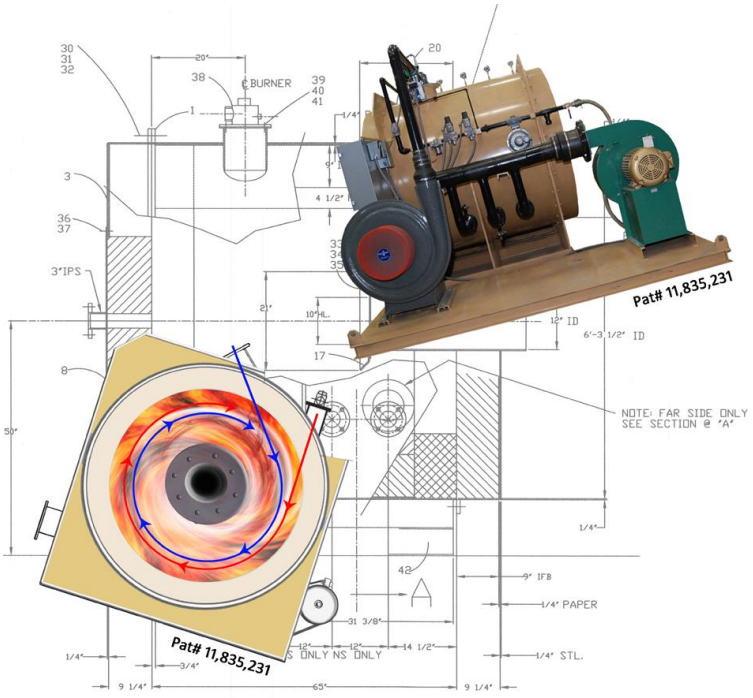

*Thermo*MAX™ Series – Thermal Vortex Technology

WHITE PAPER

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Executive Summary

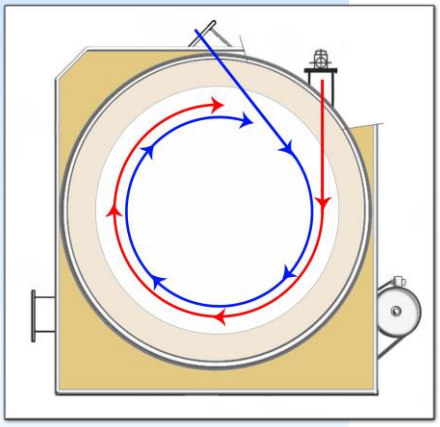
White Papers have been around for over 100 years, and there are basically three types: Technical, problem solving, and marketing & sales. This one will be a little bit of all three. The innovative technology we'll discuss is not too overly technical, it solves a slew of problem issues, and the potential market is immense. In no uncertain terms, it's time to start using what we have, avoid fossil fuels, and offer significant amounts of clean energy.

Three purposes of white papers:

Technical

Problem solving

The issue of clean energy has never been at the forefront of people's minds as it is right now. The need to have cleaner sources as well as the issue of cost is being talked about in the halls of Congress, various federal agencies, the administration, and even at the state level. Although this paper will look at one specific clean energy source, it's important to keep in mind that of all of the types of electricity generated right now, nuclear energy is actually the cleanest environmentally and is sometimes referred to as "the original clean energy" source. However, it is not known as a waste-to-energy process that we will discuss shortly.



The blue arrows indicate the waste material, and the red arrows represent the initial burner flame to start the process.

That scares some people, but most would be surprised at how many nuclear power plants there are in the U.S. According to the U.S. EIA, or Energy Information Agency, there is a total of 54 commercial nuclear power plants housing 94 nuclear reactors across 28 states. Illinois leads with 11 reactors, contributing approximately 12% of the nation's nuclear-generated electricity. Also according to the EIA, there are 7 nuclear sites at various stages of completion, with two in Texas, one each in Michigan, Wyoming, Virginia, Pennsylvania, and Iowa.

However, while those are impressive stats, what you will learn about over the next few pages will surprise you, and help you realize just how valuable this technology is. An original design of this technology was introduced in the late 60s and early 70s in a small Midwestern town. Although it was met with global acclaim, the large corporation that was developing the system simply decided they didn't want to be in the garbage business…landfills were abundant and the safest way to destroy various type of waste. (We have a great solution for eliminating landfills completely and then restoring the land to be able to build structures on, something not possible with today's systems.)

So, welcome to the exciting world of waste-to-energy (WtE) using thermal vortex technology with our ThermoMAX™ Series Vortex Combustion System!

VORTEX ENERGY GROUP LLC

Did You Know…?

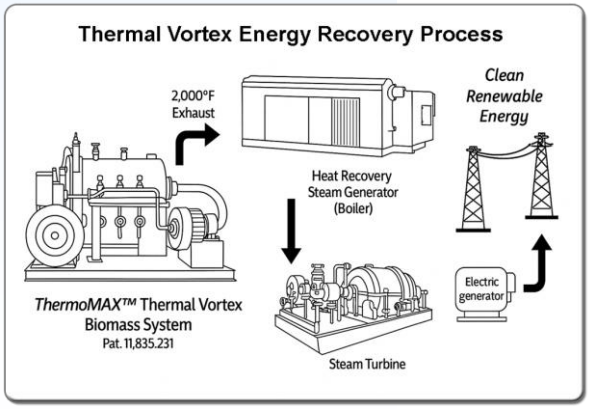
… Cows emit a massive amount of methane through belching, with a lesser amount from flatulence. Research shows that cows can expel as much as 50 gallons of methane every day, which is comparable to the pollution that is produced by one car. ***They're the original waste-to-energy source!***

What is waste-to-energy?

Simply put, WtE is taking a variety of waste materials, and converting them into energy – electricity. WtE technologies have grown in importance as society seeks sustainable methods that will manage waste and generate energy. One emerging technique is the use of thermal vortex technology (TVT). This paper will outline the key advantages of integrating TVT into the process of energy recovery that has been around for over 150 years. There are 4 basic types of WtE currently:

1. Incineration (That's a bad word, and we don't use it!)
2. Gasification
3. Pyrolysis
4. Anaerobic digestion

No need to dive into each one too much, but in a quick overview: Incineration is used, but the technology is too old, and very costly to try and scrub, or clean the exhaust gases. This is due to something known as **incomplete combustion**. An easy way to tell them apart is to look at the oxygen used. Gasification uses high heat, but with limited oxygen used. The byproducts are a syngas, including carbon monoxide (deadly), ash, and char. Pyrolysis uses high heat, with no oxygen in the process. Byproducts are biofuel, syngas, and biochar. Anaerobic Digestion doesn't use heat, but rather microorganisms break down organic matter, with no oxygen, and produces biogas. Now, for TVT, the process uses oxygen to improve the process and allow for **complete combustion**, which means we have control of the atmosphere inside the chamber. The byproducts of this method are super-heated exhaust, and very minor amounts of various gases, with no ash produced.



Thermal Vortex Energy Recovery Process

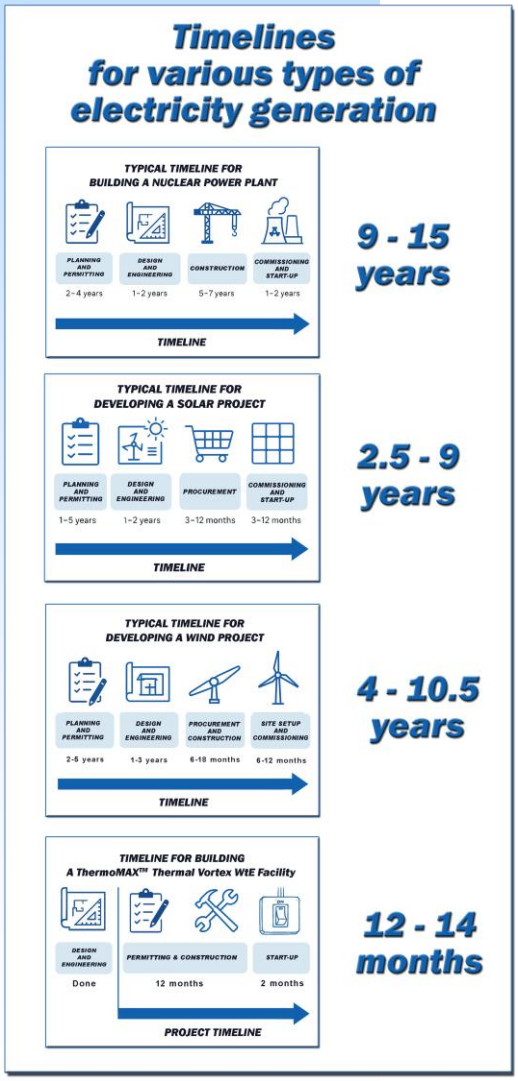
The diagram to the left shows the major components of a thermal vortex energy recovery system, that would be part of a WtE facility that can be launched in an existing building, or one built for this specific purpose. The building could be as small as 15,000 sq. ft.

Now for the fun details. As the waste materials are fed into the vortex chamber, they will be introduced into a 90-mph vortex, also called cyclone or tornado, with a typical temperature of 2,000°F. After 15 to 20 minutes, the external fuel source (methane, propane, or natural gas) used by the burner, is shut off, and at that point, the waste material becomes its own fuel. The waste materials burn in full suspension inside the vortex, and are not able to produce smoke or fumes...due to complete combustion. The system can run for 24 hours as long as waste materials are

being fed into it. Some other key points: this is the only combustion system in the world that allows the waste materials to be mixed together and also have up to a 49% moisture content. That wasn't so bad! Leaving the technical details behind, let's look at the advantages of using Thermal Vortex Technology.

Advantages of TVT

As you can tell so far, just looking at the basic comparisons of the other methods, TVT is the most effective WtE process available. As stated previously, this technology was designed and built more than 50 years ago but then was discarded because the company didn't think it fit their product profile. The first redesign came about because of a need to put these systems on flatbed trucks, or even inside a shipping cargo container and sent overseas. But, in the process of using the core concepts of the high heat and the vortex, and considering the need to reduce the size, we were able to take advantage of something we have all come to know – miniaturization. We created a system that was almost three times as efficient, and almost half of the size of the original.



Timelines for various types of electricity generation

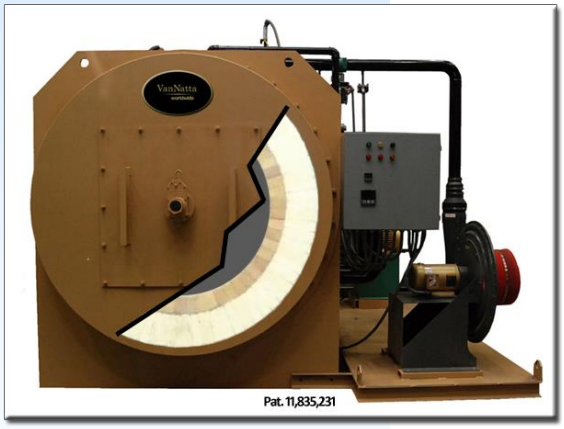
Benefits of TVT in WtE facilities

Operational benefits

***Scalability*:** TVT units are available in two sizes; a 3-4 ton per hour unit that can process up to 96 tons of municipal solid waste (MSW) per day, and a 6-8 ton per hour unit capable of processing 192 tons per day.

Did You Know…?

… 90 mph is the wind speed of an F1 tornado. At that speed, mobile homes can be destroyed, homes have serious roof damage, trees can be uprooted, and semi-trucks can be blown off the road. Now imagine that power inside a cylinder that is 4 feet wide, by 5 ½ feet long!



Flexibility: Most combustion-based WtE systems can process a variety of waste materials. An advantage we have is that our vortex technology can actually process a variety of waste materials at the same time. Without getting too technical, all combustible materials have an inherent thermal value measured in BTUs (British Thermal Units), similar to our home HVAC systems. To produce sufficient heat to be used in an energy recovery process, there is a set amount of BTUs needed. All we have to do is ensure the total BTU value is reached is add up the volumes of each type of waste.

Less Maintenance: Because the chamber has no moving parts inside, and with a 90-mph tornado, there is little to no maintenance needed. Current technologies require regular shutdowns to do maintenance. That represents a significant loss in productivity.

Enhanced Energy Efficiency

Higher Thermal Value Recovery: As referenced previously, these types of technologies measure the input and output in BTUs. Because of the design, as well as features like 13 ½ inches of fire brick (similar to the inside of your fireplace and chimney) made up of two types, we are able to reach a 98% thermal efficiency, with only a 2% heat loss. Other furnaces and similar industrial ovens only have 60-65% thermal efficiency. With the *Thermo*MAX™ system, with 2,000°F 90 mph tornado inside, if you touch the outer steel casing, it will be whatever the ambient temperature is!

Extremely low external fuel usage: The system starts up using a commercial burner that begins the burning process. Our 3-4 ton per hour unit uses a 1 million BTU burner, and the 6-8 ton per hour unit uses a 2 million BTU burner. These burners can be natural gas, methane, or propane. After 15 to 20 minutes, the external fuel source is turned off, as the waste material becomes its own fuel, dramatically reducing any fossil fuel used in the process, as well as costs.

Economic Advantages

Extended Equipment Lifespan: Without giving away too much intellectual property, our system was designed to allow a 60-year lifespan on the vortex chamber itself. That's virtually unheard of with similar industrial furnaces, which is the closest technology we can compare to. However, with the firebrick materials referenced earlier, not only can we achieve high thermal efficiency, but in so doing, we ensure the outer steel shell will not warp or weaken due to excessive heat. With other components, such as the burners and the blowers, they have industry standard warranties.

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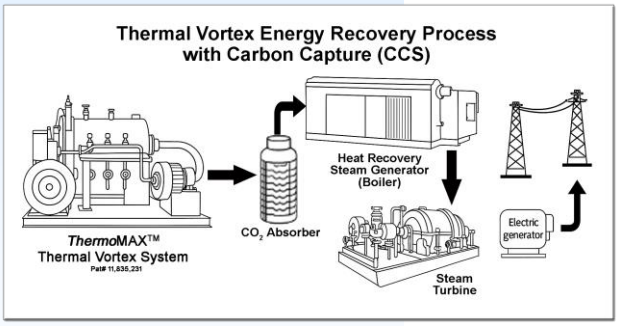
Lower Operating Costs: As stated, by reducing or eliminating external fuel, we are able to lower the operating costs. Additional cost savings occur with commercially available components such as burners, blowers, electronics including sensors, programmable logic controllers, thermocouples, and peripherals (shredders and chippers). Energy recovery systems, namely waste heat boilers and steam turbine gen sets are also readily available. Finally, because of the operating design of the entire WtE systems and facility, there is no need for higher cost personnel.

Decreased Environmental Impact

No Harmful Emissions: Based on the vortex chamber's design and using trusted scientific principles, this technology does not produce any harmful emissions. As referenced previously, the only byproduct is super-heated exhaust. This technology is considered to be a "low emitter," or "small emitter" based on the overall volume of emissions, using what is known as CO_2e or carbon dioxide equivalent. However, with some applications requiring "Net Zero" emissions, mostly in other countries, we have a relatively simple process for carbon capture and storage, or CCS.



Note that in the graphic on the left, the overall energy recovery system is the same as previously discussed, but with the addition of a CO_2 Absorber. Using a proprietary design, we are able to take the CO_2 out of the emission stream (or an old term – effluent), and store it directly into gas cylinders, sometimes called bottles. These cylinders can then be sold to various industries, but most of all they are used in commercial greenhouses where CO_2 is used to enhance the plants. Since trees and plants need CO_2 to grow, using it in this manner completes the carbon cycle, and also adds a sort of steroid effect on the plants. I guess you could refer to them as "power plants!"

In addition to CO_2, some waste materials contain a high level of sulfur dioxide or SO_2 such as coal fines, tailings, and rejects, industrial waste, tires & vulcanized rubber, and construction & demolition (including drywall). Sulfur scrubbers are readily available, and relatively low cost.

Innovative Waste Management

Resource Recovery: A topic that is not widely discussed is the potential recovery of valuable metals and minerals from waste, offering additional revenue streams since they are increasingly in demand for use in technology, manufacturing, and clean energy systems.

Recycling: Although some form of reusing some materials has been around since the 11th century, the practice and methods have developed alongside our own advancements and growth. But the beginning of the broad awareness began with the first Earth Day on April 22, 1970, in the U.S. As part of our overall WtE efforts, we incorporate a new and innovative method for separation and sorting of materials. The combustible materials, including plastics, paper, organics, and textiles, are destroyed, while the metal and glass items are separated in order to be used as a secondary revenue source.

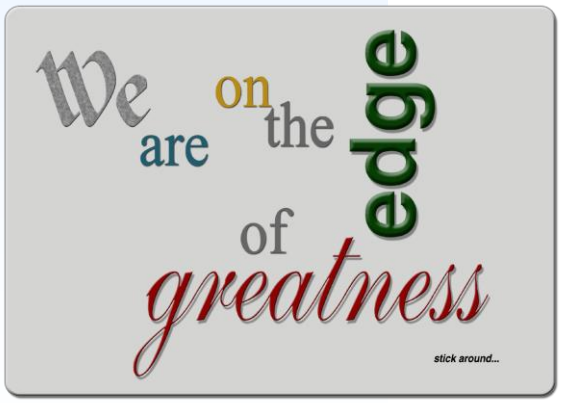
Waste Reduction and Elimination: Proper and sustainable waste management is an issue all over the world. It doesn't matter if it's a superpower, a small village, or a developing nation, waste is a problem that is rarely handled well. The concept of dealing with waste or garbage is universal, yet low cost, efficient, and environmentally friendly methods are woefully inadequate. The graphic on the left lists various applications or fuel sources we can process. You will notice that some of those waste materials are in the news a great deal. MSW and landfills are in the news because of the serious problem in Puerto Rico where 12 out of the island's 29 landfills are at or near capacity. Woody biomass is front and center because of the recent L.A. fires, caused by not only a lack of sufficient water, but also because forest thinning in the surrounding area has been reduced by more than 80%.

Applications (fuel sources) where we can have a very serious impact on environmental and energy issues:

1. Municipal solid waste (MSW), which is also referred to as collected garbage, including residential, commercial, and industrial.
2. Landfills and landfill reclamation
3. Woody and agricultural biomass (includes forest thinning, woodlands landscaping, crop wastes, and sargasso)
4. Coal, specifically residual coal or waste coal
5. Medical waste
6. Shredded tires
7. Construction and demolition
8. Disaster cleanup
9. Desalination (Salton Sea)
10. Great Pacific Garbage Patch, wind turbine blades destruction, and others.

Conclusion

Thermal Vortex Technology presents a transformative approach to waste-to-energy applications. With its numerous advantages, including efficiency, environmental sustainability, operational benefits, and economics, it stands at the forefront of the future of sustainable energy recovery from waste. With a low cost of implementation, as well as a very quick timeline to be operational, this technology and overall WtE process offers the best solution available today.



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