

Battery technology - the drive power of the future in track construction

Thomas Hölzlwimmer, Deputy Head of Development, Machinery and Tools, Robel, describes the equipment.

The recent politically initiated turnaround in energy policy and the global climate protection targets of the international community have given rise to criticism of combustion engines with their harmful emissions. The call for alternative, environmentally friendly technologies determines the political debate.

Railway as an environmentally friendly means of transport plays a significant role in this scenario. The rolling stock sector responds to the pressure for technological change with electrification, amongst others, and the railway construction sector is beginning to equip its vehicles and machines with new drives. International demand is high; distributors worldwide expect 40% of all track construction machines to be battery-operated by 2025.

Robel has been working intensively for years on the development of alternative drive and power supply technologies of its hand-operated construction machines. As far back as 2013, the company presented a rail drilling machine and an impact wrench with modular rechargeable battery packs for zero-emission and ergonomic work on the track.

The lithium batteries, together with high-performance electric motors, have since become a true alternative to the combustion engine, providing high performance and durability as well as comfortable working.

The completely battery-powered worksite

That the expansion of the battery-powered fleet of machines has a top priority at Robel can be seen from the considerable growth of their 'Akku Family' (as pictured above right).

As well as the rail band saw and the vertical tamper, which already have a proven range of use in track maintenance, there is a new battery high pressure hydraulic aggregate to operate both the rail stressor and the weld trimmer. These machines are all powered by the same interchangeable battery.

This group is complemented by further electric machines such as a rail cutter, a



welding joint grinding machine and a hybrid railhead profile grinding machine - that can either be driven by a 2kWh battery, a 6kWh battery or a power supply.

By the end of this year, Robel is going to offer more than 10 battery-driven machines, also including a disc cutter, a spike puller and a clipping machine for FE/FC clips. With this machinery pool, it is for the first time possible to realise a complete rail exchange with battery-powered machines only.

Modular design for more sustainability

All the Robel family of battery-powered machines work with the same battery pack, a lithium-ion based accumulator with a voltage level of 43V and a capacity of approximately 16 Ah, which has been tried and tested for many years. The battery is firmly secured to the machine through form-fit and position lock, yet it can be released with just two actions by hand. The sturdy handle of the battery pack also serves as a carrying

Robel's 'Akku Family' consisting of a vertical tamper, a band saw, a rail drilling machine, an impact wrench and a high pressure hydraulic aggregate all powered by an exchangeable high performance battery.

handle for the machine (for instance on the drilling machine).

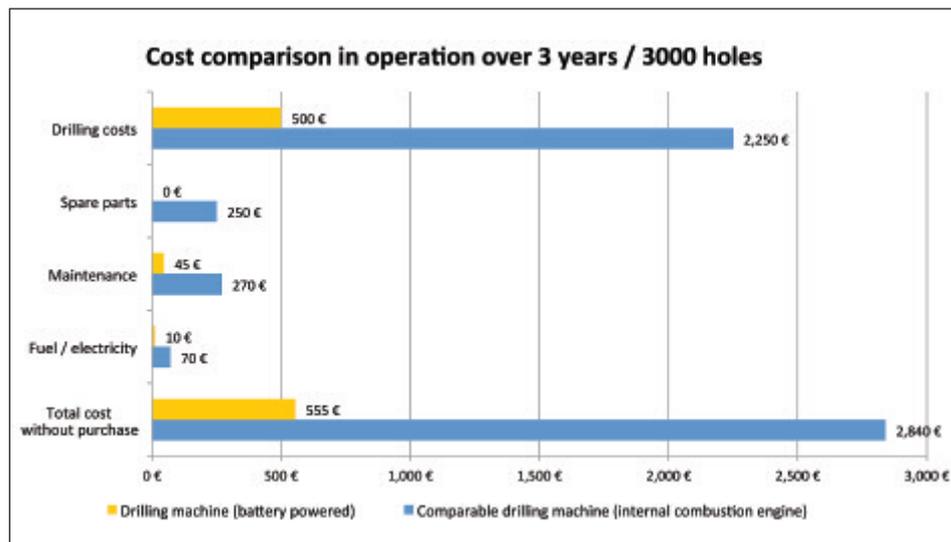
Sustainability is a key argument in favour of alternative drives. The battery service life is approximately 500 charge cycles and even 5.000 cycles for the 6kWh battery. After 500 cycles, the capacity is still 80%. The battery pack is completely maintenance-free. The machines themselves are capable of operating fault-free for many years due to their sturdy design and low wear.

Sometimes, worksites take longer than expected. The modular design of the battery-driven machines allows the application of bigger batteries or a power supply. The reason for this is a self-developed Robel motor controller that can be energised with 43V and 60V.

Less weight - improved ergonomics and safety

The latest generation of electric motors is considerably smaller and lighter than their predecessors with the same output. This has multiple benefits for the design of the machine. The compact motor opens up new possibilities for its positioning on the machine, e.g. to optimise its centre of gravity. Thus, operation and transport of the machine requires considerably less effort. The lack of a heavy and high-vibration combustion engine on the machine allows for a still sturdy but light aluminium construction. The battery impact wrench, for instance, weighs 20% less than the same model with a four-

Cost comparison of operating a battery-powered drilling machine and a drilling machine with combustion engine over three years and 3,000 drilling operations.



● stroke engine.

The view of the workplace remains clear and the operator's posture is ergonomically perfect. There are no fuel tanks or handling of fuel, no hot exhaust or engine parts during operation. Furthermore, the machine operators are no longer exposed to engine fumes or a high level of noise and hand-arm vibration. This not only promotes the health of the construction crew but also increases their motivation and availability for work.

**Used everywhere
- quiet and clean**

It has become increasingly difficult for track construction sites in noise-sensitive areas to be accepted by local residents and local authorities due to the intolerable noise levels, especially at night. The use of battery-powered machines and tools reduces the on-site noise levels considerably. The Robel battery rail band saw is verifiably 10 times quieter than a comparable cutting device with combustion engine. In some other cases, maintenance only becomes possible with alternative drives, for instance, where the use of fuel is forbidden by law, such as in certain tunnels.

In terrain that is difficult to access, it can be a huge benefit for operators if the machines can be transported easily by hand over longer distances with little effort. Here, the battery-powered machines come into their own due to their lightweight design. A lot less material is moved to the worksite as the replacement batteries are the same for all machines.

**The question of cost -
why battery technology pays off**

For the maintenance company, the total cost of ownership - made up of procurement, service life and maintenance costs - is a key consideration. The total cost of ownership of battery-powered machines and tools always comes up trumps.

A two or four-stroke engine has around

200 parts, many of which are moving. The brushless electric motor essentially consists of the stator, rotor and the bearing, making it completely maintenance-free. Furthermore, a battery-powered drilling machine or impact wrench will not require a gearbox for right-left rotation, which increases the availability of the machine even further. Monitoring and routine activities, such as filling up with fuel, oil change and filter cleaning as well as the considerable spare parts logistics including storage, are a thing of the past with electric motors.

Add to this the cost savings during operation. Machines powered by electric motors are, unlike combustion engines, ready to be operated on-site straight away, at full speed and performance, without the need for a warm-up phase. No more cold start attempts, which are often required for petrol engines in cold weather. Faster drilling and wrenching cycles increase the work output per shift. Intelligent design, LED lighting of the work area and the positioning of the switches and handles, deliver a better work result in shorter time.

**How to get external/high
capacity batteries to the track**

In order to drive all machines deployed on the worksite during a complete shift with one single battery charge, large and heavy batteries are required. Robel has developed two solutions for the safe and ergonomic transport of these external/high capacity batteries to the worksite.

On the rail/road trolley, a battery pack, which weighs about 80kg, is built into a housing that is equipped with a rail guide in the centre and rollers on the rear for transport in the field. In addition, the trolley has a storage area for machines, tools, personal protective equipment and consumables.

The portable battery pack with its approximately 18kg is carried to the worksite by the operator like a comfortable rucksack or



A Robel rail grinding machine powered by a 2kWh battery.

a bag with a belt and then put down on the track for work.

With the battery-powered family of machines and the new battery and power supply solutions, tried and tested models with alternative drive concepts are already in use. At the Rail Live exhibition in September, Robel will be showcasing to visitors full worksites equipped with battery and hybrid-driven construction machines. ●



Robel rail/road trolley has been specially designed for easy transport of the high capacity battery pack and other materials, which might be required at the worksite.