances from modern rubber mixtures. The elimination of resorcinol is already realized by a novolakbased reinforcing resin.

A combination of this novolak-based resin together with a zinc-based catalyzing additive additionally allows the elimination of cobalt and cobalt salts from steelcord adhesion mixtures without sacrificing vulcanization activity, mechanical properties and adhesion characteristics.

- No cobalt
- No resorcinol
- High adhesion to steel
- High mechanical properties
- Low zinc and heavy metal content

	Standard system	Cobalt- and resorcinol-free system
NR	100	100
N326	55	55
Stearinic acid	2	2
Silica	15	15
TMQ	1	1
Oil	4	4
Additive package 1	9.75	
Additive package 2		8.5
HMMM	4	4
Sulfur	6	6
DCBS	0.6	0.6
TBBS	0.9	0.9

Additive package 1: Cobalt salt, resorcinol and standard ZnO Additive package 2: Zinc- and novolak-based additive package without cobalt and resorcinol



Fig. 1: Rheometer curves measured at 155 °C.



Fig. 2: Pull-out force values according to ASTM D 2229-02



Fig. 3: Improvement of mechanical properties of cobalt- and resorcinol-free system compared to standard system (in percent)

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