A Division of Vortex Energy Group LLC

VAN NATTA WORLDWIDE LTD

Research and Education Division

A Definitive Guide to Thermal Vortex Technology

RESEARCH AND EDUCATION DIVISION

A Definitive Guide to Thermal Vortex Technology

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Dedication

This book is dedicated to my late father, Ralph W. VanNatta, who was instrumental in this technology being advanced more than 50 years ago, and also for his dedication and efforts to helping redesign, update, and improve the technology, as well as the overall program. His keen insights, knowledge, and experience continue to give me inspiration and the drive to succeed.

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intro

An Introduction to Our Technology and Programs

Everything you need to know about thermal vortex technology!

With environmental energy issues being one of the most important topics we face today, there is a lot of discussion about alternative and renewable sources of energy. These methods are protective of our precious environment, but virtually all of them are so costly, they require government subsidies just to survive. Private funding is difficult by itself, because the typical return on investment is 20 to 30 years for wind farms and solar arrays.

We've all seen the headlines, where taxpayer money has subsidized failed programs to the tune of several billions of dollars. Wind farms receive billions of dollars in government money, and not in production tax credits, but set-up funding and ongoing financial support. Other companies receive hundreds of millions of dollars and then declare bankruptcy shortly after, with their executives getting all of their own money protected, making the American public weary of this kind of government financial support. Instead of a promise of a cleaner, energy independent future, the term alternative energy sometimes brings concerns and hesitation.

But, we have a solution. This booklet will describe our unique and innovative technology, as well as detail the financial and environmental benefits found with our thermal vortex system. Our technology began more than 50 years ago, developed by the undisputed leader in furnace and combustion technology at the time. For internal reasons, the project was shut down, but only after successful development, testing, and approval by the United States EPA and its predecessors.

The following pages will offer details about the company, the technology, and our ongoing programs, including our efforts all around the world, to provide clean, renewable and alternative energy at a fraction of the cost and size we now face with existing technologies.

Chapter 1

Background

This program was started almost thirteen years ago in a suburb of Chicago. In the early part of 2014, I brought the operations back home to Shelbyville, Indiana for several reasons, but primarily to return to where this concept was born. The company was formed in response to the energy crisis that was engulfing this country, as gasoline prices rose to a national average of over $4 a gallon. Years later, we are once again facing this impact on our wallets and our economy as a whole.

Our focus has been to find alternative sources of energy in order to overcome our dependence on foreign oil, as well as our use of environmentally damaging fuels to generate electricity. For many years, wind turbines and solar arrays seemed to be the only recognized source for these alternative fuels, with other methods still too far out on the horizon. Another critical factor was the cost, as all of these methods, including wind and solar, prove to be very expensive to implement, and typically require massive government subsidies in order to be viable.

In the late 1960's, a brilliant engineer and inventor, the late Robert J. Hasselbring, a project manager at General Electric's Industrial Heating Department in Shelbyville, developed a unique method for destroying waste materials, using an innovative technique, namely a high speed, high temperature vortex inside a cylinder laying on its side. This method flew in the face of conventional thinking, but soon proved to be the most efficient process for destroying a variety of waste types.

My late father, Ralph W. VanNatta, was mayor of Shelbyville at the time, and the two men collaborated to develop a demonstration project partially funded by the federal government, GE, and the City of Shelbyville. This system not only proved to be a rousing success, but also caught the attention of the newly named Director of the United States Environmental Protection Agency, William Ruckelshaus. His wife Jill even did the commemoration of the building that housed the first production unit.

A few years later as the demonstration project came to a close, GE decided to shut the project down, not because the technology didn't work, but as some have indicated, being in the trash business didn't fit the profile that GE wanted for the company. This was not a terrible decision and not unexpected considering at the time, the conventional thinking was that we had vast amounts of land available for landfills, and there was no need to change course with our methods of managing our waste issues.

A few years ago, I called Dad and suggested that we reincarnate the vortex system since the massive volume of clean heat that comes off the back of the system can be used to produce energy. He told me to stick to wind and solar, since that is what everybody was talking about. Thank goodness I'm stubborn, because I called him back a week later, and he gave me Bob Hasselbring's phone number. I called Bob, and as they say: the rest is history!

With Bob's incredible knowledge and assistance, we began this process by updating and upgrading the original designs, while keeping the core of the technology untouched. What we have added are some very exciting new technologies unavailable forty years ago. These modifications include real-time data transmission, remote access, process automation, and a host of new sensors and monitors to control every aspect of the process, and to ensure the clean and efficient operation of the chamber. Using these new designs, we submitted utility patent applications two years ago, and have just recently had our patent applications granted.

THERMOMAX™

Thermogenic Maximum Eco Waste Destroyer

Our system, known as the *Thermo*MAX™ Thermal Vortex System™ is available in two sizes, with various options depending on the type of waste material to be used:

1. *Thermo*MAX3™ rated at a throughput of 3-4 tons per hour, with exhaust capacity of over 350,000 standard cubic feet of superheated exhaust per hour, with dimensions of approximately 7'1" wide by 7'0" long by 8'6" high.
2. *Thermo*MAX6™ rated at a throughput of 6-8 tons per hour, with exhaust capacity of over 700,000 standard cubic feet of superheated exhaust per hour, with dimensions of approximately 7'1" wide by 13'3" long by 8'6" high.

Following are terms that are commonly used in the combustion industry, as well as in the production and distribution of electricity. Knowing these terms will also help as we further describe this exciting and innovative technology, as well as our programs that will provide massive volumes of clean, renewable and alternative energy, and to better manage our waste issues, and even benefit local economies. We may not refer to all of these terms in this document, but they are available for you as you learn more about this important and timely issue facing us today.

Chapter 2

Terms

Combustion: Combustion takes place when fuel, most commonly a fossil fuel, reacts with the oxygen in air to produce heat. The heat created by the burning of a fossil fuel is used in the operation of equipment such as boilers, furnaces, kilns, and engines. Along with heat, CO_2 (carbon dioxide) and H_20 (water) are created as byproducts of the exothermic reaction.

Complete combustion: Combustion efficiency is the calculation of how effectively the combustion process runs. To achieve the highest levels of combustion efficiency, complete combustion should take place. Complete combustion occurs when all of the energy in the fuel being burned is extracted and none of the Carbon and Hydrogen compounds are left unburned. Complete combustion will occur when the proper amounts of fuel and air (fuel/air ratio) are mixed for the correct amount of time under the appropriate conditions of turbulence and temperature.

Vortex: a whirling mass of air, especially one in the form of a visible column or spiral, as a tornado. Our system contains a horizontal vortex at 90 mph.

Municipal solid waste (MSW): this is the collected trash that is discarded by residents and commercial sites. We typically think of anything that goes into the waste stream that trash trucks pick up in front of our house, or from the large bins at businesses, as MSW. It can also include discarded tires and in some cases, yard waste.

BTU (British Thermal Unit): the amount of heat required to raise the temperature of 1 pound (0.4 kg) of water 1°F. Waste materials have a specific thermal value, and with proper combustion efficiency, there should be very little heat loss throughout the process. Our system maintains a 98% thermal efficiency. Here are examples of the various fuel types and their BTU value:

Fuel source	BTU / lb	BTU / ton
MSW	4,000	8,000,000
Waste coal (3% sulfur content)	6,500	13,000,000
Wood	8,000	16,000,000
Crops, - corn or sugarcane (bagasse)	8,500	17,000,000
Tires	16,000	32,000,000

Waste-to-energy (WtE): this is a decades-old method of disposing of waste materials (usually MSW), and transforming the byproduct into a usable energy source. Although it's the lowest cost and most efficient method of producing electricity, many sites have come under fire for not maintaining clean emissions as regulated by the EPA.

Biomass: is biological material from living, or recently living organisms. As an energy source, biomass can either be used directly, or converted into other energy products such as biofuel, or various types of feedstock for boilers. Included is yard waste, agricultural crop waste, and woody biomass.

Woody biomass: Woody biomass is biomass material that originates from wood sources, most notably from forest thinning and similar activities. Yard waste is typically not considered to be woody biomass, unless it is mostly made up of limbs, branches, and other wood material.

Waste coal: this is coal that contains a higher concentration of sulfur, usually as much as 3%. Waste coal is not able to be used in conventional coal-fired furnaces due to this high amount of sulfur, and is usually either discarded or processed for other purposes, which is very costly.

Heat recovery steam generator: also known as an HRSG, waste heat boiler, steam generator, and most often – a boiler. A boiler is a closed vessel in which water and other fluids are heated. The heated or vaporized fluid exits the boiler for use in various processes or heating applications, including boiler-based power generation, cooking, and sanitation. In our configuration, the waste heat boiler heats up the water in tubes and generates steam. That steam is then used by a steam turbine to generate electricity.

Steam turbine: a device that extracts thermal energy from pressurized steam and uses it to do mechanical work on a rotating output shaft. Steam turbines in the modern sense have been around since the late 1800's. Because the turbine generates rotary motion, it is particularly suited to be used to drive an electrical generator. About 80% of all electricity generation in the world is by use of steam turbines, in combination with various types of heat sources.

Energy recovery: this is the concept of capturing heat and using it to generate some form of energy. In our configuration, the superheated exhaust from our combustion chamber is passed through a waste heat boiler, where it is converted into steam, which is then used by the steam turbine to produce energy. This process is also known as recycled energy.

Cogeneration: also known as combined heat and power (CHP), it is most widely known as the process used to simultaneously generate both electricity

and useful heat. The world's first commercial power plant was actually a cogeneration plant. In 1882, Thomas Edison converted warehouse buildings in lower Manhattan in New York, known as the Pearl Street Station. It not only produced electricity for many of the businesses close by, but it also provided thermal energy in the form of heat for area buildings.

Watt: is a unit of power, named after the Scottish engineer James Watt (1736–1819). The unit, defined as one joule per second, measures the rate of energy conversion or transfer. A joule is defined as the work required to produce one watt of power for one second, or one "watt second" (W·s)

Kilowatt: one thousand watts. One kilowatt of power is approximately equal to 1.34 horsepower. A small electric heater with one heating element can use 1.0 kilowatt. We measure this in hourly usage, known as kilowatt hours or kWh. In 2010, the average annual electricity consumption for a U.S. residential utility customer was 11,496 kWh, an average of 958 kilowatt hours (kWh) per month. Tennessee had the highest annual consumption at 16,716 kWh and Maine the lowest at 6,252 kWh.

Megawatt: one million watts. A typical wind turbine has a power capacity of 1 to 3 MW. On railways, modern high-powered electric locomotives typically have a peak power output of 5 or 6 MW.

Tipping fees: charges or fees for depositing waste, usually at landfills or transfer stations. These range from $35 per ton in many parts of the U.S., to as high as $95 a ton in the Northeast, especially in densely populated areas. These fees are an excellent source of revenue, and in some cases may even surpass the income from the production of electricity.

Dioxins: Polychlorinated dibenzodioxins (PCDDs), or simply dioxins, are a group of polyhalogenated compounds which are significant because they act as environmental pollutants. Dioxins occur as by-products in the manufacture of organochlorides, in the incineration of chlorine-containing substances such as PVC (polyvinyl chloride), in the bleaching of paper, and from natural sources such as volcanoes and forest fires.

NOx: is a generic term for mono-nitrogen oxides NO and NO_2 (nitric oxide and nitrogen dioxide). They are produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. In atmospheric chemistry, the term means the total concentration of NO and NO_2. NOx react to form smog and acid rain.

CO_2: Carbon dioxide is used by plants during photosynthesis to make sugars, which may either be consumed in respiration or used as the raw material to

produce other organic compounds needed for plant growth and development. It is produced during respiration by plants, and by all animals, fungi and microorganisms that depend either directly or indirectly on plants for food. It is thus a major component of the carbon cycle. Carbon dioxide is generated as a by-product of the combustion of fossil fuels or the burning of vegetable matter, among other chemical processes.

Related terms:

PTCs: Renewable energy production tax credits are specific tax incentives with values ranging from 1¢ per kilowatt hour of renewable energy produced, to 2.1¢ per kilowatt hour. These tax credits are very valuable for the producer of the renewable energy, but are not generally considered to be subsidies since they are given only for the production of energy, and not for the development of the technology.

CREBs: Clean Renewable Energy Bonds may be used by certain entities -- primarily in the public sector -- to finance renewable energy projects. The list of qualifying technologies is generally the same as that used for PTCs. CREBs may be issued by electric cooperatives, government entities (states, cities, counties, territories, Indian tribal governments or any political subdivision thereof), and by certain lenders. CREBs are issued -- theoretically -- with a 0% interest rate. The borrower pays back only the principal of the bond, and the bondholder receives federal tax credits in lieu of the traditional bond interest.

RECs: Renewable Energy Certificates (RECs), are tradable, non-tangible energy commodities in the United States that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource. In states that have a REC program, a green energy provider (such as a wind farm) is credited with one REC for every 1,000 kWh or 1 MWh of electricity it produces (for reference, an average residential customer consumes about 800 kWh in a month).

RPS: Renewable Portfolio Standards. An RPS requires electric utilities and other retail electric providers to supply a specified minimum amount of customer load with electricity from eligible renewable energy sources. The goal of an RPS is to stimulate market and technology development so that, ultimately, renewable energy will be economically competitive with conventional forms of electric power. States create RPS programs because of the energy, environmental, and economic benefits of renewable energy and sometimes other clean energy approaches, such as energy efficiency and combined heat and power (CHP).

Chapter 3

Technology

Now that we have the terminology out of the way, let's take a look at the technology itself. The question we are asked the most is whether or not this is an incinerator. Let me answer this very simply: yes and no. It's like an incinerator in that it burns waste material at high temperatures. It is unlike an incinerator in so many ways, but we will focus on just a couple of important ones.

First of all, a conventional incinerator uses a grate at the bottom of the chamber, where the waste material will sit. Not too unlike a gas grill, an incinerator provides a constant flame from the bottom and burns the material on the grate. The burning material is allowed to sit and smolder, creating smoke, fumes, and other potentially harmful emissions due to the incomplete combustion.

The *Thermo*MAX™ does not use a grate, but instead, processes the shredded or chipped waste material by inserting it into a free-standing vortex, where it burns in full suspension, never allowed to rest or smolder. We achieve complete and perfect combustion by having full control over the atmospheric conditions inside the chamber.

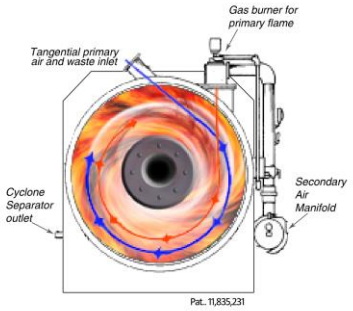

FIGURE 3.1 This image shows a front view of the chamber with indicators for the direction and flow of the flame and the waste material.

The procedure is actually quite simple, in that a large 2 million BTU natural gas flame is inserted into the chamber, where it will immediately begin to follow the curve of the inside of the chamber, creating the initial vortex. The waste material is shredded or chipped, and then blown into the chamber with a primary air flow that also helps with the motion of the vortex.

The flame is indicated in the drawing on the left by the red line and arrows, and the primary air and waste material flow is indicated by the blue line and arrows. Once the ideal temperature is reached inside the chamber, after about 15 or 20 minutes, the gas flow is turned off. This is important in that the system does not require a constant external fuel source, because the waste material becomes its own fuel supply, giving it a very small fuel footprint.

As the material burns in full suspension inside the 90 mph free vortex, it moves very quickly to the back wall, where, through a patented process, all of the remaining unburned material, including microscopic dust, is reintroduced back into the vortex for a continuous burning cycle. This extended residence time and the design of the exhaust outlet, results in not allowing any unburned material, also known as fly ash, to exit into the atmosphere.

Because of the complete and perfect combustion, combined with the high temperatures, high level of turbulence, and the unique internal design characteristics, this technology

offers a clean, pollution-free method of destroying a variety of waste materials quickly and at significant volumes. This is another very important distinction between the V-3™ and a conventional incinerator, in that we are able to achieve complete and perfect combustion and incinerators are only able to reach incomplete combustion due to the inability to control the ratio of air, waste, and fuel.

The second most popular question is how we are able to burn these materials without putting harmful emissions into the air. The quick answer is that we use our exclusive **CLEAN*BURN*™** technology. The slightly longer answer is that this system uses a blending of various technologies and processes to ensure the most efficient method of destroying the waste material, while not allowing any harmful emissions to be produced in the first place.

The process can best be described by breaking it down into two portions.

1. The design characteristics of the system with the use of a high speed vortex.
2. The operational temperature range.

We have already discussed the most important aspects of the design, but here is a recap: The chamber is horizontally placed, with a high speed vortex (90 mph tornado on its side), and a patented process to reintroduce any particulate matter that is not yet fully burned, back into the vortex for a virtual infinite residence time.

When people ask about the emissions, or the safety of burning hazardous materials, they most often ask about dioxins and furans, nitrogen oxides or NOx, or things like medical waste. Again, the response to how this process does not produce any harmful emissions deals with the temperature. Our standard operating temperature range is between 1,800°F and 2,200°F, with typical temperature at 2,000°F.

1. Dioxins and furans are only produced at temperatures between 200°C and 450°C, or 392°F and 842°F.
2. NOx can only be produced at temperatures above 1,700°K, or 2,600°F (1,426°C).
3. According to the US EPA, the temperature needed to properly destroy pathogens and biologically active materials is between 1,800°F and 2,200°F (982°C and 1,204°C). This is our exact operating temperature, with the average of 2,000°F (1,093°C).

Putting it more simply, we are too hot to produce dioxins, too cold to produce NOx, but just right to destroy harmful materials. In addition, since we add excess air to our process, the exhaust also contains O_2 and N_2. The exhaust is made up of the following percentages:

CO_2 = 6.979 % VOL
H_2O = 13.958 % VOL
O_2 = 5.583 % VOL
N_2 = 73.478 % VOL

Chapter 4

Applications and Markets

Something else that makes this technology so exciting is the large number of fuel sources, applications, and markets that can be utilized. Many alternative energy solutions are restricted to one or perhaps even two different fuel types, but none offer the wide range of materials, and in various applications that this technology does. Keep in mind that the *Thermo*MAX™ Thermal Vortex System™ functions as the heat source in an energy recovery process, or as a stand-alone unit to process waste materials.

Over the past several years, we have also seen a shift in renewable energy facilities, often going from a WtE facility processing collected trash, to a woody biomass site typically with collected wood waste from residential and commercial curbside pickups and landscaping residue. Some also depend on large volume sources, such as tree removal and in some cases, forest thinning. However, most forest thinning activities now occur in the Western states, where the small-diameter wood material (2 to 5 inches in diameter) is cut down, piled up, and then burned in prescription burns after seasoning or drying out for a full year.

Since the fuel sources and the applications are so similar, or are at least related, let's take a look at the currently identified fuel sources:

Municipal Solid Waste (MSW)
Woody biomass (forest thinning)
Residential & commercial yard waste
Agricultural waste (corn, sugar cane, rice hulls, sargassum…)
Medical / Hospital / Infectious waste
Waste coal
Scrap tires

Another advantage we offer with our system is the ability to mix fuels. Because of our presorting and shredding or chipping process, we are able to store various fuels that can be later blended together depending on the volume needed, as well as the BTU requirements for that particular site's output. By blending these various fuel types, the operator has more control over the throughput and the output needed to supply the appropriate amount of heat exhaust when combined with energy recovery systems.

The applications, many of which overlap with fuel sources, include but are not limited to:

Residential and commercial waste collection (MSW, yard waste, scrap tires…)
Landfills (active) and landfill reclamation (closed)
Sargassum (also called sargasso) seaweed
Forest thinning
Mobile and emergency response cleanup

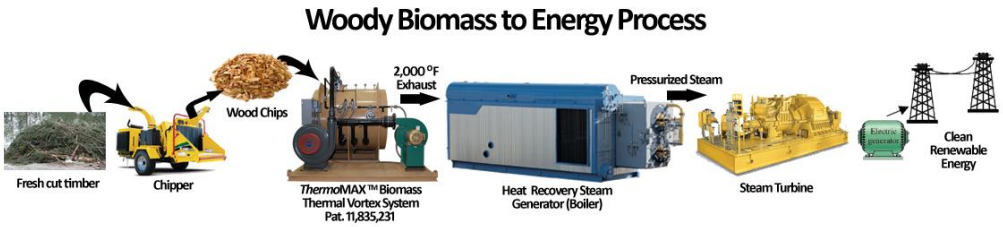

FIGURE 4.1 This image shows how forest thinning activities take fresh cut timber, without the need to dry out or season for long periods, and processes the woody biomass material in an energy recovery system to generate clean renewable electricity.

With a large range of fuel sources and applications available, it is important to identify the various markets to approach. Following is a list of just a few of the markets that we believe this technology could make a significant impact on:

There are thousands of communities in this country that are 35 to 50 thousand in population, or larger and including connected communities that could combine to equal that population range.

There are 3,500 active landfills and over 10,000 closed landfills, giving us the chance to do landfill reclamation producing energy or not.

There are more than 28 million acres of Ponderosa Pine trees in 12 Western states covering approximately 35% of the Continental US land mass. We would need more than 160 systems to process only 1 tree per acre for an entire year!

There are more than 50 million acres in the Western states with Pinyon-Juniper woodlands, where more than 289 systems would be needed to process only 1 tree from each acre.

There are thousands of medical facilities, including doctor's offices, labs, hospitals, emergency care facilities, as well as scientific research centers for animals, humans, and other types of biological testing. Each of these are required by law to properly dispose of the waste materials that include pathogens and biologically active materials.

We dispose of more than 300 million tires each year, almost one for every man, women and child. This doesn't include the volume used in recycling into other uses.

The *Thermo*MAX™ unit can be used for first-response cleanup operations such as Hurricane Katrina, the Gulf oil spill, or the recent Superstorm Sandy vegetative cleanup.

There is a huge problem with military burn pits at bases all around the world. Currently, the only solution is to pour jet fuel over the landfill trash and then burn it. The risk is the exposure to the toxic fumes for everyone nearby.

Chapter 5

Benefits

We have covered several of the features of this exciting technology, but now we would like to describe a few of the many benefits of using this system with the various fuel types and applications as previously outlined.

Size: We have all seen large power plants spewing smoke and exhaust high up into the air. Those days could be gone soon, as our technology offers a solution to having these behemoths around. Our system is designed to be small, but with a high throughput and a very significant output of superheated exhaust. For a 6 MW micro power generation facility using MSW as a fuel source, the building would need to only be about 20,000 square feet, and sit on only 3 or 4 acres. The only exhaust stack would be to vent the exhaust from the energy recovery process, or specifically from the steam turbine. Even for a stand-alone system with no energy recovery, the exhaust stack needed would not be a towering giant.

Flexibility: As previously stated, the *Thermo*MAX™ Thermal Vortex System™ is capable of processing several different types of fuel, which makes it a great solution for waste management, especially for a small community. The *Thermo*MAX™ is also small enough that it can be loaded onto a flat-bed "low boy" truck for mobile applications.

Low cost: Cost is one of the biggest hurdles that most groups face when looking at power production at this scale. A complete micro power generation facility with the *Thermo*MAX™ combined with energy recovery equipment costs a fraction of the cost to build a wind farm or solar array. This system is even much lower than conventional combustion methods available today. The return on investment is also only a fraction of that from wind and solar or any other renewable energy program.

Green jobs: With a tattered economy, and unemployment levels at record highs, another benefit of our system is that through our Developer Program (third-party owner/operator), each micro power generation facility can employ between 18 and 20 workers to cover 24 hour operations. These jobs will be well-paying positions, with extremely competitive benefits.

Ease of operations: Using the *Thermo*MAX™ as either a stand-alone unit for processing waste materials, or in combination with energy recovery equipment, this system is very simple to operate. Most small communities could use entry-level workers to operate this, with only one supervisor per shift needed.

Rapid deployment: Because of our modular design and manufacturing process, each *Thermo*MAX™ can be ordered and delivered in less than two months. That is a fraction of the time it takes for any other similar technology.

Chapter 6

Comparisons

Different technologies are available today to produce renewable energy, but none can offer the low cost, high efficiency, small footprint, and flexibility that the *Thermo*MAX™ Thermal Vortex System™ can. This section will look at not only those systems where production of energy is the primary function, but also for stand-alone applications.

Based on our industry research, following are the rankings on cost per MW of energy produced for alternative or renewable energy:

1. Combustion (lowest cost per unit of energy)
2. Solar
3. Wind
4. Anaerobic Digestion
5. Methane capture from landfills
6. Biofuels (highest cost per unit of energy)

Combustion systems produce more energy at a lower cost than any other form of energy recapture involving alternative or renewable processes. The exact fuel in the combustion system is not as relevant, but only relates to the efficiency based on the throughput. As was shown earlier, various fuels (waste materials) have different thermal values. We can also offer blending or co-firing of the waste material, making it easier to monitor and manage the waste process.

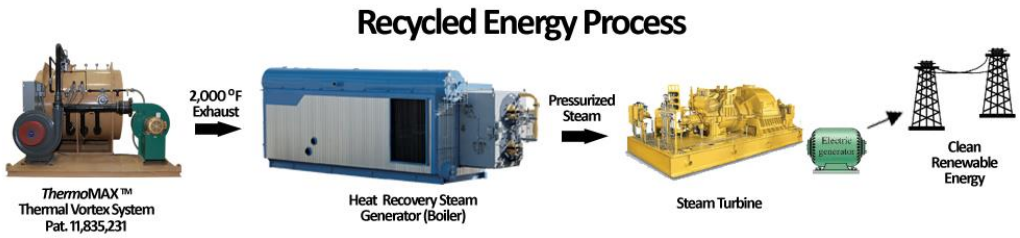

FIGURE 6.1 This image shows the simplicity of this energy generation process. By capturing the superheated exhaust from the *Thermo*MAX™ Thermal Vortex System™, the waste heat boiler uses that heat to produce steam, which in turn is used by the steam turbine to produce clean, renewable energy.

As you can see from Figure 6.1, our process does not require the production of feedstock or synthetic fuels to operate. We simply use the raw waste materials as the primary fuel, without requiring constant external fuel sources as conventional combustion technologies do.

We all know about the massive costs and issues facing the wind and solar industries today. These technologies require huge subsidies in order to get started, as well as large budgets to manage the ongoing costs of operations. Some have compared wind turbines to helicopters in that both require constant maintenance due to the number of moving components. Solar arrays are also quite costly, and as we have seen with recent headlines, can only survive with government bailouts and subsidies.

Not everyone is as aware of anaerobic digestion. It's a series of processes in which microorganisms break down biodegradable material in the absence of oxygen. It's used for industrial or domestic purposes to manage waste and/or to release energy as part of the process to treat biodegradable waste (typically animal manure) and sewage sludge. Anaerobic digestion is widely used as a source of renewable energy. The process produces a biogas, consisting of methane, carbon dioxide and traces of other 'contaminant' gases.

The real comparison is in the cost of these various methods. As the list on the previous page indicates, combustion is by far the most efficient and lowest cost method of producing energy, including renewable energy. In most cases combustion is nearly 1/2 to 1/3rd of the cost of wind and solar. Anaerobic digestion is typically 4 times the cost of energy produced by combustion methods, and methane capture from landfills and biofuel processing are even more costly.

It also needs to be stated that we are not suggesting that our system alone can solve all of the environmental energy needs. We advocate a broad-based blended method, which includes the use of our technology along with wind turbines, solar arrays, and transportation fuels such as compressed natural gas (CNG) for municipalities to create an environmentally friendly model community. We must change our thinking to include all of these methods, and create energy policies that take into account all of the necessary steps to ensure that we are producing the most cost efficient energy, while at the same time protecting our precious environment.

In our Terms section, several terms are shown that relate to the financing of energy related projects. It should be made clear that these are not government subsidies, but tax incentives and benefits that are available to anyone that meets the requirements, such as the production of renewable energy. In economics, the term subsidy does not have to have a negative connotation. However, in recent years, we have casually classified any money distributed by a government body (tax dollars), as a subsidy. It may help to see the Oxford dictionary definition of subsidy: "money granted by state, public body, etc., to keep down the prices of commodities, etc."

Our financial documentation shows how our technology used in an energy recovery process, does not need any government assistance in order to survive in the market, and can rely solely on the free-market forces that the private sector can take advantage of.

Chapter 7

Programs

We are proud to be a part of this exciting industry. Over the past couple of years, we have developed programs that will not only help with the implementation of our systems, but to also give back to the local communities, and to regions around the world.

Below is a listing of the various programs and activities we have created:

	Our ***3e Certification***℠ recognizes those groups and organizations that are making a strong impact on our: ***E***nergy Independence, ***E***conomic Strength, and ***E***nvironmental Health, at the same time.
	The *3e* Research Alliance is a unique blending of the private sector (us), university research centers, and governmental agencies, all working together with the same goals. We also offer several scholarships.
	One of the most exciting programs we offer is our Global Outreach. It was created to allow us to go into developing countries to offer humanitarian aid, while at the same time, create energy infrastructures never before found in some regions of the world. We are proud to be working with the World Bank and several of its partners / associates.
	Through our Veterans Initiative, we developed a program to hire troops that are transitioning from military service back into civilian life, as well as any United States Veteran.

Chapter 8

Summary

With gasoline prices soaring to new highs for a second time in the past four years, our attention is once again drawn to our energy issues, even beyond the oil that we consume for transportation. Electric cars seem to be what many are pushing, yet they tend to ignore one of the basic aspects – Where does the electricity come from to power those all-electric vehicles? Yep, you guessed it; fossil fuel power plants! With gasoline prices near the $4 a gallon national average, and no real end in sight as we saw four years ago, this topic will most likely stay in the forefront.

The basis for our technology began more than forty years ago, as a means to be able to destroy waste materials without putting any harmful emissions into the air. Even with that success, but the corporate decision to scuttle the project, this technology literally and figuratively sat in the basement for many years. To be fair, that many years ago, landfills appeared to be the real answer to our waste disposal needs, and without any knowledge of what would or wouldn't happen over time, the mindset was not unusual.

Seeing as how technology doesn't have an expiration date, we took this core design, and only made modifications to the peripheral components, and added state-of-the-art technologies that were not available back then. We integrated a new process automation, remote access, real-time data transmission, and a host of sensors and monitors to more efficiently control the atmosphere inside the chamber. We kept the basic core design the same, but with the improvements added, we are able to improve on the overall thermal efficiency of the system.

So, being armed with the most advanced method for pollution-free waste disposal available today, we set out to discover the vast markets that this system can have the most impact on. We found several. While our initial focus was on MSW, medical waste, and landfills, we soon evolved into the energy recapture arena. The next area of concentration was with woody biomass, both with and without energy recovery, as well as agricultural waste (Sargasso, also known as sargassum is technically an agricultural biomass waste material, but it has a different processing method). Based on a contact from a friend that worked for a national retail tire chain, we then looked at the potential behind processing scrap tires. Our final market addition came after a couple of years of my Dad telling me we should look into dirty coal, now called waste coal. After meeting with a coal industry expert, we learned about the massive problems facing the coal companies in disposing of or converting this type of coal.

Obviously, we never dreamed that our technology could have such far-reaching impact on our waste management or our energy production. We have been very fortunate to be able to have some of the top subject-matter experts in various fields be advisors to our company and our programs. We have kept our eyes and our minds open to absorb as much as we possibly could about the expansive market both with and without energy production.

Currently, we have several projects around the country, and around the world. We have woody biomass, landfill, MSW, tire disposal, and waste coal opportunities here in the U.S., and woody biomass, landfill, MSW opportunities in Mexico, Canada, Nigeria, Poland, and Germany. We have trusted representatives in each of those countries, and have contacted highly-placed sources at the World Bank Group to assist us with our VanNatta Worldwide Global Outreach program.

We are very excited and honored to be able to offer such an incredible technology to the world to help with our environmental and energy issues. While we are a small company with a big idea, we welcome the opportunity to have others enter this arena in order to truly and properly handle the massive potential throughout the world.

Our *Thermo*MAX™ Thermal Vortex System™ offers a small footprint, low cost, pollution-free method of disposing of numerous types of waste, while protecting the environment from harmful emissions. Our size and flexibility allows us to solve issues normally not found with conventional technologies. Our low cost means that we are no longer stuck with only a couple of renewable or alternative energy sources, having to simply accept what's out there. For the first time ever, small communities will be able to solve their local waste issues, and become more independent by producing significant amounts of electricity that can be sold onto the grid. As stated previously, one system can handle the waste needs for a population of approximately 50,000 people, and produce more than 12 MW of power, enough to supply electricity to between 6,000 and 12,000 homes depending on size!

Thank you for taking the time to learn more about our company, our technology, and our programs. We hope you find this as interesting and as exciting as we do. If you have any questions, or would like to find a way to get involved, please see the information in the next section on how to contact us.

Chapter 9

Contact Us

For more information or to offer ideas, comments, or suggestion, or to learn how you can be involved, including investment opportunities, please contact us by:

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We are now Vortex Energy Group LLC!