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# *Hydrogen* Today

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## Show Me the Hydrogen



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### Hydrogen Wind Electrolyzer, Foam Traps & Double Bubbler

Larry Spicer, an Iowa farmer, patented his electrolyzer in 1980. He later wrote articles for Home Power magazine and published "Water Electrolyzer Files" in 2004. His \$175 electrolyzer helped many of us understand the vagaries of hydrogen production. Mr. Spicer has retired, but the AHA's Hydrogen Wind Electrolyzer continues to make hydrogen on our MicroDwell hydrogen house with solar electricity.

At 40 Amps, one cell can produce 14 liters of H<sub>2</sub> per hour. Multiple cells were intended to be ganged together for more useful volumes. Output pressure depends on the height of the replenishment water column, but 100 psi can be generated using Spicer's floating equalizer valves design. (continued on page 2)

### *"Quotations"*

"People who say it cannot be done should not interrupt those who are doing it." George Bernard Shaw

"The dictionary is the only place where success comes before work." Vince Lombardi

"Formula for Success: Rise early, work hard, strike oil," J. Paul Getty

*'We Deliver Clean Air'*

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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.

### Show Me the Hydrogen (cont...)

Gas separation is accomplished with a simple semicircular steel plate. The foam traps are empty PVC shells which prevent foam from carrying KOH electrolyte away from the electrolyzer. The Walt Pyle Double Bubbler scrubs any residual KOH and gives a visual indication of operation. The Board of Directors recently named Mr. Spicer an AHA Honorary Lifetime Member.

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

<http://hionsolar.com/> - Double Bubbler kits & plans

## Hydrogen on the Internet

Your neighborhood will never experience a typhoon, wild fire, flood, quake or blizzard, right? Here's some not end of the world stuff, but inexpensive and common sense solutions for your family when the grid is down and roads are closed for four days. Steve Harris has several enlightening lessons on small solar systems, running an inverter off your car engine, 1<sup>st</sup> aid, fuel storage, keeping your refrigerator cold and communications.

<http://www.steven1234.com/>

Way back in 1966, United Technology started selling fuel cells to NASA to provide both electricity and drinking water for Apollo space missions. They partnered with Toshiba in 1985 to form International Fuel Cells and in 1991, along with ONSI, began production of their 200 kW phosphoric acid PC25 fuel cells. The AHA inherited three of these magnificent 35 ton machines. They became UTC Power in 2001. This company was bought by Clear Edge Power in 2013, a company started by Brett Vinsant in his garage. Clear Edge abruptly closed their South Windsor, CT factory in 2014 and filed for bankruptcy. Shortly after, Doosan, a South Korean conglomerate, bought the company and reopened the plant where fifty years later they now make 400kW fuel cells with a 10 year stack life. <http://www.doosanfuelcell.com/en/main.do>

## Editorial

It used to surprise me when members asked “What can I do?” As long as there is one child hungry, sick or who can’t read, there are plenty of ways to help. But while most of us can’t join the Peace Corps or find a cure for leukemia, you can still be a hero – every day. Our ultimate goal is the Age of Hydrogen and prosperous families without hungry, sick or illiterate kids. Here are some ways to invest a few hours, a few dollars. Learn more about hydrogen. Our [www.clean-air.org](http://www.clean-air.org) website is a good place to start. Ask questions. Teach someone about hydrogen. Donate a copy of “Solar Hydrogen Civilization” to your public library. Adding some information to the AHA Hydrogen Safety Handbook in progress can save lives, maybe yours. Write a hydrogen themed video script for YouTube. Do an experiment. Can you discover something that GE or Toyota missed? You sure can. Corporations don’t have any monopoly on curiosity, luck, keen observation or creativity.

Nest time, I’ll report on living in the 96 square foot AHA MicroDwell hydrogen house. Whether for urban off-grid, emergencies or Burning Man, we’ll attempt to live well and eat healthy starting with no refrigeration and a twenty-nine dollar 650W rice cooker/steamer/crock pot.

## Hydrogen Events

The Phoenix American Hydrogen Association meets 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.

The Phoenix Alternative Energy Meetup meets the second Saturday of every month, 1:30 PM at AHA Headquarters, 444 S. Morris, Mesa, AZ 85210 (SE Country Club/Broadway). Find out the Truth about oil spills, Smartmeters and turning corn into fuel.

Need a \$1,000,000? The Hydrogen Education Foundation, sponsored by the DOE, is offering the H2 Refuel H-Prize for the best home/community hydrogen generation system using electricity or natural gas to refuel hydrogen vehicles. <http://www.hydrogenprize.org/>

Oct. 22, 2015 – Registration deadline

Dec. 2015 – Finalists selected

July, 2016 – Systems testing begins

Oct. 31, 2016 – Competition ends

Dec. 2016 - Prize awarded

6<sup>th</sup> World Hydrogen Technologies Convention, 11-14 October, 2015, Sydney, Australia. (\$1350) The theme for 2015 is vehicles and energy storage systems, towards full commercialization of hydrogen and fuel cell technologies. Hosted by International Association for Hydrogen Energy (IAEA) and the Australian Association for Hydrogen Energy. <http://www.whtc2015.com/>

2015 Fuel Cell Seminar and Energy Exposition, 16-19 November, Los Angeles, CA. (\$495-\$1200) Topics include: Renewable hydrogen, market for fuel cells, fuel cell applications, latest fuel cell technology, hydrogen storage and fuel cell training. <http://fuelcellseminar.com/>

## 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.

Biofuels Engineering Process Technology; Drapcho, Nhuan and Walker, 2008

McGraw-Hill, \$99.84, 371 pages

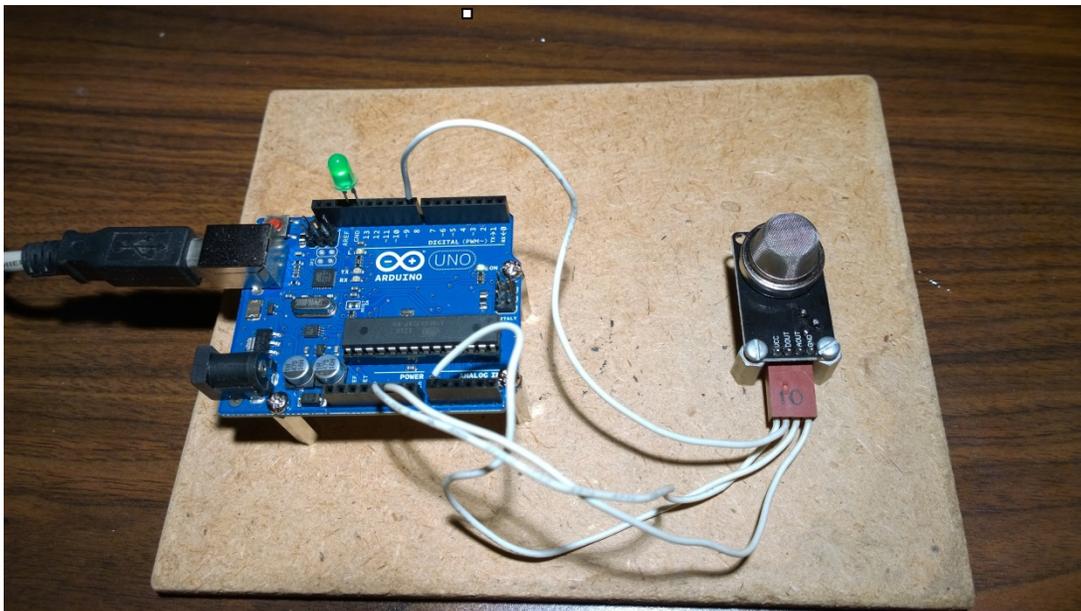
“Biofuels” gives a thorough and clear description of the following technologies that anyone with high school algebra and chemistry should have no problem following:

- Bioconversion chemistry
- Biofuel feedstock
- Ethanol production
- Biodiesel
- Biological production of hydrogen
- Microbial fuel cells
- Methane production

## H2 University

### Show Me the Hydrogen – H2 Leaks

Hydrogen gas may be colorless, odorless and tasteless, but we still have to know when there's a leak. We regularly hear the myth that the tiny hydrogen molecule escapes out of anything. It will leak out of a poorly designed or improperly installed system. Commercial detectors are available for a few hundred dollars. Much less expensive do-it-yourself hardware is now for sale on the Internet. Keep in mind the reliability and accuracy of these designs have not been proven yet and they are not something you want to bet your life on.



MQ-8 Hydrogen Gas Sensor Module

MQ-8's are available on eBay for \$2-3 direct from China. An Arduino microcomputer connects easily to the MQ-8 and powers the sensor's 5 volt heater. The Arduino is programmed and powered through a USB cable to a laptop. A "MQ-8, Arduino" search will immediately provide the hookups and simple code you'll need. Output is displayed as numbers from 0 to 1023, which corresponds to 100 to 100,000 ppm hydrogen. One hundred thousand parts per million is 1% hydrogen. That's about the right alarm level since the lower explosive limit of hydrogen in air is 4%.

Any time there's a flammable gas leak, be prepared for a fire. Unless you can hear it or see the heat waves, a hydrogen fire is also difficult to detect. In the absence of burning carbon, there is very little color. In the old days, fire-crackers were strategically placed in engine compartments to alert to a hydrogen fire. Like the MQ-8, IR (infrared) flame detectors are available on eBay for a couple dollars. They are almost interchangeable with the MQ-8. According to specifications, it covers a 60° angle. There are also 5 LED versions that cover 120 degrees. The range was not well determined in the well-lit lab. It would easily pick up a butane lighter at 4 feet, but it also picked up reflected sunlight through the lab window. Much more testing needs to be done and reported.



Oxycheq Meter

We do a lot of experimenting with solar electrolyzers. There are various failures modes that can contaminate the hydrogen with oxygen, which becomes explosive at 6% O<sub>2</sub>. This oxygen sensor was developed for monitoring medical oxygen. SCUBA divers adapted it to verify their deep-water gas blends contained the right percent of life-sustaining oxygen. We use the El Cheapo II Oxygen Analyzer to periodically sample the hydrogen output from the electrolyzers. An easy-to-assemble kit is available for \$110. Calibration is simple with the 21% oxygen in air. <http://www.oxycheq.com/analyzers-sensors/el-cheapo-ii-analyzer-kit.html>

## Thanks

Addison – 46 copies of his books

Patti – 1995 Honda Civic

Warren – Giant ultrasonic parts cleaner, mounting pole for solar furnace

Ben – Powder coating hydrogen truck wheels, welding table

Marie - \$\$\$ and satellite antennas

Microsoft – MS Office Professional

Claude – New pulley cover for bandsaw

## Harbor Freight 45 Watt Solar Panel Kit Review

This Harbor Freight #68751 Thunderbolt Magnum Solar Panel Kit was purchased for educational use. It was on sale for \$139, or about \$3/Watt. It comes with (3) 15 Watt panels, battery charger, cables, two CFL lamps and a stout PVC frame. With two people, it can easily be assembled in half an hour. Most of the 100+ reviews were positive. Some complained about plastic cracking. The frame is supported by a single leg. To prevent the wind from blowing it over, we mounted the kit on a Mark I Manual Solar Tracking System – 2 x 4's and casters.

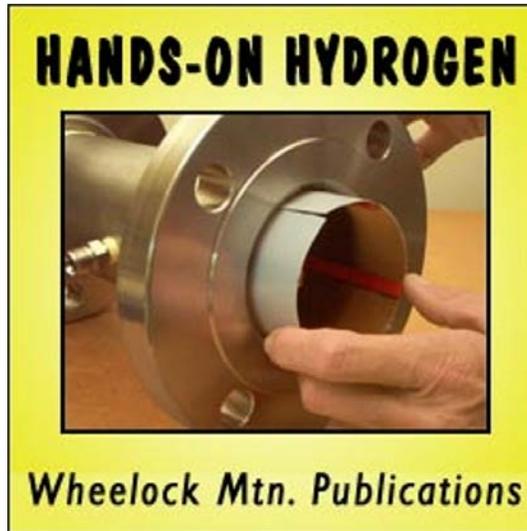
By itself the kit can recharge your dead car battery, but to be useful beyond that we added a HF #68680 35 Amp hour battery (\$69.99). This will store the electricity to run the CFL lamps at night. The two bulbs supplied are 12 volt, not easy to find locally. A better idea is to use a HF #69660 750 Watt inverter (\$37.99) and purchase some 120 volt power-miser LED bulbs. The inverter will also power a laptop, electric drill or TV. Don't expect it to run a refrigerator or the microwave. The charger does have a 5V USB port for keeping phones and cameras charged. There is also a handy digital LED voltage meter. This light duty kit would be suitable for a small RV, portable or backup applications.



Three 15 Watt Solar Panels



Charger, Battery and CFL Lamp



*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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## 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 (60 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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*Prosperity Without Pollution.*

AHA publishes *Hydrogen Today* to help educate the public about new developments in renewable energy and the science and people behind them. Join us in making a better world. You can help too by writing for *Hydrogen Today*. Tell others about your grassroots alternative energy projects, either scientific or social. Review a book, product, service or event. A picture is still worth a thousand words. The range should be approximately 300-1000 words. Send to the above address or to the *Hydrogen Today* editor at [editor@clean-air.org](mailto:editor@clean-air.org)