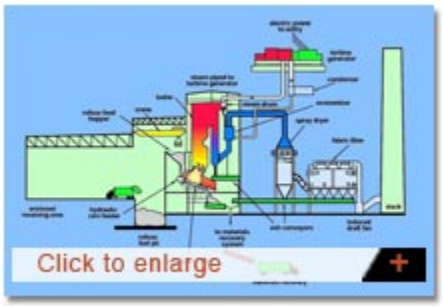
INTEGRATED WASTE SERVICES ASSOCIATION

How Does Waste-to-Energy Turn Your Garbage into Green Power?

The modern waste-to-energy plant is a technical marvel. It must burn a fuel from the size of a pea to the size of a tree limb. The fuel can be wet or dry, and it varies greatly in energy content.

The first step in processing the trash is the receiving building. Most municipalities served by waste-to-energy plants have some sort of recycling program, so the trash that is received at the plant has already had a majority of recyclables removed. The trash is deposited onto the floor or into a large concrete pit in the receiving building. In many facilities, trash is then loaded directly into the furnaces. In other facilities, however, the trash is processed and shredded to produce a fuel before putting it into the boilers. Air for the combustion process in the furnaces is drawn from within the receiving building so that air is always flowing into the building from the outside. This creates a “negative pressure” within the building that prevents dust and odors from escaping the building.

The next step is the furnace itself, where high temperature combustion completely destroys viruses, bacteria, rotting food and other organic compounds found in household garbage that could potentially impact human health. The heat from the burning garbage boils water flowing inside the boiler tubes and turns the water into steam. The steam can be used directly in a heating system or a factory.



Usually, however the steam is used to turn a turbine-generator to make electricity. After any uncombustible residue (ash) cools, magnets and other mechanical devices pull metals from the ash for recycling. This is an important step, since a waste-to-energy plant can recycle thousands of tons of metals from its ash.

The really advanced technology in burning trash is the air quality (emission) control system. Waste-to-energy plants meet or exceed the strictest federal standards set by EPA, which have been further tightened as recently as May, 2006. Waste-to-energy employs a multi-step process to achieve superior environmental performance.

Good air quality control begins in the furnace. Good combustion minimizes the formation of carbon monoxide and products of incomplete combustion.

Good furnace control also limits the formation of nitrogen oxides. Nitrogen oxides that do form are reduced by spraying ammonia or urea into the hot flue gas (a technology called Selective Non-Catalytic Reduction), which converts nitrogen oxides to harmless nitrogen and water.

Acid gases are removed by a "dry scrubber." This is a device that typically sprays a mixture of lime and water into the hot exhaust. The scrubber uses lime to neutralize acid gases, just as a gardener uses lime to neutralize acid soil.

Dry scrubber systems, including the scrubber-baghouse and carbon equipment, also trap much of the heavy metals and organics. Currently, waste-to-energy is the only solid waste management method that permanently removes significant quantities of mercury from the environment. The greatest advances in mercury control, however, have come from the reduction of mercury in batteries, paint, and other consumer products, an effort manufacturers, states and the U.S. Environmental Protection Agency began several years ago. In fact, between 1980 and 2000, use of mercury in manufacturing dropped by almost 90%.

The final step in air quality control is to remove all these potential contaminants---the lime salts, the activated charcoal, and particulates. These particles are called "fly ash" because they are light and tend to be carried along in the hot flue gas. Fly ash is usually removed by a "bag house," which works like a giant vacuum cleaner with hundreds of fabric filter bags. Some plants use a different device, called an electrostatic precipitator, which uses electrically charged plates to capture the small particles of fly ash, much like a television screen attracts house dust.

Flue gas that is discharged from the stack is primarily carbon dioxide, nitrogen, oxygen and water with trace amounts of other constituents.

Resources:

U.S. Energy Information Administration Kids Page on Waste-to-Energy

EIA's Online Field Trip to a Waste-to-Energy Plant for Kids