



The Facts on Delta Thermo Energy™ Near Zero Emissions

The DTE Green Waste to Fuel™ Series of Reports

A Report by Delta Thermo Energy Labs, a Division of Delta Thermo Energy™

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Disclaimer

Many of the competitive technologies identified within this report are many years old and some have been in use for many decades. Delta Thermo Energy may not be aware of the latest advances put in place by individual plant operators or by their suppliers and subcontractors. Comparisons with new DTE Green Waste to Fuel technology and the underlying core technology we use is based upon publicly available information available to us. Our core technology, DTE Hydrothermal Decomposition™, is supported by proprietary and unique intellectual property protected by existing and pending patents. Trade secrets are also part of our operating procedures and implementation and our necessary to achieve stated performance levels.

The reduction in pollutants released into the environment during and as a byproduct of DTE Hydrothermal Decomposition is significantly lower, in some cases by more than an order of magnitude, than most legacy waste processing practices. In any comparison with legacy Waste to Fuel and other widely used waste processing techniques our comparisons use generalized numbers based upon authoritative third party sources and the results of testing within our existing facilities. Individual plant key performance metrics will vary based upon many factors and which will vary amongst plants.

About The DTE Green Waste to Fuel Series of Reports

These reports highlight the results of our research into current or potential critical waste processing and Waste to Fuel issues. The DTE Green Waste to Fuel (GWE) report series are publications of Delta Thermo Energy Labs, a division of Delta Thermo Energy. The mission of Delta Thermo Energy Labs is to conduct important waste processing and Waste to Fuel analysis and investigation, and to report the findings back to the community at large through our publications. The Delta Thermo Energy Labs knowledge base benefits from information on waste processing shared with us during the operation of our facilities within the United States and those of partners which are in operation around the world.

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Executive Summary

In this white paper we overview and define the Near Zero Emissions operating environment of our DTE Green Waste to Fuel™ systems and DTE Green Waste to Fuel™ to Energy facilities. Near Zero Emissions refers to the emissions exhausted from any Delta Thermo Energy facility. We list them in detail and compare them to many current legacy incinerator plants. We compare our estimated levels of emissions with permitted levels associated with legacy waste processing incinerator plants. In most instances a Delta Thermo Energy facility is cleaner by one, two or more orders of magnitude.

Incinerators burn trash - we do not. Our facilities absolutely do not burn municipal solid waste (MSW). We convert it to a clean burning fuel. DTE Green Waste to Fuel implements new clean processes based upon DTE Hydrothermal Decomposition™ core technology. DTE Hydrothermal Decomposition includes a combination of innovative waste processing technologies licensed exclusively around the world assembled in conjunction with new intellectual property. DTE Hydrothermal Decomposition is a remarkable technology, one that promises to change our view of what is attainable in our fight to keep our environment clean.

DTE Green Waste to Fuel brings a highly disruptive and positive change to the legacy incineration of municipal waste. The Near Zero Emissions of a DTE Green Waste to Fuel system or a DTE Green Waste to Fuel to Energy facility challenge the entire industry. DTE can work with you to integrate our Waste to Fuel systems into your existing incineration facilities so you can gain the green benefits of using clean burning engineered pulverized fuel (EPF). We can also deliver a complete Waste to Fuel to Energy facility for your community or industry. We're pleased to work with you and your key partners. In the final analysis, DTE Green Waste to Fuel and DTE Hydrothermal Decomposition technology will rapidly emerge as the solution of choice for communities and industry around the world.

DTE Converts Municipal Solid Waste to a Clean Fuel

The DTE Green Waste to Fuel process using the DTE Hydrothermal Decomposition is unlike anything in use in the Waste Processing industry today. DTE Hydrothermal Decomposition substantially reduces the emissions and byproduct production of pollutants to a very small percentage of existing legacy waste processing techniques.

Our core technology, DTE Hydrothermal Decomposition, converts the Municipal Solid Waste (MSW) and sludge to Engineered Pulverized Fuel (EPF). This EPF burns hotter and cleaner than coal. We use this fuel to power generators that deliver clean electric energy back to the community.

DTE Green Waste to Fuel takes all of the waste from the community, processes it cleanly and delivers green electric energy and beneficial use byproducts. Your need for landfills can be substantially reduced.

Engineered Pulverized Fuel (EPF) has a meaningful heating value for energy recovery that is similar to coal, and superior, in that it contains, in many cases, low levels of naturally occurring HAP and conventional air pollutant precursors and carbon derived from biomass rather than fossil sources. Hence it burns both hotter, more efficiently and most important, cleaner than coal. This clean fuel burns without the production of the dangerous and toxic compounds such as furans and dioxins typical of incinerator stack emission.

Comparison of DTE With Legacy Incineration

Pollutant	Typical Incinerator Permit Numbers	Estimated DTE Performance Numbers	Notes
			1,3
	(tons/year)	(tons/year)	
NOX	6	0.25	
SOX	176.6	0.365	
Lead	6.7	0.0003	
HCL	113.6	0.025	
HF	1.78	0.023	
PM	30	0.075	
CO	60.3	0.67	
	(ug/dscm)	(ug/dscm)	4
Lead	440	10	
Dioxins/Furans	0.03	ZERO	
Arsenic	27,215,550	0.36	
Beryllium	68,800,000	0.01	
Cadmium	35	0.79	
Hex Chromium	NR	0.115	2
Nickel	NR	1.25	2
Notes:			
Note 1: Original reporting for incinerator levels were converted so that units could be easily compared.			
Note 2: NR indicates no need to report			
Note 3: Permitted levels indicate not-to-exceed restrictions			
Note 4: DSCM = Dry Standard Cubic Meter a unit referenced by environmental agencies			
Reference Data:			
1 kilogram = 1,000 grams		gm: grams	
1 gram = 1,000 milligrams		mg: milligrams	
1 milligram = 1,000 micrograms		ug: micrograms	
1 microgram = 1,000 nanograms		ng: nanograms	
1 ton = 907,185 grams			

Comparison of DTE with Landfills

Landfills Emit Toxic Gases and Compounds

In most landfills bacteria decompose organic waste to produce methane and carbon dioxide together with traces of other compounds. Landfill gas is approximately 50% methane with the great majority of the remainder being carbon dioxide. Less than 1% of landfill gas may include other trace gases to include volatile organic compounds (VOCs).

Landfills also produce a liquid effluent called leachate. Leachate is a liquid which comes out of the waste in a landfill. Leachate contains many pollutants including ammonia, dioxin, benzene, toluene, chlorinated pesticides, metals, PCBs and other dangerous and toxic compounds.

Landfills often have internal systems to prevent leachate from contaminating ground water. These internal systems, such as liners, may ultimately degrade and allow liquids containing these dangerous toxins to flow into the local environment.

Landfill Health Risks

A multitude of studies have shown possible increased risks associated with living near landfills. Depending on the study, this may include cancer, birth defects, reduced immune system function, asthma, and respiratory infection.

DTE Near Zero Emissions Versus Landfills

Our DTE Green Waste to Fuel™ to Energy facilities produce no leachates and no methane. Refer to the table in the prior section of this white paper to see our performance numbers relating to emissions.

Understanding Pollutant Dangers

Dangers of NOX

Health Impact. NOx together with CO and VOC's are called ozone precursors. NOx reacts with carbon monoxide (CO) and volatile organic compounds (VOCs) and sunlight to produce ozone. Even low levels of ozone exposure can cause coughing, chest pain, shortness of breath and irritation. Further these levels of ozone can worsen chronic respiratory diseases such as asthma, increase the risk of bronchitis or even pneumonia and compromise the body's overall ability to fight respiratory infection. NOx reacts with other compounds to form a wide variety of toxic products. These toxic chemicals include nitroarenes, nitrosamines and other related compounds.

Acid Rain. NOx and sulfur dioxide react with other compounds, which precipitate in rain. This acid rain damages the environment in many ways. It can cause lakes, waterways and streams to become acidic and then toxic for many kinds of fish. This can reduce oxygen content in the water further impacting the ecological life chain.

Global Warming. One type of NOx is nitrous oxide. Nitrous oxide builds up in the atmosphere with other greenhouse gasses which is causing a slow but continued rise in the earth's temperature. This will impact ecological life chains on a broad basis over time.

Dangers of SOX

Health Impact. SOX forms sulphates or salts that can be breathed as particulates that form acids later in the presence of moisture. Health impacts can include, but are not limited to difficulty breathing, inflammation, eye irritation, pulmonary edema, circulatory collapse and even heart failure. Sulphur dioxide is closely linked to asthma, chronic bronchitis, and increased rates of mortality increase in old people and infants.

Broad Ecological Impact. The level of 0.3 micrograms per cubic meter of air brings potential risk for human health, but for vegetation, 0.2 micrograms per cubic meter is also damaging. SOX is often linked with the long term damage to vegetation.

Dangers of Lead

Health Impact. Lead is extremely toxic can damage the liver, kidneys, reproductive system, and nervous system and impact overall brain function, intelligence and cognition. Children are the most threatened by lead exposure. Lead also accumulates in the body - concentrations do not dissipate and diminish over time. To make this worse - the harmful effects of lead exposure are often irreversible. Exposure may also bring a suppressed immune system, which leads to a myriad of

problems. Pregnant women are also at high risk from lead. Lead exposure can accumulate in the bones until pregnancy occurs. Then this lead can flow through the bloodstream to harm both the fetus and the mother.

Dangers of Hydrochloric Acid (HCL) and Hydrofluoric Acid (HF)

Health. Hydrochloric and Hydrofluoric acid vapor can cause coughing, shortness of breath and a broad range of respiratory problems and distress.

Dangers of Particulate Matter (PM)

Particle Pollutants are Easy to Ingest. Particulate matter contains solids that can be inhaled and then result in health problems. The smallest particles often present the greatest problems because they can go from your lungs into your bloodstream. These particles include dirt, soot, smoke and more.

Health. Breathing in particle pollution can be harmful to your health. Larger particles can irritate your respiratory system and your eyes. Smaller particles can impact people with pulmonary and respiratory disease. Children and older adults are often adversely impacted as well.

Dangers of Carbon Monoxide (CO)

Health. Depending on the dosage, carbon monoxide can result in brain damage, heart problems, major organ dysfunction, memory or cognitive problems, behavioral and personality changes and a range of other permanent problems.

Environmental. Carbon Monoxide is also an ozone precursor and contributes to broad ecological impact including global warming and other adverse changes to the environment.

Dangers of Dioxins and Furans

Overview. The term dioxin generally refers to both dioxins and furans, although the chemical differences are often subtle, but significant. Dioxins and furans are by-products of incineration and the burning of municipal waste product and other industrial manufacturing processes. Different dioxin and furan compounds vary greatly in their demonstrated ability to cause adverse health effects across a wide range of living creatures. Of the 200+ dioxin and furan compounds a bit less than 10% are the focus of regulatory action.

Low Temperatures of Legacy Incineration Produce Dioxins and Furans. High temperatures and related factors can destroy dioxins during the combustion process. A high combustion temperature, adequate combustion time, and turbulence to distribute heat all contribute to maximize dioxin destruction.

Incredibly Toxic and Dangerous to Human Health. Dioxins and furans some of the most dangerous and toxic chemicals known by the scientific community. US Environmental Protection Agency

described dioxin as a serious public health threat and noted that there appear to be no safe level of exposure to dioxin and that, but levels found in the general US population that are in many cases at levels associated with adverse health effects. Dioxins are a known carcinogen. Dioxin is linked to birth defects, pregnancy problems, diabetes, cognitive disabilities, immune system disorders, respiratory system problems and much more.

Easily Absorbed by Our Food Chain. Dioxin is fat soluble and hence is absorbed initially in our food chain and then creates a cascade of ongoing impact. Dioxin accumulates in meat, dairy products and in the fish in our waterways and oceans.

Dangers of Arsenic

Overview. Arsenic is a white-metallic element that occurs naturally on our planet. Arsenic compounds are used primarily in wood preservatives, pesticides and in other processes and products. Upon combustion by incinerators, this arsenic may be liberated into the environment. Our food chain is generally the principal contributor to arsenic exposure.

Health Impact. Arsenic is a known poison to most of us. It is a carcinogen contributing to bladder, liver, prostate, skin, lung and other types of cancer. It is obvious that consuming or breathing in large quantities of arsenic can cause death. Further, exposure to arsenic may increase the risk of damage to a developing fetus. Arsenic can also impact our immune system, respiratory system and cause a variety of problems to our health.

Dangers of Beryllium

Toxicity. Beryllium is one of the most toxic elements found in nature. Beryllium is a Class A EPA carcinogen. Coal power plants and early nuclear weapons manufacturing have released beryllium into the environment.

Health Impact. Fumes containing beryllium can cause respiratory system duress, disease and carcinoma. Other impact can result in skin irritation and impact to a developing fetus. Exposure is can be caused through industrial exhaust and related combustion processes.

Dangers of Cadmium

Toxicity. Cadmium is highly toxic and exposure can cause cancer. Cadmium and related compounds target almost all of the human body's systems. Exposure to cadmium occurs through the ingestion of foods such as vegetables. There is no safe amount for cadmium ingestion.

Health Impact. Cadmium is toxic even at low levels of ingestion. Cadmium can negatively impact the cardiovascular and reproductive systems, the renal system, the nervous system and more. Cadmium has a very harmful effect on central nervous system to include cognitive impairment.

Dangers of Hex Chromium (Chromium Hexavalent)

Overview. Chromium hexavalent comes from the chemical element chromium, which is a hard, silvery metal. In low dosage, it is important for human metabolism. Industrial process can produce chromium hexavalent, which is extremely dangerous and toxic for most living things.

Health Impact. It is accepted that chromium hexavalent compounds are dangerous carcinogens. Chromium exposure has been linked to immunity a wide variety of disorders including DNA damage.

Dangers of Nickel

Health Impact. Nickel exposure has been connected with increased risk of lung cancer, cardiovascular disease, and neurological impact. Nickel can also damage reproductive health and cause birth defects and related reproductive problems.

Summary of Benefits

The benefits of a partnership between Delta Thermo Energy and your community are considerable. We provide benefits in multiple areas that positively impact your community today and far into the future.

Our new technology can help protect the planet we all share. Delta Thermo Energy's DTE Green Waste to Fuel systems and DTE Green Waste to Fuel to Energy facilities produce Near Zero Emissions and virtually no landfill impact. Everything we process produces primarily water vapor and gases normally found in the atmosphere prior to industrialization. Our facilities do not require huge smokestacks to disperse harmful airborne pollutants, nor do they produce many tons of hazardous waste for landfills.

Sustainable green energy for your community is now in sight. Sustainable green energy is the creation of usable energy such that it meets the needs of the present generation without compromising the ability of future generations. Sustainable green energy must be renewable, produced on an efficient basis, and not harm or pollute the environment. Nothing could be more ideal than to process waste cleanly, without pollution, and then to leave a byproduct as useful as energy for the community. DTE Hydrothermal Decomposition technology brings together innovative and unique technology from around the world to enable the world's first sustainable DTE Green Waste to Fuel process.

Company

Delta Thermo Energy is a leader in delivering the world's first sustainable DTE Green Waste to Fuel process for industry and community. Uniquely, our internationally patented and U.S. patent pending DTE Hydrothermal Decomposition technology enables our systems to convert municipal solid waste into a clean-burning fuel that produces Near Zero Emissions. Our modern systems reduce costs and pollution within existing waste processing plants, protect the environment and return clean energy to the community. Our markets include industrial manufacturers and small to mid-sized communities across the world.

Trademarks and Copyright Notice

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