

Mr. Leon Toups
Toups Technology Licensing
7887 Bryan Dairy Road, Suite 105
Largo, Florida 33777

Re: TTL Liquid Recyclers

Dear Mr. Toups:

The Bureau of Waste Cleanup hereby accepts the TTL Liquid Recyclers Process (Patent Pending) as an innovative technology for the destruction of environmental contaminants. This ex-situ remediation process uses an electric arc via a conventional DC or AC generator. Liquid wastes are destroyed by decomposing the molecules in an electric arc at 7000 degrees F. Gases, liquids and solid precipitates are produced in this complex reaction, all of which can eventually be used as products.

The electric arc decomposes the molecules of contaminated liquids into their atomic constituents. The electric current then strips these individual atoms of most of their peripheral electrons forming plasma of mostly ionized atoms. A combustible, non-explosive gas is formed in the process along with other by-products.

The potential of the TTL Liquid Recyclers Process to serve as a tool in the remediation of contaminated sites, and as a method for the destruction of industrial and other type of wastes in Florida, is hereby recognized. For the remediation of contaminated sites, there are no objections to the use of this process provided: (a) the considerations of this letter are taken into account; (b) a Remedial Action Plan is approved by the Department; and (c) applicable and appropriate regulations are observed.

For the prevention of pollution, when using the TTL Liquid Recyclers Process for the destruction of wastes as they are produced by manufacturing processes (or other generators of wastes), all applicable and appropriate regulations, if any, pertaining to air emissions, discharges to waters, and solid wastes should be observed when utilizing the by-products or disposing of the waste materials. Please note that the regulation of waste products from specific industries is not in the jurisdiction of either the Bureau of Waste Cleanup or the Bureau of Petroleum Storage Systems.

Mr. Leon Toups
April 19, 2000
Page Two

While the Department of Environmental Protection does not provide endorsement of specific or brand name remediation products or processes, it does recognize the need to determine their acceptability from an environmental standpoint with respect to applicable rules and regulations, and the interest of public health, safety and welfare. Vendor's must then market the products or processes on their own merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace.

Prepares of Remedial Action Plans which propose TTL Liquid Recyclers Process are advised to include a copy of this letter in the appendix of the plans they submit, and call attention to it in the text of their document. In this way, technical reviewers throughout the state will be informed that you have contacted the Department of Environmental Protection to inquire about its environmental acceptability. For the purposes of briefing those reviewers on the technical aspects, the information provided to the Bureau of Waste Cleanup has been incorporated into this letter as Enclosure 1.

The Department reserves the right to revoke its acceptance of a product or process if the nature of its performance, or any other aspect has been falsely represented. Additionally, Department acceptance of any product or process does not imply it has been deemed applicable for all cleanup situations, or that it is preferred over other treatment or cleanup techniques in any particular case.

This acceptance letter shall not be construed as an exemption from the requirement that a Remedial Action Plan be prepared for the cleanup of a contaminated site, nor shall it be construed to imply automatic approval of any Remedial Action Plan prescribing the accepted product or process. A site specific evaluation of applicability and cost-effectiveness must be considered for any product or process, whether conventional or innovative, and adequate site specific design details must be provided in a Remedial Action Plan submitted for review and approval by the Department or one of its contracted reviewing agencies.

This acceptance letter will be posted on the Department of Environmental Protection's innovative technologies web page at <http://www.dep.state.fl.us/dwm/programs/pcp/innovative.htm> Please visit this site for a listing of innovative technologies accepted by the Department.

Mr. Leon Toups
April 19, 2000
Page Three

Please contact the Bureau of Waste Cleanup at 850/488-3935 if you have any questions regarding this acceptance letter.

Sincerely,

William Neimes, P.E.
Bureau of Waste Cleanup

cc: Rick Ruscito - BPSS
Tom Conrardy - BPSS
Vince Seibold - Industrial Wastewater Section

inn_042.doc

TOUPS TECHNOLOGY LICENSING

DIVISION OF ENVIRONMENTAL SOLUTIONS

7887 Bryan Dairy Road, Suite 105

Largo, FL 33777

Tel. +1-727-548 0918; Fax +1-727-549 8138

e-address toups@toupstech.com

TTL LIQUID RECYCLERS

**with Santilli PlasmaArcFlow™ Reactors
producing clean burning Magnegas™,
heat, and irrigation water**

PART 1:

BACKGROUND OF THE NEW TECHNOLOGY

1.1. PLASMA-ARC-FLOW™ REACTORS (PATENTS PENDING)

1.1.A. MAIN FEATURES.

Santilli's PlasmaArcFlow™ Reactors constructed at TTL consist of an all encompassing metal chamber filled up with the liquid waste to be recycled. The liquid is forced to flow by a recirculating pump through a DC or AC electric arc between submerged electrodes, according to a variety of geometries under Patents Pending. The activation of the electric arc via a conventional DC or AC generator recycles the liquid waste by first decomposing its molecules, and then by producing:

- 1) a clean burning combustible gas;
- 2) heat in the liquid waste which is usable as another source of energy;
- 3) solid precipitates good as fertilizers or other uses;
- 4) carbon, which can be used for the production of electrodes; and
- 5) water good for irrigation, when admitted as a residue.

Because of these features, the reactors are also called **PlasmaArcFlow™ Recyclers** or **Liquid Recyclers**.

The main steps in the recycling are the following:

- 1) The electric arc decomposes the molecules of contaminated liquids into their atomic constituents, generally consisting of hydrogen, oxygen, and carbon, plus other possible elements in smaller percentages;
- 2) The electric current then strips the individual atoms of most of their peripheral electrons by forming a plasma of mostly ionized atoms (naked nuclei) of H, O and C at about 7000 degrees F.
- 3) The flow of the plasma through the arc controls the subsequent reactions. In particular, the known affinity of carbon and oxygen removes all available oxygen, thus forming a combustible, but non-explosive gas. The gas cools down in the liquid surrounding the arc, and bubbles to the surface where it is collected; solids precipitate to the bottom of the reactor, where they are periodically removed; and possible residual water is released following filtering.

1.1.B. CLASSIFICATION OF REACTORS.

TTL has developed the following two main types of Liquid Recyclers based on Santilli PlasmaArcFlow™ Process, all producing the clean burning Magnegas™:

TTL TOTAL RECYCLERS (TTL-TR)

They are used for the complete recycling of contaminated liquids, which cannot be released in the environment, such as radiator antifreeze, engine oils, various industrial wastes; and other liquid wastes. In this case, TTL Total Recyclers completely turn the original liquid waste into a clean burning combustible gas, plus solid precipitates for various uses, and heat (see [Figure 1.1](#) below for the schematics of the reactor, and later on for pictures of available equipment).

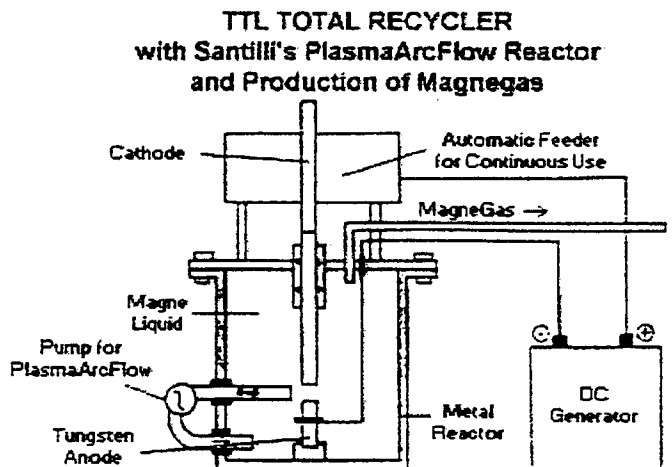


FIGURE 1.1: A schematic view of Santilli PlasmaArcFlow™ Reactor used in TTL Total Recyclers.

TTL WATER RECYCLERS (TTL-WR).

They are used for the removal of contaminants from water, such as: salt water; liquid sewage, whey; and other contaminated waters. In this case, TTL Water Recyclers remove the contaminants from the original waste, by producing: a clean burning gas; solid precipitates generally usable for fertilizers; and water rich in nutrients, which is excellent for irrigation (see [Figure 1.2](#) below for the schematics of the reactor, and later on for pictures of available equipment)

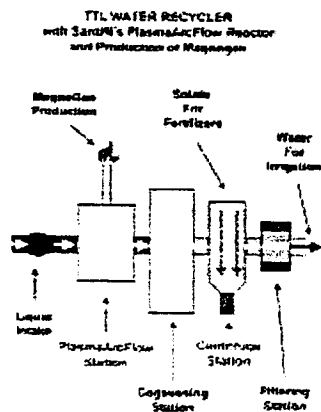


FIGURE 1.2: A schematic view of Santilli PlasmaArcFlow™ Reactors used in TTL Water Recyclers .

1.1.C. ORIGINATION OF THE TECHNOLOGY.

The new **PlasmaArcFlow Technology™** was developed at TTL by Dr. **Ruggero Maria Santilli**, a U. S. physicist, President of the INSTITUTE FOR BASIC RESEARCH (IBR), Palm harbor, Florida, following 22 years of research initiated in 1978 at Harvard University under various DOE grants.

Thanks to the participation of various mathematicians, theoreticians, and experimentalists, these studies resulted in a generalization of quantum mechanics known as **hadronic mechanics**, which is the sole science capable of prediction and quantitative interpretation of the several anomalous features of the PlasmaArcFlow™ process. For this reason, PlasmaArcFlow™ Reactors are also called **Santilli's Hadronic Reactors™**.

The physical, chemical, and superconductivity foundations of TTL PlasmaArcFlow™ technology are treated in: over 1,000 articles published in major technical journals in various countries; fifteen post Ph.D. monographs; and fifty volumes of conference proceedings.

A summary scientific presentation of the new PlasmaArcFlow™ Technology is available in the IBR web site. More specifically:

An outline is available in the IBR main page

Introductory topics are available in Part 1 of the page

<http://home1.qte.net/ibr/ir00020.htm>

A detailed scientific description of the hadronic reactors is available in Part 2

<http://home1.qte.net/ibr/ir00020a.htm>

An outline of the physical, chemical and superconductivity aspects are available in Part 3

<http://home1.qte.net/ibr/ir00020b.htm>

An outline of the new hadronic mechanics is available in the page

<http://home1.qte.net/ibr/ir00019.htm>

An outline of the new mathematics used for the new technology is available in page

<http://home1.qte.net/ibr/ir00018.htm>

The exclusive world-wide rights on the technical know-how, trademarks, and patents pending on Santilli's PlasmaArcFlow™ Reactors are owned by Toups Technology Licensing.

[Back to Table of Contents](#)

1.2. MAGNEGASES™ (PATENTS PENDING)

1.2.A. MAIN FEATURES.

The clean combustible gases produced by TTL Liquid Recyclers are called **Santilli Magnegases™**, where the prefix "Magne" indicates the magnetic origin of the creation and structure of the gases.

The gases are produced under the very intense magnetic fields of the electric arc (which are of the order of several Tesla). Under these conditions, the valence and other peripheral electrons lose their space distribution to acquire the polarization in a plane (more technically, in a toroid). The resulting chemical structure is no longer conventional, and it is constituted by a **new chemical species** called **Santilli Magnecules™**, which consists of clusters of conventional atoms and molecules under a new bond of magnetic origin due to the plane polarization of the orbits of valence electrons. By comparison, molecules are constituted by clusters of atoms under the conventional valence bond. For technical details, see the IBR page <http://home1.qte.net/ibr/ir00020b.htm>.

1.2.B. CHEMICAL STRUCTURE OF MAGNEGAS™:

The chemical structure depends on the liquid used for the production of the gas. All Magnegases™ produced from wastes of organic nature (including fossil fuels) have a common chemical structure essentially composed by hydrogen, oxygen, and carbon. Since Magnegases™ are produced at the 7000 degrees F of the electric arc, their molecular structure is very elementary, essentially consisting of H₂, CO, O₂, and CO₂ molecules with traces of other substances. In particular, no complex hydrocarbon (HC) can be formed in the 7000 degrees F of the electric arc, thus being absent in filtered Magnegases™ (unfiltered Magnegases™ may have traces of HC which are acquired when bubbling through the waste). These features explain the very clean character of Magnegases™ combustion exhausts.

According to numerous mass spectrographic analyses conducted by NATIONAL TECHNICAL SYSTEMS, McClellan Air Force Base, Sacramento, California, and in other analytic laboratories, we have the following:

Molecular Structure of Magnegases of Organic Origin

TO BE UPLOADED

Magnecular Structure of Magnegases™ of Organic Origin

It is composed by Magnecules™ of small and large molecular weight (all the way to 1000 a.m.u.) whose constituents are the above conventional molecules, plus individual atoms of hydrogen, oxygen, and carbon.

The above Magnecular structure of Magnegases™ is stable at ordinary conditions, and it is actually enhanced at higher pressures at ordinary temperatures. However, as it is the case for all magnetic effects, all Magnecules disappear at a sufficiently high temperature (of the order of 250 F), or at the initiation of combustion.

For technical details see Part 3 of page 20 of the IBR web page <http://home1.gte.net/ibr/ir00020b.htm>

1.2.C. CHEMICAL STRUCTURE OF COMBUSTION EXHAUSTS:

The primary constituents of Magnegases of organic origin are H₂ and CO molecules magnetically bonded in small and large clusters. The combustion first decomposes all Magnecules, and then activates conventional chemical reactions. Therefore, the primary constituents in the Magnegas™ combustion exhausts are, in decreasing percentages: water, oxygen, and CO₂. More particularly, the hydrogen content combines with oxygen to produce water vapors; some of the CO is oxidized into CO₂; a percentage of carbon is released as power; and the balance of oxygen is released as breathable O₂.

It should be stressed that the above features of combustion exhausts refer to **filtered Magnegases™**. Unfiltered Magnegases™ may contain a small percentage of the original liquid waste magnetically trapped in the gas while it was bubbling to the surface, in which case this liquid residue implies additional components in the exhausts.

1.2.D. ENERGY CONTENT OF MAGNEGASES™:

According to quantum chemistry, a gas composed of H₂ and CO can at most have 180 BTU/cf. Despite a similar conventional chemical structure, Magnegases™ have a much higher energy content, as established by the fact that **Magnegases™ cuts metals as fast and efficiently as acetylene (which has 2,300 BTU/cf)**. This anomaly (that is, a feature outside quantum chemistry) is due to the novel chemical species of Magnecules™ which can store anomalous amounts of energy, and permit more efficient chemical reactions. For technical details, the visitor may inspect Part 3 of Page 20 of the IBR site <http://home1.gte.net/ibr/ir00020b.htm>

The minimal energy content of filtered Magnegas is 400 BTU/cf when originating from water with small percentages of contaminants (as in town sewage); while other Magnegases™ may have an energy content comparable to that of natural gas (1000 BTU/cf). For instance, various measurements conducted by MOTORFUELERS, INC., Largo, Florida, have established an energy content of 800 BTU/cf for Magnegas™ produced from radiator antifreeze mixed with organic waste.

[Back to Table of Contents](#)

1.2.E. CLASSIFICATION OF MAGNEGASES.

The new **TTL Technology to Synthesized Fuels** can fabricate a combustible gas with the desired optimal features for a given use, such as: a type of Magnegas™ for electric generators; another for metal cutting; another type for automobile fuel; a still different type to fuel diesel engines; etc.

The selection of a specific type of Magnegas™ is generally made on the basis of the Customer's specific needs regarding costs, energy content, and combustion exhausts. Different Magnegases™ are then synthesized via Santilli's Hadronic Reactors™ operating with different liquids, different PlasmaArcFlows™, different currents, and other requirements. For instance, when the combustion has to occur in the interior of buildings, TTL can supply a filtered Magnegas™ with no toxic substances in the exhausts, rich in oxygen, and with a low CO₂ content.

Three main types of Magnegases™ have been identified, all possessing similar chemical structure, energy content, and combustion exhausts:

1) Magnegases™ produced from water with small percentages of mineral or organic contaminants, such as sea water or town sewage. They have 400 to 500 BTU/cf, high octane values, and extremely clean exhausts. As such, these Magnegases™ are excellent to fuel electric generators, metal cutting, cooking, and other applications.

2) Magnegases™ produced from highly contaminated organic liquids, such as automotive antifreeze and oil waste, or heavy farm waste. They are similar to natural gas for energy content, have about 150 octanes, and produce large percentages of oxygen in the exhausts (measured up to 14%). As such, they are excellent for use as automotive fuel in lieu of fuels of fossil origin.

3) Magnegases produced from liquid wastes with large toxic content, such as industrial wastes with high Cl percentages. They have very high values of BTU, but require processing before being usable as ecologically acceptable fuels.

Prospective Customers are suggested to consult TTL technicians and scientists for the identification of the proper Magnegas™ and its optimal use.

[Back to Table of Contents](#)

1.3. MAGNELIQUIDS™ (PATENTS PENDING)

The new **TTL PlasmaArcFlow™** technology includes:

- 1) a basically new process for the production of combustible gases from a liquid waste (under patents pending);
- 2) combustible gases with a basically new chemical structure (under separate patents pending); and
- 3) the creation of a basically new chemical structure in the liquid waste used for the gas production (under additional patents pending).

Recall that the chemical structure of **Magnegas™** is that of clusters of conventional molecules and atoms under a new magnetic bond, called **Santilli Gas Magnecules™**. Similarly, the new TTL technology turns the liquid waste used for the production of **Magnegas™** into a form with a new chemical structure, this time with **Santilli Liquid Magnecules™**, namely, clusters of liquid molecules and atoms under a new magnetic bond. The resulting liquid is then called **Santilli Magneliquid™**.

This new liquid structure is important for waste recycling, because it permits a molecular bond of liquids which are not generally attracted one to the other. Turning a mixture of liquid wastes into a **Magneliquid™** is also important for the production of **Magnegas™** with the desired characteristics in BTU content and combustion exhausts.

[Back to Table of Contents](#)

1.4. ALARMING ENVIRONMENTAL PROBLEMS CAUSED BY FOSSIL FUELS AND THEIR RESOLUTION BY MAGNEGASES™

As is well known, every day in our planet we have an average use of 500,000,000 cars, 1,000,000 trucks, 100,000 planes, plus additional military, agricultural, and industrial vehicles, and a very large number of household usage (for instance, for heat). This disproportionate use of fossil fuels is causing alarming environmental problems because their combustion exhausts:

- 1) contain the largest percentage of carcinogenic and other toxic substances released in our environment today;
- 2) cause an alarming oxygen depletion (the oxygen in the exhausts is a fraction of the oxygen used for the combustion); and
- 3) emit an excessive volume of CO₂ which cannot be any longer recycled by the ever diminishing forests.

Santilli Magnegas™ resolve all the above environmental problems. In fact, numerous chemical analyses have established that **Magnegas™ of organic origin verify the following main features:**

- 1) **Absence of carcinogenic or other toxic substances**
- 2) **Positive oxygen balance (the oxygen in the exhausts is bigger than that used for the combustion); and**
- 3) **Carbon dioxide down to single digit percentages which can be further reduced via chemical sponges.**

As indicated earlier, **Magnegas™** are created at 7000 degrees F. Therefore, filtered **Magnegas™** cannot have any hydrocarbon in their structure, and are essentially composed by hydrogen, carbon monoxide, and oxygen, whose combustion is notoriously free of any carcinogenic substance.

Similarly, the achievement of a combustible gas with the desired positive oxygen balance in the combustion exhausts is reduced to the selection of a Magneliquid™ containing an excess oxygen over that needed to burn all available hydrogen.

Finally, the CO₂ content is controlled via the PlasmaArcFlow™ preventing CO from being oxidized into CO₂.

Thus, Magnegases™ have environmental features dramatically superior than those of any other fuel of fossil origin. Hydrogen is not recommended for large scale uses because of its excessive oxygen depletion, which is much bigger than that of gasoline.

In fact, oxygen is contained in gasoline exhausts in the form of CO₂ which is partly absorbed by plants with the re-emission of oxygen. By comparison, the combustion exhausts of hydrogen are essentially constituted by water, with the consequential permanent removal of oxygen in our atmosphere, while the separation of the water exhausts to re-create oxygen is prohibited by the notorious high cost of water separation.

As an illustration, the replacement with hydrogen of all fuels used in densely populated area for automotive, household, industrial and other uses, would imply a local oxygen depletion below the percentage needed for the human hearth, thus causing severe health problems, with predictable legal implications.

In summary, the combustion exhausts of fossil fuels are a major source of current health problems, as well as increasingly catastrophic climactic changes. By comparison, the combustion exhausts of (filtered) Santilli's Magnegases™ are so clean, and so rich in oxygen, that they can sustain life.

For additional details, see Part 1 of Page 20 of the IBR site <http://home1.gte.net/ibr/ir00020.htm>

[Back to Table of Contents](#)

1.5. CERTIFIED DOUBLE OVER-UNITY OF SANTILLI HADRONIC REACTORS™.

1.5.A. DEFINITION.

Another important feature of TTL Liquid Recyclers is that of having **double over-unity**, that is, of **having a first over-unity in the production of the combustible gas, and a second over-unity in the increase of heat in the liquid used for the production of the gas.** As we shall see in Part 2 below, this double over-unity has major financial implications, because it implies a large reduction of operating costs for TTL Liquid Recyclers.

[Back to Table of Contents](#)

1.5.B. COMMERCIAL ENERGY BALANCE

The over-unity here referred to is a commercial energy balance computed as the ratio between the energy produced (the combustible Magnegas™ + heat), and the electric energy needed for its production, which ratio is bigger than one (over-unity) for Santilli's Hadronic Reactors™. In this commercial calculation, there is no consideration of the energy in the liquid used for the production of said energy, since such a liquid is a waste (automotive liquid wastes; town, farms, and industrial wastes; etc.), thus carrying an income, rather than costing money.

[Back to Table of Contents](#)

1.5.C. SCIENTIFIC ENERGY BALANCE

The energy balance computed in science is different than the commercial one, and consists of the ratio between the total final energy (Magnegas™ + heat + dissipations) divided by the total initial energy (electric energy + energy in liquid), which ratio is always smaller than one, due to the conservation of the total initial energy and other physical and chemical laws, which are rigorously verified by all versions of Santilli's Hadronic Reactors™. Other factors, such as the energy used in the production of the electrodes and of the equipment have a comparatively small, thus ignorable contribution.

Therefore, Santilli's Hadronic Reactors™ tap energy from liquids, in essentially the same way as nuclear reactors tap energy from nuclei, all cases occurring under the strict verification of known physical and chemical laws.

[Back to Table of Contents](#)

1.5.D. CERTIFICATION BY MOTORFUELERS, INC.

As an illustration, in September, 1999, MOTORFUELERS, INC, of Largo, Florida, has certified that Magnegas™ produced by a mixture of antifreeze and organic waste requires 122 watts = 416 BTU of electricity per cubic foot of electricity produced which has 800 BTU/cf. Jointly, Motorfuelers measured the production of 285 BTU/cf in the Magneliquid itself, yielding about 500 BTU/cf of heat when the heavy metal parts of the reactors are included. These certified measurements imply a first over-unity in the production of the gas given by $800 \text{ BTU} / 416 \text{ BTU} = 1.92$, and a second over-unity in the production of heat given by $500 \text{ BTU} / 416 \text{ BTU} = 1.20$.

A reproduction of the certification of over-unity by Motorfuelers, Inc., and a scientific study of its origin, are available in Part 2, Page 20, of the IBR web site <http://home1.gte.net/ibr/ir00020a.htm>

[Back to Table of Contents](#)

1.5.E. DOUBLE OVER-UNITY OF NEW RECYCLERS.

It should be indicated that the certification by Motorfuelers, Inc., was conducted with the first, manually operated prototype of Santilli's Hadronic Reactor™, as per [Figure 1.1](#). The double over-unity of the new TTL Reactors with automatic operation are higher than those measured by Motorfuelers.

The increase of double over-unity over the value of the measurements by Motorfuelers, Inc., is due to several improvements of the efficiency in the new reactors, including:

- 1) the automatic initiation and control of the electric arc, with consequential decrease of energy losses;
- 2) the increase of the pressure of the reactors, with consequential increase of the efficiency;
- 3) the increase of the liquid flow; and other factors.

The double over-unity of the new automatic reactors is currently under independent certification. The results will be uploaded in this page as soon as available. In the meantime, the computation of costs will be conservatively based in Part 2 on the double over-unity of 4 measured by Motorfuelers, Inc., that is, a first over-unity in the production of Magnegas, and an additional over-unity in the production of heat.

[Back to Table of Contents](#)

1.6. CERTIFIED ABSENCE OF RADIATION OR HARMFUL WASTES

Immediately following the discovery of the over-unity of Santilli Hadronic Reactors™, comprehensive measurements were conducted for possible radiation, or other health hazards, which were conducted by Dr. David A. Hernandez, of RADIATION PROTECTION ASSOCIATES, Dade City, Florida. Particular was devoted to the measurement of the only radiation that can escape from the heavy gauge metal walls of the reactor: low or high energy neutrons and hard photons.

Under the presence of several eyewitnesses, none of the various counters placed in the immediate vicinity of the reactor showed any measurement of any radiation at all. As a result, **Radiation Protection Associates released an official Certificate that Santilli's PlasmaArcFlow™ Reactor "has met, and exceeds the regulatory regulations set forth in Florida's Administrative Code, Chapter 64-E. Accordingly, the reactor is declared free of radiation leakage."**

A reproduction of the certification for lack of radiation and a related scientific analysis, are available in the site <http://home1.gte.net/ibr/ir00020a.htm>

[Back to Table of Contents](#)