WHAT IS CLAIMED IS:

1. A method comprising:

placing a liquid medium comprising water and an electron beam irradiated lignocellulosic feedstock in a vessel;

saccharifying the electron beam irradiated lignocellulosic feedstock in the vessel, while mixing with a jet mixer comprising a plurality of jet flow agitators, to form a sugar solution, and

in the same vessel, converting the sugar solution to a product, utilizing an enzyme and/or a microorganism,

wherein the irradiated lignocellulosic feedstock has been irradiated with a dose of at least 10 Mrad.

2. The method of claim 1 wherein the method further comprises distillation of the product.

3. The method of claim 2 wherein distillation comprises vacuum distillation.

4. The method of claim 3 wherein distillation is performed at a vacuum of less than 70 Torr.

5. The method of claim 3 wherein distillation is performed at ambient temperature.

6. The method of claim 1 wherein the product comprises an alcohol.

7. The method of claim 1 wherein the feedstock has a bulk density of less than about 0.75 g/cm^3.

8. The method of claim 1 wherein the liquid medium contains a saccahrifying agent that comprises an enzyme.

9. The method of claim 8 further comprising monitoring the glucose level of a mixture of the feedstock, the liquid medium and the saccharifying agent during saccharification.

10. The method of claim 1 further comprising adding additional feedstock and saccharifying agent during saccharification.

11. The method of claim 1 wherein the vessel comprises a tank.

12. The method of claim 1 wherein converting comprises fermentation of the sugar solution.

13. The method of claim 12 further comprising monitoring oxygen level in the vessel during fermentation.

14. The method of claim 1 wherein the sugar solution further comprises xylose.

15. The method of claim 14 further comprising converting xylose to xylitol.

16. The method of claim 1 wherein each jet flow agitator comprises an impeller disposed within a shroud.

17. The method of claim 1 wherein at least 10% solids of the lignocellulosic material is placed in the vessel.

18. The method of claim 1 wherein at least 20% solids of the lignocellulosic material is placed in the vessel.

19. The method of claim 1 wherein at least 30% solids of the lignocellulosic material is placed in the vessel.

20. The method of claim 1 further comprising causing one or more of the jet flow agitators to up pump and one or more other of the jet flow agitators to down pump.

WHAT IS CLAIMED IS:

1. A method comprising:

saccharifying a biomass feedstock in a liquid medium in a vessel to form a sugar solution having a concentration of at least 15%, and converting the sugar solution to a product, in the same vessel, utilizing an enzyme and/or a microorganism.

2. The method of claim 1 wherein converting comprises fermentation.

3. The method of claim 1 or 2 wherein converting further comprises distillation.

4. The method of claim 3 wherein distillation comprises vacuum distillation.

5. The method of claim 4 wherein distillation is performed at a vacuum of less than 70 Torr.

6. The method of any one of claims 3-5 wherein distillation is performed at ambient temperature.

7. The method of any one of the above claims wherein the product comprises an alcohol.

8. The method of any one of the above claims wherein the feedstock has a bulk density of less than about 0.5 g/cm^3.

9. The method of any one of the above claims wherein the liquid medium comprises water.

10. The method of any one of the above claims wherein the saccharifying agent comprises an enzyme.

11. The method of any one of the above claims further comprising mixing with a jet mixer during saccharification.

12. The method of any one of the above claims further comprising monitoring a glucose level of a mixture of the feedstock, the liquid medium and the saccharifying agent during saccharification.

13. The method of any one of the above claims further comprising adding additional feedstock and saccharifying agent to the vessel during saccharification and dispersing the feedstock in the medium using the dispersing system.

14. The method of any one of the above claims wherein the vessel comprises a tank.

15. The method of any one of the above claims wherein the feedstock comprises a cellulosic or lignocellulosic material.

16. The method of claim 15 wherein the feedstock comprises paper.

17. The method of any one of the above claims further comprising adding an emulsifier or surfactant to the mixture in the vessel.

18. The method of claim 3 or 4 further comprising mixing during distillation.

19. The method of claim 18 wherein mixing during distillation is performed using a jet mixer.

20. A system comprising:

a tank,

a delivery system configured to deliver a biomass feedstock, a saccharification agent, and a liquid medium to the tank,

a mixer configured to mix the delivered biomass feedstock and saccharifying agent, and

a vacuum distillation system in communication with the tank, configured to distill a product from the contents of the tank.

21. The system of claim 20 further comprising a delivery device configured to inoculate the contents of the tank with a microorganism.

22. The system of claim 20 or 21 further comprising an oxygen monitor configured to monitor the oxygen level of the contents of the tank.

23. The system of any one of claims 20-22 wherein the mixer comprises a jet mixer.

24. The system of any one of claims 20-23 wherein the delivery system is configured to deliver the biomass feedstock and liquid medium to the tank in the form of a dispersion.