



Rock on with Hydrogen!

Schatz Overcomes Hurdles to Get Fuel Cell Demo on Summer Concert Tour

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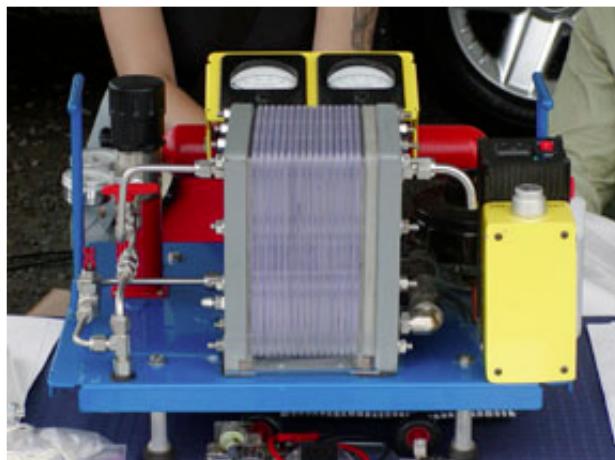
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by [Patrick Serfass](#), National Hydrogen Association
(with contributions by Richard Engel, Schatz Energy Research Center)

This spring at the NHA's Annual Conference, a representative of the legendary rock music festival, [Lollapalooza](#), asked the [Schatz Energy Research Center](#) (SERC) to bring their fuel cell on the summer concert tour. Thrilled, Schatz said yes, but getting less than ten grams of hydrogen to the thirty venues around the country wasn't quite as easy as they thought it would be.

Getting Hydrogen on Tour



To support their 75 Watt continuous/100 Watt peak [Stack-in-a-Box](#)® (SIAB, at left) which operates with a lecture bottle of hydrogen (2"dia. x 12" long and holds about 4 grams of H₂ @ 1800psi), Schatz wanted to bring 2-3 larger 44-type cylinders (about 9" x 51") on the tour's semi. These cylinders would hold enough hydrogen to refill the lecture bottle many times and run the SIAB all day at each concert. [\[i\]](#)

The larger cylinders are DOT approved, but DOT regulations require that the driver be hazmat certified. In addition, Schatz would have to provide a 24-hour emergency contact number. Since Schatz is a laboratory for California's Humboldt State University, they simply provided the number for the University's hazmat office and offered to train the driver themselves. However, Lollapalooza would be starting in a few weeks and the tour would be using a transport company with several drivers over the summer. Time was already running out.

While searching for a solution to these logistical issues, Schatz discovered another problem: they needed to provide certificates to Lollapalooza and its transport company documenting that Schatz carried sufficient liability and worker's compensation insurance. After many phone calls, legal reviews and mounds of red tape, Schatz was able to document their insurance coverage and convinced the transport company to provide drivers to transport the hydrogen on their semi. However, due to unavoidable delays in getting the needed insurance certificates issued by the insurer, Lollapalooza meanwhile had become nervous about liability and decided to punt. They notified all thirty venues on the tour that there would be no hydrogen. In the process both the promoters and the individual venues became nervous about the same perceived liability issues—a hurdle that would have to be overcome later.

Still not completely disheartened, Schatz began exploring the cost of shipping the small

lecture bottles via FedEx to each concert venue. They hoped that in the meantime they could convince the skeptics that there would be no liability or safety issues. In order to ship the small quantity of hydrogen (the energy equivalent of about a tablespoon of gasoline), FedEx requires hazmat documentation and a \$60 fee in addition to regular shipping charges for shipping up to 150 kg of H₂; Schatz would be shipping a total of 0.008 kg in two bottles. Plus, since there would be no way to refill the bottles, Schatz would have to ship the empties back to the lab to be refilled, which would result in another \$60 charge per venue. Unless the bottles are purged with an inert gas, FedEx requires the same \$60 hazmat fee to return the bottles even if the cylinders are reduced to atmospheric pressure.

In order to avoid the extra hassle and expense of having to send the empty lecture bottles back as hazmat, Schatz came up with a simple rig that purged the hydrogen bottles with helium. One bottle of helium would purge the two hydrogen bottles up to three times each. Schatz determined that if they pressurized the empty bottles twice up to 200 psi and vented them to atmospheric pressure, the residual hydrogen quantity would be less than 1% of the lecture bottle's volume--easily below the lower flammability limit of 4%.



However, shipping the pressurized helium *with* the hydrogen requires the sender to provide additional documentation for shipping multiple hazmat items in accordance with International Air Transport Association (IATA) specifications.

Although this concept offered a safe and technically feasible solution, it was not within Schatz's planned budget to do this for some thirty concerts across the country, and additional funding through sponsorship of the booth could not be secured in time.

With the first concert only days away, Schatz decided to temporarily abandon sending the hydrogen to the concerts. They would do a "dry lab" demonstration. Schatz decided that with the tour underway, they could continue working behind the scenes to eventually get the hydrogen to some venues and remove the growing liability concerns.

Hydrogen at Lollapalooza

Founded in 1991 by Perry Farrell, the lead singer of Jane's Addiction, the Lollapalooza tour combines entertainment with a forum for groups promoting environmental causes and social activism. The tour started on July 5th in Noblesville, IN and has multiple stages for bands and entertainment during the all-day shows. During the day, Lollapalooza erects a small city of tents and canopies dubbed the "World of Just BeCauses" which include displays for the Sierra Club, organic products, solar energy and others, including Schatz's "Hydrogen and Fuel Cells."



Nate Coleman (at left), engineer and spokesperson for Schatz, has only a few weeks left on this summer's tour and has reported great success despite not having the hydrogen to run the fuel cell at every site. Fortunately, Schatz's display includes a small solar-powered electrolyser/fuel cell that powers a small toy car. In this way, at least the technology was demonstrable. Nate reports that at the beginning of the tour Lollapalooza organizers and concertgoers alike were excited about

having the fuel cell on tour, and even Perry Farrell was hoping that eventually everyone would be able to see it work.

(From left to right):

Zack Lyman, *American Council for Renewable Energy (ACRE)*

Nate Coleman, *Schatz Energy Research Center (SERC)*

Perry Farrell, *Jane's Addiction*

Patrick Serfass, *National Hydrogen Association (NHA)*

Tara Willey, *Solar Electric Power Association (SEPA)*



For the Washington, DC show at Nissan Pavilion, Schatz shipped the hydrogen via FedEx to NHA headquarters so the author could hand-deliver it to the concert. Excitement that the fuel cell would be operating at the DC concert spread quickly so Claudette Silver, one of the concert organizers for Lollapalooza, arranged a media event with Perry at the Schatz booth for the end of the day. After a full day of answering questions for concertgoers aged 7 to 70 and running small appliances like light bulbs and laptops from the fuel cell, Nate fired up the Stack-in-a-Box® for the crowd that had gathered and made the rock star a frozen fruit smoothie with a blender plugged into the fuel cell.

For the fans, the media and tour organizers, it was a real crowd-pleaser, and became the beginning of what has turned into a happy ending for the pile of obstacles that seemed to get in the way of trying to bring 4 grams of hydrogen to a rock concert.

Since the August 1 concert in DC, Schatz has demonstrated their SIAB with hydrogen in Dallas, and plans to ship it to a few more selected venues before the tour ends August 24 in Portland, OR. Schatz reports that Lollapalooza, the venues, and the promoters are all becoming more comfortable with hydrogen. The growing successes with the

demonstrations, the media, and Perry Farrell have been important to Schatz's ability to encourage future sites to welcome the universe's most abundant element.

Click [here](#) to view the NHA-Schatz press release!

Resources:

- Refer to the [FedEx Dangerous Goods](#) workbook for instructions on how to ship hydrogen.
- In addition they also have a checklist for shipping non-radioactive dangerous goods. Click [here](#) to download it.
- Click [here](#) for info on the IATA (International Air Transport Association) dangerous goods shipping manual that FedEx uses.
- The FedEx guide also refers to CFR49 sections 172.700 to 172.704. Schatz referred to section 173.29 for a definition of "empty packagings" when they determined what they would have to do to make it safe and legal to return the cylinders via FedEx as NON-hazmat.

Endnote: Schatz and Metal Hydrides

[i] Last year, Schatz acquired a HERA metal hydride container and made minor modifications in their SIAB to accommodate this unit. According to Schatz, the change was very successful, allowing them to run the stack five times as long with a storage unit that was only very slightly larger and heavier than the lecture bottles. It was also safer from a pressure standpoint, having a full pressure of just 250 psig, compared to 1775 psig for a full lecture bottle.

Naturally, Schatz wanted to send this safer, more advanced and more useful technology out on the road to show it off. However, DOT has not yet approved these hydride containers for highway transport. Schatz needed to provide the transport company with something that they could document as safe and legal to carry on highways, so they went back to using lecture bottles.

[National Hydrogen Association](#)

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