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Could the Future of Ultra Low Emissions Be...Diesel?

Alternative powertrains are the future, but ultra low-emission diesel engines could help us clean up our act in the meantime.



By [Eric Tegler](#) Mar 30, 2018

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Just five years ago, diesel engines were at the center of [a near-term green tech revolution](#). Because of new engine software and materials, a diesel vehicle's fuel efficiency could [effectively rival a Tesla](#).

But after [Volkswagen's dieselgate scandal in 2015](#), diesel took a huge public relations nose dive. Now electric powertrains are pitched as the uncontested future. Automakers like GM [promise to ditch the internal combustion engine](#), and some companies [are laying down lots of cash](#) for Tesla's [upcoming electric semi](#). So is the diesel engine resigned to the scrap heap of history?

Evan Johnson doesn't think so. To him, diesel just needs some help from another alternative fuel—hydrogen. Johnson, CTO of HyTech Power, says that injecting hydrogen into the air-fuel mixture of a diesel engine can dramatically improve fuel mileage and lower its emissions. HyTech promises a 20 to 30 percent reduction in fuel consumption, 85 percent less particulate matter, and a reduction in nitrogen oxides of 50 to 90 percent.

If he's right, hydrogen injection could save diesel from oblivion.

Cleaning Up Its Act



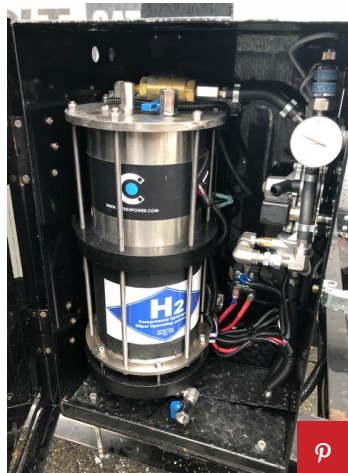


HyTech Power's ICA port-injection sensors and lines fitted to the diesel engine.

HYTECH POWER

HyTech calls its process Internal Combustion Assistance, or ICA. It's a new take on a decades-old idea that by adding pure hydrogen and oxygen (HHO) to diesel fuel just before it combusts, you can make a better and more efficient engine. A decade ago, *Popular Mechanics* wrote about HHO systems and [found them to be mostly hype](#). Times have changed.

ICA begins by supplying hydrogen by electrolysis. When a current is applied to a catalyst within a small water tank near the engine, hydrogen and oxygen molecules are forced apart and hydrogen rises as a gas. This gas is transported to the engine intake where it is injected into the air-fuel mixture just prior to combustion. The hydrogen burns 10 times faster than diesel fuel, igniting the entire mixture quickly and completely, generating more power and fewer emissions.



HyTech Power's water tank for electrolysis with patented catalyst inside.

HYTECH POWER

But this process comes with some complications. To date, the fuel efficiency gains have been negligible, primarily because HHO systems draw so much power from the alternator for electrolysis. In the lab, this process increased fuel economy by only five percent. Those figures often improved out on the road, but varied widely depending on engine condition, fuel, and load. Simply put, the gains couldn't justify the costs.

HyTech Power says it has overcome those problems by making a small electrolyzer that's three to four times more efficient than previous units. This thrifty electrolyzer is paired with new software which can more precisely time the hydrogen injections. HyTech feeds crankshaft/camshaft timing signals from a diesel engine's computer into its own custom algorithms which determine precisely when and how much hydrogen to inject into each cylinder intake port, maximizing combustion efficiency in real-time.

"That's how we've cracked a 40-year old code," Johnson told *Popular Mechanics*. "There was a ton of trial and error...we've been going over this for a decade, making tiny changes."

The best part about ICA and its software is that it can be tailored to any engine as a completely independent add-on. At \$10,000 per unit, Hytech says most commercial trucks can make back that money in nine months through fuel savings and lower maintenance costs. For commercial diesel generators, it takes even less time to pay off that price.

Realizing Diesel's Untapped Potential



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After recent scandals and several false starts, skepticism about any diesel breakthrough is

warranted. But Matthew Borst, editor at the Society of Automotive Engineers (SAE), says that HyTech's advances could revive interest in diesel. *HiQpdf Evaluation 03/31/2018*

"What's new here are the controls," Borst told *Popular Mechanics*. "I think that the ability to better control electrolysis and injection with new technology are matched by desire within the [freight] industry for improvements in combustion efficiency and emissions reductions...the potential of the system sounds positive."

The system is already recognized as EPA-compliant with older diesels. ICA is currently road testing with diesel truck operator fleets in the Seattle area. FedEx trucks have demonstrated 20 to 30 percent fuel economy gains with reduced pollution and particulate filter maintenance costs, HyTech says.

FEDEX TRUCKS HAVE DEMONSTRATED 20-30 PERCENT FUEL ECONOMY GAINS WITH REDUCED POLLUTION.

Swiss verification and testing lab, SGS, confirms that ICA raised the fuel efficiency of a FedEx delivery truck by 27.4 percent. Now limited trials are underway with Caterpillar and other generator-makers.

HyTech has been reluctant to discuss its work until this year, and ICA is only the first of three hydrogen systems in development. Systems for gasoline-powered cars and ultimately, large scale hydrogen power storage are also in the works.

HAS THE DEATH OF DIESEL BEEN GREATLY EXAGGERATED?



The Fledgling Revival of American Diesel



The Tesla Semi Is an Electrified Monster



The Electric Semi Is Here, and Autonomy Is Next

ICA is already on sale, available to retrofit the 3.4 million Class 8 trucks, which haul over 70 percent of all freight in the U.S. But could Tesla squeeze out any need for souped-up diesel engines?

Johnson says electric semis don't have the infrastructure for long haul and continuous duty shipping, and SAE's Borst agrees. "Obviously an electric powertrain is not yet a viable option for long haul shipping...for local routes it may

be a viable technology."

Borst stresses that there is no one-size-fits-all powerplant, whether you're talking electric, diesel, or another energy source. HyTech's ICA and other diesel research may be a "bridging technology" to even more efficient engines of the future, but the more choices we have, the better.

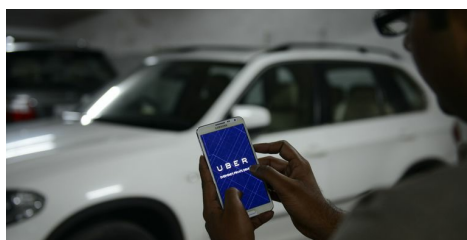
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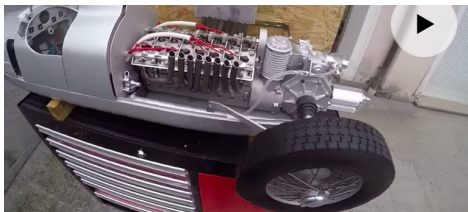


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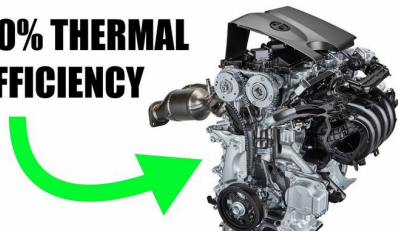


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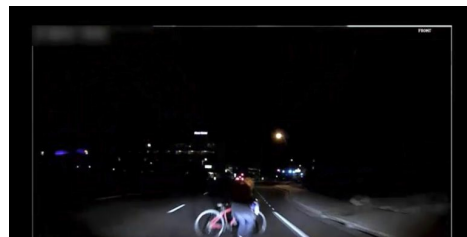
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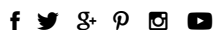
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