Hydrogen Today

Inside H2 Today

'We Deliver Clean Air'

Show Me the Hydrogen

Field Trip Report
Hydrogen From Water
Phillips Company – Catalytic Carbon Reaction with Scrap Aluminum

During the first week of April 2013, a small group of engineers and business men arranged a two day meeting at the invitation of the non-profit Phillips Company, an Oklahoma FDA registered pharmaceutical manufacturing company. The primary purpose of the conference was "...to host a meeting where engineers and hardware designers can meet with political, business, academia, energy sector specialists and professionals in a collective meeting to observe, discuss, and analyze Phillips Company's energy efficient, scalable Hydrogen-On-Demand process destined for commercialization."

The participants in the conference represented a wide range of technical and business experience including engineering, sales and business professionals, chemical engineering and experienced process mechanical technicians. The informal social discussions after the presentation of the basic chemical process provided the best forum for questions and long term perspectives on how the Phillips process can be commercialized with the development of the needed process mechanical and electrical equipment. (continued on page 2)

"Quotations"

"All that is necessary for the triumph of evil is that good men do nothing." Edmund Burke, Irish statesman (d.1797)

"We chose to go to the moon in this decade, not because it was easy, but because it was hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone and one which we intend to win." John F. Kennedy (1962)

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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.

Field Trip Report

(continued from page 1)

From my notes during the meetings I learned:

- All chemical reactions can be increased in reaction by adding heat or catalyst
- The recommended operating temperature is about 180ºF. One experienced user who attended the conference reported that his results showed that the best temperature for the Phillips patent pending catalytic process = 177º F.
- Phillip's Catalytic Carbon will reduce the activation energy of the process
- Dirty water is okay however testing is currently underway to determine the full effect of chlorinated water on the reaction process.
- The quality of the aluminum grind will affect the productivity of the process—it is ideal when that most of the aluminum particles are 200 micron grind.
- The ideal reaction process will generate 93 % H2 and 7 % water vapor
- Aluminum hydroxide will be the byproduct of the process. The commercialized process will have to address the economic use and disposal applications.
- Variables that affect the reaction process
  * Temperature
  * Grind quality of the scrap aluminum
  * Lead electrodes in the reaction chamber to introduce small power to reduce clumping of the aluminum powder in the reaction chamber
  * Rate of adding water
  * Continuous operation vs. batch operation
  * Agitation of the reaction chamber
  * Design of the reaction chamber to safely contain the hydrogen @ Standard Temperature and Pressure
  * Possible introduction of Potassium Hydroxide into the process

- While the process has been documented in laboratory testing, there is substantial opportunity for the design of commercial equipment that will validate the economics in the market place.
- The meeting participants discussed potential commercial applications
    - Hydrogen to fuel ships is promising because the process works well for producing hydrogen from sea water.
    - Electric power generators on islands or in remote locations where water is plentiful
    - Stationary solar / hydrogen Energy Stations – providing electrical power and heat for "Mini-Grid" residential and small commercial developments.
    - Boost power for internal combustion gasoline and diesel engines.

Dr. Howard Phillips has years of practical engineering skills and enjoys building his own testing equipment as illustrated by the attached photos.

Dr. Phillips with his catalytic carbon hydrogen on demand reaction equipment attached to his Lincoln Continental.

Dr. Phillips with his collection of experimental testing equipment

The conference meeting has motivated me to prepare to further analyze the commercial and economic potential of the Phillips process with the following design criteria:

- Prepare an Excel spreadsheet simulation study that can be used to study the economic variables for a Stationary Energy Pac operating continuously and the hydrogen is generated and used on demand studying the natural temperature zones, time of year, consumption of KWHs based on number of users.
- Establish the design criteria for "Micro Grids", where the Energy Pac will deliver hydrogen gas for heating on demand & electrical power from fuel cells to no more than 100 end users in the micro grid.
- Work with other engineers to assist with the construction and testing of applicable reaction chambers.
- Document the full life cycle of the process to validate the potential economics using the existing test data.

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Hydrogen on the Internet

Kids 4 Hydrogen in California is recruiting 55,000 people to notify manufacturers that they're ready to buy a fuel cell car in 2015. Check out their two hour tour of Mike Strizki's Hydrogen House in New Jersey.
http://kids4hydrogen.org/

R.Q. Riley's 125 MPG XR3 diesel hybrid going into production.
http://jalopnik.com/5291013/125-mpg-diesel+electric-three+wheeled-car-headed-for-production

Combusting methane (CH_4), the main component of natural gas and landfill gas, is relatively cleaner than burning petroleum, but it still emits CO_2. Researchers at the Karlsruhe Institute of Technology in southwest Germany separate methane into hydrogen and carbon by bubbling it through liquid metal.
http://phys.org/news/2013-04-hydrogen-methane-co2-emissions.html

United Nations study says 3.3 million people die every year from air pollution; one million being children under age five who die from pneumonia. Think about it next time you fill 'er up.
http://inhabitat.com/un-says-air-pollution-kills-more-people-than-aids-and-malaria-combined-clean-energy-could-halve-death-toll/

Hydrogenics (Canada) will build a 1 megawatt renewable energy to hydrogen storage system. Hydrogen produced by the world's largest electrolyzer will be stored in the natural gas infrastructure.
http://www.hydrogenics.com/invest/News_Details.asp?RELEASEID=754920

Ballard will manufacture fuel cells for Volkswagen.
http://www.cantechletter.com/2013/03/ballard-power-goes-back-to-the-future-with-vw-fuel-cell-deal0307/

Ford, Daimler and Nissan commit to affordable fuel cell vehicles by 2017.
http://www.technologyreview.com/view/510416/ford-daimler-and-nissan-commit-to-fuel-cells/

Members of the AHA Silicon Valley chapter examine the prototype Hysolgenics EL-5000 solar electrolyzer. It will produce 117 $ft.^3$ per hour of 60 PSI hydrogen at 80 % efficiency.
http://hysolgenics.com/

Editorial

We participated in several Earth Day events this month. We demonstrated a working solar electrolyzer and a solar Stirling engine. A few students would walk by with headphones on, oblivious. But what a joy to meet others with their faces full of enthusiasm and curiosity. They make it plain what they want. They want to DO things. They want to create and wouldn't it be great if they could get paid for it.

Global warming or not, the news is constantly full of hurricanes, blizzards, floods and wildfires. Something not in the news is how hospitals, police stations and businesses keep running on fuel cell power when the electric lines go down and the backup generators run out of diesel after a couple days. Fuel cells run on natural gas delivered by underground pipelines, unfazed by wind, rain or three feet of snow.

A Russian proverb says, "If you chase two rabbits, you will not catch either one." We feel like a kid in a candy store sometimes. There are so many fascinating hydrogen projects, that we can't make up our mind. It's time now to make the call. We know our mission is Education & Develop Hydrogen Technologies, but who do we educate? How do we educate? How do we pay for research? The Board of Directors is now working on the AHA Grand Purpose. Please help by letting us know what the AHA can do for you. Thanks americanhydrogenassociation@gmail.com or 480-234-5070

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 Clean Transportation ACT Expo, 24-27, June, Washington, D.C. ($575) Find out what the big fleets, manufacturers, Shell and clean city coalitions are doing with electrics, natural gas & propane, hydrogen and biodiesel. http://actexpo.com/index.html

(Zing) Hydrogen and Fuel Cells Conference 2013, 12-15 July 2013, Napa Valley, CA ($1300) Five themes- Hydrogen Production, Hydrogen Storage, Fuel Cell R&D, Hydrogen Applications and Hydrogen Safety. http://www.zingconferences.com/index.cfm?page=conference&intConferenceID=109

Alternative Energy Expo, 12-14 December, 2013, Las Vegas. http://www.alternativeenergyexpos.com/#

Get your passport for:

Hydrail 2013, 11-12 June, 2013, Toronto, Canada. Eighth international conference on hydrogen locomotives. Eliminate diesel pollution and overhead power lines maintenance. http://hydrail.org/

Hydrogen Events (continued)

Hydrogen + Fuel Cells 2013, 16-19 June, 2013, Vancouver, Canada ($1025, $375 for students) Theme is "Power, Transportation & Energy Storage." Tour Ballard, Mercedes fuel cell factory, hydrogen bus fleet facility and more. http://www.hfc2013.com

5th International Conference on Hydrogen Safety (ICHS 2013) 9-11 September 2013, Brussels, Belgium. With the coming of fuel cell cars, hydrogen is moving out of labs and factories into the hands of the public. Users will need to be educated on hydrogen safety. Some of the themes are hydrogen infrastructure, codes, accidents review, safe storage, risk management and fuel cell safety. http://www.ichs2013.com

5th World Hydrogen Technologies Conference, 25-28 September, 2013, Shanghai, China ($600) Theme is "Hydrogen Cooling the Earth." http://www.whtc2013.com

Books & Publications

The Electrolysis of Water: Processes and Applications, Viktor Englehardt, 1904
Various republishers, 140 pages.

What can an Austrian book published in 1904 possibly have to say to us a century later? Well, plenty. The author details about 20 apparatuses for generating either straight hydrogen or "detonating gas," a colorful name for HHO. The book will help you understand how electrolyzers work and give you ideas for constructing your own with modern materials. Hydrogen costs are given for a few of the designs. A year's labor was $625. Where did they get the electricity to run the electrolyzers? Mostly from coal-fired steam generators. There is a simple test for determining if your hydrogen is contaminated with O2.

Rocket Mass Heaters: Super Efficient Woodstoves You Can Build, Evans & Jackson, 2007
Cob Cottage Co., $18, 100 pages.

Two unique features set a rocket mass heater apart from traditional wood-burning stoves. First, it burns at a higher temperature, acting like a gasifier, which more completely combusts your hydrocarbon fuel into heat instead of pollutants like smoke, tar, soot and ash.

Second, the flue is surrounded by a thermal mass that absorbs the majority of heat produced instead of allowing the heat to be drawn out the chimney. This drastically reduces your wood consumption and wood-splitting chores.

The rocket heater isn't designed to heat 2,000 square feet, but the thermal mass can keep your butt warm for two days after the fire's out. The author's preferred mass is cob- a composite of clay, sand and

straw. You can build a rocket heater for about $100 worth of second-hand materials such as steel barrels, bricks and insulation. The book has instructions, drawings and photos for building your own heater, but some details have been left out. If you need a step-by-step cookbook or if you don't know what carbon monoxide will do to you, then this book is not for you. The book briefly mentions cooking and heating water.

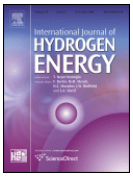
At first, I thought it was called a rocket stove because of the long metal tubes, but someone mentioned it made a gentle roar in operation like a rocket in flight.

The Island President, (DVD), John Shenk, director, 2011
First Run Features, 101 minutes

The Maldives is an island nation of 300,000 people in the Indian Ocean. A predicted seal level rise of two feet by 2100 will submerge their country, which has an average elevation of only four feet. Follow young President Mohamed Nasheed as he pleads to the United Nations and the Copenhagen Climate Change Summit to reduce CO_2 emissions. They are already facing trouble. Fishing is declining, ground water is getting salty and they're spending health and education money on concrete seawalls to prevent shoreline erosion.

Hydrogen Technologies Code (NFPA 2), Martin Gresho et al, 2011 Edition..
National Fire Protection Association, $52, 197 pages.

You may not care much about stuffy rules regarding ventilation rates, No Smoking signs and flame detectors, but when something goes wrong, the authorities and the jury are going to be very interested in how well you understood and complied with NFPA 2.



International Journal of Hydrogen Energy, Nejat Veziroglu, ed,
International Association for Hydrogen Energy, subscription-$175 per year.

Dozens of articles biweekly on the latest hydrogen research. Covers electrolyzers, photochemistry, bio hydrogen, catalysts, fuel cells, hydrogen infrastructure, I.C. engines and storage. See who's going to discover the magic catalyst that turn water into hydrogen for 25¢/GGE. http://www.iahe.org/

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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H2 University

HHO Safety

By Russell Philips

Water can be split with electricity to create burnable gaseous fuel. Electrolyzer cells split water into H2 gas & O2 gas. The two types of electrolyzers are: hydrogen separation cells and HHO cells. Separation cells, or splitter cells, create and separate H2 gas from O2 gas. Pure H2 (or O2) is generally collected into pressurized tanks for safe storage. HHO cells allow both gasses to bubble out together as HHO. HHO is explosive if stored.

HHO Safety Rule #1: NEVER STORE HHO!

The first rule of HHO is: NEVER ALLOW HHO TO ACCUMULATE - especially under pressure. Storing HHO in tanks is never allowed. HHO can detonate inside sealed containers. Why? The hydrogen and oxygen is already mixed and ready to burn. Pure hydrogen requires oxygen from air to burn. Thus, pure hydrogen is quite safe in a tank. Please understand and remember that HHO is ready to burn! The burn rate of HHO is classified as explosive. NEVER STORE HHO! Immediately report any storage of HHO. It is never safe to store HHO.

HHO Safety Rule #2: STRONG IS SAFE!

By design, count on detonations. When working with HHO, build devices with the strength to handle the explosive detonations of HHO. If the HHO volumes are small enough, STRENGTH IS SAFETY! Counting on detonations forces the required strength, by design. Ensuring detonation capable material strength leads to greater HHO safety. Strong is safe!

HHO Safety Rule #3: MINIMIZE HHO VOLUMES!

By counting on detonations, we will minimize the HHO accumulation volume areas. Please limit hose and piping to minimum diameters and length. Re-engineer systems to have smaller HHO accumulation areas in: electrolyzers, separators, reservoirs, & bubblers. Smaller HHO volumes increase safety. This is the most difficult aspect of HHO safety. Proper design and re-engineering minimizes HHO accumulation areas. Be safe! Minimize accumulation areas.

HHO Safety Rule #4: USE PRESSURE RELIEF VALVES!

Use self-sealing pressure relief valves in any HHO accumulation area other than hose and piping. Flashback arresters are good. Never rely upon flashback arrestors in place of pressure relief valves. If we count on detonations, we will build with pressure relief valves.

HHO Safety Rule #5: USE BUBBLERS!

Bubblers arrest flashbacks! Bubbling HHO into the bubbler bottom, up through water (electrolyzer or other fluid), and out through the top volume - provides a water barrier against the extreme flame front speed. Bubbler containers are required to handle detonations. Pressure relief valves are required. Container material strength is required. Flashes in a well engineered hydrogen-on-demand HHO system are unlikely. The source is usually from the direction of the engine, not the cell. Using a bubbler is a simple safety device that allows for and arrests this problem.

HHO Safety Rule #6: RESERVOIR BUBBLER WARNING!

An electrolyte reservoir can double as a separator and bubbler. Note that as electrolyte level lowers, HHO area increases. Automatic feeds can help to diminish this hazard. This is also true for bubblers and water level. Please be safe.

Thanks

Russ- HHO safety article & use of projector.

Al- Ride home after unauthorized use of Doug's car at AHA meeting.

Ralph- Locating sites for AHA Headquarters.

Jon- Carpooled with his Prius to HQ sites, ethanol plant and test track in Maricopa.

Ken- Meetings with property sellers.

John- EL-5000 photos

Brian & Thomas- Arranging Earth Day event at Scottsdale Community College

Mark- Arranging Earth Day event at Glendale Community College

Roy- Magnificent $$$$$ donations

Claude- Restoring tough-dog handicapped van to service

Rob- Video production lessons

Frank- Link to phys.org

Mada Medical- Mailed one O-ring needed instead of charging $29 for a box.

Jim- Catalytic Carbon report

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" - $6.95 postpaid

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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.