

Breaking up with the diesel

Florian Bühs developed the architecture for the eHighway's pantograph.

An overhead power line for commercial vehicles: For congested municipal areas, this is a solution that Siemens is already putting into action. In doing so, the company faces a special challenge posed by the pantograph, the unit on a vehicle that draws power from an overhead line. The pantograph must safely move up and down, depending on whether the vehicle is being powered by electricity or its internal combustion engine.

Florian Bühs developed the architecture for the pantograph and won the award in the Talent category for his work.



Dr. Florian Bühs

Engineer in Berlin, Germany





Dr. Florian Bühs

Inventor of the Year 2017

“To meet the needs of a heavily traveled freeway, a pantograph must be designed in a completely different way.”

Los Angeles has a tremendous problem with nitrogen oxide emissions and fine particulate matter. As a result of its legendary traffic, the California metropolitan area suffers from chronically poor air quality. In their search for potential solutions, scientists at the South Coast Air Quality Districts (SCAQMD), a regulatory authority for air pollution, discovered the eHighway project being conducted by Mobility. The idea is simple: Power lines will be strung up over streets, and pantographs will be installed on commercial vehicles. As a result, the vehicles can travel through some areas without producing a trace of emissions whatsoever – in the case of L.A., a distance of several kilometers that extend from the port, run through the city and end at the freeways.

Pulling off this trick is hardly a piece of cake, though: Unlike a streetcar that uses rails, a truck can move freely as it travels down a street: It can drive around potential barriers and pass other vehicles. It needs a continuous source of power to do so and must be able to immediately switch from an electric drive system to a hybrid unit instantaneously. Florian Bühs is a member of the development team who is responsible for pantographs. “The system is hardly new,” he says. “You see them on streetcars, and Eastern European countries frequently employ electric buses that use overhead power systems.” But to meet the needs of a heavily

traveled freeway, a pantograph must be designed in a completely different way. During a trip on a freeway, the pantograph must be moved up and down, depending on whether the vehicle is traveling beneath an overhead power line, passing another vehicle or using a stretch of highway that has no power lines at all. To address this need, Bühs developed sensor systems that assess the current situation and instruct the control unit to trigger the pantograph mechanism. The pantograph can follow the overhead power line with the help of sensors and actors. Power flows immediately after contact is established and fuels the vehicle’s electric motor. The truck’s batteries are charged at the same time. As a result, the vehicle can travel for a period of time even without an overhead line.

Siemens is the only company that has developed the eHighway system with an overhead-power line system. Bühs has patented several of his inventions as a result. One of them is an electrical protection system that prevents the vehicles from posing an electrocution risk if a defect occurs. When he wants to try out new technologies, Bühs simply has to drive to the eHighway proving grounds located in the Schorfheide heath region, 60 kilometers northeast of Berlin. The grounds have several electric trucks and a test track with a power line system. The project has now outgrown its infancy. A two-kilometer test track has been built in Sweden. Other test tracks are being constructed in the German states of Hesse and Schleswig-Holstein. A one-kilometer test track has also been in operation in L.A. since October. The regulatory authority SCAQMD is really hopeful about the project and plans to electrify all commercial vehicle traffic traveling in the harbor and in neighboring city areas. “We definitely have to lower our high nitrogen oxide levels,” Dr. Clark E. Parker, a member of the SCAQM’s Governing Board, said during a visit to the German proving ground. Siemens has global experience in the execution of highly complex projects, Parker added. This is why the agency is seeking to jointly carry out the eHighway work with the company, he said.

Dr. Florian Bühs (40) attended undergraduate school and earned his doctorate at the Technical University of Berlin after completing a skilled-trade program in Bremen. He has been delving into new concepts for electric transportation at Mobility for five years now. He has registered 64 inventions during this period. Some are already protected in 28 patent families. Bühs lives in central Berlin with his wife and children.

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