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An Alternative to the Alternator

The case for replacing alternators with DC-DC converters in road transport

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With innovative manufacturers developing and expanding their range of solutions, engineers have more reasons than ever to replace alternators with DC-DC converters in road transport applications.

Today's eMobility and hybrid and electric vehicle manufacturers emphasize the efficiency, reliability and practical advantages of a DC-DC converter over an alternator – not just in powering DC auxiliary components but in battery charging. To meet every engineering need, these products are available in a wide variety of standard configurations and, importantly, there is no limit to the scope for custom modifications.

Many global manufacturers have committed to the electrification of transport by establishing specialized eMobility units within their businesses (Bel Power Solutions, Eaton, etc.) by focusing on creating and improving industrial EV power components. Technology design centres are currently located throughout the world and in many countries throughout Europe, Asia and the United States, which cover the whole spectrum of electric and



Figure 1: The Bel Power Solutions 350DNC40 is a 4 kW DC/DC Converter that creates DC voltages in hybrid and electric vehicles suitable to power low voltage accessories. Features include very high efficiency, high reliability, low output voltage noise and excellent dynamic response to load/input changes.



Figure 2: For an electric bus in Europe, Bel Power Solutions was selected to power all the auxiliary DC peripherals, as our product had the right current to power it. It turned out to be so successful that this unit is now being used in a fully electric double deck bus.

hybrid vehicle types, sizes and power levels.

As well as road-going buses, trucks and all kinds of cars, from taxis to luxury sports models and even ground support equipment and heavy construction vehicles, DC-DC converters can be used in every form of off-road and workplace transport. That includes construction equipment, airport ground support vehicles and the marine sector. The list is endless, embracing such unusual fields as rollercoaster operation.

Why DC-DC conversion is superior

The benefits of DC-DC converters, compared to alternators, stem largely from the fact that they draw power directly from an HV battery pack rather than from the rotation of an engine or motor. Not only is this more efficient, but it dispenses with the need for various moving parts, like belts and pulleys, and so reduces maintenance needs and potential sources of failure. A DC-DC converter also scores more highly in terms of reliably regulating an output voltage.

On top of these inherent advantages, technology leaders within eMobility have used their expertise in this vertical market to build superior design, specification and support into their DC-DC converters, offering to maximize the positive effect on customers' businesses. By incorporating the latest advances in CAN communication and other technologies, the products are reliable with high performance – and each can be customized for specific applications and requirements. Furthermore, prices are increasingly competitive, with shorter lead times, and are backed by excellent customer service, expert technical advice and engineering support.

For example, Bel Power Solutions has both liquid cooled 350/700 DNC40-12/24-8G and convection cooled 350/700 DNC40-12/24-

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CG models. These down-converters deliver up to 4 kW of power when liquid cooled or 3.3 kW with convection cooling. Depending on the model chosen, they handle input voltages ranging from 240 to 850 VDC.

Along with very high efficiency – typically up to 93% – users can expect robust, highly dependable performance, low output voltage noise and excellent dynamic response to changes in load or input. Nominal output voltage is either 14.4 V or 28 V, but this is adjustable as required via CAN bus. Input and output are fully isolated, galvanically, from each other. Communication and control are optimised

via a CAN bus serial interface according to SAE J1939.

There is a choice of liquid or convection cooling. Liquid cooled models have an operating temperature range between -40° and +85°C. For those with convection cooling, the range is -40° to +45°C. In addition to over-temperature, output over-voltage and over-current protection, each model is protected in relation to input and output polarity. Ingress protection is rated at IP65 and IP67, and there is also the confidence of E-mark compliance.

Customization can be key

While the varying standardized specifications have been designed to cater for most situations, today's manufacturers understand that every customer's needs are unique and their engineering teams welcome requests for modified solutions. Output voltage is just one of the factors which can be tailored to precise requirements, but there are many more possibilities. Customers are strongly encouraged to ask about these services when doing their research.

For example, Zurich Airport has implemented a DC-DC converter to enhance the supply of auxiliary power while airplanes are being serviced at the gate. Previously, a ground support vehicle carried a diesel generator to charge the planes' auxiliary power units. The generator has now been replaced by a 300 VDC battery pack and a

DC-DC converter, for cleaner and more convenient charging.

At its simplest, a DC-DC converter is an easy way of supplying DC power at the right voltage to things like dashboard instruments, lights, radios and other low-powered accessories. More unusually, one eMobility manufacturer was asked to provide DC-DC products for a roller coaster project in which power needed to be maintained in 20 carts.

Electrifying trends

Electric and hybrid manufacturers anticipate growing demand for DC-DC converter solutions as the electrification trend continues and customers seek to optimise their conversions. Major drivers of change include consumer interest in sustainability, business recognition of electric cost-effectiveness and legislators' increasingly strict emission limits.

Current EU regulations are pushing many cities into replacing highly polluting diesel buses and even petrol-powered vehicles with clean electric alternatives. By 2025, it is likely that the switch to fully electric buses will be complete in many city centres.

For the logistics industry, urban emission restrictions and extra congestion charges are not the only reason for moving toward electric power. Businesses in that efficiency- and reputation-conscious industry are

increasingly attracted by the cost-cutting potential and PR rewards it offers.

After buses and trucks, the next-largest growth area for eMobility is large off-road vehicles as used in military operations and in the mining and construction industry. Then there is the marine market, including ferries and pleasure boats. It is expected, for instance, that within the next few years all canal boats in Amsterdam will be electric powered.

Time to change

It has taken a relatively short time for electric cars and industrial EVs to grow from a very small interest area into one with a significant market presence. Now that the trend has achieved real momentum, it is time for more businesses to get on-board and start electrifying their vehicles.

With its advanced technology and deep knowledge in this area, Bel Power Solutions is ideally placed to help customers replace their alternators with efficient, reliable DC-DC converters. Better still, Bel Power will work with companies to ensure the right model choice – and modify its specification, if necessary, for a perfect fit with the application. Whatever new electric power demands an industry faces, Bel Power is ready to tackle those challenges and provide customers with the ideal solution.

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