

# BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE

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## INCINERATION AND GASIFICATION: A TOXIC COMPARISON

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The United States Environmental Protection Agency distinguishes pollution from mass burn incinerators and starved air gasification units by the amount of pollution emitted, not by the type. In other words, both starved air and excess air combustors emit the same pollutants into the atmosphere, but in different amounts. For example, EPA data show that gasification units emit more nitrogen oxides and dioxins than incinerators, and equal amounts of mercury.

Mass burn incinerators are *excess air* combustion units; that is, waste is burned in the presence of more air than is necessary to oxidize or burn the materials in the firebox. Gasification units utilize *starved air* combustion to create a fuel gas. The levels of oxygen and nitrogen in the combustion process affect the levels of some air pollutants; for example, starved air conditions appear to reduce the production of sulfur dioxide but increase the emissions of nitrogen oxides and dioxins. Emissions of some pollutants are largely unchanged; in both types of combustion heavy metals are atomized and released into the atmosphere in elemental form. The US EPA compiles emission levels for many categories of waste burning units, including excess air and starved air types<sup>1</sup>. Using EPA emission data, we compared annual air emissions for each type of unit burning the same amount of solid waste: 100 tons per day, or 36,500 tons per year. The results are listed below.

### **Toxic Air Emissions From Solid Waste Combustion Units**

<b>Pollutant</b>	<b>Incineration<sup>a</sup></b>	<b>Gasification<sup>a</sup></b>
Dioxins + furans	.06 <sup>c</sup>	0.11 <sup>f</sup>
Mercury	204 <sup>d</sup>	204 <sup>f</sup>
Lead	110 <sup>d,b</sup>	103 <sup>f,b</sup>
Sulfur dioxide	126,290 <sup>d</sup>	117,895 <sup>f</sup>
Nitrogen oxides	90,155 <sup>e</sup>	115,340 <sup>f</sup>
Carbon monoxide	16,900 <sup>c</sup>	10,913 <sup>f</sup>

All emissions are in pounds per year

a Uncontrolled emissions unless indicated

b With electrostatic precipitator control device

c Emission Factors for Mass Burn Waterwall Combustors, AP-42 Table 2.1-4

d Emission Factors for Mass Burn and Modular Excess Air Combustors, AP-42 Table 2.1-2

e Emission Factors for Modular Excess Air Combustors, AP-42 Table 2.1-7

f Emission Factors for Modular Starved Air Combustors, AP-42 Table 2.1-9

## **NITROGEN OXIDES**

Compared to incinerators, gasification combustors emit 28% more nitrogen oxides. NO<sub>x</sub> contributes to smog, or ground-level ozone pollution. Children and adults with lung disease or

asthma, and those who work or exercise outdoors risk lung damage from NO<sub>x</sub> pollution. According to the US EPA, the levels of NO<sub>x</sub> are increasing.<sup>4</sup> The EPA Office of Air and Radiation reports that:

In the air, NO<sub>x</sub> reacts readily with common organic chemicals and even ozone. Examples of these chemicals include the nitrate radical, nitroarenes, and nitrosamines. NO<sub>x</sub> reacts with ammonia, moisture, and other compounds to form nitric acid and related particles. Human health concerns include effects on breathing and the respiratory system, damage to lung tissue, and premature death.<sup>4</sup>

## DIOXINS

Gasification units emit 83% more furans and dioxins than mass burn incinerators. Dioxin is one of the most toxic substances known; there is no safe level. Dioxin is a “known human carcinogen.”<sup>3</sup> According to the latest report by the US Department of Health and Human Services:

2,3,7,8-Tetrachlorodibenzo-*p*-Dioxin (TCDD); DIOXIN, CAS No. 1746-01-6  
First listed in the *Second Annual Report on Carcinogens as Reasonably Anticipated to be a Human Carcinogen*, updated to *Known to be a Human Carcinogen* in the January 2001 addendum to the *Ninth Report on Carcinogens*. The revised profile listing TCDD as a *Known to be a Human Carcinogen* was published as a result of ruling by the U.S. Court of Appeals for the District of Columbia Circuit dismissing the request for an injunction to prevent the listing of TCDD as a “known human carcinogen” in the Ninth Report pending appeal of the district court’s decision upholding the listing. The revised profile listing TCDD as a *Known to be a Human Carcinogen* is found on page III-58A and III-58B which is attached to the inside front cover of this copy of the *Ninth Report on Carcinogens*.<sup>3</sup>

North Carolina Department of Environment and Natural Resources lists dioxin (TCDD) as a toxic air pollutant which is hazardous to human health above 3 parts per *trillion* in the air.<sup>5</sup>

## MERCURY

Mercury emissions from gasification units are equal to the emissions from mass burn incinerators. NC toxic air pollutant regulations indicate that mercury is unhealthy above 0.6 parts per billion.<sup>5</sup> The US Agency for Toxic Substances and Disease Registry issued this health alert on the dangers of mercury exposure to the general public:

It is important for the general public to understand that either short-term or long-term exposures to metallic mercury can lead to serious health problems. Human exposure to metallic mercury occurs primarily from breathing contaminated air. Other forms of mercury can be absorbed by drinking contaminated water, eating food (usually fish containing mercury), and from skin contact. At high levels, metallic mercury can cause effects on the nervous system and the developing fetus. Other forms of mercury can damage other organs. Even at low levels,

metallic mercury can cause health problems. *Metallic mercury exposure can cause harm before symptoms arise.* Once released into the environment, mercury is very hard to clear up. If it is left unattended where exposures can occur, it can have dangerous effects on human health.<sup>6</sup>

## CONCLUSION

Incineration and gasification two sides of the same coin. Both have smokestacks which emit pollution into the atmosphere. Both burn the same type of fuel: municipal solid waste. Both expose waste to similar temperatures: 1000 to 1600 degrees F. Therefore, it should be no surprise that the lists of toxic air pollutants emitted by both are identical. Pound-for-pound comparisons of the levels of emissions from gasification units and incinerators are for some compounds higher, some identical, and some lower, but in every case represent an unnecessary risk to environmental protection and public health.

## Footnotes

1. US Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Volume 1, Fifth Edition, AP-42
2. C. Lowell Miller telephone interview with Louis Zeller on March 29, 2002
3. *Report on Carcinogens, Ninth Edition*, Revised January 2001, U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program
4. US Environmental Protection Agency, Office of Air & Radiation  
<http://www.epa.gov/air/urbanair/nox/hlth.html>
5. NC Air Pollution Control Requirements, 15A NCAC 2D.1104
6. 7. National Alert: A Warning About Continuing Patterns of Metallic Mercury Exposure, Agency for Toxic Substances and Disease Registry and USEPA,  
<http://www.atsdr.cdc.gov/alerts/970626.html>