*Introducing:*

# MAX

# THERMOMAX™

## Thermogenic Maximum
## Eco Waste Destroyer

## Simple description of our process

Our two basic scientific principles deal with combustion in general, and stoichiometric combustion, also known as "**complete and perfect combustion**." ***(See Thermal Vortex for Dummies to learn more about complete and perfect combustion.)***

In addition, we can also explain why we are able to achieve such an extensive level of efficiency, and why our performance will easily exceed current standards, including the strictest standards in the world with AQMD, the Air Quality Management District in Southern California.

Simply put, we don't follow all of the typical methods for processing waste materials. Our technology is actually closer to being a fumes burner than an incinerator, in that the ***waste material is shredded*** and fed into the chamber, where it ***burns in full suspension inside the vortex***, and never rests. When waste material rests on a grate, and has a constant flame from a fuel source underneath, that material smolders, and results in an **"incomplete combustion."**

Through our patented design (Pat # 11835,231), we are able to enhance typical parameters of combustion, and offer much higher levels of performance. Essentially, we shred the waste material (1½ inch chip size and smaller), blow it into the chamber with our primary air feed (enhanced with heated air), where it is blended tangentially (meaning that it moves in the same direction as the vortex to avoid any "friction") into the 2,000°F, 90 mph vortex (tornado on its side). The waste material undergoes the first phase in our process, which is the thermal destruction. As any of the material is moved to the back wall, whatever has mass to it, even microscopic dust particles, it travels along that back wall, then moves forward on the flue pipe that extends inward, where it then reaches a low pressure point along with a baffle that forces it to be deflected and reintroduced to the vortex slightly upstream. *(That's a lot of technical jargon that simply means that the combustible waste material burns up, becomes ash, and gets redirected back upstream in the vortex where the combustible material repeats this operation until completely converted to gases and is able to exit the exhaust portal.)*

In addition to the efficient combustion process, and again through proprietary methods, we introduce additional air flows in a manner that increases the performance level significantly. In fact, during a demonstration using a unit we built for a company from Poland, we achieved our primary performance levels (minimum 1,800°F and 90 mph vortex) using only 40% of our air intake! Because of our extensive efficiency level, and the fact that since we don't require exhaust scrubbers, our temperatures are never reduced, we are able to produce higher flow rates. ***We are able to more than double the typical performance***, and produce sufficient exhaust flow to boil the required volume of steam that will be used with the steam turbine to produce electricity. ***Because of our fire bricks and refractory materials, with 2,000°F inside the chamber, the external steel material will be whatever the ambient temperature is. That means you can touch the outer steel shell while in full operation, and you will feel the temperature of the surrounding area. Because of this, we create a 98% thermal efficiency inside the chamber.***

To summarize, we shred the waste material, introduce it into the thermal vortex chamber with a pneumatic (air forced) conveyor, and with enhanced designs, we are able to achieve **complete and perfect combustion.** We easily produce significantly higher performance levels than conventional methods, with a byproduct of super-heated, clean exhaust that can then either be expressed into the atmosphere, or used in a waste-to-energy (WtE) system with a *waste heat boiler* to generate steam that will in turn be used in a *steam turbine* and produce clean energy.

## *Thermo*MAX™ Series General Specifications

| | ***Thermo*MAX3™ *(3 tons/hr)*** | ***Thermo*MAX6™ *(6 tons/hr)*** |
|---|---|---|
| Dimensions | 7' 1" wide<br>7' 0" long<br>8' 6" tall | 7' 1" wide<br>13' 3" long<br>8' 6" tall |
| Capacity | 69.08 cubic feet | 138.16 cubic feet |
| Throughput rate | Up to 3 tons per hour using: Single waste type such as wood, coal, or tires<br><br>4 + tons per hour using: Municipal solid waste (MSW) | Up to 6 tons per hour using: Single waste type such as wood, coal, or tires<br><br>8 + tons per hour using: Municipal solid waste (MSW) |
| Thermal output @ STP ***** (Standard Temperature & Pressure) | 350,676 scfh<br>5,844 scfm | 701,352 scfh<br>11,689 scfm |
| Exhaust breakdown | $CO_2$ = 6.979% VOL<br>$H_2O$ = 13.958% VOL<br>$O_2$ = 5.583% VOL<br>$N_2$ = 73.478% VOL<br>(Remaining .002% made up of minor emissions) | $CO_2$ = 6.979% VOL<br>$H_2O$ = 13.958% VOL<br>$O_2$ = 5.583% VOL<br>$N_2$ = 73.478% VOL<br>(Remaining .002% made up of minor emissions) |
| Thermal efficiency<br>*Thermo*MAX™ *Series only* | 98% | 98% |
| Thermal efficiency<br>*Complete energy recovery system* | 81% | 81% |
| Energy production | With waste heat boiler and Two 3 MW steam turbines<br>6 MW | With 2 waste heat boilers and Four 3 MW steam turbines<br>12 MW |

***** *This is based on conventional systems… our design parameters, specifically the minimum 1,800℉ exhaust temperature, allow us to far exceed this criteria.*

**THERMOMAX™**
*Thermogenic Maximum*
*Eco Waste Destroyer*

## *Thermo*MAX™ Series General Specifications

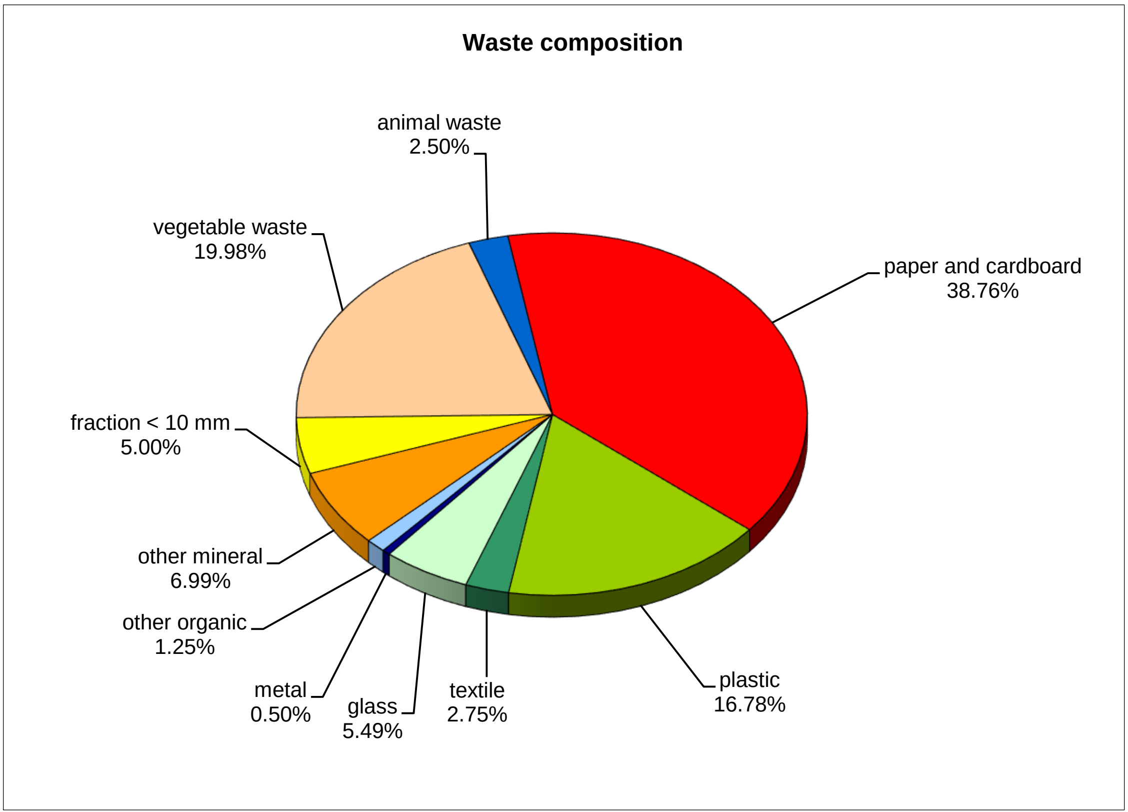
**(metric conversions)**

| | ***Thermo*MAX3™** *(3 tons/hr)* | ***Thermo*MAX6™** *(6 tons/hr)* |
|---|---|---|
| Dimensions | 215.88 cm wide<br>213.36 cm long<br>262.13 cm tall | 215.88 cm wide<br>403.86 cm long<br>262.13 cm tall |
| Capacity | 1.96 cubic meters | 3.91 cubic meters |
| Throughput rate | Up to 2.72 metric tons/hour using: Single waste type such as wood, coal, or tires<br><br>3.63 metric tons/hour using: Municipal solid waste (MSW) | Up to 5.44 metric tons/hour using: Single waste type such as wood, coal, or tires<br><br>7.26 metric tons/hour using: Municipal solid waste (MSW) |
| Thermal output @ STP *****<br>(Standard Temperature & Pressure) | 9,930 cubic meters/hour<br>165.48 cubic meters/minute | 19,860.08 cubic meters/hour<br>331.00 cubic meters/minute |
| Exhaust breakdown | $CO_2$ = 6.979% VOL<br>$H_2O$ = 13.958% VOL<br>$O_2$ = 5.583% VOL<br>$N_2$ = 73.478% VOL<br>(Remaining .002% made up of minor emissions) | $CO_2$ = 6.979% VOL<br>$H_2O$ = 13.958% VOL<br>$O_2$ = 5.583% VOL<br>$N_2$ = 73.478% VOL<br>(Remaining .002% made up of minor emissions) |
| Thermal efficiency<br>*Thermo*MAX™ *Series only* | 98% | 98% |
| Thermal efficiency<br>*Complete energy recovery system* | 81% | 81% |
| Energy production | With waste heat boiler and Two 3 MW steam turbines<br>6 MW | With 2 waste heat boilers and Four 3 MW steam turbines<br>12 MW |

***** *This is based on conventional systems… our design parameters, specifically the minimum 982.23℃ exhaust temperature, allow us to far exceed this criteria.*

THERMOMAX™

*Thermogenic Maximum Eco Waste Destroyer*




**Analysis**

**Waste sample number 005834**

| Symbol | Name | Characteristic | Individual component as % of sample |
|---|---|---|---|
| 1 | food waste vegetable origin | Food waste<br>Vegetable origin remains of vegetable substances, resulting in the preparation of food, such as peelings, leftover vegetables and fruits, rotten vegetables and fruits, leftover post-consumer food, food products treated as waste, such as breads, cereals or flour in packs, and other waste impossible to precisely specify | **20.0** |
| 2 | Waste food of animal origin | The remnants of meat, bone, meat, fish, fats, cheese, etc. | **2.50** |
| 3 | Waste of paper and cardboard | Any residues and products paper and cardboard | **38.8** |
| 4 | Plastic waste | Any residues and plastic products | **16.8** |

| | | | |
|---|---|---|---|
| 5 | Textile waste | Any leftovers and products out of wool, cotton, linen and chemical fiber | **2.75** |
| 6 | Glass waste | All glassware and glass cullet | **5.50** |
| 7 | metal | All products and scrap of all types of metal | **0.50** |
| 8 | Other organic waste | Organic waste remaining after being selected, ingredients such as plant residues1-5, the dried flowers, grass, tree branches, etc. | **1.25** |
| 9 | Other mineral waste | Mineral waste remaining after being selected from components number 6-7as pieces of concrete, bricks, debris, ceramic, etc. | **7.00** |
| 10 | fraction<10 mm | Mostly soil and ash | **5.00** |
| | | **Total** | **100.00 ± 0.5%** |

## *Projected performance based on initial testing and design criteria*

## *Composition of exhaust gases*

Primary 99.998% exhaust components:

| | |
|---|---|
| 6.979 | carbon dioxide |
| 13.958 | water vapor |
| 5.583 | oxygen |
| 73.478 | nitrogen |
| ***99.998*** | |

Remaining .002% (20 parts per million) exhaust components possible, depending on original waste material:

cadmium
thalium
mercury
antomonium
carbon monoxide
arsenic
lead
chromium
cobalt
copper
manganese
nickel
vanadium
nitrogen dioxide
hydrogen chloride
hydrofluoric acid
total organic carbon
sulfur dioxide

# Details of the process for each type of waste material used for Waste-to-Energy (WtE) in ***Thermo*MAX™**

Following are descriptions of the steps at each level for processing various waste materials. Each will vary slightly depending on material, location, and resources available. However, from the point of insertion into the vortex chamber, each will be the same, which is to produce super-heated exhaust that will exit the vortex unit, enter the waste heat boiler or heat recovery steam generator (HRSG), where the exhaust heats water-filled tubes to reach a boiling point, creating steam. From there, the steam exits the boiler and enters the steam generator under proper temperature and pressure. The generator then creates the desired amount of electricity. Once the steam is used in that stage, it goes through a condenser, where it is cooled to a level that returns it to water, and piped back to the water source for the waste heat boiler.

With all of the following waste materials, input volume will depend on the BTU or thermal value of the material used, and other conditions such as moisture content. For instance, the amount of municipal solid waste (MSW) needed to produce the needed exhaust flow and volume, and steam to generate up to 6 megawatts of electricity is typically going to be 4 tons per hour. Using scrap tires, that input volume reduces to only 1 ton per hour.

## *Municipal Solid Waste:*

One of the largest issues facing the world is how to handle their garbage – trash – MSW. While the composition of the waste stream will vary significantly for each location, the process is pretty much the same. Here are the simplified steps:

1. Starts with curbside collection or from commercial sites; including collection from remote bins.
2. It is then transported to a transfer station or directly to a landfill for processing.
3. Waste material is then sorted, removing non-combustibles such as glass or metal, which are then handed off to a recycler.
4. The sorted waste material is then put onto standard conveyors, where a final visual check and sort could take place.
5. The waste material goes into a hopper, where it is fed into a shredder, reducing the size of the waste to approximately a 1.5 to 2 inch chip size.
6. Once shredded, it is conveyed to an input hopper and inserted into the portal on the vortex chamber. In some cases, there will also be an air flow that assists with the movement of the waste materials (also called pneumatic conveyor), plus adds a significant volume of heated air that enhances the internal vortex, plus dries the materials as needed.
7. If there are any remaining non-combustible materials, they are separated internally, and then pulled out into a cyclone separator where they will drop into a bin. Any gases or fly ash that is pulled out, will be returned to the chamber for continued processing.

** Note: This is the point where the process is the same for all other waste materials used.*

***Woody Biomass:***

One of the best waste materials to use is woody biomass. According to a joint study between the USDA and the Department of Energy, there is more than 368 million tons of woody biomass available in this country. This comes from residential and commercial yard waste, forest thinning, woodlands landscaping, storm damage, and other sources. Since it is a natural material, there are no issues or concerns about potential harmful emissions into the atmosphere. It's like a fireplace or an outdoor fire pit. In addition, it's a resource that is in abundant supply. Another advantage our process offers is that unlike conventional methods of using wood waste for energy generation, we can use all of the wood waste, including bark, twigs, branches, leaves, or needles. In our operation, those materials offer a higher BTU value for the input materials. Here are the simplified steps:

1. Starts with method of collection, depending on specific type of woody biomass, but for our purposes here, we will describe the process for the project in Caliente, Nevada, which is woodlands landscaping treatments.
2. Sections of woodlands will be marked off and designated for treatment by the Bureau of Land Management (BLM).
3. Qualified and approved crews will cut down the prescribed number of trees based on a strategic plan, and remove the wood waste to a processing site close to the treatment area.
4. At that mobile processing site, the materials just cut down will be fed into wood chippers, with the chips being conveyed into waiting trucks.
5. The trucks will then transport the wood chips to the WtE facility for temporary storage, or directly into the process.

** Note: This is the point where the process is the same for all other waste materials used.*

***Agricultural Waste, specifically Crop Residues:***

Crop residues are divided into two groups – field residues and process residues. These include stalks, branches, leaves from wheat, rice, barley straw, corn stover, sorghum stalks, coconut husks, sugarcane bagasse, and pineapple and banana leaves. Based on surveys and data collected by the BLM, US Forest Service, and a joint study by the USDA and the Department of Energy, there is almost three times as much volume of waste material with crop residues than woody biomass, or 998 million tons available in this country. While the BTU value is typically similar to woody biomass, the method for processing is somewhat different. Here are the simplified steps:

1. Starts with collecting the waste materials. This will also vary significantly depending on materials as listed above. Depending on the material, there may be an additional shredding or size reduction required.
2. If using a material that has a high moisture content, the process would include a drying tunnel that would help dry the waste material as it travels along the conveyor to the hopper for insertion into the vortex chamber.

** Note: This is the point where the process is the same for all other waste materials used.*

***Waste Coal:***

Waste coal, which is known as residue coal or dirty coal, comes already size reduced. The material itself is known also as crumbed or coal fines. A good visual representation would be to crumble Oreo cookies as you would for a recipe. This material is pulled out of the bottom of mines that are considered barren or fully extracted. It has no real value since the cost of bringing it up from these closed mines or soon to be closed mines, outweighs what it can be used for. Typically, it's used to produce charcoal, but due to having a slightly higher sulfur content, it can't be used in coal-fired furnaces. That is one of the advantages of our technology, in that even if processing waste coal produces slightly elevated levels of sulfur dioxide ($SO_2$), we can remove that in a simple, efficient, and relatively low cost method compared to how it would have to be eliminated if used in conventional systems. Here are the simplified steps:

1. Depending on the mine itself, this would typically be removed through the use of augers and conveyors.
2. Since the material is already size-reduced, it would simply need to be stored at the facility, and then loaded onto conveyors that would feed it into the hopper, and then into the vortex chamber.

** Note: This is the point where the process is the same for all other waste materials used.*

***Landfill and Landfill Reclamation:***

In the United States, there are currently between 3,100 and 3,500 active landfills, with over 10,000 closed landfills and transfer stations. Issues related to landfills, active or closed, are such things as methane release, foul stench in the air, potential danger anyone entering without proper authorization and protections, and leachate found in the ground water that can have an impact for miles in every direction. The process for using landfill waste is the same as for landfill reclamation (reclaiming the land and repurposing it), with the only major exception is working around the active intake traffic. Here are the simplified steps:

1. Landfills are divided into cells. The starting point is to designate a cell to be unearthed, and all precautions and protocols based on state and federal environmental protection agencies need to be followed.
2. With the proper equipment, each section will be dug up, and an initial sorting would take place at that site.
3. The waste material is then transported to the facility for further processing. What makes this different from MSW processing is the use of a shaker conveyor system. The purpose for the shaker conveyor is to remove as much of the dirt that has been blended into the MSW, and depositing it into bins underneath the conveyor. The dirt and rocks will then be removed and returned to the cell from where it was removed.
4. The remaining sorted and separated material will be conveyed into a hopper on top of a properly sized shredder, and the shredded material will then be conveyed into the vortex chamber.

** Note: This is the point where the process is the same for all other waste materials used.*

### *Sargassum Seaweed:*

Sargassum seaweed, also known as sargasso, is a brown algae that floats on the surface of the ocean, and unlike other types of seaweed, floats and reproduces on the surface, and not the ocean floor. Some believe the origin of the sargassum problem in the Gulf of Mexico and Caribbean is the Sargasso Sea, a two million square mile area in the Atlantic Ocean. Others believe that it comes from the coast of South America. No matter the origin, this seaweed has become an invading force. So much so, that the government of Barbados declared a national state of emergency in June of 2018.

Sargassum collects on the beaches along the coastlines of islands and coastal communities, states, and countries of the Gulf of Mexico and the Caribbean. The collection on the beaches began to be a problem in 2011, with later surges in 2015, with increased volumes resurging each year thereafter. Our initial activity involves the Riviera Maya, in the State of Quintana Roo in Mexico. Major communities there are Cancun, Playa del Carmen, and Cozumel. We are currently working with government officials in Belize on MSW and sargassum issues. Although we are not ready to take on any additional activity, there are several dozen locations that we have made initial contact with, but will follow up in the future.

Sargassum seaweed is similar in makeup to other types of agricultural waste, or crop residues. However, this material requires a couple of modifications in the processing or destruction phases. Here are the simplified steps:

1. Several attempts to properly collect the sargassum have completely failed. We have offered a unique solution that includes working closely with subject matter experts, and professionals from the field of waste collection, and specifically beach raking. By having this committee or consortium, which will also include local officials, and representatives from various agencies, we will ensure that future programs and attempts to find a solution will be more successful.
2. As an example, a beach that has significant volumes of sargassum would need to have an initial removal process that would not be the same going forward. Heavy equipment would be used to collect the seaweed, then loaded onto whatever type of transport would fit that specific locale.
3. After that, a daily maintenance and upkeep protocol will be implemented, which would include a number of beach rakes depending on the size of the beach needed to be cleaned. That material will also be loaded onto whatever type of transport would fit that specific locale.
4. Once collected, the sargassum will be delivered to the WtE facility instead of a landfill, which is essentially a large compost heap.
5. At the facility, the sargassum is loaded onto a shaker conveyor similar to that used in landfill operations. The purpose is to shake off the sand that attaches itself to the seaweed. The sand will then be returned to the beach, which is a requirement under most environmental regulations in the region.
6. This conveyor would also pass through a partially enclosed tunnel with blowing hot air, that will not only dry out the sargassum making it burn more efficiently, but also to dry the seaweed so that the sand will detach easily.
7. Once finished with the heating and sand removal, the seaweed would go through a simple cutting process, and then into the vortex chamber.

** Note: This is the point where the process is the same for all other waste materials used.*

***Medical Waste:***

Medical waste disposal poses several problems, which is why it's highly regulated in each state. In the past, it was simple enough to throw it in the incinerator, and then periodically clean out the chamber. However, one of the issues that the US EPA discovered is from the use of what are known as "red bags." These are the thick plastic bags that are made in a heavily chlorinated process. As the bags are combusted, typically at temperatures below 1,400º F, they produce dioxins, which are harmful emissions. Our process burns at a higher temperature range, from 1,800º F to 2,200º F, with an average of 2,000º F. Dioxins can't be produced at that temperature range. In addition, according to the US EPA, the proper range to destroy pathogens and biologically active material is 1,800º F to 2,200º F. Here are the simplified steps:

1. Following state regulations on proper handling of medical waste, all hospitals, clinics, and doctor's offices are required to ensure that red bags and other containers are destroyed properly. There are private companies that collect and dispose of the medical waste, and some larger facilities do that on their own. Several years ago, using conventional incinerators was banned by the US EPA.
2. Once the medical waste arrives at the WtE facility, it can simply be loaded onto conveyors that will move it into a shredder. Due to the potential risks of the needles for this particular type of waste, there would be no handling of the material in any way. The needles and other non-combustible material can simply be introduced into the vortex chamber, where it will be pulled out into the cyclone separator and deposited into a protective bin. That small amount of material can be processed properly for disposal that follow state guidelines.

** Note: This is the point where the process is the same for all other waste materials used.*

***Scrap Tires:***

Old, scrapped tires are a very serious waste issue in this country. Estimates are that nearly 325 million tires are disposed of each year. That's a tire for each man, woman, and child in the US. These are the ones disposed of, and not the ones that make it into recycled products, such as road material, or any one of a dozen uses for repurposed tire rubber.

Tires have been a difficult issue in terms of properly disposing without any harmful effects on the environment. In some cases, tires are melted, where the steel belts are removed, and the rubber is then separated and used to create a biofuel. One problem with burning tires using conventional technologies is the significant amount of think black smoke that is released into the atmosphere. Our technology addresses that, and can process the tires without producing any harmful emissions, not even smoke.

One of the unique issues with scrap tires is the various ways in which tires are gathered or collected. While most are received at tire stores in exchange for new ones, and then sold off to tire scrapping companies, a large number are simply dropped along the roadside, and collected by local or county trash collectors and then processed. Here are the simplified steps:

1. Once the tires are collected, they will be taken to the WtE facility, where they will be put into shredders and reduced to manageable chip sizes… the steel belts do not need to be removed.

2. Once the scrap tires are shredded, they will be introduced into the vortex chamber with the use of a specialized hopper that is customized for this type of waste material.
3. Inside the vortex chamber, the rubber will virtually flash burn, leaving the non-combustible steel belts to be pulled out into the cyclone separator, and deposited into the bins for later processing.

** Note: This is the point where the process is the same for all other waste materials used.*

As previously stated, while each waste material presents its own challenges and needs, the overall concept is to collect the waste material, shred or chip (if necessary) to reduce the size, and then insert into the vortex chamber where it will burn in full suspension inside the high-temperature, high-turbulence vortex. With the patented process, any remaining combustible material will be deflected back upstream into the vortex, where it will be entrained in a continuous burning cycle, allowing us to achieve complete and perfect combustion, or virtually achieve stoichiometric combustion, which is the ultimate level of combustion.

### *Special Note:*

While we offer a great deal of information regarding this technology, and the process in which it will be utilized, there are a couple of points that need to be stated, that will help to separate this technology from other conventional systems available currently.  For the most part, these relate to the type of materials to be destroyed, which in essence become the fuel source.

Typically, WtE is thought of in terms of the type of waste material and the specific system that is used to destroy it, and then convert it into another state, such as a gas.  For instance, some refer to a woody biomass gasification system, where syngas, or biogas is the byproduct or the output needed in order to use as a fuel in another system to then be heated sufficiently to boil water to create steam.  Our byproduct is the super-heated exhaust that flows out of the vortex chamber, then into a waste heat boiler that creates the steam used by a steam generator… the oldest, most efficient, and cost effective method to produce electricity.  This process, known as energy recovery, or sometimes referred to as recycled energy, is more than 150 years old.  We are simply replacing the heat source, that was typically an incinerator, coal-fired furnace, or any other method of producing extreme heat, with an extremely efficient method, that is also significantly more eco-friendly than anything available currently.

The previous information focused on the various waste materials that can be processed in the ***Thermo*****MAX™** Thermal Vortex Systems.  One feature that separates this technology from every other system or method used today, is the ability to take the various waste materials and blend them together for processing if necessary.  For instance, in a small town that may not have sufficient MSW to generate the required output, other waste materials, such as woody biomass, waste coal, or scrap tires, can be blended in to achieve the necessary BTU level.  Because the system can take up to a 49% moisture content, we can intake materials that other systems can't.  The only aspect that we have to consider, is the total BTU value for the volume of material processed.  It can literally be mixed as if creating a "recipe."  This recipe can easily accept substitutions, as long as the total volume of each material used adds up to the BTU value needed on the intake.