

Maximum corrosion protection for special requirements

Zinc flake coating of threaded bolts for wind turbines, e-trucks and timber construction

Markgröningen, February 19, 2025 - BENSELER offers an effective solution for corrosion protection in the most demanding applications with its zinc flake coating: Threaded bolts and screws in larger diameters and lengths in particular, such as those used in wind turbines, e-trucks and timber constructions, benefit from the advantages of the process and the surface specialists' expertise.

Corrosion is a key challenge in many areas, especially for threaded bolts that are exposed to high mechanical loads and adverse environmental conditions. With zinc flake coating, BENSELER offers a resistant alternative to processes such as electrogalvanizing, which not only provides long-lasting corrosion protection but also pays off in terms of the bolting properties: In contrast to conventional galvanizing processes, the specific lamellar structure of the coating ensures that it reacts very slowly to corrosion, even when damaged. This distinguishes the zinc flake coating significantly from galvanized zinc coatings. These are often susceptible to corrosion after a short time if damaged. Furthermore, because the zinc flake is not applied electrolytically, there is no risk of hydrogen embrittlement. The zinc flake coating process, for example using dip-spin technology, significantly reduces the risk of brittle fracture, particularly in the case of high-strength fasteners. Another advantage is the low coating thickness, which prevents any impairment of the fit, installability and functionality of the screws.

Wind turbines: protection for extreme conditions

In wind turbines, both onshore and offshore, the conditions for fasteners are particularly harsh. Threaded bolts with diameters of up to 42 mm and lengths of between 500 mm and 1,200 mm are used to fasten the rotor blades. The extreme weather conditions, combined with salty air and high humidity, require outstanding corrosion protection. Although BENSELER applies the zinc flake coating with a layer

thickness of just 15 µm, the bolts have a salt spray resistance of up to 2,000 hours in accordance with DIN EN ISO 9227.

E-trucks: Reliable bolted connections despite adverse influences

Battery boxes in e-trucks, which protect the energy storage system, are exposed to highly variable weather and road conditions. Particularly long screws with lengths of up to 1,400 mm and a diameter of only 14 -18 mm ensure the stability of these boxes. BENSELER guarantees maximum corrosion protection for the screws thanks to the zinc flake as well as their resistance to mechanical stresses and chemicals such as organic solvents, oils or greases and continuous temperature resistance up to 200 °C.

Timber construction: Durable fasteners for safe structures

In timber construction, DIN EN ISO 9227 requires corrosion resistance of over 1,500 hours. At the same time, timber construction screws, which are often screwed in without pre-drilling, must have constant friction properties and a defined screw-in torque. For BENSELER, zinc flake coating is therefore the process of choice here too: the friction values can be precisely adjusted according to customer requirements and specifications, resulting in a defined screw-in torque with a constant torsional load on the screw during assembly.

Size and volume require special processes

Zinc flake coating is one of the most resource-saving processes precisely because it is highly effective even at a low layer thickness. It can be applied in bulk or in racks, either by spraying or by the dip-spin method. The latter is suitable for all workpieces that cannot be spun as bulk goods due to their size or weight and is therefore used at BENSELER for threaded bolts with extraordinary lengths of up to one meter. The parts are hung loosely but securely in a rack. They remain securely in place during the dipping and drying process in the centrifuge. This prevents damage caused by snagging or knocking and guarantees high process stability. The method enables uniform coating even in hard-to-reach areas, such as under the screw heads. After spinning, the screws are dried at temperatures of 220 to 300 °C, allowing the liquid zinc flake layer to harden and develop its full protective effect.



Effective controls for the highest quality

BENSELER monitors the quality of its coatings through comprehensive tests in its own test laboratories. Coating thickness measurement, coating weight determination, adhesion testing and corrosion tests in the salt spray test in accordance with DIN EN ISO 9227 prove that the parts coated here fully meet the specification requirements. The experts also test the friction properties: Up to five complete screwing cycles (screwing in and unscrewing) enable the coating to remain intact even under intensive use.

About BENSELER

BENSELER is a competent service provider and partner for technically sophisticated solutions in the areas of coating, surface finishing, deburring and electrochemical metalworking of series parts. The BENSELER Group, based in Markgröningen near Stuttgart, consists of two divisions: Coatings and Deburring. In 2018, the company also entered additive manufacturing in the metal sector.

The company is constantly developing its core processes, supplementing them with upstream and downstream processes and maintaining system partnerships with its customers. BENSELER therefore understands the needs of the market and can offer solutions with added value. Several locations in Germany, the new subsidiary in Poland and holdings in Switzerland and the Czech Republic ensure proximity to the customer.

The BENSELER Group achieved a turnover of around 135 million euros in the 2024 financial year. It currently employs around 980 people, including 30 trainees. In addition to technical expertise, sustainability and social commitment characterize the actions of the family business, which has been in existence for more than 60 years.

Further information can be found at: www.BENSELER.de

Image material

Image 01 Angular power plant

(Source: Werner Muenzker/Shutterstock)



Threaded bolts like this one on a wind turbine, with diameters of up to 42 mm and lengths of up to 1,200 mm, are coated by BENSELER using the zinc flake process.

Image 02 Wood construction screw

(Source: BENSELER)



BENSELER's zinc flake coating also ensures maximum corrosion protection, stability and defined coefficients of friction for durable wooden structures and e-trucks.

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