# Third wheel?


**On the face of it there is a strong argument in favour of electrified axles such as ZF's eTrailer becoming a standard fitment on all semi-trailers. But the devil is in the detail, reports Steve Banner**

The axle's intelligent electric motor recuperates energy which would otherwise be lost during braking or when the truck coasts downhill. That can then be used to power ancillary equipment on the trailer or boost the vehicle's performance.

ZF contends that eTrailer can deliver fuel and $CO_2$ savings of up to 16% on short-haul routes and up to 7% on long-haul runs, allowing every conventional truck to become a hybrid. It could also used to extend the range of an electric tractor unit ZF adds, or enable it to be equipped with a smaller, lighter battery pack.

The potential of electrified axles has not been lost on other major OE suppliers. BPW has come up with ePower, which involves equipping a trailer axle with a pair of hub generators, while SAF-Holland has developed a regenerative trailer axle under the SAF TRAKr banner.

UK manufacturer Advanced Electric Machines is now supplying an electric motor for use with TRAKr that does not contain any rare earths or copper. The extraction of both places a considerable burden on the environment, SAF-Holland points out.

BPW is promoting ePower with the requirement of temperature-controlled semi-trailers in mind. Using its power rather than a diesel donkey-engine can cut fuel usage by around 2,500 litres a year, the firm calculates.

"Even with an additional battery for interim storage of the energy, ePower is weight-neutral when compared to cooling by means of a diesel generator," BPW contends. "Furthermore, it can be mounted on existing axle designs."

Emissions from diesel-driven fridge units are coming under sharper focus as clean air zones are rolled out in urban areas; and electric fridges are far quieter than their diesel-fuelled counterparts. It is also worth noting that duty-rebated diesel for fridge units will disappear in 2022-23.

## OTHER ANCILLARIES

While there may be an argument for using electrified axles to power fridge units, the case in favour of employing them to run other items of ancillary equipment on a trailer is less convincing, say industry executives.

"If you want to power a tail-lift, for instance, then you might want to consider putting solar panels on the trailer's roof and use them to charge a 24V battery," suggests body and trailer engineering expert, Lionel Curtis. "They can produce 150W/$m^2$, weigh next to nothing and continue to charge the battery while the trailer is stationary." Solar panels could also power a double-deck trailer's lifting deck, he suggests.

By contrast, an electrified axle only makes its contribution when the vehicle is in motion, and imposes a weight penalty. "The generator adds 150kg to 200kg, and then there is the weight of the battery pack to be borne in mind." A 35kWh-capacity unit could weigh 250kg.

The battery's temperature will have to be kept stable, which will probably involve a liquid coolant, which adds further weight and cost. "The battery alone will cost you several thousand pounds," says Curtis, now head of engineering at Aerodyne Global.

Another question which has to be addressed is whereabouts on the trailer the battery should be positioned. Says Don-Bur group marketing manager, Richard Owens: "We had some limited experience of this type of technology a while back. The difficulty we found is that if you mount the battery beneath the trailer ahead of the axles, then it is vulnerable to dirt and debris kicked up from the highway. "So you have to

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Lionel Curtis



consider shielding it, but at the same time you've got to find a way of keeping it cool too."

Owens and his colleagues eventually concluded that the expense and complications involved made the whole project unviable, so it was abandoned. He qualifies that by adding: "I love the idea and I think the technology is well worth considering, but it is not something I would want us to revisit any time soon," he observes.

"Solar panels are a better bet for many applications. If all you want to do is power a tail-lift, though, then you might just as well fit a couple of heavy-duty leisure batteries to your trailer and ensure they're charged up at the depot before the truck departs," he adds. "The incremental cost will be a lot less."

Curtis and Owens readily concede that electrified axles can generate large amounts of energy, and Schmitz Cargobull is convinced they have a key role to play when it comes to driving fridge units.

Back in July it put a prototype S.KOe Cool Smart temperature-controlled semi-trailer with an electrified Schmitz axle plus an electric S.CUe refrigeration system into service in the Netherlands with supermarket chain Albert Heijn. Also involved in the project are rental fleet TIP and logistics specialist Cornelissen.

A number of Dutch local authorities will be introducing zero-emission inner city zones from 2025 onwards, says Albert Heijn transport manager, Peter Leegstraten. "The all-electric S.KOe means we will be able to continue to drive into these zones in combination with a zero-emission tractor unit without any problems," he observes.

Using an electrified axle means that the fridge unit's battery may not need to be charged up at a distribution centre, Schmitz Cargobull points out, thus shortening waiting times. The S.KOe trailer is equipped with the company's TrailerConnect telematics system which is used to monitor the battery's state of charge, how much range it has got left, and how long it will take to charge it up again.

The S.CUe unit offers up to 15.9kW of cooling and 9.1kW of heating power.

Not to be outdone, Krone has worked with Dutch electric fridge trailer specialist THT New Cool to develop a version of its Cool Liner refrigerated semi-trailer with an electrified axle and a 320kg battery pack to feed the fridge unit (pictured, near left and inset). The total weight of the fully-electric trailer is the same as that of a conventional fridge trailer with a full diesel tank, says Krone.

Last December saw one of these trailers go into service in Germany with logistics company Nagel Group.

Used to transport sausages on behalf of chilled meats producer Herta, it produces less than 2kg of $CO_2$ an hour compared with the 6.5kg generated by a trailer with a diesel refrigeration system, says Krone. Noise levels have been reduced from 70dB to 59dB, it adds. Says Nagel Group fleet manager Arthur Ebel: "This corresponds to reducing the noise level from that of a lawnmower to a normal conversation."

## POWER BOOST

Attempts made to use electrified trailer axles to give tractor/semi-trailer combinations a power boost from the energy recovered to improve their performance and cut fuel consumption have met with mixed success.

Some five years ago, SDC trialled a system on a curtainsider semi-trailer which employed graphene-based ultra-capacitors. Fitted with a motor/generator, the axle recovered the energy which could then be released by the ultra-capacitors to drive it in what amounted to a virtuous circle. Fuel savings of 25% were promised, but operational problems resulted in the project being abandoned.

A Schmitz Cargobull semi-trailer which worked along similar lines but employed a 22kWh lithium-ion battery performed rather better under the European Commission-backed Transformers project (pictured, left). It offered potential fuel savings of up to 18%, but weighed a hefty 1,140kg. TE