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(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **RHATIGAN, William, F.**; Pocasset, MA 02559 (US). **O'BRIEN, Gerard, J.**; Pocasset, MA 02559 (US).

(74) Agent: **HAAS, Thomas, M.**; Sullivan & Worcester LLP, 1666 K Street NW Suite 7, Washington, DC 20006 (US).

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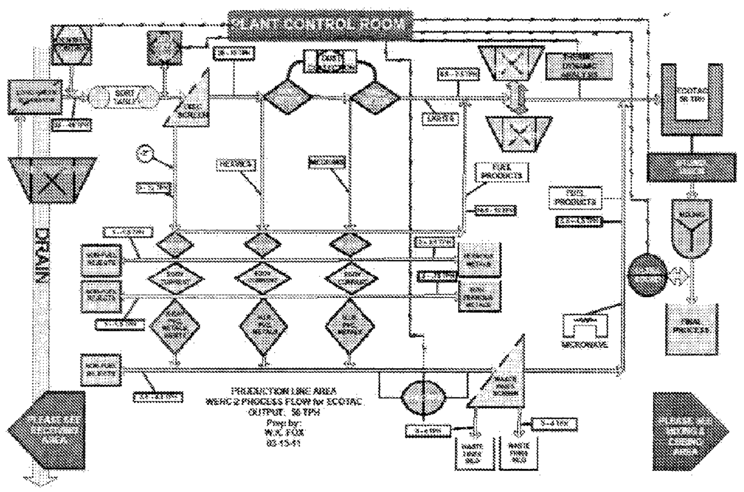
(54) **Title**: PROCESS AND SYSTEM FOR MIXING, BINDING AND STABILIZING AGENTS FOR MANUFACTURING REFUSE DRIVEN SOLID WASTE

Figure 3



(57) **Abstract**: The present invention generally relates to waste to energy systems and methods for making solid fuels from various waste compositions. The instant invention is further directed to processes and systems for mixing, binding, and stabilizing agents for manufactured refuse driven solid fuel. Said solid fuels enhance the efficiency and throughputs of energy generation in the fields of coal, natural gas, syngas, gasification, plasma arc gasification pyrolysis, and pyrolysis gasification. One embodiment relates to the composition of the compounds used in the system and the method of mixing or injection of the compounds into the engineered fuel to bind into a solid form, regardless of shape. Embodied in the process is the ability to increase or decrease BTU value of the engineered fuel and its base chemical or thermal image. The present invention provides means to act as a method of stabilization or containment of any type or form of waste.

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Process and system for mixing, binding and stabilizing agents for manufacturing refuse driven solid waste.

Inventors: William F. Rhatigan and Gerard J O'Brien

FIELD OF THE INVENTION

The present invention generally relates to waste to energy systems and methods. The instant invention is further directed to processes and systems for mixing, binding, and stabilizing agents for manufactured refuse driven solid fuel.

BACKGROUND OF THE INVENTION

Large quantities of solid waste, construction debris, large items, and low value hazardous waste are generated daily in urban, suburban, and rural areas. Additionally, industrial, manufacturing, and agricultural businesses generate solid waste in vast quantities. This waste is a problem globally. Typically, land filling and incineration have been used as common means of waste disposal. This creates excessive environmental problems, e.g., various chemical leaching and air pollution, etc., and contributes significantly to greenhouse gas concerns.

Even with recycling efforts and increased awareness, the majority of waste is being hauled and buried in landfills, which within itself creates environmental concerns and problems. It is accordingly desirable to process and manufacture this waste into a viable and renewable manufactured product, such as solid, usable fuel.

Gasification is a proven manufacturing process that converts hydrocarbons in any organic fuel to a synthesis gas (syngas), which can be further processed to produce chemicals, fertilizers, liquid fuels, hydrogen, and electricity. Gasification is a flexible, commercially proven, and efficient technology. Waste to Energy (WTE) gasification can help improve air quality by reducing Green House Gas emissions as well as emissions of several major key air pollutants, as well as dioxins, depending on which feedstock's are employed. These emission reductions can provide economic and environmental benefits by virtually eliminating toxic emissions and lowering emission-related operating costs, such as allowance permit costs and emissions-control equipment expenses WTE gasification achieves the reduction of greenhouse gas emission through three separate mechanisms: 1) Generating electrical power or steam, - combustion avoids carbon dioxide (CO2) emissions from fossil fuel based electrical generation, 2) gasification process effectively avoids all potential methane emissions from landfills; thereby avoiding any potential release of methane in the future and, 3) Recovery of ferrous and nonferrous metals from a MSW (Manufactured Solid Waste) is more energy efficient than production from raw materials.

In addition to gasification, the use of coal in power generation currently is 1 billion tons per year, in the USA alone. Coal provides an economical method to heat and steam generation. The inherent problem with coal as a fuel is the emissions creating greenhouse gases and toxic dioxins. EcoTac $_{tm}$ reduces the gases and toxic dioxins when co-fired with coal, while not impeding the efficiency or operation.

The composition of the waste material in its natural state is also a limiting factor as a result of decomposition, odor, environmental leachate, and the inability to store or create inventory. The processes of alternative and traditional power generation, such as coal, gas, pyrolisis gasification, gasification and plasma arc gasification, are all benefited from the stabilization and the method of creating a variable or constant BTU value and thermal image.

Currently, the majority of solid or industrial waste is transported in its "natural form". This provides for not only environmental issues, but an extremely poor weight to volume ratio. There are methods of compacting and bailing that will increase the weight to volume, but neither method environmentally stabilizes the product. Additionally, these methods provide little ability to prolong 'shelf life". The process and system will not only resolve these issues, but add the benefit of altering the BTU value and thermal model positively or negatively.

SUMMARY OF THE INVENTION

The instant invention provides systems and methods for making solid fuels from various waste compositions.

The present invention provides solid fuels that enhance the efficiency and throughputs of energy generation in the fields of coal, natural gas, syngas, gasification, plasma arc gasification pyrolysis, and pyrolysis gasification.

One embodiment of the present intervention relates generally to the composition of the compounds used in the system and the method of mixing or injection of the compounds into the engineered fuel to bind into a solid form, regardless of shape. Also, embodied in the process is the ability to increase or decrease BTU value of the engineered fuel and its base chemical or thermal image. Additionally, the present invention provides means to act as a method of stabilization or containment of any type or form of waste.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a diagram of one embodiment of the present invention.

Figure 2 is a diagram of a system in accordance with the present invention.

Figure 3 is a diagram of a system in accordance with the present invention.

Figure 4 is a chart representing the analysis of a composition in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

For simplicity and illustrative purposes, the principles of the present invention are described by referring to various exemplary embodiments thereof. Although the preferred embodiments of the invention are particularly disclosed herein, one of ordinary skill in the art will readily recognize that the same principles are equally applicable to, and can be implicated in other compositions and methods, and that any such variation would be within such modifications that do not part from the scope of the present invention. Before explaining the disclosed embodiments of the present invention in detail, it is also to be understood that the invention is not limited in its application to the details of any particular embodiment shown, since of course the invention is capable of other embodiments. The terminology used herein is for the purpose of description and not of limitation. Further, although certain methods are described with reference to certain steps that are presented herein in certain order, in many instances, these steps may be performed in any order as may be appreciated by one skilled in the art, and the methods are not limited to the particular arrangement of steps disclosed herein.

The system and process of the present invention may be used with any combination of any solid or liquid refuse driven fuel. The combination of organic or inorganic compounds may be used in the process or either may be used singularly to produce the stabilization and density of the engineered fuel.

The invention may comprise one or several features as described herein, and or several combinations of the process of injection and mixing. The process is comprised of various materials both organic and inorganic, but considered carbon neutral. The base process will provide binding of either solid or liquid and can be used in any combination or ratio of solid to liquid as a percentage of weight or volume. The system will use the resultant of the process to create a base product and will inject or insert into the engineered fuel.

The system will use a mixer to establish the baseline product. The system may comprise an additional mixer to enhance or reduce the viscosity and absorption ratio predicated of the initial state of the engineered fuel.

Additional embodiments of the system may comprise automatic controllers to adjust and limit the exact amount of the additives to the baseline products. The additives may be either organic or inorganic and will have the ability to increase or decrease the BTU value of the base engineered fuel. Further embodiments may comprise the addition of heat to the system for its drying and ability to transform the products neutral state.

The mixture can be based on a single compound, either organic or inorganic and will establish a baseline BTU value and thermal model. The single compound can be blended with two or more alternative compounds that will produce a difficult BTU value and a set of trace chemical elements. The addition of heat to the final blend will only be added to affect the viscosity and set time of the injection into the solid fuel mix.

Depending on the form and shape of the final enclosed or encapsulation, the material will be injected under pressure. The volume and pressure will be a function of density of the solid fuel, amount of oxygen balance, as well as BTU and thermal model.

Example 1

With the establishment of the desired BTU value and chemical composition for the manufactured solid fuel, the fuel will be balanced by either stabilization, encasement or solidifying methods. In either case, the use of binding agents may be used.

The BTU value of the manufactured solid fuel may be manipulated by the addition of either a single compound or two or more compounds.

The compounds may be either organic or inorganic, or a combination of either group to increase or decrease the final BTU value and thermal image of the gaseous compounds of the solid fuel.

Ideally, the compounds, either organics or inorganic, will be derived as a byproduct or substate of the original MSW, but have been altered in either state or molecular structure.

Compounds may also be added to increase viscosity of the additive to the solid fuel. The compounds may be comprised of variable compositions and can be either Newtonian or non-Newtonian in composition.

BTU value and thermal image of the additive may be used to increase or decrease the base mix of either the binding or solidifying agent of the solid fuel to effect stability of the final solid fuel.

The viscosity of either the single or multiple variable compositions of the additive to the solid fuel may be used to effectively increase or decrease the additive of the solid fuel for shear stress, velocity or gradient of the additive and ultimately the final solid fuel.

Dry or liquid organics or inorganics may be used as a binding agent. The medium may be either neutral in BTU value, or be combined singularly or with two or more mediums as to increase or decrease carbon value.

Organic or Inorganic medium used as a binding agent may be used singularly or with two or more agents as to not affect BTU value, but used to change the molecular structure to increase or decrease gas composition of the thermal image.

Mixing of the medium used to create the binding agent may be accomplished by either manual or automatic process. The use of a singular mixing means and methods will produce a 60% of the singular agent or the introduction of two or more mediums used as the base binding agent or the manufactured solid fuel.

The mixing process will enable a desired level of air and moisture entrapment in the base binding agent. This process may be used singularly or with two or more of the medium used to create the blended binding agent.

Entrapment of moisture and air may be adjusted singularly or in combination and may be mixed as to generate disproportionate ratios of air and moisture.

The process of mixing may be accomplished manually or automatically in any combination that creates the effective binding agent with the necessary cohesiveness to solidify the manufactured solid fuel from the transformation point in the manufacturing process of recombination, but before final packaging.

The use of automated controllers may be added to the mixing process. The addition of the controllers may be either hydraulic or electrical, and/or any combination of the two.

The controllers may be used to adjust the speed, volume, temperature and velocity of the medium used in the binding agent either singularly or in any combination of two or more agents that are creating the binding agent.

Controllers used in the mixing may be incorporated to adjust the process on either the x or y axis to effect moisture, and/or entrapment of air.

The controllers may be used in the mixing process to affect the additives from either a solid to a liquid, or liquid to a solid, while maintaining the optimum dynamic viscosity.

Automated controllers used in the mixing process will effect mixing not only dimensionally on the x and y axis, but also as it correlates to volume, density, temperature, as well as fugitive elasticity, not only as a factor of the binding agent, but also the manufactured solid fuel.

During mixing of the binding agent should a gas be created or incorporated as part of the entrapment mixing a defined minimum and maximum ratio will be used to increase or decrease viscosity with the increase if temperature of the binding agent.

The use of a single or multiple controllers as to location, size, functionality, in the process of establishing the medium(s) used to develop the base binding agent may be established with the introduction of computer aided design simulation or CAE to the process.

If CAE is used; the simulation will not only be for the incorporation of the controllers, but may be used to establish concurrent engineering versus sequentional engineering and material control.

Additionally, CAE simulation for the binding agent may be used to establish process parameter control, encasement design considerations and cost estimation.

The binding agent may be incorporated into the solid fuel process manually or automatically by various forms and techniques of injection.

Manual incorporation of the binding agent may use singular or multiple components in the additive and may be placed in a free flow manner, with varying degrees or percentages of incorporation into the manufactured solid fuel.

Automatic incorporation of the binding agent into the manufactured solid fuel process may be instituted in single or multiple steps and area's of the manufacturing process.

Variables effecting the location and volume of the manual or automatic incorporation of the binding agent are dependent on the desired specification of the solid fuel for BTU value and thermal value.

Automatic injection of the binding agent will be based on the thermal properties of the mediums used to create the binding agent.

Automatic injection of the binding agent may be incorporated into the process at a single point or at multiple points of the x and y axis dependant on shape, volume, density of the encapsulation and method used to process for shipment.

The form and type of material used to encapsulate the manufactured solid fuel may require single or multiple parts of injection of the binding agent to ensure total solidification of the binding agent to the manufactured solid fuel.

Mold flow analysis may be added to the CAE simulation process to adjust injection pressure and to manipulate thermal property, variable solidifying rates, flow paths and set time.

Single gates or two or more gates may be used to ensure complete integration of the binding into the manufactured solid fuels.

A single gate or multiple gates can be incorporated into the injection controllers to set a uniform rate of psi (pounds per square inch) or exert a maximum pressure of 20,000 psi.

Pressure and flow control for injection will also be based on the thickness of the wall encapsulation material, shape and compressive strength.

Dynamic modeling of pressure, flow and gates may be incorporated to establish the tensile or compressive strength under full load of the encapsulated manufactured solid fuel.

Additional pumps may be introduced to create vacuum pressure for the removal of air within the encasement as the manufactured solid fuel is added. The addition of one or more binding agents may be incorporated for desired vacuum pressure prior to full encapsulation.

The volume of air removed is a direct ratio of the optimum fuel design as required by the customer. The quality of entrapped air may be modified positively or negatively to maintain BTU and thermal value.

Controllers used in conjunction with pumps will adjust excessive transient pressure to prevent molecular degradation of the material and shape used for encapsulation.

The introduction of moisture may be found/used in either as a by product of organic and/or inorganic material used in either the binding agent or within the manufactured solid fuel.

Moisture will be adjusted by addition or subtraction by either pumps or gate valves to prevent dangerous transient pressures being entrapped as a final component of the manufactured solid fuel.

Example 2

A solid fuel was produced using methods in accordance with the instant invention. The desired analysis of the solid fuel is outlined in Table 2.

Table 2

FUEL COMPOSITION BTU/ RANGE 10,500 - 14,500
DESIRED ULTIMATE ANALYSIS ON DRY BASIS:

ASH - < 54%C - > 68%
H 8.1%
O - < 16%
N 1%%
S - < 1.0%
CL - < .1%
FL - < .004%
H2O - 5.0%

HG < .3 PPM

Based on an average 5% moisture content

Examples of the actual analysis of the solid fuel can be seen in Table 1.

Table 1

SAMPLE IDENTIFICATION

MUNICIPAL WASTE

DATE REPORTED: 03/26/10

Note: Sample Tested using ASTM Volume 05.06 for Gaseous Fuels; Coal and Coke

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	0.88	2.14	91.08	5.90	12683	0.07
DRY BASIS	------	2.16	91.89	5.95	12796	0.07
M-A-FREE					13078	

ULTIMATE ANALYSIS	(% DRY BASIS)
ASH	2.16
HYDROGEN	7.54
CARBON	66.41
NITROGEN	0.61
SULFUR	0.07
OXYGEN	23.21
CHLORINE	0.41

As shown in Table 1, solid fuel produced in accordance with the instant invention surpasses desired dry analysis targets.

Example 3

Additional samples of solid fuel were produced in accordance with the methods described herein. The analysis of these samples is shown in Tables 3 and 4.

Table 3

PROXIMATE ANALYSIS		As Received	Dry Basis
% Moisture	D3302	2.17	*****
% Ash	D3174	4.41	4.51
% Volatile	D3175	92.28	94.33
% Fixed Carbon	D3172	1.13	1.16
BTU	D5865	13483	13782
MAF-BTU	D3180	14433	
% Total Sulfur	D4239B	0.05	0.05
SULFUR FORMS			
% Pyritic	D2492	*****	*****
% Sulfate	D2492	*****	*****
% Organic	D2492	*****	*****
% Total Sulfur	D4239B	0.05	0.05
WATER SOLUBLE			
% Na2O	ASME1974	*****	*****
% K2O	ASME1974	*****	*****
% Chlorine	ASME1974	*****	*****
Alkalies as Na2O	ASME1974	*****	*****
FUSION TEMP. OF ASH	D1857	Reducing	Oxidizing
I.D.		*****	*****
H=W		*****	*****
H=1/2W		*****	*****
Fluid		*****	*****
GRINDABILITY INDEX	D409	***** @	***** % Moist.
GRIND INDEX UNCONDITIONED		***** @	***** % Moist.
FREE SWELLING INDEX	D720	*****	
Apparent Specific Gravity of Coal	ModIC7113	*****	
% Equilibrium Moisture	D1412	*****	

ULTIMATE ANALYSIS (Weight %)		As Received	Dry Basis
% Moisture	D3302	2.17	*****
% Carbon	D5373	65.89	67.35
% Hydrogen	D5373	8.12	8.30
% Nitrogen	D5373	1.91	1.95
% Chlorine	D6721	0.15	0.15
% Sulfur	D4239B	0.05	0.05
% Ash	D3174	4.41	4.51
% Oxygen (Diff.)	D3176	17.30	17.69
(Chlorine D6721 Dry Basis ug/g			1471)
MINERAL ANALYSIS	D6349	% Ignited	Basis
Phos. Pentoxide, P2O5			*****
Silica, SiO2			*****
Ferric Oxide, Fe2O3			*****
Alumina, Al2O3			*****
Titania, TiO2			*****
Lime, CaO			*****
Magnesia, MgO			*****
Sulfur Trioxide, SO3			*****
Potassium Oxide, K2O			*****
Sodium Oxide, Na2O			*****
Barium Oxide, BaO			*****
Strontium Oxide, SrO			*****
Manganese Dioxide, MnO2			*****
Undetermined			*****
Type of Ash	ASME1974		*****
Silica Value	ASME1974		*****
T250 Deg	B&W		*****
Base/Acid Ratio	ASME1974		*****
lb Ash/mm BTU			3.27
lb SO2/mm BTU			0.07
Fouling Index	ASME1974		*****
Slagging Index	ASME1974		*****
(Mercury D6722 Dry Basis ug/g			0.019)

Table 4

PROXIMATE ANALYSIS		As Received	Dry Basis
% Moisture	D3302	2.12	*****
% Ash	D3174	2.30	2.35
% Volatile	D3175	94.15	96.19
% Fixed Carbon	D3172	1.43	1.46
BTU	D5865	13652	13948
MAF-BTU	D3180	14284	
% Total Sulfur	D4239B	0.03	0.03
SULFUR FORMS			
% Pyritic	D2492	*****	*****
% Sulfate	D2492	*****	*****
% Organic	D2492	*****	*****
% Total Sulfur	D4239B	0.03	0.03
WATER SOLUBLE			
% Na2O	ASME1974	*****	*****
% K2O	ASME1974	*****	*****
% Chlorine	ASME1974	*****	*****
Alkalies as Na2O	ASME1974	*****	*****
FUSION TEMP. OF ASH	D1857	Reducing	Oxidizing
I.D.		*****	*****
H=W		*****	*****
H=1/2W		*****	*****
Fluid		*****	*****
GRINDABILITY INDEX	D409	***** @	***** % Moist.
GRIND INDEX UNCONDITIONED		***** @	***** % Moist.
FREE SWELLING INDEX	D720	*****	
Apparent Specific Gravity of Coal	ModIC7113	*****	
% Equilibrium Moisture	D1412	*****	

ULTIMATE ANALYSIS		Weight % As Received	Weight % Dry Basis
% Moisture	D3302	2.12	*****
% Carbon	D5373	66.91	68.36
% Hydrogen	D5373	8.31	8.49
% Nitrogen	D5373	2.30	2.35
% Chlorine	D6721	0.15	0.15
% Sulfur	D4239B	0.03	0.03
% Ash	D3174	2.30	2.35
% Oxygen (Diff.)	D3176	17.88	18.27
(Chlorine D6721 Dry Basis ug/g			1486)
MINERAL ANALYSIS	D6349	% Ignited	Basis
Phos. Pentoxide, P2O5			*****
Silica, SiO2			*****
Ferric Oxide, Fe2O3			*****
Alumina, Al2O3			*****
Titania, TiO2			*****
Lime, CaO			*****
Magnesia, MgO			*****
Sulfur Trioxide, SO3			*****
Potassium Oxide, K2O			*****
Sodium Oxide, Na2O			*****
Barium Oxide, BaO			*****
Strontium Oxide, SrO			*****
Manganese Dioxide, MnO2			*****
Undetermined			*****
Type of Ash	ASME1974		*****
Silica Value	ASME1974		*****
T250 Deg	B&W		*****
Base/Acid Ratio	ASME1974		*****
lb Ash/mm BTU			1.68
lb SO2/mm BTU			0.04
Fouling Index	ASME1974		*****
Slagging Index	ASME1974		*****
(Mercury D6722 Dry Basis ug/g			0.015)

While the invention has been described with reference to certain exemplary embodiments thereof, those skilled in the art may make various modifications to the described embodiments of the invention without departing from the scope of the invention. The terms and descriptions used herein are set forth by way of illustration only and are not meant as limitations. In particular, although the present invention has been described by way of examples, a variety of compositions and methods would practice the inventive concepts described herein. Although the invention has been described and disclosed in various terms and certain embodiments, the scope of the invention is not intended to be, nor should it be deemed to be, limited thereby and such other modifications or embodiments as may be suggested by the teachings herein are particularly reserved, especially as they fall within the breadth and scope of the claims here appended. Those skilled in the art will recognize that these and other variations are possible within the scope of the invention as defined in the following claims and their equivalents.

What is claimed is:

1. A method for manufacturing solid fuel with enhanced efficiency and throughputs of energy from solid waste comprising the steps of :
determining a desired BTU value for the solid fuel;
obtaining solid waste;
determining the BTU value of the solid waste;
manipulating the BTU value of the solid waste to the desired BTU value; and
manufacturing solid fuel from the solid waste.

2. The method of claim 1, further comprising the step of adding a binding agent to the solid waste.

3. The method of claim 2, wherein the binding agent is organic.

4. The method of claim 2, wherein the binding agent is inorganic.

5. The method of claim 1, wherein the BTU value of the solid waste is manipulated by the addition of at least one composition of known BTU value.

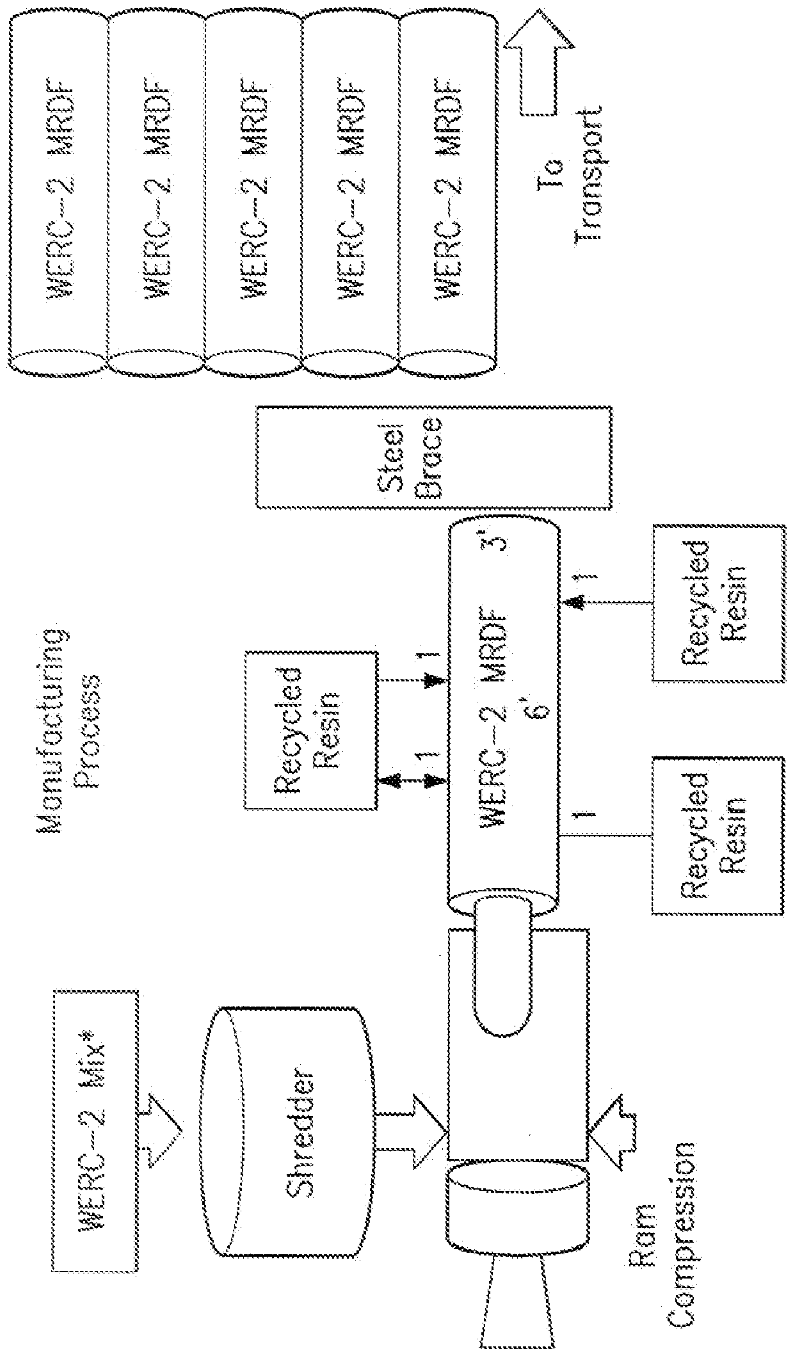
6. The method of claim 1, further comprising the step of adding additional compounds in order to affect the physical characteristics of the solid fuel.

7. The method of claim 1, wherein the method is a machine implemented method.

8. The method of claim 1, wherein the solid waste comprises inorganic waste.

9. The method of claim 1, wherein the solid waste comprises organic waste.

10. Solid fuel manufactured in accordance with the method of claim 1.



* – WERC-2 Mix prepared to specifications
1 – Injection ports for recycled resin (i.e. water bottles)

FIG. 1

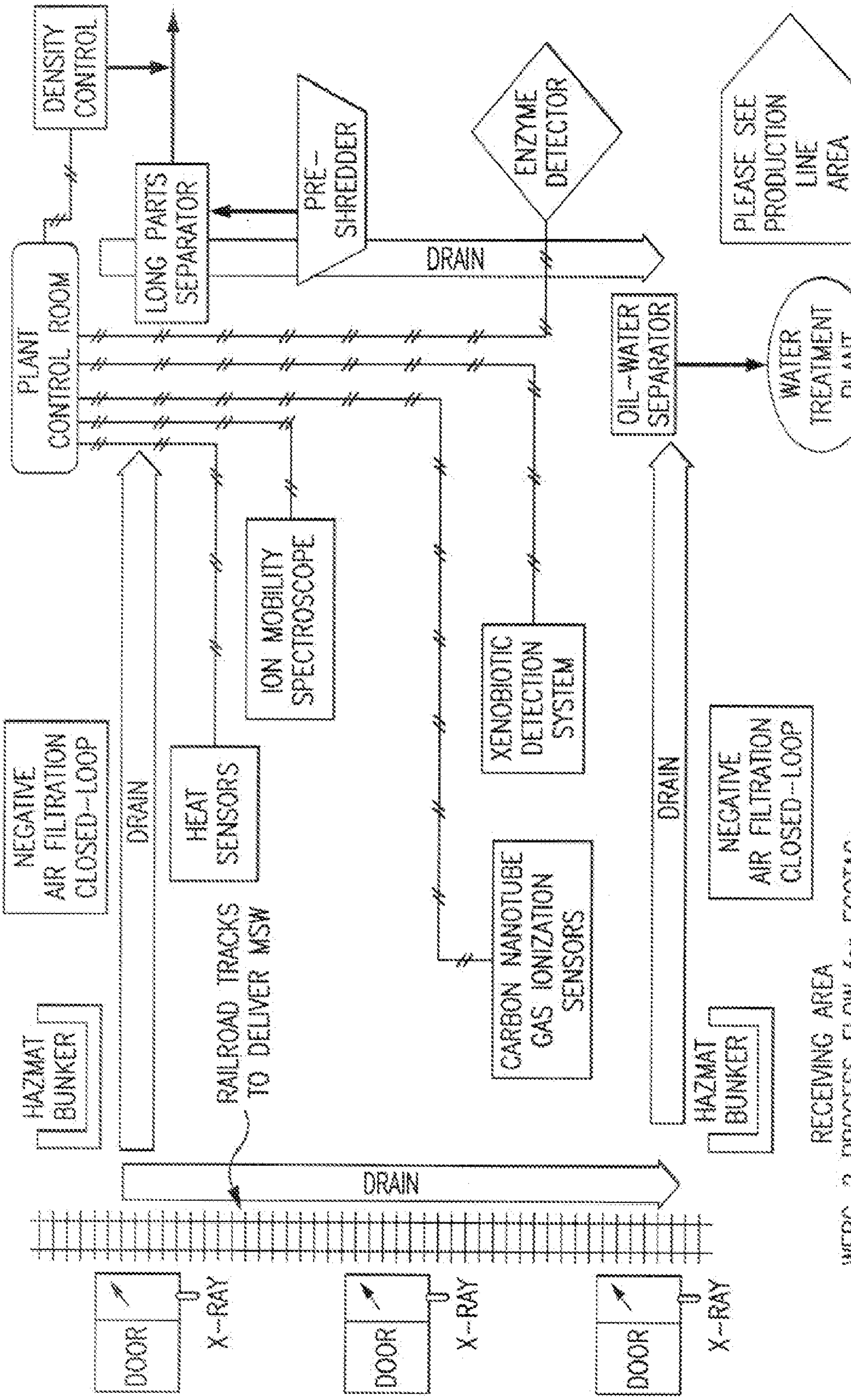
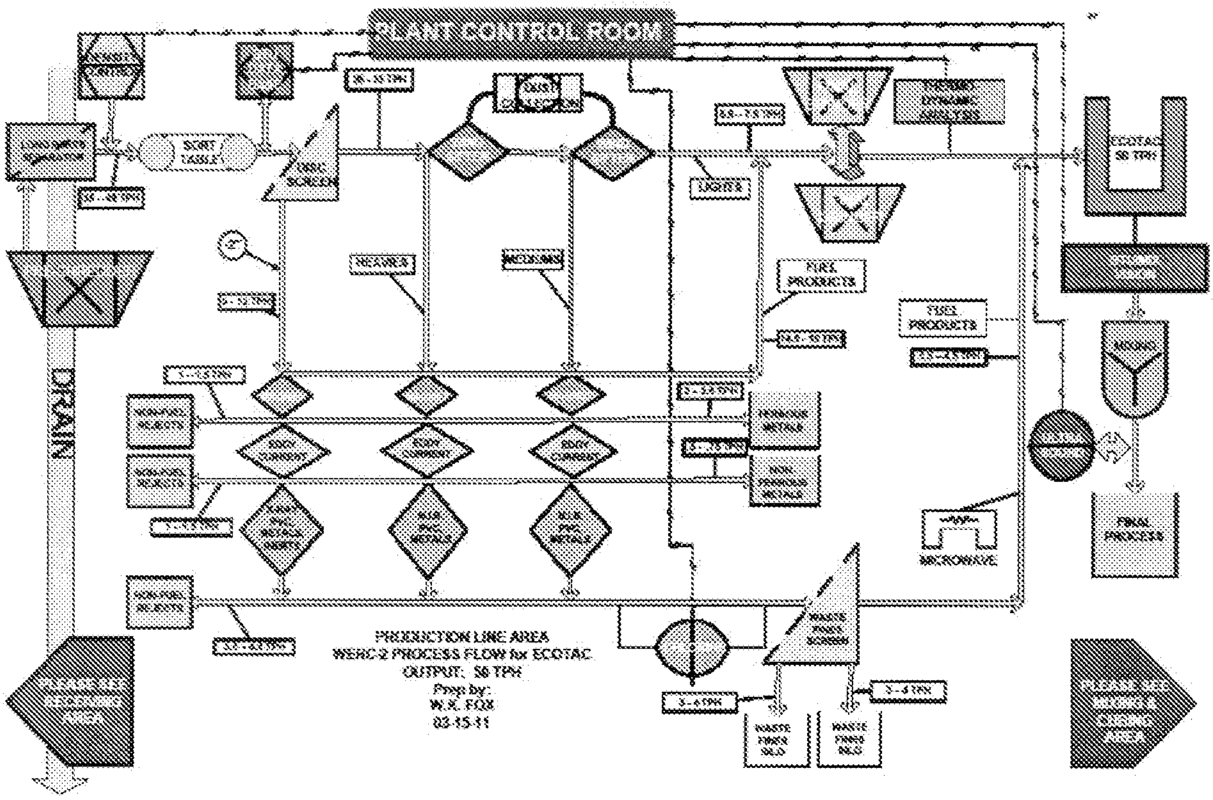


FIG. 2

SUBSTITUTE SHEET (RULE 26)

Figure 3


PLANT CONTROL ROOM
SORT TABLE
DISC SCREEN
HEAVIES
MEDIUMS
LIGHTS
FUEL PRODUCTS
DRAIN
EDDY CURRENT
FERROUS METALS
MICROWAVE
FINAL PROCESS
WASTE FINES SILO
PRODUCTION LINE AREA
WERC-2 PROCESS FLOW for ECOTAC
OUTPUT: 58 TPH
Prep by:
W.K. FOX
03-15-11

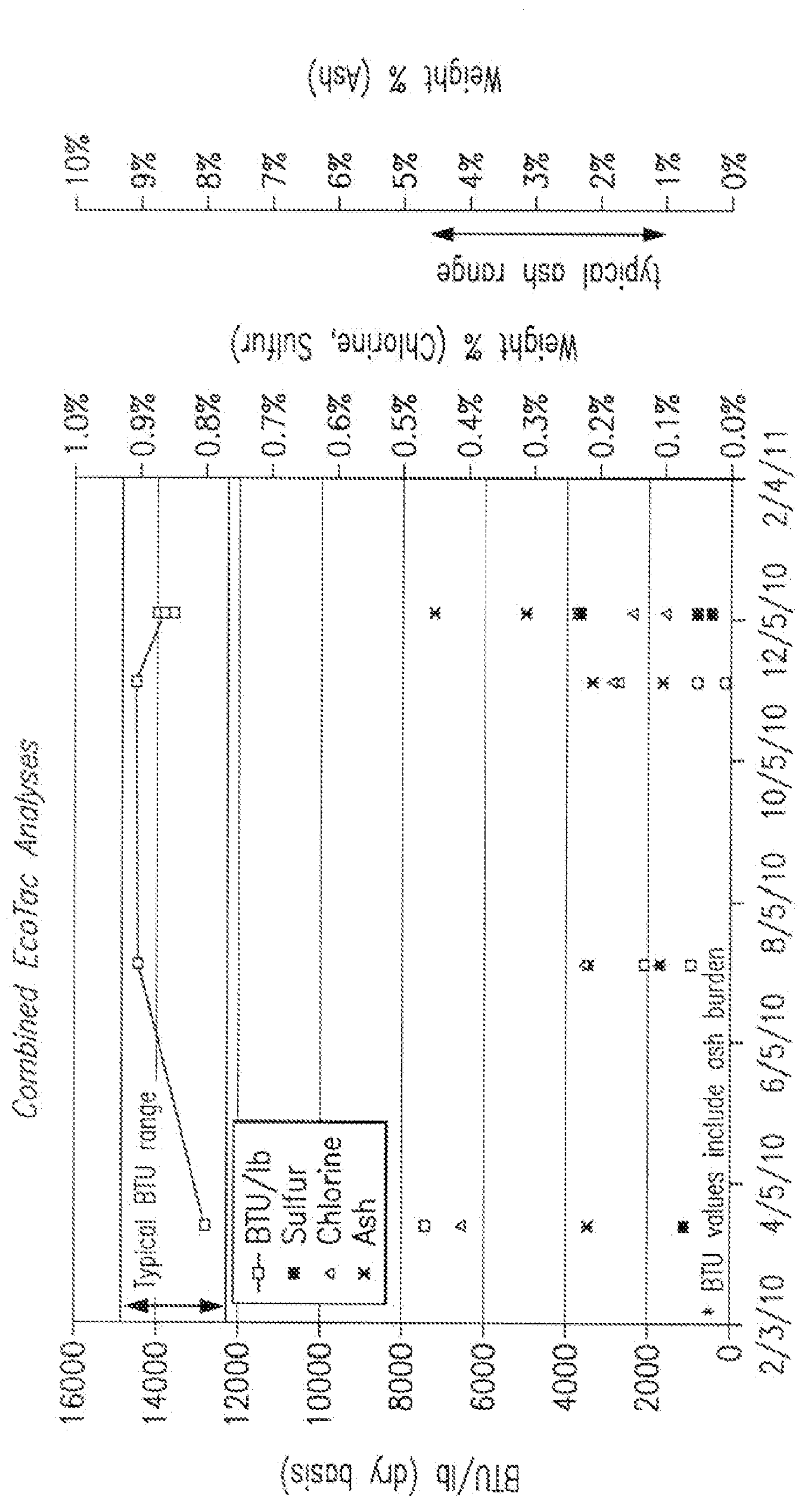


FIG. 4

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 11/33150

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - C10L 5/00; C10L 5/40 (2011.01)
USPC - 44/550; 44/589
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8)- C10L 5/00; C10L 5/40 (2011.01)
USPC- 44/550; 44/589

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Patents and NPL (classification, keyword; search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWest (US Pat, PgPub, EPO, JPO), GoogleScholar (PL, NPL), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL); search terms: manufacture, determine, blend, combine, calculate, manipulate, fuel, solid, waste, btu, thermal, heat, unit, value, efficiency, throughout, bind, binder

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 5,888,256 A (MORRISON) 30 March 1999 (30.03.1999), col 4, ln 50-67; col 7, ln 29-32; col 8, ln 3 to col 9, ln 16; col 12, ln 8-24; col 14, ln 8; col 15, ln 12-62; Tables 4A, 4B	1-3, 5-10 — 4
Y	US 5,429,645 A (BENSON et al.) 04 July 1995 (04.07.1995), Abstract, col 1, ln 62-64; col 7, ln 11-52	4
Y	US 2008/0022587 A1 (MACCHIO) 31 January 2008 (31.01.2008), para [0028]-[0068]	1-10
Y	US 2006/0004237 A1 (APPEL et al.) 05 January 2006 (05.01.2006), para [0028]-[0164]	1-10
Y	WO 99/55806 A1 (MYASOEDOVA) 04 November 1999 (04.11.1999), pg 2-14	1-10

☐ Further documents are listed in the continuation of Box C. ☐

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Date of mailing of the international search report
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Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:
Lee W. Young
PCT Helpdesk: 571-272-4300
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