GEODYN™ - TOTAL WASTE PROCCESSING SYSTEM

Turning Trash Into Treasure

- 2019 -

GEODYN™ SOLUTIONS

Description of Technology

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- This system is one of the world's most innovative municipal waste processing systems.
- The Total Waste System is a patented process using proprietary technology to turn any solid waste material into marketable products. Recovery facilities normally have to remove recyclable materials from the sorting line and the remaining waste must be landfilled. Not anymore, thanks to the technology we discovered and the Total Waste System.
- The process starts by placing waste material on the initial conveyor. This system can use a small loader but can be configured to accept materials directly from collection vehicles. This is useful for waste material with high organic content. In configurations of 5 tons-per-hour and higher comes equipped for a "negative-sort", removing metals, rock, and other inert materials or other potential contaminants. This sorting line is on ground level and is typically 3-feet wide.

Description of Technology

- With heavier sorting requirements, this system have the option of adding a trammel screen and elevated sorting line for the removal of recyclables. Immediately prior to the sorting line, we place a rotating-screen trammel to remove all materials that are under a designated size. Typically, this is a 3-inch screen, so all small materials drop to the ground-level sorting line, where metals are removed by magnet and rocks and other inert are removed in a negative sort performed by sorter-laborers. The trammels are sized to the desired processing capacity of the system. At the client's discretion, additional mechanical sorting equipment can be added (optical sorters, air handlers, etc.).
- All of the processing systems start with shredders featuring a proprietary design with a hydraulic pusher moving towards the shredding drum, which is designed from the ground up. No shredder on the market can produce uniformly sized material quicker or more consistently than our system. Tested on the toughest materials (palm fronds and plastic sheeting), our shredders can process up to 42 tons-per-hour to uniform sizes of 50 millimeters or less. This is vital to the process as a small uniform size allows our system to quickly kill bacteria, viruses, and odors.

Description of Technology

- After shredding, the material goes to radiant heat extractor where all the actions of killing the bacteria and odors will transpire. Then after the extractor, it will transfer to the press to remove the liquid. From there the waste material is brought to a moisture content of less than 40%. From the press the liquid will transfer to the special filtration system via pump. This process also reclaims water and by adding chemicals, it brings the reclaimed water up to irrigation standards. During this process the solids gets removed and is transferred back to the radiant heat dryer. The treated filtered liquid is used for irrigation, truck cleaning or other on-site or off-site uses.
- From the press, the material travels to the radiant heat drying processor. From there all the material get stabilized, and moisture gets extracted to a vapor within 1 - 6% moisture.
- A grinder is used to prepare the stable material from the radiant heat processor for palletizing or briquettes.
- Pellets and briquettes can be made to any specification. This system uses our pellet-chilling unit to create a long lasting and high-value commodity for food and green waste to fertilizer and animal feed. Energy products can also be made from municipal waste. These pellets burn cleaner; and have a higher BTU value than coal.

Waste Industry & Market

Waste

A WORLDWIDE PROBLEM … ever since the cave man days

2.2 Billion Tons
of waste globally each year

99 % of the stuff we buy is trashed within 6 months

WASTE

…. Problem continues

1. The waste we produce **every day chokes our living spaces**, produces greenhouse gas emissions and bacteria and creates deadly health risks.

2. Traditional methods of disposal are ineffective, inefficient, and unsustainable.

- Current waste created is accelerating. Earth's capacity to regenerate resources cannot cope with the demand.
- Landfill capacity and acreage required for traditional waste management systems is simply not available.

Our Vision

GOAL

Minimize Landfill use

A disruptive solution to the problem of municipal waste

- Team's intent is to strive to ZERO LANDFILL by conversion of ALL Municipal Waste {Total Waste and Organic Waste) into useful products: in a ZERO bacteria and ZERO carbon footprint process.

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HOW TO STRIVE ALSO TO MONITIZE WASTE?

MONETIZING WASTE

- Our intent is to save landfills by making conversion of trillion tons of waste a PROFIT CENTRE! by converting it to Golden-Pellets
- These GP are transformed into one of the following: green diesel, electricity, rubber filler, fertilizer, animal feed, Syngas, Hydrogen, Nitrogen and soil amendments.
- The ultimate end-product depends on the incoming waste (total waste or organics waste); all kinds of wastes are welcome.
- These revenue generating end-products make the commercial deployments feasible with very attractive ROI.

Our Innovative Deployment & Business Models

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Intellectual Property

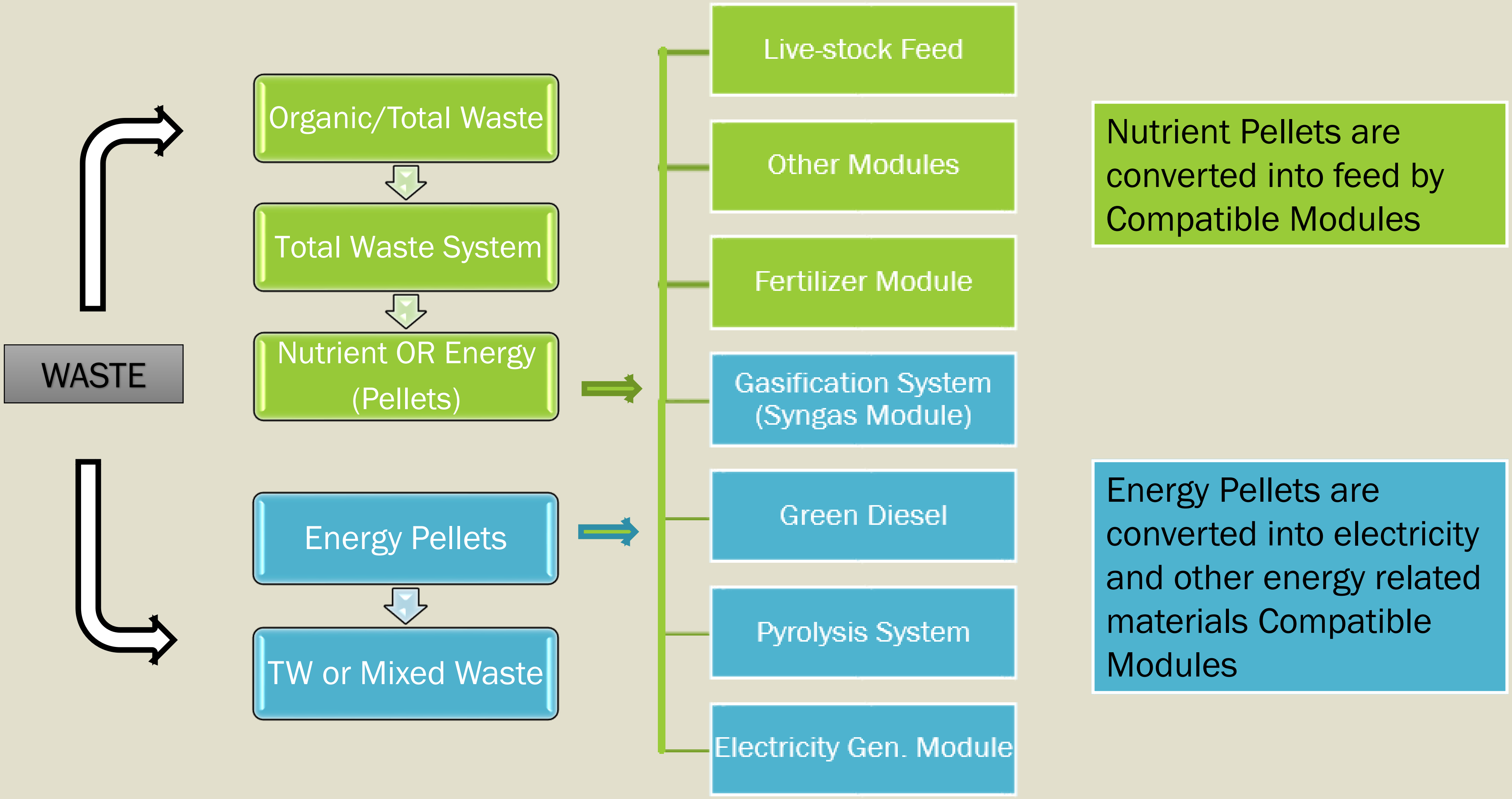
We innovate and protect

Our Team focus is on Innovation, cost reduction, performance and smaller foot-print and Protection of its IP by strong patents

- Complete Municipal Waste to Useful Product conversion systems
- Conversion of Municipal Waste to USEFUL products
- Thermal Technology to KILL PATHOGENS
- Effective SHREDDING of Mixed Municipal Waste
- System to dry to within 3% HUMIDITY

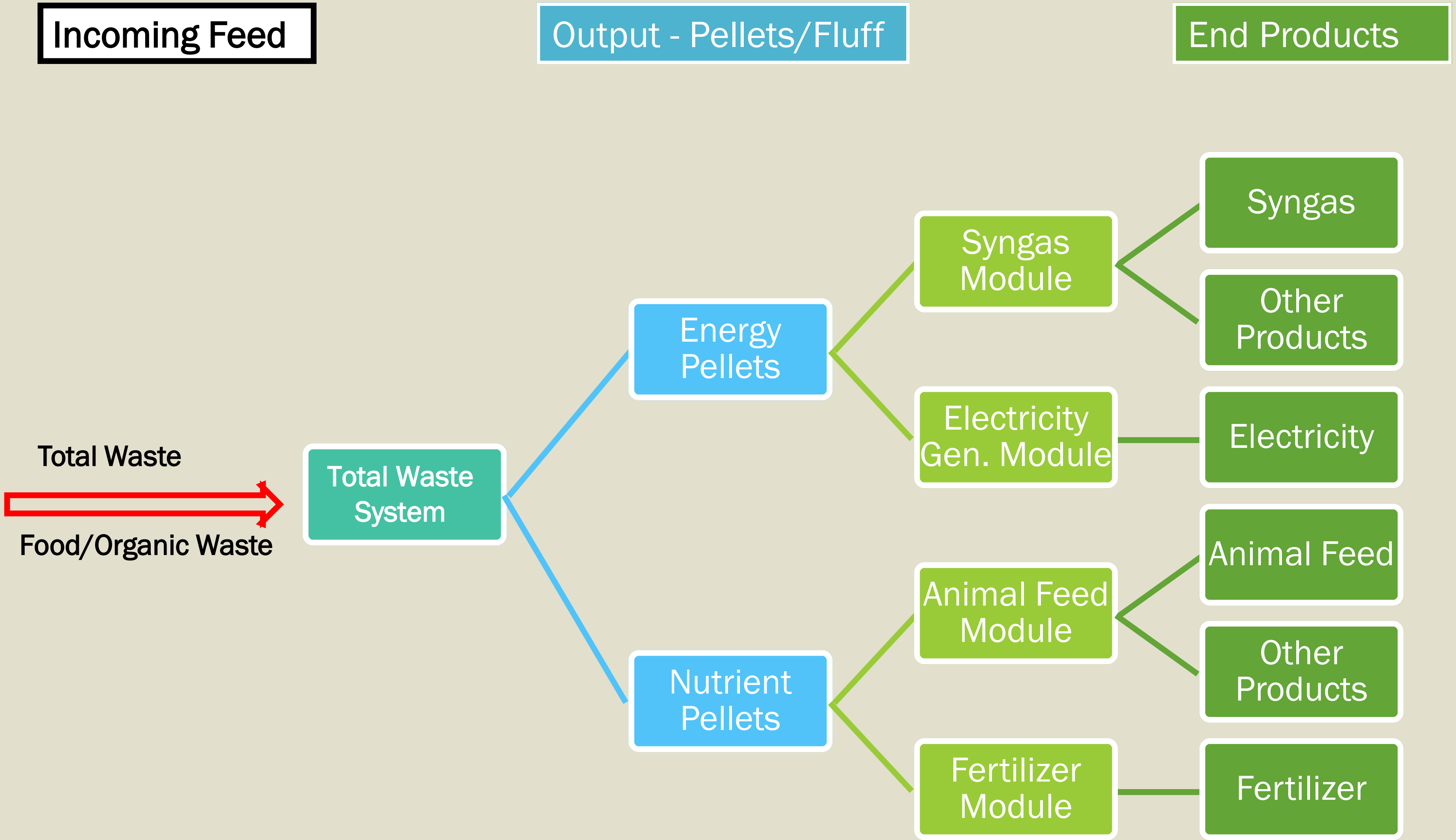
HORIZONTAL SYSTEM

Waste to pellets then to diverse end products



Our Compatible Modules

WASTE TO PELLETS THEN TO DIVERSE END PRODUCTS



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DISRUPTIVE TECHNOLOGIES & PROCESSES

- Transforms Municipal Waste into i/p for other processes
- Closed loop system – radiant heat – safe and efficient
- "Zero Emission" – Negative Carbon Foot Print
- "Zero" Landfill
- "Eliminates all bacteria" (arrests sporification)
- "Auditable" Enable sales of Carbon Credits
- Reclamation – Elimination of old and aging landfills
- Simple and Adaptable Process
- 45% global warming reduction from animal manure
- 25% global warming reduction from Food Waste

Technology Benefits

Trash to Pellets or "fluff' as the resulting product. This is sold on open Market to major users. By adding back-end modules, this product can be monetized by converting it into usable products, e.g. electricity, animal feed, chilling/air conditioning, other gases(H or N), rubber filler, etc.

DISRUPTIVE TECHNOLOGY

BENEFITS

- Targets both commercial and residential waste and Total Waste and Organic waste.
- No expensive and environmentally toxic storage or staging is required -- immediate conversion in less than one hour.
- System can process both fresh AND legacy waste piled up at aging landfills - allows reclamation of land.
- Modular systems with small footprint are easy to assemble, transport and scale as needed.
- Patented systems are manufactured under licensing agreements for us.
- Multiple manufacturing sites are strategically located to provide redundant and optimal sourcing support.
- These systems are easily "sized to fit" for different municipal waste loads - from 5TPH to 50 TPH (100 TPD to 3000 TPD) .
- The systems are design for longevity, ease of maintenance and low complexity -- as a result of combination of quality materials and manufacturing process and very low RPM.

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UTILIZING OUR SYSTEMS

Trash to fluff or pellets in less than one hour

Munixipal Waste - Raw Material

Shredded Waste

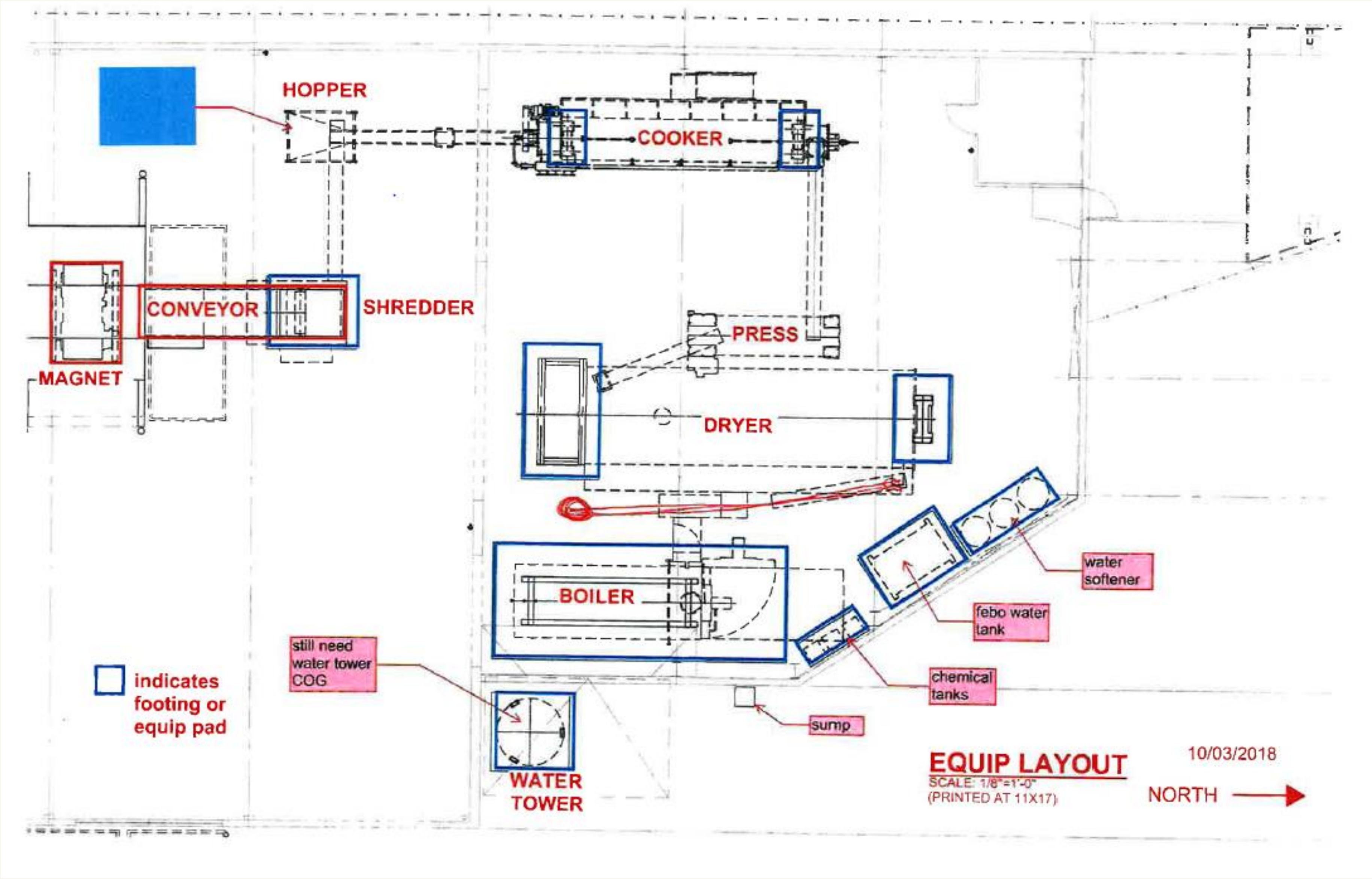
Pressed Waste

Pressed Liquid
from the Presses

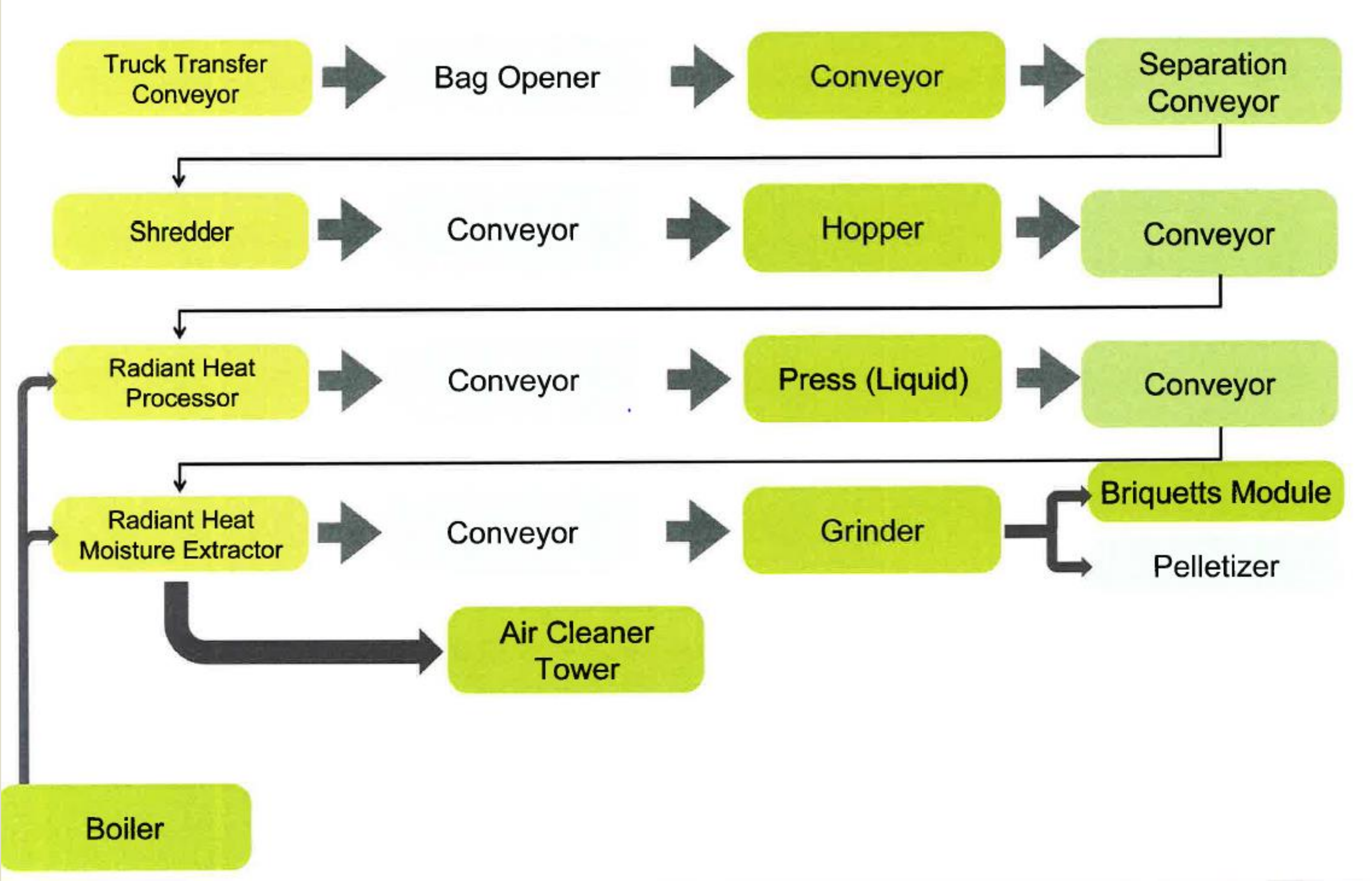
Radiant Heat
Processor/Dryer

Fluff

Our Process


HOPPER
COOKER
CONVEYOR
SHREDDER
MAGNET
PRESS
DRYER
BOILER
water softener
febo water tank
chemical tanks
sump
still need water tower COG
WATER TOWER
indicates footing or equip pad
EQUIP LAYOUT
SCALE: 1/8"=1'-0"
(PRINTED AT 11X17)
10/03/2018
NORTH

Process & Sub-Systems



Organic Waste Radiant Heat Processor

Models from 5 to 42 Tons Per Hour

- Gas Usage - 58 Nm^3 per metric ton
- Electricity Usage – minimal - average only $27 per-day US for 120 TPD operation.
- Footprint - 300 square feet to 1,000 square feet
- Hopper - Built to Suite Up to 20 tons holding capacity – metered feed
- Shredder -Sized from Model 25 to 80 depending on processing needs
- Evaporation Rate - 15% of organic material weight

Machines with 10 years of development and 4 years of testing. Able to process all types of organic waste in minutes. Produces odor free, harmful bacteria free and nutrient rich solids and liquid at a continuous rate.
Discarded organic waste travels through the "cooker" where dry steam never touches the material. This proprietary bellows system encapsulates and controls the steam to cook all material at a constant 150 degrees. The "press" removes liquids, then the dryer brings solid material to a 0% to 10% moisture level.

Comparison of Various Technologies

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Comparison of Various Technologies

S.No.	Technology	Process Time (days)	Working Temp (Co)	Output	% Residual to Landfill	Odor Free End Product	Humidity Control	Pathogen Free End Product	Power Needed	kCal Output	Power Production	Investment	Land Area Required	Environment Risks	Challenges	Sample Companies	Challenges/Advantages
1	Biotunnel Composting	24-28	55-60	• C02 • Compost • Stab Fraction	45%-55%	No	No	No	Mod	No	None	Low to Mod	High	Low	Area for Maturation	Cleanaway Tunnel	• Quality of Compost • Compost for Sale • Odors
2	In Vessel Composting System	7-Apr	55-60	• C02 • Compost • Stab Fraction	45%-55%	Yes	No	No	Mod	No	None	Low to Mod	High	Low	Area for Maturation	Green Mountain	• Quality of Compost
3	Anaerobic Digestion	50-60	40-45	• Biogas • Digestate • Stab Fraction	40%-45%	No	No	No	Mod	No	Low	Mod	High	Low to Mod	Operational Challenges		• Odors
4	Incineration	< 1	800-1200	• Gases • Bottom Ash • Fly ash • Liquid Waste	15%-25%	Yes	No	No (due to sporification)	Mod to High	No	High	High	Mod	High	High Initial Moisture		• Minimum calorific values • Control and monitoring of gas emissions • Disposal of Bottom and Fly ash • Exhaust Gas Dispersion • Skilled staff is needed • Operational Challenges
5	Pyrolysis	< 1	350-600	• Gases • Char • Bio-Oil	15%-25%	Yes	No	Yes	High	High	Mod	High	Mod	Mod	High Initial Moisture	Pacific Pyrolysis	• Gas control • Tars • Heavy Metals • Skilled Staffs • Operational Challenges
6	Gasification	< 1	800-1200	• Syngas • Char	15%-25%	Yes	N/A	Yes	High	High	Mod	High	Mod	Mod	High Initial Moisture		• Gas control • Tars • Heavy Metals • Skilled Staffs • Operational Challenges
7	Plasma Hi Temp Gasification	4 hrs	2200	• Syngas • Char	15%-25%	Yes	N/A	Yes	High	High	Mod	Very High	Mod	High	High Initial Moisture	Plasma Waste Disposal	• Gas control • Tars • Heavy Metals • Skilled Staffs • Operational Challenges
8	Dehydration	12-18 hours	80	• Desiccated food waste	45%	Yes	Yes	No	High	No	None	Low	Mod	None	High Initial Moisture	Somat	• Finding uses for the desiccated food wastes. With addition of humidity and moisture it come putrid again
9	Our Pellets	< 1 hour [Real time]	120-240 [very low]	• RDF Pellets • Filtrated Liquid Waste • Pellets used for steam/electricity	5%-10%	Yes	Yes	Yes	Moderate Also, self generation is possible	High	Highest % of conversion	Lowest	Minimum	Very Low			• System designed to be run by unskilled workers • Produces power which can be used to run the machine • Pellets can be transported to central station for power/steam production

Market Competition

Abstract

Summary of the Report

Sources of Waste

World Bank recognizes following sources of waste:

1. Domestic Waste
2. Commercial Waste
3. Institutional Waste
4. Industrial Waste
5. Street Sweepings
6. Construction and Demolition Waste

The waste from each sources has different composition (mix). Further, the mix changes with seasons and geography. This variation can't be handled by most waste treatment systems, as they are optimized to handle one or two types of waste streams. To accommodate the variation and to recycle and recover plastics, metals, and other reusable materials the waste is typically taken to an interim yard. This yard, where the waste is typically taken is a material recovery facility (MRF). Here the waste is segregated into buckets that are disposed of together.

Here are the various "waste classes":

1. Mixed municipal solid waste (low moisture and high moisture)
2. Farm and livestock waste (FLW)
3. Green waste - Christmas trees, palm trees, garden waste
4. Electronics components and products
5. Tires
6. Sewage sludge
7. Medical waste

Each of these waste classes have different moisture content, combustible materials, pathogens, organic and chemical compounds. This makes some systems more suited than others. This will be illustrated in the comparison tables.

Waste Addressed by Total Waste System

This process was designed to be a ZERO LANDFILL solution. Hence the innovations were done to make the system flexible across many different classes of wastes. The modular approach allows a variety of classes of waste to be processed in the main system - then use the intermediate output - "fluff" - to be used by either our end product modules, our certified modules OR even competitor's full processes. This was done by our teams to leverage huge existing installations that are lying closed due to changing mix conditions. We are able to help revive "sick" waste to energy plants.

Some examples:

1. The seasonal variations in moisture content can significantly lower the profitability of most incinerators. In fact, during the monsoons the waste had to be staged to be used as the feedstock. On the other hand, this processor can convert mixed waste which varies from 40% moisture to 95%moisture - without making any changes. This is due to the fact that the system was designed to use indirect steam heat which provides heat transfer only in the areas where it is needed. Thus a low moisture waste receives less heat while a pulpy rotting apple will get more heat. This ensures that all the waste entering the system will be processed in a similar manner.
2. The green garden waste. This along with the farm and livestock waste is the single greatest contributor of the greenhouse gases. This processor with its patented shredder can shred palm trees and fronds into small uniform fibers. Then the Organic Processor can convert it into fluff. Thus the green waste can also be processed in the same plant and ALL the material is converted with nothing sent to the landfill. Most facilities segregate the green waste and send it to an Anaerobic Digester system to reclaim the greenhouse gases before the residue is either spread as a fertilizer or sent to the landfills.
3. These processors can handle sewage sludge which is immediately converted into fluff (fertilizer) and reclaimed water.
4. Medical waste, from which all metals are recycled and waste is converted into a pathogen free fluff for fuel. Tires are stripped of the wires and metals and the rubber is converted into carbon black.
5. Existing plasma installations. The plasma installations are very sensitive to the type of mix and moisture content. Preprocessing the municipal solid waste and producing "fluff'', and then using that fluff as the feed stock to the Plasma systems not only makes the plasma systems more efficient and consistent, it allows MORE OF THE WASTE to be processed in the system.

The THREE classes of waste -- sewage sludge, medical waste and tires are specialized machines which are not being launched at the present time. The systems are able to process them but since those machines need further regulatory approvals, it is expected that after the required approvals that market segment will be discussed.

1. In summary, we focused successfully on the following classes of waste:
2. Mixed municipal solid waste
3. Farm and livestock waste (FLW)
4. Green waste - Christmas trees, palm trees, garden waste

Competitors

- Here are some competitive technologies that are available to address the conversion of the waste into useful products or energy.
- Biotunnel Composting (BTC)
- In-vessel Composting (IVC)
- Anaerobic Digestion (AD)
- Incineration (IN)
- Pyrolysis (PY)
- Gasification (GF)
- Plasma Hi Temperature Gasification (PHTG)
- Dehydration (DHY)
- The Process(TP)

To compare and discuss each of the above technologies, it helps to focus on the class of waste the technology is optimized for and its limitations.

The following tables list each technology, its main advantages and key metrics so that they can be compared with TP.

Biotunnel Composting (BTC)

The BTC process is used to compost separated municipal organic waste, food waste, yard waste,

digestate from AD, bio solids from waste water treatment and manure. It can be used for drying, stabilization or control of pathogens. (sample BioMRF Technologies Inc., CleanAway Tunnel)

The main issues are long time, odor complaints, expensive and large facilities. Ability to sell compost, typically the facilities end up giving away the compost to save charges from the landfill.

The waste is put in the reactor which is a tunnel made of reinforced concrete with sliding door and aerated floor. The material sits there while the air flow and temperatures are controlled until the composting is complete. Then the gases are recovered and the material is used tor fertilizer. Material needs to be mixed with wood chips or shredding to provide a proper uniform air flow. Since the wood does not degrade it is reclaimed and reused.

Class of Waste	Comment	Total Waste System
Minicipal Waste (Low moisture)	Waste is taken to MRF (material recovery facility) and the green waste is segregated. That waste is possible to be used in the BTC	• This system can help increase the capacity of the existing system and make the process faster using its shredders. • It can post process and remove all odors and pathogens
Minicipal Waste (High moisture)	Same as above the water is extracted from the waste prior to processing.	
Farm Waste	Most of the farm waste can be accomodated by BTC and it take from 24-28 days to process.	The shredders can preprocess the waste before the BTC and due to their ability to convert waste into small uniform pieces it greatly speeds up the BTC process AND provides a more uniform fertilizer products
Livestock Waste	Livestock waste is NOT processed in BTC due to its inability to kill the pathogens in the waste.	
Green Waste	The green leafy waste is composted while the branches are separated and sent to mulching or landfill.	The shredders can preprocess the waste and then it can be composted in BTC. That allows the operator to extract the greenhouse gases from the branches too, and eliminate the cost of disposal.
Palm Trees	Not used	Shreds the palm trees and fronds and converts into possible animal feed.

Bio Tunnel Composting System						
Process Time (days)	24-28	Odor Free End Product	No	kCal Output	No	Environment Risks Low
Working Tem (°C)	55-60	Humidity Control	No	Power Production	None	
Output	• C02 • Compost • Stab Fraction	Pathogen Free End Product	No	Investment	Low to Mod	
% Residual to Landfill	45%-55%	Power Needed	Mod	Land Area Required	High	

In Vessel Composting System

This is a group of methods that confine the compositing materials within a building, container or vessel. This process is used for municipal organic waste processing including treatment of sewage bio solids to a stable state for reclamation as a soil amendment.

The putrefaction causes odors that along with the slow process, expensive facilities and large area of buildings are the main issues with IVC. Many of the existing facilities are at capacity and unable to expand. Ability to find markets for the compost.

The bio solids are kept in the vessel and the air is controlled to provide optimum temperature for the reactions. The air is reclaimed via air filters.

Class of Waste	Comment	Total Waste System
Municipal Waste (Low moisture) Municipal Waste (High moisture)	The sewage sludge is composted to stabilize the material. The pathogens are stabilized but NOT KILLED. They can be revived as soon as they encounter favorable conditions. Secondly, the capacity of most facilities are under pressure	The processor can process the sludge to kill all pathogens. Secondly using our shredders as a conditions preprocessor can greatly increase the capacity of existing facility.
Farm Waste	Not used	
Livestock Waste	Not used	
Green Waste	Not used	
Palm Trees	Not used	

In Vessel Composting System						
Process Time (days)	24-28	Odor Free End Product	Yes	kCal Output	No	Environment Risks Low
Working Tem (°C)	55-60	Humidity Control	No	Power Production	None	
Output	• C02 • Compost • Stab Fraction	Pathogen Free End Product	No	Investment	Low to Mod	
% Residual to Landfill	45%-55%	Power Needed	Mod	Land Area Required	High	

Anaerobic Digestate

AD is used to treat biodegradable waste and sewage sludge. This reduces the emission of landfill gas into the atmosphere. (sample company GreenMountain)

Only 8% of the total hydrocarbon content is reclaimed as the gas, the rest of the heat value is wasted and goes with the sludge to be used as the fertilizer or soil amendments.

AD is a series of biological processes where microorganism breakdown biodegradable material in absence of oxygen. One of the end products is biogas, which is combusted to generate electricity and heat, or can be processed into renewable natural gas and fuel.

Class of Waste	Comment	Total Waste System
Municipal Waste (Low moisture)	The sewage sludge is composted to stabilize the material. They can be revived as soon as they encounter favorable condition.	This process can process the sludge to kill all pathogens. Secondly using the shredders as a preprocessor can greatly increase the capacity of the existing facility. Finally, TP can convert SLUDGE INTO FLUFF and is wasted. extract 1OX more calorific value than AD alone.
Municipal Waste (High moisture)	The capacity of most facilities are under pressure. There is tremendous calorific value in the sludge which	
Farm Waste	Not used	
Livestock Waste	Not used	
Green Waste	Not used	
Palm Trees	Not used	

Anaerobic Digestate						
Process Time (days)	50-60	Odor Free End Product	No	kCal Output	No	Environment Risks Low to Mod
Working Tem (°C)	40-45	Humidity Control	No	Power Production	Low	
Output	• Biogas • Disgestate • Stab Fraction	Pathogen Free End Product	No	Investment	Mod	
% Residual to Landfill	40%-45%	Power Needed	Mod	Land Area Required	High	

Total Waste Processing to Fluff/Pellets

Waste to Fluff/Pellets

Then we cover the system- waste to Pellets. This gives a major flexibility of having now the capability.

Then we can cover it with a comprehensive detail.

Going from waste to fluff (powder, pellets), now the waste can be processed on very distributed fashion and scalable system with modularity.

This gets rid of many problems from centralizing the processing, the landfills, the issues you stated (in urban areas the expensive real estate, hauling costs, etc.).

In rural areas, the issues relate to transmission lines and connecting to the grid for using the generated power when not needed, etc. Now we have the capability of the storage of energy and Nutrients for use later or another relocation. Once the pellets are done, you can transport the Energy Pellets and Nutrient Pellets.

Pellets to Energy

The Modules are then used to generate the end product (which includes electricity).

We can now look at the resulting End Products with the competitors. Electricity, SynGas, Green diesel, jet fluid, animal feed, fertilizer, rubber filler etc.

We do not need to go into detail of the other categories at this point (tires, etc.)

Types of Waste Processed

Domestic Waste	Waste from household activities, including food preparation, cleaning, fuel burning. Old clothes and furniture, obsolete utensils and equipment, packaging, newsprint, and garden wastes. In lower-income countries. domestic waste is dominated by food waste and ash. Middle- and higher-income countries have a larger proportion of paper, plastic, metal, glass, discarded items and hazardous matter.
Commercial Waste	Waste from shops. offices, restaurants, hotels. and similar commercial establishments; typically consisting of packaging materials, office supplies. and food waste and bearing a dose resemblance to domestic waste. In lower-income countries. food markets may contribute a large proportion of the commercial waste. Commercial waste may include hazardous components such as contaminated packaging materials.
Institutional Waste	Waste from schools, hospitals, clinics, government offices, military bases, and so on. It is similar to both domestic and commercial waste, although there are generally more packaging materials than food waste. Hospital and clinical waste includes potentially infectious and hazardous materials. It is important to separate the hazardous and non-hazardous components to reduce health risks.
Industrial Waste	The composition of industrial waste depends on the kind of industries involved. Basically, industrial waste includes components similar to domestic and commercial source waste, including food wastes from kitchens and canteens. packaging materials, plastics, paper. and metal items. Some production processes, however, utilize or generate hazardous (chemical or infectious) substances. Disposal routes for hazardous wastes are usually different from those for non-hazardous waste and depend on the composition of the actual waste type.
Street Sweepings	This waste is dominated by dust and soil together with varying amounts of paper. metal. and other litter from the streets. In lower-income countries, street sweepings may also include drain cleaning and domestic waste dumped along the roads, plant remains, and animal manure.
Construction and Demolition Waste	The composition of this waste depends on the type of building materials, but typically includes soil, stone, brick, concrete and ceramic" materials, wood packaging materials, and the like.

Description of the W2E Process

The types of waste described above are sent to a material recovery yard and the output of that can be categorized into TWO parts for this discussion.

1.) organic waste - which contains food waste and green waste and 2.) mixed waste - which contains everything that can't be recycled, reused and is not metallic or inert (stones, rocks etc.).

The two types of wastes are handled differently by MOST technologies. The technologies are limited by the type of waste, amount of heat content and finally the moisture content.

For example, for most technologies the waste has to have a balance of MOSITURE, COMBUSTIBLE and ASH CONTENT.

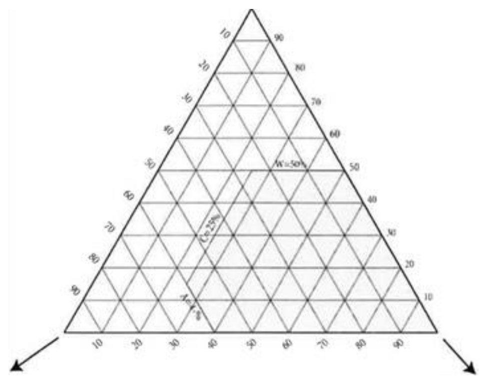
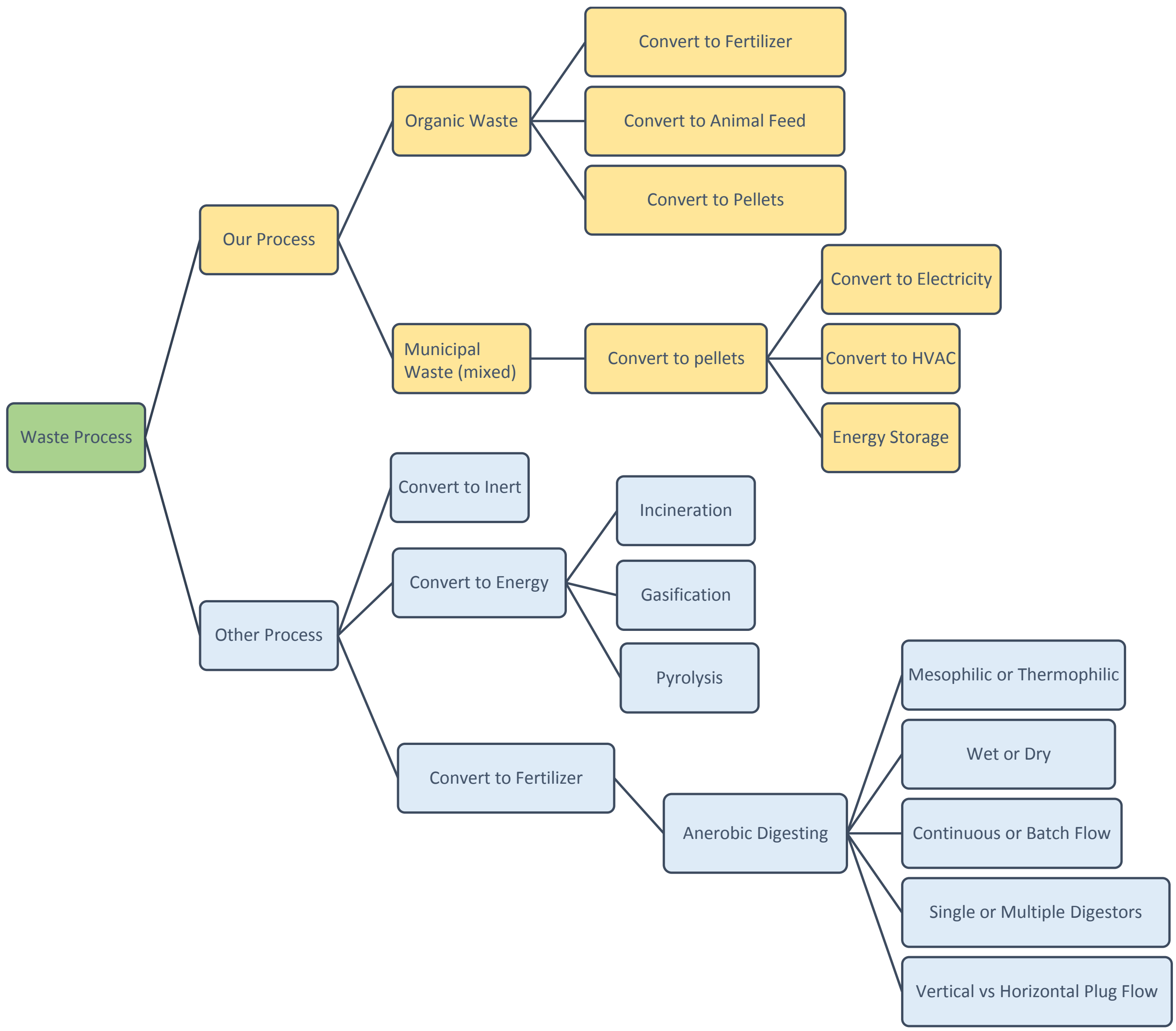


Figure 2.1 Tanner triangle for assessment of combustibility of MSW

On the other hand, the process can take waste from either end of the spectrum. This lowers the cost of conversion by reducing the need to segregate. Still, it is advisable to segregate if it is possible as the REVENUE from the output is much higher from the organic waste compared to the mixed solid waste.

For example, the organic waste can be converted into animal feed or fertilizers which are much higher and best use of the nutrient energy in the conversion process than simply converting the calorific value into energy.

The chart below shows the various destinations of the waste



So we are going to compare the conversion of Municipal Waste into energy and organic waste into fertilizer.

One more aspect that we need to balance is the conversion efficiency and investment efficiency.

A note on efficiency:

Each energy conversion process (chemical to heat, heat to steam, steam to electricity, etc.) has losses. The more stages equate to higher losses and lower the efficiency. Further, since each stage requires investment, it is plain that a lower number of stages result in a HIGHER conversion efficiency and a HIGHER investment efficiency. We will also note the number of stages needed to get to the useful product.

Pellet Production Estimator

We have a very robust and tested estimation for the tons of pellets produced. This chart shows for example, a machine of 5TPH capacity can convert 1OOTPD of typical municipal waste into 55 TPD of pellets.

The tons of pellets and the kCal from the estimator above - allows us to effectively design the systems and lower the financial risk.

Incoming Waste Capacity	Machine Capacity	Water Content	Liquid Extracted	Pellets Produced	Oper. Hours	Pellets Per Day	Energy Equivalent	E. Output (19%)	Equivalent P Plant
Daily	TPH		TPH	TPH	Hr	TPD	MWHr	MWHr	MW
20.0	LO	45%	0.5	0.6	20.0	11-0	60.4	11.5	0.48
100.0	s.o	45%	2-3	2.8	20.0	55.0	301-8	57-3	2.3!1
200.0	10.0	45%	4_5	5.5	20.0	110.0	603-5	114.7	4.78
400.0	20.0	45%	9.0	11.0	20.0	220.0	1207.0	229.3	9.56

Key Takeaways:

. The 5 TPH machine can produce about 100 TPD of food waste and is equivalent to a 2.4 MW

power plant based on waste delivering 4,717 Kcal/kg

. System energy conversion efficiency Is 19%.

. It takes 24 Tons of pellets per day to generate energy equivalent to a 1MW plant.

Use of Pellets

The system was designed to be able to provide ROI even if the long term PPA were not available

The multi-use pellets again provide flexibility and future-proofing for our plant. It has been found that most PPA are being rescinded and rarely extend more than 5-8 years. This flexibility lowers the RISK of our plant. The pellets can be sold to ever changing and higher value as market conditions change.

Typically, the plant is financially structured based on "non segregated fuel pellets", which are the lowest revenue product. As the mix of waste is stabilized and more particular testing completed - the pellets can be successively sold for higher and higher best use.

This patented system, continuous and lowest conversion cost per ton process, converts Municipal Waste or Organic waste with up to 90% liquid content into a 4-7% humidity fluff;

This fluff can be extruded into pellets of various sizes, density and surface attributes to match the fuel use applications. The typical heat value of the fluff/pellets is 4,300 Kcal/kg (it ranges from 3,800 to 5,500 kCal/kg) and depends on the inputs. The heat value and burn characteristics can be modified and controlled by minor batching; use of additives and physical surface. [e.g. animal manure and bedding (3,900 Kcal/kg), just manure (3,200 Kcal/kg), plastic mixed (5,400 Kcal/kg)}.

This makes our process into the most efficient (lowest energy use, floor space and time) and flexible converter of Municipal Waste and organic waste.

Some of the applications Fluff being used for:

- Currently the primary use is as a high kCal fuel for the cement factories
- Pellets are sold all over the world:
  - Fuel
  - Heating
  - Steam generation
- Use of pellets for HVAC applications
  - Our pellets in direct fired absorption chillers can deliver 44°F chilled water - in sizes from 10 tons to 600 ton cooling capacity. These are used in applications for apartment and office buildings, hotels, casinos and high rise offices and apartments.
  - This chiller uses 78.9 kg of pellet to run a 100 room hotel in 24 hours.
- Other applications:
  - Production of Green Diesel (Sulphur free)
  - Production of emission free Syngas
  - Production of Jet Fuel
- For fluff/pellets made from food waste:
  - Animal feed ($200-400 per ton).
  - Production of Organic Rubber filler, sold to car manufacturers ($2,500 per ton).
  - Production of Bio Char f$50- $100 per ton) used for farming
- For fluff/pellets made from ruminant of digester systems
  - Organic fertilizers
- Electricity production
  - Typically, 2 tons of wet municipal waste or Food waste with 50% moisture content produces 1Ton pellets which can produce 1- 1.2 MW
- The pellets also used for power storage and used on demand and ship it anywhere with ease.

Comparison of Organic Waste Processor and Anaerobic Biogas Digesters

Anaerobic Digestion is the bacterial breakdown of organic materials in the absence of oxygen. There are over 200 sites worldwide with operating capacities of 2,500 tons per-year or more. There are very few large-scale anaerobic digester sites than can approach the 90,000 tons per- year a 15 ton-per-hour Organic Waste Processor can handle. There are two facilities located in California which are the largest of their types in the world and are comparable.

These two ambitious installations are the Zero Waste Energy Development (ZWE) system in San Jose, California (Dry) and the CR&R Anaerobic Digester Facility in Perris, California (Wet). The CR&R facility is a $105 million installation that can process up to 335,000 tons per-year. This facility does not produce electricity. It pipes the methane gas produced to a natural gas pipeline. The CR&R Digester is over twice as costly, on a processing capacity basis, as a 15 TPH Organics System and syngas system at at least 50% cheaper than others. Also the CR&R Digester has significant "digestate" material (as a residual waste) which CR&R must be pay $50 per-ton to have land-farmed to dry for use as biomass, which is an added cost that the system doesn't have.

The Zero Waste Energy Development (SWE) system in San Jose is considered a better installation for comparison purposes, as it has the same capacity and produces electricity. The table below shows the key metrics:

Anaerobic Digestion vs. Total Waste System

Element	ZWE System San Jose, CA	Our 15 TPH 20 Hours @ 300 days
# of Processing Units	16	1
Annual Processing Capacity	90,000 tons	90,000 tons
BioChar Residual	0	9,000 tons
Compost	34,000 tons	0
Electrical Output	1.6 MW	3.4 MW
Equipment Cost	$40 million	At least 50% cheaper
Processing Time	21 Days	1Hour
Residua l Waste Disposed	13,500 tons	0
Site Acreage	23	2

The ZWE system is more costly, as it requires a much larger site, and produces less electricity. Our Organic Waste Processor does not produce compost as an end product. However, the biochar produced has a value that is in the $50 to $100 per-ton range, while the ZWER "compost blend" is valued at $14 per-ton. Also, the SWE system only utilizes 84.5% of the incoming material. Over 13,000 tons per-year is disposed in landfills.

Clearly the Total Waste System is the better value and the better energy producer.

Comparison of Electrical Power Generation: Solar Array vs Total Waste System

There are inherent differences in the two systems. Total Waste System is capable of **continuous power generation** using municipal waste Pellets, while solar systems are dependent on the sunshine. The key advantage of a solar system is that once it is installed there a very small (3%) annual maintenance cost. The power is reliably generated over the life of the system (usually 25 years). The system relies on the municipal waste to generate energy. Once the system is installed, the input is the municipal solid waste, which in most markets commands a tipping fee to use the municipal waste and divert it from the landfills; due to which the variable cost differential is reversed.

Another key difference in the two systems is that **our pellets can be easily stored** and transported to be used where there is need for power. This reduces the dependence on storage batteries and transmission lines. Solar system, due to the daily and seasonal variation, are not suited for primary generation but typically act as the base load generators.

With the above issues, comparison of the two systems is not straight forward. For this request, we were asked to compare the two systems based on **comparable usable energy generated**. The study does not include the interest payments, tipping fees are also NOT included in the analysis, neither was the cost of storage (batteries) that is needed in case of solar systems.

The unit of comparison is based on **ONE 15 TPH machine working 20 hours per day**. The system generates pellets which are converted into electrical energy of 73,500 MWhr per year. A corresponding solar system would be one rated at 40 MW plate capacity. This system will generate about 66,000 MWhr per year. We deemed them to be comparable.

	Solar Plant	Our System
Generation Cost of Power (kWh)	$0.016	$0.019
Area Needed (Acres)	200	4
Investment	$36 MM	at least 50% cheaper
Annual Power Output (MWhr)	66,000	73,000
Operating Cost	$1MM	$1.5 MM

Investment:

The total investment for the solar system would be $36 million and the system will be installed over 200 Acres of land. Our comparable system will require an investment of at least 50% less and use about 4 acres of land.

Per Unit Cost:

Not including the cost of financing, revenue from tipping fees, or energy storage the comparable variable cost per unit of energy are almost equal. A unit of energy generated from the solar system costs $0.016 kWh (about 2 cents) compared to $0.019 kWh (2 cents) for our system.

Summary:

It is noted that not only our system provides 24-hour power, takes 50x less area and the investment is 2.5x less, it reduced the use of landfills, removed the organic matter from the landfill and hence reduces greenhouse gases. Both the systems have their own place but for an inhabited city or a place with organic, farm or animal waste - Total Waste System is the preferred system.

Application - Pellets used for HVAC

The BEST and HIGHEST use of our pellets is the use in a HVAC system. The conversion of energy from pellet to cold water has the least number of steps and hence the most effective energy conversion. This system is the simplest, lowest in investment and highest conversion efficiency system for W2E conversion. No other technology can do the same.

The chart below shows that a 100Ton/hour of cooling is achieved by 51 kg of pellets per hour. In fact, a 100,000 sqm mall can be cooled with 75 tons of pellets per day.

Cooling Equat ion [cooling load at 44°F]

558,000 BTU/hr	66 Tons of cooling
1Tons of cooling	8,455 BTU/hr

Cooling Provided	Heat Needed		Pellets Required	Square Meters		
[Broad Std Sizes]				India	CA	Shopping Mall
66 Tons/hr	558,000	BTU/hr	33.5 Kg/hr	1,533	1,839	1,226
100 Tons/hr	845,455	BTU/hr	50.8 Kg/hr	2,323	2,787	1,858
165 Tons/hr	1,395,000	BTU/hr	83.8 Kg/hr	3,832	4,599	3,066
248 Tons/hr	2,096,727	BTU/hr	125.9 Kg/hr	5,760	6,912	4,608
331 Tons/hr	2,798,455	BTU/hr	168.0 Kg/hr	7,688	9,225	6,150
413 Tons/hr	3,491,727	BTU/hr	209.7 Kg/hr	9,592	11,511	7,674
496 Tons/hr	4,193,455	BTU/hr	251.8 Kg/hr	11,520	13,824	9,216
5974 Tons/hr	50,507,225	BTU/hr	3032.9 Kg/hr	138,750	166,500	111,000

Sample:
A 111,000 sqm mall will need 75 ton of pellets per day.
A 280 sqm (3,000 sqft) Pizza Hut will need 185 kg of pellets/day.
To cool a CA hotel room needs about 0.51 Kg of Pellets/Hr

Reference: Chiller needs cooling tower with water at 85 °F

Cooling Loads	Shopping Mall	200 sqft per Ton	18.6 sq mt
	India	250 sqft per Ton	23.2 sq mt
	California	300 sqft per Ton	27.9 sq mt
	MacDonald/Pizza Hut	200 sqft per Ton	18.6 sq mt

OXIDATION

There are three oxidation methods where each have their own pro/cons. They are different in the amount of oxygen that is made available for the conversion. This results in different end products but all are limited by the moisture content and the calorific value in the waste. The systems were designed TO CONVERT WASTE INTO ENERGY but were NOT DESIGNED as profit centers. They all have a NET COST to convert the waste into electricity. Our system is the only process that converts W2E with a NET low to zero cost.

Incineration

Incineration: is the complete oxidation of Municipal Solid Waste. The combustible materials contained in the solid waste fuel, and its process is highly exothermic. During combustion of solid waste, several complex processes happen simultaneously. Initially, the heat in the combustion chamber evaporates the moisture contained in the solid waste, and volatilizes the solid waste components. The resulting gases are then ignited in the presence of combustion air to begin the actual combustion process. The process leads to the waste fuel conversion into fuel gas, ash and heat. The heat released is used to produce a high-pressure superheated steam from water. This steam is then sent to the steam turbine that is coupled with a generator to produce electricity, or used to provide process steam. It is important to note that the bottom ash and fly ash are formed by the inorganic constitutes of the waste. Depending on the bottom ash treatment options, ferrous and non-ferrous metals can also be recovered and the remaining ash can be further enhanced. This can be used for road construction and buildings.

- Combustion of raw Municipal Waste , moisture less than 50%.
- Sufficient amount of oxygen is required to fully oxidize the fuel.
- Needs high calorific value waste to keep combustion process going, otherwise requires high energy for maintaining high temperatures
- Combustion temperatures are in excess of 850 degrees C.
- Waste is converted into C02 and water, concerns about toxins (dioxin, furans).
- Bacteria are not killed

Gasification

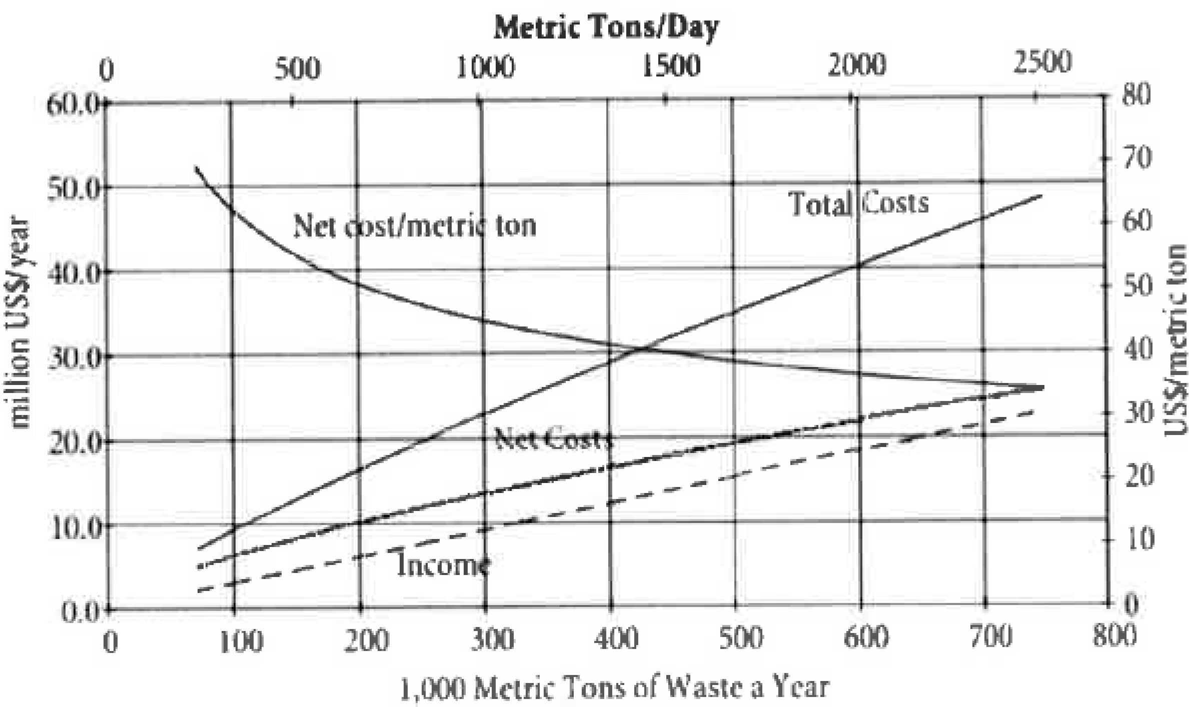
Solid waste gasification is the partial oxidation of waste fuel in the presence of an oxidant of a lower amount than that required for the stoichiometric combustion. The gasification process breaks down the solid waste or any carbon-based waste feedstock into useful by-products that contain a significant amount of partially oxidized compounds, primarily a mixture of carbon monoxide, hydrogen and carbon dioxide.

Furthermore, the heat required for the gasification process is provided either by partial combustion to gasify the rest or heat energy is provided by using an external heat supply. The produced gas, which is called syngas, can be used for various applications after syngas cleaning process, which is the greatest challenge to commercialize this plant in large scale. Once the syngas gas is cleaned, it can be used to generate high quality fuels, chemicals or synthetic natural gas (SNG); it can be used in a more efficient gas turbines and/or internal combustion engines or it can be burned in a conventional burner that is connected to a boiler and steam turbine. However, the heterogeneous nature of the solid waste fuelmakes the gasification process very difficult together with the challenges of syngas cleaning, and there are not many large-scale stand-alone waste gasification plants in Europe.

Pyrolysis

Pyrolysis of solid waste fuel is defined as a thermo-chemical decomposition of waste fuel at elevated temperatures, approximately between 500 degrees C and 800 degrees C, in the absence of air and it converts municipal waste into gas (syngas), liquid (tar) and solid products (char). The main goal of pyrolysis is to increase thermal decomposition of solid waste to gases and condensed phases. The amount of useful products from pyrolysis process (CO, H2, CH4, and other hydrocarbons) and their proportion depends entirely on the pyrolysis temperature and the rate of heating. It is important to note that the mechanical treatment ahead of gasification, sensitivity to feedstock properties, low heating value of waste fuel, costly flue gas clean-up systems, difficulty of syngas clean-up and poor performance at small scale have been a great challenge during gasification of Municipal Waste

Figure 4.4 Net Treatment Cost



Comparison of Various Technologies to Handle Organic Municipal Waste

S No.	*Technology*	*By-Product*	*Capacity*	*Zero Landfill*	*Processing Time*	*Processing municipal waste to Pellets*	*Pathogen Free End Product*	*Odor Free End Product*	*Humidity Control*	*Indirect Heat Controlled Cooker*	*Indirect Heat Controlled Drying*	*Pelletizing*	*High Kcal Output*	*Piquid Separation / Filtration*
1	**Total Waste System**	Fertilizer / Feed Fuel Pellets and water recover	Up to 42 TPH	Yes	21 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Kcal pellets	Yes
2	**Tunnel Composting**	Compost	Various	No	7-30 days	No	No	No	No	No	No	No	No	No
3	**Dry Fermentation Digester**	Bio-gas	Various	No	21-28 days	No	No	No	No	No	No	No	No	No
4	**In Vessel Composting System**	Compost	40-59Yds	No	14-21 days	No	No	No	No	No	No	No	No	No
5	**Biomass Pyrolysis**	BioChar/Syngas	2-4 TPH	No	2-4 TPH	No	Yes	Yes	No	No	No	No	Yes Kcal Gas	No
6	**Plasma Waste Disposal**	PCG (Plasma Converted Gas)	10-500 TPD	No		No	Yes	Yes	No	No	No	No	Yes Kcal Gas	No
7	**Dehydration System**	Dehydrated Food Waste	110-220 lbs/day	No	12-18 Hrs	No	No	Yes	Yes	No	No	No	No	No
8	**In Vessel Composting System**	Compost	75 tons	No	4-7 days	No	No	Yes	No	No	No	No	No	No

TOTAL WASTE SYSTEMS AND SUB-SYSTEMS

System Layout

Radiant Heat Processor Sub-system

Press Sub-system

Radiant Heat Dryer

System & Subsystems

- Transfer Conveyer (truck to the Bag Opener)
- Bag Opener
- Separating Conveyer (w/Fe metallic magnetic)
- Shredder Loading Conveyer
- Loading Conveyer (Shredder to Hopper)
- Hopper
- Conveyer from Hopper to Radiant Heat Cooking Processor
- Radiant Heat Cooking Processor
- Conveyer from Cooker to Press
- Separation Press
- Conveyer from Press to Radiant Heat Dryer
- Moisture removing Silo, fan and filtration to return dust back to the dryer for emission free system
- 8 T/Hr boiler, water softener

GEODYN™ SOLUTIONS

GEODYN™ SOLUTIONS

TRUCK TRANSFER CONVEYOR

- This a heavy duty platform and conveyor designed to take the municipal waste from truck. These are custom designed to application and prevent spillage and contamination of soil water.
- Steel conveyor designed for heavy impact
- 11m x 2.6m x 2m

BAG OPENER

- This system is designed to open all bags and homogenize the trash for efficient separation and processing
- This is matched to our system and is designed to open both very thin and thick bags.
- 8.1 m x 2.1 m x 2m. Total volume 16 cubic meter

SEPARATION CONVEYOR

- This is used for manual visual inspection and separation of municipal waste before the shredder. They can be fitted with various metallic, non-metallic separators.
- This includes automatic magnetic separator .
- 8.0m x 1.0m

SHREDDER

- These shredders are the heart of our 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.
- 2.8m x 2.1m x2.7m
- 10,692 Lbs
- Sizes: ¼, 5, 15, 42 T/Hr

HOPPER

- This is a buffer hopper used to match the variation of municipal waste constitution and the speed of the various sub systems.

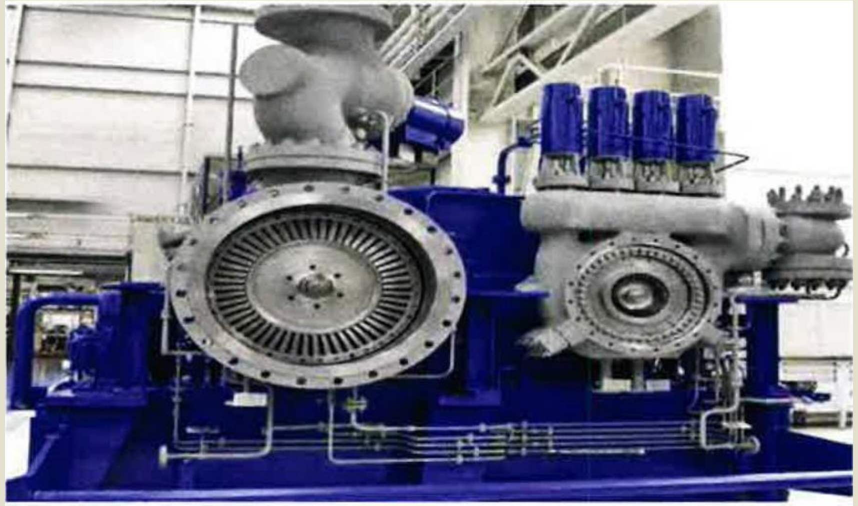
RADIANT HEAT PROCESSOR

- This processes the shredded waste by space age technology to deliver zero bacteria. It utilizes INDIRECT dry steam or oil for energy. Disintegrates many of the toxins found in the municipal waste.
- Operating temp 160ºC, at low rotation speeds (3RPM)
- Operating pressure: 6 bar
- 9.9m x 1.19m x 1.4m
- Motor 7.5 Kw
- 10,700 Kg

Compatible Modules - Pyrolysis

Compatible Modules - Gasification System

Compatible Modules - Green Diesel System



Compatible Modules - Steam Turbine Generator

GEODYN™ SOLUTIONS

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
- 11m x 2.6m x 2m
- Speed - 3 to 4 RPM

RADIANT HEAT MOISTURE EXTRACTOR

- This is designed to kill all remaining pathogens. It also lowers the moisture content to 1%. The operator using indirect dry steam or oil at 6 bar pressure.
- The dryer is able to efficiently deliver up to 1% humidity in a continuous operation due to patented technology .
- 10 m x 2.6 m x 3.9 m
- 110 kW. 30,000 Kg

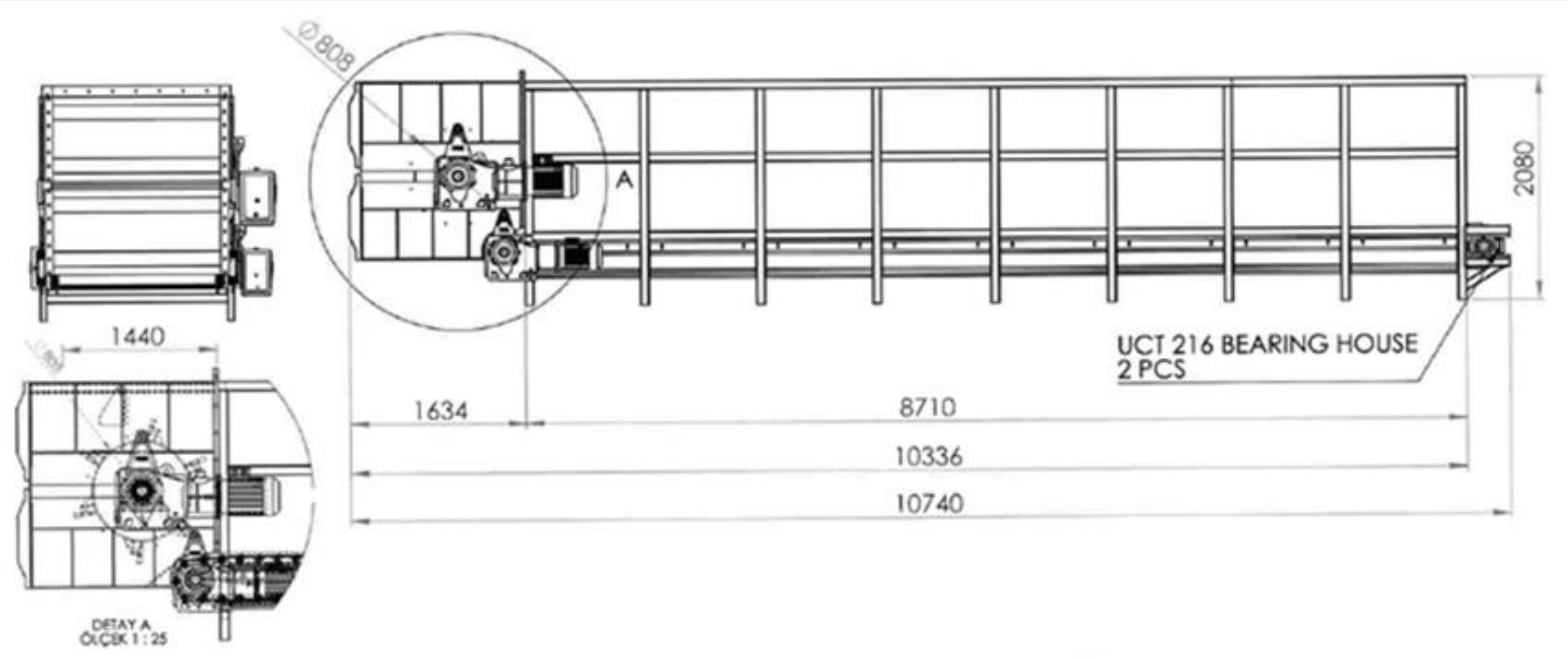
AIR CLEAN TOWER

- This tower has multiple bends to create turbulence and remove all airborne particles and absorb remaining toxins -- to deliver acceptable emissions.
- This can be designed to meet and exceed the local air quality standards.

PELLETIZER

- This OPTIONAL system is used to convert the fluff into pellets as specified by the customer.
- Our pellets are made without using ANY RESIN or additives.

BAG OPENER



Description:

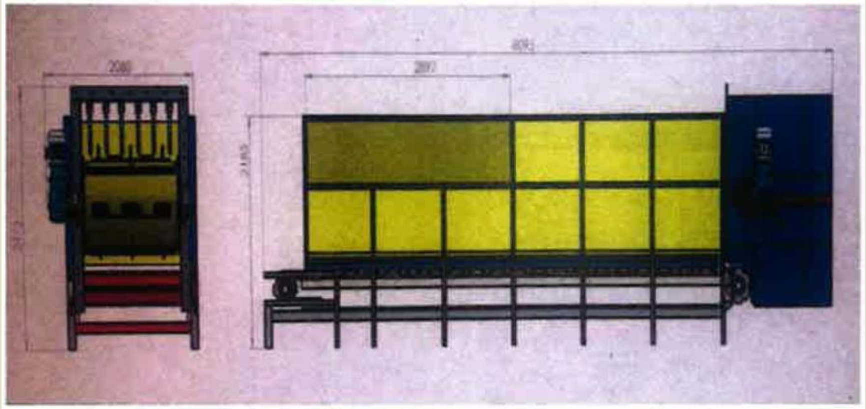
- This is used to make the municipal waste homogenous and open all bags.

Key Elements:

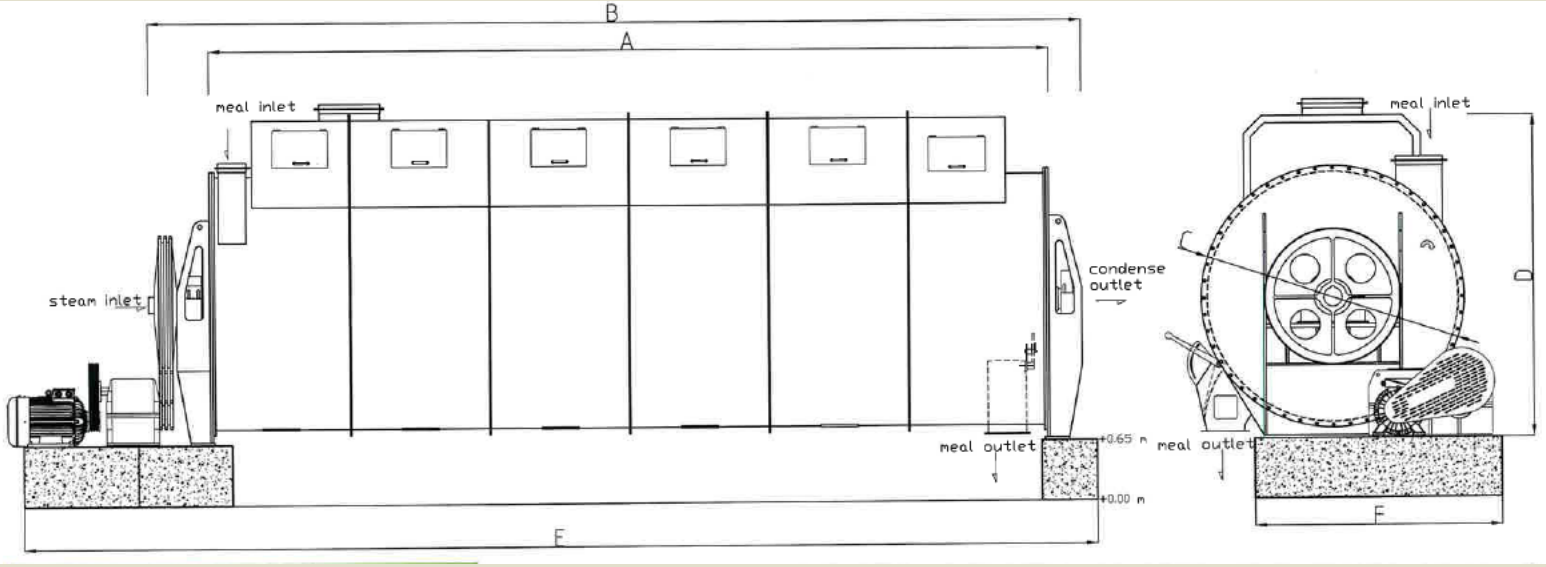
- Targets both commercial and residential waste.
- No expensive and environmentally toxic storage or staging is required -- immediate conversion in less than one hour.

BAG OPENER

- This system is designed to open all bags and homogenize the trash for efficient separation and processing
- This is matched to our system and is designed to open both very thin and thick bags.
- 8.1 m x 2.1 m x 2m. Total volume 16 cubic meter



Radiant Heat Moisture Extractor

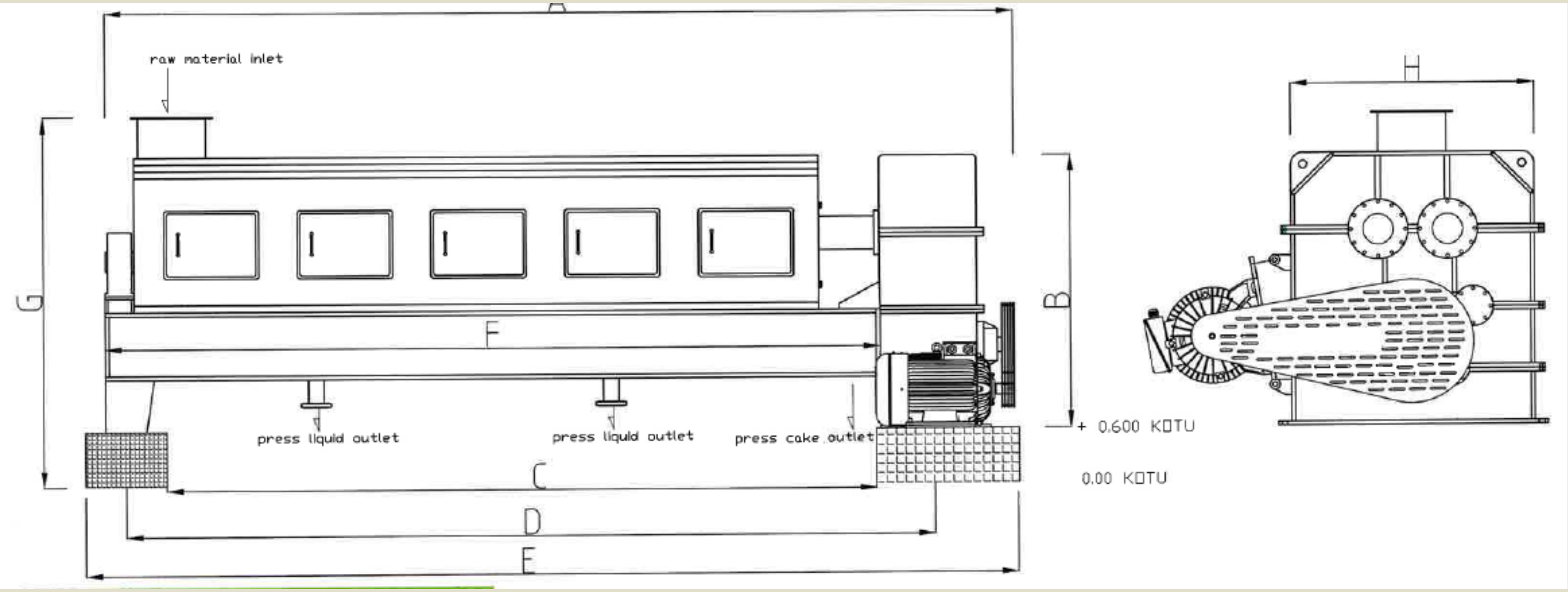


- This is designed to kill all remaining pathogens. It also lowers the moisture content to 1%. The operator uses indirect dry steam or oil at 6 bar pressure.
- The dryer is able to efficiently deliver up to 1% humidity in a continuous operation due to our patented technology.
- 10m x 2.6m x 3.9m

  110kW. 30,000 Kg

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

Press Liquid Extractor

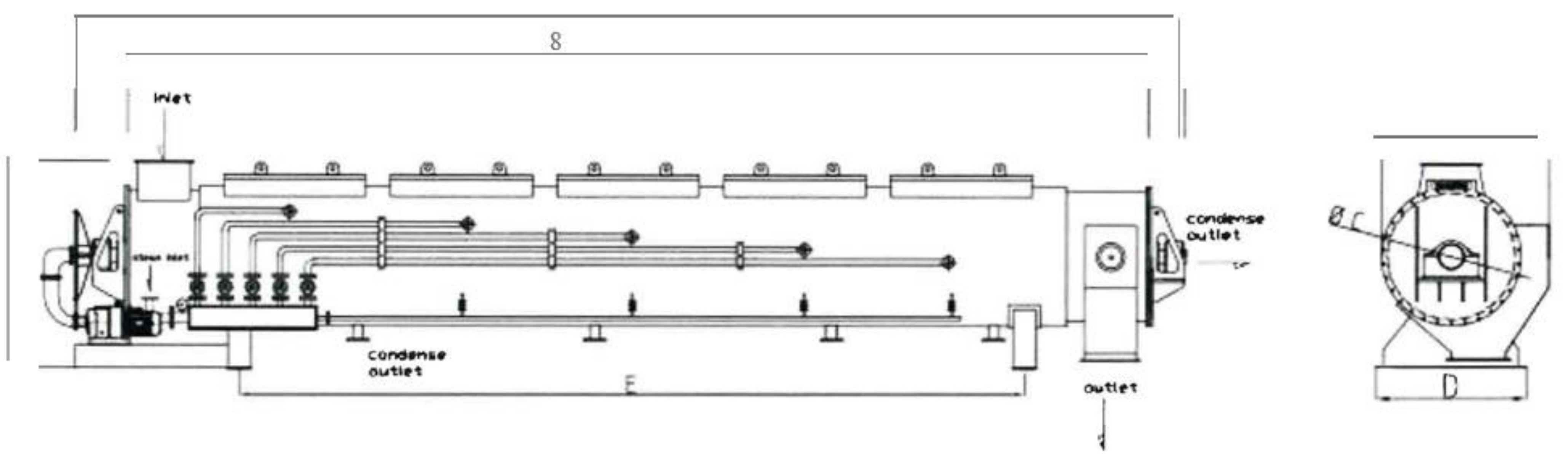


- The press is a continuous operation press with low pressure. The system is designed to be cleaned quickly to accommodate 24 hour operation.
- Designed to be easy to clean and in continuous operation.
- Cap: 15 TPH 37kW
  4.7m x 1.4m x 1.5m
  Mesh size 2.0 mm and 0.4mm Speed – 3 to 4 RPM

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”	16,535 lbs	22 kW
P 350	350 tons/day	174.41”	48.62”	132.48’	156.10”	179.72”	144.88”	83.07”	51.77”	20,944 lbs	37 kW
P 400	400 tons/day	189.96”	52.56”	143.70”	167.32”	190.94”	157.87”	83.27”	52.36”	23,986 lbs	45 kW
P 800	800 tons/day	269.88”	72.44”	198.82”	234.25”	269.69”	224.41”	104.33”	72.44”	58,643 lbs	55 kW

Radiant Heat Processor



- This processes the shredded waste by space age technology to deliver zero bacteria. It utilizes INDIRECT dry steam or oil for energy. Disintegrates many of the toxins found in the municipal waste .
- Operating temp 160 Deg C., at low rotation speeds (3RPM)
- Operating pressure: 6 bar
  9.9m x 1.19m x 1.4m
  Motor 7.5 kW 10,700 Kg

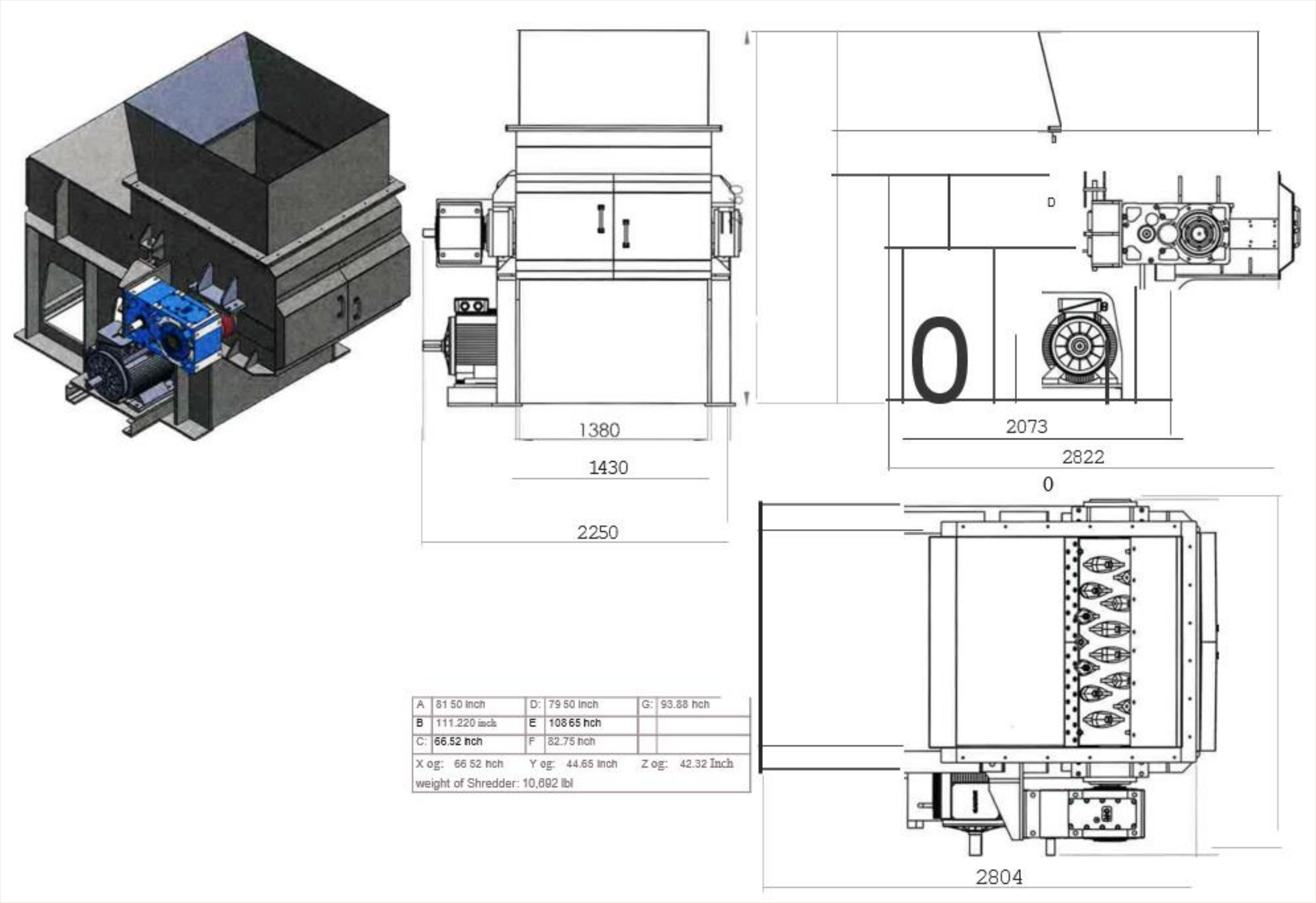
COOKER											
TYPE	CAPACITY	A	B	C	D	E	F	G	OPERATING PRESSURE	WEIGHT	POWER
C 350	350 tons/day	9860 mm	9000 mm	Ø1032 mm	950 mm	4050 mm	1412 mm	1190 mm	6 BAR	10700 kg	7.5 kW
C 400	400 tons/day	9860 mm	9000 mm	Ø1202 mm	950 mm	4050 mm	1580 mm	1360 mm	6 BAR	12680 kg	11 kW
C 800	800 tons/day	13020 mm	12000 mm	Ø1345 mm	1650 mm	…	2457 mm	1850 mm	6 BAR	17500 kg	15 kW

Shredder

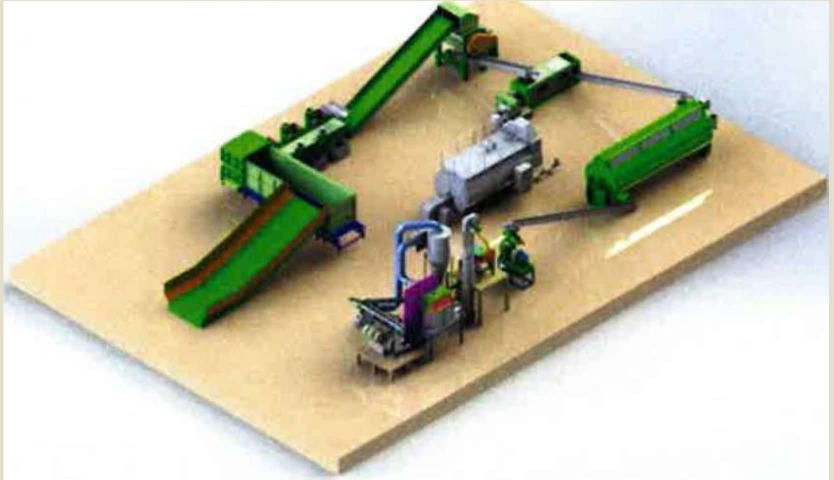
- These shredders are the heart of our systems - using patented blade cooling systems – they can shred from plastic film to palm fronds without jamming or gumming.
- These shredders have hydraulic pushers, antijaming sensors and PLC controls.
- 2.8m x 2.1m x2.7m

  10,692 Lbs

  Sizes: ¼, 5, 15, 42 T/Hr



Machine Photos



System Layout

Radiant Heat Processor Sub-system

Press Subsystem

Radiant Heat Dryer

Organic Waste Recycling Processor

Models from 5 to 42 Tons Per Hour

Gas Usage – 58 Nm3 per metric ton

Electricity Usage – minimal – average only $27 per-day US for 120 TPD operation.

Footprint – 300 square feet to 1,000 square feet

Hopper – Built to suite up to 20 tons holding capacity – metered feed

Shredder – Sized from Model 25 to 80 depending on processing needs

Evaporation Rate – 15% of organic material weight

Machines with 10 years of development and 4 years of testing. Able to process all types of organic waste in minutes. Produces odor free. harmful bacteria free. and nutrient rich solids and liquids at a continuous rate.

Discarded organic waste travels through the ..cooker" where dry steam never touches the material. Our proprietary bellows system encapsulates and controls the steam to cook all material at a constant 150 degrees. The •press• removes liquids, then the dryer brings solid material to a 0% to 10% moisture level.

Pellet Uses

PELLET USES

1Kg = 1Kw/Hr (1Ton = 1MW/Hr Electricity)

1 MT = 343 liters of Diesel

1 liter = 4.63 Kw/Hr Electricity

ABSORPTION CHILLERS

25 kg/hr of Pellets → *Cooling, Hot Water and Cold Water for 100 Hotel rooms*

Emission Reports

Our Pellets

Emission Report

Physico-chemical Characterisation of Fuel

Report Serial No.: R&D/Lab/16/40

Sample Name
1.Agriculture Waste Pellets 2.MSW+Sludge Pellets

Parameters	Agriculture Waste Pellets	MSW+Sludge Pellets
Moisture Content on wet basis, %	9.10	6.25
Ash, % on dry basis	13.45	19.88
Volatile, % on dry basis	68.37	60.21
Fixed carbon, % on dry basis	18.18	19.91
Ash Fusion (°C)	Ash Deformation at 1000	Ash Deformation at 1000
Bulk Density, kg/m^3	450	255
True Density, kg/m^3	955	525
Size (in mm)	Dia:6, L:15-30	Dia:4, L:20-30
Ignition test	Burns easily	Burns easily
Flow ability test	Flows easily	Flows easily
CV, kcal/kg (on dry basis)	4063	3893
Disintegration of Sample in water	Starts in 85 seconds; completes in 490 seconds	Starts in 190 seconds; completes in 955 seconds

Assessment:

Both agriculture waste and MSW+Sludge pellets have high ash content and low ash fusion temperature. Clinkering would be an issue. Both can be used in MSW gasifier.

APPENDIX

Proprietary Pellet kCal Estimator Expert System

Calorific Value Estimator Tool

(250 Tons of Solid Waste on Daily Basis) Calorific Value and Material Composition as follows:

Table 1 - Average Composition of 45 TPD

Component	Average Fraction	Composition on Kg/Ton
Paper	8.00%	20.00
Plastics	9.00%	22.50
Cloth & Textiles	4.00%	10.00
Wood	0.50%	125
Rubber & Synthetics	0.25%	0.63
Leather	0.25%	0.63
Metal, Glass, Stone, Sand & Grit	24.00%	60.00
Organic Matter	54.00%	135.00
Total	100.00%	250.00

Heat Value of Sorted Municipal Waste

Table 2 - Expected Pellet Output

Component	Weight (Kg)	Water Weight Removed	Pellet Weight (Kg)
Paper	20,000	7.0%	18,600
Plastics	22,500	1.0%	22,275
Cloth & Textiles	10,000	10.0%	9,000
Wood	1250	10.0%	1125
Rubber & Synthetics	625	1.0%	619
Leather	625	5.0%	594
Metal, Glass, Stone, Sand & Grid	60,000	0.0%	60,000
Organic Matter	135,000	55.0%	60,750
Total	250,000		172,963
		Less: Inert Waste	**(60,000)**
		Net Pellet Output	**112,963**

Pellet kCal Estimator is used in presales to design the system that fits the customer's needs. It helps in identification of the pellet buyers. This has been validated over many different municipal waste mix rates - worldwide. We have a very diverse worldwide data on municipal waste

Calorific Values of various matters, within Final Pellet

1Kg Pellet : Consisting of all below matter in Homogenised form.
Calorific Value: 4815 Kcal/Kg
Moisture Level: 5%

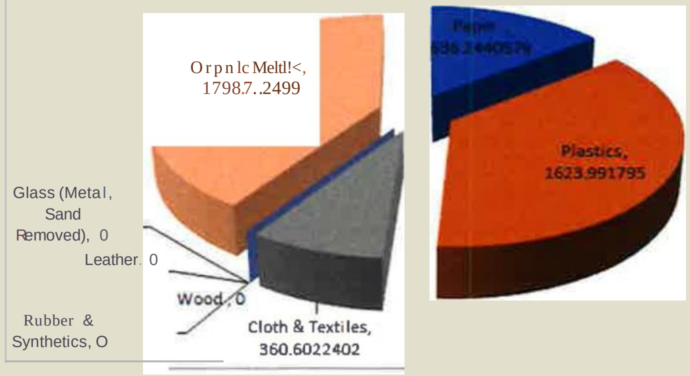


Table 3 - Expected calorific value of Pelet

Component	Pellet Weight + 10" Moisture	Percentage of Total	Defined Kcal/Kg (Dry)	Overall Kcals per kg of pellets
Paper	20,460	16.47%	4,652	719.23
Plastics	24,503	19.72%	9,906	1834.14
Cloth & Textiles	9,900	7.97%	5,444	407.26
Wood	1238	1.00%	4,925	46.05
Rubber & Synthetics	681	0.55%	7,111	36.57
Leather	653	0.53%	4,585	22.63
Glass (Metal, Sand Removed)		0.00%		
Organic Matter	66,825	53.78%	4,700	2,373.34
Total	124,259	100.00%		5,439.23

Average Calorific Value of Pellet (Kcal/Kg = 5,439

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PELLET COMPARISON

MUNICIPAL WASTE TO PELLET PRODUCTION

1,000 MT With 50% moisture → 500MT pellets → Sun-Gas → 20 MW/Hr electricity

Our pellets vs COAL	
Our Pellets 293MT →	600MW @ 4,500 Kcal/Kg
Coal 440MT →	600MW @ 3,000 Kcal/Kg

Incinerator (SWEDEN)	
2000MT Capacity →	12MW/Hr Electricity
Our Pellets 1,200MT →	50MW/Hr Electricity

APPENDIX: GREEN PELLET

Our Pyrolysis System Creates

- 40% Pyro-Oil
- 40% Carbon Black
- 20% Syngas

COMPARING: TWS PELLET vs SOLAR

SOLAR	$36MM	40MW installed capacity	7.53MW/Hr (200 acres of land required)
OUR SYSTEM	At Least 50% cheaper	8MW installed capacity	8.4MW/Hr (1 acres of land required)

APPENDIX 2

Systems Disruptive

Technology and Processes

Intermediate product - Pellets from Total Waste

(Energy Pellets and Organic Pellets)

Carbon Credits measurable and reliable data

End products- from Pellets using special Compatible Modules to get high end value products

Pellet Utilizations

Ground and Processed Municipal Waste

Pellets

Hydrogenerator System

Equivalent Power Plant

Incoming Waste Capacity	Machine Capacity	Water Content	Liquid Extracted	Pellets Produced	Oper. Hours	Pellets Per Day	Energy Equivalent	E. Output (19%)	Equivalent P. Plant
Daily	TPH	%	TPH	TPH	Hr	TPD	M\NHr	MWHr	MW
20.0	1.0	45%	0.5	0.6	20.0	11.0	60.4	11.5	0.48
100.0	5.0	45%	2.3	2.8	20.0	55.0	301.8	57_3	2.39
200.0	10.0	45%	4.5	5.5	20.0	110.0	603.S	114.7	4.78
400.0	20.0	45%	9.0	11.0	20.0	220.0	U07.0	229.3	9.56

Key Takeaways:

Our 5TPH machine can process about 100 TPD of food waste and is equivalent to a 2.4 MW power plant
Based on waste deliverIng 4,717 Kcal/kg
System energy conversion efficiency is 19%
It takes 24 Tons of pellets per day to generate energy equivalent to a 1MW plant.

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Efficiency Calculations

Energy Input

1 Ton of Pellets = 5.5 MWHr

Useful Energy Output

Conversion from Pellet to SynGas

Chemical to Heat (98%)

Heat to Reduction (45%)

Leg Efficiency	44%

5.5	MWHr	=>	2.4	MWHr
		=>	223.9	cu m (nat gas)
		=>	82.8	therm

SynGas to Mechanical

Chemical to Mechanical (45%)

Leg Efficiency	45%

2.4 MWHr = 1.1 MWHr

Mechanical to Electrical

Electrical Generation (98%)

Leg Efficiency	98%

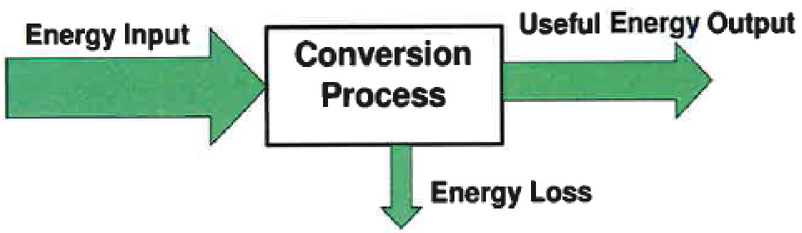
1.1 MWHr = 1.1 MWHr

Efficiency Calculation

Total System Eff. = Output / Input

19%

η(system) = η(a)*η(b)*η(c)



Equivalent Power Plant

- TPH system is equivalent to a 40 MW solar installation - and both produce about similar annual power output.
- Our system helps REDUCE the waste from landfills
- The system delivers power 24hours vs variable power output from Solar
- The Golden Pellets store energy

	Solar Pant	Our System
Generation Cost of Power (kWh)	$0.016	$0.019
Area Needed (Acres)	200	4
Investment	$36MM	At Least 50% cheaper
Annual Power Output (MWhr)	66,000	73,000
Operating Cost	$1MM	$1.5MM

HVAC Applications Estimates

Cooling Equat ion [cooling load at 44^{o}F]

558,000 BTU/hr	66 Tons of cooling
1Tons of cooling	8,455 BTU/hr

Cooling Provided	Heat Needed		Pellets Required	Square Meters		
[Broad Std Sizes]				India	CA	Shopping Mall
66 Tons/hr	558,000	BTU/hr	33.5 Kg/hr	1,533	1,839	1,226
100 Tons/hr	845,455	BTU/hr	50.8 Kg/hr	2,323	2,787	1,858
165 Tons/hr	1,395,000	BTU/hr	83.8 Kg/hr	3,832	4,599	3,066
248 Tons/hr	2,096,727	BTU/hr	125.9 Kg/hr	5,760	6,912	4,608
331 Tons/hr	2,798,455	BTU/hr	168.0 Kg/hr	7,688	9,225	6,150
413 Tons/hr	3,491,727	BTU/hr	209.7 Kg/hr	9,592	11,511	7,674
496 Tons/hr	4,193,455	BTU/hr	251.8 Kg/hr	11,520	13,824	9,216
5974 Tons/hr	**50,507,225**	**BTU/hr**	**3032.9 Kg/hr**	**138,750**	**166,500**	**111,000**

Sample:

A 111,000 sqm mall will need 75 ton of pellets per day.

A 280 sqm (3,000 sqft) Pizza Hut will need 185 kg of pellets/day.

To cool a CA hotel room, 0.51 kg of pellets/hr will be needed

Reference: Chiller needs a cooling tower with water at 85 ^{o}F

Cooling Loads	Shopping Mall	200 sqft per Ton	18.6 sq mt
	India	250 sqft per Ton	23.2 sq mt
	California	300 sqft per Ton	27.9 sq mt
	MacDonald/Pizza Hut	200 sqft per Ton	18.6 sq mt

Validation Report

GEODYN™ SOLUTIONS

MSW/Organic Processor Validation Report

Usage of Pellets and Fluff

This patented system, continuous and lowest conversion cost per ton process, converts MSW or Organic waste with up to 90% liquid content into a 4-7% humidity fluff; in 45 minutes or less.

This fluff can be extruded into pellets of various sizes, density and surface attributes to match the fuel use applications.

The typical heat value of the fluff/pellets is 4,300 Kcal/kg (it ranges from 3,800 to 5,500 kCal/kg) and depends on the inputs. The heat value and burn characteristics can be modified and controlled by minor batching, use of additives and physical surface. [e.g. animal manure and bedding (3,900 Kcal/kg), just manure (3,200 Kcal/kg), plastic mixed (5,400 Kcal/kg)].

This makes our process into the most efficient (lowest energy use, floor space and time) and flexible converter of MSW and organic waste.

Some of the applications Fluff being used:

Currently the primary use is as a high kCal fliel for the cement factories

Pellets are sold all over the world: o

- o Fuel
- o Heating
- o Steam generation

Use of pellets for HVAC applications

- o Regreen pellets in direct fired absorption chillers can deliver 44 deg F chilled water - in sizes from 10 ton to 600 ton cooling capacity. These are used in applications for apartment and office buildings, hotels, casinos and high rise offices and apartments.
- o This chiller uses 78.9 kg of pellet to run a 100 room hotel in 24 hours.

Other applications:

- o Production of Green Diesel (sulphur free) o Production of emission free Syngas
- o Production of Jet Fuel

For fluff/pellets made from food waste:

- o Animal feed ($200-400 per ton).
- oProduction of Organic Rubber filler, sold to car manufacturers ($2,500 per ton). o Production of Bio Char ($50- $100 per ton) used for farming

For fluff/pellets made from ruminant of digestor systems o Organic fertilizers

Electricity Production

- o Typically, 2 ton of wet MSW or Food waste with 50% moisture content produces 1 Ton pellets which can produce 1- 1.2 MW of electricity.

The pellets also used for power storage and used on demand and ship it anywhere with ease.

GEODYN™ SOLUTIONS

MSW/Organic Processor Validation Report

[All test reports above are available on request]

Sample Id : **Compost**

Nutrient	Total - Dry Weight	Extractable - Dry Weight	Saturation Extract	Sufficiency Factor
Nitrogen (N)	2.71 %	727 ppm		4.3
NH_4-N		661 ppm		
NO_3-N		66 ppm		
Phosphorus (P)	0.3 %	101 ppm		1.0
Phosphorus (P_2O_5)	0.69 %	231 ppm		
Potassium (K)	0.91 %	6017 ppm	14.9 meq/L	10.4
Potassium (K_2O)	1.1 %	7281 ppm		
Calcium (Ca)	0.82 %	2297 ppm	7.9 meq/L	0.3
Magnesium (Mg)	0.13 %	565 ppm	3.8 meq/L	0.6
Sodium (Na)	0.56 %		22.3 meq/L	
Sulfur (S)	0.22 %			
Sulfate (SO_4)			2.3 meq/L	0.8
Chloride (Cl)			24.9 meq/L	
Copper (Cu)	25 ppm	1.6 ppm		0.3
Zinc (Zn)	52 ppm	10 ppm		0.4
Manganese (Mn)	46 ppm	7 ppm		0.1
Iron (Fe)	3550 ppm	91 ppm		0.4
Dilute Acid Fe		0.20 %		
Boron (B)	16 ppm		0.46 ppm	1.5

Test	Result
pH (sat paste)	4.5 s.u.
% Half Sat.	84
TEC	401 meq/kg
Qualitative Lime	None
Salinity (EC of sat ext.)	4.3 dS/m
SAR (Sodium adsorption ratio)	9.23
Sodium as % of ECe	47 %
Bulk Density - Dry	687 lbs/yd^3
Bulk Density - As Received	742 lbs/yd^3
Moisture - As Received	7.4 %
Organic	91.2 %
Weight of organic / yd^3	626 lbs/yd^3
Weight of mineral / yd^3	60 lbs/yd^3
C/N Ratio	20.2

Gradation	
Wt Percent Retained 1"	0.0 %
Wt Percent Retained 1/2"	1.2 %

Fraction Passing 1/2 inch Screen - Dry Weight Basis Screen Opening	% Passing
Passing 9.5mm	
Passing 6.4mm (1/4")	
Passing 4.75mm	
Passing 2.36mm	
Passing 1.00mm	
Passing 0.50mm	

Lab Reports

Lab Reports

School of Forest Resources
College of Natural Sciences, Forestry, and Agriculture

1865 THE UNIVERSITY OF MAINE

5755 Nutting Hall
Orono, Maine 04469-5755
Tel: 207-581-2841
Fax: 207-581-2875
www.forest.umaine.edu
www.umaine.edu

	Sample Designator		
Test	RG0100GW	RG2080FG	RG8020F
Inorganic Ash, %	21.32	17.53	33.70
Moisture, %	9.59	11.96	25.29
Chloride, ppm	4498.8	4727.7	6234.6
Heating Value (BTU)	6016.1	6765.7	4911.9

Prepared by: [signature]
R. W. Rice, Ph.D
Professor of Wood Science
University of Maine
207-581-2883

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Lab Reports (cont.)

Summary:

The flare capacity of the existing pellets can be increased by 10X and the ash content reduced by Hansen's pellet fortification technology. This results in 3X extraction of the cal value of the pellets. This technology has TWO components which are added after the pellets are made and in the cooling chamber. There is an inert facilitator and one accelerator.

Flare time 58 minutes with a 13" flame vs 6 minutes with untreated pellets. After further surface treatment, additional 20 minutes of fire was observed.

Experiment:

The current MSW pellets were sent to the lab last month. They were tested in the lab under various conditions. It was observed that the flare time for the pellets was about 6 minutes and 25 seconds and the temperature of combustion was lower than that was expected.

The different variables explored were - presence of binding agent (not present), scaling during the pellet extrusion (not present) and oxygen content of the burner (changed by enlarging the holes in the combustion chamber).

Finally, the pellets were treated by the Hansen's (to be patented) fortification combination. The results were as follows:

Flare time 58 minutes with a 13" flame
After further surface treatment, additional 20 minutes of fire was observed.

Impact:

The impact of the additional flare time was to reduce the ash content and essentially extract 3X the calorific value from the same pellets!

Next Steps:

The company to send 20 lbs of pellets to Dr. Hansen for further testing and he will treat them and send back for the company to do internal test. Dr. Hansen to file the patents (2 weeks).

Dr. Hansen to discuss the licensing of the technology with the company **Other Consideration:**

At some point he wants to talk about selling the pellets to S. Africa, where he has existing customers. Also he currently manufactures heavy gasification equipment and would like a chance to quote building equipment in USA.

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Lab Reports

Feed Analysis Report

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

920-261-0446
office@rockriverlab.com
www.rockriverlab.com

Representative: Nathan deBoom

Nathan DeBoom 2439
PO Box 41346
Pasadena, CA 91114
951.542.1148

1 Dried Produce Waste
N/A

Dry Matter 96.04% Moisture 3.96%

Description (%DM unless specified)	Dry Matter Basis	Miscellaneous 60 dy Avg	Miscellaneous 4 yr Avg
Crude Protein	16.41		
Avail. Crude Protein	11.99		
ADICP	4.42		
NDICP	5.02		
ADICP %CP	26.93		
ADF	20.57		
aNDF	23.26		
Calcium	0.87		
Phosphorus	0.29		
Magnesium	0.10		
Potassium	0.80		
Sulfur	0.18		
Fat (EE)	15.45		
Ash	8.82		
Lignin	10.95		
Calculations			
TDN (California, 90% DM Basis)	60.23		
NFC	41.08		
NRC 2001 Energy calculations (Lignin)			
TDN 1X	79.22		
NEL 3x, Mcal/lb	0.824		
NEG, Mcal/lb	0.648		
NEM, Mcal/lb	0.951		

For analysis guidelines, please visit http://www.rockriverlab.com

Comments

Analyzed by wet chemical methods.

Minerals by ICP

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Lab Reports

School of Forest Resources
College of Natural Sciences, Forestry, and Agriculture

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5755 Nutting Hall
Orono, Maine 04469-5755
Tel: 207-581-2841
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www.forest.umaine.edu
www.umaine.edu

Dear ,

Below are the results from pellet sample 100-HM.

100-HM

[redacted]

MC Wet basis (%); ASTM E871:	8.31
Energy Value; Btu/lb; Parr 6200:	
As Received :	6942.77
Moisture Free :	7572.10
Moisture and Ash Free (MAF):	9074.47
Ash (%); ASTM D-1102, ASTM D-790, 590 C:	15.18
Chlorides ASTM-D4208 (<300ppm)	4192.14

[redacted]

Prepared by: ____________
R. W. Rice, Ph.D
Professor of Wood Science
University of Maine
207-581-2883

MAINE'S LAND GRANT AND SEA GRANT UNIVERSITY
A Member of the University of Maine System

Lab Reports

Feed Analysis Report

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

920-261-0446
office@rockriverlab.com
www.rockriverlab.com

Representative: Jeremy

Resource Buyers 9271
4274 S. K St.
Tulare, CA 93274
559.679.7586

1 Veggie & Meat

Dry Matter 95.34% Moisture 4.66%

Description (%DM unless specified)	Dry Matter Basis	Miscellaneous 60 dy Avg	4 yr Avg
Crude Protein	19.31		
ADF	28.43		
aNDF	35.64		
Calcium	1.30		
Phosphorus	0.48		
Magnesium	0.24		
Potassium	1.03		
Sulfur	0.27		
Ash	12.10		
Starch	7.33		
Calculations			
TDN (California, 90% DM Basis)	54.91		
TDN (ADF Calc)	66.67		
Net energy lactation (ADF Calc), Mcal/lb	0.694		
Net energy of gain (ADF Calc), Mcal/lb	0.462		
Net energy maint. (ADF Calc), Mcal/lb	0.736		
NFC	21.82		

For analysis guidelines, please visit http://www.rockriverlab.com

Comments

Minerals by ICP
Analyzed by wet chemical methods.

GEODYN™ SOLUTIONS

Lab Reports

Waypoint ANALYTICAL

4741 East Hunter Ave. Suite A
Anaheim, CA 92807
Main 714-282-8777 ° Fax 714-282-8575
www.waypointanalytical.com

COMPOST / AMENDMENT EVALUATION

Send To :	Project :	
Residuals Recovery Group Inc/Ag Concepts 7325 Edison Ave Ontario CA 91762	Job #: Dried Grocery	Report Number : 17-333-0009 Customer Number : 07327 Date printed : 12/06/2017 Date received : 11/29/2017 Page : 2 of 3 Lab Number : 93421

Sample Id : **Compost**

NUTRIENT SUMMARY

Test	Amount Per Cubic Yard				Amount Per Ton, As Rec'd				Available as a % Of Total
	Total		Available		Total		Available		
Nitrogen	18.62	lbs	0.5	lbs	50.19	lbs	1.35	lbs	3
Phosphorus (P)	2.05	lbs	0.07	lbs	5.54	lbs	0.19	lbs	3
Phosphorus (P_2O_5)	4.7	lbs	0.16	lbs	12.68	lbs	0.43	lbs	3
Potassium (K)	6.22	lbs	4.13	lbs	16.76	lbs	11.14	lbs	66
Potassium (K_2O)	7.52	lbs	5	lbs	20.28	lbs	13.48	lbs	66
Calcium	5.63	lbs	1.58	lbs	15.19	lbs	4.25	lbs	28
Magnesium	0.9	lbs	0.39	lbs	2.43	lbs	1.05	lbs	43
Sulfur	1.54	lbs	0.04	lbs	4.15	lbs	0.11	lbs	3
Copper	0.27	ozs	0.02	ozs	0.74	ozs	0.05	ozs	7
Zinc	0.57	ozs	0.11	ozs	1.54	ozs	0.29	ozs	19
Manganese	0.51	ozs	0.08	ozs	1.36	ozs	0.21	ozs	15
Iron	39.02	ozs	1	ozs	105.19	ozs	2.7	ozs	3
Boron	0.18	ozs	0.01	ozs	0.47	ozs	0.02	ozs	4
Organic Matter	627	lbs			1689	lbs			

GEODYN™ SOLUTIONS

Lab Reports

Waypoint ANALYTICAL

4741 East Hunter Ave. Suite A
Anaheim, CA 92807
Main 714-282-8777 • Fax 714-282-8575
www.waypointanalytical.com

COMPOST / AMENDMENT EVALUATION

Send To :	Project :	Report Number : 17-333-0009
Residuals Recovery Group Inc/Ag Concepts	Job #: Dried Grocery	Customer Number : 07327
7325 Edison Ave		Date printed : 12/06/2017
Ontario CA 91762		Date received : 11/29/2017
		Page : 3 of 3
		Lab Number : 93421

Sample Id : **Compost**

POTENTIAL RATE LIMIT FACTORS

Test	% Volume rate limit	Cubic yard amendment per 1000 sf to 6": 1	2	3	4	5	6	7	8
		Volume % amendment blend with sandy loam: 5	11	16	22	27	32	38	43
EC sat. ext.	56 %								
Sodium sol.	72 %								
Chloride sol.	64 %								
Boron sol.	No Limit								
NH_4-N	76 %								
Available									
Nitrogen	86 %								
PO_4P	No Limit								
Copper	No Limit								
Zinc	No Limit								

Rate limit estimates based on amending a non-problematic sandy loam

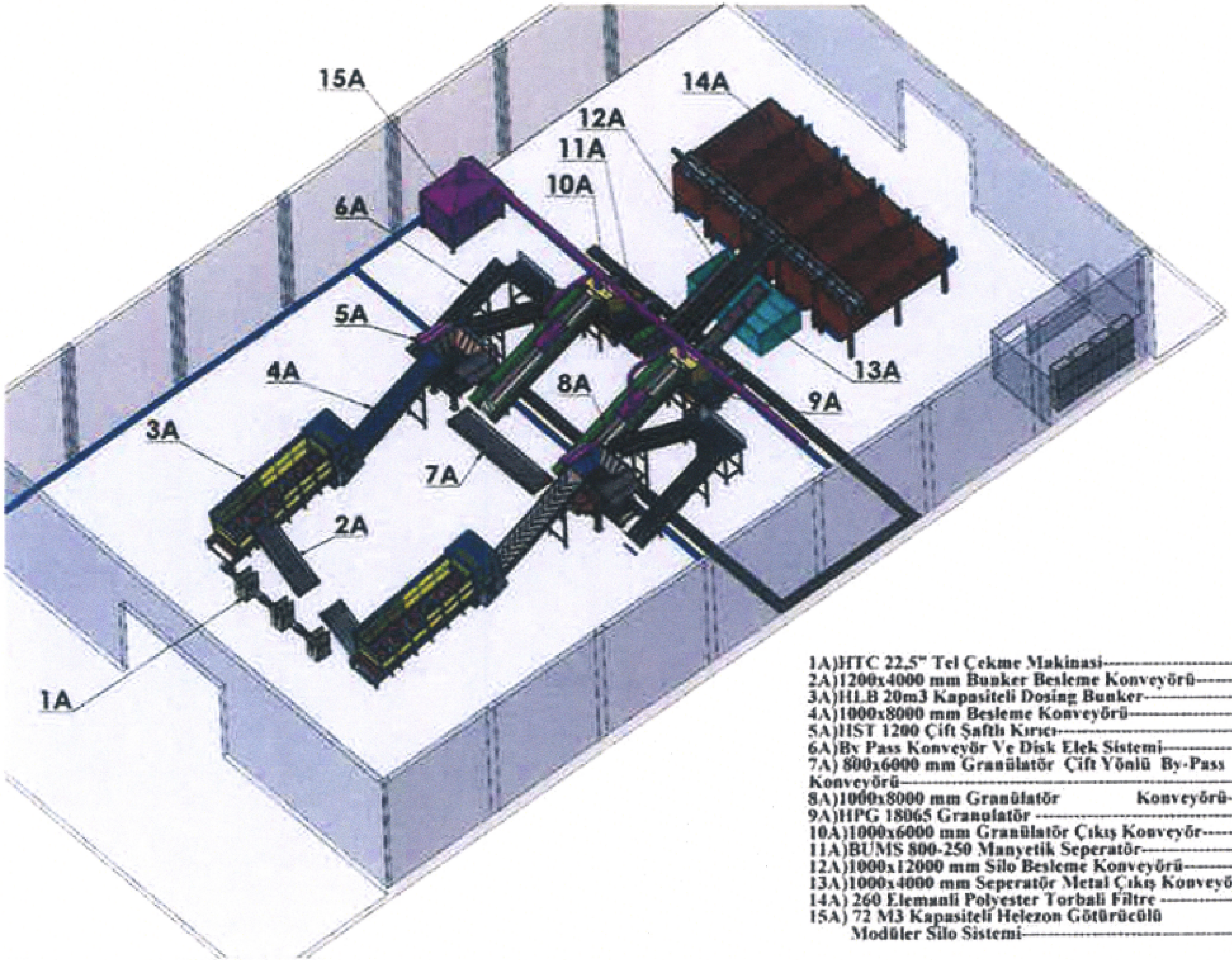
RELATIVE IMMEDIATE NUTRIENT AND ORGANIC VALUE

* Example Rate 16 %	Slight	Moderate	Abundant
Nitrogen			
Phosphorus			
Potassium			
Calcium			
Magnesium			
Copper			
Zinc			
Manganese			
Iron			
Sulfate			
Organic Matter			

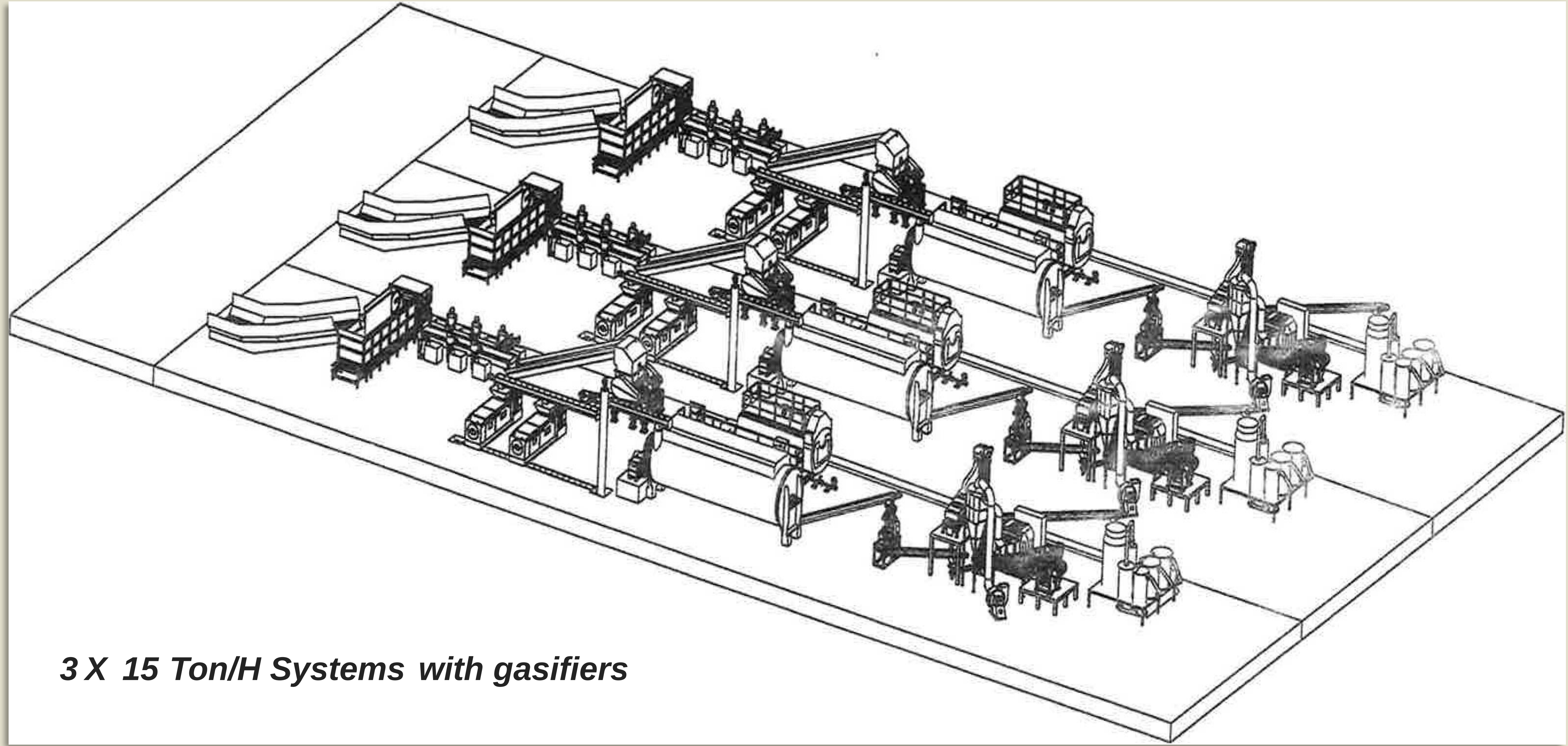
* If no chemical characteristics are rate limiting, the example rate is based on organic content of the amendment (up to a max of 43%).

Different Sizes and Configuration Layouts

Different Sizes and Configuration Layouts

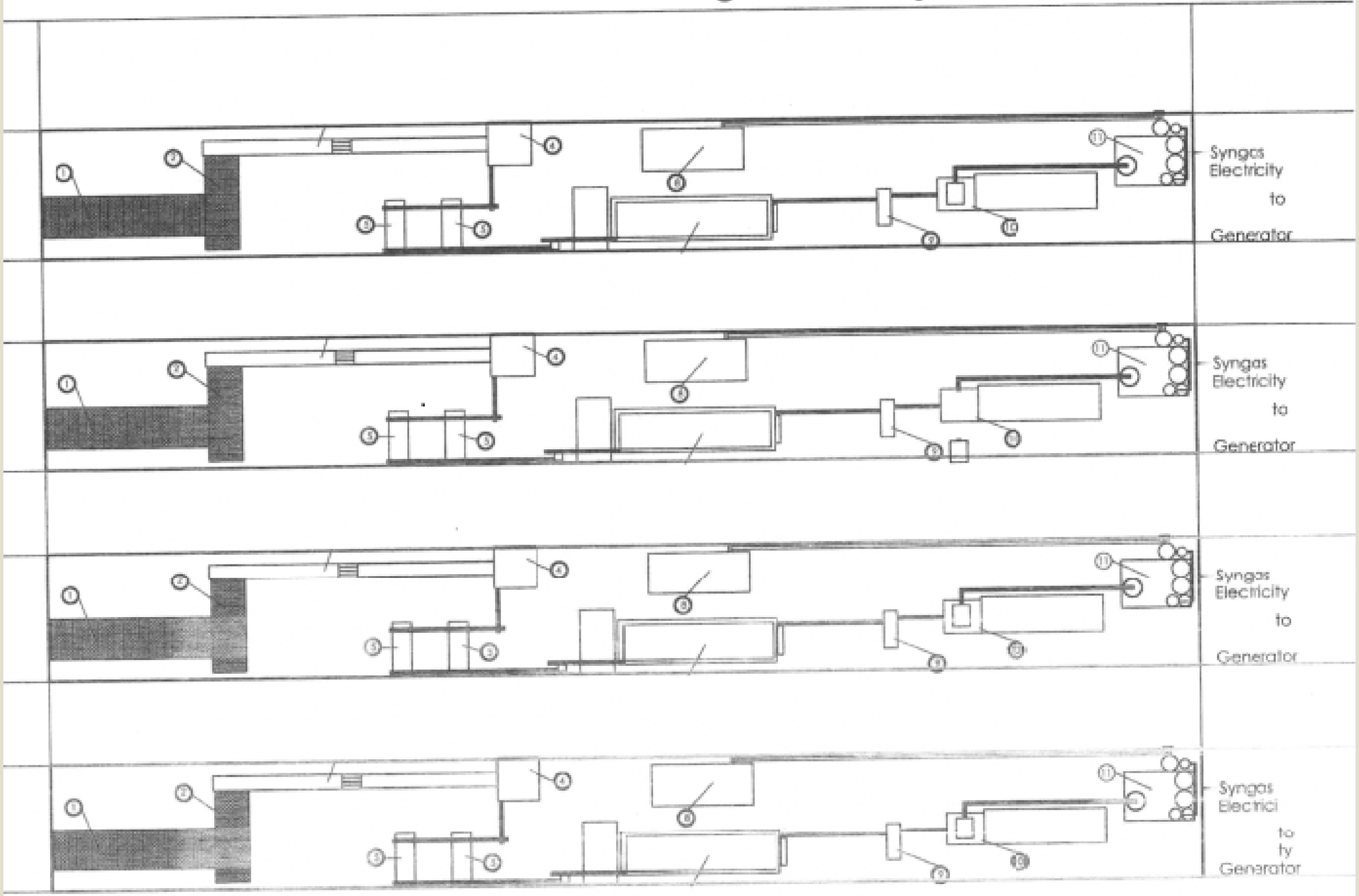


1A)HTC 22,5" Tel Çekme Makinasi---------------------------3ADET
2A)1200x4000 mm Bunker Besleme Konveyörü----------2ADET
3A)HLB 20m3 Kapasiteli Dosing Bunker------------------2ADET
4A)1000x8000 mm Besleme Konveyörü-------------------2ADET
5A)HST 1200 Çift Şaftlı Kırıcı---------------------------2ADET
6A)By Pass Konveyör Ve Disk Elek Sistemi---------------2ADET
7A) 800x6000 mm Granülatör Çift Yönlü By-Pass
Konveyörü--1 ADET
8A)1000x8000 mm Granülatör Konveyörü----2ADET
9A)HPG 18065 Granulatör -----------------------------------2ADET
10A)1000x6000 mm Granülatör Çıkış Konveyör-----------2ADET
11A)BUMS 800-250 Manyetik Seperatör--------------------2ADET
12A)1000x12000 mm Silo Besleme Konveyörü--------------1ADET
13A)1000x4000 mm Seperatör Metal Çıkış Konveyörü -----2ADET
14A) 260 Elemanli Polyester Torbali Filtre ---------------1ADET
15A) 72 M3 Kapasiteli Helezon Götürücülü
Modüler Silo Sistemi-----------------------------------5ADET

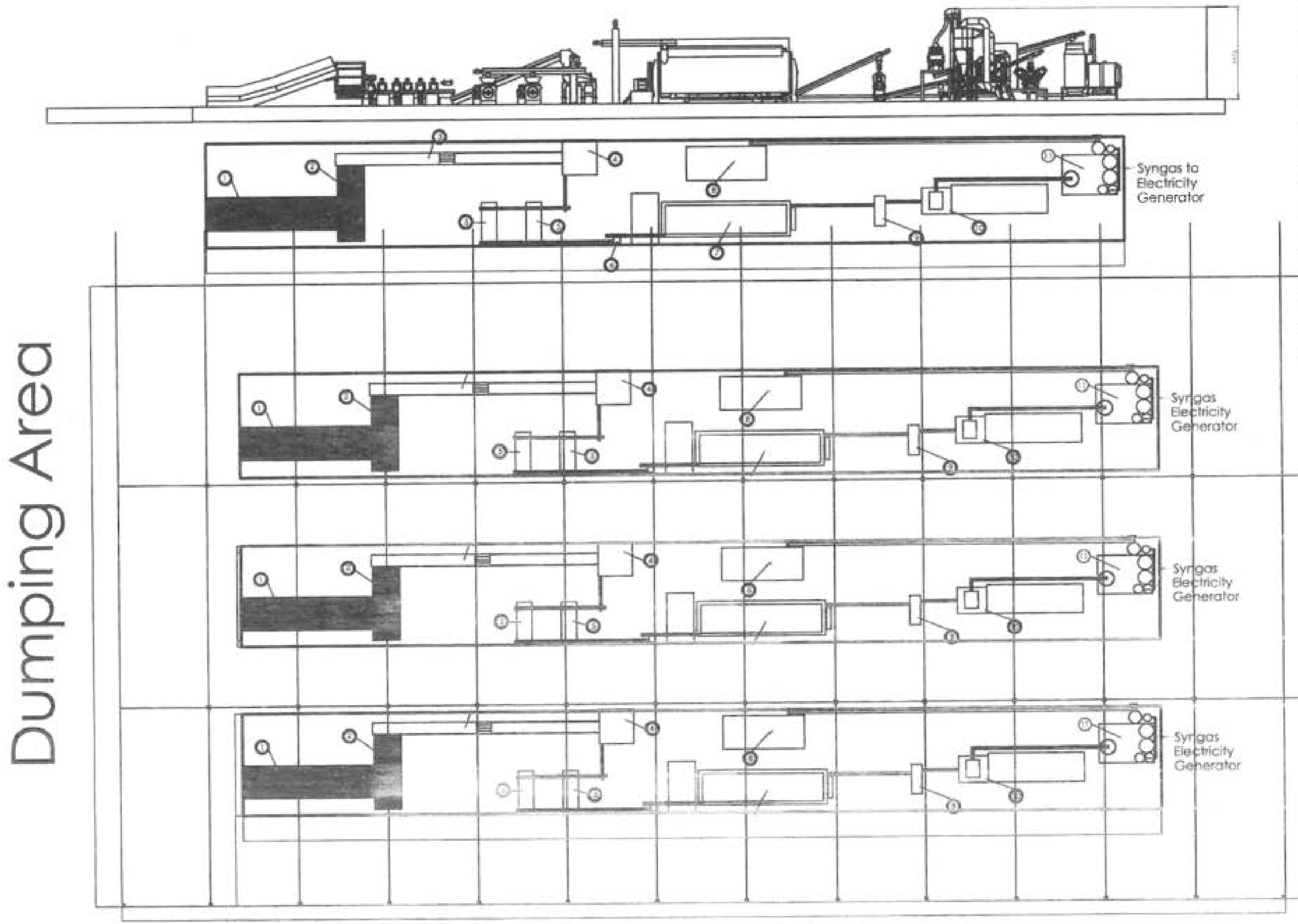


3 X 15 Ton/H Systems with gasifiers

Different Sizes and Configuration Layouts



Different Sizes and Configuration Layouts

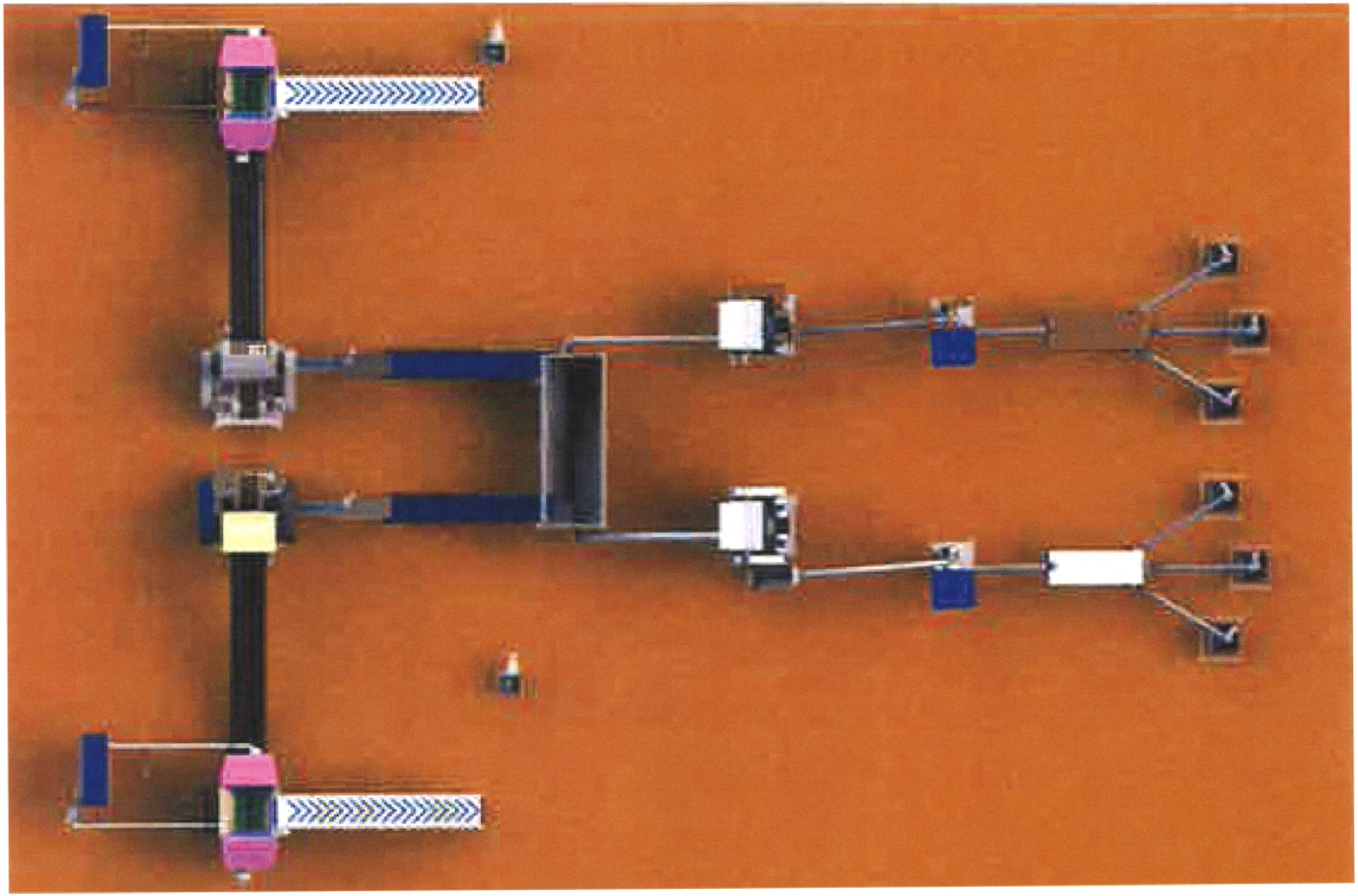


Nr	Description
1	Dumping Conveyor
2	Bag Ripper
3	Sorting Unit
4	Shredder
5	Press
6	Elevator
7	Dryer
8	Steam Boiler
9	Grinder
10	Pelletizing Unit
11	Gasifier

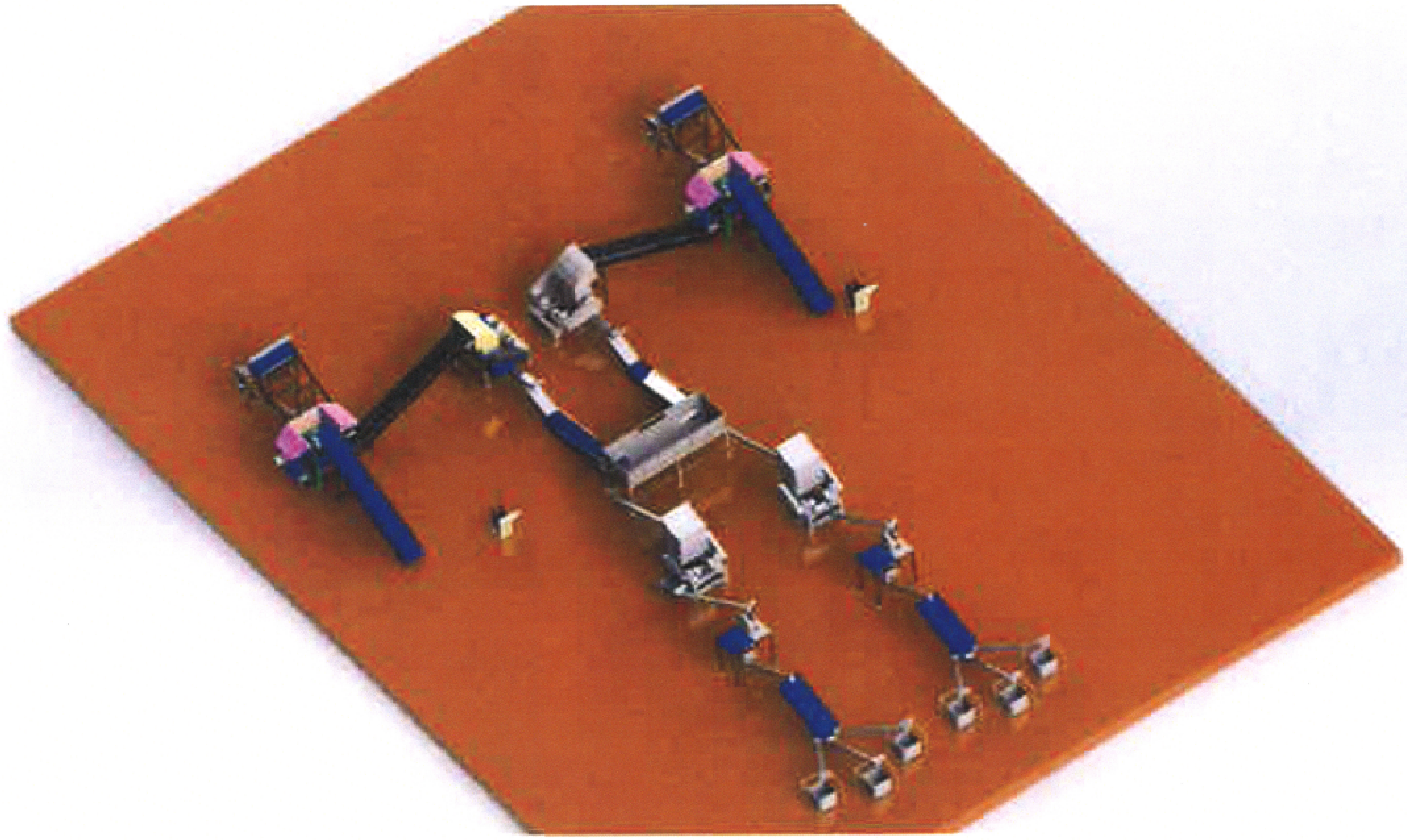
3 x 15 TON/H SYSTEM WITH GASIFIER

	M.KARAKURT	
Controlled	A.MARDIKIAN	25.07.2016
Approved	A.MARDIKIAN	25.07.2016

Different Sizes and Configuration Layouts



Different Sizes and Configuration Layouts



Pyrolysis	Gasification	Incineration	Total Waste System	Anaerobic Digestion
Normally No Air	Sub Stoichiometric Air Exothermic / Endothermic	Excess Air Very Exothermic	Stoichiometric Air	No Air
Only Heat (external or internal)	Lower total volumetric flow	Higher Volumetric flowrate	High Volumetric flowrate	Micro-organisms
Want liquid, gases not desired	Syngas Lower fly ash carry over	Fly ash carry over	No residues	Digestate
Pollutants in reduced form (H_2S, COS)	Pollutants in reduced form (H_2S, COS)	Pollutants in oxidized form (Sox, Nox etc.)	No Pollutants, only Water Vapor is discharged	No Pollutants
Higher Char	Char at low temperatures Vitrified slag at high	Bottom Ash	Pellets for Energy Production	Bio-gas (Methane)
Scale: 50 tons/day	Scale: 100 tons/day	Scale: 1500 tons/day	Scale: 350 tons/day	Scale: 250 tons/day
No additional oxygen (only heat)	Some additional oxygen (or air)	Much additional oxygen (or air)	No additional oxygen	No additional oxygen
Batch Processing	Batch Processing	Continuous Processing	Continuous Processing	Batch Processing
Large Footprint	Large Footprint	Large Footprint	Small Footprint	Large Footprint
No Bacteria	No Bacteria	Bacteria Present	No Bacteria	Bacteria Present
No odor	No odor	No odor	No odor	Odor present
Operational Costs High	Operational Costs High	Operational Costs High	Operational Costs Low	Operational Costs High
Life Cycle of Equipment: 10 years	Life Cycle of Equipment: 10 years	Life Cycle of Equipment: 20-30 years	Life Cycle of Equipment: 30 years	Unknown Life Cycle
Efficiency	High Efficiency	Low Efficiency	High Efficiency	Low Efficiency

GEODYN™ SOLUTIONS