FUEL PELLET BRIQUETTES FROM BIOMASS AND RECOVERED COAL SLURRIES

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ABSTRACT

The invention makes burnable renewal fuel (RF) briquettes from recovered coal from coal slurry ponds, biomass, and a binder. The briquettes may be augmented with one or more of recovered environmental burnable fraction from municipal solid waste (MSW), agricultural livestock waste, lumber processing residue, solid wood waste material, agricultural by-products and crops, and like burnable waste material. Accordingly, the method for making burnable renewal fuel (RF) briquettes includes the steps of recovering coal from coal slurry ponds; recovering biomass; adding a binder to said recovered coal and said biomass; and forming solid burnable RF fuel briquettes therefrom.
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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] None.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not applicable.

BACKGROUND OF THE INVENTION

[0003] The present invention generally relates to formation of environmentally friendly, fuel pellet briquettes and more particularly to their formation from biomass (e.g., municipal solid waste (MSW) burnable fractions), recovered coal from coal slurry ponds, and binder.

[0004] A variety of biomass sources provide an opportunity as a fuel source. Often, such biomass is a "waste" material, such as sawdust from lumber mills, waste wood pallets, construction wood waste, and the like. Additionally, cellulose and lignin burnable fractions from municipal solid waste (MSW) represents another potential fuel source, once it is successfully separated from the entire MSW.

[0005] In an environmentally related area, abandoned coal mines represent a continuing and unnecessary liability to the mine owner. In the United States alone, there are an estimated one billion tons of economically recoverable coal fines. This is the energy equivalent of approximately 10 years of electricity needs for the United States.

[0006] Uniting these two fuel sources would represent an opportunity to reuse and recycle materials that otherwise represent a disposal burden. It is to such an opportunity that the present invention is addressed.

BRIEF SUMMARY OF THE INVENTION

[0007] The invention makes burnable renewal fuel (RF) briquettes from recovered coal from coal slurry ponds, biomass, and a binder. The briquettes may be augmented with one or more of recovered environmental burnable fraction from municipal solid waste (MSW), agricultural livestock waste, lumber processing residue, solid wood waste material, agricultural by-products and crops, and like burnable waste material.

[0008] Accordingly, the method for making burnable renewal fuel (RF) briquettes includes the steps of recovering coal from coal slurry ponds; recovering biomass; adding a binder to said recovered coal and said biomass; and forming solid burnable RF fuel briquettes therefrom.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] For a fuller understanding of the nature and advantages of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

[0010] FIG. 1 is a simplified block diagram showing the formation of the burnable renewal fuel (RF) briquettes of the present invention.

[0011] It will be described in further detail below.
treatment stages. These stages serve to remove inorganic components such as metals, glass, and plastics from the organic component of the MSW. The segregated or separated by-product materials, such as ferrous and non-ferrous metals, glass, and plastic, increasingly are becoming valuable resources worthy of the expenditure of capital for effective separation equipment. Of course, the quality and resultant value of the organic material also is dependent upon the corresponding quality of separation, the presence of plastics, glass, or other foreign particles being undesirable or unacceptable for most commercial applications.

A broad variety of separation techniques have been known to industry. Among those, both manual and automatic techniques have been used. The manual techniques that generally involves human pickers usually is neither cost effective nor desirable. The automatic techniques which rely on the fraction size for sorting by a grizzly or the magnetic characteristics of the fraction or the density of the fraction for air separation have generally not been employed by industry in such a manner as to eliminate the extensive need of human pickers to further separate MSW into the various fractions where air separation techniques have been applied to municipal waste separation. Designers have found that achieving high quality separation within reasonable cost limits proves to be an elusive goal. Since municipal waste varies widely in geographical, as well as daily, make-up and consistency, a uniform product is not available for separation treatment. Therefore, any separation system involving the sorting of solid waste must be capable of handling a wide variation of waste components.

One acceptable such MSW separation system is represented in U.S. Pat. Nos. 4,844,351, 4,540,495, and 4,342,830, these disclosures of which are expressly incorporated herein by reference.

Additional biomass includes, for example, agricultural animal waste (e.g., manure), agricultural livestock waste nutrients such as, for example, litter, wood shavings, rice hulls, straw, and like animal bedding; forest related waste, such as, for example, mill and timber harvesting residue, pre-commercial thinning lumber, slash, and brush; solid wood waste, such as, for example, waste wooden pallets, crates, dunnage, manufacturing and construction wood wastes (other than pressure-treated, chemically treated, or painted wood waste), landscape or right-of-way tree trimmings, and the like; agricultural sources including, for example, bagasse, orchard tree crops, vineyard, grain, legumes, sugar, and like crop by-products and residues; and the like and mixtures thereof.

Thus, it will be apparent that a wide variety of biomass is suitable for inclusion in the inventive fuel pellets or briquettes. Individual biomass components often have a size of around 0.25 inches or smaller, which is suitable for use in the present invention.

Binder Component

A wide variety of materials are suitable for use as a binder in making the inventive fuel briquettes. The binder similarly can be a waste product and/or it can be a new binder material. Traditionally, molten hydrocarbons (e.g., asphalt) have been used to bind coal fines together for forming briquettes. Additional binders include, for example, wood tar, starch (e.g., corn starch), and the like. Burnable binders enhance the process and the value of the inventive fuel briquettes. Just enough binder is used in order to produce fuel briquettes that have sufficient mechanical strength to be handled from production to burning.

Briquetting Equipment

Briquetters of choice often influence the choice and amount of binder. Representative briquetters include the Model DH briquetters (K.R. Komrek, Inc., Elk Grove, Ill. 60007). Heat and pressure typically is used by commercial briquetting equipment and can be used for making the inventive fuel briquettes.

Briquetting Process

Referring to FIG. 1, coal fines are recovered in step 10 of the process. Biomass is recovered and processed in step 12 of the process. The suitable binder is provided in step 14 of the process. Each of these products is sent to briquetting step 16 of the process. Withdrawn from briquetting step 16 are the desired fuel briquettes, 18. The ratio of coal fines:biomass:binder particle size thereof more often is determined by availability of each component, requirements of the briquette equipment, intended use for the fuel briquettes, and like factors known to those skilled in the art. A ratio of about 5% to about 25% biomass with the balance being coal plus binder is acceptable for briquetting. Final briquette sizes often are about 0.5 by about 2 inches in size.

While the invention has been described with reference to a preferred embodiment, those skilled in the art will understand that various changes may be made and equivalents may be substituted for elements thereof without departing from the essence of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims. In this application all units are in the metric system and all amounts and percentages are by weight, unless otherwise expressly indicated. Also, all citations referred herein are expressly incorporated herein by reference.

I claim:

1. Method for making burnable renewable fuel (RF) briquettes, which comprises the steps of:
   (a) recovering coal from coal slurry ponds;
   (b) recovering biomass;
   (c) adding a binder to said recovered coal and said biomass; and
   (d) forming solid burnable RF fuel briquettes therefrom.

2. The method of claim 1, wherein said biomass is one or more of a burnable cellulose fraction of municipal solid waste (MSW), animal waste, agricultural livestock waste nutrients, wood, bagasse, or agricultural crop waste.

3. The method of claim 2, wherein said biomass is one or more of manure, litter, wood shavings, rice hulls, straw, mill and timber harvesting residue, pre-commercial thinning lumber, slash, brush, wooden pallets, crates, dunnage, manufacturing and construction wood wastes, landscape and
right-of-way tree trimmings, bagasse, orchard tree crops, 
vineyard, grain, legumes, or sugar.

4. The method of claim 1, wherein said binder is a 
hydrocarbon.

5. The method of claim 4, wherein said hydrocarbon is 
one or more of wood tar, asphalt, or starch.

6. The briquette made according to the process of claim 1.

7. The briquette made according to the process of claim 2.

8. The briquette made according to the process of claim 3.

9. The briquette made according to the process of claim 4.

10. The briquette made according to the process of claim 5.

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