

TUBES

SPECIAL FEATURE

MOBILE MACHINES



MOBILE MACHINES

COOLANT SUPPLY FOR BATTERIES

ELECTRIC DRIVING UNDERGROUND

Customised tubes are used not only in hydraulics, but also in other applications – for example for the coolant supply of batteries in electric vehicles. The Bortana EV is an electric vehicle that is used in an underground mine in Australia. Complicated tube shapes were required for cooling its batteries.

High ground clearance, a sealed chassis, galvanised body panels and a strong bullbar – the Australian Bortana EV is ideally prepared for use in extreme conditions. But it has an unusual drive system: It does not start up with great noise and a plume of exhaust fumes, but whisper-quiet. That is because it has an electric drive, which was developed specially for use underground.

The trigger for the development of this vehicle was the fact that even extremely robust offroad vehicles achieve an average service life of just around one and a half years when used in a mining environment – as a result of the aggressive combination of corrosion, heat, moisture and high mechanical impact.

RETHINKING UNDERGROUND VEHICLES

This fact prompted the Australian mining company Safescope, which supplies safety products for mining operations, to completely rethink the concept of „light vehicles for underground mining“. The focus was not only on increasing the service life, but also on a new drive solution, because internal combustion

**” THE BATTERY MAKES UP THE
GREATEST PART OF THE VALUE
OF THE VEHICLE**

engines have turned out to be particularly critical in these applications. Beau McKenna, Marketing Manager at Safescope: „The great number of moving parts susceptible to corrosion in a diesel engine are the cause for many vehicle failures underground. We also wanted to eliminate the particle emissions and heat generation from the internal combustion engine in order to make the working conditions for personnel underground safer.“

The alternative is obvious and is used in millions of road vehicles already: „An electric motor is the ideal drive. It has only few moving parts, requires little maintenance, generates little heat and no emissions and range is not an issue because the vehicle is only used within the mine. In addition to this, the

01



01 State-of-the-art machines ensure reproducible production of ready-to-install tubes

02 The bonnet of the Bortana conceals an electric drive with a powerful battery pack

02



CUSTOM-FABRICATED TUBES

From component manufacturer to service provider: The companies in the Stauff Group and their authorised system partners follow this principle to offer machine and plant engineering companies the following services for the processing of tubes, in particular for (but not limited to) mobile and industrial hydraulics:

- Automatically controlled and monitored bending of seamless precision tubes made of regular steel (Zistaplex®, Zista® Seal, galvanised, phosphated, untreated), stainless steel, copper and various special-purpose materials in all common metric tube diameters and wall thicknesses, up to 6 m long
- Automatically controlled and monitored assembly of cutting rings and union nuts
- Tube end forming with Stauff Form and other common systems
- Inductive soldering, Cu hard soldering as well as WIG, MIG and MAG for welding non-positive connections
- Testing in line with standards or customer specifications
- Cleaning of lines to achieve specific cleanliness levels and specifications
- Sealing and protecting the tube ends and other connections

entire drive can be easily protected against the typical strains of the mining environment such as dust, moisture containing acid and salt, and impact and vibrations.“

Once the choice of drive technology was made, a base vehicle was required. The experts at Safescape decided on the Agrale Marruá: a heavy-duty commercial vehicle with four-wheel drive from Brazil that was developed for military use. The name of the vehicle („wild bull“) is very fitting – from the bull bar in front of the grille to the platform. Beau McKenna: „The Marruá is extremely robust. It has a payload of two tons, the manufacturing quality is excellent and the corrosion protection for the body and components as well: All body components are galvanised and the chassis is fully sealed. These are the best prerequisites for a long service life underground.“

HEAVY-DUTY OFFROAD VEHICLE WITH ELECTRIC DRIVE

The integration of the electric drive in the vehicle also required a complete redesign of the cooling system for the battery packs, including the lines from the cooling unit to the battery pack. Safescape cooperated with the Australian Stauff subsidiary for this task.

The reason: With a wide range of high-quality tube connection components and systems, in particular for hydraulic systems, Stauff manufactures and delivers customised tubes – worldwide, from their own subsidiaries and with partners. Stauff also provides this service for Safescape and the Bortana EV.

In the first step, Safescape inquired about ready-to-install, three-dimensionally bent 19 mm tubes with machined ends from Stauff Corporation Pty Ltd. in Melbourne, for conveying the coolant to the powerful battery packs. Stauff received the order,



followed directly by another inquiry about fully fabricated 28 mm tubes for protecting the electric cables: a good idea and a necessity in underground mining applications.

Stauff initially manufactured several trial tube sets made of stainless steel, up to 1.85 m long and with multiple three-dimensional bends. The tubes are manufactured at the Australian Stauff headquarters in Unanderra. They are attached with Stauff clamps and are delivered exactly as designed by Safescape, because the 3D design data can be imported directly into the Stauff software for the forming systems

A POWERFUL BATTERY DRIVE

The 160 kW electric motor of the Bortana EV generates an impressive torque of 350 Nm. It receives its power from a lithium-ion energy with a high energy density. In the mine, the Bortana can be „refuelled“ to 100 % within just 2 hours using an onboard charger with 1000 VAC/25 kW. Above ground, an 80 kW DC quick charge unit (CCS2) or a 25 kW/415 VAC charger (type 2) are used for this task.

Among other things, the battery packs feature a high level of safety and a very long service life. Beau McKenna: „Because the battery packs make up the greatest part of the value of an electric vehicle, it is important that the vehicle itself achieves a long service life. This is the challenge in underground mining that the Bortana EV has to overcome.“

PRODUCTION TO START IN 2023

Safescape are currently manufacturing a fleet of ten test vehicles which undergo intensive testing in different Australian mines.

Standard production is scheduled to start in 2023 – with a production volume of initially ten Bortana EV per month, which could be increased to up to 100 vehicles.

Stauff in Unanderra are prepared for this, and the employees are proud of their contribution to the success of this unusual project „engineered and made in Australia“.

Photos: Stauff, Safescape

www.stauff.com

TO THE POINT



**BENDING IS CONTROLLED
AND MONITORED BY MACHINES**

**CLEANING OF LINES TO ACHIEVE THE
SPECIFICATIONS**

**TESTING IN LINE WITH
THE STANDARD**

**STANDARD PRODUCTION
PLANNED FROM 2023**