

# Rotating current collector for dynamic charging of electrical vehicles

*Cutting carbon emission from road transports worldwide is a key component in limiting global warming, and electrification is one of the most likely automotive technologies to achieve this goal. Therefore, Elonroad is developing an electric road system that will allow its users to charge while driving. This allows greater range and a reduction in battery sizes.*

When an electric vehicle equipped with a current collector drives over the electric road, the charging automatically starts. Just like a train gets its power from the cables above, the electrical road system is a rail integrated in the asphalt that charges the vehicles from below using the current collector.

To successfully charge vehicles driving along the highway, it is important to have a well-functioning current collector that can track and follow the charging rail, in order to always deliver charge when desired.

The purpose of this master thesis is to develop a new and simple mechanical design of the current collector. To help the driver maintain constant charging, the proposed current collector follows the charging rail horizontally by rotating the arms. Each collector arm is controlled individually by a servo motor which gives the proposed solution great flexibility to parry the vehicle's side movements. The number of current collector arms can vary between three and six, depending on the power that the vehicle needs.



To transfer the power from the road, a wide copper cable runs along the arm and through the rotational axis. From there, all the cables merge and the power is directed to either the vehicles battery or directly to power the electric motors. The new current collector needs to be reliable in its positioning in order to always be able to

charge the vehicle without the driver giving it a single thought.

Elaboration with creative ideas and iterating the concepts lead to the final proposed current collector. The final proposal was built into a full-scale prototype that was tested by simulating a real case scenario of driving for five hours. Several prototype iterations resulted in a final and improved version.



In the future the electrical road system is to be placed at highways as part of the infrastructure. The rail consists of segments that are about one to one and a half kilometres long. The current collectors are hopefully to be developed by the vehicle manufacturers and thereby be integrated in the vehicles as a possible extra feature for the customers. This will hopefully allow a standard to grow forth and simplify going fully electric for all car owners.

The purpose of the master thesis is considered to be fulfilled and Elonroad can now test their technology with a new current collector on the road.