

TRAINING OFF THE PAGE - JON PALFREY

# USING WASTE FOR ENERGY PROVISION & THE CYCLONIC THERMAL PROCESS

Jon Palfrey discusses the Vortex/Thermal Energy Solutions multi-functional waste to energy system and its impact on the plumbing industry.

Traditionally the plumbing industry has relied on energy sources distributed via mains transmission in electricity and natural gas and in recent years has also seen the development of solar energy being used to heat water.

The next step in energy obtainability is the capacity to use waste and clean burn it to provide power, heated and chilled water.

This article will explore the innovation and development in this energy category and illustrate some fundamentals relating to function and applications where this system type can be used.

Waste management in any application and associated issues relative to landfill and transportation can be reduced using a Vortex/Thermal Energy

Solutions energy production system using Enermax (formally Rotex) tanks to capture heated water banking the energy gathered and reticulate to fixtures on a standard recirculatory DHW system design.

The above attributes have come together in the design of the Vortex/ TES CTP System [Cyclonic Thermal Process]. This is the term given to the description as to how the system functions by the clean burn of waste and the conversion to the use of high temperature air transferred to an air to water heat exchanger for DHW requirements.

From this process, air and water can be used to generate services supply for standard use across domestic water heating, mechanical heating and even chilled water supply via electricity

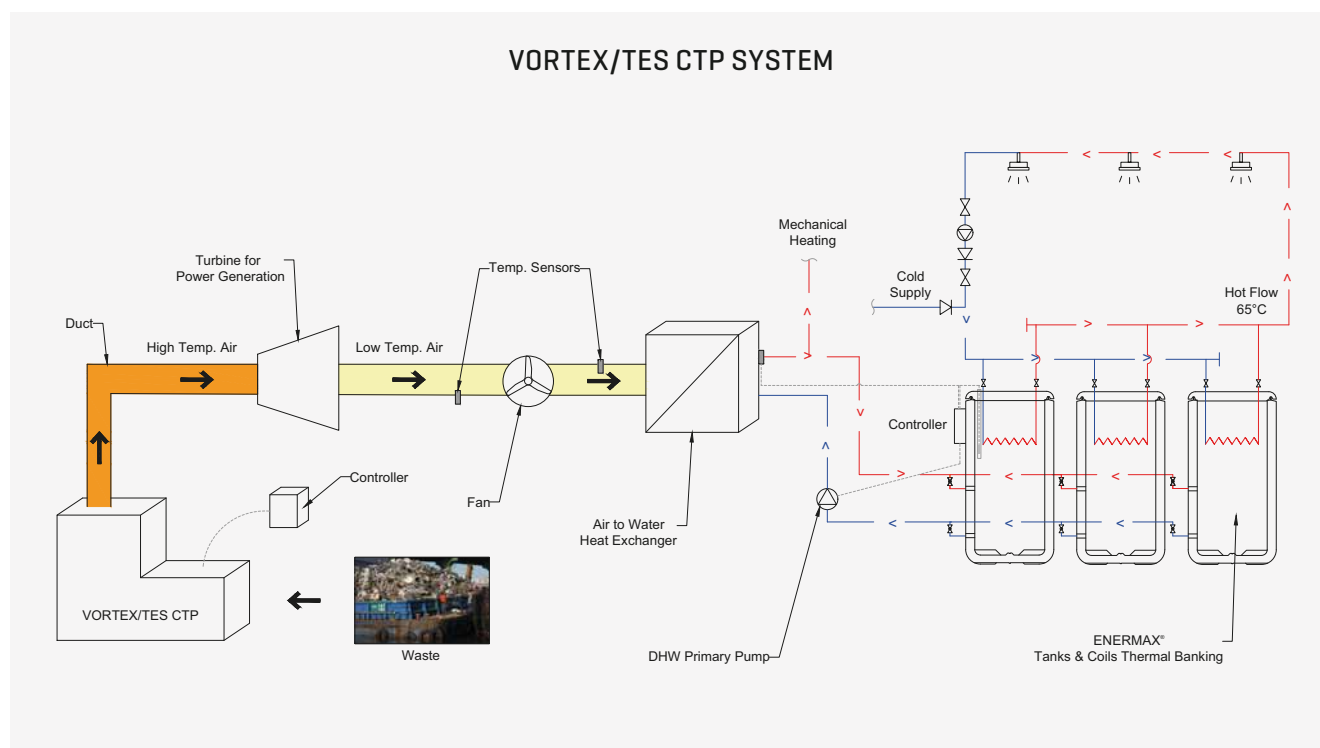
created by this system.

The related diagram shows in basic concept a Vortex/ TES system linked to an air to water heat exchanger connected to a primary loop and storage tanks functioning unpressurised.

The combination of burning waste to create energy, system control, hygienic water supply and numerous other significant sustainability advantages for residential dwellings up to large hospitals and retail developments.

## SYSTEM INNOVATION & NECESSITY

After in depth market analysis as well as technology development, Vortex/ TES identified the need for a small decentralised high thermal output system that could service the needs of industry from the commercial sector through to the domestic residential market.



The Vortex/TES unit is unique when it comes to waste to energy technology.

The waste to energy system is designed to convert input fuel into a high temperature clean thermal gas that can then be used through multiple applications.

Apart from the high thermal output of the system, the Vortex/TES system is also designed to include the following benefits:

- Small footprint [<24sqm]
- Modular and scalable for any demand requirements
- Portable/relocatable
- Minimal moving parts for ease of service and maintenance.

**THE FOLLOWING ARE SOME NEW TERMS TO CONSIDER:**

**MICROGENERATION – MICROGRID**

Microgeneration is the size of the localised generating plant or facility typically used in a large commercial application, and microgrids focus on the distribution and transmission of the energy source produced.

**MICRO GENERATION**

Micro generation is the small-scale generation of heat and/or power designed to suit the needs of communities, businesses or residences. Microgeneration relies on energy being produced at a localised generation facility that is smaller than an industrial-scale plant which serves a city or region.

Energy is produced locally rather than at great distances away and thus, transmissions are shorter, resulting in less energy loss during the distribution process.

Microgeneration often has a smaller carbon footprint and less environmental impact than industrial-scale generation as it relies more on alternate energy sources such as biomass.

Although microgeneration can refer to thermal energy being generated and then used by multiple end users within proximity, the most popular use for microgeneration would be for the generation and distribution of electricity. Conversion of the thermal energy into cooling/heating circuits can also be classed as microgeneration.

Vortex/TES - CTP [Cyclonic Thermal Process] is an example of a microgeneration power concept.

Power and heat are generated through the process of cogeneration that can then use both of these energy outputs to provide cleaner, lower cost, sustainable energy while benefitting local economies, and reducing the impact of land fill on the environment. This process can be classed as base load supply since the Vortex/TES system is not reliant on environmental conditions like sun or wind.

**HOW CYCLONIC THERMAL PROCESS (CTP) WORKS**

Pre-prepared fuel [waste] is injected into the specifically designed chamber where it is held in full suspension in high velocity airflow. An ignition heat source initiates the combustion process which is continuous and maintained via full control over the atmospheric conditions inside the chamber relevant to fuel characteristic values.

This process creates full suspension combustion which is opposite to incineration where waste can sit on a grate



'Nautilus' Dual Flush Valve Incl Large Mounting Plate



RBA1882-100-001

'Nautilus' Dual Flush Valve Incl Small Mounting Plate



RBA1882-100-002

'Nautilus' Dual Flush Valve Incl Small White Mounting Plate



RBA1882-100-003

'Nautilus' Dual Flush Valve Incl Small Black Mounting Plate



RBA1882-100-005

**“With over 25 years of experience our Flush Valves offer an attractive solution for any commercial bathroom...”**

'Nautilus' Accessible Dual Flush Valve Incl Large Mounting Plate



RBA1882-100-007

'Nautilus' Dual Flush Valve Incl Indication Rings



RBA1882-100-008



process and burns from outside to in – left smouldering, creating fumes and other potentially harmful emissions due to incomplete combustion.

The following list highlights multiple outcomes in the conversion of thermal output from the Cyclonic Thermal Process system:

- Electricity
- Steam
- Hot Water/chilled water
- Refrigeration
- Thermal gas
- Heating/cooling or a combination of all or any of the above.

The combination of the Vortex/ TES system operating on the cyclonic thermal process requires storage volume to capture and hold the heat.

Having a modular storage system to “bank up” the available heat energy now provides any application with an ongoing reservoir of waste to energy transfer capacity.

Industry and commercial applications benefit not only with the supply of electricity and heat, but also surplus thermal energy available to produce steam, hot water, chilled water, heating and cooling.

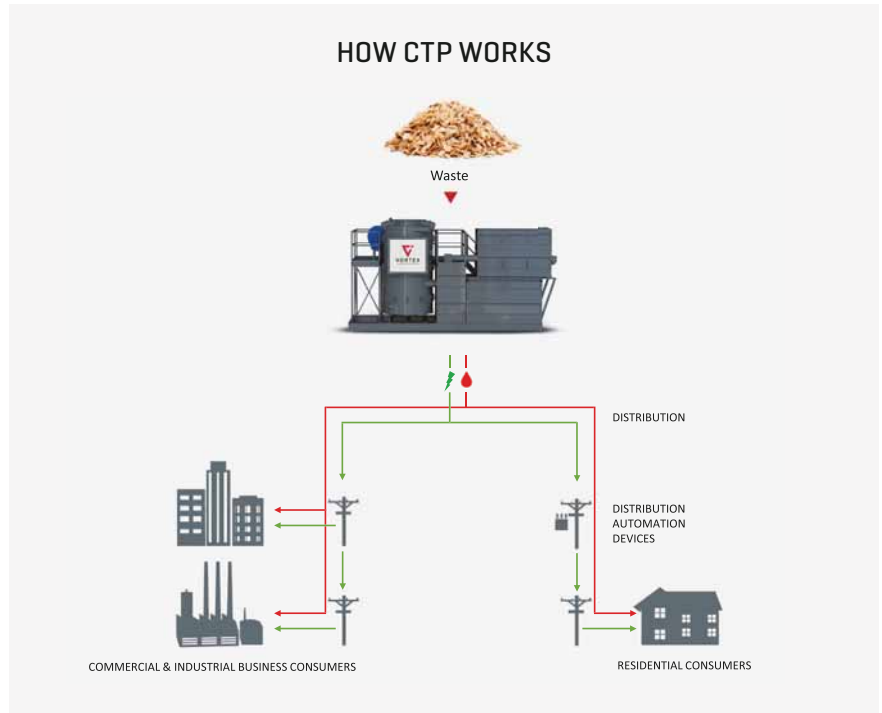
Accordingly, this will result in the reduction in the consumption of natural gas and electricity, both of which currently use fossil fuel reserves to supply these resources.

Vortex/ TES CTP can reduce the demand to use fossil fuels to generate Thermal Energy while concurrently consuming GHG producing waste as a fuel source rather than be destined to landfill.

Interestingly, generation of heat can account for up to 92% of the total energy requirements for industry, services and households.

Benefits of small-scale energy plants for commercial applications include:

- Reduced vehicular/truck movement of waste carriers
- Reduced volume of waste to landfill
- Vortex/ TES CTP is modular/scalable – increase number of units in a module sizing design requirement to meet demand of thermal energy consumption in commercial applications.



- Provision of high-level heat to commercial and industrial applications where high-pressure natural gas supply is not available or desirable due to remote geographic location or financial constraints in supply.
- Offers large industry flexibility in location and benefits in reduced regional land costs
- Heat energy gathered and used in modular Enermax storage tanks providing unpressurised temperature control and energy distribution to services
- Hygienic heated water supply via stainless steel coil sets for high flow rate and delivery performance in a modular capacity.

While microgrids are mainly related to electricity supply, the same model can be expanded into chilled/hot water circuits for estates and commercial industries as well as individual project applications such as hotels/resorts, aged care facilities, hospitals and large residential applications.

The Vortex/ TES system operates as a clean, sustainable means of supplementing the current energy supply and needs for residential developments and commercial project applications. This will not only assist to reduce local

energy costs but will help by reducing the existing transmission loads and need for expensive system upgrades.

Take a hospital as an example. Being able to use the waste accumulated over daily patient and staff usage then convert that into a clean and efficient fuel to provide domestic hot water, chilled water, heating and ventilation requirements throughout the facility and remove waste management issues is a new and exciting direction that is being taken now.

Advantages of such as system include the provision of clean low-cost energy for standard services supply.

As the plumbing industry adapts to energy demand options, more and more decisions are being based on non-conventional energy alternatives that are becoming part of a new services supply initiative.

Vortex/ Thermal Energy Solutions is well positioned to provide an alternative energy system solution in this new and exciting industry sector. ■

Jon Palfrey is the Thermanl Energy Solutions/ Rotex Commercial Manager. He conducts training to industry groups relating to all things water heating.

