

eXact

Direct electric excavator

The eXact project under coordination from SUNCAR developed a fully electric excavator by replacing hydraulic components with efficient electric linear and slew drives. These innovations eliminated hydraulic losses, improved precision, enabled regenerative braking for energy recovery and autonomous control. Tests showed up to 90% lower energy consumption and increased productivity, demonstrating the feasibility and sustainability of a hydraulics-free next-generation construction machine.



Objectives

- Development of a **next-generation construction machine** based on the Volvo ECR25 Electric
- **Replacement of hydraulic actuators** with high-efficiency **electric linear actuators** for boom, arm, and bucket
- Integration of a **direct-electric slew drive** using a separate electric motor with planetary gearbox and brake
- Complete **redesign of the control system** with centralized ECU, CAN bus communication, and safety functions
- **Augmented reality interface** for real-time visualization of machine data and working range
- **Wireless data transfer and monitoring** via a custom-developed software application

Results

- **Significant energy savings** through elimination of hydraulic losses
- **Regenerative braking** enables recovery of kinetic energy and feedback to the battery
- Up to **90% reduction in energy consumption** during slew operation (254 Wh → 33 Wh / 10 min)
- **25% higher productivity** due to faster and more precise motion cycles
- Fast and easy integration of **advanced assistance systems** due to high precision controllability without complications of hydraulics
- Reduced noise, smoother control, and improved **safety** for operators

