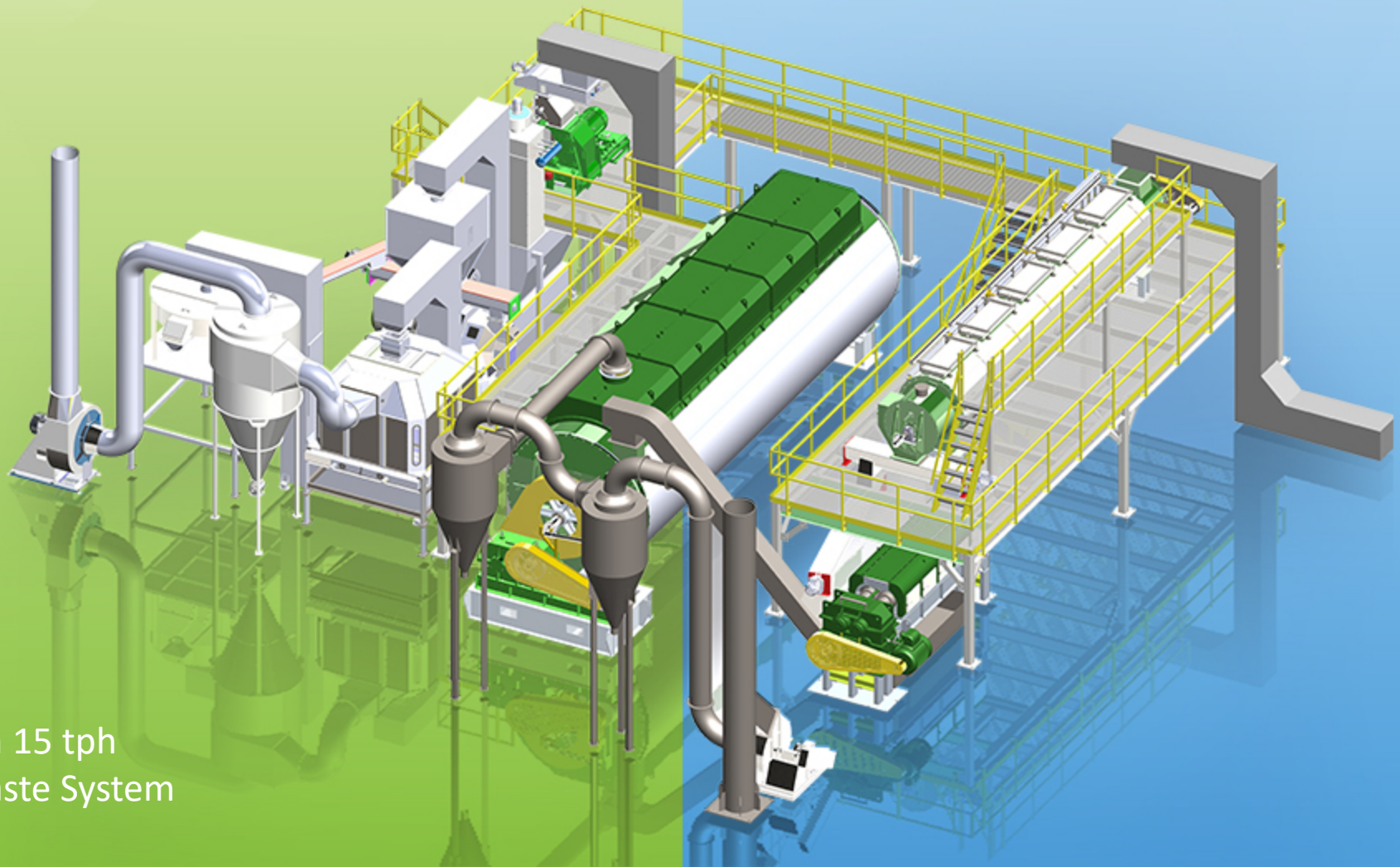


# TURNING MUNICIPAL SOLID WASTE (MSW) INTO A GREEN COAL EQUIVALENT SUBSTITUTE

**REGREEN** **FUTURES**



ReGreen 15 tph  
Total Waste System

# Introduction

The total waste system (TWS) is a patented process using specialized technology to turn any solid waste material into a marketable product. Recovery facilities normally have to remove recyclable materials from the sorting line and the remaining waste is then landfilled. However, with the introduction of Regreen Technology, that is no longer the case.

With Regreen's Technology, the process begins by placing waste material on to the initial conveyor. The system can use a small loader or it can be configured to accept material directly from collection vehicles. The process is very useful for waste material with high organic content. The TWS comes equipped for a "negative sort", removing rocks, metals, and other inert materials or potential contaminants. This sorting line is on the ground level and is typically three feet wide (0.91 meters).

With heavier sorting requirements, Regreen has the option of adding a trommel screen and elevated sorting line for the removal of recyclables. Immediately prior to the sorting line, the rotating trommel screen can be placed to remove materials that are under a designated size. Typically, this screen is 3 inches (7.6 cm), so all small materials will drop into the ground level sorting line. At this point metals will be removed by a ferrous magnetic sorter and rocks and glass are removed by a sorting personal. The trommels are sized to the desired processing capacity of the system, also it could be designed at the client's discretion. Also, additional mechanical sorting equipment may be added such as optical sorters and air handlers or other processing equipment.

All of Regreen's process systems starts with shredders featuring a proprietary design. The system is the heart of the Regreen systems.

### **Shredder**

- Equipped with hydraulic pusher moving waste towards the shredding drum.
- The system uses patented blade cooling system.
- It can shred from thin to thick plastic films to toughest palm fronds.
- The waste is processed into uniform sizes of 50 millimeters or less.
- Uniform size and smaller particles are vital to the process since it helps the system to quickly kill bacteria, germs, and eliminate odors.

### **Regreen Radiant Heat Processor**

- During the initial unloading stage (prior to shredder), the odor is initially controlled by a built in mist/spray system.
- The Regreen Radiant Heat Processor will process the shredded waste to reduce the bacteria and odor causing pathogens.
- It is designed to lower the moisture content to less than 10%.
- It utilizes INDIRECT dry steam or oil for energy.

### **Press**

- After exiting the Radian Heat Processor, the waste will transfer to the Press.
- It is designed to further remove the moisture content by 40%.
- The liquid extracted from the process is gathered and transferred to a special filtration system via a pump.

### **Liquid Extractor/Water Treatment**

- The dirty water from the press is ran through sand filters first.
- The waste water is further filtered through activated carbon filters.
- The process adds chemicals to the water in order to reclaim it and in effect brings it back up to irrigation standards.
- The reclaimed water can then be used for cleaning, farming, or any other on/off site uses.

## **Regreen Radiant Heat Moisture Extractor**

- While the extracted liquid is going through the reclaim process, the solids are transferred to the Radiant Heat Moisture Extractor via the conveyor belt.
- At this stage, solids are further stabilized and the leftover moisture gets extracted and turned into a vapor, leaving the solids with the desired moisture level (as low as 4%).
- It also disintegrates many of the toxins that are found in the MSW.
- It utilizes INDIRECT dry steam or oil for energy.

## **Pelletizer**

- A grinder is then used to prepare the material for pelletizing or briquettes.
- The pellets can be made to any specification.
- This system uses Regreen's pellet-chilling unit to create a long lasting and high value commodity for energy applications.
- If only organic waste is used, the end product can also be used as fertilizer and/or animal feed.

## **Finished Product Specification**

- Regreen pellets burn cleaner than any other source of fuel, and have a high BTU value.
- Our pellets do not produce smoke while burning and burns longer due to compact of the pellets.
- Smoke from the pellets if any, would be the Syngass
- Some applications will not require pellets, so material straight from the dryer (aka "fluff") or ground into a powder form are also options.
- Pellets, fluff, and powder are highly marketable for energy production, even when not in pellet form.

In summary, Regreens TWS processed material (garbage or organic waste) performs better than any other processed material in gasifiers or applications that use coal for energy production. The Regreen process eliminates odor, greatly reduces harmful bacteria, and viruses from garbage and/or organic waste. Our system also effectively homogenizes the processed material. These unique actions and benefits, along with the lowest moisture content produced by any system in the world, creates end products (pellets/fluff/powder) that are significantly lower in emissions and avoid clinkering issues in all energy production applications.

# Utilizing Regreen Systems

*Trash to fluff/pellets in less than 1 hour*



MSW Raw Material



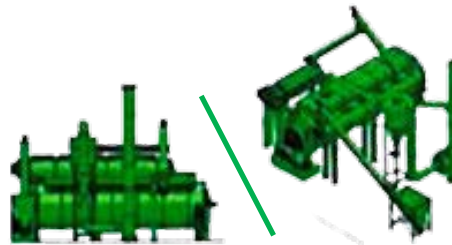
Shredded MSW



Pressed MSW



Fluff

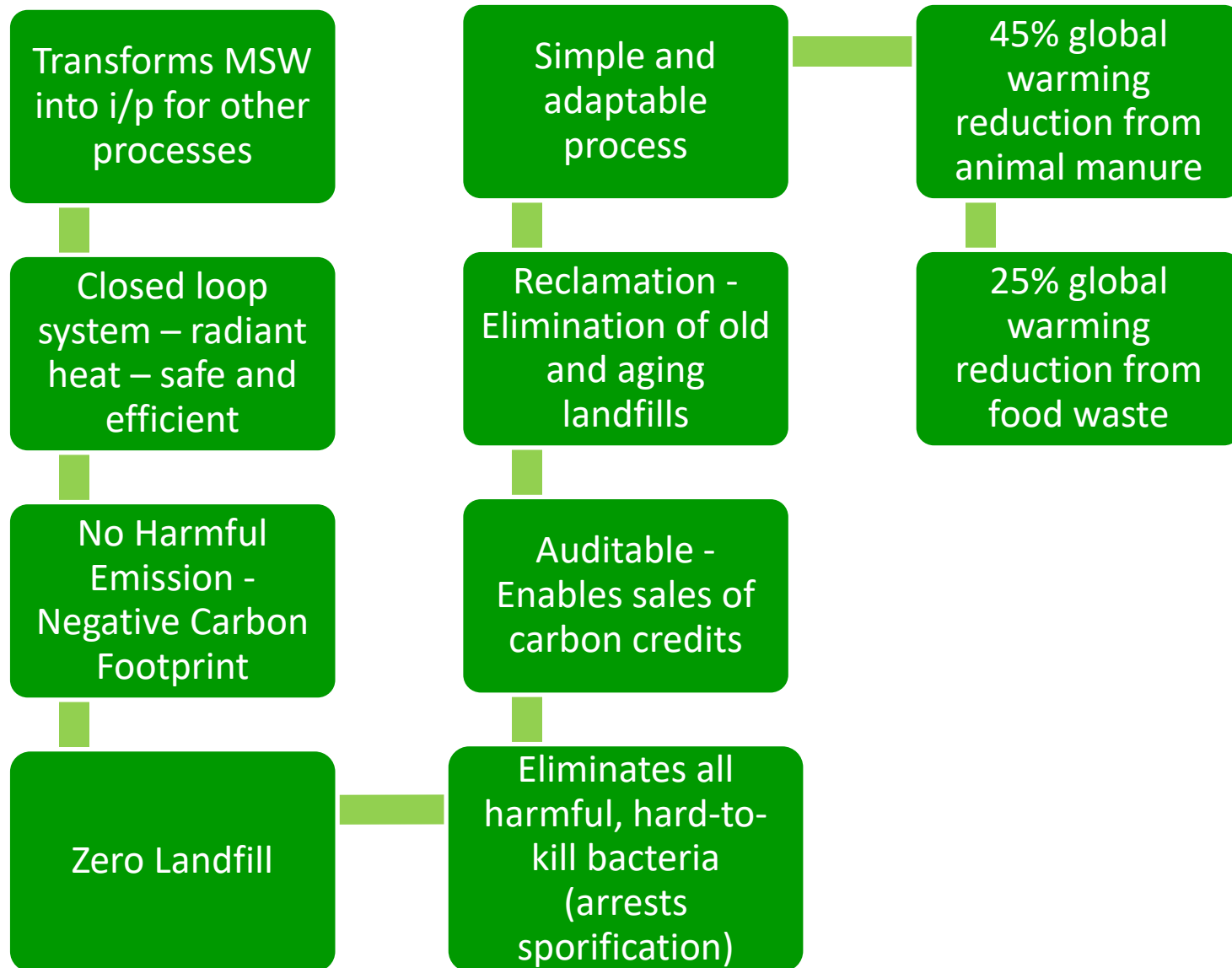


Radiant Heat  
Processor/Dryer



MSW Raw Material

# Technologies and Processes



## Technology Benefits

Trash is converted to pellets/fluff, then sold on open market to major users. Another additional option is to add back-end modules to the Regreen system, further monetizing the pellets by converting them into other usable/marketable products like electricity, animal feed, other gases (H or N), rubber filler, etc.

# Regreen vs Composting & Dehydration

Technology	By Product	Capacity	Processing Time	Pathogen Free End Product	Odor Free End Product	Humidity Control	Liquid Separation/ Pelletizing Option	High BTU Output
Regreen Processor	Fertilizer/Soil Amendment / Feed / Fuel / Energy & Wood Substitute Pellets	Up to 42 TPH Continuous	47 minutes	✓	✓	✓	✓	✓
In Vessel Composting	Compost/Soil Amendment	40 to 50 Yds	14-21 days	✗	✓	✗	✗	✗
Tunnel Composting	Compost / Soil Amendment	Various batch-sizes	7-30 days	✗	✗	✗	✗	✗
Dehydration System	Dehydrated Food Waste	100 to 2,000 pounds / Day	12-18 hours	✗	✓	✓	✗	✗
Traditional Composting	Compost / Soil Amendment	Limited Only by Land Size	3 to 6 months	✗	✓	✗	✗	✗

The Regreen system provides a much larger variety of end products than competing technologies in the organic waste to soils and animal feed market. Our proprietary Radiant Heat Processor is the only one that ensures an end product free of harmful bacteria. What is also a unique advantage for Regreen is the short amount of time it takes to have a stable, finished product. While most processes will eventually reach an odor free state, most take weeks or months to do so. We do it in minutes.

While dehydration systems can also control the moisture content of their finished product, they are limited by small batch sizes and a process that takes half a day or longer to complete. State of California testing has determined that dehydration systems do not create a stable product as the material exhibits the same reactivity to water as unprocessed waste. Therefore, the “finished” product from these systems is still categorized as food waste and not permitted for immediate land application. Regreen’s process is certified to kill all harmful, hard-to-kill bacteria and suitable for immediate use in any soil or feed application.

While Regreen offers a superior alternative to all competing organic waste processing systems, ours is also a complimentary process for traditional composting facilities. Use of a Regreen system significantly increases daily processing capacities, eliminates the need for large plots of land, and provide free liquids which are essential to the composting process.

# Regreen vs. Energy Market Competitors

Regreen's processing systems can convert municipal solid waste (MSW), as well as all types of organic wastes, into end products that have good BTU values, consistently delivered at a 5% to 7% moisture content. End product characteristics can be blended for specific applications. All of our end product pellets have tested out as highly-efficient and compatible with any gasification system. Regreen offers both syngas and pyrolysis modules to team with the Regreen Processor to produce electricity, fuels, and marketable byproducts, with no harmful emissions.

Regreen-processed organic wastes will provide BTU values of 6300 to 8300 per-pound (3500 to 4600 kcal/kg) and the residue from use in energy production is a high-value biochar product. If pyrolysis is used, an organic rubber product can also be created. MSW will provide higher BTU values of 8000 to 11000 per-pound (4400 to 6100 kcal/kg) and the ash has superior bonding properties to coal ash, thus making it marketable as an additive for concrete production.

## Anaerobic and Aerobic Digestion

Anaerobic (and to a lesser extent Aerobic) digestion is currently seen as the preferred technology for organic waste to energy. Both feature a series of biological processes in which microorganisms are used to break down biodegradable material and create a methane gas suitable for use in energy production.

## Why Regreen is better and also a complementary technology

95% of the material processed through anaerobic digestion requires subsequent processing to become a suitable end product. Odor and bacteria issues with the digestate (semi-solids and solids not converted to methane gas by anaerobic digestion) require a lengthy composting process. In addition, anaerobic digestion systems require significant pre-processing of incoming waste material, often employing costly systems to create a slurry from pre-sorted organic material. Lastly, anaerobic digestion systems, in order to handle any volume of waste, must be built in a large and costly fashion and require trained engineers to operate.

Regreen captures and utilizes 100% of the carbon from organic wastes and utilizes 100% of the energy value. Once our pellets are used to create electricity or fuels, the ash is a marketable product with no further processing required. It is also a more valuable end product than compost made from anaerobic digestion digestate.

## Coal Fired Power Plants and Similar Facilities

Power plants and cement production facilities use coal and other processed fuel (biomass, RDF, etc.) in their operations. Coal is unpopular from an environmental perspective and many coal-fired facilities have closed or will close as a result of legislation. Biomass and RDF alternatives typically have much higher moisture content (20%+) and/or less efficient burn-properties. They cannot produce heat/energy in the environmentally friendly manner Regreen provides. As an energy source, coal is not nearly as efficient as Regreen's pellets.

Technology	Megatons	Calorific Value	Energy Produced
Pellets	293 MT	4,500 kcal/kg	600 MW
Coal	440 MT	3,000 kcal/kg	600 MW

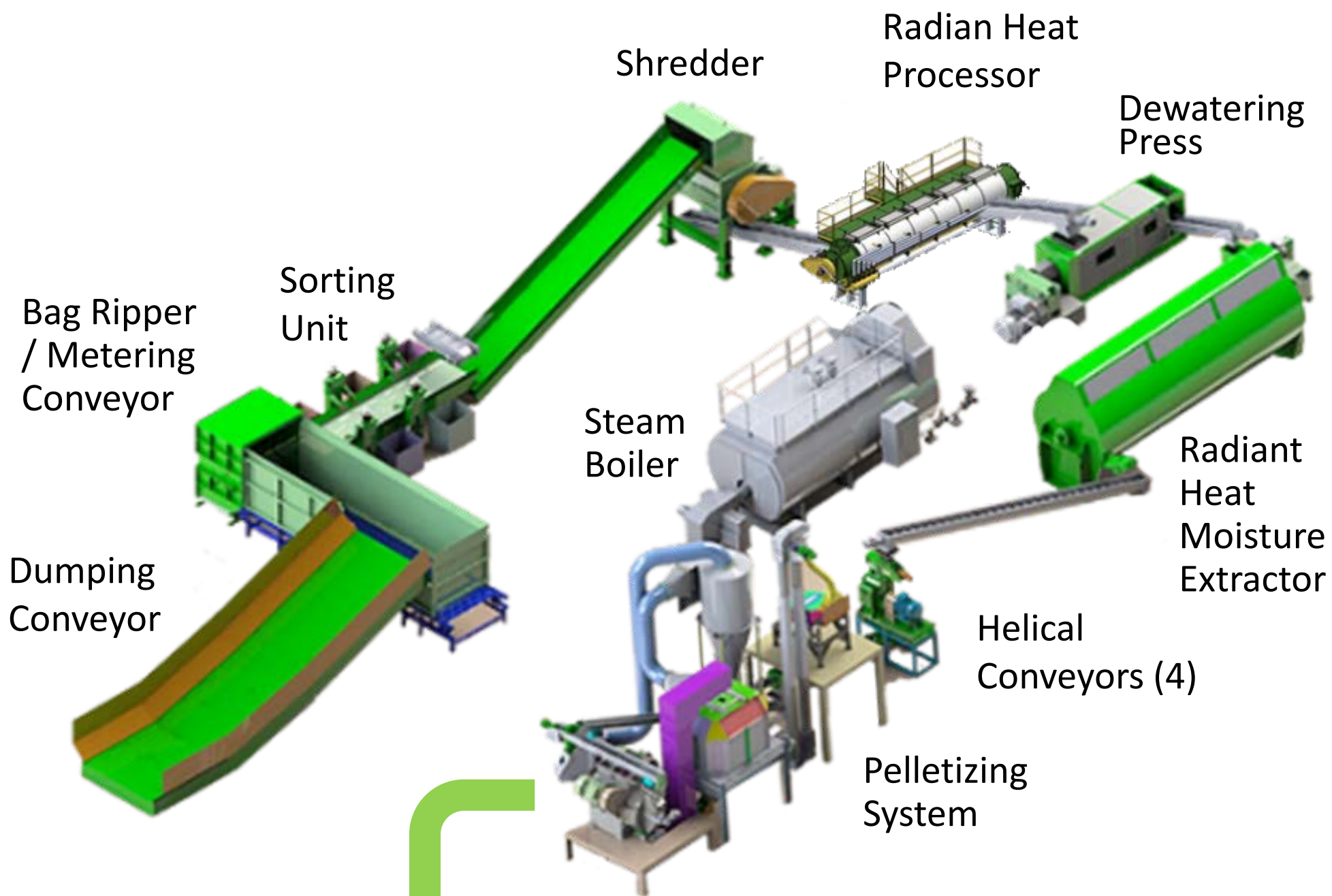
## Incineration

Air pollution and inefficient energy production levels are the main drawbacks to incineration of MSW. It is impossible to burn 30%+ moisture content material efficiently. Also, it is too time consuming and costly for these facilities to dry MSW further. This higher moisture content leads to significant air pollution issues, and increased operational costs that have led to facility closures.

A Regreen system, teamed either with a syngas or pyrolysis system, is about twice as efficient as incineration (70% conversion, versus 30% to 40%). Since both Regreen energy production modules capture and control emissions, this type of Regreen power-generation application has none of the pollution issues and associated regulatory problems of incineration.

	Capacity	Energy Produced
RGS	1,200 MT	12 MW/hr
Incinerator	2,000 MT	50 MW/hr

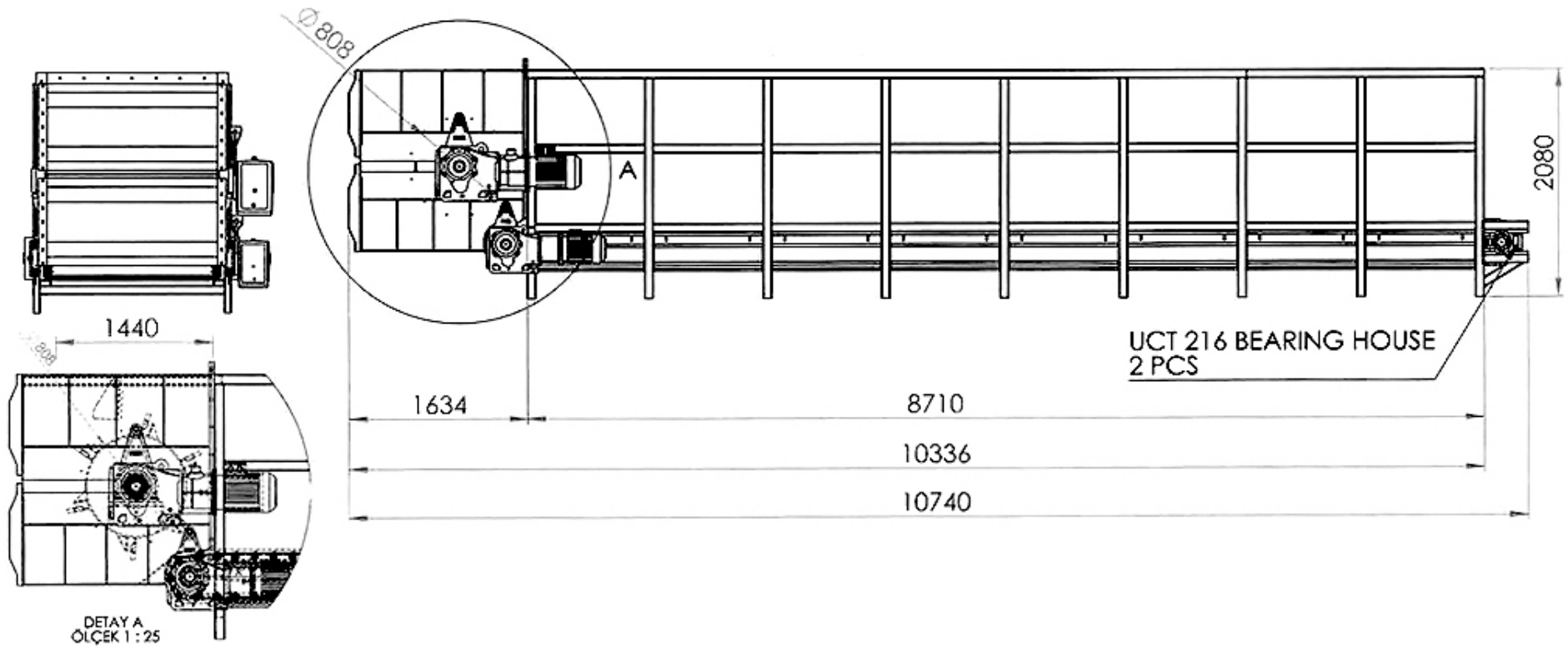
# Regreen 15tph TWS Legend



## Pyrolysis System



# Bag Opener



## DESCRIPTION:

- This is used to make the MSW homogenous and open all bags.

## KEY ELEMENTS:

- Targets both commercial and residential waste.
- No expensive and environmentally toxic storage or staging is required -- immediate conversion in less than one hour.

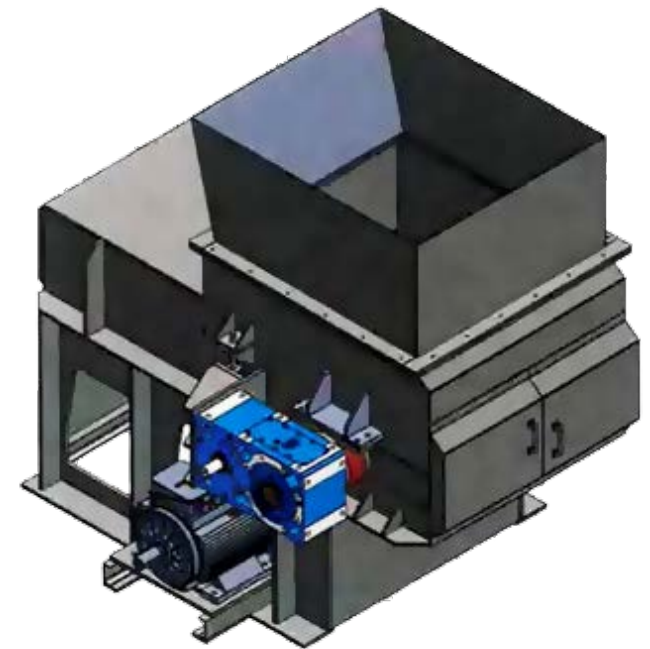
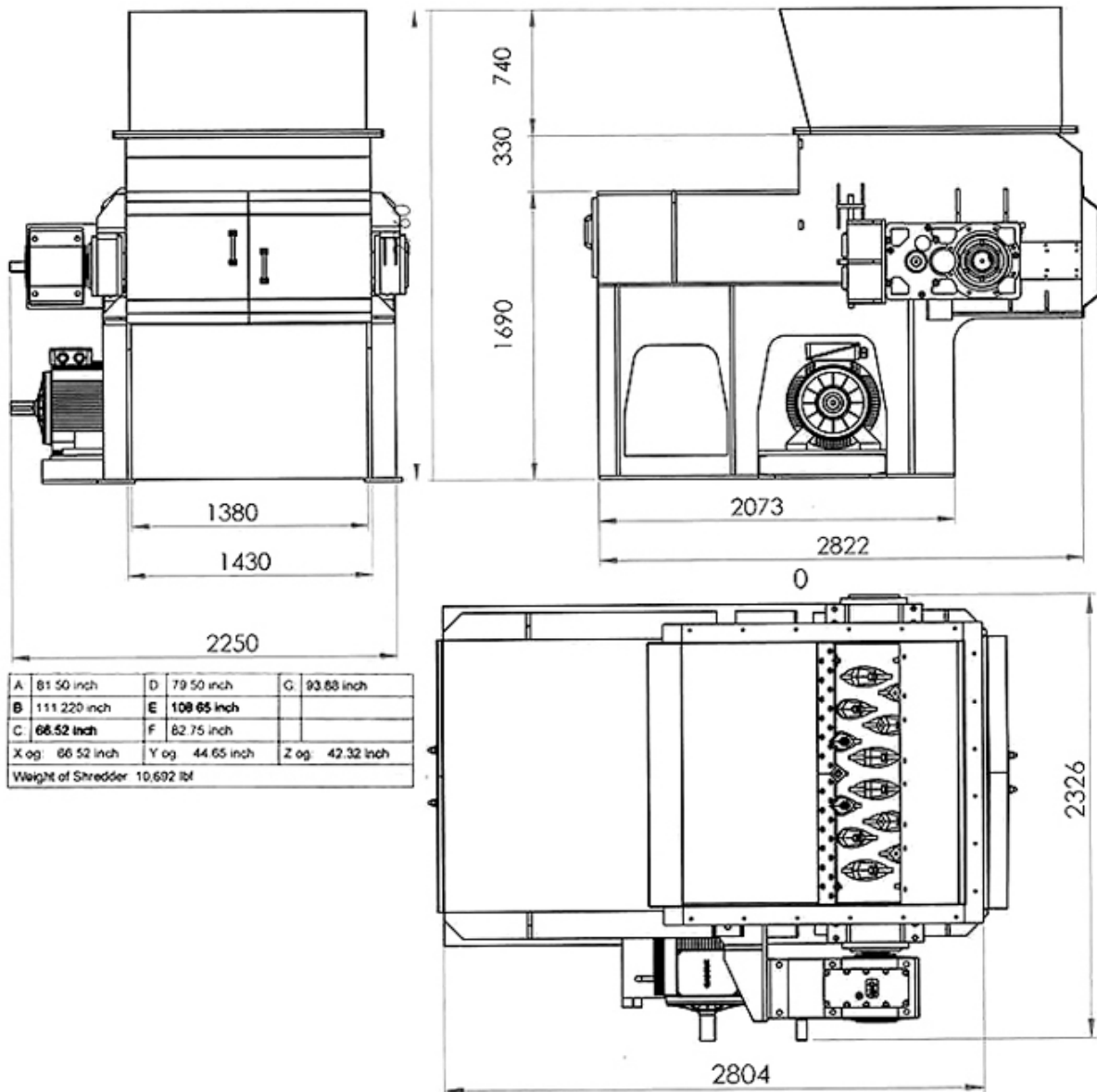
## Bag Opener

This system is designed to open all bags and homogenize the trash for efficient separation and processing

This is matched to the Regreen system and is designed to open both very thin and thick bag

8.1 m x 2.1 m x 2 m  
Total volume 16 cu m

# Regreen Shredder



## Shredder

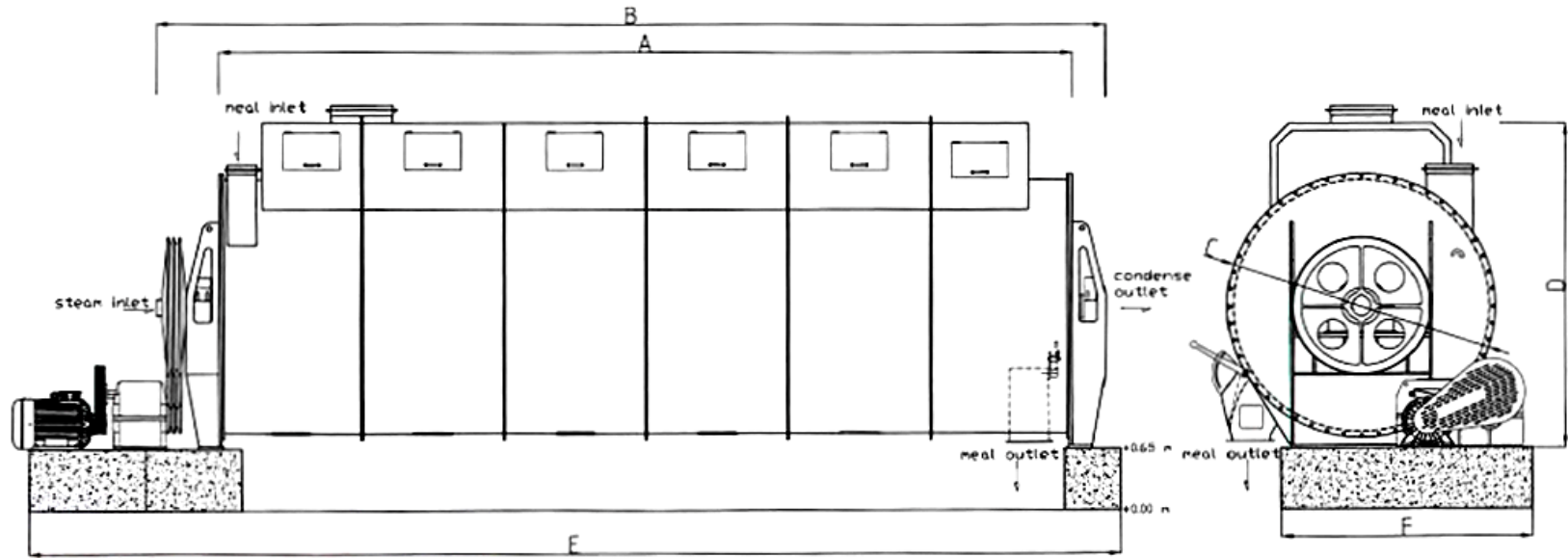
These shredders are the heart of the Regreen systems – using patented blade cooling systems – they can shred from plastic: film to palm fronds without jamming or gumming.

These shredders have hydraulic pushers, antijaming sensors and PLC controls.

2.8 m x 2.1 m x 2.7 m  
10,692 lbs  
Sizes: ¼, 5, 15, 42 T/hr



# Regreen Radiant Heat Processor



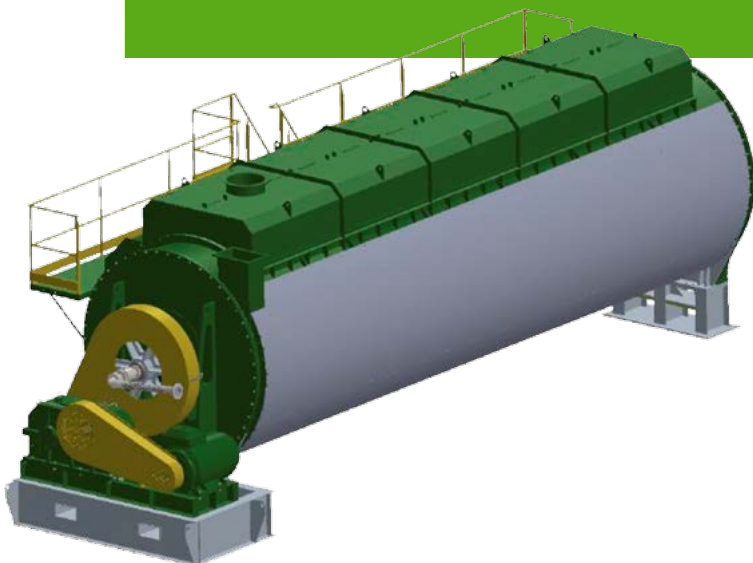
## Radiant Heat Processor

It is designed to kill bacteria and odor causing pathogens. It is also designed to lower the moisture content to less than 10%. Operating using indirect dry steam or oil at 8 bar pressure.

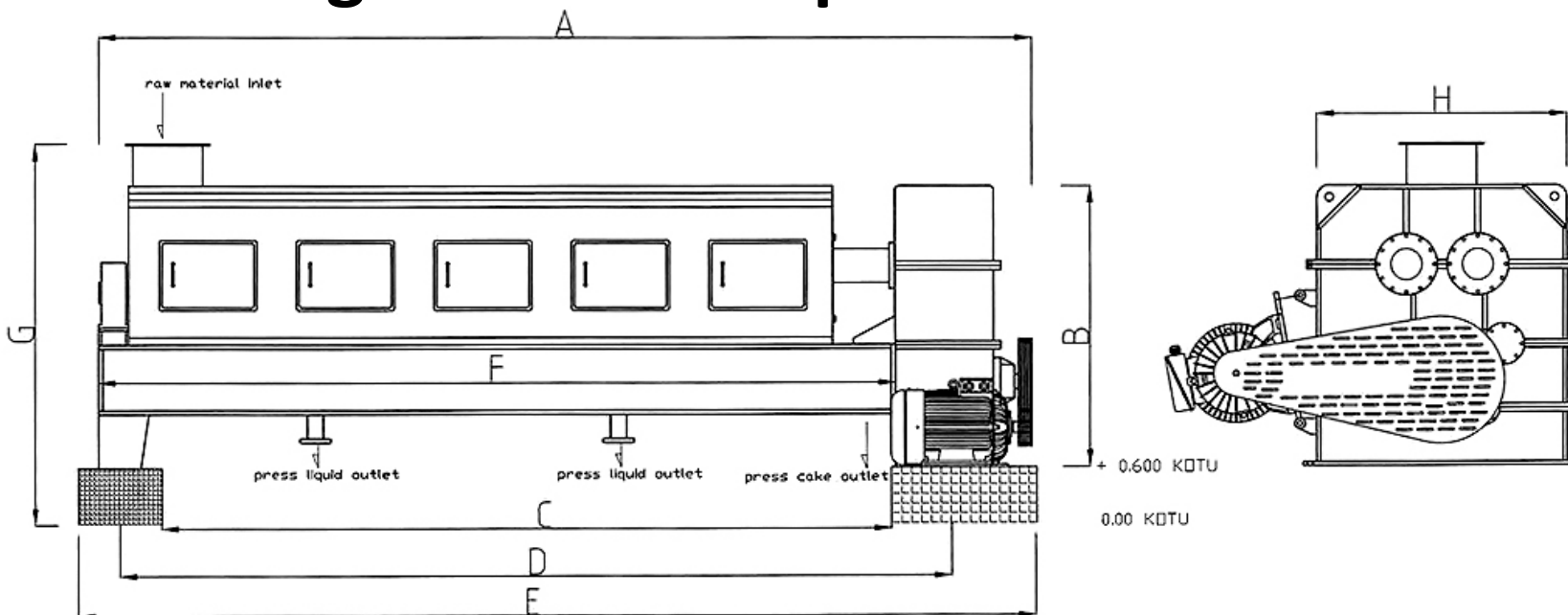
The dryer is able to efficiently deliver up to 1% humidity in a continuous operation due to patented Regreen Technology.

10 m x 2.6 m x 3.9 m  
110 kW, 30,000 Kg

DRYER										
TYPE	HEATING SURFACE	A	B	C	D	E	F	OPERATING PRESSURE	WEIGHT	POWER
D 150	7,945.8 ft <sup>2</sup>	354"	391.73"	91.34"	98.43"	425.20	99.21"	87 PSI	41,006lbs	55 kW
D 9000	13,066.4 ft <sup>2</sup>	354"	396.85"	113.39"	137.60"	456.69"	104.92"	87 PSI	61,729lbs	90 kW
D 10000	14,902.8 ft <sup>2</sup>	393.7"	436.22"	113.39"	137.60"	496.06"	104.92"	87 PSI	66,139lbs	110 kW



# Regreen Press Liquid Extractor



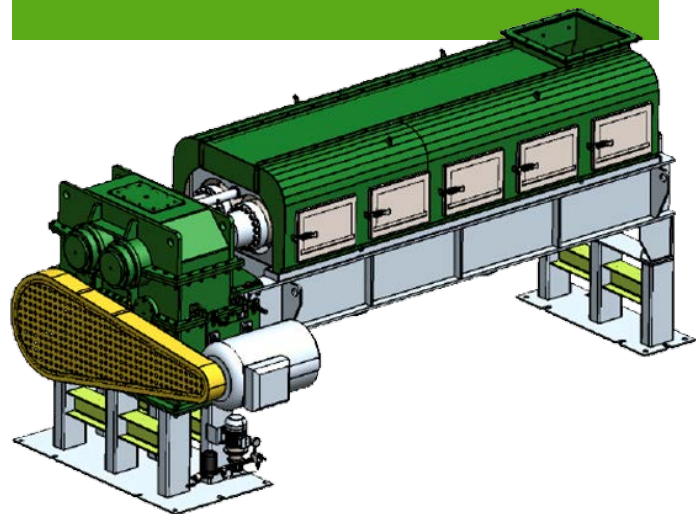
## Press

The press is a continuous operation press with low pressure. The system is designed to be cleaned quickly to accommodate 24 hour operation.

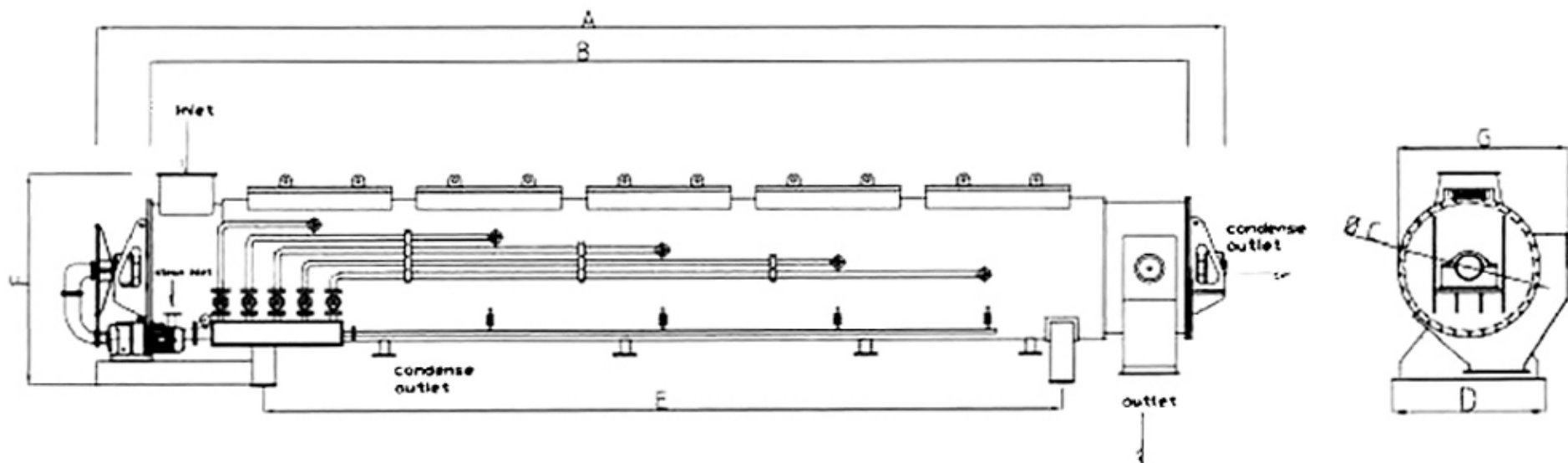
Designed to be easy to clean and in continuous operation.

Cap: 15 TPH 37 kW  
4.7 m x 1.4 m x 1.5 m  
Mesh size 2.0 mm and 0.4 mm  
Speed – 3 to RPM

TWIN SCREW PRESS											
TYPE	CAPACITY	A	B	C	D	E	F	G	H	WEIGHT	POWER
P 150	150 tons / day	165.35"	45.67"	120.08"	143.70"	167.32"	137.01"	76.77"	47.64"	16,535lbs	22 kW
P 350	350 tons / day	174.41"	48.62"	132.48"	156.10"	179.72"	144.88"	83.07"	51.77"	20,944lbs	37 kW
P 400	400 tons / day	189.96"	52.56"	143.70"	167.32"	190.94"	157.87"	83.27"	52.36"	23,986lbs	45 kW
P 800	800 tons / day	269.88"	72.44"	198.82"	234.25"	269.69"	224.41"	104.33"	72.44"	58,643lbs	55 kW



# Regreen Radiant Heat Moisture Extractor

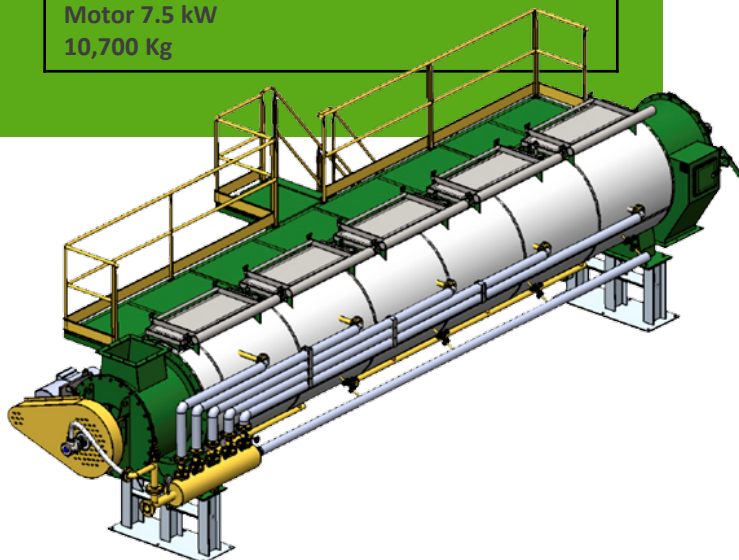


## Radiant Heat Moisture Extractor

Solids are further stabilized, and the leftover moisture gets extracted and turned into a vapor. Leaving the solids with the desired moisture level (as low as 4%). It utilizes INDIRECT dry steam or oil for energy. Disintegrates many of the toxins found in the MSW.

Operating temp 160 Deg C., at low rotation speeds (3RPM)

Operating pressure: 6 bar  
9.9 m x 1.19 m x 1.4 m  
Motor 7.5 kW  
10,700 Kg



COOKER											
TYPE	CAPACITY	A	B	C	D	E	F	G	OPERATING PRESSURE	WEIGHT	POWER
C 350	350 tons / day	9860 mm	9000 mm	Ø1032 mm	950 mm	4050 mm	1412 mm	1190 mm	6 BAR	10700 kg	7.5 kW
C 400	400 tons / day	9860 mm	9000 mm	Ø1202mm	950 mm	4050 mm	1580 mm	1360 mm	6 BAR	12600 kg	11 kW
C 800	800 tons / day	13020 mm	12000 mm	Ø1345 mm	1660 mm	—	2457 mm	1850 mm	6 BAR	17500 kg	15 kW

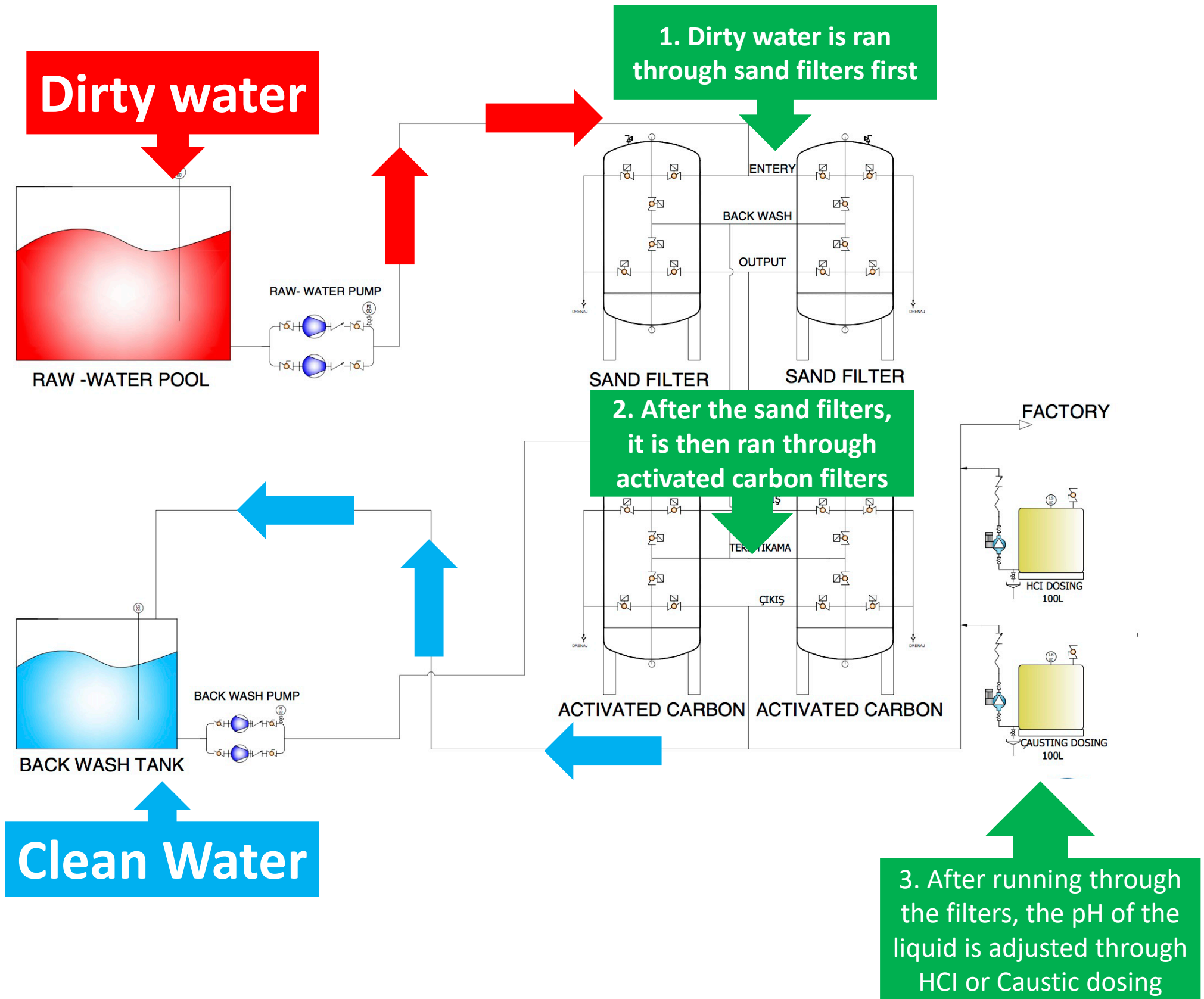


## Grinder and Pelletizing System

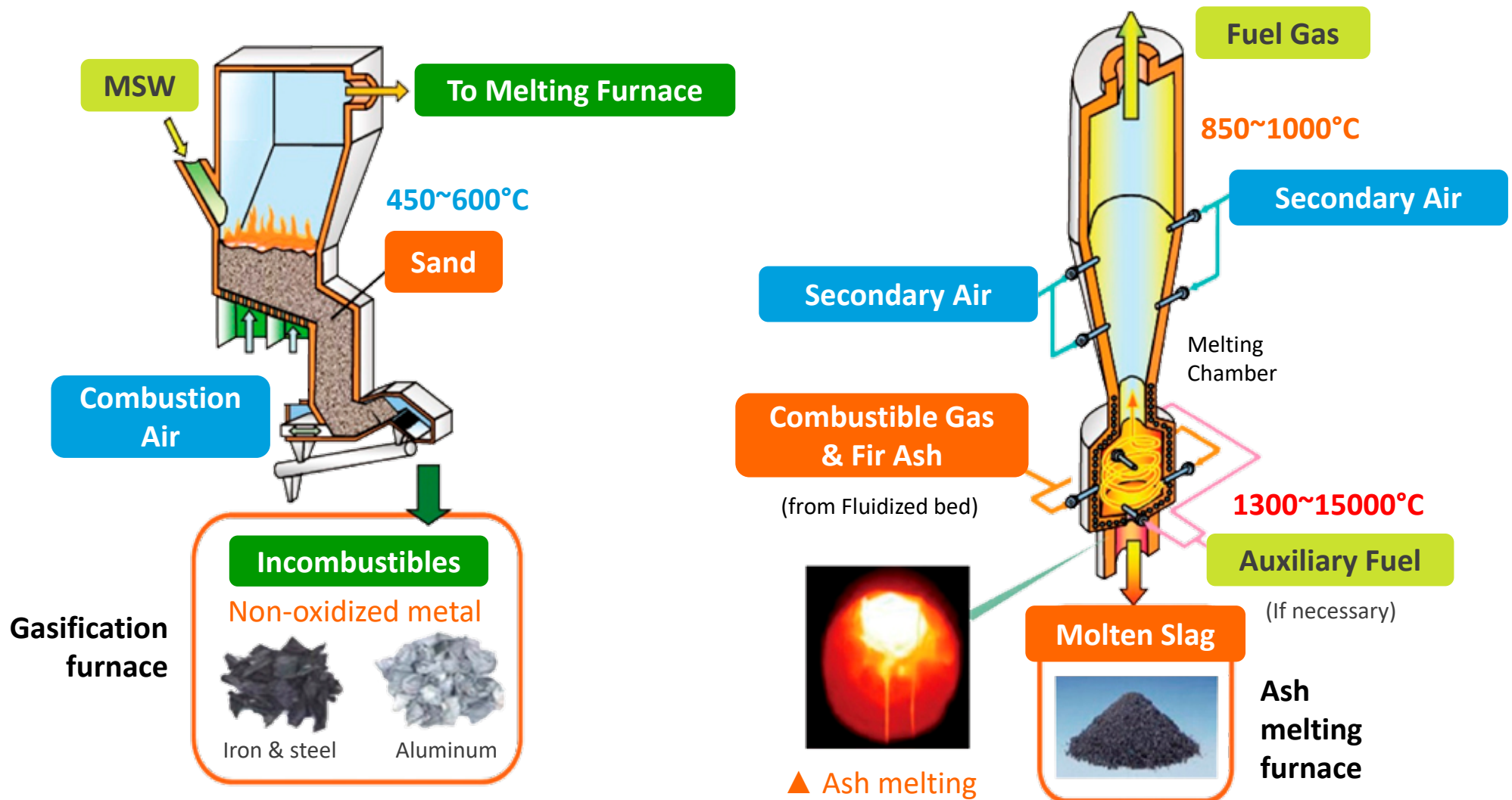
A grinder is used to prepare end products if pellets or soil amendments are desired. The pelletizer and cooling tower create 5% moisture-content pellets, impervious to ambient moisture.



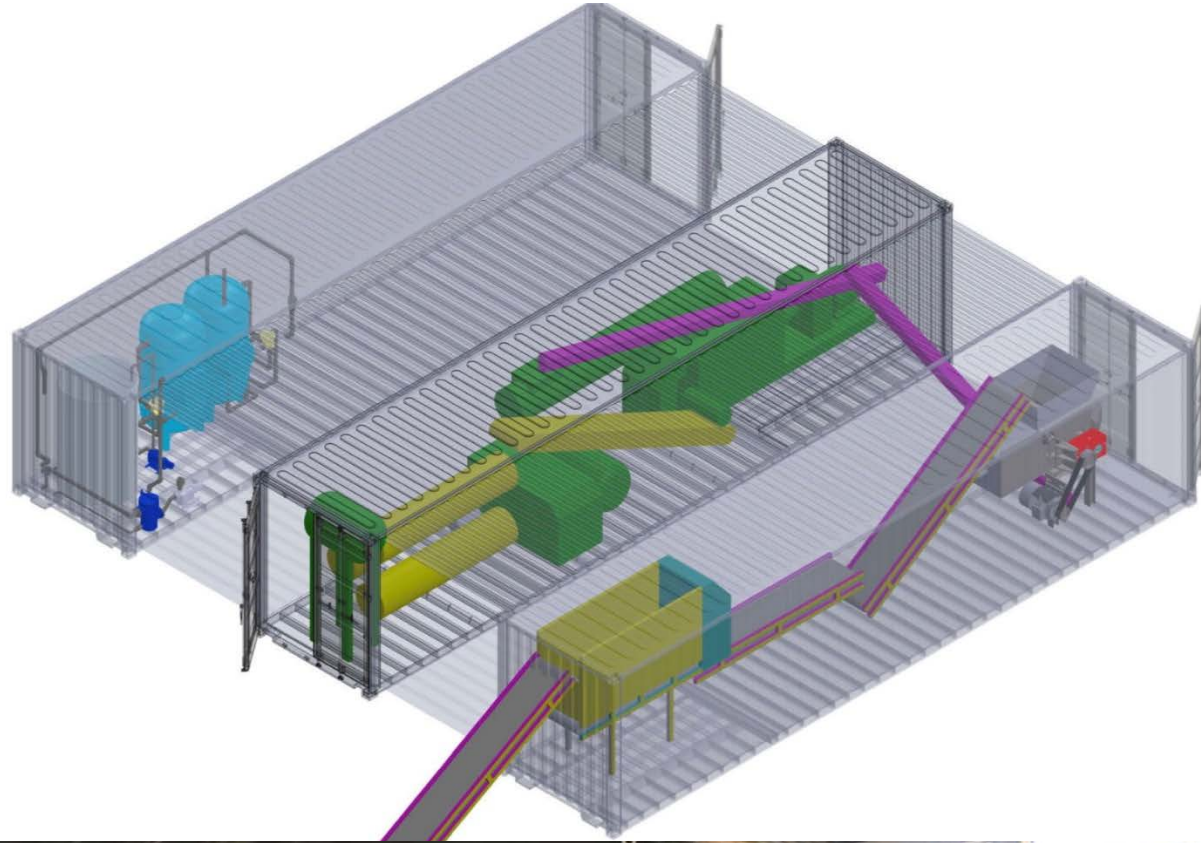
# Regreen Water Filter Schematic



# Gasification and Ash Melting Furnace

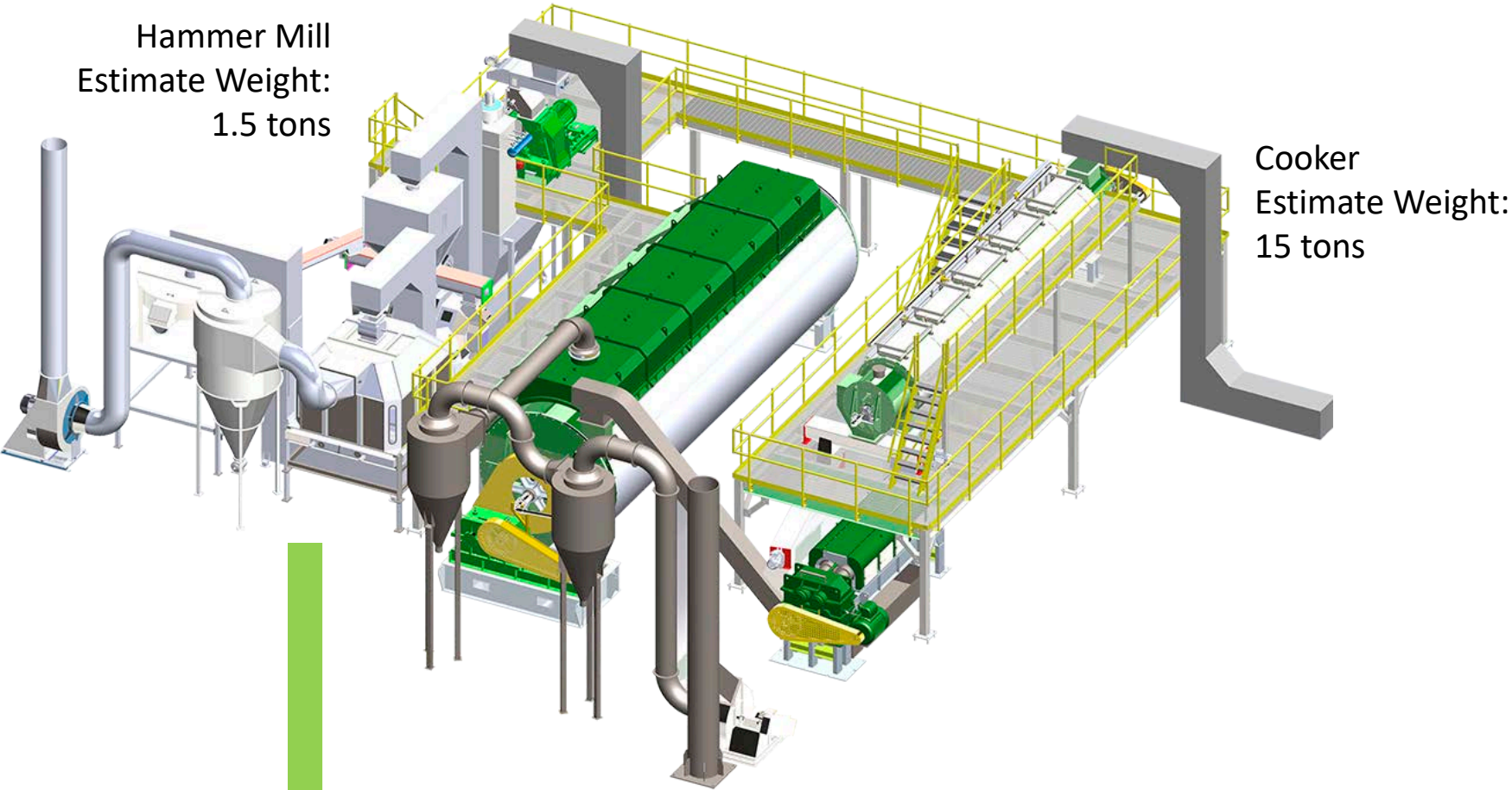


# Quad Deck "Plug and Play" System



This is a Regreen Plug & Play Processor. These are Regreen Systems that are ready to ship out, plug in, and turn on. They include all parts of the Regreen System, plus gasifier and water filter, all contained in three storage containers.

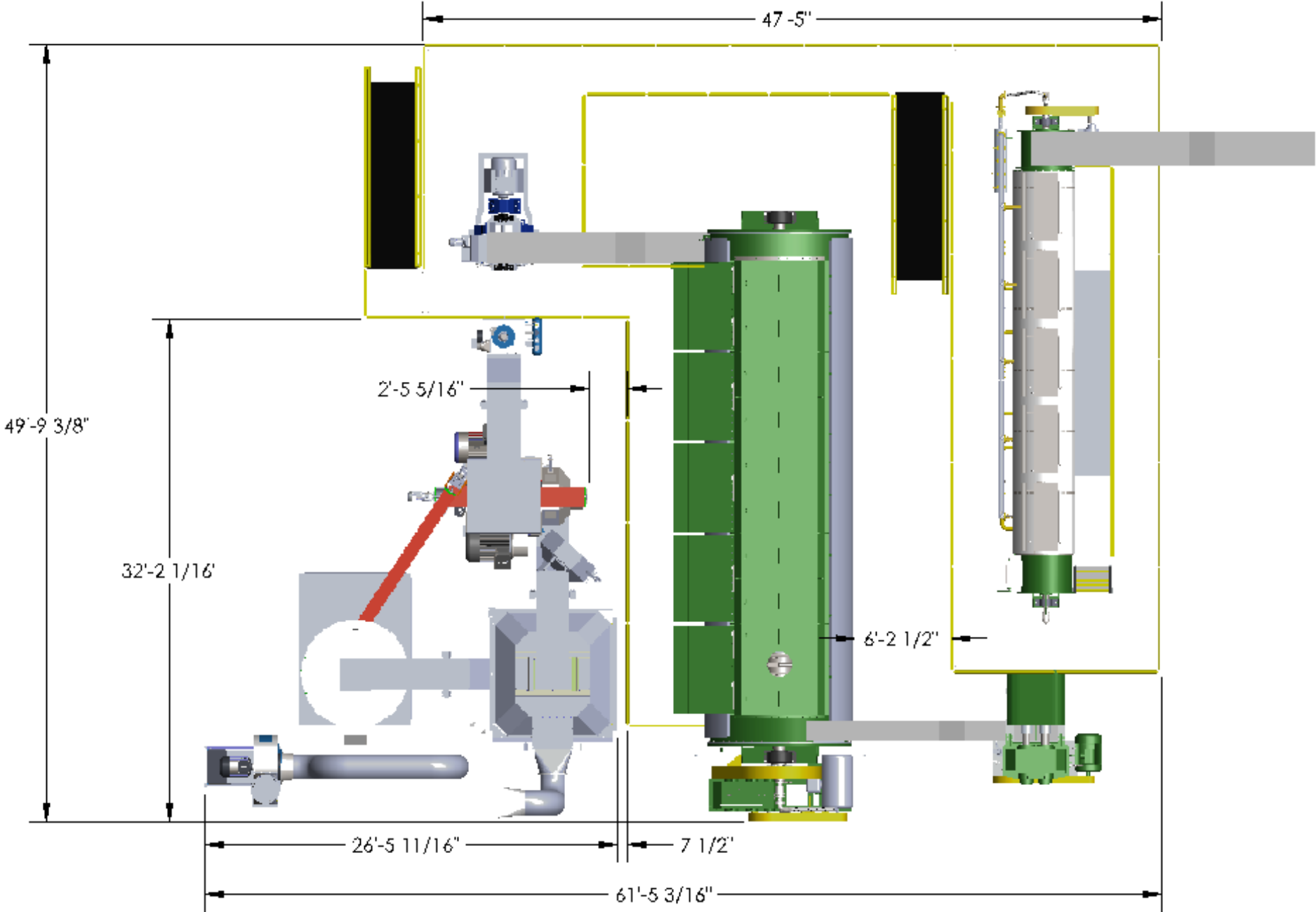
# Regreen Delta Configuration – Right Angle View



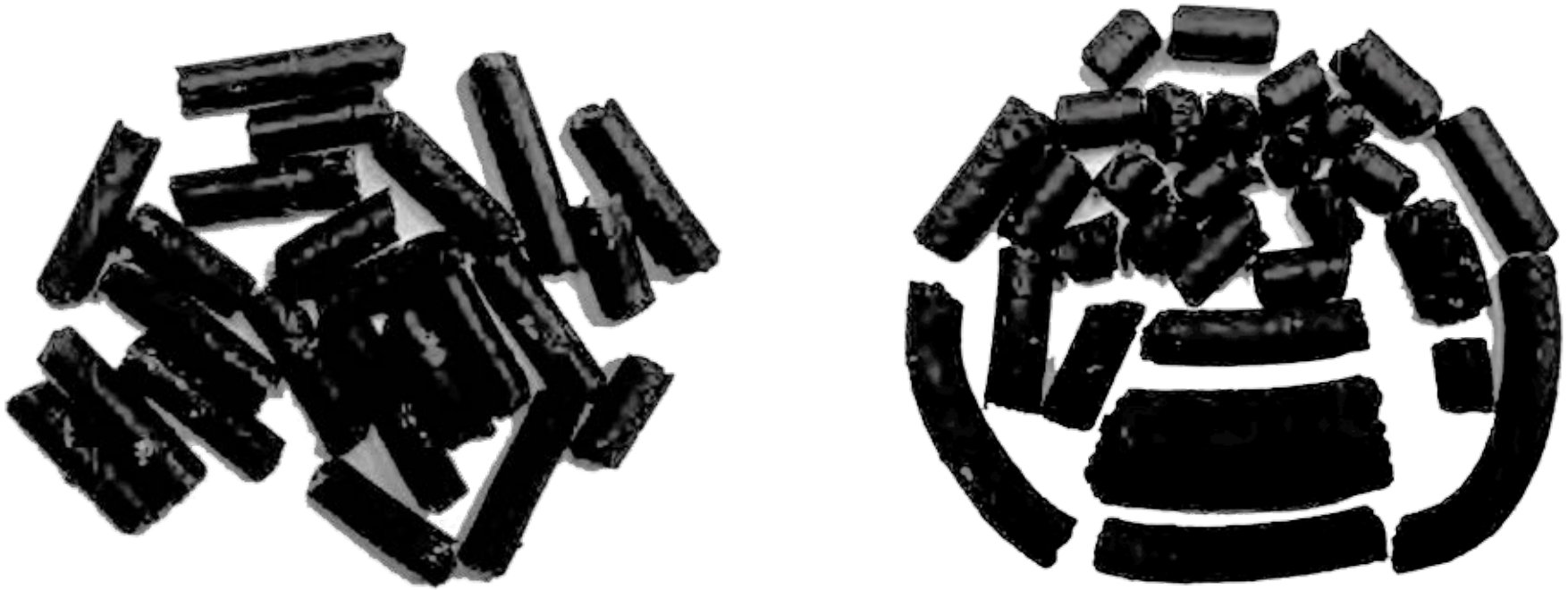
Pyrolysis with Turbine Electric Generator



# Regreen Delta Configuration – Top View



# Regreen Pellets



Regreen's pellets are the system's coal equivalent. After going through the pelletizer, pellets are then subjected to the gasification process to create syngas. Syngas is used to create steam, which will be used to power an electric turbine and produce electricity.

These pellets are financially viable. They are turning waste that would usually go into landfills into a legitimate source of energy that even rivals coal, and does not create pollution emissions or a carbon footprint. This means that the regreen system has found a way to "buy back" waste and turn it into pellets that are marketable just like coal but without the pollution and emissions, and additionally earn the vendor carbon credits as well.

These pellets are only limited by what classes of waste are being fed into the regreen system. In comparison to other sources of energy, we see that emission-wise and pollutant-wise they are the superior in every way, especially considering that they are never burned and do not go through the incineration process. On average, one megaton of Regreen pellets will be able to produce 1MW/hr of electricity.

# Fuel Comparison

Item	NG	Diesel	Coal	Regreen Pellets
Heat Value	8,700 KCal/kg	10,200 KCal/kg	5,000 KCal/kg	4,496 KCal/kg
Boiler Efficiency	88%	88%	74%	80%
Density Kg/m3	0.74	830	833	719
CO	1.96%	3.06%	1.78%	<1.00%
SO2	–	3.25%	0.5%	0.07%
Nox ppm	1.87	3.67	2.94	1.02

# REGREEN-Equivalent Power Plant

Incoming MSW Capacity	Machine Capacity	Liquid Extracted	Pellets Produced	Oper. Hours	Pellets Per Day	Energy Equivalent	Energy Output (19%)	Equivalent Power Plant
Daily (Ton)	TPH	TPH	TPH	Hours	TPD	MWh	MWh	MW
20.0	1.0	0.5	0.6	20.0	11.0	60.4	11.5	0.48
<b>100.0</b>	<b>5.0</b>	<b>2.3</b>	<b>2.8</b>	<b>20.0</b>	<b>55.0</b>	<b>301.8</b>	<b>57.3</b>	<b>2.39</b>
200.0	10.0	4.5	5.5	20.0	110.0	603.5	114.7	4.78
400.0	20.0	9.0	11.0	20.0	220.0	1207.0	229.3	9.56

## Key Takeaways:

- Regreen's 5 TPH machine can process 100 TPD of food waste and is equivalent to 2.4 MW power plant.

## Base conversion:

- Waste delivering 4717 kcal/kg.
- Systems Energy conversion efficiency is 19%
- It takes 24 Tons of Pellets per Day to generate energy equivalent to a 1 MW plant.

## Absolute Energy:

1 Ton of Regreen Pellets = 4,717,500 kcal

=5.5 MWh

Regreen Technologies, Inc.  
Return on Investment Projection

Projected Full Turn-Key with Installation

1 - 42 TPH System

Project specific ROI on request



**Regreen Today to Power Tomorrow**

[www.RegreenTechnologies.com](http://www.RegreenTechnologies.com)