Advancing electric vehicle technology with cold-formed connectors

With the move to electric and hybrid vehicles and the tightening regulations on CO_2 emissions even F1 is having to save fuel by making cars that are ever

move towards sustainability in automotive. Away from the racetrack

the shape of the increasing numbers of electric and hybrid vehicles on our roads which are now dominating the automotive world.

Manufacturers such as BMW and Nissan have successfully proved the viability of the market with their own electric vehicles; the Nissan LEAF has dominated the electric vehicle market for years. According to the SMMT (Society of Motor Manufacturers and Traders), electric vehicle registrations had a record year in 2017 with a 27% increase compared to the year before and 2018 looks to be another record-breaking year, clearly demonstrating a massive consumer appetite for 100% electric and plug-in hybrid cars.

Since the number of pure electric vehicle models in SMMT's registration , perhaps the most striking statistic is presented by the SMMT's table of the Top 10 lowest CO_2-emitting models[1]. Since

tailpipe emissions, the Number 1 spot in SMMT's Top 10 lowest CO_2- emitting models is shared between 11 such vehicles. And while such models continue to expand in numbers, no vehicle that is not purely electric has any hope of ever again entering the Top 10.

The engineering challenge

Although electric transport brings hope for enhanced future sustainability it also carries with it challenges for the engineering industry, as each advance in one stage of the power transmission chain requires others alongside to match it. The best current lithium-ion battery, which employs metal oxides in the positive electrode, cannot provide much more than 200 miles of service – not a viable solution for widespread take-up. And then there are charging stations to consider. As plug-in electric vehicle ownership continues to expand, so does the need for charging stations, with fast charging capabilities.

In addition to on-street facilities provided by electric utility companies, there are now mobile charging stations providing a range of special connectors to accommodate a variety of vehicles.

According to Richard Martin, editorial director for clean technology mark Navigant Research, "Fast charging, however and whenever it gets built out, is going to be key for the development of a mainstream market for plug-in electric vehicles."[2]

So, enhancements to even the smallest components are required to establish the electric car as a serious competitor to petrol-powered transport. And such is the need to enhance sustainability – and the potential commercial reward

ely that solutions will be found to circumvent any problem that stands in the way of electric vehicles.

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Powertrain innovations

excellent way to increase electric vehicle mileage and reduce energy consumption while maintaining performance levels and there has therefore been considerable innovation

For example, electric vehicle motors are engineered to run at extremely

power density. In turn, this means that components such as bearings have to be engineered to minimise friction while operating for far longer periods than has previously been the norm.

To meet this need, bearings have been designed that combine design feature innovations such as optimised internal geometry, making them extremely

sustained high speeds. Innovations such as this are helping electric vehicle

increased mileage and overall improved robustness of the powertrain's key components.

Enhanced connectors

Similarly, recent advances in the manufacture of power connector technology are enabling designers to

and power trains. Power connectors are widely used in electric vehicles, for example in charging units and the motors used to drive each wheel. The

connectors to minimise power losses while reducing weight and cost.

One option is to engineer connectors using precision cold forming, which

cuts metal waste.

Cold forming

Precision cold forming is capable of delivering precision engineered parts with up to 80% less scrap than other machining processes. Coupled with

and improved mechanical characteristics, precision cold forming

manufacturers to take advantage of enhanced component quality while also reducing costs.

Performed at ambient temperatures, cold forming is a far quicker process than many competing techniques. This means that components can be made to order extremely quickly, cutting lead times and the need to store high volumes of spare parts onsite. Aside from tangible cost savings, cold forming makes for superior quality products by plasticising metals along their grain boundaries, rather than cutting across, thus producing parts with extremely low levels of stress deformation and high levels of mechanical integrity, resulting in far greater performance and reliability.

outstanding le ven on parts with complex contours.

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Dimensional tolerances can be to

cases require no further machining or polishing.

Additionally, parts undergo work hardening during the cold forming process, improving their machinability and durability still further. Work hardening reforms the structure of the metal in a way that prevents further dislocations, resulting in a stronger component.

As this increase in strength is comparable to that of heat treating,

work a less costly and weaker metal than to hot work a more expensive metal, particularly where a precision

The cold forming process also makes it possible to produce component parts

and on the surface. Accurate internal

are possible, enabling precision parts to be manufactured; this can have a

of the equipment in which they are

used. Furthermore, there is almost no limit to the shape, size or complexity of the metal components that can be produced using cold forming. Simple or highly complex cold formed and

be produced for a diverse range of applications.

At Dawson Shanahan, we have used our renowned precision cold forming expertise to manufacture power connectors that optimise the performance of electric vehicle charging units. Our high power connectors are generally produced from oxygen-free, high conductivity materials that are vital to ensure there are no power losses in this application.

References

1. SMMT: New Car CO_2 Report 2014 (Chart 7)
2. Climate Wire

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