

Mining Vehicle Supplier goes electric – in Hamm it's Watts that count

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Fig. 1: Conversion work beneath the bonnet

Photos 1, 3 and 4: Kai Rüsberg

The last German colliery has closed and orders from the German hard coal industry are now a thing of the past: but rather than complaining the mining supplier SMT Scharf is looking to the future – and is converting its diesel vehicles to electric for the global deep mining industry.

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‘Let’s go round again!’ The team of reporters will not be stopped. We are at the SMT Scharf factory in Hamm and they are taking us on a test drive in the new E-Cruiser, which is a Toyota Land Cruiser that has been converted to electric power (Figs. 1 and 2). The growl of the big diesel engine has been replaced by the quiet hum of a powerful electric motor – and it’s almost inaudible. This only serves to amplify all the other sound effects, especially when the two-tonne pickup is travelling over a bumpy surface. And we could go round many more times – the battery has a capacity for about 120 km.

‘The demand for battery-powered vehicles is growing enormously because of the increasingly stringent requirements being introduced to protect those working in the mining sector,’ explains our guide as we bump along. SMT Scharf has a global workforce of some 440

employees and is mainly involved in producing rail-bound monorails and floor-mounted track systems for the underground mining industry (Fig. 3).

As a lot of energy is expended in supplying fresh air to the underground workings it really pays off for mine operators to convert to emission-free drives. This motivated SMT Scharf to develop an ‘E-Cruiser’ based on the Toyota Land Cruiser and to put a lot of effort into



Fig. 2: bauma 2019: Toyota Land Cruiser converted to electric power

Photo: Manfred König



Fig. 3: Overhead monorails on the production line

adapting it to comply with the strict explosion protection requirements applying below ground. This all-terrain vehicle with its classic diesel drive train, several thousand of which are currently operating in the mining sector, has proved its worth as a robust transport solution. The company mainly has Markus Wilting, head of its development and design department, to thank for coming up with the new E-Cruiser. His office is all about mining, as can be seen from the wall poster of the old Zollverein colliery in Essen, Germany. 'For me this is just a little piece of home,' says the Essen-born mechanical engineer as he prepares for another customer visit. 'This development of ours is not just designed for the hard coal mining industry but is also suitable for other underground applications – such as iron ore mines for example'. And he goes on: 'However there is still a lot of spadework to be done with international authorising and licensing authorities because there are as yet no technical standards for the approval of this technology. All this costs a lot of time and money, for the licences vary from one country to the next.' And products from the company's core business segment can serve as a template for the kind of procedures involved.

We leave Wilting's office and pay a flying visit to the final assembly line right next door which is bustling with activity. Things are being bolted up, hammered out, brazed, welded and fitted together. With its white walls and typically blue industrial flooring this cavernous production shop mainly turns out overhead monorail equipment for the mining and tunnelling industries (Fig. 3). A series of steel beams runs right across the shop. These are used for carrying the monorail traction units (known as trolleys) awaiting their final stage of production. Wilting confers with his technician Gregor Steiniger and consults a checklist to assess how the work is progressing.

These monorail trolleys are the result of SMT Scharf's expertise in building electromobility equipment: more than 20 years ago the company produced a 'battery trolley' for Ibbenbüren colliery. 'The lithium iron phosphate battery that we use in the trolleys is not the one with the highest energy density, but in return it

does have the safest and most durable technology', emphasises Wilting. 'That is why they are used as energy storage systems for buildings. One important point in their favour is that in the unlikely event of a fire this can be extinguished with water.'

A change of scene: we cross the yard to an elongated building that contains a stockroom and a testing shed. 'This is where we only recently used to repair components for Prosper-Haniel colliery, the last German hard coal mine to close', says site manager Jörg Ahmann in reference to Germany's long mining history. Now it is a test hall where diesel vehicles become electric cars for the underground mining industry.

On this particular Monday morning two technicians, Jannis Brösel and Patrick Wündisch, are busy converting two diesel vehicles to electric. The pair in their matching overalls have just come down from working overhead on the hydraulic ramp and are now bent over the bonnet of the second vehicle (Fig. 1). Their scheduled break gives me the chance to have a quick chat. 'We took a course at TÜV Süd and then got product training at the vehicle company', explains industrial mechanic Brösel. 'The biggest challenge was dealing with the electrical components. That is why it was like a second apprenticeship.' This is further highlighted by his colleague Patrick Wündisch: 'We have to pay special attention to safety because we were constantly working with high voltages of 400 V'. A team of eight technicians were trained to work on the E-Cruiser project.

The most important aspect of the work is the battery conversion procedure. For these particular pickups the Westphalian factory opted for standard lithium ion batteries, even though this involved some fairly elaborate preparations. Each individual cell is immersed in a special chemical fluid that does not conduct electrical current and does not burn. Beneath the bonnet of the vehicle there is a small, see-through plastic tank of clear fluid and this contains the special chemical mixture that is pumped into the battery cells and electronics to keep everything cool.

The company carefully documents the sequence of assembly operations so that this can be used for the process management concept that will underpin the larger-scale production to follow. An adjacent wing of the building, which is still being used as a storage area, is destined to be converted into an assembly bay with separate workstations where vehicles can be converted to individual customer specifications. SMT Scharf AG has decided against series production as the company wants to build its electric vehicles to order and on a small scale.

Product development manager Markus Bäcker joins in the discussion: 'I'm basically a troubleshooter and my job is to ensure that everything works smoothly – from the declaration of conformity and the sales planning process through to liaising with the system supplier.' For the moment all kinds of boxes and crates are awaiting the attention of the former business management graduate. And standing behind is the unmistakable shape of an

electric LHD vehicle from Canadian subsidiary RDH Scharf. Designed for iron ore mining operations this machine is equipped with a shovel that can pick up as much as three tonnes of blasted ore or rock salt (**Fig. 4**). This jack-of-all-trades can transport blasted material to the tipping point or can load a dumper truck. Its lithium iron phosphate battery is contained in a flameproof housing and is fit for use in hard coal mining environments. One of these batteries sits alongside the loader. Electrical engineer Daniel Schweins opens a thick sheet steel plate: 'This flameproof enclosure prevents any sparks from getting out when methane concentrations are high.'

So what's next for the Hamm factory? SMT Scharf-produced electric vehicles have now been making an impression outside the mining industry. At the *bauma* trade fair for construction machinery in Munich (**Fig. 2**) interest in the E-Cruiser extended beyond the mining sector to include municipal utilities, steelmakers and power plant operators. Yet even without the newcomers the market for these Westphalian products is set to be a promising one, simply because the underground mining industry is not going to disappear any time soon. For in the end practically all the raw materi-



Fig. 4: LHD vehicle retrofitted for the coal mining industry

als that are needed to produce solar cells, wind turbines, batteries, electric motors, entire electric vehicles and even mobile phones come in one way or another from mining or from recycling.

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