



THE BIG 6 RENTAL CHALLENGES IN THE ENERGY TRANSITION

What rental businesses need to consider when investigating the transition towards electric, battery-driven power solutions

The evolution of electrification is creating a watershed moment for rental companies. Sustainability has become critical to the industry, driving the need for decarbonisation and placing pressure on the rental market to adopt environmentally friendly materials and efficient waste management systems to reduce carbon footprints and achieve sustainability targets. The need for electrification and renewable energy sources has never been greater and battery development has never been more advanced or more effective given that lithium-ion technology is already considered one of the leading alternative energy sources.

The push for zero-emissions along with constantly evolving industry regulations mean that rental companies seeking to electrify their fleets face big decisions and a wealth of potentially confusing information. All while continuing to meet the fundamental need to remain cost-effective and

maintain a positive brand image in a competitive marketplace. Businesses are investigating fresh ways to extend product lifecycle and minimise waste, with the resulting benefit of reduced total cost of ownership (TCO).

There is no doubt that the energy transition is one of the biggest and most complex transitions the rental market has ever encountered, making it vital that rental companies invest time in research and knowledge acquisition before making the move to electrification.

To this end, this white paper covers 'The Big 6' criteria that rental companies must consider when investigating battery-powered equipment for their fleets. In addition, it covers critical factors for OEMs to achieve successful integration and adoption of their battery-powered products into the critical rental channel.

THE BIG 6 CRITERIA



1. STANDARDISATION

The rental industry operates on a vast commercial scale, with fleets of different machines in constant use to safeguard productivity on the worksite. Historically, batteries have not been standardised across different equipment, resulting in the need for different types of batteries for different machines. This multiplicity adds complexity to the day-to-day running of equipment on the ground, as well as cost implications around ensuring that all batteries are charged and available when needed to avoid downtime.

Conversely, by standardising the batteries in use across all machines, the delivery of work instantly becomes easier and more efficient for the rental company and the OEM alike. With only one process to follow regardless of the equipment brand and application type, confusion is nullified and productivity is maintained, ultimately resulting in an overall reduction of the total cost of ownership (TCO).

ONE SHOULD CONSIDER THE STANDARDISATION OF BATTERIES FOR THE RENTAL MARKET FROM POINT OF ENTRY THROUGH TO MARKET EXIT, AS IT WILL SPECIFICALLY IMPACT:

CHARGING:

Quite obviously there is a need to charge batteries before use and to re-charge as their power runs out during use. If each application had a different battery with an individual charger, worksites would become overwhelmed with supplementary equipment, increasing the danger of misuse and resulting in damage. Standardised batteries work with a complementary charger, providing a single, familiar process for workers to follow, as well as reducing the volume of equipment on-site and making maintenance or replacement a much more straightforward and cost-effective process. This can be a particularly useful benefit in rental, simplifying and speeding up charging processes to ensure equipment is ready for each new customer.





COMMUNICATION PROTOCOLS (DATA)

Fleet management is an intricate enough procedure without the added complexities of different assets associated with diverse apps and software applications. This multifaceted scenario makes fleet surveillance much more challenging and dramatically increases the risk of losing clear insights and control.

The standardisation of batteries in operation immediately simplifies communication between batteries and other parts of the application, such as motors and controllers, and facilitates improved quality of data tracking.

Vanguard™ lithium-ion battery packs as an example have tremendous connectivity capabilities thanks to the J1939 standardised communication protocol. Also used extensively in heavy-duty automotive

applications, J1939 defines the communication network architecture, message format, and rules for exchanging data between electronic control units (ECUs) in commercial vehicles. This allows Vanguard battery packs to communicate effectively with other components of equipment, enabling seamless integration and efficient operation. Standardised and recognised, the J1939 CANbus protocol enables integration and communication with diverse products and applications, giving fleet managers easy access to data in a standard format regardless of the equipment brand or application.

Again, this uniformity speeds up working processes, boosting productivity through a more efficient and user-friendly means of data acquisition and data management.

SAFETY

Safety is paramount for any organisation and even more so on a working industrial site. Battery standardisation contributes to safety in the rental industry at every touchpoint, from the depot through logistics on route to the customer and, finally, at point of use, by making battery management easier and more efficient.

Standardisation eliminates the need to master multiple systems, simplifying the handling of equipment throughout the supply chain from depot, through transport, to delivery and service. A single proven system will safeguard logistics and allow handlers to acquire expertise through repetitive, practised use.

The safety features of lithium-ion batteries have advanced to minimise common issues. An excellent example of this are Vanguard lithium-ion batteries, which deliver the following battery safety measures:



Cylindrical cells

Benefit: No thermal expansion, largely predictable reaction to abuse, smallest potential energy unit.



Redundant contactors

Benefit: Terminals not live until BMS confirms and closes. Second contactor as backup for potential of failure in closed position.



Wire bonding

Benefit: Each cell connected with individual fuse, removing a failed cell electrically from the pack.



CMA modules

Benefit: Smaller unit to have finer resolution on temperature, currents, resistance, voltage within the pack. Serviceable.



1/4 in. aluminum tier plates

Benefit: Helps to limit propagation if an issue occurs.



Onboard BMS

Benefit: Protection from over voltage, over temperature, or over current events which could lead to pack failure. Communicates with application to avoid inadvertent shutdowns.

INTERCHANGEABILITY ACROSS ASSETS

With a large fleet running on battery power, the ability to swap batteries easily between applications would streamline use and significantly reduce downtime. If applied across diverse brands and categories, this battery interchangeability would increase efficiencies by a large extent.



Batteries that can be easily removed and fitted to other applications are worthy assets in terms of total cost of ownership per item and optimising the workload for each battery.

Fixed power solutions result in downtime while charging if the battery does not have the capacity to run for a full working day. They can also cause an overspend if the entire capacity of a fully charged battery is not deployed. The ability to interchange batteries between different applications means the charge can be put to use wherever it is needed, in whatever machine is needed, minimising wastage and reducing the total number of batteries required to power the fleet.

The benefits of interchangeability impact all stakeholders in the rental market: OEM, rental and end-user.

- For OEMs expanding and developing their electrification portfolios, it simplifies the integration of new kits.
- For rental businesses, it streamlines efficiencies, making the job easier for frontline staff while lowering the TCO.
- For the end-user, a single battery system on-site, that can be applied to any equipment or brand, delivers efficiency and ease of use for workers.

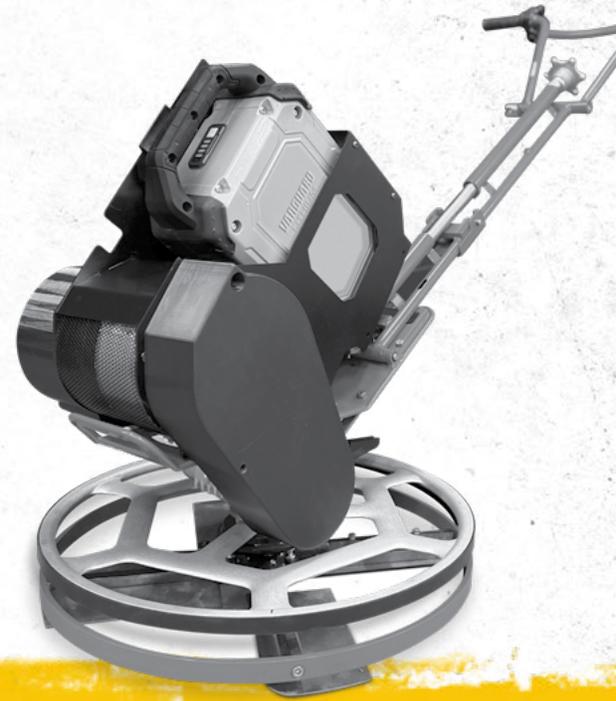
REPAIR, MAINTENANCE AND WARRANTY

The advantage of standardised batteries for repair and maintenance is straightforward. Rather than needing to manage the contacts and procedures of many different battery manufacturers, all your team needs to do is contact your individual supplier to have a battery issue resolved - regardless of the equipment type or brand. This level of focused service leads to reduced equipment downtime and more productive fleets.

In addition to this, a reliable warranty, such as the Vanguard eight-year commercial warranty¹, brings peace of mind and confidence in the quality of both your supplier and its products.

Standardised battery maintenance also makes for streamlined processes and the operation of a more efficient workplace. The ease of charging identical batteries across identical chargers and having multiple batteries available for every machine can eliminate downtime, as all team members are familiar with standard routines to avoid deep discharging, such as charging after return, ultimately helping to avoid costly and time-consuming repairs.

¹ See www.vanguardpower.com for warranty details.



“ My main focus, if I was a battery user in the rental industry, would be correct and proper maintenance.

We see so many batteries that have failed due to the user not charging the batteries correctly or in time.

Users are used to operating machines with internal combustion engines and if they are out of fuel they can simply fill them up again on Monday morning, this is not the case with a discharged battery as they self-discharge.

Self-discharge is when a battery still discharges itself whilst not in use. Therefore, a battery received by a rental company on Friday afternoon in a state of discharge may reach deep discharge within a few days if it's not charged correctly and then require additional maintenance from a company such as Nowos to bring it back to life. ”

Steven Bradshaw
Sales Director at NOWOS

2. UPFRONT CAPITAL COST VS. TOTAL COST OF OWNERSHIP (TCO)

For any business, the need to be cost-effective is imperative, which is why total cost of ownership (TCO) is such an important consideration when transitioning to electrified equipment.

When researching electrification and investing in batteries, take a deep-dive into the whole lifecycle of the battery and/or application. While it is worth taking the time to compare different battery technologies to make an informed decision, it is important to compare like-for-like technology, so lithium-ion vs lithium-ion and not necessarily lithium-ion vs petrol or lead-acid.

At face value, one battery may have a lower upfront cost compared to another battery, but the reality of deployment on-site could see a dramatically shorter runtime, necessitating more batteries to change, or more frequent recharging periods leading to higher long-term charging costs and the risk of increased downtime, both impacting the TCO.

An in-depth understanding of the technologies, performance parameters including charge and recharge times together with cycle life can impact your fleet TCO significantly. Lower purchase price seldom translates to a lower Total Cost of Ownership as one typically gets what they pay for.

3. DECARBONISATION & EMISSIONS

A primary goal of electrification is the quest to achieve zero-emissions in line with many new industry regulations. To this end, the zero-emissions at-point-of-use for battery-powered machines provide a much safer and healthier working environment for the operators on the ground.

In line with decarbonisation targets, the laws and regulations around emissions are under constant review and growing stricter, especially in inner-city areas. It is crucial that rental businesses are equipped with machines suitable for work in these emission- and/or sound-sensitive areas in order to meet customer demand and stay ahead in the rental market.

Noise emission reduction is a growing priority, allowing for greater breadth of deployment for machinery. Emission-sensitive areas, such as town centres or indoor areas, may require battery-powered equipment to meet the associated regulations. For example, the Scorpick® ENTER pick & carry electric crawler crane, powered by Vanguard lithium-ion batteries, is regularly deployed to work in indoor spaces, such as shopping centres or commercial buildings. The electric application is six times quieter than its diesel-powered equivalent (diesel engine 100dB vs electric version 70 dB = -30dB).





4. PRODUCT AVAILABILITY & RANGE

For rental companies to maintain a competitive edge, they need to ensure breadth and depth in their product range to maximise their customer offering. This means: scalable battery power that can be applied to machines of different sizes, allowing for standardisation across different power requirements, is an obvious win.

Offering both swappable and fixed batteries, Vanguard provides a modular battery power solution that is fully scalable, with battery capacity ranging from 1.5kWh up to 7kWh*. Almost all the batteries in the range can be combined or run in parallel for additional capacity, and seamlessly integrated into a broad range of applications across small, medium and large OEMs.

Vanguard batteries are being integrated into an ever expanding portfolio of battery-driven rental applications across numerous brands and categories from small to medium sizes. Examples of these include small aerators or blowers, walk-behind trowels such as from B-Mac, agricultural machines like the Drägen by Mapro Systems, or wheelbarrows like the Muck-Truck® E-Max, and EDCO grinders, all the way up to compact track loaders, the Kovo Vujtek Scorpick® pick & carry crane and the LIGHT BOY light tower.

Furthermore, as battery technology evolves, more and more electrified products will come to market and equipment ranges will continue to develop in parallel.

* Total energy measured using a 0.2C discharge per IEC 61960-3:2017

5. PERFORMANCE

The concern that electrification could lead to a compromise on performance is a very real consideration for rental companies, however this does not have to be the case.

When working through the relevant factors of ease, size and performance, a battery powerhead system with the same envelope as a petrol engine will not necessarily provide the same performance. While many systems may offer easier front-end integration as a 'drop fit' solution, the ease of integration will come at the expense of back-end performance, usually with a reduction in runtime, for example.

To eliminate this costly and undesirable result, the best and most effective approach is to design for efficiency together with right sizing of the battery to ensure optimal performance with battery power - not just replacing petrol engines with a battery and hoping it runs long enough to get the job done! A massive chance for OEMs to develop new products with new characteristics especially for the rental market.

To this end, Vanguard designs and manufactures its own integrated lithium-ion battery systems in-house, providing extensive power application engineering expertise to OEMs via its own Power Application Centre or via a world-class network of integration partners offering integrative and scalable battery solutions that can be tailored to a broad range of needs.

6. SECOND LIFE & END-OF-LIFE (EOL)

A major driver for moving to electrified equipment is the focus on decarbonisation, therefore lithium-ion battery recycling is an important factor to consider when choosing an electrification partner. Your electrification partner should ultimately help to provide a solution for both the second-life and end-of-life to ensure easy and efficient handling and management at this critical stage of battery life.

Vanguard batteries, for example, are already designed for easy repurposing for second life, eliminating this as a concern for end-users. They feature a reusable aluminium cast that can be recycled, while the battery cell modules are created to allow easy removal of the cells to be repurposed as new battery cells.

“ When it comes to electrifying equipment for rental, the OEM should prioritise the efficiency of the application and have a clear understanding of the typical user’s behaviour to deliver equipment that will meet rental customers’ performance expectations. From the rental company perspective, priority should be placed on energy efficiency over lowest possible cost because simply electrifying equipment on a lowest possible cost basis will lead to poor equipment performance and dissatisfied customers. ”

Anders Olssons

Founder and CEO of Eqlab,
Swedish based electrification
consultancy and Vanguard Technology Partner



This is made possible at the Vanguard factories in the US and through a partnership with second-life and end-of-life expert NOWOS in Europe (EU; CH, UK) whose primary goal is to avoid recycling whenever possible by repairing and remanufacturing the battery packs. NOWOS has developed a revolutionary process for reusing and repurposing the cells and modules of batteries which have come to the end of their first intended life, helping B2B partners to develop a true circular economy.

Through these means, Vanguard strives to ensure that its batteries deliver outstanding performance throughout their lifetime, without becoming a customer problem when this lifetime reaches its natural end.

CONCLUSION

The variety of lithium-ion battery solutions on the market can be overwhelming. When looking to electrify their equipment, rental companies should look for a provider that offers rental fleets an easy route to electrification with a complete and standardised commercial battery solution, such as Vanguard. It is crucial for standardisation that batteries work across different brands and applications to deliver electrified efficiency.

The expert team comprising the Vanguard Technology Partner network will collaborate with each OEM to identify a solution tailored uniquely to their equipment. The team makes it a priority to understand the applications that Vanguard batteries are integrating with.

Based on total cost of ownership and customer experience, Vanguard batteries are the go-to power solution for rental. Constructed with multiple protective features and tested to withstand harsh conditions,

Vanguard batteries feature an integrated BMS that monitors, controls and protects the battery helping to prevent misuse and safeguarding your investment. This confidence is evident in the commercial eight-year warranty, which comes as standard with all Vanguard batteries.

When it comes to The Big 6 criteria facing the rental market in electrification, Vanguard power solutions answer them all, ensuring easy integration, efficiency, scalable battery capacity delivering longer runtime, and exemplary performance, all driving a lower total cost of ownership while meeting stricter regulations especially for emission-sensitive areas.

If you would like to find out more, simply connect with the Vanguard team of experts and see how Vanguard can support your rental business through electrification.



More details, further information and contacts:

www.vanguardpower.com/big6