



Getting a grip on fasteners and their coatings within the transport sector



A focus on automotive and the EV market

By **Sven Brehler**, Engineering Project Manager at TR Fastenings

As a full service provider with a worldwide reach from the USA to Asia and Europe to the UK, TR Fastenings works closely with automotive Tier 1 companies to respond to their needs and global developments. Supplying 10,000 different fasteners annually into the automotive sector, TR is playing a central role in shaping the future of the fastener industry within this changing space.

The global electric-vehicle (EV) industry is expanding rapidly with 60% year on year increase and sales growing to 2.1 million units in 2018¹. As a result, advanced technology is now a top priority for competing OEM's and the role of fasteners is significant.

Transport technology companies around the world are under pressure to innovate as a result of rising cost pressures, and trends such as lightweighting, autonomous driving and electro mobility growing apace.

Suppliers into Tier 1, such as TR Fastenings are increasingly required to come up with technical innovations for fasteners that work harder and 'smarter' that can be produced quickly and cost-effectively.

The key fastening applications within automotive include sub tier manufacturers; seating; power trains; thermal management; HVAC; high-end performance cars and the EV market - the latter being the fastest growing sector for TR Fastenings to which they supply automotive grade fasteners to OEM specification.

It's an evolving application that is leading the fastener industry to greater sophistication.

Lightweighting in fastener technology

Achieving fastener weight reduction whilst maintaining high torque demands have become an important requirement in automotive applications. Industrial drive systems such as the Mortorq® screw require up to 25% less material in the head yet still provide super high strength internal drive – an example of an innovative system providing the lowest head possible without compromising on fastener assembly performance.

One of the heaviest components in an EV is the electric battery, which runs the risk of negating the idea of carbon emission reductions if the vehicle's weight increases energy consumption. As a result, fastener companies such as TR and their supply chains are constantly looking to innovate and are inspired by other transport industries such as aerospace.

Fastenings and their coatings within the EV sector

Batteries, motors, transmissions and all their associated electronics are the leading technology areas of EV R&D and the fastenings and their coatings play an essential role.

Innovative engineering techniques are now being applied throughout the design and manufacturing process in order to meet customers fast changing needs.





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Why are fastening innovations crucial for EV battery (EVB) manufacturers?

There are a number of components which are particularly relevant for EVB assembly - fasteners with electrically isolating coatings; lightweight, non-magnetic fasteners; battery retention bolts; cable management hardware and compression limiters.

All these require fasteners to provide robust and secure settings for the costly battery. And fasteners are essential, not only in the electric vehicles themselves but also in supporting technology and applications including charging units, EV battery casings, and general infrastructure equipment.

Coatings do more than just provide protection against corrosion

An EV's battery module can be secured with inserts for plastics that are used to maintain either good connectivity where required or avoid unwanted short-circuits due to corrosion or product failure.

Fasteners for the EV batteries are designed to incorporate various coatings to suit the functionality of the joint. Examples of these include: silver plating to improve connectivity or high temperature resistant organic top coat to provide an electrical barrier.

Sven Brehler, Engineering Project Manager at TR Fastenings explains: "Component suppliers are beginning to work closely with battery module manufacturers to develop and apply functional coatings to fasteners including protection from corrosion.

These help to either maintain good electrical connectivity or retain isolation where needed to avoid unwanted electrical resistance or potential short circuits."

Battery heat

Highly conductive coatings can be applied to certain materials such as plastic fasteners or fasteners prone to corrosion so they can act as electrical conductors, being part of the electrical circuitry. Increase in electrical resistance causes generation of heat together with loss of energy.

Sven continues; "EV batteries can generate high levels of heat, so it's essential that it is distributed over the assembly to provide general cooling and avoid localized overheating. Busbars can support the distribution of heat from local hotspots to heat sinks, but only when correctly tightened to optimise heat transfer between the various elements. Using fasteners in thermally and electrically conductive coatings will aid an effective service life."

Insulation coatings are advantageous

Regarding insulation coatings, in certain cases electrical currents must be contained. Barrier coatings avoid electricity from going where it shouldn't and causing interference or a risk to safety through electrocution or fire.

Specific coatings used include PTFE (Polytetrafluoroethylene) because it is highly heat resistant with the ability to retain its properties across a temperature range, from -200°C to +260°C.





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It also has low predictable friction, which can help to create secure joints through torque control essential when assembling the battery module.

One solution does not fit all

As well as hardware in battery casings and structures, many differing conditions also need to be considered so adopting a 'one solutions fits all' approach to applying coatings would not be appropriate.

Depending on the material and the function of a particular component and the task it performs, different solutions are necessary.

Automotive quality standards

TR Fastenings supplies from its own IATF 16949 as well as from a select range of external suppliers. The International Standard for Automotive Quality Management Systems is based on ISO 9001 and applicable to organisations that manufacture components, assemblies and parts for the supply into the automotive industry.

Only manufacturers passing strict audits and reviews by TR's fully VDA 6.3 certified auditors, and able to deliver to the highest OEM quality standards are used to provide the necessary high quality products into the battery market. This helps to ensure a stable and sustainable supply chain in addition to the engineering and logistics TR can deliver.

Early engagement in design

Manufacturers and sub-contractors must work together from the start to ensure the correct Design for

Manufacturing (DfM) considerations. When cost-efficiency, sourcing, materials and product lifecycle concerns are discussed early on at the design table; costly delays later on can be avoided.

As an emerging transport sector, the fasteners needed in EV charging units and their associated structures, requires manufacturers and their supply chain to have technical knowledge and experience. There are increasing pressures and opportunities involved working within intricate global supply chain networks, and manufacturers servicing the automotive, electronics and technology sectors will be best placed to work with emerging EV related businesses.

Looking to the future

The EV sector is a fascinating one to watch as it develops and gains momentum. As the requirement for robust EV charging points grows, the automotive industry continues to innovate with fasteners playing a major role in the electric vehicle revolution.

It is a rapidly accelerating market with huge potential for manufacturers and suppliers. It is therefore essential the supply chain has the infrastructure, technology and solutions in place to meet future demand for electric car use.

Source 1: <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/expanding-electric-vehicle-adoption-despite-early-growing-pains>

