



## Rare-Earth Recovery Systems™

**Key Research Words:**

mass spectrometer, mass spectrometry, semiconductor manufacturing, ion implanter, analyzer magnet, ion sources, semiconductor capital equipment, plasma sources, Laser Driven Fusion, magnetron, Faraday Cup, Faraday, Tesla, Varian Brothers, Westinghouse Family History, Maxwell's Field Theory, and, simple Physics.

For over 600 years the world's best Scientists, Chemists, Physicists, and Alchemists have been searching for a Universal Solvent; something that they could use to dissolve anything, so it could be reconstituted into anything else they might need; like Gold, or Diamonds, or Fresh Water, or Hydrogen, even Oxygen: The Ultimate Trick of Material Science.

Although it is not a liquid, there is already a solution for this.

It is quite possible to build a large Mass Spectrometer the size of a city block and collect Hydrogen, Oxygen, Carbon, and other pure elements directly from E-Waste and trash.

Let's use this abundant resource to balance our national economic trade security with China, reduce our massive plastic and e-waste landfills, and power our upcoming Fuel Cell Economy.

There is an rich source of Hydrogen, Oxygen, Carbon and other Rare Earth Elements being stored in post-consumer plastics, used solvents & oils, toxic waste dumps, and thousands of warehouses stuffed full of discarded chemical byproducts & E-wastes.

Rare-Earth Recovery Systems are designed to recover these rare earth elements from high-tech trash needed to make high-tech before it becomes trash. The added benefit is building a clean energy resource from US trash piles. This drastically reduces the need for strip-mining new Land. Instead, the Mining Companies can strip-mine the overflowing garbage dumps and burgeoning e-waste warehouses for the rare earth elements used in today's high-tech electronic manufacturing.

These purified elements can be sold back to China at a profit for next year's imports of our high-tech products, instead of letting them leach into their soils.

Using well-known technologies and methods from both the Mass Spectrum Analysis Industry and the Semiconductor Manufacturing Industry, we could already be using these Rare-Earth Recovery machines. We could be dissolving old computers, consuming toxic wastes, and clearing out Super Fund Sites for these precious Rare Earth materials.

Moreover, this same technology can be modified to recover vast amounts of CO<sub>2</sub> from the Earth's Atmosphere, mitigate Global Warming issues, and return pure Oxygen to our breathable atmosphere as fast as our missing Rain Forests. It can supply a large abundance of pure Carbon to a variety of Industries from tires, to water filters, to lubricants, to structural fibers, to carbon nano-tubes, to diamond coatings, and the rest.

*Consider this: a few plastic bottles have enough Oxygen and Hydrogen bound-up in long-chain molecules to supply the average consumer with about 1500 watts of heat, electricity, and a pint of hot water from their Household Fuel Cell each morning.*

*Also consider the large plastic bloom(s) in the South Pacific, each one larger than the state of Texas. This is a massive untapped material resource. It is much cheaper to convert plastics into fuels on the surface, and much easier to get to than drilling four miles down in the Gulf of Mexico; not to mention a great chance to clean up the fragile ecosystem of the Pacific Ocean.*

The secret to a Universal Solvent is Temperature. Every Atom, Element, and Chemical known on Earth has a Melting Temperature, an Evaporation Temperature, an Ionization Temperature, an Eichner Frequency, and an Ionization Potential. These five principles can be used in conjunction with proper machine timing to melt, evaporate, ionize, sort by atomic weight, and recycle a wide variety of toxic materials, chemicals, solvents, plastics, and most importantly, E-Wastes; just like any Mass Spectrometer can do,

***-only on a much larger scale.***

These recovered pure Rare Earth elements are the same ones currently used in Hi-Tech Manufacturing today; and sorted in a very similar way that these toxic Computer Chips are made in the first place.

*This is not about New Science. This is about the Conservation of Matter;  
Conserving the last of the Planet's Rare-Earth Resources,  
--down to the last atom.*

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There are five basic machine configurations to start working with; a description of each follows below. More detailed drawings and engineering specs will be published in the months to come as more people, businesses, and organizations contribute. In the meantime, consider starting newsletters on the various subjects involved.

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## 1) KNOWN MATERIALS MACHINE

This is the easiest machine to design and is specifically suited to work on a particular semiconductor-manufacturing floor, where all the elemental materials used in the foundry are well known and quantified on a daily basis. This is useful for returning defective products and test materials back into the manufacturing process before they ever leave the factory.

This could easily reduce in-house waste and material costs by 20 to 30%.

The basic idea is to expand the "sorting capability" of the average Ion Implanter. A long Analyzer Magnet, used as a "pre-sorter", can shift the mass of lighter ions/atoms to the inside curve and the heavier ions/atoms to the outside. Then a series of smaller, more specific Analyzer Magnets can sort the different materials at a finer level into the various Collection Chambers.

A Mass Spectrometer sorts different ions/atoms onto a flat screen or printer. The Rare-Earth Recovery Equipment takes that one step further and sorts the different ions/atoms into various "holding cups" that can be changed out daily or weekly. These recovered elements can be sold back to the semiconductor foundries at a lower price and a higher purity.

It's important to return the electrons from the Combustion Chamber in the right proportions to the different Collection Cups, (Faraday holding cups), to cancel their Ionic Motion. This provides far more efficient collection of the Rare Earth Elements and their specific isotopes; like Arsenic, Boron, Cobalt, Gallium, Lead, Mercury, Nickel, Copper, Iron, Oxygen, Tin, Aluminum, and Gold. These elements are used 24 hours a day in the production of semiconductor based products.

The earliest prototype machines for Rare-Earth Recovery should be able to reach at least 99.999% purity of separation and can be designed and built in about 2-3 years with industry standard components.

There are basically two types of Collection Chambers:

- 1) Re-Changeable Cryo-Heads that "freeze" the atoms in place for solid materials, and,
- 2) Two-Stage Turbo Pump-Down Canisters for gases and liquids.

The physical floor space for this type of machinery is likely to be fairly large, but it needs little or no Clean Room considerations, just a solid, stable foundation, with good access to trucking and railroads.

## **2) GENERAL PURPOSE MACHINE FOR LAND WASTE RECOVERY**

This one is the most important. This type of Rare-Earth Recovery machinery could be trucked into all Super Fund Sites and used to literally 'mine' these toxic waste dumps for raw elements needed in the hi-tech manufacturing sector for next year's products.

This solves three very important problems at once;

- 1) we can completely clean up these horrific toxic land-spills polluting our watersheds;
- 2) supply the Hi-Tech Manufacturing Industry with the refined elements it needs; and,
- 3) most important of all, we never have to strip-mine the fresh Earth for raw materials ever again, -saving tremendous amounts of fossil fuel and coal emissions in the smelting process.

We have already dug up enough materials from the Earth for all of Humanity. We just need to start strip-mining the toxic landfills and overflowing trash dumps for the necessary hi-tech raw minerals we use, instead of pristine mountainsides.

Ideally, this design requires a two-story building; the upper floor is a column that processes the lighter volatiles and plastic out-gases, and the lower floor processes the more solid materials and heavy metals similar to the KNOWN MATERIALS MACHINE described above.

By using Ionization Potential to sort the volatile gases, certain chemicals will "light-up" with color at certain voltage potentials. Once ionized between a pair of electrode screens, different gases can be shifted sideways at different heights in the column with either small magnet assemblies or more high voltage Extraction Plates. Again, close attention to the reverse electron flow is necessary for the pure collection of these ionized particles.

### 3) HEAVY LIQUIDS IONIZATION COLUMN

This is a much more sophisticated version Ionization Column described above. It combines many of the standard practices of an Oil Refractory Tower. But, if done properly, it can reduce a barrel of Crude Oil into pure Hydrogen and pure Oxygen, (both of which are needed in common Fuel Cells), also, pure Carbon to make fibers for Filters, Carbon Micro-Tubules, Hi-Tech Composite Structures, and Industrial Diamonds. There will also be a bit of leftover Sulfur and other trace and rare elements. This Rare-Earth Recovery machine can process a wider variety of heavy liquids, waste oils, and biohazard materials faster, cheaper, for half the energy, and one-fifth the real estate than existing Oil Refineries.

While not advocating for more Oil Drilling, this is the best way to turn a barrel of Crude Oil, or any other toxic Organic Chemical(s), into pure, non-polluting energy for Fuel Cells. We need to start recovering both Oxygen and Hydrogen immediately to make Fresh Water with Fuel Cells from the wide variety Solvents, Oils, Plastics, and Post-Consumer Waste Products; --most of which have been created by/for the Automobile Industry in the first place.

This machinery can provide the best foundation for a smooth transition into a "Hydrogen Economy". It is crucial to recover the Oxygen as well; This is just as important as Hydrogen in the H<sub>2</sub>O Fuel Cell Process for recovering the purest Water and maintaining the longest lasting Fuel Cells. In fact, using both purified Oxygen and purified Hydrogen together is crucial in sustaining a long term Fuel Cell Economy.

Keep in mind, an H<sub>2</sub>O Fuel Cell can suck as much Oxygen from the air as a 'large-block V8' engine; like that found in most SUV's and trucks. Yes, there is no pollution in the room, but there's also no more air for you to breathe either.

With the extensive amounts of clear-cutting, reducing the redwood/pine forests, and deforestation of the Rain Forests world-wide, the Oxygen re-generating systems of the Planet are seriously compromised; and we don't need to use up the rest of the Oxygen making "clean energy" fuel cells.

*Recovering Oxygen from plastics and other heavy liquid wastes  
is just as crucial as recovering Hydrogen.*

#### 4) INDUCTIVE CENTRIFUGE MACHINE

This is used strictly for sorting Heavy Metals. This Rare-Earth Recovery machine is similar, but somewhat larger than the "G-Force" machines used to test how flabby astronauts' cheeks get before their bodies turn to mush.

It consists of four large, balanced, spinning ceramic crucibles with inductive properties. These crucibles spin past powerful magnets and use the Eddy Currents involved to heat the material to just past melting temperatures. This can be controlled with the speed; the faster this centrifuge goes around, the hotter things get. And, at those forces, it would be easy to separate many different metals from each other without using any more toxic metals chemistry, or coal-fired foundries.

The second step is to turn off the magnets while everything is still spinning, letting it cool and solidify in place.

The third step is to drop these hot "layered slugs" into large vats of Liquid Nitrogen and let the different Coefficients of Thermal Expansions snap the various metals apart into separate disks. With additional thermal shocks, you may be able to powderize each of these disks as well.

#### 5) CO<sub>2</sub> ATMOSPHERIC EXTRACTION TO RE-BALANCE ATMOSPHERIC O<sub>2</sub> LEVELS

A new variant in the Rare-Earth Recovery toolbox is called for by Virgin Fuels. They have offered CO<sub>2</sub> Technical Challenge: process nearly 3 million tons of atmosphere a day to remove Carbon from CO<sub>2</sub> and return almost 2 million tons of O<sub>2</sub> to our breathable atmosphere each day. This is roughly the same amount that our recently destroyed Rain Forests were producing for millennia.

This reduction of CO<sub>2</sub> with the replenishment of O<sub>2</sub> to our natural atmosphere is critical to our overall Planetary Health. Without enough Oxygen, everything dies, regardless of anything other environmental disaster we may have caused.

In response to the challenge put up by Mr. Branson of Virgin Industries, <http://www.virgin.com/subsites/virginfuels/> an airport facility the size of the Moffet Field with its large Wind Tunnel in Mtn. View CA can be converted into a massive CO<sub>2</sub> Scrubbing Plant. This equates to removing roughly 27,000 Tons of Carbon each day from the atmosphere. And Moffet Field is just the right place to fly it out in large cargo planes to a variety of worldwide industries from tires, to water filters, to structural fibers, and diamond coatings. This would definitely keep Moffet Field in business; -far more than being just a historical museum.

Plans and Systems need to be developed to tackle this extreme challenge.

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The concepts as described above for Rare-Earth Recovery Technologies are critically needed to clean up our overly polluted & toxic planet. Any advancements in these areas will speed the transition into an H<sub>2</sub>O Fuel Cell, Emission Free Economy.

It is critical to start building this Rare-Earth Recovery machinery and dissolving all the Super Fund Sites, toxic landfills, obsolete computers, and cell phone dumps. It is vital we start generating pure Hydrogen, Oxygen, Carbon, Silicon, Gold, Silver, Platinum and other precious metals and minerals from our refuse, before strip-mining any more fresh Land, then sending it to China as toxic trash for yet more worldwide pollution.

When we really begin to see how much is at stake with our instantly disposable, western worldview of this one-and-only planet; there is a stronger sense of urgency to do something different. If we as a society, leading the rest of the world in consumerism, can't change our own habitual consumption, then we had better change the way we view our trash, -as the last remaining worldwide resource that hasn't been used up yet.

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**RADIOACTIVE MATERIALS DISCLAIMER**

None of this Equipment is designed for, or to be used with anything Radioactive, or anything involved in processing Pre/Post Nuclear Products and/or Wastes.

There is more to be said on this subject, but not in this article.

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**More Background Research Links:**

Hydrogen & Fuel Cell Letter - February 2001

<http://www.hfcletter.com/letter/february01/>

JEOL MS: Novice Explanation for Spectrum Analyzers

<http://www.jeol.com/ms/docs/whatisms.html>

How does it work?

[http://www.gso.uri.edu/icpms/how\\_does.htm](http://www.gso.uri.edu/icpms/how_does.htm)

Mass Spectroscopy Tutorial

<http://chipo.chem.uic.edu/web1/ocol/spec/MS2.htm>

A History of Mass Spectrometry

<http://masspec.scripps.edu/information/history/>

A virtual lab for 'mass spec'

<http://www.post-gazette.com/healthscience/20030324virtual0324p5.asp>

MDS SCIEX

<http://www.sciex.com/products/aboutmass.htm>

NASA's Genesis Mission - The Science - Closer Look - Mass Spectrometry

[http://www.genesismission.org/science/mod3\\_SunlightSolarHeat/MassSpectrometry/](http://www.genesismission.org/science/mod3_SunlightSolarHeat/MassSpectrometry/)

Ionalytics - Technology - How Does Ionalytics Selectra Work?

<http://www.ionalytics.com/en/technology/how.shtml>