The Power Principle

By Sara Waddington, Managing Editor, SCTE

Broadband Journal spent the day with Murata Power Solutions (Celab) who demonstrated how power can be optimised in high-speed broadband networks.

"At Celab, we see a bright future. As power supply density, efficiency and functionality increases, we foresee a growing demand for our specialist design skills and power products and solutions," Murata Power Solutions (Celab) Limited told *Broadband Journal* during a recent visit to Celab's factory in Bordon (Hampshire, UK).

A senior engineer designs bespoke products using CAD systems

Celab's rugged intelligent power supply capabilities cover every aspect from design concept to end-to-end manufacture across a variety of harsh environments on land, sea and in the air. Tailor-made products are used across multiple sectors, including industrial, defence and telecommunications. It offers custom power design services for new, existing or legacy systems. Early modelling and simulation techniques dramatically reduce design cycle time and project risk as its engineers use the latest design tools to develop innovative products.

PCB assemblies manufactured by Celab

L-R, Mimi Lunt, marketing manager, Jessica Edwards, purchasing manager, and Julian Wood, MD, Celab

The Celab assembly line

Loading a PCB into newly bought machinery

Celab's new Ersa Versaflow selective solder machine

Celab, an SCTE corporate member, produces a range of space-saving uninterruptible power supplies (UPS) specifically developed for the industrial cable television (CATV) and telecom market. Its manufacturing capabilities range from PCBs to complex electro-mechanical sub-assemblies. They combine AC and DC outputs, typically in 19" rack mounting enclosures with enhanced SNMP Ethernet monitoring for remote status diagnostics.

Investing for success

"After more than 45 years of business, we continue to trade with customers who have known us for all this time. In addition to existing defence and Cable TV customers, we have won new important business in the industrial power sector. September 2017 was the tenth anniversary of our incorporation into Murata Manufacturing Co Ltd., and we have benefited greatly from being part of this major Japanese group," explained Julian Wood, managing director, Celab.

"We recently undertook a major reorganisation, growing at more than 20% per year and, if all goes well this year, we will have doubled our size (in terms of revenue) within five years, which reflects Murata's general rate of growth."

Celab embarked upon an intensive capital investment programme in plant and equipment last year to ensure that its UK facilities remained relevant and ready to meet the individual needs of its customers. Following the reorganisation of its 2,000m^2 factory, the upgrade allowed specialist business units to have their own dedicated space within the factory, including industrial, defence and engineering teams.

"We have invested in the machinery and equipment to allow us to continue manufacturing in the UK and we are now recruiting and taking on more people. We have the engineering experience and a strong heritage to help our customers. We effectively offer a 'cradle to grave' service, usually spanning more than a decade for each product type," Julian Wood told *Broadband Journal.*

The Industrial production area has now more than doubled in floor space to meet long-term customer demand. To support this requirement, Celab has made significant capital investment with provision of a new Juki GL Printer, KE1080 Pick & Place and RS800 reflow oven. Within Stores, both parts and packing bay areas have enlarged three-fold to cope with the increased stockholding and general material logistics. The Defence division has centralised manufacturing

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into a purpose-built, climate-controlled, secure area. The Engineering team (electrical and mechanical) has moved to a new dedicated area with expanded facilities for developing testing, including direct access to environmental chambers and vibration rigs. The pre-compliance EMC chamber has benefited from a new spectrum analyser and programmable AC source.

An automated Ersa Power Flow Air wave soldering machine and a Delta-8 conformal coating and dispensing machine (a new flexible robotic conformal coating PVA system) were also purchased as part of this initiative.

"Our highest volume products are several kilowatts of power and contain many thousands of individual components. Our focus is to produce innovative designs, supported by a global supply chain with manufacturing options available in the UK and Far East. We have invested in automation in our UK operation, providing a 'lean' local manufacturing facility to service European customers with more complex power systems," explained Julian Wood.

Power for telecoms

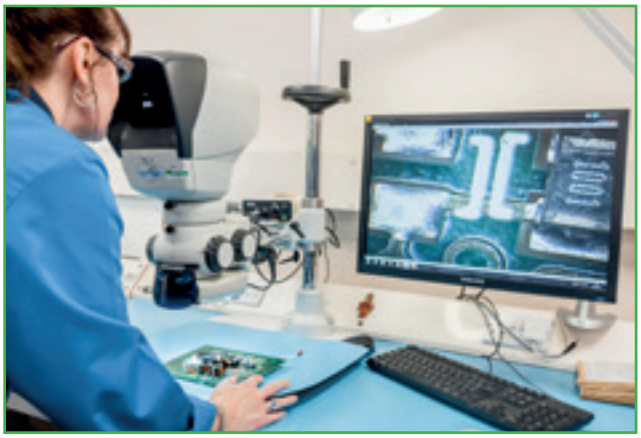
"We took our experience in the environmentally tough military market into the cable market, demonstrating how far you can push electronics. How you package, treat and look after the products is key. In the military, you can do a lot with commercial off-the-shelf (COTS) equipment so the two have fed into each other. We provide multiple power solutions including: custom and semi-custom; commercial off the shelf, post design support and reverse engineering. Our power supplies go through meticulous assembly, detailed inspection and our test facilities ensure full compliance prior to delivery," commented Keith Harrison, Celab's chief electronics engineer.

Celab's uninterruptible power supply products for the telecommunications industry are not only designed to meet custom or standard form factors but also to undergo extensive design verification testing including vibration, sine/random, bump, salt fog, EMC and HALT. Its engineering teams collaborate closely with its customers to ensure thorough certification and specification compliance and provide continued support through system performance testing and field use.

"All of our customers have slightly differing primary requirements. They all, however, require highly reliable products at competitive prices. Our products tend to stay in service for ten years or more, so long-term technical support from local engineers brings further value to our customers," added Harrison.

"Because of the way that the mechanical and electrical teams work together, we offer a very clean communication channel and the benefit of real focus. We are a mid-sized team – less than a hundred people – but all the management team and staff know what is going on. If there is a technical, delivery or commercial issue, for example, we can respond quickly and be flexible. We also do not sell anything off the shelf,

Keith Harrison, Celab's chief electronics engineer, and Mimi Lunt, marketing manager, Celab



Rigorous inspection of a product before being dispatched to a customer

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nor through distributors – everything is bespoke to a certain customer, and designed and supported for that customer. All of our products have a long lifecycle."

So, how can Celab make the lives of cable MSOs easier?

"We can offer bespoke knowledge, design and collaboration. It is expected that most established CATV power supplies in the market should now be robust. From a user point of view, do you have the right level of communication for engineers to make their lives easier? We provide a lot of data from the power supply which engineers can then use to decide how they address a situation. There is probably more that can be done on this such as, for example, customising the format of the data. This saves cost and time. We can also offer more training on how engineers can use this data," explained Keith Harrison.

"Power efficiency is the second consideration – is it appropriate in size and scale? We have high efficiency levels across the entire load range. It's also about knowing whether the customer is still using the network in the same way that he was a few years ago. How has the network changed and is it still an appropriate fit? This might affect design and scale and tuning, after discussions with our customers. We do offer battery back-up for our products. Redundancy is not an issue. With an outage, we go into battery back-up mode and shut down telephony last of all."

Celab has been most successful in complex environments such as street cabinets etc. Its expertise is particularly suited to environmentally challenging environments in the telecoms industry and more niche areas in telecoms i.e. power on a pole in the sunlight etc.

"Power is moving out of the headend with the virtualisation of the networks. The cabinets are taking more and more power, so MSOs need to be more power-efficient to keep the heat down. We can do that with PFCs, so you get lower losses at the front end and are not putting so much noise back onto the circuit, whether it is street lighting etc. We are efficient at light load but we could be even better, even make it adaptive with a really clean front-end etc. We have done a lot of work on interfaces and data, and this data can be very valuable. If an MSO has an issue with longer coaxial lengths dropping voltage, we can do something about that e.g. we can put up the voltage or make it adaptive, adjust it or relay back from one end to the other etc. Power supplies are constantly improving and are much more efficient now," Harrison told *Broadband Journal.*

Trends, challenges and opportunities

Julian Wood pointed out a few trends that he could see developing in global cable, broadband and power markets.

"I see a continued focus on power efficiency and greater communication channels between the power system and the customer. Opportunities exist for development and deployment of power supplies with performance tuned for the latest system demands. FTTH installations require different power supplies from the HFC network. However, the continued roll-

Celab's Dual Telco/CATV 1490 UPS for the cable market

Celab's CATV 1660 UPS

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out and legacy support of HFC indicated a continued need for the 60V power source. Prognostics capability is also included in the latest products, which gives the ability to target field support to the most critical areas," he explained.

In terms of the greatest challenges and opportunities, Wood flagged electronic component lead-times, which have now stretched to 52 weeks and beyond. This has made forecasting and planning more complex but, fortunately, Celab has managed to stay on top of customer demand.

"Longer term, there's always the challenge of greater complexity of design whilst trying to make the design process more efficient, with faster time to market. The opportunity comes from creative, experienced and thorough engineers using software tools to speed up the design and proving processes with the fewest iterations," he told *Broadband Journal.*

Celab's next move is to ensure that it consolidates its position after several years of high growth. The strategy for this year, confirmed Wood, is to work on all its lean initiatives in the UK to ensure that it is as efficient as possible.

"We believe that if we have the right level of automation in the UK, and if we are buying in the parts at the right global prices (despite slightly higher labour costs in the UK), with the automation this tips the balance to have the product made in the UK with all the right quality levels, support etc. The next level of growth will firstly come from expanding within the three markets (industrial, defence and telecoms) that we already have, and we have seen growth particularly from the cable side. On top of that, we are looking for the next pillar of business in harsh environments where we can best offer a product and service. It quite possibly will be in the automotive sector (a shared approach with Murata), as electric cars grow in popularity and power supplies become more relevant. Within 24 months, we may need some more space……," he added.

Skills development and training

Celab takes education, staff development and training very seriously. It actively encourages its staff to further develop and improve their skill sets. It has developed relationships with several local colleges and universities to help further develop our staff in their chosen fields. These include Basingstoke and Highbury Colleges and Southampton and Portsmouth universities.

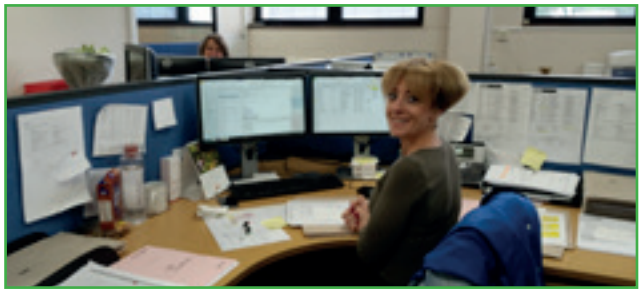
"Our heads of engineering have an ongoing relationship with several universities, encouraging engineering undergraduates to take up internships with Celab. Future-proofing our economy means having an 'educated pipeline' of young talent. At Celab, we actively encourage young learners to choose STEM subjects (Science, Technology, Engineering and Mathematics). These young students and school children can be sure of having a stimulating and fulfilling career ahead of them. We also provide short-term work experience to local school children and provide employment for interested students during their holiday periods," explained Mimi Lunt, marketing manager at Celab.

"Apprenticeships are also encouraged at Celab. For our engineering apprenticeship and learners, we offer and support BTEC qualifications, from foundation to extended diplomas, while offering support progression and work experience. We launched Power School in 2015 and it proved to be an immediate success with staff. Power School is the perfect learning platform for employees who are starting their career in electronic engineering to learn the basics."

Keith Harrison highlighted how these initiatives have helped to protect the company against the general shortage of experienced engineers in Europe.

"This year is the UK government's year of engineering, so we are doing our part by inviting small college groups to come

Future-proofing our economy means having an 'educated pipeline' of young talent.



and see our operations. We help our young teams to do their exams while they work here (across engineering, procurement, business admin etc.), and we support them on college day release and, if they pass, we help with the course cost. It is important that, as the older generation of engineers leave, we fill the gaps in knowledge for the younger generation," he explained.

"We run a Power School for our employees where we focus on different aspects of power and electronics to educate employees. Safety is a key aspect, as is fault-finding. In fault-finding, you have to understand what you expect to see before you start testing, for example. It is also very helpful for younger engineers to increase their confidence and knowledge, sharing ideas on best practice."

Celab has worked in the UK cable industry for nearly 20 years now. It has seen many changes and mergers within the industry over that time but sees increasing potential for optimising power in cable networks.

"We are thankful for the business from our customers and proud of our contribution to the high-speed broadband network available in many parts of the UK. We very much welcome and look forward to providing products for future network architectures," concluded Julian Wood.

CONTACT

For further information, see **www.celab.co.uk**