



GOAL

To collect real time data about the routes and vehicle behavior in a harsh real-world environment.

SUMMARY

The BEV Battle Motors LNT 240kwh pack worked a seven-hour day in temperatures ranging from 46 to 60 degrees Fahrenheit, digging a series of holes for telephone pole installation in Kansas City, Missouri. The Battle Motors truck is ready for market launch in the Utility space.

APPLICATION

Utility

INTRODUCTION

Battle Motors was founded in 2021 by Mike Patterson, the founder of Romeo Power. Battle Motors, a leader in the development of electric vehicle (EV) technology, acquired commercial vehicle Original Equipment Manufacturer (OEM), Crane Carrier Company, LLC (CCC) in 2021. Battle Motors is the leader in the vocational truck industry, providing work-ready diesel, compressed natural gas (CNG), and now EV chassis designed and manufactured in North America for the refuse and recycling markets. Battle Motor's durable, dependable trucks are built to excel in a multitude of applications that now include middle-mile and last-mile delivery. CCC has been manufacturing commercial vehicles for 76 years and is based in New Philadelphia, Ohio. [battlemotors.com](https://www.battlemotors.com)

MATERIALS

BEV LNT – 240 kWh – Digger Derrick Body – Weight is 37,000lbs.

TRUCK DATA AT HIGH LEVEL

The following information was pulled on one truck over a single workday (12/02/2022). It is relevant to note this was over a consecutive seven-hour span with a break for lunch.

Maximum Distance Traveled in One Day	27 miles
Max Speed	45 mph
Max Battery Required Recommendation	240 kWh
Type of Utility work - Residential or Commercial	Residential

DATA REVIEW

During the testing of Battle Motors' Digger Derrick BEV truck, it was used to dig 10 holes over the span of one workday. The truck was driven in a repetitive manner between each hole. It was used to dig the hole, then driven up and down a 13% grade and an 8% grade over the span of approximately 2.5 miles. After which, the cycle was repeated until the truck drove for a total of 27 miles and dug a total of ten holes.

SOC at test start	99%
SOC at test end	58%
Duration	7 hours
Total miles traveled	27 miles
Total holes dug	10 holes
Depth of holes dug	10 feet
Total distance traveled uphill (per pass)	8% grade 750.13 feet 13% grade 321.80 feet
Total distance traveled downhill (per pass)	8% grade 750.13 feet 13% grade 321.80 feet
Average battery used to dig one hole	2%
Average battery used to travel between each hole (~2.5 miles)	2%

BATTERY RECOMMENDATION

Currently, Battle Motors offers two major configurations for battery usage on the trucks. These configurations allow for a wide variety of usage patterns and fits the use cases in the marketplace. Configuration options are expected to increase as the market wants more variety. As of now, these are the pack configurations that battle provides.

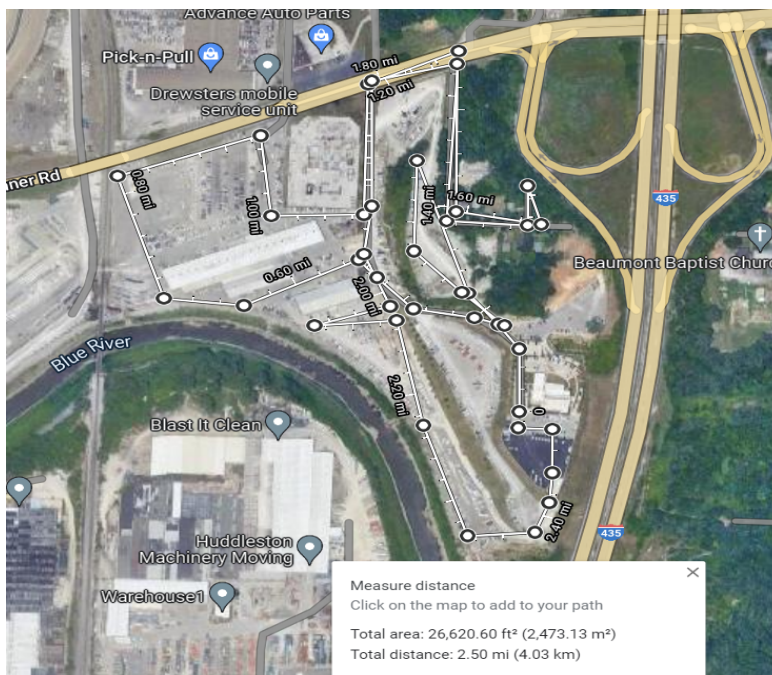
- 240 kWh
- 400 kWh

PER TRUCK BATTERY RECOMMENDATION

Truck	kWh*
Digger Derrick	240

NOTES DURING TESTING

Start	99%	
Round 1	95%	94%
Round 2	92%	90%
Round 3	88%	miss
Round 4	84%	82%
Round 5	80%	78%
Round 6	75%	74%
Round 7	72%	69%
Round 8	67%	65%
Round 9	63%	61%
Round 10	59%	58%
Average Use Per Round	2%	2%

ROUTE


CONCLUSION

After viewing all the data from this test, we found that 240 kWh exceeded expectations. Customers mentioned the truck felt solid to drive and had a fantastic turning radius. They felt it significantly outperformed other Digger Derricks with ease, cutting through rock and steel without issue. Employees were able to hold conversations while the auger was running because it ran so quietly and noticed this made for a safer work environment.

BATTERY SPECS

Battery Cell Chemistry	LFP
Operational Temperature Range	-35°C – 60°C
Rated Energy	240kWh
Maximum Continuous Charge Current	346A
Maximum Continuous Charge Power	240kW
Peak Charge Power	480kW
Maximum Continuous Discharge Power	240kW
Peak Discharge Power	556kW
Thermal Management	Cooling: Liquid Cooling Heating: Heating Film
Operational Voltage Range	540V – 750V

POWERTRAIN SPECS

Drive Motor	BorgWarner Cascadia Motion HVH410-150
Drive Inverter	BorgWarner Cascadia Motion PM250
Peak Torque	2050Nm
Peak Power	300kW
Maximum Motor Speed	6,000RPM
Transmission	IEdrives 2-speed
Cooling Medium	Dexron VI
Motor Assembly Mass (Motor Only)	140kg
Maximum Efficiency	95%