Petitioner's Environmental Report
Petition for Rulemaking PRM-40-29

January 2005

INTRODUCTION

1.1 The Petition for Rulemaking

"CFR 40.13 Unimportant quantities of source material.

(C)(*10*) Any person is exempt from the regulations in this part and from the requirements for a license set forth in section 62 of the Act to the extent such person receives, uses, or transfers thorium contained in catalytic devices, provided that each person receives, possesses, uses or transfers thorium in catalytic devices using a catalyst bead coated with thorium, *Provided*, That

(i) The catalyst bead coating does not contain more than 30 percent by weight of thorium; and *Provided*, That;
(a) Each catalytic device is durably labeled or marked with the identification of the manufacturer; and the statement "Unauthorized alteration prohibited"; and
(b) Each catalytic device is durably labeled or marked with the statement " Return to the manufacturer for safe disposal"; and
(c) Each catalytic device is durably labeled or marked with the statement "See MSDS for health and safety information"; and
(d) Each catalytic device is constructed in a manner that will prevent casual exposure of the public or workers to radiation in the course of the normal application of the device."

The purpose of this rule change is to make available to the citizens of this country a proven combustion process exhaust air pollution emission reduction technology that is currently being used in Japan that not only reduces air pollutants but has also achieved a net fuel savings for the users.

The positive benefit of the implementation of this change is that it will benefit the citizens of this country by contributing towards the reduction of pollutants in the air we all breath, reduce fuel consumption by internal combustion engine users (trucks, buses, etc.), offer increased engine life (MTBO) and provide for reduced regulatory record keeping by eliminating the need for each end user to apply for a license to have and use the device.

A negative risk might be the exposure of someone to low level radiation from the radionuclide as a result of a worst case scenario, which would be a possible, but statistically of a low probability, catastrophic incident or accident of such a severe nature that it would completely demolish a vehicle to the extent that it would cause the materials to be released from their shielding/containment. This risk would not normally apply to stationary applications.

1.1.1 History of development:

In the 1990's a number of students in Okayama, Japan found themselves having to walk up a roadway to get to their school. The local bus line traveled this roadway as well.

Although Japan has stringent air quality standards, the regulations were not being applied to the local bus company (Okayama Bus Line).

Whenever the buses, powered by diesel engines, passed by, on a very narrow and often twisted public road, black smoke discharged from the exhaust pipes would hit pedestrians both young and old alike. The parents of these school children became concerned about the health effects that the soot (PM) was having on their children. They started a movement to resolve this issue.

Two Japanese scientists spearheaded this effort, one with a chemical engineering degree and the other with a medical degree. The chemical engineer collected all available data on the buses and searched for all available anti-pollution devices and their corresponding cost to a typical bus company. Meanwhile, the medical doctor, with the help of the local health authority, collected medical evidence chronicling the effects of air pollution on the human body, emphasizing his local residents, which included the school children who used the narrow road to travel to school.

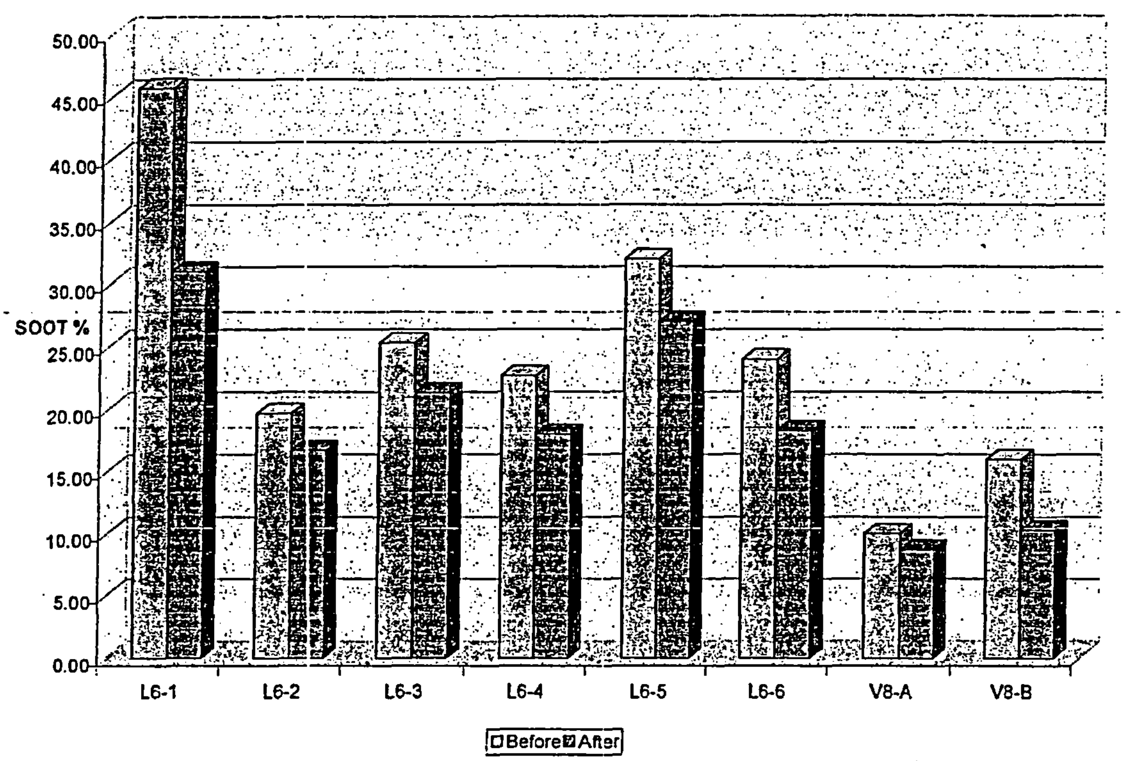
As a result of his massive research the chemical engineer came across a particular device. He went to various automobile and bus repair shops to validate the performance data for it, using tests before and after the installation of the device to establish the true effect on exhaust emissions.

The two engineers presented their evidence to the bus company's management team and the company acknowledged the merits of the devices. They subsequently installed them on 8 buses. The test results are shown in the next section.

1.1.2 Performance Results:

Okayama Bus Company
Japan PM Emission Standard:
Limit for buses manufactured before 1995 = 50%
Limit for buses manufactured after 1995 = 25%

BLACK SMOKE (PM) REDUCTION-OKAYAMA BUS LINES



	L6-1	L6-2	L6-3	L6-4	L6-5	L6-6	V8-A	V8-B
Before	45.7 %	19.7%	25.3%	22.7%	32.0%	24.0%	16.0%	10.0%
After	31.0%	16.7%	21.3%	18.0%	27.0%	18.3%	10.3%	8.7%
%R	**32.2%**	**15.2%**	**15.8%**	**20.7%**	**15.6%**	**23.8%**	**35.6%**	**13.0%**

L6 = Bus with L6 Diesel engine.
V8 = Bus with V8 diesel engine.
%R= Percentage of reduction soot (PM) emissions as measured.

For test reports see Addendum "A"→

1.2 The Petitioner

Terence O. Hee
4530 West 6200 South
Kearns, UT 84118
Vice President, Ion Technology. An organization formed to promote the sale and distribution of the IonTechno devices in the North and South America.

Competition

As both national and international patents offer protection for the devices it is uncertain at this time how many competitors would attempt to enter the market, although it is conceivable that there might be imitators and/or those who would attempt to circumvent the existing patents once the environmental and economic benefits become widely known.

Relationship to IonTechno

IonTechnolgy has been authorized by the inventor, and patent holder, to act as the distributor of the product in the United States, Canada, Central and South America. The devices would be manufactured in Japan and the petitioner would import the devices. It is anticipated that the distribution would be achieved by direct sales to OEM manufacturers, vehicle fleet operators and individual owners.

DESCRIPTION AND USE OF IonTechno THAT CONTAINS THORIUM

2.1 Description

A patented, proprietary device to be applied to combustion processes to achieve reduction of exhaust particulate matter, NOx and CO emissions, increased fuel economy, increased MTBO for internal combustion engines and reduce the usage of lubrication oil as a result of increased time in service before change out is required.

2.1.1 General Construction

Construction

See Addendum "A"→

Chemical and physical form

See Addendum "A".→

Drawings

See Addendum "A".→

Photos

See Addendum "A".→

Measured radiation doses: See Addendum "A".→

	SURFACE	6 Inches	12 Inches
Millirems	0	0	0

Test Instrument: Horiba Aloka
Model TCS 222

Test results that show integrity of containment and shielding of radioactive material

See Addendum "A" →

2.1.2 The Radio nuclides

Thorium:

Nuclear properties

Nuclide	Half-Life	Alpha Energy (MeV)	Beta Energy (keV)	Gamma Energy (keV)	ALI/DAC
Th-212	0.03 a	7.92			
Th-213	0.14 s	7.69			
Th-214	0.10 a	7.68			
Th-215	1.20 s	7.40-7.52			
Th-216	0.16-28 ms	7.92-9.91			
Th-217	0.25 ms	9.25			
Th-218	0.11 us	9.67			
Th-219	1.05 us	9.34			
Th-220	10 us	9.79			
Th-221	1.7 rns	8.146-8.471			
Th-222	2.8 rns	7.98			
Th-223	0.65 s	7.29-7.32			
Th-224	1.05 s	7.17-7.00		176	
Th-225	8.72 m	6.441-6.501		246-359	
Th-226	30.6 m	6.228-6.338		111.1-242.1	
Th-227	18.72 d	5.757-6.038			
Th-228	1.91 y	5.34-5.42	65.0	12.3	
Th-229	7340 y	4.845-6.050	6.2-67.2	12.3-100.0	
Th-230	77000 y	4.621-4.688	48.4-66.5	12.3	
Th-231	25.52 h	-	205.5-304.8	14.3-1025.9	
Th-232(*)	14.1E9 y	3.953-4.010	9.1-57.8	12.3	
Th-233	22.3 m	----	1.245	86.5-459.3	----
Th-234	24.1 d	----	75.8-188.6	13.3-92.8	
Th-235	7.2 m	----	----	110.8	----
Th-236	37.5 m				----
Th-237					----

Note: (*) Only Isotope to occur naturally.

(http:"www.thorium-waste.com/Radiation.html)

Abundance's:

"Thorium resources occur in geologic provinces similar to those that contain reserves. The largest share is contained in placer deposits. Resources of more than 500,000 tons are contained in placer, vein, and carbonatite deposits. Disseminated deposits in various other alkaline igneous rocks contain additional resources of more than 2 million tons. Large thorium resources are found in Australia, Brazil, Canada, Greenland, India, South Africa and the United States."

World Refinery Production, Reserves and Reserve Base: (Tons)

COUNTRY	REFINERY PRODUCTION 2001	REFINERY PRODUCTION 2002	RESERVES	RESERVE BASE
United States	--	--	160,000	300,000
Australia	--	--	300,000	340,000
Brazil	NA	NA	16,000	18,000
Canada	NA	NA	100,000	100,000
India	NA	NA	290,000	300,000
Malaysia	--	--	4,500	4,500
Norway	--	--	170,000	180,000
South Africa	--	--	35,000	39,000
Others	NA	NA	90,000	100,000
WORLD TOTAL	NA	NA	1,200,000	1,400,000

(P.174-175.James B. Hedrick, U.S. Geological Survey, Mineral Commodity Summaries, January 2003)

Pertinent chemical data:

Atomic Number	90
Atomic Mass	232.038
Electron shells	7
Periodic table	Group IIIB (Actinide Series)
Specific Gravity	11.7
Oxidation states	4

(http://pearl1.lanl.gov/periodic/elements/90.html)

Pertinent biological data:

"When a radioactive chemical is released .... it enters the environment as a radioactive chemical emission. This emission, which is also called a release, does not always lead to exposure. You are exposed only when you come into contact with it in the environment through breathing air, eating, drinking or smoking substances containing the radioactive chemical. Exposure may also result from skin contact with the radioactive chemical alone, or with a substance containing it. Exposure can also occur by being near radioactive chemicals at concentrations that may be found at hazardous waste sites or industrial accidents.

Thorium is a naturally-occurring, radioactive metal. Small amounts of thorium are present in all rocks, soil, above-ground and underground water, plants and animals. These small amounts of thorium contribute to the weak background radiation for such substances. Soil commonly contains an average of about 6 parts of thorium per million parts (ppm) of soil...

More than 99% of natural thorium exists in the form (isotope) thorium-232. Besides this natural thorium isotope there are more than 10 other different isotopes that can be artificially produced...... Most thorium compounds commonly found in the environment do not dissolve easily in water and do not evaporate from the soil or water into the air....

Since thorium is found almost everywhere, you will be exposed to small amounts of it in the air you breathe and in the food and water you eat and drink. Scientists know, roughly, the average amounts of thorium in food and drinking water. Most people in the United States eat some thorium with their food every day. Normally, very little of the thorium in lakes, rivers, and oceans gets into the fish or seafood we eat. The amounts in the air are usually so small they can be ignored....

Only a small amount of the thorium that you breathe or swallow in your food, water, or soil enters your blood. One animal study has shown that thorium can enter the body if it is placed on the skin. After breathing thorium, you will usually sneeze, cough, or breathe out some of it within minutes. Some forms of thorium can stay in your lungs for long periods of time. However, in most cases, the small amount of thorium left in your lungs will leave your body in the feces and urine...the main way thorium will enter your body is by breathing dust contaminated with thorium...

Thorium is odorless and tasteless, so you cannot tell if you are being exposed to thorium. We know very little about specific exposure levels of thorium that result in harmful effects in people or animals. High levels of exposure have been shown

The EPA has set a drinking water limit of 15 Pico curies per liter (5pCi/L) of water for gross alpha particle activity and 4 Millirems/year for beta particles and photon activity (for example, gamma radiation and X-rays)."

(Public Health Statement, Toxicological Profile for Thorium, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service/U.S. EPA, October 1990)

Negative risk:

As the final manufactured form of the thorium in the product is a solid the most probable route of exposure would be dermal for someone who was cleaning up after an extremely severe, catastrophic vehicle accident that had caused the material to be released from the containment/shielding should they handle it with their hands. Since the most common method of cleaning up after a traffic accident is to sweep the accident debris into a pile and shovel it into a bucket for disposal the risk of dermal exposure is thought to be extremely low.

Pertinent physical data:

Symbol	Th
Appearance	Soft, ductile, lustrous, silvery white when freshly cut.
Solid	@ Room temperature.
Melts @	1750 Degrees Celsius
Boils @	4788 Degrees Celsius
Density @ 293 K	11.72 g/cm^3
Electrical resistivity	15E-8 Siemens
CAS Registry No.	7440-29-1

(http://pearl1.lanl.gov/periodic/elements/90.html)

Availability:

Thorium is a by-product of the processing of rare earth elements.
It makes up about .001% of the earth's crust and occurs in the minerals Thorite, Thorianite and Monzanite. These minerals are found in Sweden, Norway, South Africa, Brazil, India, United States, Canada and Australia.
It is 3 times as abundant as Uranium.
(htttp://peral1.lanl.gov/periodic/elements/90.html)
See 2.1.12 "Abundances" above.

Cost of material:

Because of the size of the Thorium industry, quoted prices are unique to individual companies that sell it. The Thorium price, which is variable, depends on the material's purity and the quantity purchased. A price has been quoted on the internet of $150.00/oz.

(p. 155-157, Thorium, by James B. Hedrick)

2.2 Operations

See Addendum "A" for further details.

Typical operating conditions would include the normal range of ambient ~~temperature for a given geographical area where the devices were being used.~~ Typical labels and instructions that relate to the safety and operation of the product are listed in section 1.1 (C)(10)(I)(a)...(c) of this document.

Additional labeling would include the following:

Model No. _______ Lot No. _______
"Warning: DO NOT disassemble.
"Contents not for human consumption"
"Contents exempt from licensing requirements of U.S. CFR."
"Introduction into foods, beverages, cosmetics, drugs or medicines or any other products manufactured for commercial distribution is expressly prohibited."

2.3 Uses

Beneficial uses would include school buses, rapid transit buses, industrial engines, truck engines, railroad engines, boilers and turbine engines.

Possible unintended uses after distribution might possibly include treatment of other fluids or gases that have not been tested by the manufacturer.

The facilitation of each use is discussed in Addendum "A".

2.4 Methods of use

The devices are to be permanently installed on mobile and stationary combustion engines or processes. The product can be used by OEM equipment manufacturers that produce vehicles that use internal combustion engines; owners of industrial processes, operators of diesel truck fleets, school districts that bus pupils to school, operators of bus lines, operators of railroad trains, industrial engine installations, power generation turbines and industrial boilers in power plants, hospitals and other installations.

The expected service life after installation is predicted by the inventor to be 30 years under normal use conditions.

A negative impact might be the situation, as in all catalytic applications, if foreign substances are introduced that are not normally found in the process, and contaminate or occlude the catalyst the efficiency and service life would drop off proportionate to the rate of contamination.

Persons to be affected by use of the product may include:

Positive benefits:

General Population (Cleaner air) 117.2 Million

Calculation Assumptions:

Number persons living in the United States [2]	293.0 Million
Number person living in polluted air[1]	40%
Calculated persons affected	117.2 Million

Commuters: Using personal vehicle (Cleaner air, less fuel) 54.7 Million

Calculation Assumptions:

Number commuters in the United States [2]	84.2 Million
Market penetration estimate	65%
Calculated number of persons affected	54.7 Million

Commuters: Using public transit (Cleaner air) 3.9 Million

Calculation Assumptions:

Commuters using public transit [2]	6.1 Million
Market penetration estimate	65%
Calculated number of persons affected	3.9 Million

School children bused to school (Cleaner air, less fuel) 10.6 Million

Calculation Assumptions:

School children bused to school [2]	26.7 Million
Percentage living in polluted air [1]	405%
Calculated number of persons affected	10.6 Million

Bus Systems (Less fuel consumed, longer engine life, longer lube oil life) 406

Calculation Assumptions:

Number of bus systems in the United States [2]	508
Estimated ultimate market penetration	80%
Calculated installations	406

Taxi Cab owners (Less fuel consumed, longer engine life, less $ spent on lube oil)

Calculation Assumptions:

Number of taxi cabs the United States [3]	136,000
Estimated ultimate market penetration	80%
Calculated installations	108,800

Truck Owners (Less fuel consumed, longer engine life) 5.1 Million

Calculation Assumptions:

Number of trucks in the United States [3]	7.85 Million
Estimated ultimate market penetration	65%
Calculated installations	5.1 Million

(1) (www.calvert-henderson.com/enviro1.pdf)

(2) *(Commuting Trends in the United States, William Bell, Dec 1994, Center for Urban Transportation Research).*

(3) *(Bobit Publishing Co., Automotive Fleet fact Book, 2001)*

Negative Risks

Tow truck drivers: Called upon to clean up after traffic accidents.

Calculation Assumptions:

Number of Tow Truck Drivers in United States (TTD)	Unknown.
Number of truck accidents per year	434,000 (a)
% of truck population involved in accidents	5.5%
Estimated # of IonTechno equipped trucks in accidents.	280,500
Estimated # of TTD that might handle the product	140

(a) NHTSA 2002

This is based on probability of 0.0005% of Ion Techno being damaged by the crash and 65% market penetration.

2.5 Distribution

The devices would be distributed to the purchasers from a central warehouse in Nevada via trucking companies. No other locations are planned to store the products.

2.5.1 Packaging

Units per package: 1
Packages per box: 1
Boxes per carton: Depends on orders being shipped.
Construction materials for boxes will be: Heavy duty cardboard.

Labeling:

IonTechno Emission Control Device
Ion Technology
Company Address
Company Telephone Number

"WARNING! Do NOT dispose of the contents without contacting the manufacturer."
"Not designed for applications that have not been approved by the manufacturer. Contact the manufacturer for a list of approved applications.
"Unauthorized alteration prohibited"

Markings:

None.

Instructions inside the container:

IonTechno Emission Control Device
Ion Technology
Company Address
Co. Telephone Number (IN LARGE NUMBERS)

Warning: Do NOT dispose of the device or contents without contacting the manufacturer.

"See MSDS for health and safety information"

"Unauthorized alteration prohibited"

In case of an accident that crushes the device in this box contact the manufacturer for proper handling and disposal procedures.

Emergency service personnel should treat the device as hazardous waste which should be returned to the manufacturer for safe disposal.

DO NOT send to metal scrap or dispose of as industrial waste. Contains a hazardous material that should be disposed of ONLY by return to the manufacturer.

"DO NOT cut the device open".

"Maintenance personnel should NEVER attempt to dismantle the device as it contains a hazardous substance that could be dangerous to your health."

Instructions outside the container:

"In case of an accident that crushes the device in this box contact the manufacturer immediately for proper handling and disposal procedures.

"DO NOT DISPOSE OF AS METAL SCRAP!"

RADIATION DOSE RATES AT SPECIFIED DISTANCES FROM CARTONS:

	SPECIFIED	DISTANCES
Surface	@ 6 Inches	@ 12 Inches
None	None	None.

Instrument used: Aloka
Model TCS 222
Horiba Mfg.

2.5.2 Distribution

One warehouse is planned where the product will be temporarily located during distribution. Initially the number of units that will pass through the site is estimated to be 40 to-50 per week. They will only be manufactured to fill orders.

The temperature range of the warehouse is expected to have no adverse impact on the boxed product.

As the probability of a fire is site specific, based on a "Risk analysis" it cannot be calculated with any certainty at this time. A reasonable probability can only be arrived at as a result of the selection of an actual warehouse, followed by a site specific "Risk Analysis".

Most real world problems involving elements of uncertainty are too complex to be solved by strict analytical methods such as linear extrapolation from historical data. There are too many possible combinations of input values to calculate ~~every possible answer, yet insight about the range of possible outcomes is~~ critical for stakeholders.

"Risk Analysis" is a technique to systematically address the underlying uncertainty or variability in model inputs. Rather than developing a single estimate for an input, a probability distribution describing the uncertainty or variability of the data for the input is selected.

However, it is planned at this point to lower the probability and minimize the risk by implementing best case warehouse management practices such as:

A. Nothing will be stored in the warehouse but the IonTechno product.
B. The warehouse will be equipped with a standard sprinkler system per fire code requirements.
C. No materials will be stacked closer than 18 Inches to the sprinkler heads.
D. Aisles between materials will be maintained at 48 Inches or wider.
E. A "No Smoking" policy will be strictly enforced.
F. "No Smoking" signs will be posted.
G. The warehouse will also be equipped with an electronic fire monitoring alarm system.
H. Waste materials will not be accumulated inside the warehouse.

A "Hazardous Materials Plan (HMP)" will be implemented with full documentation on file in the warehouse office. This "HMP" will also be filed with the local fire department. Signs on the warehouse will identify the fact that the warehouse stores devices that have radioactive materials contained within the devices and an emergency number will be posted.

The warehouse will be fully ventilated to mitigate the possibility of the accumulation of Radon gas.

2.5.3 Transport

Modes of transport that will be used to transfer the product from the place of manufacture in Japan to the warehouse in Nevada and ultimately to the user.

MODE	No. Cartons	No. Shipments	How Often	Route	Avg. Miles	Environment	Dose Rate @ Surface	Dose Rate @ 6 "
Ship		1	Monthly	Japan to Long Beach	5,451	Dry	None	None
Truck		1	Monthly	Long Beach to Las Vegas	280	Dry	None	None
Truck		2	Weekly	Varied	100-2000	Dry	None	None
FedEx	0	0	N.A.	N.A.	0*	Dry	None	None
UPS	0	0	N.A.	N.A	0*	Dry	None	None

* These carriers do not accept shipments of radioactive materials.

2.6 Installation, Maintenance and Repair

Intended methods of performing installation:

See Addendum "A" ⟶

Intended methods of maintenance:

Normal service requires no maintenance. In the event of contamination of the catalyst by a foreign substance, flushing of the devices with the appropriate solvent to remove the contamination will be the preferred method.

Intended methods of repair with related radiation safety procedures:

None are provided. The devices will either be in service or will be returned to the manufacturer for repair or replacement.

Methods precluded by design:

See Addendum "A" ⟶

Methods possible and likely to be performed:

See Addendum "A" ⟶

Frequency of installation activities:

This will depend entirely on market acceptance and the resultant sales. One scenario might be the case where a trucking company with a fleet of 1,000 trucks may decide to install the devices. This could result in an average 10 installations per week depending on the size of the maintenance staff of the fleet owner and the availability of the trucks.

Frequency of maintenance activities:

It is anticipated that maintenance activities would include return of the devices to the manufacturer when the application is taken out of service, which could be on the order of 5 years, 10 years, and 15 years depending on the application. It could also include flushing of the devices with a cleaning fluid if there is contamination of the device by foreign substances. This is estimated to be on the order of <0.5% per year as most fleet operators have extensive maintenance programs in place to preclude this from happening as a way to protect their investment in the equipment.

Frequency of repair activities:

There are no repair activities anticipated to be performed by users as the devices are not designed to be repaired. They are either in service or are returned to the manufacturer for repair or replacement.

Operations during which persons will come into contact with the radioactive material or during which the shielding of the radioactive material might be significantly reduced or the radioactive material released:

The inherent design of the devices precludes persons coming into contact with the radioactive material under normal conditions. The shielding is welded so that it cannot be disassembled. One case for the potential of exposure is an accidental physical incident of sufficient force and magnitude that would rupture the shielding of the devices. The possibility of this occurring is difficult to quantify. Current data bases on national vehicle accidents do not provide the detail required to fully evaluate the probability involved.

2.7 Disposal

Likely methods of disposal would include:

Return to manufacturer	97.5-98.5% (Estimated)
Industrial scrap metal	1.0-2.0% (Estimated)
Industrial solid waste	0.25-0.5% (Estimated)
	100 %

To encourage "Return to Manufacturer" as the preferred method the product will have a label instructing the owner to do so.

Disposal procedures during which persons might come in contact with the product might include crushing or grinding up of the device as scrap metal or cutting the device apart which may cause the release of radioactive material from the product.

MARKET FOR IonTechno THAT CONTAINS THORIUM

3.1 Need

3.1.1 For air pollution reduction devices:

"The poor air quality that many Americans know as smog and soot is caused by six (6) ubiquitous pollutants labeled "Criteria Air Pollutants" by the government regulators. Over 130 million people currently live in counties where federal air quality standards are not met., facing increased risks of heart and lung disease and premature mortality. Most of the 20 million people suffering from asthma also live in areas where poor air quality: ozone, particulates and sulfur dioxide are all known to worsen the health of asthmatics and trigger asthma attacks."(1)

"Criteria air pollutants include the six most common air pollutants in the U.S.: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Congress has focused regulatory attention on these six pollutants because they endanger public health and the environment, are widespread throughout the U.S., and come from a variety of sources. Criteria pollutants are responsible for many adverse effects on human health, causing thousands of cases of premature mortality and tens of thousands of emergency room visits annually. They also cause acid rain and can significantly harm ecosystems and the built environment."(1)

"Criteria pollutants are the only pollutants with national air quality standards that define allowable concentrations of these substances in ambient air. In 1997, EPA concluded that several of our current national air quality standards do not provide sufficient public health protection. New, more stringent air quality standards were adopted for ozone and particulate matter. Implementation of these standards has been slowed by legal challenges, but the U.S. Supreme Court upheld most of the EPA's air quality rules in February 2001. The court approved EPA's new standard for particulates, which expanded regulation s of fine pollution particles ~~down to 2.5 microns. The court approved EPA's new ozone standard as~~ well...."(1)

"EPA's air quality monitoring network indicates that over 130 million people live in counties with unhealthy air due to one or more criteria pollutants."(1)

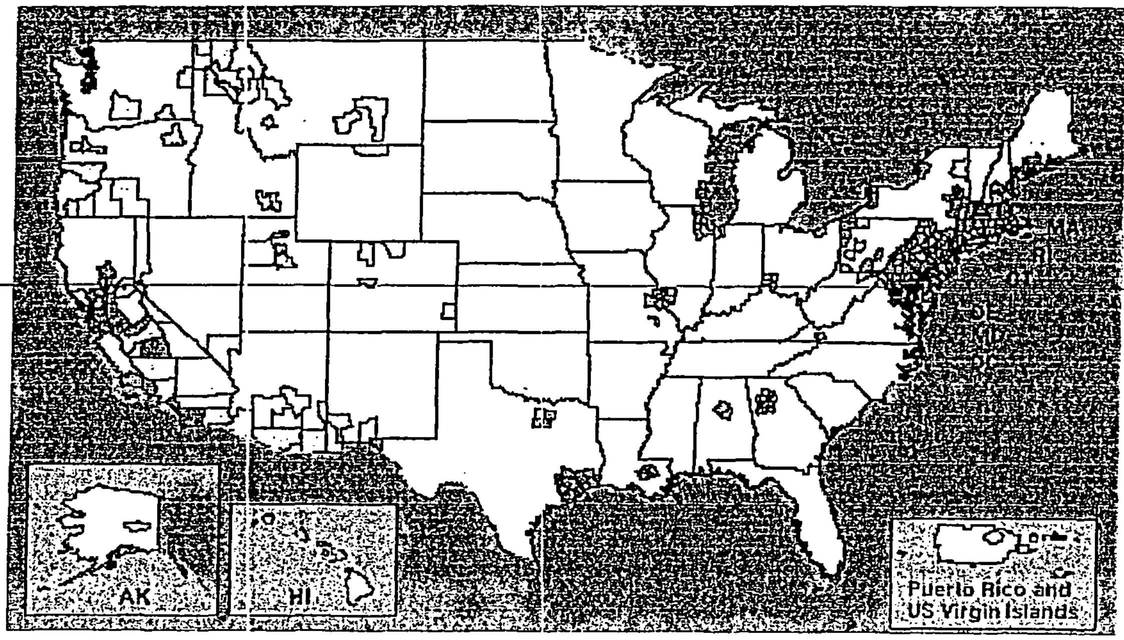
"An area that persistently fails to meet air quality standards can be designated as a nonattainment area for one or more pollutants. Presently over 100 nonattainment areas have been designated by the U.S. Environmental Protection Agency. Most are located in metropolitan areas, where air quality problems are more severe."(1)

"EPA's criteria air pollutant emissions inventory indicates that releases of all criteria pollutants EXCEPT nitrogen dioxides (NOx) have been in decline since the passage of the 1970 Clean Air Act. Overall air quality across the country has improved significantly since the 1980's.
These improvements, however, have NOT ELIMINATED air quality problems, and major efforts to control pollution sources are still required to ensure that everyone breathes air that meets Clean Air Act standards." (1)

"Air pollution comes from a wide variety of sources that are usually classified into three groups: mobile, area and point sources. Mobile sources (like cars and trucks) are responsible for about 75% of carbon monoxide (CO) pollution, and for more nitrogen dioxide (NOx) and volatile organic compound (VOC) emissions than area or point sources. Area sources (like small businesses) are responsible for over 50% of particulate matter emissions and for nearly half of the volatile organic compound emissions. Point sources (like power plants and industrial factories) account for nearly 90% of sulfur dioxide emissions."(1)

"Emissions and exposure information for criteria air pollutants is derived from two U.S. EPA sources: The National Emissions Trend (NET) database and the Air Quality System (AQS) database."[1]

NON-ATTAINMENT AREAS:



Map Legend

Entire county is in nonattainment

Part of county is in nonattainment

(1)

Health risks from Criteria Pollutants: (Ranked by all Criteria air pollutants)
Person-days exceeding of NAAQS

Rank	State	Person-days		Rank	State	Person-days
1	California	4,885,825,902		25	South Carolina	26,599,457
2	Texas	802,472,531		26	New Hampshire	17,564,400
3	Illinois	559,766,045		27	Rhode Island	11,021,918
4	Ohio	360,136,650		28	Maine	10,448,185
5	Pennsylvania	345,377,398		29	Utah	9,732,998
6	New York	224,710,632		30	West Virginia	8,252,444
7	Arizona	198,910,082		31	Colorado	8,094,788

8	North Carolina	179,547,084		32	Oklahoma	7,681,970
9	New Jersey	160,451,555		33	Arkansas	5,639,762
10	Connecticut	154, 082,152		34	Louisiana	4,697,539
11	Maryland	143,089,551		35	Florida	3,758,994
12	Indiana	137,455,343		36	Mississippi	2,034,816
13	Michigan	126,249,418		37	Kansas	1,424,400
14	Virginia	112,088,228		38	Hawaii	1,083,558
15	Missouri	96,328,096		39	Vermont	744,276
16	Massachusetts	84,838,720		40	New Mexico	714,656
17	Georgia	61,165,005		41	Iowa	710,815
18	Tennessee	59,832,414		42	Minnesota	579,815
19	Wisconsin	40,600,623		43	Oregon	544,904
20	Nevada	38,054,100		44	Washington	324,499
21	Kentucky	37,542,698		45	Idaho	319,687
22	Wash. D.C.	34,824,778		46	Wyoming	145,524
23	Delaware	34,581,552		47	Montana	37,330
24	Alabama	26,964,296				

(1)

1991 Emissions Summary of Criteria Pollutants (Annual Tons)[(1)]

Sources	Carbon Monoxide	Nitrogen Oxides	PM-2.5	PM-10	Sulfur Dioxide	Volatile Organic Compounds
Mobile	75,151,535	14,105,483	2,729,621	12,831,958	1,299,342	8,536,092
Area	16,972,636	2,251,929	3,369,684	9,734,269	1,289,884	7,574,071
Point	5,307,982	9,037,572	672,951	1,111,756	16,296,167	2,061,167

(1) *http://www.scorecard.org/env-releases/cap/index.tcl)*

The data presented by the EPA leads us to conclude that it is reasonable to assume that while there has been improvement in the reduction of air pollution there is still a critical need for further improvement in terms of public health risk.

3.1.2 For fuel savings

Highway Trucks:
Assumptions

2001	Registrations (thousands)	Vehicle Travel (million miles)	Fuel Use (million gallons)	Fuel Economy (miles/ gallon
	2,154	135,400	25,555	5.3

U.S. DOT, FHA, Highway Statistics 2001, Washington DC Table VM1 and Annual.

3.1.3 For IonTechno

In air pollution Reduction:

Highway trucks (Does not include buses and other vehicles).

Assumptions: Stated in Annual Tons

		CO	NOx	PM-10
Mobile Emissions[(a)]		75,151,535	14,105,483	1,299,342
Market Penetration				
Minimum	55%	41,333,344	7,758,015	714,638
Mean	60%	45,090,921	8,563,289	779,605
Maximum	65%	48,848,497	9,168,563	844,572
Actual reductions %[(b)]	51.75%	-	-	672,409
	89.60%	-	-	1,164,210
Calculated reductions				
Minimum		31,454,675	3,879,008	578,856
Mean		34,314,191	4,281,645	631,480
Maximum		37,173,706	4,584,282	684,103

(a) *http://www.scorecard.org/env-releases/cap/index.tcl)*
(b) *Actual fleet operating results, Muroo Co. Ltd.*

In Fuel consumption reduction:
Highway Trucks (Does not include buses and other vehicles).

Assumptions:

		Fuel use (million gallons)	Fuel use Without Ion Techno	Fuel use With Ion Techno
Registrations (thousands)	2,154	25,555*	25,555	--
Market Penetration	65%	--	--	--
Projected Users	1,400	--	25,490*	23,324* 19,704
Fuel Savings Range	3.3% - 70.2%	--	--	--
Net Reduction	Minimum Mean Maximum	--	--	841.17 8,207.8 17,894

* Fuel stated in million gallons/year

Third Party Independent Test:

Toshio Yamashita, President
Muroo Company, Ltd.
1-6-9 Chuuo, Kure City
Hiroshima-Ken, Japan 737-0051

Fleet of 800 Mitsubishi Refrigerated Trucks
6.7 L, 400 HP Diesel Engines

Vehicle No. 010

Before IonTechno	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Totals
Km Driven	5,386	9,457	10,610	8,938	9,370	
Fuel/Liters	2,407	2,838	4,517	3,512	2,975	
Km/Liter	2.24	3.33	2.35	2.54	3.15	

After IonTechno	Oct 2003	Nov 2003	Dec 2003	Jan 2003	Feb 2003	
Km Driven	16,403	18,817	17,250	17,881	11,012	
Fuel/Liters	4,652	5,072	4,795	4,785	3,148	
Km/Liter	3.53	3.71	3.60	3.74	3.50	

Fuel Savings	36.5%	10%	34.7%	15.7%	9.9%	

Cost Savings	173,940 ¥ 1,656 $	37,635 ¥ 358$	165,712 ¥ 1,578 $	146,770 ¥ 1,397 $	22,685 ¥ 216 $	546,742 ¥ 5,207 $
Increased Km/Liter	57.58%	11.41%	53.19%	47.24%	11.11%	36.1%

Fuel @ 65 Yen/Liter

Vehicle No. 1048

Before IonTechno	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
Km Driven	8,299	6,431	9,510	6,138	7,743
Fuel/Liters	2,407	2,838	4,517	3,512	2,806
Km/Liter	2.62	2.26	1.95	1.88	2.72

After IonTechno	Oct 2003	Nov 2003	Dec 2003	Jan 2003	Feb 2003
Km Driven	12,215	11,151	10,931	10,005	9,557
Fuel/Liters	3,986	4,362	4,057	3,125	3,399
Km/Liter	3.06	2.56	2.69	3.20	2.81

Fuel Savings	36.85 %	39.08 %	45.79 %	49.69 %	22.23 %	
Cost Savings	175,354 ¥ 1,670 $	211,516 ¥ 2,014 $	263,325 ¥ 2,507 $	307,201 ¥ 2,925 $	58,534 ¥ 557 $	1,015,930¥ 9,675 $
Increased Km/Liter	16.9 %	13.27 %	37.95 %	70.21 %	3.31 %	

Fuel @ 65 Yen/Liter

Note: As a result of this test the Muroo Company began in April, 2004 to equip their entire fleet of 800 trucks with the IonTechno devices.

3.2 The air pollution reduction industry

Buses

"Clean Burn" diesel engine designs, catalytic exhaust converters, conversion to LNG, conversion to CNG, conversion to diesel-electric and experimental hydrogen fuel cells.

Industrial Boilers

Low NOx gas burner designs.

Power Generation Turbines

Ammonia injection combined with exhaust catalyst.

Highway Trucks

Electronic injection, electronic air-fuel ratio controls, catalytic exhaust converters.

Off Highway Trucks

Electronic injection, electronic air-fuel ratio controls.

Railroad Engines

Electronic injection, electronic air-fuel ratio controls.

3.3 Demand

Estimate of historical demand

Short term (1 to 10 years)

> "With the implementation of the EPA rules issued on January 18, 2001, (40 CFR parts 69, 80 and 86) concerning the control of air pollution from new motor vehicles, i.e. heavy-duty engine and vehicle standards and highway diesel fuel sulfur control, the EPA is establishing a comprehensive national control program that will regulate the heavy-duty vehicle and its fuel as a single system. As part of this program, new emission standards will begin to take effect in model year 2007, and will apply to heavy-duty highway engines and vehicles. These standards are based on the use of high efficiency catalytic exhaust emission control devices or comparably effective advanced technologies."
>
> *Daniel W. Leubecker, Maritime Safety and Environmental Specialist, Office of Environmental Activities, Maritime Administration, USDOT http://MARAD.dot.gov/nmrec/Report59/drft59sm.pdf*

With the market for retrofit and for new vehicle manufacturing it is expected that there will be short term demand.

Long term (10, 20, 30, 40 and 50 years)

As long as air pollution is a public health issue in this country there will be a demand for technologies that reduce it. As long as crude oil prices remain at historical highs there will be a demand for technologies that increase internal combustion engine fuel efficiencies. It is postulated, based on the progress that has been made in the last 20 years that for the next 10-20 years there will be a demand. Beyond that it is difficult to predict when these factors will no longer be a driving force over the following years.

Bases for estimates

The hydrogen economy has been talked about for some time. The hydrogen fuel cell has been "5 years away from economies of scale that make it economically feasible" since the 1980"s. The hydrogen industry suffers from the "Chicken or the Egg?" syndrome. No one will make the massive monetary investment in a nationwide production and distribution system until there are sufficient vehicles to support it. No one is going to mass manufacture a hydrogen fueled vehicle until there is a nationwide distribution system to support it. The most likely scenario, which we are seeing the beginnings of now, is further adoption of hybrid vehicles that use the existing fuel distribution infrastructure and the existing fuels.

3.3.1 For Air Pollution Reduction Technologies

Past demand

This has been on going since the 1950's.

Present demand

While there have been major strides made in air emissions control and reduction there still remains a need for further advancements.

Future short term demand

An item of major interest in many non-attainment areas of the country.

Future Long Term demand

Unknown at this time.

3.3.2 For IonTechno

Presently, without advertising, the market sector stakeholders in the United States are generally unaware of the product.

In the future it is anticipated that once the market segment decision-makers are made aware of the benefits and cost savings the demand will begin and increase over time. Particularly with the rise in the cost of crude oil the fuel cost savings created by application of the product will make it more and more attractive to mobile application operators/owners.

Traditional technologies for exhaust pollutant reduction (Catalytic mufflers, EGR systems, and electronic fuel control systems) certainly have their place in the marketplace. While most OEM engine manufacturers have on going research and development programs to achieve even further reduction in pollutants and increased mileage IonTechno provides significant reductions in pollutants and reduced fuel consumption now without the substantial expense of research and re-tooling that new designs require.

3.4 *Supply*

3.4.1 Of Air Pollution Reduction Technologies

Traditional technologies (exhaust treating catalysts) used in the United States are available from a variety of manufacturers:
Exhaust catalytic converters
Exhaust plasma fuel reformer
Lean NOx catalyst

ENVIRONMENTAL EFFECTS OF NORMAL DISTRIBUTION, USE AND DISPOSAL OF IonTechno

4.1 Environments and Populations Affected

4.1.1 During Distribution

Environment

Under normal conditions it is expected that there would be no effect on the environment during distribution due to the shielding of the radionuclide.

Populations

Under normal conditions it is expected that there would be no effect on the populations along the routes of distribution due to the robust shielding of the radionuclide.

4.1.2 During Use

Environment

It is expected that there would be a reduction in CO, NOx and PM-10 in the environment during use of the product. (See section 3.1.3)

Populations

A positive health benefit is expected as a result of the reduction in air pollution.

4.1.3 During Installation, Maintenance and Repair

Environment
No effects are anticipated.

Populations
No effects are anticipated.

4.1.4 Due to Disposal

Environment
Possible minor deposits of devices in sanitary landfills due to failure of users to dispose of them properly.

Populations
Uncertain.

4.2 Radiological Impacts

4.2.1 On Man

4.2.1.1 During Distribution
Are estimated to be none.

4.2.1.2 During Use
Are estimated to be none.

4.2.1.3 During Installation, Maintenance and Repair
During installation they are estimated to be none.
During maintenance they are estimated to be zero Radiation dose/person
During repair they are estimated to be zero Radiation dose/person as repair is not an option.

4.2.2 On Terrestrial and Aquatic Ecology (Radiation dose and contamination)

4.2.2.1 During Distribution
Radiation dose = none. Even if there was a transportation accident the catalyst is contained in welded stainless steel tubes and housings. The probability of the destruction and breaking open of these housings in this scenario is very low

4.2.2.2 During Installation, Maintenance and Repair
Radiation dose during Installation = none.
Radiation dose during maintenance = none.
Radiation dose during repair = none.

4.2.2.3 **Due to Disposal**

With the return of the product to the manufacturer for safe disposal it is estimated that there will be about 98% returned.

With the possibility that some customers may not observe the directions on the label to return it to the manufacturer for safe disposal it is conceivable that some .25 to .50% may be thrown into the trash. The radiation dose under this scenario is difficult to assess as it assumes that the welded containers are still intact and would simply be buried in a sanitary landfill without anyone being exposed to the catalyst itself.

It is also estimated that 1.0 to 2.0% may be inadvertently processed as scrap metal. Under this scenario the radiation dose is difficult to assess as the typical scrap disposal methods most often involve crushing the materials to reduce their physical bulk and then sending them directly to a furnace for melting. Another method of scrapping is to shred metal into smaller pieces before sending it to the smelter. In this case it is also difficult to estimate or assess the radiation dose per person as the materials are handled by automated machinery.

4.2.2.4 **On Land, Air and Water Use**

None is anticipated.

4.2.2.5 **During Distribution**

None is anticipated.

4.2.2.6 **During Use**

None is anticipated.

4.2.2.7 **During Installation, Maintenance and Repair**

None is anticipated.

4.3 Nonradiological Impacts

4.3.1 On Man

4.3.1.1 **During Distribution**

None is anticipated.

4.3.1.2 **During Use**

Improved air quality, reduced fuel usage.

4.3.1.3 **During Installation Maintenance and Repair**

None is anticipated.

4.3.2 On Terrestrial and Aquatic Ecology

4.3.2.1 **During Distribution**

None is anticipated

4.3.2.2 **During Installation, Maintenance and Repair**
None is anticipated as installation and maintenance activities are to be performed in controlled environments. No repair activities applicable for this product.

4.3.2.3 **Due to disposal**
No effect is anticipated as the inadvertent disposal to a landfill is thought to not increase the effect on the terrestrial ecology over what the landfill already poses.

4.3.3 On Land, Air and Water Use

4.3.3.1 During Distribution
None is anticipated.

4.3.3.2 During Use
None is anticipated.

4.3.3.3 During Installation, Maintenance and Repair
None is anticipated.

*4.4 **Impacts on the Community*** (Estimated Magnitude of impacts of the product both beneficial and adverse)

4.4.1 Economic

4.4.1.1 During Distribution

Employment
Unknown.

Secondary effects
Energy conservation through improved mileage.

Tax Revenues
Unknown.

Service Revenues
Minor due to the physical size of the devices.

Improved Service
None anticipated.

4.4.1.2 During Use

Employment
Minor.

Secondary effects
Cleaner air.

Tax Revenues
Unknown.

Service Revenues
None anticipated.

Improved Service
None anticipated.

4.4.1.3 During Installation, Maintenance and Repair

Employment
Minor.
Secondary effects
None anticipated.
Tax Revenues
Unknown.
Service Revenues
None anticipated.
Improved Service
None anticipated.

4.4.1.4 Due to Disposal

Employment
None anticipated.
Secondary effects
Unknown.
Tax Revenues
Unknown.
Service Revenues
None anticipated.
Improved Service
Unknown.

4.4.2 Social

4.4.2.1 During Distribution

Community Services

The need for services such as housing, schools, hospitals, police and fire protection, recreation areas, and other institutions is not expected to change, either increased or decreased.

National Goals and security

Energy conservation

Could play a significant role here.

New technologies

Certainly a new application.

Improved or reduced national security

Unknown.

Balance of payments

Thought to be negligible due to currency conversion.

More efficient use of resources.

~~Higher fuel efficiency.~~

Concern about introducing radionuclides into the environment

With the shielding and the containment the concern about introduction of the radionuclide into the environment is thought to be somewhat negligible.

4.4.2.2 During Use

Community Services

None anticipated.

National Goals and security

Energy conservation:

Reduced fuel usage.

New technologies:

Introduction of a new technology.

Improved or reduced national security:

Unknown.

Balance of payments:

Negligible when compared to other imports.

More efficient use of resources.

Improved fuel efficiency leading to possible reduced fuel usage.

Concern about introducing radionuclides into the environment
With the rugged integrity of the shielding/containment and the low probability of introduction into the environment it is anticipated that this is minimal.

4.4.2.3 During Installation, Maintenance and Repair

Community Services
None anticipated.
National Goals and security
No effect anticipated.
Concern about introducing radionuclides into the environment
No effect anticipated.

4.4.2.4 Due to Disposal

Community Services
~~None anticipated.~~
National Goals and security
None anticipated.
Concern about introducing radionuclides into the environment
It is postulated that this should be minimal as the majority of users would return the device to the manufacturer for disposal.

4.5 Resources Committed

There are no irreversible commitments of resources involved in manufacturing the product and in its distribution, use, repair, and disposal.

Direct commitments consist of the responsibility to receive devices from users and dispose of devices that have outlived their service life safely.

Irreversible environmental losses and natural resource use consist of the use of the thorium in the product.

As the use of Thorium has declined in the United States lost resources from viewpoint of both relative impacts and long-term net effects is not thought to be an item of any import.

The commitment by the manufacturer in Japan is 100% of their resources to manufacture, distribute, and dispose of the product.

With the acceptance and use of the IonTechno devices in Japan and the orient the resources that-would be committed to provide an equivalent service by an alternative means are not planned or considered.

ENVIRONMENTAL EFFECTS OF POSTULATED ACCIDENTS OR MISUSE

5.1 ***Radiological Impacts of Accidents*** (postulate, describe and indicate the probability of occurrence of all credible accidents or misuse of the product. Describe the effects of each, and assess the impacts associated therewith. Fire, explosion, submersion, mechanical failure, abrasion, wind, shredding. The quantity or radioactive material should be stated. Should be described and assesed to air, land or water.

5.1.1 During Distribution

Probable accidents or misuses of the product:

Event	Accident	Probability
Fire	Fire on ship board	>0.01 but <0.1
Fire	Fire during truck transport	>0.01 but <0.1
Explosion	Warehouse	<0.00001
Submersion	Ship sinks at sea.	>0.0001 but <0.001
Mechanical Failure	Uncertain	Uncertain
Abrasion	Truck falls over a cliff, slides on rocks.	>0.01 but <0.1
Wind	Truck tips over, spills cargo.	>0.01 but <0.1
Shredding	Uncertain	Uncertain

Quantity of material: (In Grams)

	Fire	Explosion	Submersion	Mechanical Failure	Abrasion	Wind	Shredding
Air	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Land	141	141	N.A.	N.A.	141	141	N.A.
Water	141	141	141	N.A.	N.A.	N.A.	N.A.

5:1:2 During Use

Probable accidents or misuses of the product:

Event	Accident	Probability
Fire	Fire on ship board	N.A.
Fire	Fire at truck accident site	>0.01 but <0.1
Explosion	At truck accident site.	>0.001 but <0.01
Submersion	Truck drives into river/lake.	>0.001 but <0.01
Mechanical Failure	Fuel line breaks.	>0.0001 but <0.001
Abrasion	Truck falls over a cliff, slides on rocks.	>0.001 but <0.01
Wind	Truck tips over.	>0.01 but <0.1
Shredding	Uncertain.	Uncertain.

Quantity of material: (In Grams)

	Fire	Explosion	Submersion	Mechanical Failure	Abrasion	Wind	Shred ding
Air	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Land	1.4	1.4	1.4	0	0	0	N.A.
Water	N.A.	1.4	1.4	0	0	0	N.A.

5.1.3 During Installation, Maintenance and Repair

Probable accidents or misuses of the product:

Event	Accident	Probability
Fire	Fire on ship board	N.A.
Fire	Fire in shop	>0:01 but <0.1
Explosion	Shop explodes	>0.00001 but <0.001
Submersion	N.A.	N.A.
Mechanical Failure	Mechanic disassembles unit	>0.0001 but <0.001
Abrasion	Uncertain	Uncertain
Wind	N.A.	N.A.
Shredding	Uncertain	Uncertain

Quantity of material: (In Grams)

	Fire	Explosion	Submersion	Mechanical Failure	Abrasion	Wind	Shred ding
Air	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Land	1.4	1.4	N.A.	1.4	N.A.	N.A.	N.A.
Water	N.A.	1.4	N.A.	N.A.	N.A.	N.A.	N.A.

5.1.4 During Disposal

Probable accidents or misuses of the product:

Event	Accident	Probability
Fire	Fire on ship board	>0.01 but <0.1
Fire	Fire during truck transport	>0.01 but <0.1
Explosion	Warehouse	<0.00001
Submersion	Ship sinks at sea.	>0.0001 but <0.001
Mechanical Failure	Uncertain	Uncertain
Abrasion	Truck falls over a cliff, slides on rocks.	>0.01 but <0.1
Wind	Truck tips over, spills cargo.	>0.01 but <0.1
Shredding	Uncertain	Uncertain

Quantity of material: (In Grams)

	Fire	Explosion	Submersion	Mechanical Failure	Abrasion	Wind	Shredding
Air	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Land	141	141	N.A.	N.A.	141	141	N.A.
Water	141	141	141	N.A.	N.A.	N.A.	N.A.

5.2 *Nonradiological Impacts of Accidents* (Describe and assess accidents or misuses in which release of the radioactive material IS NOT a significant factor but in which significant personal injury or property loss may occur.

5.2.1 During distribution

Event	Accident	Probability
Fire	Fire on ship board	>0.01 but <0.1
Fire	Fire during truck transport	>0.01 but <0.1
Explosion	Truck accident of such severity as to cause explosion.	<0.00001
Submersion	Ship sinks at sea.	>0.0001 but <0.001
Mechanical Failure		Uncertain
Abrasion	Truck falls over a cliff, slides on rocks.	>0.01 but <0.1
Wind	Truck tips over, spills cargo.	>0.01 but <0.1
Shredding	Unknown.	Uncertain

5.2.2 During Use

Event	Accident	Probability
Fire	Truck involved in fire.	N.A.
Explosion	Truck accident of such severity as to cause explosion.	>0.01 but <0.1
Submersion	Truck drives off a bridge.	>0.001 but <0.01
Mechanical Failure	Truck involved in motor vehicle accident.	>0.001 but <0.01
Abrasion	Truck falls over a cliff, slides on rocks.	>0.0001 but <0.001
Wind	Truck tips over, truck damaged.	>0.001 but <0.01
Shredding	Not applicable.	Uncertain

5.2.3 During Installation, Maintenance and Repair

Event	Accident	Probability
Fire	Fire in maintenance shop.	>0.001 but <0.01
Explosion	Maintenance shop has explosion from other sources.	>0.01 but <0.1
Submersion	Not applicable.	>0.00001 but <0.001
Mechanical Failure	Installer welds on device.	>0.0001 but <0.001
Abrasion	N.A.	N.A.
Wind	N.A.	N.A.
Shredding	Salvager ignores warnings, sends device to scrap.	>0.01 but <0.1

5.2.4 During Disposal

Event	Accident	Probability
Fire	Fire on ship board	>0.01 but <0.1
Fire	Fire during truck transport	>0.01 but <0.1
Explosion	Truck accident of such severity as to cause explosion.	<0.00001
Submersion	Ship sinks at sea.	>0.0001 but <0.001
Mechanical Failure	Not applicable.	Uncertain

Abrasion	Truck falls over a cliff, slides on rocks.	>0.01 but <0.1
Wind	Truck tips over, spills cargo.	>0.01 but <0.1
Shredding	Salvager ignores instructions.	Uncertain

Probability Categories

Description	*Annual Probability range*
Very Likely	>0.1 (1 in 10)
Possible	>0.01 (1 in 100) but <0.1
Unlikely	>0.001 (1 in 1,000) but < 0.01
Highly Unlikely	>0.0001 (1 In 10,000) but <0.001
Not Credible	>0.00001 (1 in 100,000) but <0.0001
Practically Impossible	<0.00001 (1 in 100,000)

ALTERNATIVES

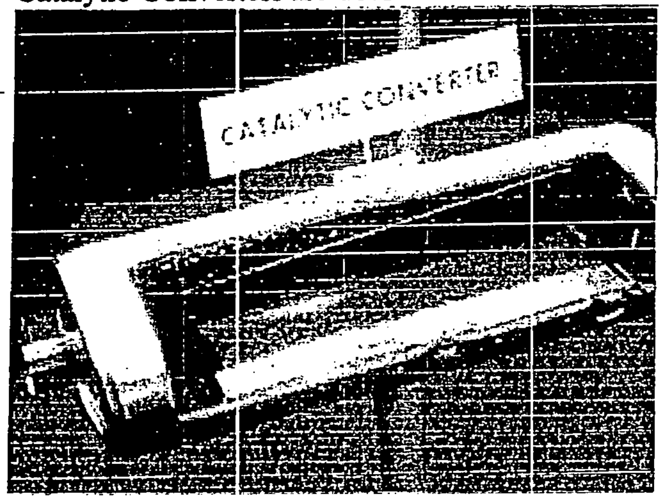
6.1 ***Alternatives Related to IonTechno***(alternatives to the specific product and to it's design , distribution, use and disposal should be described and compared to those proposed in Chapter 2 and should show which alternative is best and the basis for the decision (environmental, technical, economic)).

6.1.1 Alternative Radionuclides
There are no feasible alternative Radionuclides deemed applicable by the inventor of the IonTechno catalyst, due to the radiation emitted.

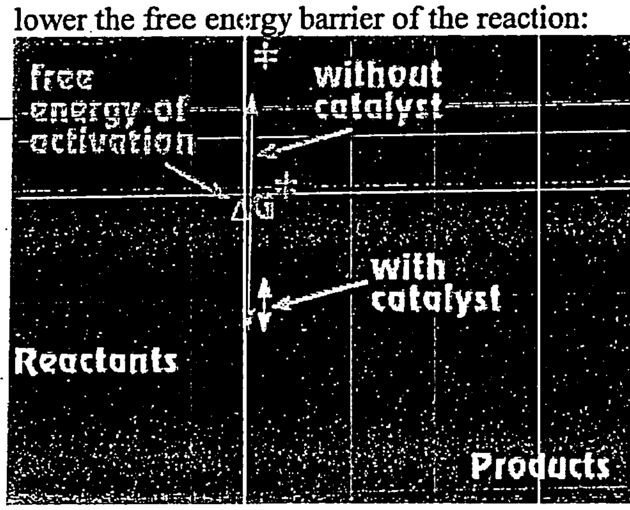
6.1.2 Other Products or Designs (Feasible alternative designs of the product, the advantages and disadvantages of the designs, and the reasons why they are not used. Discuss all alternative products, both radioactive and non-radioactive that could be used in place of the product and compare with the product.

- "The exhaust emissions are the most dangerous to humans, as well as, the environment. These emissions can be reduced by adding fresh air to the exhaust gas. By supplying more oxygen, more complete burning of the exhaust gas can take place. A second way to reduce exhaust emissions is to allow for more thorough combustion which is achieved by controlling the air-fuel mixture and ignition timing. Also, an oxidation catalyst can be placed on the tailpipe of an automobile to oxidize almost all of the carbon monoxide given off in the exhaust. Finally, catalytic converters are used to aid in the reduction of emitted pollutants.

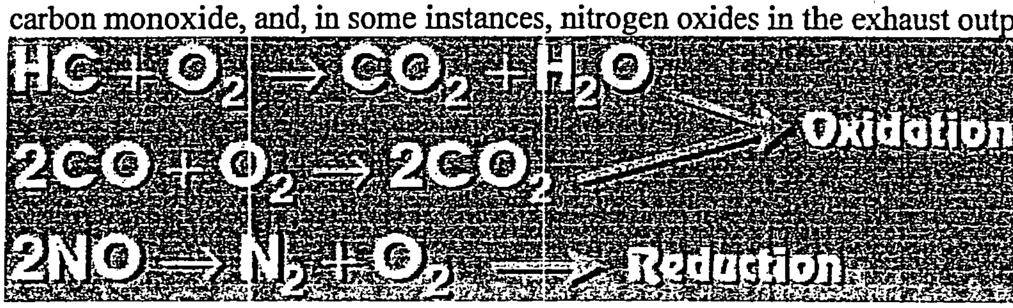
Catalytic Converters are devices built into the exhaust system of an automobile:



Catalytic converters are used to increase the rates of the reactions by using a catalyst to lower the free energy barrier of the reaction:



The goal of a catalytic converter is to limit the discharge of noxious gases from the internal-combustion engine. Catalytic converters reduce unburned hydrocarbons, carbon monoxide, and, in some instances, nitrogen oxides in the exhaust output:



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Catalytic converters consist of an insulated chamber containing pellets of a variety of metal oxides through which the exhaust gases are passed. The hydrocarbons and carbon monoxide in the exhaust are converted to water vapor and less harmful carbon dioxide. Catalytic converters are not always effective or efficient. For example, during warm-up stages of a car, the temperatures are so low that emissions cannot be catalyzed. Another problem is that catalysts are rendered ineffective by the lead compounds sometimes added to gasoline. That's the reason for most automobiles using Unleaded gasoline. "

http://www.roanoke.edu/Chemistry/JSteehler/HNRS301/Pollution/AirPollution-Controls.html#top

6.1.3 Other Means of Distribution, Use and Disposal:

Topic	Proposed Means	Alternate Means	Discussion
Packaging:	Heavy duty cardboard.	Wooden boxes.	Not used due to cost and weight considerations.
Labeling:	Imprinted on outside of box and foil labels on the devices	Etched on body of devices.	More expensive process. Foil labels more likely to not be painted over.
Transport:	By ship to U.S. then by truck to warehouse and end use customers.	Delivery by personal vehicle.	Not practical due to costs.
Routing	Japan to Los Angeles, Los Angeles to Las Vegas, and then others.	Uncertain.	Routing will be determined by geographic location of end user.
Storage	Warehouse.	No warehouse.	Not practical in terms of being and able to distribute the product efficiently.
Sales	Contact with OEM manufacturers, fleet owners.	Factory direct.	Not in keeping with the distributor agreement that has been entered in to.
Intended uses	Combustion processes.	Unknown.	---
Unintended uses	Unknown.	Unknown.	---
Return for disposal	To manufacturer in Japan.	Hazardous waste sites in U.S.	Reduce probability of introducing radionuclide into the environment by returning to Japan.
Disposal	See above.	See above.	See above.
Installation	Permanent installation on combustion process equipment.	Not applicable.	---
Maintenance	Possible flushing of device if contaminated by foreign substance.	Return to manufacturer and replace with new device.	Not probable due to costs involved.
Repair	None.	None.	Not designed to be repaired.

6.2 Alternatives Related to Licensing Requirements for IonTechno

Administrative effects related to a different licensing action applied to the product would be that it would become a record keeping task of gargantuan proportions due to the large number of permits that could be involved over time, and would possibly not comply with the intent of the federal "Paperwork Reduction Act of 1995".

Economic effects related to a different licensing action applied to the product would be that it might become a source of additional revenue for state health departments, but that may be offset by increased administrative costs and it would also add an economic burden to the users.

Psychological effects of a different licensing action applied to the product would be to create a barrier to its acceptance and adoption by the market place.

6.2.1 General License

Currently the product would require every user to apply for a license to have the product. Some states refer back to the CFR as a reason to prohibit the product due to the concentration levels.

6.2.2 Specific License (Each purchaser)

SUMMARY OF POTENTIAL BENEFITS AND POSSIBLE COSTS DUE TO THE INTRODUCTION OF IonTechno

(A table should summarize and quantify the impacts, emphasis should be placed on environmental and societal benefits and costs, but private benefits (producer-consumer) benefits and costs should be considered as well)

IMPACT	*Min*	*Mean*	*Max*	*UNITS*
RADIOLOGICAL				
Potential radiation doses to individuals:				
Under normal conditions	**0**	**0**	**0**	**Millirems/year**
Under accident conditions	**0.00000 0875**	**.000001 75**	**.000003 5**	**Millirems/year (2min-5 Min-10 Min exposures)**
Potential radiation doses to population	**0.1312**	**0.2625**	**0.525**	**Person-rems/year**
Introduction of radioactive materials into				

The environment	1.44E-12	2.88E-12	5.96E-12	µCi/Year
Potential contamination of environment				
(Disposal sites)	1.44E-12	2.88E-12	5.96E-12	$\mu Ci/m^3$ or $\mu Ci/m^2$
	?	?	?	Total volume of areas (Sites located in Japan)
SOCIOECONOMIC				
Provision of new product	?	?	?	Reduced health care costs due to cleaner air.
Savings from new product	1,682.3	16,415	35,788	Fuel costs (Million U.S.$
Uses of resources	841.17	8,207.8	17,894	Reduced usage of fuels.
				(Millions gallons diesel)
Employment	1	2	3	Negligible
Stimulation of competition within industry	-	-	-	It is postulated that ther may be other companies that will attempt to ente the market with similar products once the impac of the product is known within the various industries.
National Security	-	-	-	Uncertain.
Balance of payments	-	-	-	Negligible compared to volume of agricultural and other imports/expor
Effects on existing products	-	-	-	None postulated.
TECHNOLOGICAL				
Introduction of new product	-	-	-	Uncertain.
Other	-	-	-	Unknown.
Ecological and Other: Reduced exhaust emissions into atmosphere.	3,889.09	5,310.95	6,733.5 7	CO (Annual Million Tons)
	729.95	996.83	1,263.8 5	NOx (Annual Million Tons)
	67.24	91.82	116.42	PM-10 (Annual Million Tons)