

Coated spring wires for medical applications

Bekaert has developed a new range of zinc-aluminium coated wires, Bezinal XC and Bezinal XP, designed specifically for critical spring applications, to be used in demanding environments. Bezinal XP's strength in corrosion and cathodic protection, and Bezinal XC's stable coating integrity means the wires provide excellent performance in medical application, where they can be used as high-performing alternatives for stainless-steel wire.

Corrosion is perceived as the primary cause of breakdowns, malfunctions and premature failures for springs. Choosing a steel wire with the right corrosion protection is essential for the success of spring applications, primarily when used in aggressive atmospheres.

The advanced properties of Bezinal XC and XP offer superior corrosion resistance, excellent cathodic protection at grinded and cut edges, and improved white-rust behaviour. Compared with traditional coatings like phosphate and zinc, Bezinal XC and XP show considerable increase in resistance to salt-spray corrosion. Long product life can also be expected in special and harsh environments with high degrees of humidity, alkaline contact, oil or even a wide variety of organic solvents.

The coating properties are also maintained after a heat-treatment process of 30 minutes at 250°C, rendering the exposure temperature higher than for traditional zinc coatings. Optimal processibility for Bezinal XC and XP is obtained with the specially designed coating composition and a microstructure that displays a highly ductile behaviour upon deformation, as in the case of bending or coiling.

Fully protected

As the wire properties remain fully intact after processing, no additional protection is required, eliminating the need for expensive post-coating processes. In addition, pre-coated wires deliver complete protection to the spring, in contrast with post-coated springs, which do not allow penetration on the inside of the coils (like closed extension springs).

Such pre-coated spring wires demonstrate better resistance to hydrogen embrittlement and consequent fatigue performance compared with, for instance, electrolytically galvanised post-coated wires. For this reason, Bezinal XC and XP are promoted as high-performing pre-coated wires that can be used in demanding spring designs and shapes that are difficult to obtain using classic materials.

These novel materials allow improved production efficiency, showing a significant decrease in reject rate, and can be formed at higher coiling speeds than traditionally coated solutions. The coating serves as an excellent alternative for stainless steel material, exhibiting not only comparable corrosion performance, but also improved material properties, like a higher E-modulus, as well as a more constant spring processibility.

Figure 1. Salt-spray corrosion test of heat-treated and non-heat-treated spring samples (hours until occurrence of 5% dark brown rust)

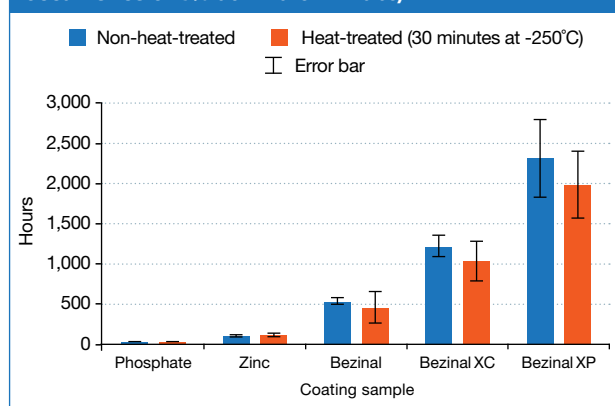
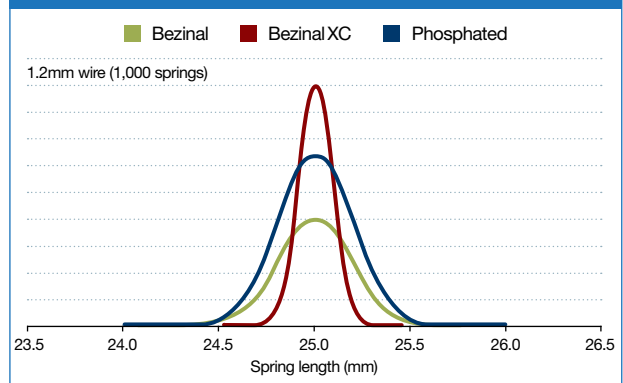


Figure 2. Normal distribution of spring length deviation for a coiling test of 1,000 springs (mm)



Meeting market demand

Based on positive feedback from the market in terms of coilability and handling in production, Bezinal XC and XP coated wires can be proposed as excellent candidates for various applications. They address several market demands, such as the increased need for miniaturisation, prolonged shelf life and cost-efficient production. Within its scope of potential application are, among others, aerosol, inhalers, retractable syringes, and dosing or auto-injector pens. ■

Further information

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