

## Inventors are revolutionizing the diesel market

*Diesel is still the most important fuel on railway lines.*

*HEION CLEAN DIESEL could be a solution to quickly and easily reduce pollutant emissions on rail too. The founders of the startup HEION are convinced of this and are supported by the Federal Ministry of Transport, among others. Dortmunder Eisenbahn GmbH, a company of the Captrain Deutschland Group and Dortmunder Hafen AG, tested the innovative fuel for the first time in 2022.*

In 2017, at an event in the USA, the entrepreneur Andreas Heine and the graduate engineer and inventor Anton Ledwon developed the idea of a green tech startup called HEION - composed of the first and last letters of their last names. A short time later, Waldemar Lewtschenko, also an inventor and the spiritual father – as the other two refer to him – joined them. Together they invented a process to cost-effectively convert conventional diesel fuel into environmentally friendly premium diesel and patented it. “In the beginning we were laughed at when we set out to solve the diesel problem,” reports Andreas Heine. “Solutions are and were mechanical solutions that are always linked to modifications to the vehicle and a new infrastructure. Why can a small start-up create what the big players and universities have not solved and develop such a process?” However, the founders were not deterred by the disbelief, stuck to their product and promoted it in the transport industry. “The change from fossil fuels to renewable fuels will not happen overnight and will take a few years, perhaps decades. We offer a bridging technology to make this change climate-friendly,” explains

Andreas Heine. The doubts have now disappeared and the young company has also been able to gain support from the Federal Ministry of Transport. Shell partner company Schuster & Sohn successfully tested the fuel on the road for several months. The rail logistics company Captrain used the fuel in a pilot project at its subsidiary Dortmunder Eisenbahn. For the first time in the world, 30,000 liters of the fuel were filled into locomotives. “Even though rail is already the most environmentally friendly mode of transport, we want to further improve our ecological sustainability,” says Jan Läser, Managing Director of Dortmunder Eisenbahn GmbH. Proof of engine friendliness has already been provided. Further consumption tests are currently underway.

But how is clean diesel produced? In the first step, diesel molecules are radicalized and in the second step they are stabilized, thereby optimizing the overall spectrum of the diesel's hydrocarbon chains. “We synthesize normal diesel with water and change its chemical structure to produce premium diesel with a higher cetane number,” explains Andreas Heine. The key is a chemical reactor into which the diesel and water particles are pumped and set in motion by the flow speed. The two substances are then synthesized under a precisely defined pressure at a specific time. After the process, the modified diesel contains additional oxygen and hydrogen molecules, which makes it burn cleaner. The result: up to 9 percent less consumption (in the 1/3 mix on the road 6.5 percent savings with 100 percent statistical probability), 16 percent less NOx, 75 percent less soot and up to 10 percent less CO<sub>2</sub> emissions. The water is

reusable. Of course, the inventors remain silent about the exact process. The startup receives numerous inquiries. Many end customers welcome the alternative and show great willingness to make their contribution to environmental and climate protection with clean diesel. HEION has already been invited to the Ministry of Energy in Delhi and to refineries in India, and delegations from South America and the Middle East visited the inventors in Germany. The first fully automated industrial plant in Kaiserslautern is scheduled to go into operation in the fall and produce 5 million liters of the environmentally friendly diesel fuel annually.

### **HEION CLEAN DIESEL – History**

- 2018: Founding and construction of the first laboratory facility, proof of function (synthesis) and soot particle test passed. Move to the estate in Siblin for larger experiments and rent a hall in Siegburg
- 2019: Evidence EN 590 – European standard describes the properties of diesel fuels and defines uniform conditions in all EU countries as well as Iceland, Norway and Switzerland. The standard refers to the respective underlying measurement methods.
- 2020: Evidence of NOx savings research cooperation Uni SC
- 2021: Construction of a larger system, proof of fuel savings in Euro 5 cars (summer diesel via PEMS tests, real driving emissions)
- 2022: Digital system completed (rail test), proof of fuel savings in Euro 5 cars (winter diesel via PEMS tests, real driving emissions)
- 2023: Commissioning of fully automated system