WAVETECH®

BEAT©50

A New Dimension of Battery Performance

The Long-life Solution for Truck Transport

En Route to More Power

Trucks are no longer a simple means of transportation. They are equipped with a multitude of electronic innovations that facilitate fleet management, help saving fuel, increase safety and offer comfort for the driver. Manufacturers are continually working on further technological advancements, while battery performance constitutes a bottleneck. It becomes increasingly difficult for batteries to cater to the power demand under straining operating conditions.

Double Function—Double Strain

In their double function as starter and maintenance batteries for the various electronic consumers on board, batteries need to be reliable and provide high capacity. Lead acid batteries still offer the best solution in terms of price, cold-cranking ability and durability.

Nevertheless, the increasing power demands lead to an average replacement age of only 18 months, while many batteries already fail during the truck's warranty period or even before delivery. WaveTech supports truck manufacturers in their efforts to reduce costs and increase customer satisfaction by improving battery stability under taxing conditions.

On-board Electronics

A multitude of technological innovations make trucks safer and offer more comfort to the driver. Televisions, coffee makers, refrigerators, air conditioning and heating are only some of the devices that are used while the truck is parked. A truck typically consumes about 85 to 120 ampere during a 24-hour rest period. The permanent strain leads to starting problems, and in the long run to a short battery life span.

Charge Cycles

The immense power demand of today's high-performance trucks can cause deep discharge, while in operation batteries are only recharged to a maximum of 80%. Under real-life conditions, it is often impossible to follow the manufacturers' recommendation of fully charging them every three weeks. Both, complete discharge and regular undercharge, weaken the battery, which in turn affects the generator. Although built to last for 400,000 km, generators normally must be replaced after only 150,000 to 250,000 km, or two to three years in operation.

Starter Problems

After weekends, batteries often lack enough energy to start the engine. Besides electronic consumers, cold weather reduces battery capacity. Especially when battery failure occurs abroad, it causes delays as well as high service costs. As a preventive measure, many new trucks are equipped with a second set of 12V batteries that serve as starter batteries only, while the other battery pack caters to the electronic consumers. At about € 150 per battery, installing a second set of batteries results in considerable costs.

BEAT©50 counters all of these challenges. Discover the technology that puts you in control.

Crystal Control Technology

Crystal Control Technology® at a Glance

Crystal Control Technology® leads to significant improvements in battery capacity and life span by manipulating the electrochemical processes in lead acid batteries. It enables surface control of the electrodes and increases the reaction sites.

Lead batteries store energy by means of a chemical reaction between lead and lead dioxide at the electrodes and sulphuric acid. The different electrode surface materials generate voltage. The most detrimental effects on battery capacity and useful life are the growth of lead sulphate crystals on both electrodes, which destroys the imbalance of the surfaces, and a lack of density in lead dioxide crystals on the positive electrode, which reduces the energy density.

During charging, lead sulphate is dissolved and the lead dioxide layer is renewed, but not completely. With every cycle, the unwanted crystals form an increasingly impenetrable barrier while lead dioxide crystals tend to bind to existing crystals in a heap instead of distributing evenly across the electrode surface. Over time, the battery loses its capacity.

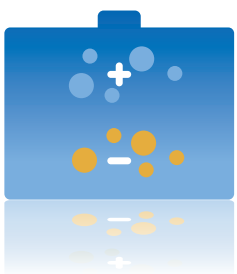
Crystal Control Technology® slows down battery ageing by using overvoltage pulses to manipulate the charging process. This creates more overvoltage at the battery electrodes and the additional energy in electrolyte helps to increase the movement of the ions with three beneficial effects:

- Residual lead sulphate is more effectively dissolved from both electrodes, increasing battery life span
- Lead dioxide forms a more even coating on the positive electrode, increasing battery capacity
- Increased charge efficiency

Independent research institutes have tested BEAT© and verified its effectiveness. It has been validated by MIRA Ltd. (UK), SINTEF Materials and Chemistry (Norway) as well as various battery manufacturers, and is already successfully employed around the globe.

Find out more about Crystal Control Technology®

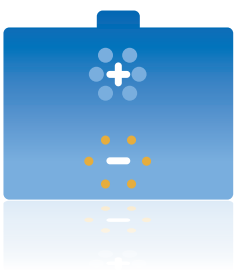
Ageing process in untreated batteries



At the positive electrode, lead dioxide crystals form heaps that reduce the reaction site

Lead sulphate crystals are not effectively dissolved and form a physical barrier on the negative electrode

Renewal with Crystal Control Technology®



Lead dioxide forms an even coating on the positive electrode to renew the reaction site

The increased ion movement effectively rids the negative electrode of lead sulphate crystals

BEAT©50—the Innovation for More Energy

Make the most of your batteries by using BEAT©50. Especially designed for high stability and durability, BEAT©50 delivers improved performance and significant savings. It employs WaveTech's patented Crystal Control Technology®, which benefits batteries in various ways.

Increased Life Span

The useful life of a battery varies depending on its operating conditions. Stop-start-systems and extreme cold reduce battery capacity to the point of provoking battery failure within just a few months. Heat, in contrast, can about double the ageing rate.

Crystal Control Technology® has proved to double the useful life of a battery under the harshest conditions. Even when applied to used batteries, BEAT© has stopped the ageing process. Batteries that last twice as long cut battery costs in half.

Higher Capacity

The progressive reduction of the reaction site and the lack of lead dioxide crystals within the battery causes its capacity to dwindle. This results in shorter discharge times and a decrease in discharge current, both of which affect battery reliability and operating costs.

Batteries treated with Crystal Control Technology® show improved capacity retention. Even after repeated charge cycles their capacity is 340% higher than that of untreated batteries. Already weak batteries show restored performance by reaching higher voltages and discharging more slowly than before.

BEAT©50 is a light-weight, hand-sized add-on that is easily attached to the battery by means of its flexible connecting cables

Improved Energy Output

Numerous electronic systems on board trucks have caused energy consumption to surge. It becomes increasingly difficult for batteries to keep pace with all the innovations.

Due to a considerable capacity increase with BEAT©50, batteries produce a steady flow of high voltage to provide more power.

Reduced Downtime

System breakdowns are an important cost factor for trucking and servicing companies. Not only do they need to purchase and store sufficient spare parts, they also have to keep back offices that are available 24/7 as well as a network of easily accessible service stations to remedy problems swiftly.

BEAT©50 lends batteries added mechanical stability, optimises energy acceptance as well as output and alleviates harmful influences. Less downtime helps trucking companies keep their schedules and service contractors save costs.

Optimised Charging Process

Truck batteries are usually only recharged to 80% of their potential capacity, which lastingly harms their efficiency. In addition, the generator has to work harder to charge the batteries, which causes its life span to dwindle.

Due to higher capacity retention with BEAT©50, batteries need less frequent recharging and charge about 14% faster. It also requires 20% less current, because the batteries accept higher voltages—improved charging for strong batteries and long-lasting generators.

Less Sensitive to Extreme Temperatures

Batteries are hardly protected against ambient temperature let alone the heat radiation from the engine. Climatic conditions are the most important factor in both battery failure and ageing.

BEAT©50 renders batteries less sensitive to extreme temperatures. Batteries have demonstrated improved stability and a longer life span under extreme climate conditions ranging from -20°C to +50°C.

Higher Stability

The active material within the lead acid battery suffers from deep discharge, undercharge and other consequences of incorrect treatment.

Since BEAT©50 controls the electrochemical processes that renew the reaction sites, it strengthens the battery against such effects. The result is a reliable power supply that keeps the voltage stable and reduces the strain on batteries.

Good for the Environment

Countries all over the world are enforcing standards limiting the emission of greenhouse gases, for example, by means of penalty payments. Eco-friendliness has therefore become a strong sales argument for manufacturers.

CO_2 emissions from battery manufacturing and recycling amount to 57.71 kg CO_2eq. By prolonging battery life with BEAT©50 they are reduced by 67% not to speak of the much higher indirect emissions caused by roadside assistance cars, spare parts logistics etc., which decrease as well. In addition, output voltage and battery uptime are improved, which necessitates lower fuel consumption. BEAT©50 thereby helps your company minimise its ecological footprint by saving resources, fuel and CO_2 emissions.

An Investment that Pays off

Discover how a onetime investment translates into long-term savings. BEAT©50 combines a short payback period with a useful life of ten years to provide an effective solution for various battery challenges as demonstrated by actual customer experience.

Focus on Battery Performance

A leading European truck manufacturer sought ways to prolong battery life and minimise starting problems. His aim was increase the life span of batteries and generators in order to increase customer satisfaction and reduce costs.

The most pressing problem posed battery failure within the warranty period—a time frame of only six months. This was a common cause for complaint from customers. Indeed, battery failure was not only common during the warranty period, but in 50% of cases occurred even before a new truck was delivered.

Since the increasing power demand of electronic systems weakened batteries quickly, the company also detected harmful effects on generators. Recharging strained batteries taxed them so much that they usually had to be replaced every two to three years after reaching 250,000 km at most instead of lasting for 400,000 km.

With a view to future technological innovations, the manufacturer is also interested in increasing battery capacity. Batteries that can hardly cope with the current power demand impose limits to the integration of additional electronic systems.

Battery Failure as a Cost Factor

Warranty and service contracts for trucks typically comprise battery and generator replacement independent on where the incident takes place. A breakdown abroad is much more expensive than inland. Since the manufacturer holds service contracts for about 50% of his long-haul trucks, this is a decisive cost factor. Furthermore, the service staff abroad require a warranty over a certain amount before they even set out to meet the truck.

Service contracts typically cover a period of four years. On the average, a truck operating on two 12V batteries needs three battery replacements and at least one new generator during this period. For long-haul trucks it can be assumed that at least one of these replacements will happen while the truck is abroad. In this case, the battery related costs for one truck during a 4-year term break down as follows:

Battery acquisition cost (six 12V batteries)	€ 965
Workshop hours (three hours)	€ 280
Roadside assistance inland	€ 200
Roadside assistance abroad	€ 1,270
Generator replacement	€ 400
Back office, logistics, storage space	€ 65
Total	**€ 3,180**

No Replacement in Two Years

For two years, the customer monitored the impact of BEAT© on motive batteries for trucks. Some of the vehicles were used for short ranges, while others covered vast distances and experienced varying climatic conditions on their routes.

During this period, not a single battery or generator had to be replaced. More interestingly, the batteries never failed to start the engine, even though they operated under the same conditions as before including stand still for several days, at times very cold weather and high power consumption by electronic systems during operating and

stand-by hours. In addition, the batteries showed increased capacity due to optimised charge behaviour.

A customer from Finland experienced similar results over an even longer trial period. The 15 trucks operated under the harsh conditions of the Finnish climate. Yet, for 2.5 years not a single battery replacement was required nor did starting problems occur.

BEAT©50 Offers Savings Potential

By doubling the useful life of batteries and tripling their capacity measured over the lifetime, BEAT©50 cuts costs in half. During a typical service contract term of four years, battery related savings amount to € 1,590.

The payback period for BEAT©50 is only six months, while it has a useful life of 10 years. Over this time span, BEAT©50 enables accumulated savings of about € 3,800 after deducting the one-time expense for the add-on.

Operational Benefits

A manufacturer of batteries for buses and trucks measured the product's influence on life span and capacity. It had never been possible to reach a target of 250 charge cycles before the capacity dropped below 75%. After the installation of BEAT©, batteries maintained this level for 345 cycles. Thereby, they even surpassed the requirement of 300 charge cycles that many battery customers in the automotive sector now demand by 15%.

During a three-year trial period on motive batteries, one customer experienced that the average life was almost tripled from seven to 20 months. Some of the batteries were even used for over 31 months.

The technology demonstrably slows down the ageing process and provides more energy over a longer time. The same holds true for the individual charge cycles. Due to improved capacity retention, discharge time can be tripled.

With Crystal Control Technology®, battery performance reaches new dimensions to meet the demands of today's transportation. Save costs on service or warranty and add extra reliability to motive batteries for a power supply that surpasses expectations.

PAYBACK PERIOD
6 MONTHS

SAVINGS OVER 10 YEARS
€ 3,800

For batteries that

- last twice as long
- have three times as much capacity
- work reliably and efficiently even under extreme conditions
- charge more rapidly and economically
- and reduce your ecological footprint

Take battery performance to the next level with

BEAT©50

For the Best Connection

Contact our experts at WaveTech for more information on how your company will benefit from BEAT©50.
We will be happy to advise you according to your special requirements!

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WAVETECH®

WaveTech was founded in 2003 with the ambition to take battery efficiency to a higher level. Expert knowledge and innovative strength paved the way for the development of Crystal Control Technology®, which forms the basis for the BEAT© product family. With a clear focus on research and quality, the German-based company provides solutions for a broad range of battery applications in the telecommunications, automotive, power storage and other sectors.