Incinerators Trash Community Health

Global Alliance for Incinerator Alternatives (GAIA)
www.zerowarming.org
dave@no-burn.org
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The incinerator industry often promotes incinerators as having "zero emissions" or as being "safe for community health". The truth, however, is that all incinerators contaminate people and the environment with toxic and cancer-causing emissions.[1]

Even the most technologically advanced incinerators emit thousands of pollutants that contaminate our air, soil and water. Identified emissions include heavy metals such as lead, cadmium, arsenic, chromium, and mercury, halogenated hydrocarbons, acid gases, particulate matter, and volatile organic compounds such as dioxin and furans.[2] Even small amounts of these toxins can be detrimental to human health and the environment; mercury, for example, is a powerful and widespread neurotoxin that impairs motor, sensory and cognitive functions.[3] Yet these known emissions are not the only cause for concern; there are also many unidentified compounds in incinerator emissions. Emissions from incinerators have been positively identified to cause cancer.[4][5]

By combining toxic materials at high temperatures, incinerators can actually *create* dioxins, furans and other supertoxins.[6] In fact, the amount of dioxin leaving an incinerator – which is an emission with no known safe quantity[7] – has been shown to exceed the amount of dioxin entering as raw waste. That means that what is coming out of an incinerator, can actually be *more* toxic than what goes in. Any disposal system that creates more toxins than it's given is an extremely unwise and unsustainable system.

Incinerators are the leading source of dioxins globally[8], which are the most-toxic known man-made substance.[9] Known health impacts of dioxin include cancer, IQ deficits, disrupted sexual development, birth defects, immune system damage, behavioral disorders, diabetes and altered sex ratios.[10] Some newer emission control devices have been effective in decreasing recorded dioxin air emissions from incinerators, but there is no known safe level of exposure to dioxins; even a little is too much. Those most at risk of receiving the highest concentrations are babies[11], because concentrated dioxin is passed from the mother in breast milk. Incinerator workers are also exposed to

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[1] National Institute of Health. 2001. Press Release: TDCC—Dioxin—is listed as a "known human carcinogen" in federal government's ninth report on carcinogens. U.S. Department of Health and Human Services, January 19. http://www.niehs.nih.gov/oc/news/dioxadd.htm (accessed November 9, 2006)

[2] K. Jay and L. Steiglitz, "Identification and Quantification of Volatile Organic Components in Emissions of Waste Incineration Plants," CHEMOSPHERE Vol. 30, No. 7 (1995), pgs. 1249-1260

[3] In, "Paternal concentrations of dioxin and sex ratio of offspring" in the Lancet 2000; 355: 1858-63, 27 May 2000

[4] Ends Europe Daily *Study reignites French incinerator health row,* Found at http://www.endseuropedaily.com/articles/index.cfm?action=article&ref=22174&searchtext=incinerator%2Bcancer&searchtype=All (browsed on February 8, 2008)

[5] P. Elliott and others, "Cancer incidence near municipal solid waste incinerators in Great Britain," BRITISH JOURNAL OF CANCER Vol. 73 (1996), pgs. 702-710.

[6] Costner et. al. (2001); Playing with Fire by Pat Costner and Joe Thornton (1990).

[7] No Evidence of Dioxin Cancer Threshold, David Mackie, Junfeng Liu, Yeong-Shang Loh, and Valerie Thomas, Abstract Found at: http://www.ehponline.org/docs/2003/5730/abstract.html

[8] U.S. EPA, The Inventory of Sources of Dioxin in the U.S. (1998); Dioxin and Furan Inventories: National and Regional Emissions of
PCDD/PCDF, U.N. Environment Programme (Geneva, Switzerland), May 1999.

[9] In, "Paternal concentrations of dioxin and sex ratio of offspring" in the Lancet 2000; 355: 1858-63, 27 May 2000

[10] Lester, Stephen, The American People's Dioxin Report, Center for Health and Environmental Justice, 1999. Available online at http://www.besafenet.com/report.html#Executive%20Summary

[11] Tangri, Neil, A Dying Technology, 2003, p. 13

high risk regardless of their use of standard protective equipment. Additionally, studies show the presence of elevated levels of dioxin in the blood of people living near municipal solid waste incinerators, when compared to the general population.[12][13][14]

Although the most lethal impacts of incinerators are to those that live nearest to them, toxins like dioxin can be carried long distances and can persist in the environment for decades. This poses a major risk for the entire population. High levels of dioxins have also been found in food and dairy products produced near incinerators,[15][16] demonstrating that the insidious toxic impacts of incinerators are thus as far-reaching as the shipment of that food to other communities. For these reasons it becomes clear that the existence of incinerators threatens everyone's health and well-being.

Studies about particles called "ultra-fines" or "nano-particles" reveal increased cause for concern about incinerator emissions of dioxin and other toxins. Ultra-fines are particles that range in size between 1 and 100 nanometers (a nanometer is one billionth of a meter). Ultra-fines emitted by incinerators include dioxins and other toxins. Because of their small size, they are difficult to capture in pollution control devices, and they are not even measured by the EPA. Ultra-fine particles can be lethal to humans in many ways including causing cancer, heart attacks, strokes, asthma, and pulmonary disease, among others.[17] They travel long distances, penetrate deep into the lungs, and carry neurotoxic metals into the brain.[18] In typical urban air, ultra-fines account for 1 to 5 percent of all airborne particles by weight. A typical person breathing the air in Los Angeles will inhale 200 billion ultra-fine particles every day, retaining half of those in his or her lungs.[19]

Some companies claim that they will get around the problem of harmful emissions by only incinerating "clean-burning" materials like wood waste or biomass. However, burning these materials has been shown to release harmful emissions. Wood waste often contains hard to detect contaminants such as chromated copper arsenate (CCA), pesticides, preservatives, lead paint, black liquor, copper, creosote and chlorine, resulting in harmful emissions such as dioxins, furans, lead and mercury. Visual sorting can miss at least 10 percent of wood contaminated with chromated copper arsenate[20] —a particularly hazardous and commonly found material[21]. Furthermore, economic pressures and loopholes in regulations can encourage incinerator operators to mix waste materials like

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[12] Ends Europe Daily *Study reignites French incinerator health row,* Found at http://www.endseuropedaily.com/articles/index.cfm?action=article&ref=22174&searchtext=incinerator%2Bcancer&searchtype=All (browsed on February 8, 2008)

[13] P. Elliott and others, "Cancer incidence near municipal solid waste incinerators in Great Britain," BRITISH JOURNAL OF CANCER Vol. 73 (1996), pgs. 702-710.

[14] Leem et al., 2006. Risk Factors Affecting Blood PCDDs and PCDFs in Residents Living near an Industrial Incinerator in Korea. Arch. Environ. Contam. Toxicol. 51:478–484 .

[15] Ellen and Paul Connett, *France: Dioxin contamination from trash incinerators*, WASTE NOT #423 (March 1998).

[16] Hwong-wen Ma, Yen-Ling Lai and Chang-Chuan Chan, *Transfer of dioxin risk between nine major municipal waste incinerators in Taiwan Environment International*, Volume 28, Issues 1-2, April 2002, Pages 103-110

[17] Oberdorster, Gunter, and others. "Nanotoxicology: An Emerging Discipline Evolving from Studies of Ultrafine Particles." Environmental Health Perspectives Vol. 113, No. 7 (July 2005), pgs. 823-839. http://tinyurl.com/2vkvbr

[18] Ibid.

[19] Hughes, Lara S., and others. "Physical and Chemical Characterization of Atmospheric Ultrafine Particles in the Los Angeles Area." Environmental Science & Technology Vol. 32, No. 9 (1998), pgs. 1153-1161. http://tinyurl.com/33d8kb

[20] Special Treatment: Disposing of CCA-Treated Wood, Environmental Health Perspectives Volume 109, Number 6, June 2001, http://www.ehponline.org/docs/2001/109-6/innovations.html

[21] Ibid. ("The ash contained high concentrations of chromium and arsenic, which we determined came from CCA-treated wood that had been inadvertently mixed in…This is a common and growing problem, with construction and demolition wood waste containing an average concentration of six percent CCA-treated wood.")

tires and plastics to what is promoted as "clean" and organic feedstocks, causing increased levels of air pollution. This is especially true when "cleaner" fuel sources become short in supply.

Many proponents of pyrolysis, plasma and gasification incineration assert that these technologies are not incinerators and do not generate hazardous by-products like dioxins. However, verified data from full-scale commercial facilities that support this claim have not been produced. In fact, data from full-scale systems have shown that dioxins, furans and other products of incomplete combustion are formed in these systems, and in some cases, these toxins are formed in higher quantities than from traditional mass-burn incinerators.

One study that examined a commercial scale German municipal waste gasification system operating under pyrolysis conditions, found that dioxins and furans were indeed formed in the process, with particularly high levels in liquid residues.[22] Another study examined the formation of dioxins and furans under pyrolysis conditions and concluded that even at oxygen concentrations lower than 2 percent, considerable amounts of highly toxic polychlorinated dioxins and furans were formed.[23] Several other researchers have found similar results for a range of common wastes, clearly demonstrating that dioxins, furans and potentially other persistent organic pollutants can be formed in pyrolysis and gasification systems.

In the case of a small pyrolysis pilot incinerator in Romoland, California, the most recent air emissions data verified by the Southern Coast Air Quality Management District shows high levels of harmful emissions. In fact, emission levels of dioxins and furans, volatile organic compounds, and particulate matter are far higher than the average mass-burn incinerator emission levels in California.[24] Using EPA data, a report from the organization Blue Ridge Environmental Defense League shows that air emissions such as dioxins and furans from gasification incinerators far exceed those of conventional mass-burn incinerators.[25] In the *Whitepaper on the Use of Plasma Arc Technology to Treat Municipal Solid Waste*, the Florida Department of Environmental Protection expresses concerns about the pollutants that can be formed by plasma incineration. It explains: "There is considerable uncertainty about the quality of the 'syngas' to be produced by this technology when processing MSW. While the high temperatures can destroy organics, some undesirable compounds, like dioxins and furans, can reform at temperature ranges between 450 and 850 degrees F if chlorine is present."[26]

Many pollutants are very difficult to remove from the airstream with pollution control devices. And the airstream is not the only potential source of pollutants. In addition, it is important to look at other output streams from any incinerator technology. As Dr. Jorge Emmanuel explains in the film *Pyrolysis and Gasification as Health Care Waste Management Technologies,* "In one pyrolysis system I examined in the late 1990s for example, I found that some of the air emissions were actually

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[22] Mohr, K., Nonn Ch. And Jager J., 1997. Behaviour of PCDD/F under pyrolysis conditions. Chemosphere 34: 1053-1064

[23] Weber, R., Sakurai, T., 2001. Formation characteristics of PCDD and PCDF during pyrolysis processes. Chemosphere 45: 1111-1117

[24] Jay Chen, P.E., South Coast Air Quality Management District, Emerging Technologies Forum, IES Romoland Emission Tests, Status Update, April 17, 2006.

[25] Blue Ridge Environmental Defense League, Incineration and Gasification: A Toxic Comparison, April 12, 2002. Available online at: www.no-burn.org/resources/library/incingafcomp.pdf

[26] Florida Department of Environmental Protection, *Whitepaper on the Use of Plasma Arc Technology to Treat Municipal Solid Waste,* September 14, 2007

coming out with the waste water through the sewer system, so stack tests were not at all representatives of all the air emissions coming out of that particular pyrolysis system."[27]

In addition to producing toxic air emissions, incineration does not eliminate the need for landfills. Since the laws of physics dictate that matter cannot be created or destroyed, the incinerator simply turns waste into several new forms of waste, including air emissions, ash and liquid discharge. In fact, incinerators have been shown to reduce waste to only about 45 percent of its original volume[28]—not a waste solution at all.

It is important to consider that in all incineration technologies, air pollution control devices are mainly devices that capture and concentrate the toxic pollutants; they don't eliminate them. By capturing and concentrating the pollutants, these devices simply take them out of the air stream and place them in other environmental media such as the slag, scrubber waste water or the bag house filter. These highly toxic materials must then be put into a landfill. Thus by incinerating mixed materials, cities are left with an ash or slag byproduct and liquid discharges that are often more toxic in nature than the original materials.

An incinerator that is equipped with more expensive and advanced air pollution control devices will often transfer toxins such as lead and mercury into its solid and liquid discharges. In one study of a high-temperature incinerator in Italy, 73 percent of the dioxins measured were found in the slag (solid residue).[29] Studies also show that a significant percentage of dioxins released from an incinerator are also found in the scrubber wastewater, or in the cake from the filters used to remove dioxin from the air. This is particularly troubling because solid and liquid discharges from incinerators that are put in landfills are not effectively regulated by the EPA.

People living near landfills that store incinerator discharges run the risk of breathing contaminated dust from the ash. Because all landfills will at some point leak, there is a strong likelihood that toxic pollutants in the incinerator discharges will also eventually leach into soil and groundwater. Attempts have been made to convert incinerator ash into different products, including roadbed and cement blocks. Studies show that heavy metals from these materials are leaching out, contaminating communities and ecosystems.[30][31] [32]

Companies promoting plasma, pyrolysis and gasification incinerator technologies have recently made claims that the slag discharges, produced in a glass-like form, are safe and non-toxic for use in products. One plasma company representative went so far as to make the claim that "the solid discharges are so safe that residents could use them safely in their home gardens". Claims like these are unfounded and irresponsible, and not supported with solid public data.

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[27] Emannuel, Jorge (2004) *Pyrolysis and Gasification as Health Care Waste Management Technologies video* available online at http://www.youtube.com/watch?v=pfehIWggW54

[28] Department of the Environment/WO,Making waste work:A strategy for sustainable waste management in England and Whales.1995,UK Department of the Environment White Paper: The Stationery Office, London.

[29] Stefano Caserini, Stefano Cernuschi, Michele Giugliano, Mario Grosso, Giovanni Lonati and Paola Mattaini Air and soil dioxin levels at three sites in Italy in proximity to MSW incineration plants Chemosphere, Volume 54, Issue 9, March 2004, Pages 1279-1287

[30] Ryder,R.E., Incinerator Ash is Inert. Tox Cat, 2000. 3(1).

[31] Ends, Regulatory foul-ups contributed to Byker ash affair. 2000. p.17-18.

[32] Greenpeace International,Incineration and Human Health:State of knowledge of the impacts of waste incinerators on human health. 2001: Amsterdam.

A review of pyrolysis systems by the Center for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET), a UK research group, raises concerns about residues from pyrolysis and gasification processes:

> "The various gasification and pyrolysis technologies have the potential for solid and liquid residues from several process stages. Many developers claim these materials are not residues requiring disposal but are products which can be used. However in many cases such claims remain to be substantiated and any comparison of various waste treatment options should consider releases to air, water and land."[33]

CADDET also paid particular attention to liquid residues:

> "The sources of liquid residues from [mass burn combustion] plant are boiler blow-down and wet scrubbing systems, when used for flue gas cleaning. Whilst these sources remain for gasification and pyrolysis systems using steam cycles or wet scrubbers, these technologies can also produce liquid residues as a result of the reduction of organic matter. Such residues have the potential to be highly toxic and so require treatment. Any releases of liquid residues into the environment should therefore be carefully considered."[34]

The Florida Department of Environmental Protection also expresses concerns about contaminants in slag produced by plasma incineration. It writes:

> "There is considerable uncertainty about the quality of the 'slag' to be produced by this technology when processing MSW. There is very little leaching data on this material for MSW. One leaching TCLP (Toxicity Characteristic Leaching Procedure) test by PyroGenesis suggests arsenic and cadmium may leach above the groundwater standards. This may adversely impact the beneficial use of this material."[35]

Safety is another area of concern. In 1998, for example, a "state-of-the-art" pyrolysis plant in Furth, Germany that was processing municipal solid waste suffered a major failure, resulting in the release of pyrolysis gas into the air. An entire neighborhood had to be evacuated, and some residents in the surrounding community were brought to the hospital for observation. Siemens, the engineering firm that installed the plant, withdrew from the market after this accident.[3637]

With certain types of gasification or pyrolysis incinerators, there is a possibility of explosions. Explosions can result from the leakage of combustible gases of from treatment chambers that are not

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[33] Advanced Thermal Conversion Technologies for Energy from Solid Waste, IEA CADDET Centre for Renewable Energy, Oxfordshire, United Kingdom. August 1998. A joint report of the IEA Bioenergy Programme and the IEA CADDET Renewable Energy Technologies Programme. http://www.caddet-re.org

[34] Ibid.

[35] Florida Department of Environmental Protection, *Whitepaper on the Use of Plasma Arc Technology to Treat Municipal Solid Waste,* September 14, 2007

[36] What Improves Waste Management? p.21 Online at www.veolia-proprete.com/pdf/pages4a25_GALILEO3_us.pdf (browsed March 5, 2008)

[37] California Integrated Waste Management Board, February, 2005, Conversion Technologies Report to the Legislature, p.30. Online at: www.ciwmb.ca.gov/organics/Conversion/Events/CTWorkshop/DraftReport.pdf (browsed March 5, 2008)

designed to handle a sudden large amount of flammable liquids. Corrosion, tar contamination of generators, and fuel blockages are examples of other engineering issues of concern.

As the GAIA and Greenaction for Environmental Health and Justice report *Incinerators In Disguise* shows, gasification, pyrolysis and plasma incinerators have endangered public safety in several other instances, despite company claims of being "pollution-free". For example, prior to being shut down in 2004, the Thermoselect gasification incinerator in Karlserue, Germany, suffered from operational problems that included an explosion, cracks of the high temperature chamber's concrete due to corrosion and heat, and a leaking sediment basin that held cyanide-contaminated wastewater.[38]

This incinerator was also found to be using an emergency gas release vent, the existence and use of which the operators had failed to mention to regulators and the community during the permit process.[39] Gases that were released through this vent were shown to exceed regulatory limits for dioxins, heavy metals and other pollutants.[40] Additionally, contrary to claims on the company's website that the incinerator had no water emissions, in 1999 Thermoselect officers were convicted by an Italian court of polluting a nearby lake with poisonous compounds from the incinerator's wastewater.[41]

Similarly, contrary to claims made by the Ebara company, its gasification incinerator in Broga, Malasia was far far from a "zero-emissions" facility. In fact, in 1999, regional environmental regulators found it to be pumping contaminated wastewater into a stream leading to the Hikichi River. The wastewater was found to have 8,100 times the regulatory limit for dioxins.[42]

In short, whether they are new start-ups or long established, an industry made up of companies that constantly mislead or lie to the public about the basic facts related to their technologies should not be trusted with the health of our families. To learn more about health and safety issues with pyrolysis, plasma and gasification incinerator technologies, please see the *Incinerators in Disguise* report at www.no-burn.org and www.greenaction.org.

Incinerator Regulations: Not Safe, Not Accurate, Not Enforced!

Incinerator companies claim that emissions from today's incinerators are safe and clean. These assertions, however, are based on three false assumptions.

1.) Not Safe: The first assumption is that safe emissions levels exist for all of the pollutants released by incinerators. The truth is that incinerator emissions standards, as regulated by the Environmental Protection Agency, are *not* based on what is scientifically safe for public health. As the EPA itself has written, "Since EPA could not clearly define a safe level of exposure to these cancer-causing pollutants, it became almost impossible to issue regulations."[43] Instead, EPA standards were created

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[38] Bernhard Baldas, "Magic Gone from Miracle Garbage Weapon [Entzauberte Müllwunderwaffe]," Die Tageszeitung [Germany] 28 Aug. 2001.

[39] Bernhard Baldas, "Magic Gone from Miracle Garbage Weapon [Entzauberte Müllwunderwaffe]," Die Tageszeitung [Germany] 28 Aug. 2001.

[40] Jürgen Dahlkamp, "Defective Miracle [Defektes Wunder]," Der Spiegel 25 Sept. 2000; TÜV Pfalz (technical control association) measurements of combusted refined synthesis gas, tests during February and March 2000.

[41] Frankfurter Rundshau [Frankfurt, Germany], "Incident Halts Incinerator Project. Regulators Want New Review of the Technology Planned for Hanau [Störfall bremst Müllofenproject. Behörde will die für Hanau geplante Technikerneut prüfen]," 22 Dec. 1999.

[42] "Dioxin in Fujisawa river 16 times official standard,"Japan Times 28 March 2000.

[43] Environmental Protection Agency, available online at: http://www.epa.gov/oig/reports/1996/mactsrep.htm (browsed February 1, 2008)

solely to require "emitters to use the best control technologies already demonstrated by industry sources."[44] As a result, these standards allow for the release of *acceptable* levels of harmful contaminants such as dioxins, mercury and lead. Additionally, these faulty standards also only regulate a handful of the thousands of known toxins, and do not take into account the countless harmful ways that toxins interact to form more dangerous compounds. In these ways, the assumption of the existence of "safe emissions levels" is clearly shown to be false.

2.) Not Accurate: The second false assumption is that incinerator air emissions are accurately measured. In reality, the most dangerous known pollutants, such as dioxin and mercury, are rarely monitored on a continuous or accurate basis. Instead of continuous monitoring, incinerators are typically subject to one or two dioxin stack tests per year, each consisting of a six-hour sample. These tests rarely, if ever, test during the peak periods of dioxin release, when the majority of dioxins are produced. In fact, studies show that stack tests can drastically underestimate emissions of dioxin, recording as little as 2 percent of the actual total.[45] Perhaps most shockingly, the EPA does not effectively regulate toxins in ash and liquids discharged from incinerators. Nor does the EPA regulate or monitor the most harmful known emissions, which are the ultra-fines that contain toxins such as PCBs, dioxins and furans.

3.) Not Enforced: The third false assumption is that air emission limits, even as currently measured, are actually met by the incinerator industry. In 2007, a federal judge ruled that the U.S. Environmental Protection Agency had been unlawfully reclassifying certain incinerators under less stringent boiler emission limits.[46] The EPA had done this to avoid enforcing more stringent incinerator emission limits on mercury, lead, arsenic, dioxins, and other highly toxic pollutants. In light of this track record, communities should question whether they trust the EPA to protect their health and properly enforce emission limits in their community.

Because emissions limits are often scientifically arbitrary, because emissions are inaccurately measured, and because even poor regulations that do exist can be ignored, it is simply fraudulent to claim, as the incinerator companies do, that incinerators are "safe and clean." This is far from the truth.

For more information about the how incineration trashes community health, visit:
Global Alliance for Incinerator Alternatives (GAIA): www.no-burn.org, www.zerowarming.org
Greenaction for Environmental Health and Justice: www.greenaction.org
The Energy Justice Network: www.energyjustice.net
Toxics Action Center: www.toxicsaction.org
Green Delaware: greendel.org
The Ecology Center: http://www.ecocenter.org
Blue Ridge Environmental Defense League: www.bredl.org
Connecticut Coalition for Environmental Justice: www.environmental-justice.org
Jorge Emmanuel, Pyrolysis and Gasification video:
Part 1 (Background): http://www.youtube.com/watch?v=09A-iQfhRUE
Part 2 (Pyrolysis, Gasification, Plasma): http://www.youtube.com/watch?v=9ftJyphJnYk
Part 3 (Environmental Concerns): http://www.youtube.com/watch?v=pfehIWggW54
Part 4 (Other Issues): http://www.youtube.com/watch?v=pbVbaF_fi7Q

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[44] Ibid.

[45] Tangri, Neil, *A Dying Technology,* 2003 p. 19

[46] Earthjustice, June 18, 2007, Court Nixes EPA Incinerator Exemption. Available online at http://www.earthjustice.org/our_work/victory/court-nixes-epa-incinerator-exemption.html (browsed March 5, 2008)