FA 06: wire products create connections: So much depends on bolts

wire 2014 will feature innovative solutions for the wire and cable industry

Daily life would be unthinkable without wire and wire-based products. They are essential for the functioning of technical systems, and they often have a direct impact on safety, so that they must generally meet the highest standards. Products of this kind include fasteners such as bolts, nuts and rivets. A modern car, for instance, contains over 1,000 bolts, and the Eiffel Tower in Paris – a unique monument – is held together by 2.5 million nuts.

The biggest customer of connecting elements is the automotive industry. Other industries that need large quantities are domestic appliances, electrics and electronics, furniture, mechanical and equipment engineering, aviation, railway and energy engineering as well as steel construction, the building industry and medical engineering. Moreover, a large number of products are sold through the retail trade. As the economies of many countries depend on the production of industrial goods, we can see a worldwide growth in the demand for fasteners. According to a study entitled “World Industrial Fasteners Market”, published by Reportlinker.com in October 2012., annual growth should be more than 5% and reach a value of over US$80 billion in 2016.

Bolts – which are probably the most frequent fasteners – are manufactured in a wide variety of forms to connect components, so that they engage with each other. Connection is based on complex interaction between forces, with the option of disengagement (a possibility that is not available with rivets). A bolt consists of a head that functions as a drive unit and a threaded shaft that tapers towards the tip of the bolt, either cylindrically or conically.

Physically, the thread can be seen as a rolled-up inclined plane, and it is this thread that allows the generation of extreme retention forces during assembly, while requiring relatively little force to be applied. The most widely used bolts are manufactured in a cold forging process, i.e. without adding heat. The advantage of this technique is that it produces high-precision products with excellent mechanical properties and that it is more cost-effective than other moulding techniques. The starting material is wire made from special steels or non-ferrous metals, delivered rolled up in rings which are then straightened before being fed into a metal forming machine. Sections are cut off the wire and are gradually fed through each of the stages of the metal forming tool. Step-by-step, they acquire their target shapes, and the final stage is the application a rolling process to create the thread.

Quite often this is followed by a tempering process, thus adding the required technical properties as the finishing touches. The machine output depends, among other things, on the dimensions of the bolt and can be 300 per minute or even more. The smallest bolts, which are used for electronic components and clockworks, have an outer diameter of less than 0.5 mm, while the biggest that can be created through cold forging are about 30 mm in size.

The general technical development is characterised by concepts such as “raw material and energy efficiency”, “miniaturisation” and “lightweight construction”. This continually presents new challenges to the production of fasteners which can only be solved through cooperation between experts from different disciplines. After all, manufacturing must take account of the interaction between materials, tools and coatings, the use of software in the dimensioning and in production processes, issues of automatic assembly and connection safety and, of course, environmental and economic criteria.

The wire 2014 trade fair

Challenges of this kind require production engineering solutions where wire and wire-based products play a vital role and where innovative processes are essential. Information about the necessary machines and equipment, the latest production engineering and development tendencies will be provided at wire, the leading international trade fair in this industry, from 7 to 11 April 2014. As before, it will be held at the Düsseldorf Exhibition Centre in conjunction with Tube, International Tube and Pipe Trade Fair.

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