

mm onto 18650 and 2170 battery can material. Compared to traditional resistance welding technologies, the "TR-16A" torch can achieve effective welding of copper with relative ease. Its low voltage operation also offers safety advantages for hand assembly applications compared to many tungsten inert gas (TIG) systems. At a lower cost than a typical laser system, the system is a more affordable option for low volume battery pack prototyping, racing vehicles, and small to medium scale battery pack rework. The flexible "TR-16A" enables battery pack concepts to be quickly manufactured and tested. It can also be incorporated into an automated manufacturing line, making the "TR-16A" appropriate for low to medium volume niche automotive production applications. (MacGregor Welding Systems, 69 Fred Dannatt Road, Mildenhall, Suffolk, IP28 7RD/UK; www.macgregorsystems.com)

All-round protection

The "Guardian" series of battery-powered, auto-darkening welding helmets consists of three types. All of them meet the safety and durability requirements laid down in relevant CE and ANSI standards. They all feature a high impact nylon shell and comfortable headgear with longitudinal and angular adjustments. The helmets are available in Böhler Welding and UTP Maintenance brand design. The "Guardian50" (Fig. 3) is the universal welding helmet for multi-process situations. It features a larger than usual viewing area of 50 mm x 100 mm and a higher optical clarity rating of 1/1/1/2 according to EN 379. With four sensors and a darkening filter shade 4, 9-13, it automatically adapts to the light intensities from the SMAW, GMAW, GTAW and FCAW process, the amperage level and the shielding gases used. Unique in its class is the use of "True Blue Color" technology which shows the welding in natural colours, rather than the greenish view from standard ADF filters. A very handy extra feature is the



Fig. 3



Fig. 2

external switch to change to grinding mode. The "Guardian62" is the universal welding helmet for multi-process situations. Its unusual light weight of 490 g makes it very comfortable to wear. Unique in its class is automatic darkening in the lower filter shade range 5 to 9, making it also suited for oxy-fuel welding and torch brazing (4, 5-9, 9-13). With a viewing area of 62 mm x 98 mm it offers a further improved sight compared with the "Guardian50", while having the same high optical clarity rating of 1/1/1/2 according to EN379. It also features an external switch to change to grinding mode. The "Guardian62F" offers the same performance as the "Guardian62", but is additionally equipped with a flip visor making it very suited for welding applications involving frequent grinding. (voestalpine Böhler Welding UK Limited, European Business Park, Taylors Lane, B692BN Oldbury West Midlands/UK; <http://www.voestalpine.com>)

Waterjet technology solves future rocket science

The Payload Adapter of today is made out of aluminum and carbon fibre technology. The two parts are thoroughly bolted together into one big cone, several metres in diameter. The design has an impressive performance. Over 600 separations have been carried out in orbit with a 100% success rate. (Fig. 4) But calculations have shown that Payload Adapter Systems in 100% carbon fibre would improve weight and stiffness significantly. A design that could increase both rocket efficiency and investment payback. Instead of bolting the two Payload Adapter pieces together the same design as on glulam beams could be used: finger joints – a design that enables a big contact surface, a strong joint and is suitable when joining similar materials. Since neither milling nor



Fig. 4

sawing was applicable for processing this kind of design, the company was contacted to conduct live waterjet test cutting. Complex carbon fibre geometries are generally difficult to process efficiently without using waterjet cutting technology. The test was performed by cutting 47 mm long finger joints in a cone shaped 12 mm thick carbon fibre material with a circumference of 7.2 m. The incision needed a tolerance of 0.1 mm around the circle, to be able to safely be glued together. A highly advanced "FiveX" machine system from Water Jet Sweden was chosen for the test. The "FiveX" machine system is unique since it has a combination of extreme precision and a full 3D abrasive cutting ability. It is specially designed for this kind of advanced applications, cutting with a repetition accuracy of +/- 0.025 mm. This was successful and gave to clear conclusions. First of all, it proved that full carbon Payload Adapters are possible on future launch vehicles, and secondly, it showed that abrasive waterjet cutting is a suitable cutting technology for carbon materials and future rocket science. (Water Jet Sweden AB, Teknikvägen 4, 372 38 Ronneby/Sweden; <https://www.waterjetSweden.com>)

Versatile application for dry grinding

With the "Norton B49" (Fig. 5) product range, the abrasives manufacturer is extending its stock programme for superabrasive solutions with an economical solution for