



Phil Schenck (right) and his crew, Jorge Pecero (center) and Carlos Chanduy are spending less money on fuel these days and breathing a lot easier.

Schenck's simple air-emission test probably wouldn't have impressed California's Air Resources Board — the state's watchdog for air pollution — but the test confirmed that what Schenck was adding to the combustion chambers of the 4-cylinder Isuzu (10,000 to 12,000 hours of use) on the front end of the 21-kW Norpro genset and the naturally aspirated 855 Cummins main engine (12,000 hours) was working.

What he is adding is supplemental hydrogen, sometimes called Brown's gas.

"When it's introduced into the system it eliminates [the pollution]," Schenck says.

Brown's gas is a mixture of hydrogen and oxygen (two hydrogen molecules and one oxygen molecule) produced by electrolyzing water and sodium hydroxide. Introduced in the engine's combustion chambers, it produces a faster and more complete burn. Less fuel is burned and less fuel goes out the stack in the form of carbon-monoxide and nitrous-oxide emissions.

The soot count has also dropped on oil samples from the genset. Schenck sends an oil sample to a lab every third oil change, which is very 600 hours. "The viscosity is right where it's supposed to be. All the additives are there, and the soot level is at 0.1," he says.

There used to be a big black area on the side of the boat where the exhaust came out. "Now it's white," Schenck notes.

It's the reduced fuel consumption for both the main engine and the genset that impresses most people. Schenck says, "If you go by the factory specs for fuel consumption and rpm, I'm using between 40 and 46 percent less fuel than before." And he's been told he should be getting a 15-percent increase in horsepower.

The precise fuel-saving figures "fluctuate depending on how crappy the weather is" he says. "Sometimes I press it a little harder because I hate doing five miles an hour into the wind.

All of this is because two years ago Schenck saw what was happening with fuel prices and decided it wouldn't be too long, "the way the world was going,

Gassed-up diesels

A clever Californian has reduced fuel consumption and emissions with his own hydrogen generators

By Michael Crowley

Phil Schenck and his crew of two, Jorge Pecero and Carlos Chanduy, fish a 48-foot, western-rigged combination boat out of San Pedro, Calif. At the dock the Terri's Gale doesn't look a lot different from other 29-year-old, wooden fishing boats that have had a number of modifications.

You'd have to know what to look for, and it's not something people spend a lot of time looking at, but check out the end of the exhaust stack on Terri's Gale.

At one time black soot ran 10-inches down the stack. Now it runs about 1½ inches.

If you're hanging around on a day

when the genset is running, there's no smell. Well, that's not completely true. When the genset is first fired up there's a definite smell of exhaust, but after awhile, nothing.

It used to be that the exhaust vapors "about gagged the crew when the boat was rafted up with other boats," Schenck says. "Now you can sit there with the genset running and the exhaust right straight in your face and there's not a trace of anything.

"You're head doesn't start spinning."

He's quick to add that this isn't something he spends much time doing. "I just wanted to see if I could smell anything."

before fishermen would be back to sails and oars.

“Everybody is getting squeezed with the fuel prices,” he laments. “People have got to start looking around for something different. This seems a pretty viable option.”

Supplemental hydrogen wasn't Schenck's first attempt to control fuel costs. Initially he tried a Fitch fuel saver, a device designed to reduce fuel consumption by ionizing and cleaning up the fuel.

But that only amounted to a 5 to 10 percent fuel reduction. Meanwhile the price of fuel kept going up and Schenck was thinking, “Jesus, I won't survive in the business.”

Then he heard about a company in Florida selling hydrogen generators. They were priced at \$7,000, which was more than Schenck was willing to pay, but he says that after some research on the generators, “a little light bulb goes on and I started messing with it.”

He ended up building his own hydrogen generators, starting out with five on the main engine and one on the genset, which increased to 10 for the main and two for the genset.

Looking back on it, Schenck says it was “mind boggling that I built [the system] myself, but there's nothing tricky involved.

“But you sort of have to do it yourself so you understand it.”

The system consists of hydrogen generators made up of 24" (tall) x 6" (round) clear water filters. They are clear because Schenck wanted to “watch how it generates. Watching gives you ideas how you want to modify or change things.”

Each hydrogen generator is wired into an inverter that plugs into a series of AC wall-mounted sockets. Inside each generator are generator plates made from 304 stainless steel. They measure 2½" x 6" and are an inch apart.

The plates have 1/8-inch holes drilled in them, which makes them more efficient than flat, solid plating. The plates are connected with non-conducting nylon bolts and nylon washers to keep them apart. The plates have been in the generators for two years and aren't showing signs of wear. Still, the next time Schenck says he'd use marine grade 316 stainless, but the “304 was scrap when I saw it and

cheap.”

Each hydrogen generator is filled about two-thirds with sodium hydroxide and distilled water. Tap water was the initial choice but Schenck didn't like what he saw. “When it gets electrolyzed you get about one inch of weird-looking crap on the bottom.”

When power flows to the generators each one uses between 80 and 120 watts. If you average it out at 100 watts it takes about 1.2 kilowatts to power up all the generators.

“You have to see it,” Schenck says of watching what happens inside the filters when power goes to the generator plates. “It looks like lava lamps at high speed with heavy currents, eddies and boils. It's sort of amusing to watch.”

This produces about seven gallons of Brown's gas a minute for the main engine and genset. The gas, if left to its own devices, would rise at a rate of 450-feet a minute. Instead it goes from the generators to a fuel manifold (a PVC pipe with inlets) and from there to a bubbler, which acts as a filter. Then the gas travels down a hose that stops about two inches from the intake manifold.

“Every time a piston goes down, it just sucks it in,” Schenck says. “On an 855 a piston has pretty decent suction to it.”

He uses about four gallons of distilled water for a two-day fishing trip with the main running 16 hours a day and the genset operating 24 hours. He figures all the parts for the system cost about \$1,500.

“It's so simple when you look at it that you think we've been getting screwed these last 100 years.

“The biggest thing was getting over the thought of burning water.”

Schenck does offer a couple of cautionary notes for those wanting to follow his example. Make sure you shut down the hydrogen generators before turning off the main or generator. Otherwise gas



Brown's gas is produced inside hydrogen generators from an electrolyzed mixture of sodium hydroxide and distilled water.

is left in the cylinders. When he made that mistake and then restarted the engine, he remembers getting, “a pretty decent bang and a pile of soot came flying out of the stack.”

There are stories of people blowing things up using Brown's gas, but Schenck says that's only with 12-volt generators. Schenck's inverters oscillate power between 2 and 22 volts, which isn't enough heat to set things off. Additionally, if the solution in a generator spills on you, you do want to have something to neutralize it. Schenck uses white vinegar. You've got to treat this with respect, Schenck warns.

Eventually Schenck hopes to refine his air-emission testing technique and his fuel consumption calculations. Once he went on Craig's List and bid on an exhaust engine analyzer, because he wanted to “see what the NO₂, CO and other stuff is,” he says, referring to nitrous oxide and carbon monoxide.

He didn't get it, but he's still looking. Still, he's pretty satisfied with the results he is seeing and smelling, and the fact that his fuel bill has been reduced.

That doesn't mean he isn't trying to improve things. This spring he was building a new group of generators for the main engine.

This time there will be 12 generators contained in a 15" (wide) x 30" (tall) x 7" (deep) plastic box manufactured by an outfit that builds holding tanks for toilets. The advantage to this setup is that the generators won't take up as much space as 10 generators strung out in a line. NF

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