This is a follow-up to the feature story on the Correa Pulsed Abnormal Glow Discharge reactor in *Infinite Energy* #7. Because of time limitations, one patent and parts of another and a laboratory report by the Correas were published in that issue. The patents and report are informative, but require careful study to extract the data of most interest to readers of *Infinite Energy*. In preparing this article, the author had the benefit of several long conversations with Dr. Correa, access to the full text of three patents, and some recent data taken with digital instrumentation.

What the Correa Reactor Does

The Correa's reactor produces short, repetitive pulses of electrical energy of multi-kilowatt magnitude which can be utilized to drive electric motors and charge batteries. The energy released is tens to hundreds of times that needed to excite the reactor. Sustained self-operation has been demonstrated.

In the course of development work on X-ray tubes, the Correas noticed some anomalous behavior in glow discharges. Further experimentation and literature search disclosed that under certain conditions, large bursts of energy are released in cold cathode discharge tubes. The bulk of the patents are devoted to means for reliably producing and enhancing the energy release, plus circuits for extracting and utilizing the energy. There are extensive and detailed test data, as well as a theoretical discussion.

The Source of the Energy

There is no obvious source for the energy bursts observed. In one of the patents, the Correas state:

Any apparent imbalance in the electrical energy input to the system and withdrawn from the system by the its operator must be considered in the context of the entire continuum in which the system operates, within which it is anticipated that accepted principles of energy balance will be maintained.

In other words, the reactor is not a "perpetual motion" machine in a thermodynamically closed system—which is impossible. It is, rather, an "open" system, open to the active vacuum, aether, ZPF, or whatever name will be given to the energetic substrate of the universe. Dr. Harold Aspden has devoted many years to the development of an alternative physics which is relevant to the Correa's invention as well as other developments of interest to readers of *IE*.

The Essential Phenomenon

The Correa's reactor is simple: a partially evacuated tube with two or three electrodes, as shown in Figure 1. The cathode area is large—128 square cm in some test samples; the area of the anode and the probe are less important. Other electrode configurations, such as a cylindrical cathode with an axial anode, are possible. Electrode spacing from a few centimeters to 20 cm are useable.

Impressing several hundreds of volts between the anode and cathode sets up an electric field which will accelerate any stray electrons sufficiently to ionize gas molecules. Electrons, being negative, are attracted to the positively charged anode. The positive ions, are attracted to the negatively charge cathode, but being much heavier, move more slowly. Conventional discussions of the gas discharge phenomena focus on electron behavior. The phenomena in the Correa's reactor are much more complex and will be discussed below.

Limiting the current flow and allowing it to increase, while measuring the voltage across the reactor, produces the curve of Figure 2, which illustrates typical behavior of the cold cathode discharge as it is generally understood. In regions where the voltage increases with current, the reactor exhibits positive resistance and its operating condition is stable. In regions where the voltage decreases with increasing current, the reactor exhibits negative resistance and is unstable.

In the Normal Glow Discharge region, the cathode becomes covered by a glow which is characteristic of the gas in the tube. This glow is commonly seen in neon indicator and decorative lamps; in the decorative lamps the current is limited so the glow does not cover the cathode and it flickers unstably.

When the current is allowed to increase, the glow covers the cathode, and then has nowhere to go. The voltage increases rapidly and the pinch effect begins to concentrate the ion flow into a smaller region. What usually happens is that the ion bombardment causes local thermionic heating of the cathode, releasing a flood of electrons and the glow collapses into the Vacuum Arc Discharge region. This is seen in fluorescent lamps, advertising signs, and high intensity flood lamps.

The Correa's patents show how to avoid the arc discharge

Figure 1.

Figure 2.

and operate in the Abnormal Glow Discharge region, with currents in the range of 0.1-10 amperes. It is in the region from F to E that the Correas discovered the energy burst which is the foundation of their invention. With proper construction and operating conditions, the energy bursts are repetitive and selfextinguishing and the reactor is quiescent between bursts.

The Pulsed Abnormal Glow Discharge, PAGD:
Is There Anomalous Energy Production?

The Correas present several kinds of evidence. Tests made with the circuit of Figure 3 show that a PAGD reactor can charge batteries and run motors, using less energy from the exciting battery than is delivered to the loads.

There is, in addition, self-sustaining operation in which net energy is produced without external input.

PAGD Utilization

The PAGD energy burst is electrical, so means are necessary to set up the PAGD conditions and capture the burst energy for external utilization. The Correas have invented a number of electrical circuits of which Figure 3 is representative, being used in the tests documented below.

A stable source of DC to set up the PAGD is provided by the Drive Pack (DP) battery with terminals A1 (+) and A2 (-). The current flowing from the Drive Pack is limited by the resistor R1. Diodes D1 and D4 prevent current from flowing into the Drive Pack from the energy burst in the PAGD reactor. Capacitors C3 and C5 couple the energy burst to the load while preventing any continuous discharge of the drive Pack into the load. Diodes D2, D3, D5, D6 comprise a full wave rectifier which charges capacitors C7a, C7b. Diodes D7 and D8 allow current to flow only into the Charge Pack battery, CP.

An auxiliary circuit containing an AC motor can also be driven by the PAGD reactor by closing switch S4 and choosing appropriate values for R4, C4, C8. Patent ‘391 has extensive information on test results with motors.

The reactor can be operated as a diode, or as a triode by closing switch S2.

Dr. Correa has furnished the author with several oscillograms taken with high performance digital instrumentation since the patents were filed. Three of these have been scanned and carefully traced using CorelDraw and reproduced as Figures 4a - 4c. In these, Voltage In is across A1 and A2, and Current In is that going into A1. Similarly, Voltage Out is across E1, E2 and Current Out is into E2. The power curves were calculated for each sample from the raw data.

The sampling interval was 80 ms.

Essentially, the energy burst charges C7a and C7b, which then discharge into the Charge Pack. Capacitors C3 and C5 reach full charge in about 3.2 ms, which suggest that the peak energy in the burst is much higher than shown in Figure 4. When the reactor extinguishes at the end of 25 ms, charge stored in C7a and C7b transfers smoothly to the

CP. The values for Coulombs of charge transferred and Joules of energy were obtained by careful reading and graphical integration of the original plots, which are detailed enough to show the values for each of the samples.

Figure 4 clearly shows substantial over-unity performance. It also indicates the difficulties in study, documentation, and utilization of the PAGD phenomenon. The data of Figure 4 are for one specific set of conditions, with a pulse rate of 0.5 pps. For higher rates, the peak values are less.

One develops a burning curiosity about the voltage and current waveforms at the reactor itself, but these, alas, remain the proprietary information of the Correas.

Measurements in the ‘989 Patent

Without the present instrumentation, the energy bursts could be observed, but not directly measured. And for practical

Figure 3.

Figure 4.

utilization, sustained runs were necessary. The Correas used calibrated batteries for the Drive and Charge Packs. (Newman cited the extended performance of batteries driving his Energy Machines as a proof of the unusual characteristics of his developments. Newman used primary cells, introducing many uncertainties in evaluating his results.)

The Correas are well aware of the problems in measuring energy with batteries. The ‘989 patent contains an extensive discussion of four different strategies and their weaknesses, resulting in an experimental protocol which is illustrated in Figure 5. This illustration is a composite of scans of the patent illustrations, with some additions and changes to clarify the protocol.

Pre Charge: The Drive and Charge Packs consisting of 12 V, 6 Ah gel-cells, are each charged in a normal fashion. Full charge is taken as the point where the charge current drops to 25 ma. The Packs are are allowed to relax for a minimum period of 15 minutes, but extended for experimental convenience.

Pre-Run Charge: The batteries are charged again as before.

Pre-Run Discharge: The batteries are again partially discharged for over an hour, taking enough data points to establish each battery’s characteristic against its immediately previous calibration.

Test Run: During the test run, the Drive Pack will lose energy and the Charge Pack will gain energy. The batteries are allowed 15 minutes to relax from the stress of discharging or charging.

Post-Run Discharge: The load resistors are again connected and voltage readings taken until the batteries’ discharge characteristic tracks the previous calibration curve. It is then possible to estimate the energy lost by the Drive Pack and the energy gained by the Charge Pack, and calculate an efficiency as shown in Table 8 of the '989 patent. Figure 5 is based on Run 3 of that table, and the battery calibration curves of Figure 5a and 5c were taken the day before Run 3.

One difficulty with the above protocol is that the measure of the energy loss of the Drive Pack amounts to the difference between large numbers, and appears in the denominator of the efficiency calculation. The result is thus vulnerable to measurement errors.

The presentation of data in Figures 16 and 17 of the '989 patent has a number of difficulties, which become more apparent with careful examination. Indeed, sparing the reader that difficulty was the motive for reformatting the data as seen in Figure 5.

A compensation for the need for elaborate calibration procedure is that the measurements are all DC, with no uncertainties from power factor, phase, and rise time as seen in Figure 4.

"Videographic" Data

Figure 20 of the '989 patent shows battery power on a running sample basis. It is reproduced in simpler form as Figure 6.

Figure 5.

A bank of Beckman RMS multimeters were set up to measure the voltage across and current through each Pack. The meters were then photographed with a video camera. Played back in a stop frame mode, it was possible to read the meters and perform power calculations at 1/30 second intervals. In Figure 6, the points a the bottom, clumped into a irregular line, are the power input from the Drive Pack. The circles are power to the Charge Pack, and the black squares the calculated efficiency for each set of measurements.

The Beckman multimeters utilize a RMS module from Analog Devices. The module contains a precision full-wave rectifier and a logarithmic squaring circuit, followed by a low-pass filter for averaging. The instrument will indicate true RMS within a range of input waveforms.

The illustrated tests were for Run 6, and the waveform data, it is probable that the Beckman multimeters were not giving accurate readings because of the low duty cycle of the pulses. The errors would affect the input and output measurements in similar ways, so Figure 6 can be taken as an interesting illustration of another aspect of the over-unity performance of the PAGD reactor.

While there are a number of criticisms which could be made of one or another aspect of the protocols, a honest study of the patents will show a thorough awareness of the uncertainties in the use of batteries, and careful, systematic characterization of the batteries at hand.

Self-sustaining Operation

When discussing over-unity performance, endless measurement is no substitute for self-sustaining operation with no apparent external input. The Correas have achieved this with two PAGD reactors and a battery-swapping procedure. The circuit arrangement is given in the ‘989 patent, with a schematic summary in Figure 7.

The Charge Pack must always be at a lower voltage than the Drive Pack. Two center-tapped battery packs are used. The full pack is used to drive the reactors, each of which charges half of the second pack. The roles are then switched.

In one test cited in the patent, the battery swapping was continued for eight hours, with both packs gaining charge. There was no external energy input. Dr. Correa indicated that this is done automatically in more recent implementations, not covered by the available patents.

Is PAGD Just a Strobe Oscillator?

The circuit of Figure 3 bears a superficial resemblance to an ordinary strobe lamp, where a capacitor connected across a discharge tube is charged to the breakdown potential, initiating a Vacuum Arc Discharge in which the peak power can be very high. In the circuit shown current from the DP flows through, and charges, the CP as the capacitors C3, C5 are charged. When the discharge occurs, a portion of the charge in C3 and C5 is again transferred to the CP, by virtue of the full-wave rectifier D2, D3, D5, D6.

Considering this hypothesis, in a first approximation the voltage of CP opposes that of DP, and R1 is 300 ohms. Using voltages from the example in Fig. 5, the available charging current is (580-300) / 300 = .93 A. Using the 70 minute test run of Figure 6, about (.93)(300)(70) / 60 = 326 Wh would be transferred from DP to CP, which is greater than the 211 Wh calculated for the test illustrated in Figure 6. This hypothetical scenario would produce flashes in the reactor tube and charge the CP from the DP, but would not show over-unity performance.

What Actually Happens in the PAGD Run

Actual measurements of the current out of the DP and into the CP in Fig. 5A show that no current flows out of the DP or into the CP except from the PAGD energy pulses. In the hypothetical case proposed, an average current of .93 A should be seen flowing out of the DP at all times, and would be easily seen in the instrumentation plots.

What is seen is a current pulse of .31 A amplitude and 25 ms duration, coincident with the energy pulse in the reactor. In that same time period, a current pulse peaking over 65 A goes into the CP. At the end of the 25 ms pulse, the current out of the DP drops to background levels.

The hypothetical strobe oscillator mode described might occur in the absence of the specific conditions of the PAGD. However, in PAGD the energy eruption drives the nominal cathode both positive and negative, and may leave C3 and C5 temporarily charged so that D1 and D4 block current flow from DP.

Thus the hypothetical strobe lamp mode does not actually occur, and the evidence points to over-unity operation.

The PAGD phenomenon, with its energy yield, can be evoked without C3, C5 or any of the attached circuitry—all of that was developed simply to couple the energy burst to useful external devices. What is essential is field-effect emission from the cathode.

Figure 6. Figure 7.

Comments on the PAGD Phenomenon

The Abnormal Glow Discharge is well known, as are anomalous forces and energies associated with plasma discharges.

In 1969, Manuel patented a coating process utilizing the AGD, with external controls to prevent the AGD from entering the VAD region. It did not generate energy, nor were the pulses self-triggered.

The PAGD phenomenon is complex. In addition to ions and electrons originating in the gas, cold-cathode auto-electronic (field effect) emission from the cathode contributes a substantial electron flow. The ions are attracted to the cathode, and the electrons to the anode, but there is a third flow of atoms to the anode, effectively neutralized by the electron stream.

This third flow was observed as far back as 1930, by Kobel and Tanberg in published reports on forces reacting on cathodes in Vacuum Arc Discharges in Physical Review. Tanberg measured a vapor velocity of 16 x 106 cm/sec.

Aspden, in a paper "The Law of Electrodynamics" in the *Journal of the Franklin Institute* in 1969, notes that where charge carriers differ markedly in mass—as with ions and electrons in plasmas—very strong longitudinal forces can appear.

These ideas are developed more fully in a privately published Energy Science Report No. 8, *Power from Space: The Correa Invention*. He proposes a radial separation between the ions and electrons at the cathode which sets up strains in the aether, releasing substantial energy.

Aspden's reasoning is consistent with the appearance of spherical or conical plasma balls on the cathode with each energy burst, shown in photographs in *IE* #7.

The cathode is eroded by the PAGD process, some portion of it being vaporized. In a sense the cathode material is a "fuel" consumed by the process. It is more likely that this is a result of the energy release, rather than the cause of it.

The cathode pits have been measured by Correa. The material removed is not adequate to produce charge carriers for the output current pulse.

In patent '391, the Correas refer to their reactor as a transducer of energy, which is an appropriate description. In the form illustrated in *IE* #7, the PAGD reactors are laboratory prototypes, built around 1992. Since then, significant advances have been made in smaller and larger configurations which address the cathode erosion problem to extend the working life of the devices.

A current development target is a reactor 80 cm long, 10 cm dia. with a power output of 5 kW and a operating life of two to three years. At present, the Correas are at about a 1 kW level. There is reason to believe that the reactors can be made smaller and the operating voltage reduced. They are having discussions with potential licensees.

Introduction

Issue 8 of *Infinite Energy* contained an overview of the Correa invention, based on three issued U.S. patents and discussions with Dr. Correa. The readership of *Infinite Energy* includes subscribers to an Internet listserver called Vortex-l, constituting an informal discussion group for the range of topics included in *Infinite Energy*.

The group includes many professionals in a variety of disciplines, who accept the possibility of new energy phenomena, but vigilantly examine each new device or process. The author is indebted to members of Vortex-l for pointing out some errors in the previous article and areas where more data and clarification is needed. In particular, Dr. Mitchell Swartz found errors by the author in Figure 4 of the previous article, and showed a need for clarifying some points concerning Figure 5.

The author is indebted also to Mark Hugo, Bob Horst, Michael Schaeffer, and others for a spirited discussion. The following material is the responsibility of the author, and carries no implied endorse-ment by Dr. Swartz, Dr. Correa, or others.

Errata, Figure 4, p. 11, *IE* #8

The three curves and scales are faithful copies of original data provided by the Correas. The author made three errors in supplemental calculations done for the convenience of readers.

In Issue #8 Figure 4a, the “Delivered charge (from the Drive Pack)” should be 0.008 amp-sec = 0.008 coulomb. The “Received Charge” (by the Charge Pack) should be 1.2 amp-sec = 1.2 coulomb. Corrected numbers now appear in the adjacent Figure 1. *The charge out/in ratio is 150.*

In Issue #8 Figure 4c, the “Charge Pack Input” energy should be 445 joules. Again, corrected numbers now appear in the adjacent Figure 1. *The energy out/in ratio is 101.* This ratio is not the same as the charge ratio because the DP delivers its charge from a source at 570V and the CP receives its charge as a sink at about 380V.

Batteries as Energy Integrators

Figure 5 of the previous article and its related text outlined a procedure used by the Correas to integrate the energy input and energy output of the reactor to test the performance of various reactor configurations. There are many uncertainties in using lead-acid batteries for this purpose, but the gel-cell construction used for the Correa tests is recognized by the industry as being the most stable, repeatable form of the lead-acid battery. Figure 5 is a graphical illustration of the procedure

used, but certain points were left unclear.
Before each PAGD run, the DP and CP batteries are each calibrated by fully charging, then discharging through fixed resistors, with the battery output power measured at frequent intervals and recorded in graphical form.
Just before a PAGD run, the batteries are again charged and partially discharged, using the same load resistors as before. This is, in effect, a new partial calibration.
The PAGD run is then performed. In the case of Figure 5, the run was 70 minutes. Any apparent differences are due to the

different scale factors and slight errors in constructing the plots.
After the PAGD run, the batteries are again connected to their resistive loads and the discharge continued, with power measured at frequent intervals.
The discharge data taken just before the PAGD run can then be mapped against the data taken in the previous complete calibration to establish the state of charge of each battery. There is no requirement that the preliminary discharge times be the same; in the case of Figure 5, the DP is discharged for about 100 minutes and the CP for about 220 minutes. It is only necessary that enough points be taken to compare with the previous calibration curve to establish confidence in the estimation of the charge state of the battery.
The discharge power data for each battery taken after the run is mapped against the previous calibration curves to establish the new charge state of the batteries. Again, it is not necessary to discharge each battery fully, only to obtain enough points that the mapping can be done with confidence. In each case the batteries were discharged for over an hour.
With all these precautions, the calculation of energy out/in is sensitive to errors involving differences of large numbers, such as the determination of the 6 Wh energy loss of the DP. Table 8, p. 38 of *IE* #7 contains summaries of six runs using different reactor configurations. The energy out/in ratios range from 4 to 34. OIF these, the run illustrated in Figure 5 has the least energy spent and the greatest gained, and the greatest

sensitivity to measurement errors. But all show substantial over-unity performance. The four curves in Figure 5 of the previous article *all deal with one experiment*, although features of the several curves could make it seem that unrelated measurements are grouped together. In particular the two curves at the right depict the separate calibrations performed before and after the PAGD runs, as noted above. The time scales are intended to indicate proportionate durations of the elements of the calibrations and runs, not clock time. The two battery packs have their own histories of charge and discharge, which are coincident in clock time only during the PAGD run. The rest times are indicated as a minimum of 15 minutes, as dictated by good practice, but there is no definite maximum time, which is unrecorded and unrepresented in the graphs.

Closed Loop Tests

A crucial test of o/u claims is the capability to operate the device without external or stored (battery) power input, while still producing tangible work. The previous article described a test the Correas performed using two reactors and two center-tapped batteries, illustrated schematically in Figure 7 of that article. Numerical data from the test is not publicly available, but Dr. Correa told the author that it was run for eight hours, with the batteries switched hourly by operation of a single switch. During this time, both batteries gained energy, as measured by power into a load resistor.

Why Batteries?

Many observers express dissatisfaction with batteries as integrators in quantitative measurements. The author has discussed this with Dr. Correa on many occasions. One answer emerged from early tests with the characterization tests

Figure 1.

Figure 2.

described below. When the PAGD event occurs, a very powerful burst of energy is released within the reactor space and more than one electrical power supply and regulator have been burned out. Batteries are rugged sources of energy.

Relaxation Oscillator?

When claims are made for a new phenomenon, particularly in the search for o/u performance, it is proper to first search for a conventional explanation for the effects seen.

Some readers have noted a similarity between the test circuit shown as Figure 3 of the previous article, and the well-known discharge tube relaxation oscillator. In this circuit, a capacitor shunts a discharge tube and is charged through a series resistor. When the capacitor charges to the tube's breakdown voltage, the accumulated energy is discharged through the tube. Repeated powerful flashes, as in a strobe lamp, result.

In this case, the energy is first stored in the capacitors, then released in the discharge tube. The test circuit shown as Figure 3 of the previous article bears a superficial similarity to a relaxation oscillator, but it does not operate as such nor does the PAGD phenomenon depend on it.

Evidence Against “Relaxation Oscillator”

The evidence is three-fold. First is a brief recapitulation of the analysis in the previous article. Second is a discussion of two oscillograms provided by the Correas, not included in the previous article. Third is a review of the extensive characterization of the PAGD phenomenon in circuits which are clearly not relaxation oscillators.

Refer now to the analysis in the previous issue. If the test circuit of Figure 3 (of the previous article), were a relaxation oscillator, a current of .93 A should flow from the DP, charging C3 and C5 with the energy to be released in the reactor flashes. A current of .93 A from a source of 570 V is 530 W. Referring to Figure 1 of this article, the power from the DP is the lower curve in each graph, and the power to the CP is the upper curve. The bottom graph has an enlarged Y-axis, with major divisions representing 1 kW.

If the circuit were operating in a relaxation oscillator mode, the 530 W power from the DP would be clearly visible. It is simply not there.

Figure 2 shows two pulses of a three pulse set of data for a run which begins with “No plasma discharge; background levels for input and output” (Correa notes). The total data set duration was 780 ms. The repetition rate was 2.8 pps. Energy in from the DP was 48.4 joules and energy out to the CP was 1071.9 joules (Correa data).

In the lower graph, the minor divisions represent 125 watts of power on the Y-axis and 2.5 ms of time on the X-axis.

The curves have the same general aspect as Fig. 4c of the previous article. The power from the DP is represented (for the first event) by a pulse of about 200 W lasting for about 12.5 ms. Immediately after the event, the DP power output drops into the noise floor of the instrumentation. The presence of noise spikes shows that the instrumentation is active and sensitive to powers in the tens of watts. Just before the second event, Correa notes “No plasma discharge, input background level.” After the second event, the power From the DP does go immediately to background levels, but decreases with time (Correa comment), until the next event.

Figure 3 shows another example taken from a longer run. Again, the upper curve is the power delivered: to the CP and the lower is the power extracted from the DP. Once again, the instrumentation is sensitive enough to detect noise, and there is essentially no power drain from the DP between pulses.

The three sets of data, two from this article, and Figure 4 of the previous article, suggest that the energy events take many forms, depending on operating conditions, but there is a consistent aspect of over-unity performance. Also illustrated is the difficulty of measurements which would unequivocally show o/u performance.

PAGD Characterization

U.S. patent #5,502,354, issued 26 March 1996 to the Correas contains data from early work in characterizing the PAGD phe-

Figure 3.

Figure 4.

Figure 5.

nomenon itself. For the purpose they used two test circuits, which are reproduced here as Figure 4 and Figure 5.

The only shunt capacitor is in the power supply output, and the ballast resistor R. in the range of 103 to 106 ohms, isolates it from the reactor. This is not the traditional relaxation oscillator circuit, where the capacitor shuts the discharge tube itself.

The patent contains 15 graphs and 17 tables in 38 pages, showing the effect of various parameters on the performance of the PAGD reactor. Salient features of the discussion are noted below, emphasizing the nature of the PAGD phenomenon as distinct from the prior art.

PAGD Characteristics

1. Repetitive, self-extinguishing, energy-producing discharges with only a stable voltage source and current limiting resistor as external circuit support.
2. Pulse rate a function of electrode area and spacing, reactor gas pressure, drive current, electrode composition, source voltage.
3. Static capacitance of reactor in the range of a few pF. Pulse rates in the range of 0.01 to >5,000 PPS. Series resistors used in tests in range 103 - 106 ohms. Such numbers are inconsistent with assumptions of relaxation oscillator action.
4. Strong field emission is necessary and is observed at field gradients lower by a factor of 105 than that predicted by theory.
5. Absence of thermionic emission from the cathode.
6. Pulse energy out/in ratios ranged from 1.5 to >50 for examples tested. Power output ranged from 25 to 400 watts.
7. Based on charge production and source voltage a dynamic

capacitance for different reactors can be estimated at 100 mF to 80,000 mF.

Cathode Erosion

Aluminum alloys are a preferred material for the cathodes and are eroded by the discharges, as illustrated in Figure 6. Measurements of the material ejected from the cathode indicate 5.8x10-8 g, or 1.3x1015 Al ions per pulse for one case. The kinetic energy of the ejected material is more than three orders of magnitude greater than found by Tandberg for a Vacuum Arc Discharge.

Reaction Forces against the cathode in excess of 300 dynes have been observed in PAGD experiments.

The erosion suggests the presence of energies only three orders of magnitude less than Aspden's estimate of the energy priming the vacuum. The energies are of the same order as those found in water-plasma arc explosions by the Graneaus.

This erosion leads to questions about the working life of a PAGD reactor. Estimates in the patent suggest a lifetime energy output of as much as 40 megawatt-hours for a reactor. While the electrode material is eroded, there is no suggestion that the energy source is a nuclear reaction in the electrode.

PAGD Phenomena

The pulse repetition rate depends, among other things listed above, on the time it takes charge carriers to redistribute within the reactor volume after a discharge event.

The event begins with the driving current enabling a glow to cover the cathode and go into saturation. Beyond that, the voltage across the electrodes rises and the field effect emission begins. The glow is attenuated and a cone-like discharge column appears with a faint glow elsewhere on the cathode.

Within the discharge column, very intense energy is released, resulting in the pitting mentioned above, but also releasing electrical energy which is captured by the output circuit of Figure 3 of the previous article.

Examination of the discharge column suggests the presence of a vortex of energy, which is also suggested by the photomicrograph of a crater in Figure 6. The work of Aspden indicates a segregation of positive and negative charge carriers, and the development of strong longitudinal forces within the discharge column.

The above comments only point to the existence of a very complex phenomenon discovered by the Correas, which warrants study in its own right.

Infinite Energy Magazine Special