



## A Guide to Tire Disposal Using Vortex Combustion Technology

### Our “Did You Know?” Series

As part of our “Did You Know” series, we are offering this detailed description of our latest Firebird V-III™ technology, for specific applications. To learn more about vortex combustion, you can read our White Paper on Vortex Combustion, or other documents in this series, available online at [www.AmericanEnergyGroup.org](http://www.AmericanEnergyGroup.org).

### General Description

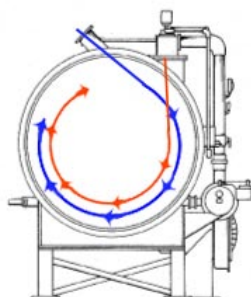
The V-III™ is a grateless combustor that uses high temperatures (2,000° F and above) with high speeds (a 90 mph tornado on its side) to more efficiently burn shredded waste material, in this case, old scrapped tires. This material then moves through the chamber towards the back wall, where (through a patented and proprietary method) it is re-introduced back into the vortex for continuous burning.

This overall process is known as “synergistic iteration.” As the waste material burns in suspension, it becomes its own fuel, mixing with controlled amounts of air (oxygen) to achieve **complete and perfect combustion**. Current technology systems allow the waste to sit or rest on a grate while burning, which produces the harmful emissions, gases, fly ash, and smoke, because of incomplete combustion. These require expensive and complex air scrubbers to remove the contaminants prior to entering the atmosphere. The V-III™ does not produce these same harmful outputs, and therefore does not require exhaust cleaning or scrubbing.



### Details

The tires are fed into a shredder, then move through a material handling manifold with the help of a fan supplying the primary air for the combustion chamber. This mixture of air and shredded tires is introduced into the chamber tangentially, which follows the contour of the chamber, and is blended with the motion and direction of the vortex flame, as shown with the blue curved line in the image to the left. This process now creates a super-heated vortex which burns the shredded tire material while fully in suspension. To achieve complete and perfect combustion, it is necessary to control



the mixture of the waste, fuel, and oxygen. Turbulence is also a critical factor, which in this case comes about with the high-speed vortex rather than a shaker-grate as some combustors use. Additionally, as the waste material is moving through the chamber, it is not only reducing in size, but becomes fuel for the process, which allows for a higher level of combustion and efficiency.

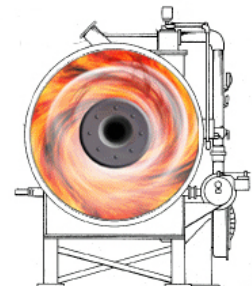


Some materials that are non-combustible are drawn out into a cyclone separator during this process. Non-combustibles encountered in this tire disposal process would be the steel belts and other reinforcing materials. With the vortex combustion, these non-combustibles become sterile and neutralized, and perfectly safe for handling and proper disposal. The extremely hot air gas that exits during this process is reintroduced back upstream into the vortex to be burned off, as in the process of a manufacturing fume burner. This super-heated air acts to enhance the overall speed and temperature of the existing vortex, improving its efficiency.

The V-III™ has been designed with state-of-the-art programmable logic controllers (PLCs) for automation processing. It is also equipped with an array of sensors which allows complete and accurate control and monitoring of numerous factors, such as vortex temperature, vortex speed, secondary air dampers, and the air quality contained in the exhaust stack. The system is equipped with EPA-approved monitoring software, with remote access capability to provide continuous transmission of the data collected and reports directly to the state environmental protection agency, and to local public works managers and supervisors.

With complete and perfect combustion, the only by-products are CO<sub>2</sub> and H<sub>2</sub>O. No harmful emissions, gases, fly ash, odors, or even smoke, are produced through the process of this vortex combustion, therefore no scrubber systems are needed. The exhaust that is released into the atmosphere is clean and harmless, far exceeding EPA air quality specifications and standards. Because this process doesn't allow for waste to sit or to collect, as well as not having soot or other messy residue build-up, there is very little maintenance required as found with current technology systems.

One of the most unique features of this technology is the high speed vortex. No other combustion system takes advantage of the efficiency that this offers, compared to standard combustors that use fixed or even shaker grates, or multiple chambers. With the use of a "free vortex" in combination with the high temperatures, and no need for the exhaust scrubber systems, the output temperature in the exhaust stack stays consistently around 2,000 ° F.

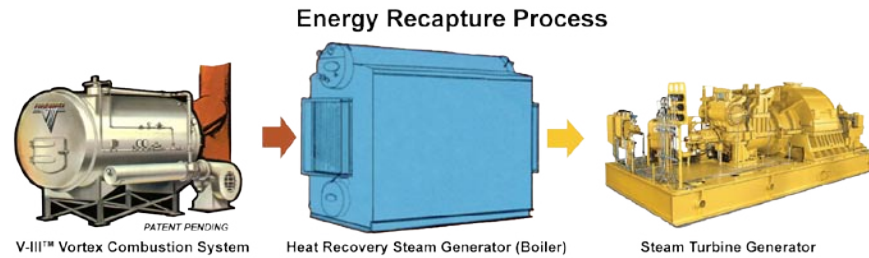


This system can be used as part of a waste-to-energy (WtE) system, where the super-heated exhaust can be directed to a heat recovery steam generator, or boiler, and then to a steam turbine for the production of electricity. By processing shredded tire material, which burns at 5 times the BTU rating of standard municipal solid waste, energy is produced more efficiently

**Did You Know...?**  
... that combustion has been used as a means of waste management since the 1800's?

**Did You Know...?**  
... that in addition to being part of our breathing process, CO<sub>2</sub> is used for adding carbonation to sodas, and in the making of wine?

than other technologies that create oils and fuels from tires. This system can easily handle shredded tires at a rate of 8 to 10 tons per hour, which will obviously generate an impressive capacity of electricity.



This energy recapture process has been used for decades in this country, as well as all around the world. In each case, there is always a boiler and a steam turbine, but the combustion source can vary based on specific needs. Other combustion sources include jet engines, natural gas / coal fired / wood burning furnaces. Combustors are used, but because of the need with current technologies to have exhaust scrubbers that reduce output temperatures, they aren't as efficient as other sources.

Without getting into technical electricity distribution and transmission concepts, the process once the electricity is generated from the steam turbine, is handled by the electric utilities. The electrical output is purchased by the utilities, and distributed into the grid as necessary. The power that is generated at one site may not be used in the same geographic region, but could be transmitted several states away.

The use of steam turbines in energy production has been going on in some form for more than 125 years. In fact, 80% of the electricity generated in the world is with the use of steam turbines. With the low cost of the V-III™, in combination with commercially available boilers and steam turbines, this process is one of the lowest costs methods available today.

## Summary

The V-III™ offers a high level of efficiency through the unique blending of extreme temperatures and high speeds, along with a patented process of reintroduction of particulate matter for continuous burning to achieve complete and perfect combustion. Because of this process, the system does not produce harmful emissions and gases, odors, fly ash, or smoke. With a small footprint, this system can be installed closer to populated areas, and offers a unique, modular design for rapid replacement or modification. The V-III™ can also be used as an eco-friendly solution for mobile needs, and can also be configured with smaller boiler/steam turbine combinations to produce electricity on a temporary basis.

In the U.S., we dispose of more than 300 million tires each year, which is approximately one for each man, woman, and child in this country. No other technology today has the capacity, low cost, or environmental benefits that the V-III™ Vortex Combustion System offers. Not only will the use of this system be able to resolve the decades-old problem of getting rid of tires, it will prevent potential environmental impacts normally found in landfills, uncontrolled tire fires, and other forms of disposal, and it will produce an abundant amount of energy, which will help us in our goal of energy independence.

**Did You Know...?**  
... that one V-III™ system with energy recapture can generate more electricity than 4 large wind turbines?