

Thinking
batteries further



Reliable use of e-snowmobiles all the way down to -40°C

How Aurora Powertrains finds the perfect
solution for e-snowmobiles with battery cells
from Farasis Energy





AURORA

POWERTRAINS

Aurora Powertrains

Aurora Powertrains, based in Finland, is one of the few electric snowmobile manufacturers. Founded in 2017 by a group of four engineers including Matti Autioniemi, CEO of Aurora Powertrains, the company is based in Rovaniemi, the capital of Lapland, where it develops and tests its powertrains and battery modules in Arctic conditions. In its early stages, the company offered tours on converted snowmobiles under the name Aurora eMotions. Today, Aurora Powertrains produces and sells a model developed in-house – the eSled.



Matti Autioniemi

The eSled produced by Aurora Powertrains

eSLED



Challenges

- + Optimal use of installation space
- + Minimizing battery aging in arctic conditions (down to -40°C)
- + Robust and waterproof technology that can withstand shock and moisture
- + High energy density for optimal performance
- + Reliable partnership with a focus on the customer's needs

Solution

- + Farasis Energy's unidirectional P32 pouch cells meet all requirements for format, robustness, and energy density



Result

- + Optimal use of limited installation space
- + High number of charge cycles through optimal combination of Farasis Energy's cell technology with Aurora Powertrains' thermal technology solution
- + More than 100 km range with an energy of 21 kWh at up to -40°C , thanks to powerful electric snowmobiles
- + Use of rugged and weatherproof technology for extreme weather conditions and rough terrain
- + Environmentally friendly and sustainable tourism enables new experiences in nature

Assembling battery in the eSled



Challenges

Arctic chill meets e-mobility

Freezing cold, snow-white landscapes and tourists who want to experience natural spectacles every minute – just some of the things Lapland has to offer. The region is easy to explore by snowmobile. Additionally, an electric snowmobile is also environmentally friendly and quiet. Thus, a typical snowmobile becomes an eSled. What sounds so simple in theory, in reality requires complex development work. A snowmobile must function at temperatures as low as -40°C and is constantly exposed to the effects of snow and moisture. The biggest challenges are the loss of power and the rapid aging of the battery in cold conditions. Here, it quickly became clear to Matti Autioniemi, Founder and CEO of Aurora Powertrains, that a battery module that would work reliably in these conditions would not be available just off the shelf.

“We knew right away that we would have to develop a module ourselves to meet the specific requirements. To do this, we sourced the market for suitable cells that would make the most of a snowmobile’s small installation space and last us a long time in the extreme environmental conditions,” Autioniemi continues.

Small, robust and durable

Although the market offered many cylindrical cells of high quality, these were ruled out for installation in a snowmobile. Only by making complete use of the small space in combination with high energy density the performance requirements could be met. The battery



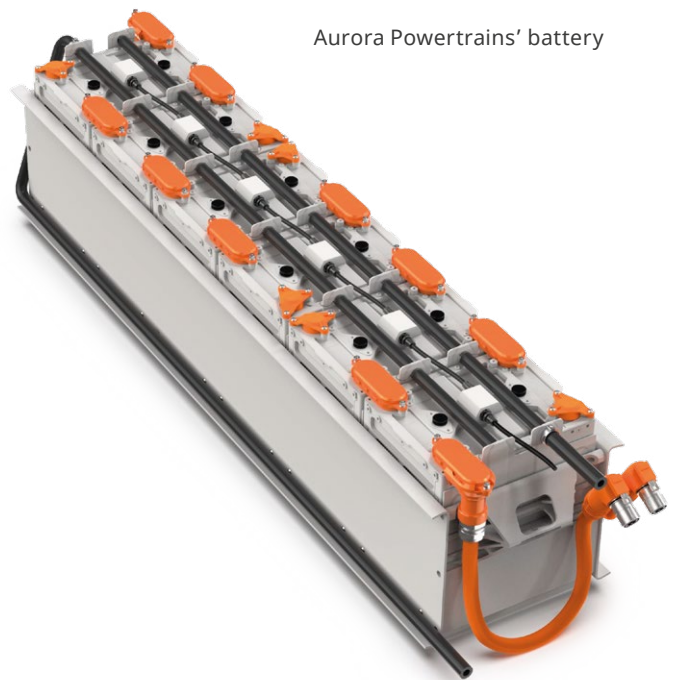
eSled in action

technology also had to withstand extreme weather conditions. Either the snowmobiles were on tour through the winter landscapes of Lapland, or they were hanging on the charger. Despite the low outside temperatures, the stresses of off-road use made it necessary to cool the battery technology. Cylindrical cells with their small surface area do not dissipate heat quickly and efficiently enough. A different solution was needed. The company was now looking for compact cells that have many life cycles, are temperature-resistant and have a high energy density. In addition, the technology had to be particularly robust, because for off-road use and in snow, the batteries are challenged by impacts and moisture at a completely different level than when used in a conventional passenger car.

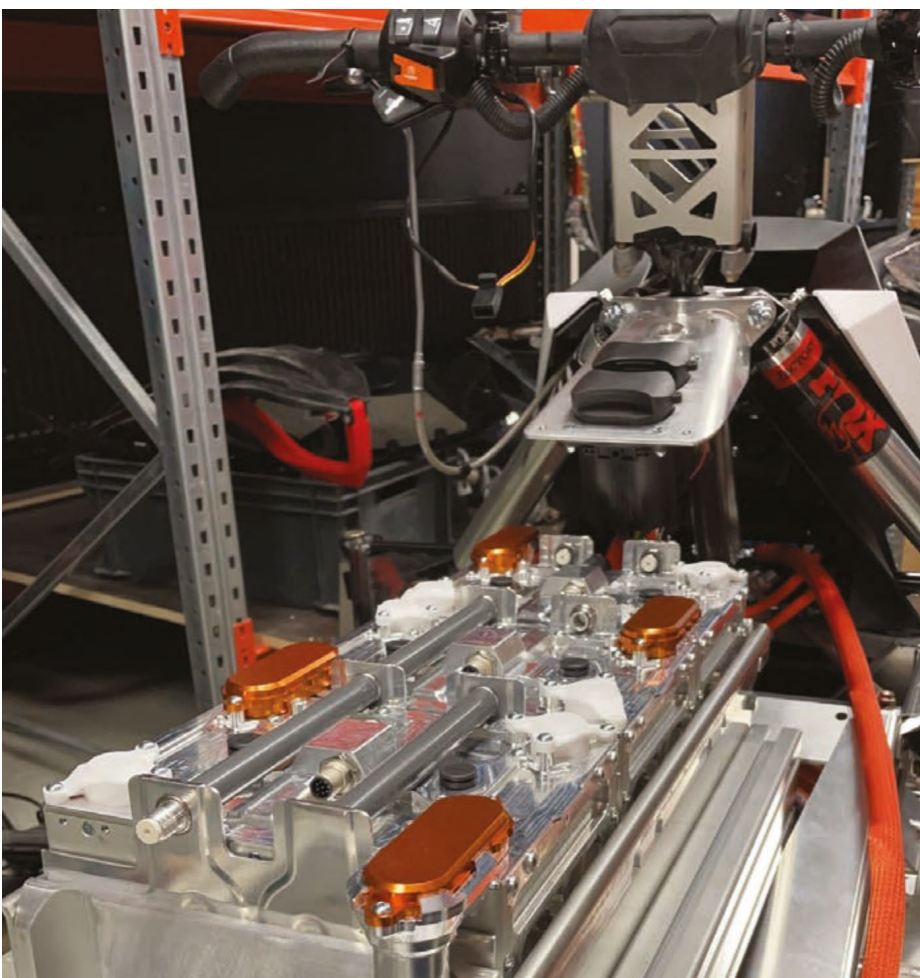
Solution

Small spaces, big potential: Mastering optimal design

The choice fell on unidirectional P32 pouch cells from Farasis Energy, because their rectangular shape, as well as their ability to expand minimally, make optimum use of the installation space. The largest battery variant of the eSled with six modules achieves an energy of 21 kilowatt hours, and ranges of around 100 kilometers are possible. These numbers could not be achieved with cylindrical or prismatic cells in the prototypes. It was also perfect for Aurora Powertrains that its own thermal management solution could be used, enabling smooth operation at temperatures as low as -40 °C.



Aurora Powertrains' battery



Production of Aurora Powertrains' battery

Result

Perfect solution – sought and found



Different views of Aurora Powertrains' battery



The cooperation between the Finnish company and Farasis Energy has been excellent since the first development project. Matching Aurora Powertrains's requirements, Farasis Energy reliably develops suitable cells. Even the changeover from the P29 to the P32 cell used initially went smoothly, as nothing changed in the design. Aurora Powertrains thus benefits from the further development of cell chemistry without having to redesign itself.

An active liquid cooling circuit compensates for temperature differences within the module. The developers also integrated heating foils on the floor, which preheat the cells to an optimal 25 °C. Although tourist groups usually cover no more than 25 kilometers on their tours, around 3 hours including breaks, the high energy density and the associated maximum range of 100 kilometers provide the necessary safety reserve in remote areas of Lapland.

Developer spirit for innovation you can experience

"One of Farasis Energy's big focuses is on research and development work. With companies like Aurora Powertrains, our developments and innovations can truly be experienced and show that we are part of the future of electric mobility. Through extreme challenges such as the Arctic cold, as well as the use of batteries in small e-vehicles, we continue to live up to our claim of 'thinking batteries further,'" explains André Gronke, Head of Overseas Product Development at Farasis Energy Europe.

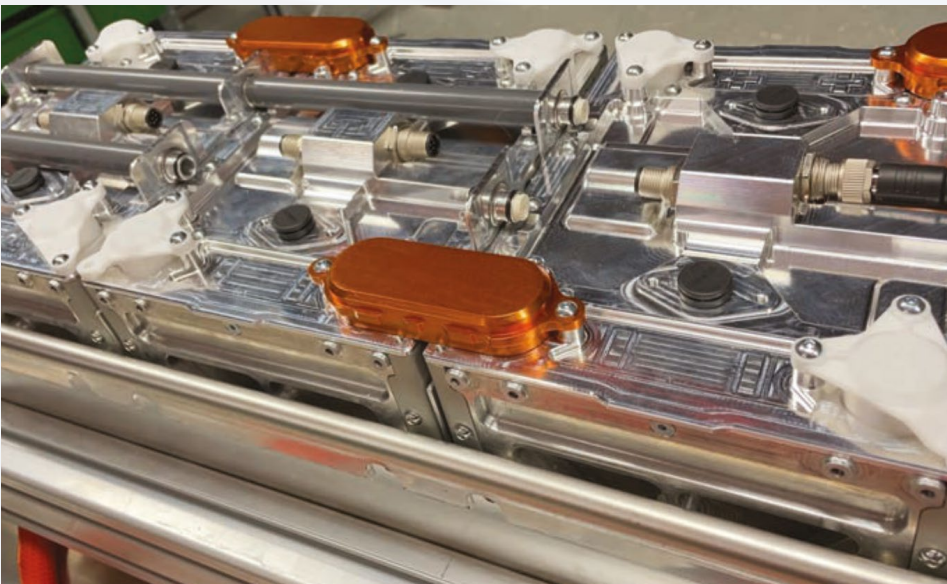
Quiet as a mouse – offroad, onboard & abroad

Depending on their needs, customers can choose between three battery capacities for the eSled: In addition to the 21-kWh module, variants with 7 or 14 kilowatt hours are also available. The battery technology offers high robustness as well as good resistance to impacts. The waterproof and dustproof battery is classified according to IP67 and has a modular and scalable design. This means that other requirements can also be fulfilled. For example, Aurora Powertrains is currently developing concepts for a Finnish electric boat company and supporting an off-road vehicle project with the 120-kWh battery. Aurora Powertrains plans to produce around 600 eSleds by early 2025. The quietly whirring snowmobiles facilitate access to sensitive areas such as national parks and make trips for tourists an exhaust-free experience.

“No engine noise, nothing but listening to the tour guide’s explanations, observing animals undisturbed, and enjoying the beautiful landscape of the far north in an environmentally friendly way. These are just some of the arguments in favor of electrically powered snowmobiles,” sums up Matti Autioniemi.

The future is electric – even in the snow

Even though in the tourism sector the more environmentally friendly e-alternative to the conventional snowmobile meets all requirements, there are still challenges on the way to a completely electric future. In the next five to ten years, the technology still needs to be further developed in order to also be able to replace special snowmobiles for use in deep snow or in racing with an e-variant. The eSleds’ many test kilometers and Farasis Energy’s development spirit support this journey.



Battery assembly

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Performance Knows No Borders



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