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# *Hydrogen* Today

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## Show Me the Hydrogen



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This is the AHA training system where everyone learns how solar electrolysis works (or doesn't work). Four Hydrogen Wind electrolyzers with 5 Kyocera 120W solar panels can produce about 2 cubic feet of hydrogen per hour. Hands-on is the only way to figure out the burping, how it draws 30 amps with no gas output and why the electrolyte turns black or rusty or green.

### *“Quotations”*

“The greatest thing a society can do to a citizen is to leave him alone”. Joseph Brodsky (Russian-American poet)

“The opposite of progress is Congress”. Mark Twain

“When you talk, you are repeating what you already know, but if you listen, you may learn something new”. Dalai Lama

“If I had asked people what they wanted, they would have said faster horses”. Henry Ford

*‘We Deliver Clean Air’*

Hydrogen Today:  
Journal of the American  
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**\*\* SAFETY FIRST \*\***

## American Hydrogen Association Mission

Develop and prove solar hydrogen technologies that will eliminate economic, environmental and energy hardships caused by burning one million years accumulation of fossil fuels every year *and*

Educate scientists, entrepreneurs and experimenters, parents and educators, CEO's, legislators, utilities, the media and farmers how to use solar hydrogen to create sustainable prosperity without pollution.

## Giving Tuesday

November 29<sup>th</sup> is national Giving Tuesday. Although all labor at the AHA and most materials are donated, we have to pay dollars for the Internet, postage and the Clean Cities membership. Please do donate a few bucks towards Prosperity Without Pollution.

<https://givingtuesday.razoo.com/us/story/Hydrogen-Association>

## Pinal Energy Corn-To-Ethanol Plant Field Trip

Nine AHA members recently had the privilege of touring Pinal Energy's corn-to-ethanol plant in Maricopa, AZ. Our guide didn't mind spending an extra hour answering all our questions. As you approach the site, there is a rich blend of aromas from the cattle lot next door and the fermenting beer. The plant was finished in 2007, employs 100 and produces 50 million gallons of ethanol a year. The alcohol is mixed with a little gasoline to make it undrinkable. Most of it ends up added into gasoline in Phoenix or Tucson.

Eighteen million bushels of corn are delivered from the Midwest annually by rail and 20 tank trucks of ethanol leave every day. There are zero discharges. The dried grain left-overs, still containing protein, feed the beef next door, local dairy cows and a nearby egg farm. All the CO<sub>2</sub> is sold for dry ice or to carbonate soft drinks and draft beer.

Operators watch computer screens to monitor everything from conveyor belt speed to motor bearing temperature. They did not allow photographs inside of their proprietary processes. Grains like sorghum produce greater ethanol yields than corn, but the plant was set up specifically for corn.

If you imagine one acre of corn, it will produce about 9 tons of kernels, which can be bio-processed into 5 tons of biomass by-product for animal feed or compost, 1.6 tons of CO<sub>2</sub> from fermenting, 0.2 tons of corn oil and about 400 gallons of ethanol.



Pinal Energy Distillation Columns

## Editorial

Here at Fort AHA, we had no trouble in meeting our quota of fails in 2016. The wind carried our 10 foot satellite dish/solar furnace over the block wall into the middle of the road, neither of the brand-new R-410 dehumidifiers obtained from eBay for Water From Air experiments worked and the monthly online members' sessions haven't started because of my chronic vocal cord inflammation. During the Arizona summer, an 8000 BTU air conditioner installed in the uninsulated MicroDwell lowered the temperature from 98° to 96°, which was a pretty good lesson in thermodynamics. We added some denim insulation.

On the positive side, we plumbed a bank of hydrogen cylinders into a fueling station for the H2 go-karts and the Dodge hydrogen pickup, added a microbial fuel cell to the lab and hand sifted through 34 barrels of ONSI fuel cell scrap to recover \$20,000 worth of platinum. Every day we save people, AHA members or not, time and money by answering questions by email or phone or from visitors. We get our share of scammers, too. The street address of a Photo Shopped warehouse showed up as a \$190 a month trailer park on Google maps.

For those of you waiting for hydrogen to happen, you're going to get left behind.

## Hydrogen Events

The Phoenix American Hydrogen Association and Phoenix Alternative Energy Meetup meet the second Thursday of every month from 6 to 8 PM at Denny's Restaurant, 650 N. Scottsdale Rd. in Tempe, AZ (SW Scottsdale Rd/202, one mile north of ASU light rail station). Call 480-234-5070.

Rethink Methane: Removing the fossil from the fuel, Feb. 21-22, 2017, Sacramento, CA. California-centric renewable methane symposium and exhibition. No cost for environmental nonprofits.

<http://rethinkmethane.org/>

13<sup>th</sup> Annual Fuel Cell & Hydrogen Expo, March 1-3, 2017, Tokyo, Japan. Billed as the world's biggest hydrogen show. Everything hydrogen conference and exhibition. <http://www.fcexpo.jp/en/Home/>

## Hydrogen on the Internet

Carbon Xprize – 27 international teams are competing for \$20 million for the most innovative technology to convert CO<sub>2</sub> to marketable products. <http://carbon.xprize.org/>

## Books & Publications

Most of the books reviewed in Hydrogen Today are available in the AHA library. Anyone can read them in house and renewed members can borrow them.

The Honest Truth About HHO, Darol Mason  
D&N Automotive Engineering eBook, \$1.99, 93 pages.

We are frequently asked if the on-board HHO generators really improve a vehicle's mileage. The builders say YES; the engineers say NO. So far, no one has shown us any decent before/after MPG data. We've seen poor quality ones leak and melt down, but do they work or not? The Corolla we were testing got totaled in an Arizona dust storm. Our strategy is to test a vehicle on a freeway with cruise control, both with HHO and without. An inexpensive OBDLink SX calculates and records miles per gallon.

<http://www.obdlink.com/sxusb/>

Mr. Mason does a good job of explaining why many HHO gens do not work. Installation is a lot more tricky than connecting 12 volts and ground. Current runs away as water is used up, the alternator is overloaded or the vehicle computer sees excess oxygen and adds *more* gasoline. However, he goes on to say that if you buy one of his \$99 controllers, all will be well. Try one and see. The question needs to be answered once and for all.

<http://www.ebay.com/itm/EXPOSING-THE-TRUTH-ABOUT-HHO-HYDROGEN-GENERATORS-DRY-CELLS-EFIES-CC-PWM-KITS-/262243650787?hash=item3d0ef08ce3:g:OcwAAOSw1x1UOwjT>

They Sailed the Skies: U.S. Navy Balloons and the Airship Program, J. Gordon Vaeth, 2005  
Naval Institute Press, 159 pages.

Lighter-than-air ships are making a comeback. Sport hot-air balloons regularly appear on the horizon and dirigibles can quickly deliver heavy loads to inaccessible areas beyond the range of helicopters. This book tells some of the dramatic history of ballooning from 1906, long before the 1936 Hindenburg fire, until the high altitude research in the '60's for the early U.S. outer space program.

Balloons had two major purposes. One was just for the adventure. Frenchmen, English, Germans and Americans wanted the front-page fame of flying further, faster or higher. In 1906, the U.S. won the first international balloon race in Paris, landing 398 miles away in England in a hydrogen balloon. High adventure came with a high price. Deaths were common from lightning, drowning, and crash landings or once from oxygen equipment failure at 42,000 feet. In 1942, an L-8 landed in Daly City, CA with no trace of the two-man crew.

The other application for balloons was, of course, warfare. Hundreds of tethered observation balloons over WWI trenches made great targets for enemy artillery. Anti-submarine patrols carried depth charges that could be thrown overboard onto U-boats. Airships rescued sailors and downed pilots.

## H2 University

### High Pressure Tube Fitting Safety

In the lab or on gaseous fuel vehicles, it's hard to get away from Swagelok-type high pressure plumbing. This design uses tapered front and back ferrules to wedge the tubing in place. A big advantage is that the connections can be used over and over without replacing any seals as long as they are kept clean and unscratched. A disadvantage is that disassembly requires enough slack to remove the tubing from the fitting. Hoke's Gyrolok and Parker's A-Lok are similar fittings, but parts should never be mixed.



AN/TMQ-42 Methanol to Hydrogen Reformer

After 40 years, I'm still skittish around high pressure gases. I've been trained, but not everyone else is. Cylinders can be mislabeled or connections can be made incorrectly. YouTube or a few hydrogen safety reports will inform you what happens when things go wrong. A slipped steel tube under pressure can whip around like a loose fire hose. Get training from someone experienced and know the properties of every material you're using. Verify the maximum pressure rating for your fittings. Practice and always leak test.

The Movie: <https://www.youtube.com/watch?v=FdthSQDH8qk>

The Book: "Swagelok Tube Fitting and Installation Manual", F.J. Callahan

Courses online or live training at your local Swagelok Sales and Service Center:  
<http://www.swagelok.com/en/Services/training-and-education>

## Hydrogen Stock Market

We are NOT going to advise you to buy any hydrogen stocks. Who in their right mind would invest their hard-earned money in “Hindenburg Stocks” that won’t make a profit for decades, if ever? Well, you may not see a Toyota fuel cell Mirai in your neighborhood soon, but hydrogen technology is moving strongly into niche markets like warehouse forklifts and backup power for cell phone towers. Here’s a few companies that are investing their money in the Hydrogen Age.

Air Products (NY) APD. Hydrogen fueling stations. Allentown, PA

<http://www.airproducts.com/industries/Energy/Hydrogen-Energy.aspx>

Ballard Power Systems (NAS) BLPD. 1 to 200kW PEM fuel cells. Burnaby, BC

<http://ballard.com/>

Fuel Cell Energy (NAS) FCEL. Stationary fuel cells. Danbury, CT.

<http://www.fuelcellenergy.com/>

Hydrogenics (NAS) HYGS. PEM electrolyzers and fuel cells. Mississauga, ON

<http://www.hydrogenics.com/>

Plug Power (NAS) PLUG. Fuel cells for warehouse forklifts. Latham, NY

<http://www.plugpower.com/>

Praxair (NY) PX. Hydrogen fueling stations. Danbury, CT

<http://www.praxair.com/gases/buy-compressed-hydrogen-gas-or-liquid-hydrogen>

Quantum (NAS) QTWW. Hydrogen delivery and storage systems. Lake Forest, CA

<http://www.qtw.com/>

Teledyne Energy Systems (NY) TDY. Electrolyzers. Hunt Valley, MD

<http://www.teledynees.com/products.htm>

Westport Fuel Systems (NAS) WPRT. Hydrogen direct injectors. Vancouver, BC

<http://www.westport.com/is/core-technologies/fuel-injectors>

Worthington Industries (NY) WOR. Hydrogen cylinders. Columbus, OH

<http://worthingtonindustries.com/Products/On-board-Fueling>

## Thanks

Duane – Organize Pinal Energy field trip, tomato plants

Warren & Ben – AHA table at Mesa SW Maker Fest

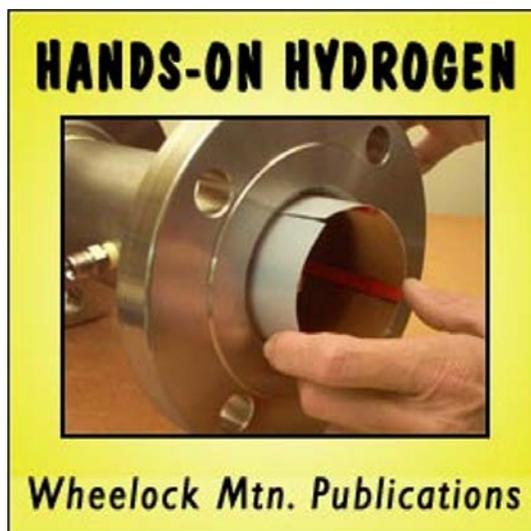
Mike, Mike and Roy - AHA table at Earth Day Texas

Claude – Earth Day table at Glendale Community College

Claude & Dave – Sort 34 barrels of fuel cell scrap for platinum.

Marie – Cash donations

Mark – Cordless microphones



*Ebooks for Do-It-Yourself Experimenters*

*By Phillip Hurley*

- Build Your Own Fuel Cells...\$14.95
- Build A Solar Hydrogen Fuel Cell System...\$16.95
- Practical Hydrogen Systems: An Experimenter's Guide...\$16.95
- Build Your Own Solar Panel...\$12.95
- Solar II...\$12.95
- Solar Supercapacitor Applications...\$16.95
- The Battery Builder's Guide...\$16.95

<http://www.goodideacreative.com/wheelockmtn.html>

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Books are now available in paperback at:

[http://www.amazon.com/Phillip-Hurley/e/B001K8XF3K/ref=sr\\_tc\\_2\\_0?qid=1449887967&sr=8-2-ent](http://www.amazon.com/Phillip-Hurley/e/B001K8XF3K/ref=sr_tc_2_0?qid=1449887967&sr=8-2-ent)

## AHA Membership Form

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Country \_\_\_\_\_

Telephone \_\_\_\_\_ email \_\_\_\_\_

- Regular Membership- \$39.00/year (New members receive a free copy of Roy McAlister's "Solar Hydrogen Civilization").
- Student, Military & Senior (55 and over) Membership- \$25.00/year
- Sustaining Membership- \$100.00/year (autographed book and H2 bookmark)
- Life Membership- \$1000
- Corporation/Institutional Membership- \$1000/year
- "Solar Hydrogen Civilization" book only - \$24.95 postpaid.
- Email *Hydrogen Today* only
- Send AHA New Chapter Packet
- "Hilda Hydro - Girls Go Green" - \$8.95 postpaid

Mail to: American Hydrogen Association  
P.O. Box 4205  
Mesa, AZ 85211  
USA

Or go to: <http://clean-air.org/store.html>

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