

## **ELEXC Project**

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**Abstract:** Electromobility offers cleaner transport solutions by reducing exhaust emissions and noise. It can also significantly reduce fuel cost for the customer. This presentation provides an introduction to why the future is ELECTRIC and supports our Volvo core values as well as enables Volvo CE to achieve this vision of the future through increasing the efficiency in our solutions to our customers.

## 1 INTRODUCTION

The electrification trend is very strong in many areas and by transitioning to electric and decoupling the subsystems, it increases total machine efficiency and controllability enabling future technologies and solutions. Indeed, fully electric vehicles are powered or propelled solely by an electric motor. They emit no particulate matter, nitrogen oxides or carbon dioxide during use and have very low noise levels. This makes them highly suitable for use in densely-populated city centers, especially at night.

The Volvo Group is at the forefront of developing electromobility technology for trucks, buses and construction equipment.

## 2 THE ELEXC PROJECT

In this context a Volvo Construction Equipment (Volvo CE) research project has delivered proof of concept on the world's first 100% electric compact excavator prototype.

Volvo CE has worked with a team of six partner companies and funding bodies in France to develop a fully electric compact excavator demonstrator (see figure 1). The project, known as ELEXC, has exceeded expectations and delivered zero emissions, eight times lower noise levels and ten times higher efficiency – leading to significantly reduced machine operation costs. The fully electric prototype machine provides the exact same performance as a conventional, diesel-powered compact excavator. It delivers the same speed, power and force – ensuring all customer needs are fulfilled.

Zero emission has been achieved by using electric energy stored in a lithium ion battery and an optimized transmission chain. Removing the hydraulic system and the thermal engine as well as reducing the cooling needs and the number of systems, allowed us to lower noise levels by eight times. Maintaining machine performance was essential to the project and it was achieved by dimensioning all components – the prototype machine has a bucket force of 2450daN, an arm force of 1800daN and a lifting force of 530kg at 3m. The machine can be operated for one full working day (eight hours) – something that has never been achieved before with electric energy. Average power consumption is just 3.5kW thanks to a completely optimized transmission chain with high efficiency actuators. The battery can be fully charged by connecting to an external electrical power source, this technology enables emissions-free. Moreover the power source is able to recover and store kinetic energy from the machine motions.

The use of electricity and a reduction in the number of maintenance operations required has led to a significant decrease in the machine's operational costs.



Figure 1: ELEXC demonstrator

The successful demonstrator has delivered proof of concept, potentially paving the way for a future electric compact excavator. This technology will help us to produce cleaner, quieter and more efficient machines and work towards the Volvo Group's vision of becoming the world leader in sustainable transport solutions. The electrification of construction equipment represents the future of our industry and this technology could help to encourage regulating bodies to enforce zero emissions on certain job sites – such as urban or confined areas where both low emission and noise levels are required.