WASTE TO ENERGY - BIOMASS

FCL

2018

This information was last revised March 2018

Waste
to
Energy
Plant Workings

WASTE TO ENERGY PLANT WORKINGS

Garbage is typically dumped via Truck into Working Pits where Grappling Cranes operated from a Control Rom will feed into Combustion Chambers or after Stirring, as Trash is NOT a Uniform Fuel Source.

With the Burning Temperatures @Minimum of 1000C: Garbage/Trash for 500,000 people can be reduced to Ash in about one (1) hour, or less.

Heat from Combustion will then be utilized for Water Heating, which creates Steam, which drives Turbines, that will create Electricity per General Electric (GE), Siemens, and/or Rolls Royce; and/or combination of Sub-Contractors of Record components, which is subject to Overall Project Scope that FCL as General Contractor will organize.

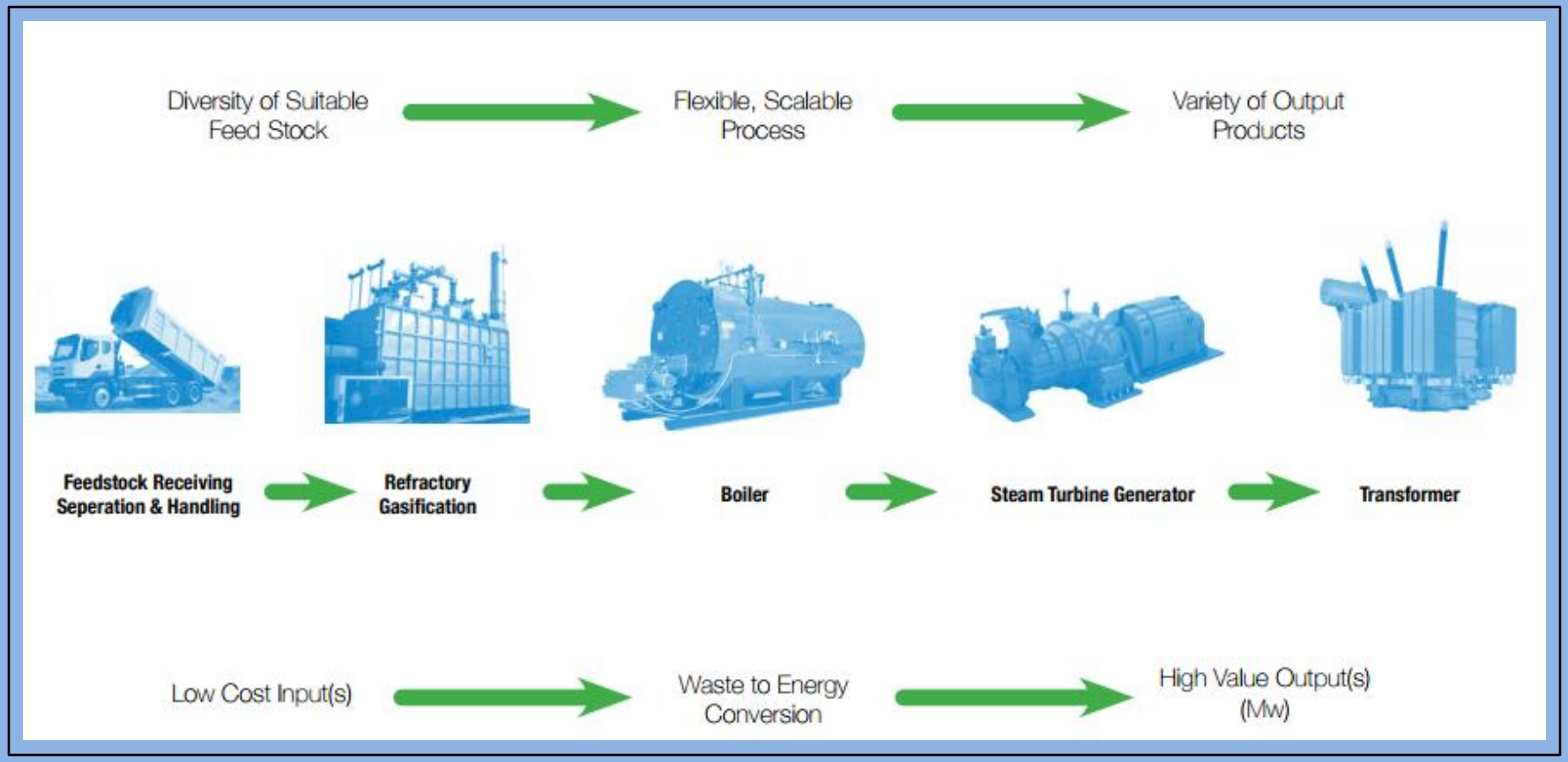
- Power in part goes into Facility Operations with Residual then sent to Grid.
- Heavy Ash falls into a Recovery Area.
- Leftover Metals can then be sorted and Sold.
- Gas and Fly Ash is fed through Systems, which injects Lime that reduces Acidity and Activated Carbon for Fine Charcoal to Bind with Heavy Metals such as Mercury.
- Gas is then Fed into Bag Houses, where it is forced through Fabric Filters for catching Particulates, PRIOR to it Exiting from Stacks.
- Remaining product or ash which is now approximately Seventy Per Cent (70%) reduced per less material by weight, or about Ninety Per Cent (90%) of Volume: will then go to Landfill.
- Rigorous Testing is employed for Landfill Sites.
- Environmental Standards are stringent and rigorous.

It should be Noted per Environmental Protection Agency (EPA) of USA: that Hydro-Chloric Acid Emissions and Toxic Chemicals such as Dioxins are now considered inconsequential in comparison to Historic Analysis of Incinerators, due to Modern Technologies now employed.

PROCEDURALLY THE FOLLOWING IS TYPICAL:

1) Garbage is collected from Homes and Businesses.
2) Waste is Delivered to Storage or Transport Sites.
3) Waste is fed into Combustion Chambers and Burned at High Temperatures.
4) Heat boils water in surrounding pipes to produce Steam.
5) Steams turns Turbine Generators to produce Electricity.
6) Electricity is used for Plant Operations and Forwarded to Grid.
7) Gases are fed through Air Pollution Equipment to Controlling the Temperature for purposes of Cooling, Collecting, and Cleaning of Gases.
8) Gas is moved through Baghouses for Fabric Filters to Collect the Particulates.
9) Constant Compliance is Controlled through Computerized Central Analysis Centres.
10) Ash is collected.
11) Metals are Extracted for Re-Cycling.
12) Leftover Ash is Re-Used or sent to Landfill Sites after Ongoing Analysis for Best Use Procedures/Placements.

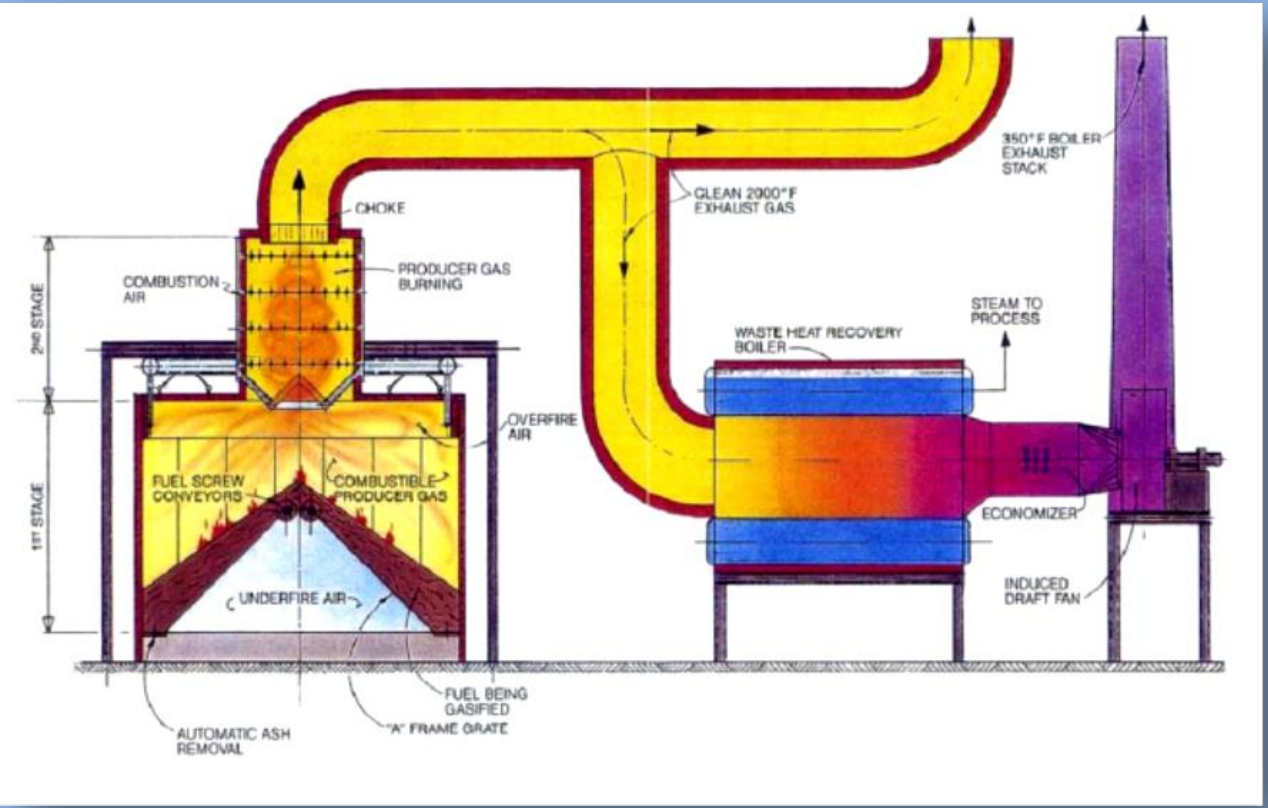
Waste to Energy - Biomass Process Flow



* Images are for illustration of process only and are not intended to represent actual equipment supplied

BENEFITS

- Reduction of environmental pollution to rivers, land and air caused by lack of regulated waste disposal and open burning waste:
- Conversion of non-reusable waste into combustible gases for electricity generation and economic benefits;
- Utilization of MSW to reduce the use of fossil fuels;
- Reduction of GHG (Green House Gas) emissions;
- Creation of employment opportunities; and
- Demonstration of a clean municipal waste treatment technology and project that can be disseminated on a global scale.



OPERATING PRICIPLE

First Stage: Gentle, updraft gasification generates combustible producer gas at critical temperatures.

Second Stage: Vigorous, cyclonic combustion of first stage producer gas with minimum excess air produces high temperature, clean products of combustion.

SPECIAL FEATURES

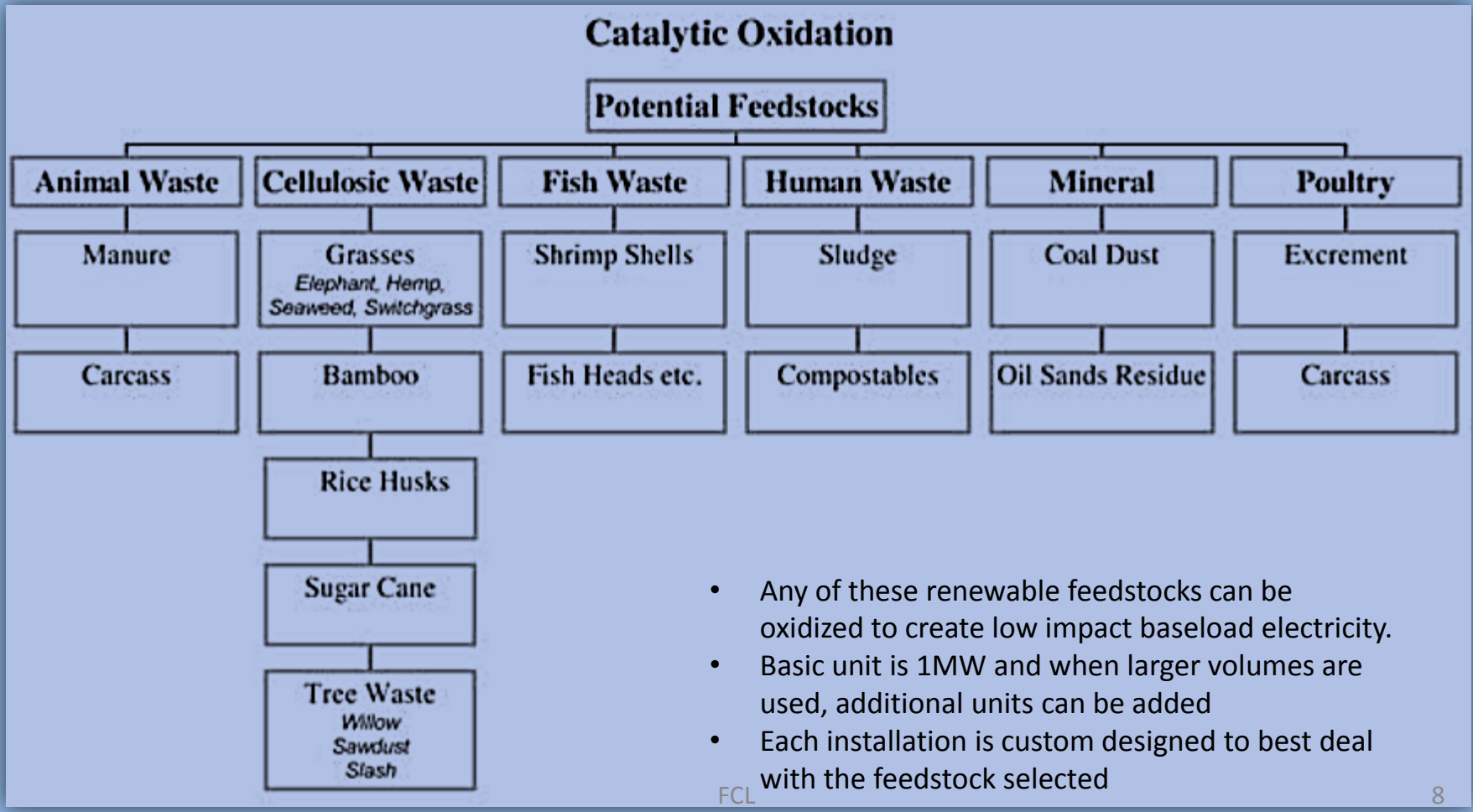
Feed: Robust, dual screw conveyors or dual hydraulic rams.

Grate: Large, stainless steel, low heat-release rate. A-frame grate.

Ash Removal: Reciprocating, wedge-type unloaders on either side of grate bottom (easily removed for servicing).

CATALYTIC OXIDATION SYSTEM

Catalytic Oxidation: a process causing combustible, cellulosic and animal wastes to lose moisture and reduce decompose into inert, pathogen-free ash, plus creating steam to generate low impact renewable energy (baseload electricity) with virtually no emissions.



- Any of these renewable feedstocks can be oxidized to create low impact baseload electricity.
- Basic unit is 1MW and when larger volumes are used, additional units can be added
- Each installation is custom designed to best deal with the feedstock selected

TECHNOLOGY

A Technology that can use various feedstocks such as, but not limited to, animal, fish, human, plant and poultry products and/or feces to generate heat and/or baseload electricity used within the typical electric power generation grid as well as safely dispose of products contaminated with any type or pathogen including prions.

- This process was used in Great Britain during the Mad Cow epidemic and was effective at disposing of the carcasses with no risk of passing on the disease.
- Multiple patents exist and new patents are pending or in the process of being filed.
- When the USA looked for a process to dispose of carcasses from potential pandemic sources, they found that only one qualified and contracted design and construction of a mobile unit then set up a testing protocol under the watchful eye of the EPA, which had published a report that states there are virtually no dangerous emissions.
- A major meat packaging corporation, one of the biggest in the world, is currently testing a unit to dispose of manure form thousands of cattle . . . On herd is over 100,000 . . . to eliminate contaminants and produce heat.
- This same company is also investigating the processing of rendered carcass waste from cattle slaughter . . . One facility processes 5,000 cattle per day.

- A plan is written to use the process at sewage treatment plants to dispose of the end product, the human sludge that every state and province is currently struggling with (i.e., how to dispose of) and are using the only option available; spreading it on farmland.
- The process can be used in the Tar Sands where the tailings from extraction would be put through this system … which would remove all contaminants, produce steam and/or electricity and a potentially valuable inert ash for fertilizer products.
- The process can be used in a Waste-to-Energy (W^2E) cycle where household waste (other than recyclables) would be turned into heat, electricity and ash … resulting in thousands of units throughout the country thereby creating distributed generation of baseload electricity on a national basis.
- This product has the largest possible "positive environmental impact" for Waste-to-Energy, no matter what the configuration.
- The process can use crushed coal more efficiently than present technologies.
- Feedstock can consist of carbon-based biomass such as fish, shrimp, animal and bird carcasses or feces, as well as cellulosic materials such as switchgrass, bamboo, willow, assorted timber, sugar cane etc.
- No matter the feedstock, at the end of the process the products are low impact green baseload energy; an inert, pathogen-free, harmless ash and virtually no emissions.

- All electricity would be renewable baseload generation produced 24 hours a day, 365 days per year versus intermittent generation such as wind or solar … so units could be located near intermittent sources in order to balance line load (which is the optimum situation desired by distribution and transmission grids).
- In a normal year, a 1MW facility will generate as many kWhrs as a 6 MW solar power facility or a 3 MW wind facility . . . In bad weather years, the differences are even greater . . . so ROI is much better than with intermittent sources.
- Catalytic Oxidation has virtually no emissions versus standard waste incineration facilities and it cuts down on landfill (which is the largest human caused producer of methane gas).
- The generating process uses a closed water system to condense the steam and recycles the water so an occasional "top up" is all that will be required.
- The system is both scalable and modular; it can easily expand capacity as the waste supply grows thus providing a solution that serves as a real alternative to traditional waste disposal while being an environmentally friendly source of "green energy".
- Income will be earned from "tipping fees" from the waste feedstock; the sale of the heat or electricity; the sale of the inert gas; *and* the sale of CERC's (Certified Energy Reduction credits) which is becoming a major global industry.

Refractory/Gasification units are sized for ease of transport and handling.

Processed biomass, fuel source ready for introduction into the refractory/gasification unit (in this case, simple manure). A wide variety of feedstocks are suitable and applicable with minor alteration to the process and/or equipment. Wood, straw, municipal solid waste, medical waste, plastics, rubber, bitumen, and many other materials may be used in these units.

Fuel is fed into a hopper on the unit.

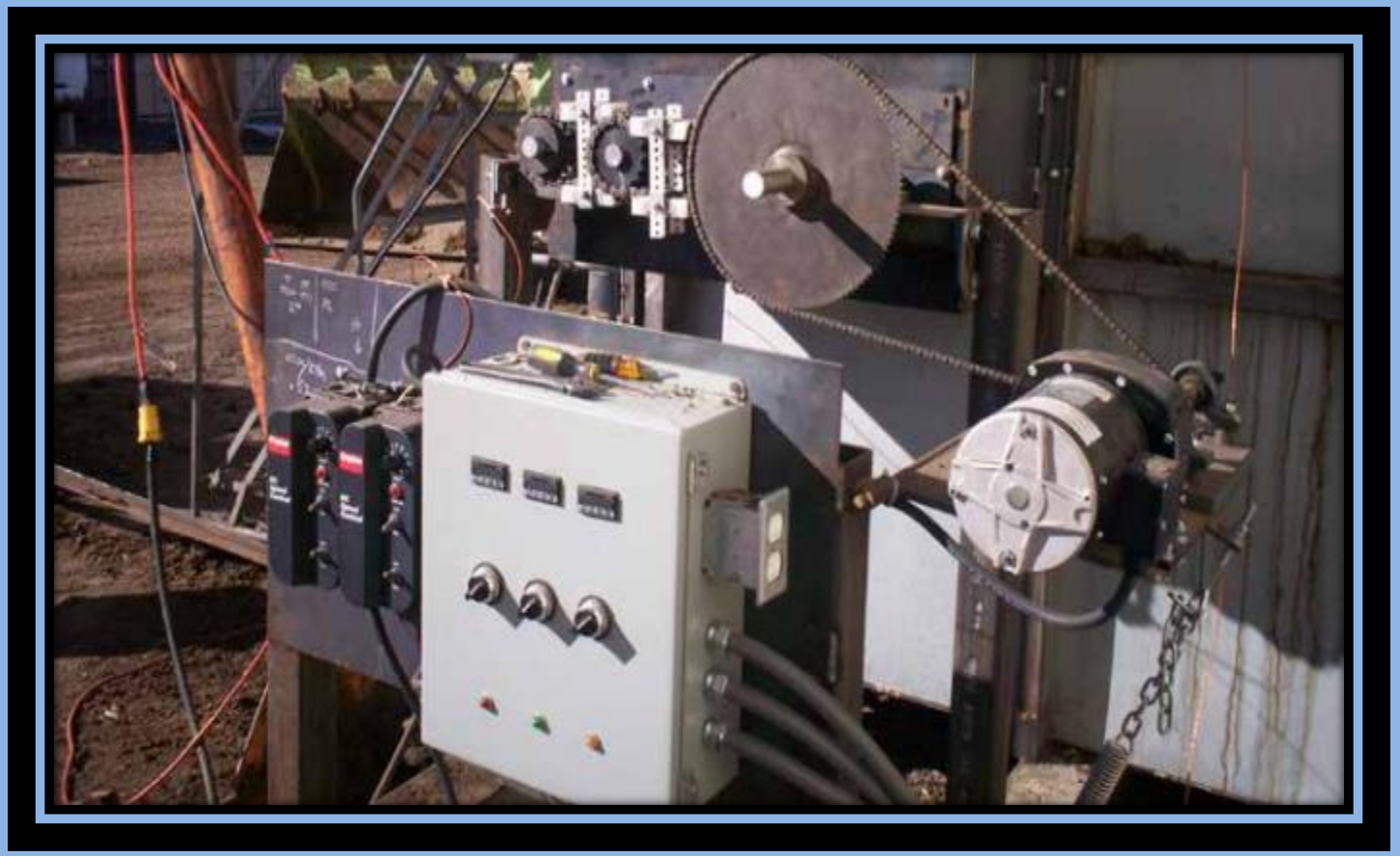
Fuel is moved from the hopper, into the process chamber with augers.

Refractory (extreme heat resistant) material is installed within the metal walls of the unit.

Double chamber refractory gasification produces virtually no emissions.

A series of screw augers are used to spread and transport the fuel through the inside of the gasification chamber.

Fuel feedstock is heated to 2,000 degrees Centigrade to create high pressure steam for electricity generation.



Simple controls adjust and monitor fuel feed speed, temperature, etc.

Inert ash is the only residual product of the process.
It is carried away and deposited by an exit auger.

The inert waste ash is collected and may be used for various applications or disposed of at a normal landfill.

Heat recovery for enhanced efficiency and added value is possible.

Easily installed automated ash removal system.

Installations can be designed to suit specific needs.