
Hydrogen Today



Show Me the Hydrogen



Inside H2 Today

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After several years of development and gallons of blood, sweat and tears, the Hysolgenics solar EL-5000 electrolyzer is finally producing hydrogen. The AHA has ordered one and it is now being mounted on a trailer for transport to Phoenix. It will produce about 1 cubic foot of H₂ per minute. See it at work:

<http://www.youtube.com/watch?v=S1tLXXj1sv8>

“Quotations”

“The earth provides for every man’s needs, but not enough for every man’s greed.” Gandhi

“Too many people spend money they haven’t earned, to buy things they don’t want, to impress people they don’t like.” Will Rogers

“Do or do not. There is no try.” Yoda

“If nothing changes, nothing changes.” Bumper sticker

‘We Deliver Clean Air’

Hydrogen Today:
Journal of the American
Hydrogen Association
P.O. Box 4205
Mesa, AZ 85211 USA
480-234-5070

www.clean-air.org

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Editor- Hydrogen Today
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bikesintl@netzero.com

AHA Chapters

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www.ahanw.org
Portland, OR

AHA Silicon Valley
www.ahasvc.org
Palo Alto, CA

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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.

Here's the Deal

American Hydrogen Association Grand Purpose
Prepared by the AHA Board of Directors

1. HYDROGEN FOR AMERICA

A century of the Petroleum Age and decades of borrowing from the future have failed to meet the basic needs of most of the world's population. We're losing clean air, clean water and soil fertility and in exchange getting wild climate change that's taking lives and livelihoods, electric grid failures, graduates without career-ready skills, 12-year-old soldiers, drug cartels and 15 million refugees. The U.S. spends over \$400 billion a year for foreign oil, enough money to create 1,000 new millionaires every day in this country.

The competition for diminishing supplies of fossil fuel to deliver more goods raises international tensions and increases the potential for terrorism and war.

The Hydrogen Age presents a clean, sustainable alternative future for everyone. We can harness the boundless energy from sunshine to make homegrown hydrogen. Renewable energy from solar panels, wind, waves, falling water or any biomass that burns or rots can be stored and transported by hydrogen. Hydrogen is not toxic. The only by-product when hydrogen is burned in homes, cars, locomotives, turbines or fuel cells is pure water. A tanker-full of spilled liquid hydrogen quickly evaporates into the air without leaving any trace. Carbon from dissociated hydrocarbons or from atmospheric CO2 can be made into raw materials stronger than steel, lighter than aluminum, resistant to corrosion and that conduct heat better than copper. Valuable wealth-expanding products can be made such as wind turbines, H2 piping and tanks, vehicles, storm-proof dwellings, tools and biochar. Millions of jobs will be created.

Americans understand that self-interested corporate CEO's, a politically paralyzed Congress and today's news anchors don't have the vision to lead us out of the fossil fuel trap. The leadership and inspiration to restore American trust, hope, pride and our future security can come from you and me, members of the American Hydrogen Association. We have the technology and the knowledge. Show that we have the courage to bring on the Hydrogen Age.

2. AHA OBJECTIVES (Long Term)

What Does the AHA Aim to Accomplish?

- Hydrogen knowledge base freely accessible to the public.
- Develop, prove and transfer solar hydrogen technologies until hydrogen is part of our everyday lives.
- Stimulate a hydrogen market until every man, woman and especially every child in every community enjoys healthy, sustainable, debt-free and secure prosperity without pollution.
- International resource for hydrogen safety
- Promote national hydrogen infrastructure with Hydrogen Hyways that encompass roads, H2/natural gas pipelines and high-speed Maglev trains.
- Recycle everything.

3. WHO NEEDS THE AHA?

- People who think burning one million years' worth of fossil fuel every year is a bad idea and who want to reduce their personal carbon footprint.
- People who want to work on cool projects; who haven't lost a child's joy and thrill of creativity and discovery; who like hanging around with straight-talking friends.
- Families that worry about a decent future for their children and grandchildren and want to leave the world better than they found it.
- People hungry for honest renewable energy information.
- People who we want to help:

Struggling farmers.

Everyone who breathes.

Disaster victims and 15 million refugees.

Isolated Native American families.

Your neighbors paying too much for dirty fossil energy.

The unemployed, returning veterans and anyone with a boring, unchallenging job.

Athletes who can't compete in the summer because of the heat and who can't compete in the winter because of there's no snow.

- Entrepreneurs needing inspiration and a place to incubate ideas.
- City governments competing for new employers.
- Students looking for valuable green career skills and high quality experience for their resumes.
- Seniors and retirees who want to finally do some work that matters to them.
- Anyone who wants to pay it forward, needs some good karma, a tax deduction or a memorial to a lost friend.
- People who enjoy teaching.

Partners and Alliances

National hydrogen associations
 ASU, community colleges, high school STEM programs
 National laboratories
 Air Liquide, Praxair, etc.
 Toyota, Benz, Briggs & Stratton, etc.
 Ballard, Horizon Fuel Cells, etc.
 Hydrogen product companies
 Companies needing a green image
 Green Chamber of Commerce
 Native American tribes
 Environmental organizations
 Hydrogen safety organizations
 Medical doctors and health insurance companies
 Entrepreneurs
 Electric car owners still recharging with fossil fuels
 Medical doctors and health insurance companies

4. WHAT CAPABILITIES DOES THE AHA NEED?

Board of Directors
 Executive Officer- runs day to day operation
 Virtual office- cell phone, Internet, online meetings
 Giftworks/Outlook membership management
 Quickbooks accounting
 Headquarters- showroom, meeting & classroom, workshop, storage
 PR Team- lecturers, demos, events, brochures
 Website/Webmaster
 YouTube/Facebook
 Measure and analyze performance
 Publishing

Hydrogen on the Internet

Hyundai hydrogen station in Chino, CA

http://hyundai-news.com//us/en-us/Media/PressRelease.aspx?mediaid=38777&title=hyundai-preps-hydrogen-energy-generation-and-fueling-station-in-chino-calif-for-first-ever-public-opening&goback=%2Egde_137901_member_263597727

Hydrogen on the Internet (cont.)

Electric ultralight airplane

http://cleantechnica.com/2013/08/05/espyder-electric-airplane-for-under-40000-video/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+IM-cleantechnica+%28CleanTechnica%29

Enjoy lobsters while you can

<http://thinkprogress.org/climate/2013/08/04/2342541/lobster-maine-climate/>

Concentrated solar produces hydrogen from water with metal oxides

http://cleantechnica.com/2013/08/02/radically-new-technique-to-produce-hydrogen-fuel-from-water-developed/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+IM-cleantechnica+%28CleanTechnica%29

ACE is the Hydrogen Place

<http://www.nuvera.com/index.php/pressroom/press-releases/171-nuvera-fuel-cells-to-supply-hydrogen-at-ace-hardware-s-new-distribution-center>

Cleveland fuel cell bus

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

The U36: World's biggest fuel cell EV – 187 feet long

<http://evworld.com/focus.cfm?cid=146>

1800 MPG ELF solar electric tricycle, built in Durham, NC.

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



Georgetown University Energy Prize- \$5 million to the community leading the way in energy efficiency

<http://guep.org/>

Editorial

We've been so busy here in Arizona, we haven't taken enough time to let you know how things are going. Most of the summer was spent on the colossal new clean-air.org website, which should be ready for testing in a couple weeks. John Gotthold has nearly finished mounting his Hysolgenics 5kW EL-5000 solar electrolyzer on a trailer so we can pick it up. It will be the heart of a hydrogen fueling station. Parts for the H₂ purification system are on the shelf and soon a Horizon fuel cell will join them. The Urineers are making progress on electrolyzing this waste product into hydrogen.

The hydrogen BBQ and hydrogen stove are plumbed up and ready for the video team's first 'cooking with hydrogen' production using two Canon Vixia camcorders. We tested several online video

conference programs and chose the best one. A Logitech C920 webcam on a tripod significantly improved the video quality. Once audio quality and wifi reliability are better, you'll be able to join our monthly and team meetings online. The AHA has been invited to 2014 Earth Day events all over the country. We're building new attention-grabbing displays and figuring out the logistics of moving them. One member has gone to grant-writing school.

Last month, we took a field trip to the Prowall Styrofoam factory in Casa Grande, Arizona and Randy Hull gave us a very interesting tour of the facility. We saw 3 ft. x 4 ft. x 24 ft. blocks of foam roll out of molds every few minutes. They were then sliced with hot wires to become building insulation or surfboards. Eight inch thick sheets are tough, have a high R value, can be quickly glued together to construct a house and are attractive and fire-resistant when coated with clay or stucco. Our MicroDwell team is planning to build a hydrogen house with Styrofoam for the MicroDwell 2014 exhibit in Phoenix. <http://www.microdwelling.net/>

Every week, we attend at least one free webinar on how to improve nonprofit management skills. We still haven't achieved our main goal of finding a suitable new AHA Headquarters. We've set out to raise another \$50,000.

You don't hear much about it on the 5 o'clock news, but climate change is wiping out hummingbirds, snowshoe rabbits and coffee beans. We should be able to figure out where this is leading. I've seen the Oswegatchie River rise 5 feet in hours, seen Idaho's Salmon River in spring roll along car-size boulders and been through a typhoon at sea. Nature can be both fragile and furious with no mercy. It's best if we don't put ourselves above Nature and mess with it. Why don't you help us save a world with a dollar or an hour?

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 480-964-0458.

The Silicon Valley AHA chapter meets every third Saturday at the Peninsula Conservation Center, 3921 East Bayshore Road, Palo Alto, CA from 10am to noon. Meetings are now online. Contact Pres. John Gotthold at 408-245-6065 or jgotthold@comcast.net He'll need your email to send you the link before the meetings. Their website is www.ahasvc.org

Alternative Energy Expo, 11-13 December, 2014, Las Vegas. <http://www.alternativeenergyexpos.com/#>

Thanks

John O'Mara Bockris, PhD. (1923-2013) Electrochemist, professor, author and hydrogen pioneer
Randy- Outstanding tour at Prowall Styrofoam plant and answering an hours' worth of questions
Russ- HHO Torch article
Clyde- Repairing Stirling engine and video
Jim- Article on E.ON hydrogen in natural gas pipeline demonstration

Books & Publications

Solar Hydrogen Energy: The Power to Save the Earth, T. Nejat Veziroğlu & John O'M. Bockris, 1991
McDonald & Co., 150 pages

Towns burning to the ground, super hurricanes, vanishing glaciers and heat-related deaths are everyday news today. But back in 1991, the authors said it was all avoidable if we switched from burning fossil fuels to solar hydrogen. The book gives a brief non-technical history of energy. They recognized the dangers of fossil fuels- CO₂ & toxic emissions, depletion and energy insecurity. Then they describe how to capture, store and transport solar energy with photovoltaics, biomass, falling water and wind. Instead of burning hydrocarbons (HC) and throwing away the carbon as CO₂, we can just burn the hydrogen. The only byproduct is water. They make their point with many excellent drawings.

The authors say, that instead of waiting for the government, it is up to us to bring about change. This book would be an excellent solar hydrogen primer to give your friends or schoolteachers or local officials. A town in New Jersey hard hit by Hurricane Sandy flooding is considering raising the whole town 10 feet before the next Sandy. Maybe they should invest in this book first.

The Composting Toilet System Book, Porto & Steinfeld, 2000
The Center for Ecological Pollution Prevention, \$29.95, 235 pages

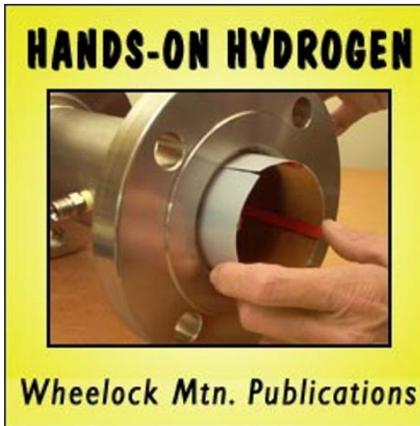
If you consider it, you may conclude it's imprudent to turn gallons of good potable water into sewage every time you flush. Some people go a step further and install a flush-less composting toilet. There are dozens of designs and brands and this book will sort it all out for you. Wastes can be dried up with a heater and a fan or bacteria can digest the excrement into compost over the course of months or a year. Some systems don't work very well to begin with and none will work for very long if overloaded or if proper installation or maintenance are neglected. If you're lucky, when things go wrong, you'll have changed enough diapers or dug up a septic tank to become immune to the sight and aroma of poop.

It would probably be difficult to remodel most bathrooms without breaking up the floor, but composting toilets should certainly be considered for new construction. The book makes a good case for diverting urine, which can be an excellent garden fertilizer. The authors cover the theory, the pros and cons and describe everything from simple homemade systems to products from many manufacturers. "Humanure" by Joseph Jenkins would be a good companion read.

Global Warming and Its Solution: Sustainable Energy, Thomas Dickerman, revised 2013
dickermn@sonic.net \$10.00, 150 pages

No observing citizen today can question climate change. Every one of us is living it. The debate is how much of it is man-made. The folks who sell us dirty energy, in their short-term self-interest, say No. Why do we argue at all? Do we really want to risk spewing ever-increasing amounts of greenhouse gases into our environment to see how much it can take before we become extinct? So what do we do?

Instead of wishing things will return to 'normal' next year, in Global Warming and Its Solution, Tom Dickerman tells us to start adapting now to changes in our water supplies and food chain. Farmers can convert to drip irrigation. We can spend our money on greener products. Conservation and increases in systems efficiency can cut America's energy bill by 40%. He thoroughly describes sustainable energy technologies and public policies that can halt, if not reverse, global warming. The only thing he can't answer is how bad do you want it.



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 Hydrogen Chronicles....\$12.95
- Solar Supercapacitor Applications....\$16.95
- The Battery Builder's Guide....\$16.95

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

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324 Minister Hill Rd.
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H2 University

HHO Torches

By Russell Philips

HHO gas is great for welding jewelry, stainless steel and exotic combinations together using hydrogen and oxygen from a water electrolyzer. HHO has an uncanny ability to burn at the melting temperature of what it comes in contact with. Surprisingly, it can be hot enough to melt tungsten and yet the torch remains cool. HHO can melt stone, stainless steel, glass, aluminum, & other metals. Some combinations are best welded by HHO and other combinations are only welded by HHO. It is amazing to witness the possibilities.

HHO torch systems can be divided into four sizes: jewelers, home, commercial and industrial. Systems can be as small and simple as a fine jeweler's torch powered by a 12 volt car battery, costing about \$1000. The 110 volt outlet home system rectifies power across a 71 plate stack (usually two cells) costing around \$2000. Commercial systems use 240v power (usually four cells), costing approximately \$4000. Industrial applications can be complex, large, and costly. Assembling your own system can cut these costs by half or more.

The primary components of the HHO torch system are:

- Electrical Power Source
- HHO Electrolyzer Dry Cell
- Electrolyte Reservoir
- Bubbler
- Pressure Relief Valves
- Torch Handle
- HHO Hose.

Electrical Power Source

In the scope of today's article, we are only covering the 12 volt application. This lowers the cost to a 21 plate dry cell. So, a car battery it is! A 12 volt car battery has hundreds of cold cranking amps. That's plenty of power for our 12 volt configured dry cell. Most welds are accomplished in 10 - 20 minutes. A deep cycle battery can provide power for periods of up to an hour. A simple battery charger plugs into the wall to replace the energy used. Charging can be done during or after user. The car battery also allows this system to be portable. Remote job locations can be accomplished by connecting to any vehicle's battery. A system can be designed into a toolbox or two wheeled tote. A movable cart with extension cord (bridge rectified line voltage) can be designed around two 36 plate cells. This very simple, efficient, and robust solution does not offer output control. A stationary bench top system has the option of a dedicated power supply. A variable DC output power supply adds cost, but varying HHO output is a desirable feature.

HHO Electrolyzer Dry Cell

Building the small 21 plate dry cell goes out of the scope of our article today. Consider purchasing a dry cell online. The 12 volt electrical wiring is configured with three negative leads and two positive leads. This uses the 4n4 configuration [-nnnn+nnnn-nnnn+nnnn-]. Neutral plates do not have electrical connections. The 6" x 6" 21 plate dry cell can produce 1.4 liters of HHO per minute at 20 amps and over 2 liters at 30 amps. Electrolyte concentration affects the amps drawn and thus, the gas output. An optional pulse width modulator (PWM) can roll back amps draw and give HHO output control.

The Electrolyte Reservoir

Vehicle windshield washer reservoirs make good electrolyte reservoirs. Polypropylene is impervious to KOH (Potassium Hydroxide or Caustic Potash). Sodium Hydroxide (NaOH) can also be used, but KOH is preferred. Use 4-6 Tablespoons per gallon of distilled water. The ideal reservoir has three hose barb fittings and a screw on electrolyte filler lid with a pressure relief valve. A 1/4" hose barb at the bottom feeds electrolyte to the bottom of the 6" cell. A 3/8" hose barb pipes in the HHO and electrolyte from the 6" cell output. The third barb out the top allows HHO to leave. The HHO output barb is on the opposite end from first two barbs. Inside the reservoir: HHO bubbles separate upward while the heavier electrolyte settles.

Bubbler

The bubbler is a water-filled safety device. The water level naturally traps out flashbacks. It also acts as a final defense of catching any electrolyte. No liquids should be leaving the bubbler. The HHO Torche hose is connected to the top of the bubbler. The reservoir's output hose is connected to the bubbler's lower 3/8" hose barb fitting. The bubbler canister must be strong enough to handle flashback detonation pressures. The pressure relief valve is essential and activates on every flashback! The pressure relief valve should be built into the screw on water filler lid. Water levels need to be maintained between high and low marks for proper use and safety. Some recommend using an inexpensive fuel filter as a final moisture trap mounted vertically on the bubbler. Any droplets can gravity feed back into the bubbler. Clear filters allow visibility; metal is stronger and more expensive.

Pressure Relief Valves

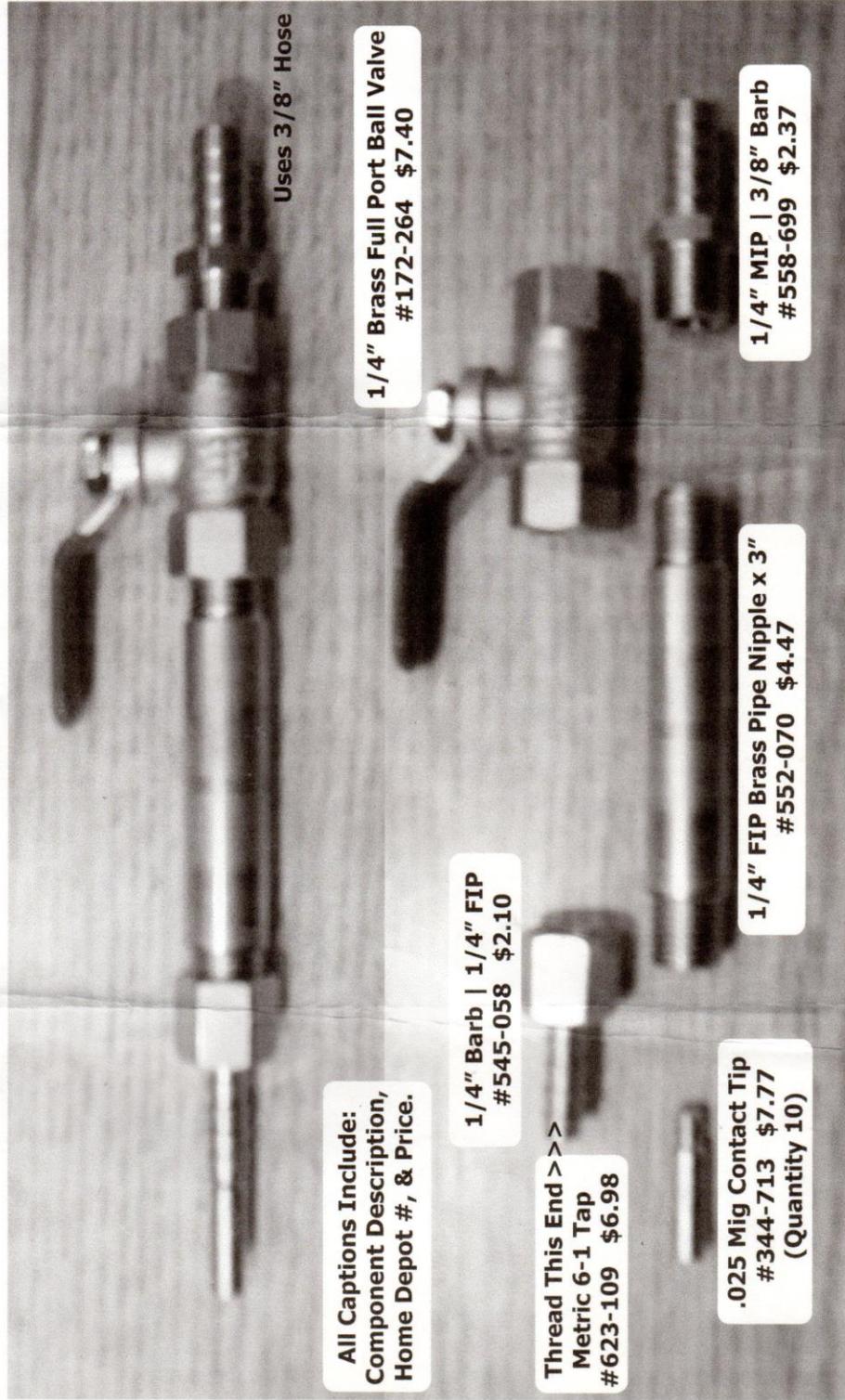
Pressure relief valves are available for purchase. Self-sealing is a requirement. We recommend no smaller opening than a 3/4" pipe thread size for safety. The faster the expanding gases can evacuate, the lower the maximum pressure on flashback.. You can make your own pressure relief valves. Stainless steel balls are impervious to corrosion and scorch, but have a higher throw out mass. Hard nylon balls are corrosion and scorch resistant and feature a lower throw out mass.

Torch Handle & HHO Hose

Torch handles are easily assembled from available parts (see image below). Pack the handle with fine bronze wool and saturate with water before each use. This helps to eliminate flashbacks. A 1/4" ID clear vinyl hose works well for a small HHO welder. Vinyl hose is inexpensive, any condensate is visible, and they are flexible and strong enough for HHO applications.

NOTE: Mixtures of hydrogen and oxygen are explosive and should never be stored.

HHO Welding System Torch Handle & Tip



Uses 3/8" Hose

All Captions Include:
Component Description,
Home Depot #, & Price.

1/4" Brass Full Port Ball Valve
#172-264 \$7.40

1/4" Barb | 1/4" FIP
#545-058 \$2.10

Thread This End >>>
Metric 6-1 Tap
#623-109 \$6.98

.025 Mig Contact Tip
#344-713 \$7.77
(Quantity 10)

1/4" FIP Brass Pipe Nipple x 3"
#552-070 \$4.47

1/4" MIP | 3/8" Barb
#558-699 \$2.37

Flash Back Suppression Not Shown:
Stuff 1/4" Pipe Nipple with Fine Bronze Wool
McMaster-Carr #7364T71 \$4.12

Also:
Assemble with
Teflon Tape

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 & 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 email payment to: americanhydrogenassociation@gmail.com through www.PayPal.com

Join the AHA and use our services to learn how every community can achieve sustainable
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 bikesintl@netzero.com.