



Word in the Square Conversation Monitoring and Analysis Report



Prepared for the Hydrogen Education Foundation
December 10, 2007

Overview

The Word in the Square Report summarizes online discussions about hydrogen within the context of alternative energy, environment, technology and sustainability. This report focuses on the online discussions for the month of November 2007.

The report is divided into five categories:

- Key Findings – provides key insight of the major topics of conversation
- Conversation Indexes – gives statistical information about conversations within blogs, forums/message boards and newsgroups
- Breakdown of Coverage – expands on the statistics provided in the conversational index, what are the key blogs and forums, and the sampling of coverage within blogs and forums
 - Blogs – are divided by subject based on our four pillars of 1) Alternative Energy, 2) Environment, 3) Technology, and 4) Infrastructure and Sustainability
 - Forums – show where the conversation began followed by sampled responses showing how conversations evolved
- Key Takeaways and Implications – Based on blogosphere conversations, key takeaways and implications provides insight as to what are the issues that need greater attention and how conversations could impact our program and the hydrogen industry
- Proposed Next Steps – details suggestions of what actions to take and program adjustments to consider

KEY FINDINGS

- Key topics that emerged in online conversations this month:
 - Honda's announcement regarding the launch of the FCX Clarity in summer 2008 and the development of the home energy system
 - Research findings from Bruce Logan at Penn State University that discovered a method to produce hydrogen from bacteria
 - Discussions around ethanol surfaced labeling the development of the alternative fuel as a "farce". Hydrogen entered the conversation within the framework of discussions around other alternative fuels and energy
 - The Los Angeles auto show sparked much debate about emerging car technologies from GM, Honda, BMW and others.
 - Debate between the electric and hydrogen cars emerged about what technology is better and preferable
- Forums continue to dominate the debate around hydrogen and alternative energy. However, November increased in the number of blogger conversations
- Fluctuating energy costs continues to draw more individuals into the conversation about alternative energy and technologies

CONVERSATION INDEX

Conversations about Hydrogen* November 2007	
Blog Postings	1807
Message Board Posts	2038
Newsgroup Posts	1065

Conversations about hydrogen and hype November 2007	
Blog Postings	45
Message Board Posts	40
Newsgroup Posts	19

Conversations about "universal fuel" November 2007	
Blog Postings	3
Message Board Posts	6
Newsgroup Posts	0

Conversations about "National Hydrogen Association" November 2007	
Blog Postings	3
Message Board Posts	0
Newsgroup Posts	0

**Keyword search: hydrogen and fuel cells, searched within subjects such as alternative energy, environment, sustainability, economy, and science*

Key Takeaways and Implications:

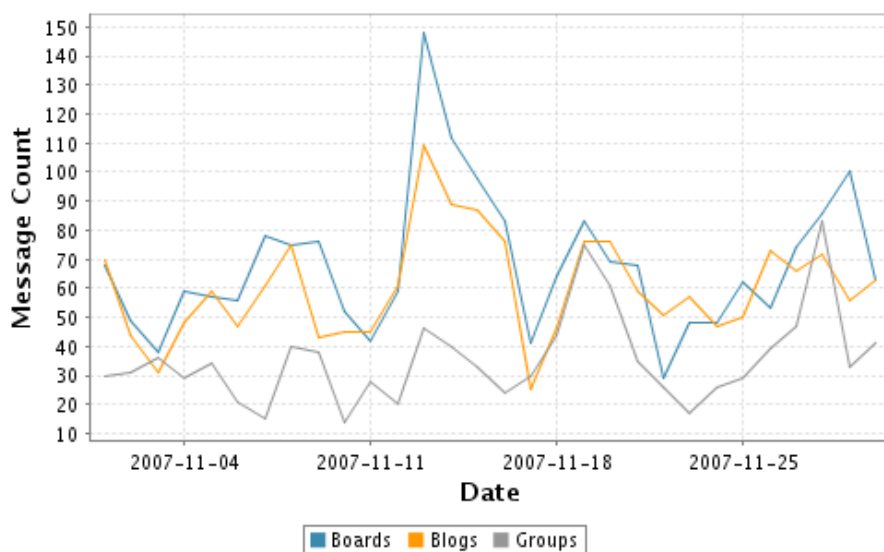
- Online conversations about hydrogen are expanding as new scientific finds are released and hydrogen applications are introduced – and H2 and You program begins to make an impact
- As ethanol continues to lose support and sparks controversy, H2 and You should educate bloggers that no single alternative will cure our energy needs. Emphasize that hydrogen can come from ethanol as well as other biofuels
- The debate between hydrogen and electric vehicles offers the opportunity to educate bloggers that the hydrogen fuel cell cars are in fact electric cars. Instead of selecting one technology, adopting both technologies is key to improving our environmental outlook
- With the announcement from Ballard and Plug Power, there is opportunity to expand the conversation about fuel cells as a proven clean technology that can improve our environmental outlook by reducing carbon emissions

Proposed Next Steps:

- Upon the launch of the H2 and You website, direct traffic to the website to improve hydrogen and fuel cell education
- Consider inviting prominent bloggers to NHA's national convention
- Utilize member case studies as content to continue to educate and validate hydrogen technologies in key blogs and forums
- Continue weekly blog tracking and respond accordingly, applying key learnings contained in the above report.

BREAKDOWN OF COVERAGE

The following chart shows the total volume of blog, message board, and newsgroup posts that include topics about hydrogen and fuel cells for November 2007:



Conversations including hydrogen and fuel cells in blogs averaged approximately 60 posts per day, reflecting an increase from the October average of about 43 posts per day. The period from August to October 2007 averaged about 39 posts per day.

The boost in online conversations was triggered by several announcements surrounding energy. Hydrogen was not necessarily the key topic. Hydrogen emerged in the broader context of various conversations.

- On November 13, the spike in message boards was caused by the announcement from Bruce Logan and the Penn State research team discovering a new method to produce hydrogen
- On November 19, conversations revolved around several topics such as the announcement from Google investing in renewable energy and Hillary Clinton's energy policy proposal

The following blogs were the most active including discussions about hydrogen and fuel cells for the Month of November:

- Green Car Congress (www.greencarcongress.com)

- The Oil Drum (www.theoil Drum.com)
- Greenie Watch (<http://antigreen.blogspot.com>)
- Jalopnik (<http://jalopnik.com/>)
- Peak Energy (<http://peakenergy.blogspot.com>)

From November 2007 the following message boards were the most active including discussions about hydrogen and fuel cells.

- forums.anandtech.com
- www.peakoil.com
- www.physicsforums.com
- forum.physorg.com

Sampling of Recent Conversation – Blogs

Alternative Energy

Hydrogen is being talked about as an alternative fuel source which requires pressurized hydrogen, and hydrogen gas stations. But it's costly and it's dangerous according to the publicity! This is a ploy, so they can charge more for it at the pumps and raise the cost of the auto. Look at the cost of the Hybrids. Hydrogen factories pollute the environment and spoil the ecological advantage of hydrogen cars. The possible alternative is simple - "HYDROGEN-ON-DEMAND". Simply put, convert H₂O (yes water!) to gas when you need it. No expensive factories, no expensive storage tanks, no expensive gas stations, no profits for the oil companies, no high cost to the auto industry, no lobbyist contributions.

Corn is not a Green Solution to our Energy Crisis: It's energy density is approximately 1/3 less than regular gasoline. This means that you need to burn much more to generate the same level of power. [...]

At that point, I think it will be those with truly innovative ideas (i.e., recycling human waste, harnessing solar energy and hydrogen, using non-edible organisms to build fuel, fuel cells, etc.) who begin cashing in, and justifiably so, on our need for alternative energy.

<http://www.outcasttrader.com/blog/2007/11/corn-for-biofuel-is-bad-deal.html>

In sum, the ethanol picture is complex. It is an alternative for now, in competition with electric and hydrogen fuel cell to power our vehicles. The eco-footprint argument for ethanol is still murky and will probably remain contentious for the next few years.

http://askpatty.typepad.com/ask_patty_/2007/11/a-murky-ethanol.html

I've always been skeptical of the true value of running a vehicle on ethanol. I feel that the next great propulsive fuel must have a net energy content greater than gasoline. **Scientifically, this means that the energy content of a given amount of future fuel must be greater than gasoline. Currently, I believe the prime candidate for this is hydrogen.**

<http://www.thecornerofficeblog.com/2007/11/26/the-ethanol-farce/>

Environment and Climate

Hydrogen is a combustible gas that can be separated from Oxygen in water through positive and electric currents. A great contribution to this method is that it emits Oxygen instead of greenhouse gases. Sounds pretty good to me. Maybe there are more solutions to our Global Warming issue in the future. And we will not see the effects of that problem in our lifetime.

<http://1issue.blogspot.com/2007/11/renewable-energy.html>

Note: The post is a response from US Senator John Cornyn sent to the blogger in response to the concern of rising energy costs.

Likewise, the Energy Policy Act of 2005 mandated the development of more fuel-efficient vehicles, among them hybrids and hydrogen powered vehicles, to combat consumption. These changes are welcome and will positively affect the resources available to us and the ways that we power our homes and automobiles.

In addressing these needs, it is important to note that increasing domestic energy production and preserving the environment are not mutually exclusive. As more advanced technologies enter the market, we can expect positive changes in the way we produce energy. One federal program showcasing new technology is FutureGen—a next-generation coal power plant that would generate electricity and hydrogen from coal with zero emissions. Texas is currently competing in a national competition to host the FutureGen plant. As the largest coal user in the country and the fifth-largest coal producer, Texas would benefit greatly from the development of FutureGen technology.

http://had-enuff.net/index.php?blog=2&title=seeking_support_for_strong_fuel_economy_&more=1&c=1&tb=1&pb=1

Science and Technology

Honda is bringing a hydrogen fuel cell-powered sedan to market, and it's not some exotic-looking techmobile, but rather a stylish sedan that just happens to not run on a single drip of fossil fuel. It's called the Honda FCX Clarity, and it just may be a game-changer in the automotive industry.

On top of its fuel-cell power plant, Honda also is develop a solar-powered hydrogen generator for the Clarity so that filling up the tank will itself be powered by clean, renewable energy.

<http://ecotality.com/life/2007/11/21/i-can-see-clearly-now-i-want-this-honda-fuel-cell-car/>

Two of the types of vehicles that tend to get a lot of press are the hydrogen fuel cell powered vehicles and electric powered vehicles. Both are lauded as the way of the future.

But which of these two options are really has the better chance of being the car your children drive.

<http://green-wheels.blogspot.com/2007/11/comparing-hydrogen-powered-cars-to.html>

According to these comments by a fuel cell expert, hydrogen cars make a lot less sense than electric cars, for several reasons. Hydrogen is difficult to store. For safety reasons, hydrogen must be allowed to evaporate, so that a hydrogen car sitting in the driveway is constantly losing fuel. Hydrogen is created by using electricity to split water, and then a fuel cell is used to recombine hydrogen to water again and get electricity, so there are two wasteful conversion steps that throw energy away.

<http://willware.blogspot.com/2007/08/electric-cars-are-better-than-hydrogen.html>

Nokia is marking a new direction in cell phone technologies, testing wireless mobile phone headsets powered by tiny fuel cells – a hydrogen-based energy source, which can increase the life of portable devices. The cells are recharged by squirting methanol from a small container into a tiny internal tank on the headset, and each charge provides about 10 hours of talk-time. Motorola, Fujitsu and Toshiba are also investing heavily in the research, mostly for batteries for laptop computers.

<http://techwireless.wordpress.com/2007/11/30/nokia-plans-cellphone-of-future/>

The researchers are trying to understand how bacteria that help termites digest wood and other plants release the hydrogen that's trapped in the material.

[...]

For example, he says, biotech engineers could mass-produce the tiny microbes for hydrogen production on an industrial scale.

The hydrogen could then power hydrogen fuel cells, a type of battery that emits only water.

But reaching large-scale production, Leadbetter cautioned, "is a pretty tall order." It would depend on how well the research is funded and how it progresses over the coming years, he said.

<http://www.sustainableenergyblog.org/posts/2007/12/01/termite-power-can-pests-guts-create-new-fuel/>

The University of Massachusetts Amherst will create a new research center focused on hydrogen fuel cell science, supported by an initial three-year, \$1.5 million grant from the National Science Foundation (NSF) to the Fueling the Future Chemical Bonding Center (CBC). The center is one of only three in the nation funded through the NSF's chemistry program that focuses on renewable energy. [...]

In theory, as long as there is hydrogen flowing in one end and oxygen in the other, a fuel cell will generate clean electricity. But scientists are still addressing the finer points of fuel-cell efficiency. One stumbling block has been how to best transport hydrogen's positively charged protons—and only the protons—across the special membrane that divides the cell. Investigating this proton transfer is the charge of the new center.

<http://www.greencarcongress.com/2007/11/umass-amherst-t.html>

Security, Economy and Sustainability

Should corn-based ethanol lose its status as the technological cure for our energy and climate change woes, it could fall pretty hard. Heard much from hydrogen lately? In 2003, Bush proposed spending \$1.2 billion to fund research in Hydrogen. In 2004, California's Governor Schwarzenegger announced:

"I am going to encourage the building of a hydrogen highway to take us to the environmental future... I intend to show the world that economic growth and the environment can coexist. And if you want to see it, then come to California...."

And senate bill 1505, signed in early 2007, turned this vision into a statute. Hydrogen has since lost much of its luster, along with much of its research funding...perhaps when politicians realized that ethanol promised to cure the same woes while also appealing to the Iowa primary voters. But that's another story.

Sampling of Recent Conversation – Forums/Message Boards

Original Post: CHICAGO (AFP) - US researchers have developed a method of producing hydrogen gas from biodegradable organic material, potentially providing an abundant source of this clean-burning fuel, according to a study released Monday.

The technology offers a way to cheaply and efficiently generate hydrogen gas from readily available and renewable biomass such as cellulose or glucose, and could be used for powering vehicles, making fertilizer and treating drinking water.

Numerous public transportation systems are moving toward hydrogen-powered engines as an alternative to gasoline, but most hydrogen today is generated from nonrenewable fossil fuels such as natural gas.

<http://www.neogaf.com/forum/showthread.php?s=d3df48bf1d4209a6aa987cda5f04c4e7&p=8588058#post8588058>

Response

- 1) Hydrogen fuel cells aren't sources of energy in themselves. They're conduits and require an outside source of energy.

- 2) Ok so hydrogen is sorted, where are we gonna get the catalyst required for all these fuel cells (ie platinum)?
- 3) The "fuel cell" they are talking about in the article is very different from the one on the howstuffworks. The one on howstuffworks is a fuel cell that generates electricity through hydrogenation of water (or, on the other hand, generating hydrogen gas from running electricity through the fuel cell and converting H₂O to H₂.)
The "fuel cell" they are talking about in the article is aimed PURELY towards the production of H₂ gas from organic materials(acetic acid in this case); thus, you don't need any Pt or Pd catalyst since you aren't worried about hydrogenating oxygen to produce water, you're only producing hydrogen gas(or ethanol, if they decide that is a more viable fuel).
- 4) The fuel cell tech isn't even that important really, you can build a hydrogen ICE car today.
The problem with hydrogen is energy density, not any major technological hurdles. Simply put, the volume of fuel required to do the same amount of work is much larger than with gasoline (by about a factor of four, even considering liquid hydrogen, and the problems inherent in storing and transporting a -423 degree liquid should be obvious).
What we need is a way to get the energy, which is what this is. It gets the stored energy from the biomass and turns it into hydrogen.

Original Post: Say good-bye to gasoline! Check out the article and tell us what you think.

User posts link to following article:

<http://www.edmunds.com/insideline/do/Drives/FirstDrives/articleId=123662>

Forum Link: <http://townhall-talk.edmunds.com/direct/view/.f171e89/0>

Responses

- 1) **This new Honda looks great, but its not ready for the public. Hydrogen cars are generally regarded as a red herring...a novelty that allows the automakers and oil giants to keep up business as usual.**
Honda could market this vehicle in 2008 - just make it a plug-in hybrid. The 2007 Camry hybrid knocks out 40 mpg - I bet Honda could get an FCX plug-in hybrid past 60 mpg if they were willing to try.
The hydrogen cars and the hydrogen refill stations are at least 25 years away (if we consider them a replacement for gasoline vehicles.
- 2) this is just a show mobile , just to get an audience. This technology is not green. Hydrogen does not fall from the sky, but is produced in inefficient power stations that produce the same soot as ever,
- 3) **Honda has just produced the car of the future. Technologically this car is at least a decade ahead of any other car company in the planet.** I just roll with laughter and ennui when a huge hog like GM's creepy "new" hybrid gets the nod, while a car that the best engineers in NASA couldn't come up with gets the cold shoulder! BTW there is nothing new to GM's hybrid it is simply an adaptation of commuter bus technology that has been around for over a decade!
- 4) *There's no infrastructure for Hydrogen!*
Honda is not trying to replace the current gasoline infrastructure. Interviews with their engineers paint a picture where hydrogen, gas-electric hybrids, clean diesels, LNG, and other alternative fuels all have a place on the road. **In the case of hydrogen, Honda does not expect all the gas stations to switch over. They expect people to fill up at home using reformed natural gas. They have partnered with another company to build units for exactly that purpose.** The units serve dual purposes as they reform natural gas and also heat/power the home. Obviously, not everyone owns a home where they can do this. So, any talk about replacing the entire gasoline infrastructure is just plain silly.
Isn't hydrogen reformation dirty?

Yes, but not as dirty as burning coal or oil to make electricity or refining oil to make gasoline.

- 5) Back to chemistry..... $H_2O + \text{Electricity} \rightarrow H_2 + O_2$. **If the electricity is produced from non hydrocarbon sources solar, wind, hydrothermal, hydroelectric or nuclear CO2 emissions for the entire cycle are exactly ZERO.**

Original Post: Is ethanol a good alternative to gasoline? Yes – 692; No – 3049

Responses

- 1) The only current technology that can produce energy in adequate quantities to replace fossil fuels is nuclear power. If our goal is a speedy transition from gasoline, we should seek to find a way to transfer power generated by a nuclear plant into a portable form, even if it's not efficient. **Hydrogen fuel cells might be an answer - use nuclear power to extract hydrogen from water. This technology is reasonably close to viability.** Beyond this, our only hope is for a radical new technology such as nuclear fusion. There can be no reliable timetable for such a breakthrough.
- 2) This country is powered by Pork and ethanol is only part of it. Ethanol from corn is the worst way to appear to be doing something about energy. Ethanol corrodes engines and provides less energy.
Nuclear is the answer with making hydrogen at night for transportation with the excess capacity. We don't have near the worry about nuclear waste if we would reprocess, another area screwed up by politicians and Carter.
- 3) **Hydrogen is what we need to harness, store, and use, that is what part we burn from Diesel and Gasoline leaving Carbon behind to foul our engines.** Enough Hydrogen can be generated with a six volt D.C. Battery and tap water, over night to fuel a 200 HP engine for a thousand miles.