Technical Article 10: High-performance wire products in automotive engineering

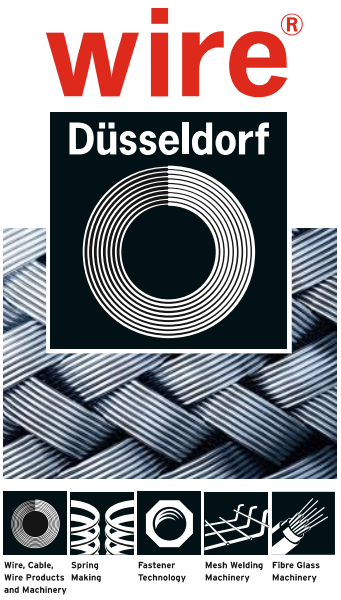
The wire, cable and wire-processing industries and the wire 2018 trade fair

Wire and wire-based products – i.e. cables, springs, screws and bolts – can be found almost everywhere. No technical systems could function without them, and neither would there be any technical progress. As the demands on technical systems are growing, the performance of such components is gradually being stretched further and further. Wire products must provide reliable service even under the most challenging conditions. They are used, for example, in automotive engineering – an industry that drives innovation in the wire industry.

A modern car has nearly 1,000 **springs**, and their reliable operation has a major impact on safety and passenger comfort. Springs are often expected to perform at the highest level, e.g. in the valves which they cause to close in a combustion engine. Situated within a four-stroke engine, a valve spring must cope with up to 10 billion movements throughout a mileage of 120,000 (200,000 kilometres). In addition to mechanical strain, a valve spring must also withstand extreme heat, hot gases and substantial temperature fluctuations. If a spring breaks, it is likely to cause severe engine damage.

Other important wire products are **screws and bolts**, as so many components are connected in this way. A modern vehicle has over 1,000 screw fittings and bolted connections, of which 250 to 300 can be found inside the engine. It's a place where up to 150 different types of screws and bolts are in use. All of them must have very narrowly defined tolerances in terms of physical properties, and they must also be convenient to insert and assemble, so that automated processing can largely proceed undisturbed.

Metal mesh, too, plays a major role. Made either from stainless steel wire or from certain non-ferrous metals, it is used, among other things, for filtering exhaust gas from combustion engines, thus helping to reduce carbon monoxide and particulate emissions. In an exhaust gas recirculation system such a filter ensures that particles from the combustion process or from the particulate trap cannot reach the



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Internationale Fachmesse Draht und Kabel

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turbocharger or engine, where this would have negative consequences. The stainless steel wire in a metal mesh has a thickness of only 35 µm, so that it is thinner than a human hair. Moreover, it can bear temperatures of 800°C and indeed more.

One of the most complex, most expensive and heaviest components in a modern vehicle is its on-board electrical system, once referred to as wiring harness. This is where the **cables** are assembled – cables which supply the ever increasing electrical and electronic components of a vehicle with power, while others transmit electronic signals. The VW Beetle, built around 1950, was equipped with a handy wiring harness that weighed no more than a few kilograms and whose cables had a total length of about 80 metres, with just over 70 electrical components connected to them. By contrast, today's on-board electrical systems comprise up to 4,000 cables, with a length of up to 3.7 miles (6 km) and up to 60 kilograms in weight. Electric and hybrid vehicles are especially demanding on the cable harness and the cables. Some cables have a high voltage of up to 1,000 volt and must withstand far higher currents and higher temperatures than their predecessors.

The *wire* trade fair

Information about state-of-the-art manufacturing technology, developments and trends in the wire, cable and wire-processing industries can be obtained every two years at *wire* – the leading international trade fair of the wire and cable industry and an event which has been held in Düsseldorf for over 30 years now.

wire 2016 put a major focus on "Industry 4.0", and so it will be exciting to see how things are developing and what kind of results will be presented at wire 2018 which, as before, will be held together with Tube, the international pipe & tube fair, from 16 to 20 April 2018.

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