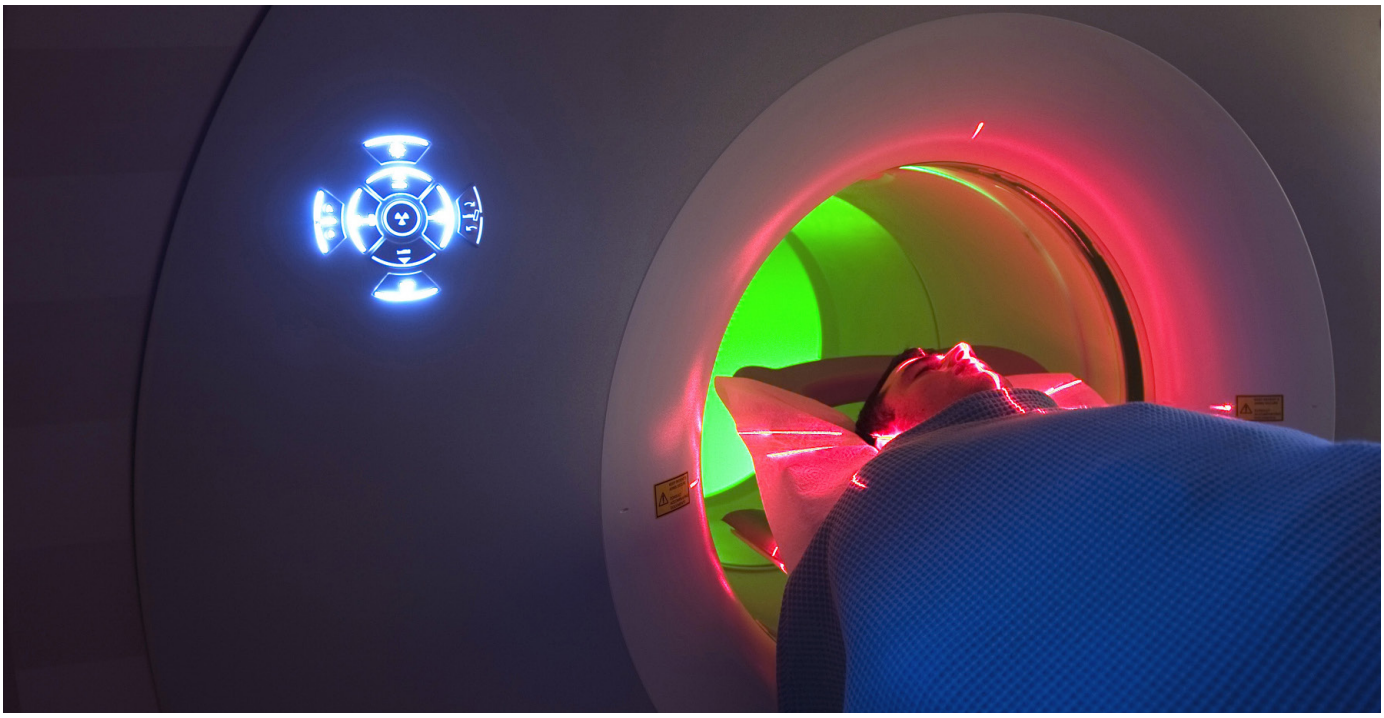

DC/DC market trend and technology forward

This article is a Q&A snapshot of the power supply industry and DC/DC converters, answering the following questions:

- → How is the market going?
- → In order to grow and increase market share, are you going to settle new market/product strategies?
- → Among your product offering, which are the more interesting and innovative?

From your point of view, how is the market going?
For decades, the Telecommunication segment has been predominant and one of the main technology driver for innovations within the power industry. We all remember the evolution in power distribution, moving from centralized-power to de-centralized power, which has been then adopted by other industries, becoming the worldwide power-architecture in all segments from Industrial to Defense. As well for the introduction of digital power technology, which is now used in many products operated in non-telecom segment. All those technology evolutions have been driven by the need to make telecom equipment more energy efficient, to reduce energy consumption and carbon footprint, but as well possible to integrate, what used to be the size of building in the eighties, down to a chipset nowadays.

Integrating, what used to be a central telecom office down to a chipset has had a big impact on the volume of power modules consumed by this industry but as well how the power distributed and optimized. At the peak days in year 2000, the worldwide production of 5 to 20W board mounted DC/DC converters for the telecom industry was close to the 35 million units, which, for similar category of products consumed in the telecom industry is estimated to be below 6 million in 2017. We all know that the telecom market has reached a certain level of saturation but they

are other reasons explaining this impressive decline in volume: Higher level of integration and increase use of discrete solution.

In order to grow and increase your market share, are you going to settle new market/product strategies?
As explained, despite expected brightening future for the so called 5G, the demand for standard DC/DC will remain stable and the product mix between ICT, Industrial, Medical, Transportation and defense will not change drastically. In some segments, DC/DC are becoming commodity products but at the same time, there is a growing number of applications requiring very specific DC/DC converters for complex and demanding applications. Since 1974, Powerbox has developed competences and expertize in custom power solutions for demanding applications where standard DC/DC converters are not enough.

The range of applications requiring custom power DC/DC is extremely large and from powering a sub-sea applications requiring to convert multi kilovolts input to 24V output to a DC/DC able to work safely in very high magnetic field such as in MRI equipment generating more than 5 Tesla, the level of competences and engineering required from the R&D team extremely high. Growing and increasing market share in such business environment requires to permanently innovate, to monitor emerging technologies, to cooperate with universities and researches institutes but as well to recruit new talents. All of these have to be conducted with sustainability and environment in mind, which is one of the top requirement place on Powerbox by our customers but also our contribution to build a sustainable society.

Among your product offering, which are the more interesting and innovative?
When developing power solution for demanding applications, every product is unique and based on a very high level of innovation but the multi-phases coreless power system we developed to power critical equipment in medical applications is probably the most innovative and remarkable product we recently released this year. Medical and industrial applications such as magnetic resonance imaging (MRI) and particle accelerators (PA) generate high magnetic fields to induce the RF energy required to activate the hydrogen nuclei in the case of imaging, or to accelerate particles in research and industrial equipment. Modern MRI systems generate 5 Tesla and even more, making conventional power supplies using ferrite material useless due to inductance saturation as a result of the MRI magnet disturbing the energy transfer. The coreless power unit is fully controlled by a digital processor that manages the complete power unit from switching parameters (e.g. dead-time and duty-cycle optimization) to output voltage characterization, which for such type of complex power solution is a first in the high demanding medical industry but innovation doesn't stop there, the system is built on modular technology reducing time to market when customers requiring more powerful solution (Figure 01).

It is for sure the market for such type of product is limited to medical, researches of very specific industrial applications involving extreme magnetic fields but reflecting the level of technology and innovation required by the demanding industries. This is what makes our lives so exciting!

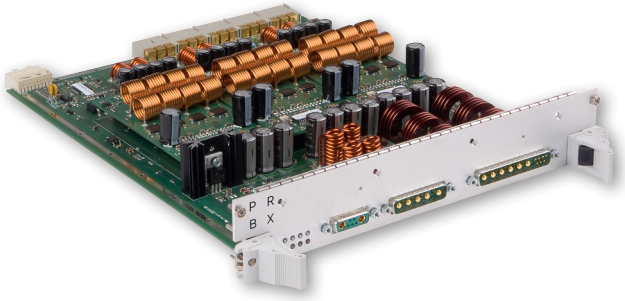

Figure 01 – Powerbox GB350 digitally controlled power supply for demanding applications operated under high electromagnetic field.

About Powerbox
Founded in 1974, with headquarters in Sweden and operations in 15 countries across four continents, Powerbox serves customers all around the globe. The company focuses on four major markets - industrial, medical, transportation/railway and defense - for which it designs and markets premium quality power conversion systems for demanding applications. Powerbox's mission is to use its expertise to increase customers' competitiveness by meeting all of their power needs. Every aspect of the company's business is focused on that goal, from the design of advanced components that go into products, through to high levels of customer service. Powerbox is recognized for technical innovations that reduce energy consumption and its ability to manage full product lifecycles while minimizing environmental impact.

PRBX white paper 015 EN Rev A
2018.04.17

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