Don Lancaster's
Tech Musings

September, 2001

The feds have just moved into a second phase of privatizing all their surplus sales. Which tells us that just about all of DRMO surplus sales to end users will end around October of 2001.

Except for really weird stuff such as hazmat term sales, large scrap lots, or certified destruction items.

One of the reasons for privatization appears to have been the admin costs of something around $1.60 for every $1.00 in sales. Over and above their average selling price of a fraction of a cent of their original dollar cost.

Your tax dollars at work.

You just might still be able to visit *www.drms.com* to find out what if anything remains available.

Levy-Latham has recently merged into *Government Liquidation*. And are now your primary source for all mil surplus. Many hundreds of new categories will be offered. Including clothes, medical items, kitchen gear, vehicles, and computers.

Your good news here is that better photos, descriptions, and NSN search details are newly available. Better yet, site managers should end up friendly and more flexible.

Especially when answering queries, arranging pickups, or negotiating on unbid or unclaimed items.

Along with far fewer bureaucratic hassles. No more having to resubmit your end user agreement six times for an obsolete piece of commercial test gear that you didn't really want.

The bad news is that all of the new interest and convenience is certain to attract bunches of new bidders and raise prices. Especially on all of the Internet auctions with viewable bids.

All those 01-XXXX sales with their flat $50 delivery fee have apparently ended. No more buying a semiload of obsolete junk just to get the superb ATA cases for fifty bucks.

Government Liquidation seems to also get into rather bizarre non-mil stuff. Like those 8,734 stale pineapple upside-down cakes recently offered.

I often try to keep my bids around a quarter cent on the dollar and aim for a five percent success rate. If you hit on more than a few percent, you are paying too much. More tutorials and links on surplus buying are up at *www.tinaja.com/auct01.asp*.

The Water Powered Car That Refuses to Die

A bizarre collection of rude trolls, obviously "scientifically challenged" individuals, conspiracy nuts, ripped off investors in terminal denial and pathological pseudoscientists seem to be striving mightily to keep the myth of the water powered car alive.

Mostly in the *sci.energy.hydrogen* and the strange *alt.energy.hydrogen* Usenet newsgroups.

While there are several sources for these water powered car fantasies, a Stanley Meyer in particular claimed he created an alternate method for

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Properties of Water Electrolysis

(1) Electrolysis is best suited for on-demand apps where the value of the generated hydrogen greatly exceeds its energy value. Electrolysis is usually highly wasteful and wildly inappropriate when misapplied for bulk energy storage. It is virtually **never** used commercially for such purposes.

(2) Hydrogen produced by electrolysis is **only** an energy carrier. It is incapable of adding net BTU's of new energy to the on-the-books economy. By no stretch of the imagination can terrestral hydrogen **ever** be considered nonpolluting.

(3) The **net** energy required to dissociate hydrogen is independent of method.

(4) One electron needs added per hydrogen atom.

(5) Approximately two electron volts of energy are required.

(6) Because of a double integration, only the **Fourier** dc term of any fancy current waveform normally contributes significantly to electrolysis.

(7) An electrolysis cell is basically a highly **nonlinear rectifier** that can convert portions of ac input components into dc current terms that in turn produce a normal dc electrolysis.

(8) Electrolysis can be up to one sixth **endothermic** at certain lower generation levels. Thus, "stays cool" operation can be normal and expected. Applying too much voltage will cause thermoneutral or exothermic results, thus reducing efficiency.

(9) Because of the hydrogen overvoltage of iron, use of stainless steel electrode surfaces will usually cut efficiency by one half or more. Efficient cells normally require platinized platinum electrodes.

(10) It is exceptionally difficult to accurately measure the power of complex waveforms. The usual problems are confusing average and **rms measurements** or not knowing how to properly deal with **crest factors**.

(11) It is exceptionally difficult to accurately measure how much of the output gas stream is in fact pure and dry STP hydrogen. The usual contaminants are water vapor or oxygen. Applying higher voltges to an electrolysis cell can produce dielectric heating effects that produce predominantly water vapor.

(12) Competent researchers in many different fields continue to verify these observations in thousands of ways day in and day out. The experiments **have** been performed. Many times over. Examples include **EIS Electrochemical Impedance Spectroscopy**, **EDM** machining, and **Qprox** proximity sensors. Plus my own careful studies.

(13) The key measure of the unburdened efficiency of an electrolysis cell is the true watt hours in compared to the net volume of dry STP pure hydrogen gas produced. Claims made without this carefully and independently reproduced measurement are ludicrous and can be dismissed outright.

(14) Because of a fundamental thermodynamic property called **exergy**, the value of a kilowatt hour of electricity is vastly higher than the value of a kilowatt hour of stored hydrogen energy. Thus, for bulk energy apps, **electrolysis is exactly the same as converting two US Dollars into one Mexican peso.**

and finally…

(15) Faraday's Laws ain't broke.

Fig. 1 – NO EXCEPTIONS to all these fundamental hydrogen electrolysis properties have ever been found and credibly demonstrated.

QUADRATIC INTERPOLATION is a possible method of dramatically reducing the file size of stored table lookups. To work, the data has to be monotonic, well behaved, and only slowly changing.

Consider this series of **Magic Sinewave** data values…

[7948656 7940931 7933105 7925170 7917113 7908926 7900596 7892109 7883447 7874592 7865523]

The object of quadratic interpolation is to store only the first val(0) value in memory. Later calculating the others on an as needed basis.

Define a Δ increment and a δ increment change as follows…

$x(0) = val(0)$ from the table lookup

$$
\begin{aligned}
x(1) &= x(0) + \Delta \\
x(2) &= x(1) + \Delta + 1*\delta = val(0) + 2*\Delta + 1*\delta \\
x(3) &= x(2) + \Delta + 2*\delta = val(0) + 3*\Delta + 3*\delta \\
x(4) &= x(3) + \Delta + 3*\delta = val(0) + 4*\Delta + 6*\delta \\
x(5) &= x(4) + \Delta + 4*\delta = val(0) + 5*\Delta + 10*\delta \\
\\
x(6) &= x(5) + \Delta + 5*\delta = val(0) + 6*\Delta + 15*\delta \\
x(7) &= x(6) + \Delta + 6*\delta = val(0) + 7*\Delta + 21*\delta \\
x(8) &= x(7) + \Delta + 7*\delta = val(0) + 8*\Delta + 28*\delta \\
x(9) &= x(8) + \Delta + 8*\delta = val(0) + 9*\Delta + 36*\delta \\
x(10) &= x(9) + \Delta + 9*\delta = val(0) + 10*\Delta + 45*\delta
\end{aligned}
$$

Use Δ and δ to exactly fit midpoint val(5) and endpoint val(10) by solving…

$$
\begin{aligned}
val(5) - val(0) &= 5*\Delta + 10*\delta \\
val(10) - val(0) &= 10*\Delta + 45*\delta
\end{aligned}
$$

… simultaneously to get…

$$
\begin{aligned}
\Delta &= (val(10) - val(0) - 4.5*(val(5) - val(0)))/12.5 \\
\delta &= (val(10) - val(0) - 2*(val(5) - val(0)))/25
\end{aligned}
$$

Or, for the above data $\Delta = -7651.97$ and $\delta = -146.964$. Using these values approximates the original sequence as…

[7948656 7941004 7933205 7925259 7917166 7908926 7900540 7892006 7883326 7874498 7865523]

… with errors that look like this…

[0 -73 -100 -89 -53 0 56 103 121 94 0]

In this case, the worst error is around twelve parts per million and around six PPM average. Note that the math changes wildly if you use fewer or more steps.

Matching other points instead of val(5) and val(10) may sometimes give an even better fit. val(-2), val(-1), val(11), and val(12) might also sometimes be useful.

Additional support at http://www.tinaja.com/magsn01.asp

Fig. 2 – SNEAKY QUADRATIC INTERPOLATION SCHEME can very much reduce the size of table lookup files.

making hydrogen from electricity.

One which was "nuclear and not chemical" and in which certain high voltage and low current audio drive pulses could generate hydrogen far more efficiently than a conventional dc electrolysis.

Through the usual claim of letting an alternator power an electricity-to-hydrogen generator that powered the engine that ran the alternator that…

"Real" scientists and engineers will immediately recognize this ploy as a **dynamic brake** that stops the car in less than its coasting distance.

These fantasy claims would appear to violate the thermodynamic laws, energy conservation, Faraday's laws, the nature of Fourier Series, hydrogen overvoltage properties, the concept of mathematical integration, the max power transfer theorem, and at least one fundamental current standard.

Besides not showing where all the electrons came from that are, by its very definition, required to dissociate hydrogen from water.

Since many investors were ripped off and several complained, a Judge Corzine from the Ohio judicial system

found a "gross and egregious fraud" and a "loose grip on reality".

Curiously, after several years, the trial transcripts do not yet exist since nobody to date has paid those admin costs to have them copied from the original courtroom tapes.

If there was the slightest credibility to the claims (or even the remotest hope for any appeal), I would expect somebody to have shown interest in acquiring the transcripts.

Meyer subsequently died. Lots of conspiracy nuts saw nefarious radio beam weapons in use. Giving vastly higher odds to an energy cartel hit than to several someone's who just had their life savings stolen.

The most probable explanation of what really came down was a highly inefficient approximation to ordinary dc electrolysis. With extra gas being generated as water vapor from some sort of dielectric heating.

Inefficiency seems guaranteed by the gross impedance mismatches, the indirect cell-as-rectifier conversion to dc components, and those inefficient electrode surface materials.

Although patents were issued, at least some competent engineers feel these are obviously errant hogwash.

Myself included.

Figure one shows us what I feel are all the fundamental characteristics of electrolysis. I know of no exceptions to **any** of these observations having been credibly verified.

Using the scientific method, your burden of proof will **always** lie with the claimant. **Extraordinary claims demand extraordinary evidence**.

Proponents who feel Meyer to be correct have two intelligent choices: They can accurately measure the true watthours input to dry STP hydrogen out and then have it independently and objectively verified.

Then publishing the results in a credible forum. Perhaps in Elsevier's **International Journal of Hydrogen Energy**. Or they can clog Aisle 14 at Wal-Mart with their product.

Either way works just fine.

I'll predict that accurate efficiency measurements will **never** get made. These are the **last** thing proponents want to see happen, as the odds are a zillion to one that they will end up conclusively and terminally proven to be clueless idiots. And many real

scientists or engineers would see no point whatsoever in wasting scads of time and energy on such an obviously futile endeavor.

More on this in *BASHPSEU.PDF*.

A useful starting point is Faraday himself. Review him in Great Books #45. Followed by a good electrochem book. Such as *these*.

Additional hydrogen resources can be found on our *Its A Gas* library.

Magic Sinewave
Table Compression

I've been doing quite a bit of work lately applying my *Steplocked Magic Sinewaves*. Which seem to be able to significantly improve the efficiency of power electronics.

At present, something like 26 bytes of data storage is typically needed per amplitude. While quite compact, for 100 steps, that is 2600 bytes. Which might tax the smaller *PIC Micros*.

Can anything get done to reduce these storage needs further?

The answer is a qualified maybe. A *quadratic interpolation* may work. Given a careful analysis and allowing very small rather than precisely zero harmonics. And somewhat fancier code during an amplitude change.

It turns out that the pulse spacings needed for successive amplitudes are sort of smooth but not precisely so. The exact zero odd harmonic values jitter at the sixth or seventh decimal place of a fifteen place result.

Here's a sting of numbers we can relate to the start of the widest pulse of integer amplitudes 80 through 90 for a seven pulse-per quadrant SL-28 best efficiency magic sinewave...

        7948656
        7940931
        7933105
        7925170
        7917113
        7908926
        7900596
        7892109
        7883447
        7874592
        7865523

You can find these values by using the *JavaScript Calculators* found on my website. For convenience in our analysis done here, we will ignore the "degrees" decimal point and truncate to seven place accuracy. Having done

so, the first differences would be...

        -7725
        -7826
        -7935
        -8057
        -8187
        -8330
        -8487
        -8662
        -8855

The numbers are clearly not evenly spaced, so a linear interpolation will not work. The differences get smaller as the amplitude goes up. Because of thicker pulses and earlier edges.

Take the second differences...

        -101
        -109
        -122
        -130
        -143
        -157
        -175
        -193

These do seem fairly uniform, so a second order interpolation might work. Our third difference does start to show us a some jitter ...

        -8
        -13
        -8
        -13
        -14
        -18
        -18

Which tells us a slower and more

complex cubic interpolation may not buy us much at all.

To approximate values 71 through 79, you add an increment each time that begins with your first difference and then gets larger or smaller by the average second difference for each new calculated value.

Math freaks will recognize this as adding a linear plus a quadratic term. For the rest of us, we are adding a small piece of a parabola to "correct" a linear approximation.

Figure two shows us how to find the first and second difference values starting with the 70, 75, and 80 (or any other start-mid-end) values. The results should be exact for these and approximate for the others.

We probably can get by with table lookup values for one-eighth of the amplitudes plus a first and second difference value for each interval. Or several hundred bytes total.

Saving us bunches of memory.

NEED HELP?

Phone or email all your US Tech Musings questions to:

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% JAVASCRIPT IE BOUNCY BRICKS
% ==================================

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% Linking welcome. Reposting expressly forbidden. Version 1.6

% This simple JavaScript code shows you how to color change menu selections on
% mouseover without any need for additional images or unique id's.

% The Bouncy Bricks work on current Internet Explorer versions. The selections
% present statically on Netscape 4. Earlier browsers may cause problems.

% Each menu selection is simply a cell in a table. The table color changes
% on mouseover. While preserving the overlaying text callout…

              <td bgcolor=#33CCCC
              onMouseOver="this.bg.color= #009999 "
              onMouseOut="this.bg.color= #33CCCC " >
              <A href=:www.link_url_goes_here.com>
              your link title goes here</A>

% This example darkens an aqua cell on mouseover. To brighten the cell, try an
% onMouseOver color of #66FFFF. onMouseDown and onMouseUp can also be used
% for special effects, such as "been there, done that". Note that a single quote
% gets used for a JavaScript quote within a quote.

% More examples in BOUNCY.PDF. Some JavaScript Books are found here.
% For InfoPack consulting: don@tinaja.com
```

Fig. 3 – JAVASCRIPT CODE to generate bouncy bricks.

We could also calculate (instead of store) every first difference. But that may not be time or code efficient.

We can see a worst case error here of twelve parts per million. Because the remaining error is somewhat of a sinusoid, you could fake a further correction. Say by storing one value in memory, and adding that value to results two, three, seven, and eight. And half of that value to results one, four, six, or nine. This would end up cleaner and faster than a cubic.

The same general scheme could be used to make trig lookup tables and such bunches smaller than you'd first suspect possible. Note that the math details change with your number of steps being approximated.

Additional custom consulting on these concepts is available per info at *www.tinaja.com/info01.asp*.

Bouncy Brick Secrets

If you've been viewing our newly upgraded *Guru's Lair* website using Internet Exploder, you've probably noticed our new *bouncy bricks* on all of our menu selections. These are clickable links that can change color when you mouse over them.

One older way to do this has been to create a separate image and unique name for each and every clicked and unclicked button. We looked at this stock *bouncy button* solution back in *MUSE151.PDF*.

But this quickly gets old when you want to have lots of selections. Not to mention totally fragmenting your downloads with zillions of individual images. Or making editing tricky.

Instead, you newly can change the background color of any table cell. Which is the secret to those bouncy bricks. All in one file that only needs a few dozen bytes per cell.

The JavaScript details appear in figure three. More code details are in *BOUNCY.PDF*.

Piezoelectric Books

I've gathered a few of the better books on piezoelectricity together for you as this month's resource sidebar.

Piezoelectricity is the capability of chosen crystals and new polymers to produce electricity whenever a stress is *changed* and vice versa.

These ac-only devices are used for microphones, speakers, actuators, sensors, and even for kiddies LED sneakers. But there are strict power, temperature, economic, and energy density limits to the technology.

We looked at the fundamentals back in *HACK63.PDF*.

New Tech Lit

One of the more interesting and lesser known semiconductor houses is *LSI/CSI*. They have all sorts of low cost chips for touch switches, power controls, and electronic locks. *Maxim* has a new MAX2206 power detector. *Maxim* and *Dallas* recently merged.

Would you like $10,000 cash for putting a few words into an email message? If so, be sure to check out *www.bountyquest.com* where they pay you for patent busting info. More on patent avoiding and busting on our *patents* library page.

Another new website of interest is *www.arXiv.org*. Where you will find lots of free e-prints on physics, math, and computer topics.

I've been doing a few interviews on personal computer history lately, so I thought it was past time to do a hysterical backgrounder. Sort of an unauthorized autobiography. Find it as our file *WAYWERE.PDF*. ❖

NAMES AND NUMBERS

Government Liquidators
6263 N Scottsdale Rd Ste 371
Scottsdale AZ 85250
(480) 367-1300
www.govliquidation.com

Intl Jnl Hydrogen Energy
Box 945
New York NY 10159
(212) 633-2730
www.elsevier.com

LSI/CSI
1235 Walt Whitman Rd
Melville NY 11747
(516) 271-0400
www.lsicsi.com

Maxim
120 San Gabriel Dr
Sunnyvale CA 94086
(800) 998-8800
www.maxim-ic.com

Microchip Technology
2355 W Chandler Blvd
Chandler AZ 85224
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www.microchip.com

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