UPDATING ABOUT THE GDPE CELL

Energy balance analysis

(Some explanations about the energy anomalies inside the cell)

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Abstract:

The electrolytic cell we've been studying - known better as its own acronym "GDPE cell"- does not show that energy gain we initially stated in a previous report of ours.
Our research team has now realized that some measurement mistakes were made, due to very high frequency energy fluctuations produced by the cell itself.
Vice versa, transmutations over the tungsten cathode still need to be verified as such anomalous matter is so far detected and confirmed throughout our experiments.

Description:

Unfortunately, totally due to logistic reasons, this research has been carried out few hours a week: the whole work could be simply sum up in a matter of some Saturdays and Sundays as well; as result, it lasted several months.
This document aims to disclose a very important consideration grown at the end of the previous summer (2008) and, since then, it's going to require a good deal of time to be solved with accuracy.

So far, investigations about the electrolytic cell followed different paths: measurements of energy anomalies (that is the optimum efficiency which, from its initial values very close to 1.2 – 1.4, is now settled to a value higher than 2) and the transmutations into the tungsten cathode which were soon detected since the early tests at the beginning of 2004.

While transmutations still remain singular phenomenon as they are very often confirmed by experience, the matter of energetic anomalies took a different turn.
Since both the instruments used for outgoing thermal energy reading and the ones adopted to read the incoming electric power have been tuned to their optimum accuracy, we got the

conclusion that the whole measurement test bench (we mean both the electrical and the calorimetric one) suffers intrinsic systemic errors which, to a deep analysis, does not allow to express a definite consideration about the real magnitude of the energy values involved. In a word, after a five-year experiment we fully realized that our measurement systems are not accurate and, as a consequence, all the measurements carried out so far cannot be used to provide any sort of datum about the existence of energy anomalies inherent to the phenomena, neither positive nor negative.

So, let's have a deep look at the measurement system weak points and to the relevant reasons.

Since the early months of 2004 (we won't mention the early experiments made at the end of summer 2003) we were fully aware that the cell itself showed its own electric characteristics establishing some very peculiar transient conditions. Measurements realized through a spectrum analyzer coupled with EMI antenna showed frequency bands hit at about 300 MHz with energy distributions up to some GHz.
The cell steady conditions (strongly affected by geometric, electric and chemical specifications) are caused by an effect very similar (but not exactly the same) to the well-known **Wehnelt** one.
Defining the GDPE cell as the evidence of Wehnelt effect is in practice a forced way to describe how it works; nevertheless it may be a practical fashion to outline it.
Towards the end of 1800, the well-known **Wehnelt electrochemical switch** was employed to make **Rumkhorff coils** working at higher dynamic regimes. And some aspects of the GDPE intermittent way of working are just connected to the speed of those regimes.
Something similar just happens into the GDPE cell. The sudden power cut caused by reiterated cathode polarizations due to gas streams as well as to heated vapours associated with pulsating regimes of electric arch into the electrolyte, leads to discontinuous current absorptions by the cell making the instantaneous electric power measurement extremely hard.

The instantaneous electric power applied to the cell is a very important parameter in order to estimate the presupposed cell efficiency. Another important parameter is the thermal energy absorbed by water which heats and leads to the electrolyte evaporation.
A very accurate measurement of these two parameters can lead to meet the GDPE energy efficiency. The instantaneous electric power can be easily time quadrate to the whole length of the experiment in order to get the energy value absorbed by the cell.

On the other hand, calories provided with the cell can be calculated by measuring the total amount of evaporated water as well as the cell heating during the total length of the test. The test has to last longer than 500 seconds in order to minimize any sort of measurement errors: usually, 1200 seconds may be the right test length. The ratio of these two energy values gives the energy efficiency or, if you like, the system efficiency.

Our efforts led us to the highest accuracy of both the measured entities (incoming and outgoing energy).

From a calorimetric point of view, all the measurements – carried out without a thermo stated cell – always lead to the reaching of the electrolyte boiling point. This phase transition circumstance imply errors on calorimetric measurements as, just because of plasma dynamics, it becomes harder to split the evaporated components from the atomized ones - that is the ones sprayed from plasma itself or dropped because of hydrolysis: that means that share lacks of accuracy.
At the same time, the calorimetric measurement system used in Caserta does not allow an instantaneous and accurate monitoring of the cell thermal behaviour but it gives the datum relevant to the outgoing thermal energy only through a line integral between maximum and minimum temperature levels added to the datum relevant to the evaporated electrolyte amount.
Besides, since we always worked with an "opened" cell (just to keep safety conditions which means that the cell itself has never been in an adiabatic state), some sort of inaccuracy – due to the heat exchange between electrolyte and the environment – still remains.
Due to the peculiarity of the plasma phenomena we couldn't perform any sort of system calibration using a warm up method different than plasma itself.
During the tests carried out at PROMETE of Naples - (2006/2007) the calorimetric measurement system was optimized providing the cell itself with a water cooling circuit. Such a system allowed us to carry out experiments where everything was constantly monitored and the cell never reached its boiling point.
Nevertheless, systemic errors due to a not-adiabatic system still remain.
As concerns the electrical measurements, since the early tests we did in Caserta (2003), we've always had 3 electric power meters simultaneously connected to the cell. Towards the end of 2005 we got a fourth instrument directly connected further down the cell.

Below, the instruments we used:

- VIP SYSTEM3: An Energy and three-phase power meter, that is an AC meter connected before of the rectifier (accuracy 1%). Measurements values got by that instrument take obviously into account of electrical losses suffered by both the chopper and the variac.
- PC Acquisition system: A computer getting the GDPE cell current and voltage values as well as other parameters. From those values, instantaneous power and

energy will be calculated. Besides, such a measurement is purely as an indication because of a very low sampling frequency value (1 Hz).

- Watt-hour meter (Italian Enel Standard) with aluminium plate just used for an overall measurement vs. time.
- Energy and electric power meter (PA2200; accuracy 0,1%) working both in AC and DC up to 500 KHz of frequency band.

The last device, has got two peculiar features concerning the energy measurement. First of all, as a DC working device, it can be easily connected to the cell input gate. In that case, power supply and variac and electric losses can be fully neglected.

Furthermore, it is also able to work with a 500 KHz frequency band. Such features made that instrument the reference one for most tests we performed since the beginning of 2006 on.

As concerns the instantaneous electric power measurement sampling of PROMETE cell (2006/2007) the acquisition rate has always been much lower than the one we had with PA2200 used in Caserta (500 KHz), that means less accuracy with a correct sampling of the typical discontinuous trend of electric current usually flowing through these cells.

Our efforts have always been focused to define what frequencies the energy inside the spectral range characterizing the trend of GDPE cell spread around.

Deep investigations carried out at the beginning of 2008 through a TEK2792 spectrum analyzer, and highly refined through the HP4195A, showed a very wide energy spectrum extremely dependent from power supply and changing with the geometry of electrodic system. Size of both the electrode and its cover, and the different power supply voltages could make the energy distribution frequency spectrum changing.

After spring 2008 we set up a new way to investigate called EPM (Energy Pulse Modulation) fully designed by our team and able to feed the GDPE cell with a pulsing voltage, providing it with tunable pulses up to a maximum of 80A@1000V.

All that just in order to estimate the cell behaviour with a pulsating regime.

Meanwhile this study has not been definitely completed yet but, thanks to it and to the early measurements carried out so far, we are at last able to state several important considerations about the electrical behaviour of the cell.

First of all the GDPE cell looks like a capacitive load and this behaviour defines its response to the power stress in a very peculiar way.

The analyzed conditions are characterised by energy transients – between power supply and electrolytic cell – working at very fast dynamics regimes.

In some cases power spectral distributions over 100MHz have been found (over 20% of average index).

Being these events quite stochastic and since power supply modifies the spectral distribution of the cell supply current, we can state that the power supply measurement can never be considered accurate.

Because of that unsteadiness and studying similar experiences about this matter, we believe we can firmly assert that the measurement of the electric power requested by the system was often wrong. And that happens just because of a very difficult sampling of the electric input variables due to a very unpredictable spectral range of the power absorbed by the cell itself.

The power meters now on sale are designed to work over well-fixed frequencies bands and, at any rate, extremely lower than 100 MHz.

So, most of instruments on sale seem to become useless as regards the real magnitude of absorption peaks invalidating the measurement correctness.

Having a deep look to the waveform of the current flowing through the cell (through a Lecroy 9320 oscilloscope) we can easily understand that the signal is made up of very high frequency harmonics fluctuating around a mean value oscillating in turn. Such fluctuation is detectable by the volt-amperemetric measurement instruments we used.

In order to get round such difficulties we are now carrying out some different kind of measurements that will save us, at last, from errors like the ones listed above.

That new measurement set up requires two cells arranged in series and provided with an external mechanism for heat dispersion just to avoid to take the electrolytes to their boiling points. The two glass cells, with the same maximum level (1000 ml) will be both filled with potassium carbonate electrolytic solution (0,2 m in 700 cc.).

The former cell hosts an adjustable resistor in order to heat the first electrolytic solution, while the latter hosts a pair of electrodes made up of a steel anode and a tungsten cathode.

It’s very important to underline that the circuit will be designed in order to have the adjustable resistor in series with the second cell power supply circuit. In that way the electrical behaviour of the current signal flowing through the cell hosting the electrolytic plasma, will be the same as the one flowing through the adjustable resistor.

From the outside a constant temperature water stream will touch on both the cells.

Well, in that way, if we switch the cells power supply on and calibrate both the resistor and the plasma so as to have the same voltage drop to their terminals, we’ll be able to state we are having two systems absorbing the same energy which we can make more accurate energetic considerations about than the ones made so far, no matter what the electric energy band distribution is.

In that case, in fact, the series electric connection guarantees the same current flowing through both the systems, while the voltage calibration shares out the power supply on both the loads.

For that reason, the calorimetric measurement will be simply a temperature measurement for both the electrolytes and every consideration will be based only on such a datum.

All that will give us more genuine information about the real importance of the cell energetic behaviour. Only after a set of accurately tuned measurements we will be able to approach with the real energetic behaviour of these cells.
Until then each result, that won't take into account the spectral distribution of electric signals, shall be considered inaccurate and not usable, neither as a positive result nor as a negative one.

Therefore, with a significant embarrassment we must admit we roughly estimated that energy surplus causing the energy anomaly that, perhaps, could even be disclosed as not existing.

Chances that the energetic anomaly could be revealed as inconsistent are increasing inside our team. This remark strengthen with data we have been analyzing: such data came out from some tests we've carried out for months using series cells.

Vice versa, we keep on noticing anomalous occurrences of chemical elements (initially absent) over the tungsten cathode. Therefore, we can confidently assert we aren't fully aware of the whole phenomena way of working at all: that means our experiments and examinations, about the several aspects of the GDPE cell, will surely continue.

Yours faithfully.

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