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Recycled Energy

Using what we have
to produce
what we need.

Contents

Introduction	2
Background	2
Our solution	4
Summary	5
3e Certification™	5
Contact	5

Introduction

In the world of environmental energy, one of the cleanest and most efficient methods used to generate electrical power is with an energy recapture or also known as energy recovery system. This paper will describe a similar process known as recycled energy.

Background

One of the easiest ways to understand what recycled energy is starts with some important vocabulary lessons. This is a somewhat straightforward and basic explanation, but you will need to keep an open mind regarding what you think you may already know.

Energy is formed in many ways, but for our purposes, we will focus on combustion, or specifically the heat that is generated from any form of combustion. Alternative energy, green energy, renewable energy; all terms that we have heard over the past few years. They are also terms that we sometimes hear being used improperly. There are vast differences, and we will hopefully try to assist in this venture.

Alternative Energy: This term has come to be defined as any source of energy that replaces our current fossil-fuel production, without the same undesirable consequences found in the original process. (often promised, and sometimes not delivered...we'll cover that in a different document later.)

Green Energy: (aka Sustainable Energy) This is one of my favorites. What does green mean to you? Therein lies the rub. There are so many definitions of "green" that one single response is neither right or wrong. The most understood definition for green energy would be an energy source that includes renewable forms (this is the chicken and the egg dilemma!) such as wind, solar, geothermal, plant matter, wave, and tidal power.



Renewable Energy: This is actually the easiest one to define. My preference is that it is energy that comes from natural sources such as sun, wind, rain, tides, and geothermal heat that are naturally replenished, or renewable. This form of energy sometimes includes biomass, which is plant matter, and oddly enough even garbage. But, we don't call it trash or garbage but rather municipal solid waste (MSW).

There are currently many programs in which people are trying to get alternative forms of energy to be classified as renewable, in order to receive valuable tax benefits, such as tax credits, as well as the right to be able to sell Renewable Energy Certificates (RECs), which are basically proof of purchase certificates. RECs should not be confused with energy offsets or carbon credits.

Biomass: Biomass is biological material from any living or recently living organisms. This is where garbage comes into the picture, based on the idea that it contains leftover and discarded food scraps. One of the most common types of biomass is wood, but it actually is given its own title – woody biomass, in order to distinguish it from other sources. As far as producing energy, other materials are also favored, such as agricultural waste, yard waste, and even corn or sugar cane stalks.

Since there is often confusion about the use of garbage in this description, it may help to understand that MSW is made up of either residential or commercial waste, and is generally differentiated from industrial waste, and medical and infectious waste. Industrial and medical/infectious waste does not contain sufficient biological materials to include it in this definition.

There is a great deal of controversy over what is included in biomass, and by extension, MSW. For instance, tires are often considered to be part of the waste stream, and therefore are considered to be included in MSW since they often originate in residential or commercial

waste streams. (although they should technically be considered as industrial)

Energy Recapture: (aka Energy Recovery)
Now this is where we come in to the picture! This process is fairly simple, in that you have a heat source, water to boil into steam, and a steam turbine. The heat source could be any combustion system, such as an incinerator, coal or gas-fired furnace, gas turbine, or even a jet engine.

Just for the record, these heat sources require a constant fuel source to operate... except our Firebird V-3™ Vortex Combustion System that only uses a fuel source to prime or start the combustion of the vortex. The waste material becomes its own fuel, allowing the gas burner to be shut off after only a few minutes. This self-sustaining fuel process means that there is a very small energy footprint associated.

With energy recapture, the heat is captured or recovered, and then used to boil heat in a device known as a heat recovery steam generator, or HRSG. This is often called a boiler, but that term may be confusing. Most people think of a specific thing when they hear boiler, something like a boiler in a school or large building. That is a direct heat boiler, and not a heat recovery steam generator. With direct heat boilers, there is a great deal of maintenance due to a buildup of something called slag.

Cogeneration: This term is often confused with co-firing, which is the method of burning two different fuel sources at the same time, such as tires mixed in with MSW, or any combination of waste materials. Cogeneration is also known as combined heat and power (CHP), and describes the use of the heat from an energy production process to generate both electricity and useful heat or steam for another purpose. Think of a splitter that takes heat in one direction to generate electricity, and in a different direction to heat a building. Cogeneration has become increasingly popular as a way to get additional benefits from the

byproducts of electrical generation, and is one of the most common forms of energy recycling.

Waste to Energy: (aka WtE) Waste to energy is a process that comes in many forms, ranging from simple incineration or combustion, to biofuels, to anaerobic digestion. The most common and also the most cost efficient one is with the use of combustion to create the heat that is then used by a waste heat boiler (HRSG) that produces steam that the steam turbine uses to generate electricity. Pretty straightforward, right?

Not always. WtE should generally be considered to be a green energy source, but even some of the larger plants using older combustion technology often create problems for the surrounding environment. A woody biomass incinerator for instance, still produces wastewater runoff that often raises concerns for area residents in terms of polluting their water supply. We will cover our technology later, and show why our solution does not pose this same problem.

Recycled Energy: As you can probably gather from reading the previous definitions, recycled energy can be broadly described. WtE, energy recapture, and cogeneration could all be considered methods of energy recycling. There is, however, a very unique description of recycled energy that hasn't been described yet. That is the system by which a manufacturing process that produces significant amounts of heat as a byproduct of their manufacturing (such as steel plants), captures the otherwise lost heat. This captured, or recovered heat, is then used in a HRSG type of boiler where it produces steam for a steam turbine to generate electricity.

This process is identical to the energy recapture process as previously described, but the big difference is that the heat source is something that is being used for other purposes, such as the heat from a steel plant that would typically be lost into the atmosphere. With most energy recovery systems, the original purpose of the



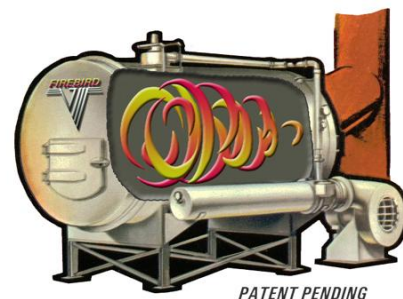
setup is to use a heat source to produce enough heat that it will be sufficient to generate the needed amount of electricity. This process uses heat sources that require a specific fuel source for continuous operation, whereas the recycled energy from the manufacturing plant comes from heat that until now served no other purpose.

Our solution

As you have been able to gather from the various descriptions of energy production in this paper, there is usually a common thread: the use of heat to boil water to create steam that will be processed through a steam turbine to generate electricity. (obviously we are only focusing on combustion methods, and not the other forms of alternative energy)

Logic escapes me when I hear the so-called pundits and experts proclaim that our only solutions will come in the form of technologies that are years into the future, and often very expensive and inefficient for the amount of energy produced. Our system offers decades-old proven methods, while using some of the most up to date sophisticated automation controls system for increased efficiency.

The Firebird V-3™ Vortex Combustion System uses our exclusive CLEANBURN™ technology that offers significant thermal output with no harmful emissions.



PATENT PENDING
Firebird V-III™ Vortex
Combustion System

With our exclusive:

CLEANBURN™
Technology



The V-3™ is a grateless vortex combustion system that burns the waste material while in a free vortex (full suspension), never allowing the burning matter to sit and smolder, which is how the harmful emissions are produced. Through a patented process, any particulate matter with any mass remaining, is then reintroduced back into the vortex for continuous burning, allowing us to achieve complete and perfect combustion, with the only byproducts being H₂O and CO₂. For more info on this, visit: www.AmericanEnergyGroup.org, and click on the **Resources** link.

Summary

The concept of taking heat and producing something useful from it has been around for as long as we have had fire. Recycling heat that is used in other processes to generate electricity has been around for a while, but has only recently been seen as one of our most valuable sources for clean energy. With cogeneration, we see the results of sharing the thermal output to increase the potential and the efficiency, and to ensure that we are not wasting anything.

Recycled energy, energy recapture, or even waste to energy, are not very sexy when you compare them to wind turbines, solar arrays, biofuels, or plasma arc gasification. Yet, they remain the most economical, dependable, and available source we have for green sustainable energy in this country.

Please join us in our efforts, as we develop our strategies and programs that encompass the best of our available resources. We have recently announced a research alliance in which we are working alongside the best minds in this country – in our universities, as well as government agencies that can offer valuable resources. You can learn more about this by going to: www.AmericanEnergyGroup.org and clicking on the link under Updates. You can also visit the Resources link at the top of the page for other documents related to our program.

3e Certification™

In addition our program is very unique in that it is also part of our **3e Certification™** which encourages our municipalities, communities, and other organizations to take the right steps to ensure:

- Energy Independence
- Economic Strength
- Environmental Health.



For more information, visit:
www.3eCertification.com

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