

CLAIMS

1. A method comprising:
 - a. heating a drying gas;
 - b. providing the heated drying gas to a dryer containing a gasification feedstock to
5 generate a dried gasification feedstock;
 - c. gasifying at least a portion of the dried gasification feedstock to generate syngas;
 - d. fermenting at least a portion the syngas in a bioreactor using a microorganism to generate at least one product and tail gas; and
 - 10 e. utilizing at least a portion of the tail gas to provide heat for heating the drying gas.
2. The method of claim 1 wherein the gasification feedstock is sorted municipal solid waste, unsorted municipal solid waste, industrial solid waste, agricultural waste, forest waste, microbial biomass, lignocellulosic material, sewerage, sludge from wastewater
15 treatment, or any combination thereof.
3. The method of claim 1 wherein the tail gas comprises carbon dioxide.
4. The method of claim 3 wherein the tail gas further comprises carbon monoxide, hydrogen, nitrogen, and methane.
5. The method of claim 1 wherein the microorganism is one or more C1-fixing
20 microorganism.
6. The method of claim 5 wherein C1-fixing microorganism is selected from *Moorella*, *Clostridium*, *Ruminococcus*, *Acetobacterium*, *Eubacterium*, *Butyribacterium*, *Oxobacter*, *Methanosarcina*, and *Desulfotomaculum*.
7. The method of claim 2, wherein the microbial biomass comprises one or more C1-
25 fixing microorganism.
8. The method of claim 7, wherein the C1-fixing microorganism is selected from *Moorella*, *Clostridium*, *Ruminococcus*, *Acetobacterium*, *Eubacterium*, *Butyribacterium*, *Oxobacter*, *Methanosarcina*, and *Desulfotomaculum*.
9. The method of claim 2 wherein the microbial biomass is from a wastewater treatment
30 plant.
10. The method of claim 1 wherein the drying gas is air.
11. The method of claim 1 wherein the gasifying produces a greater yield of syngas as compared to gasifying without drying the gasification feedstock.

12. The method of claim 1 wherein the gasifying produces a greater quality of syngas as compared to gasifying without drying the gasification feedstock.
13. The method of claim 1 wherein the tail gas is burned to provide heat for heating the drying gas.
- 5 14. The method of claim 1 wherein the tail gas is burned in a burner to provide heat for heating the drying gas.
15. An apparatus comprising:
 - a. a dryer having one or more burners for heating a drying gas, the dryer in communication with a feedstock conduit;
 - 10 b. a gasifier in communication with the dryer;
 - c. a bioreactor in fluid communication with the gasifier;
 - d. a product conduit and a tail gas conduit in fluid communication with the bioreactor; and
 - e. the tail gas conduit also in fluid communication with the one or more burners.
- 15 16. The apparatus of claim 15 further comprising a dryer gas conduit in communication with the dryer and in heat exchangeable communication with at least one burner.
17. The apparatus of claim 15 further comprising a product recovery unit in fluid communication with a wastewater treatment unit and a first recycle conduit from the wastewater treatment unit to the dryer.
- 20 18. The apparatus of claim 17 further comprising a biogas treatment unit in fluid communication with the first recycle conduit.
19. The apparatus of claim 15 further comprising a second recycle conduit from the product recovery unit to the dryer.
20. The apparatus of claim 15 further comprising at least one removal unit in fluid communication with at least the gasifier and the bioreactor.
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