

CLAIMS

1. A method for recycling an effluent downstream from a fermentation process, the method comprising:
 - a. recovering at least a portion of at least one effluent downstream from the fermentation process; and
 - b. directing at least a portion of at least one effluent to a gasification process.
2. The method of claims 1, wherein the effluent is selected from the group consisting of: biogas generated from a wastewater treatment process, unused syngas generated by the gasification process, microbial biomass generated from the fermentation process, microbial biomass generated from a wastewater treatment process, crude ethanol from a product recovery process, fusel oil from the product recovery process, microbial biomass depleted water, wastewater generated from the fermentation process, and clarified water from a wastewater treatment process.
3. The method of claim 2, wherein at least a portion of at least one effluent is gasified to produce a syngas stream.
4. The method of claim 3, wherein at least a portion of the syngas stream is passed to the fermentation process.
5. The method of claim 3, wherein microbial biomass generated from the fermentation process or the wastewater treatment process is dried prior to being gasified.
6. The method of claim 2, wherein at least a portion of at least one effluent selected from the group consisting of: the biogas generated from the wastewater treatment process, unused syngas generated by the gasification process, crude ethanol from the product recovery process, fusel oil from the product recovery process is utilized as a heating source in the gasification process.
7. The method of claim 6, wherein the gasification process utilizes at least a portion of at least one effluent for melting at least a portion of a slag produced by the gasification process.
8. The method of claim 2, wherein the gasification process utilizes at least a portion of the biogas from the wastewater treatment process for melting at least a portion of a slag produced by the gasification process.
9. The method of claim 2, wherein at least a portion of at least one effluent replaces at least a portion of a process water required by the gasification process.

10. The method of claim 9, wherein the process water required by the gasification process is reduced by at least 45 percent.
11. The method of claim 2, wherein at least a portion of at least one effluent is injected into a syngas stream produced by the gasification process to reduce the temperature of the syngas stream.
12. The method of claim 11, wherein the temperature of the syngas stream is reduced by at least 100 degrees Celsius.
13. The method of claim 2, wherein at least a portion of at least one effluent is injected into a syngas stream produced by the gasification process to remove at least one particulate from the syngas stream.
14. The method of claim 2, wherein the microbial biomass comprises one or more C1-fixing microorganism.
15. The method of claim 14, wherein the C1-fixing microorganism is selected from the group consisting of: *Moorella*, *Clostridium*, *Ruminococcus*, *Acetobacterium*, *Eubacterium*, *Butyribacterium*, *Oxobacter*, *Methanosarcina*, and *Desulfotomaculum*.
16. The method of claim 2, wherein the biogas generated from the wastewater treatment process comprises one or more component selected from the group consisting of: methane, carbon dioxide, carbon monoxide, ammonia, and a sulfur compound.
17. The method of claim 16, wherein the sulfur compound is hydrogen sulfide.
18. The method of claim 16, wherein at least a portion of the methane is reformed to produce carbon monoxide and hydrogen.