WHAT IS CLAIMED IS:

1. A method for producing a product from lignocellulosic material, comprising:

reducing the recalcitrance of the lignocellulosic material by irradiating the lignocellulosic material, thereby making a reduced recalcitrance lignocellulosic material;

wet milling and simultaneously jet mixing the reduced recalcitrance lignocellulosic material using a wet milling system comprising one or more jet mixers and one or more wet mills, wherein one or more jet heads and one or more wet milling heads are disposed in a tank containing a fluid having the reduced recalcitrance lignocellulosic material dispersed therein, thereby making wet milled lignocellulosic material;

saccharifying the ~~reduced recalcitrance~~ wet milled lignocellulosic material with a saccharifying agent, thereby producing a sugar solution;

fermenting the sugar solution with a microorganism in ~~a vessel~~ the tank, with jet mixing during fermenting, to produce a product selected ~~form~~ from the group consisting of: alcohols, organic acids, hydrocarbons and mixtures thereof~~;~~

~~during fermenting, using a jet mixer in the vessel~~.

2. The method of claim 1 wherein irradiating the lignocellulosic material comprises exposing the lignocellulosic material to an electron beam.

3. The method of claim 2 wherein irradiating the lignocellulosic material comprises delivering a dose of at least 5 Mrad to the lignocellulosic material.

4. The method of any of the above claims wherein the lignocellulosic material is selected from the group consisting of wood, particle board, sawdust, agricultural waste, sewage, silage, grasses, rice hulls, bagasse, cotton, jute, hemp, flax, bamboo, sisal, abaca, straw, wheat straw, corn cobs, corn stover, switchgrass, alfalfa, hay, coconut hair, seaweed, algae, and mixtures thereof.

5. The method of any one of the above claims further comprising densifying the reduced recalcitrance lignocellulosic material prior to wet milling.

6. The method of any of the above claims wherein wet milling is performed using a rotor/stator head.

7. The method of claim 6 wherein the rotor and stator include nesting rings of teeth.

8. The method of claim 7 wherein the stator comprises two or more concentric rings of teeth.

9. The method of claim 8 wherein the rotor comprises a ring of teeth configured to fit between adjacent rings of teeth of the stator.

10. The method of claim 6 wherein the clearance between the rotor and stator is from about 0.25 mm to 6.4 mm.

11. The method of claim 7 wherein the spacing between the teeth in each ring of teeth is from about 2.5 mm to 7.6 mm.

12. The method of claim 6 wherein wet milling is performed using a plurality of rotor/stator heads.

13. The method of claim 1 wherein wet milling is performed at a shear rate of from about 30,000 sec^{-1} to 50,000 sec^{-1}.

14. The method of claim 1 wherein wet milling is performed in-line.

~~15. The method of claim 1 wherein a jet mixer is applied during wet milling.~~

~~16.~~ 15. The method of claim 1 further comprising adding an enzyme to the reduced recalcitrance lignocellulosic material during or after wet milling.

~~17.~~ 16. A wet milling system comprising a jet mixer comprising ~~a wet mill~~ one or more jet mixers and one or more wet mills, wherein one or more jet heads and one or more wet milling heads are disposed in a tank containing a fluid having ~~a~~ biomass ~~material~~ dispersed therein.

~~18.~~ 17. The system of claim ~~17~~ 16 wherein the biomass comprises a lignocellulosic material.

~~19.~~ 18. The system of claim ~~18~~ 17 wherein the recalcitrance of the lignocellulosic material has been reduced by irradiating the ~~lignocellulosic material~~ biomass.

~~20.~~ 19. The system of claim ~~19~~ 18 wherein irradiating comprises exposing the ~~material~~ biomass to an electron beam.

~~21. The system of any one of claims 17 through 20 further comprising a jet mixer disposed in the fluid.~~

~~22.~~ 20. The system of any one of claims ~~17~~ 16 through ~~21~~ 19 wherein the wet mill comprises a rotor/stator head.

~~23.~~ 21. The system of claim ~~22~~ 20 wherein the rotor and stator include nesting rings of teeth.

~~24.~~ 22. The ~~method~~ system of claim ~~23~~ 21 wherein the stator comprises two or more concentric rings of teeth.

~~25. A system comprising a tank, a jet head and a wet mill.~~

~~26. The system of claim 25 wherein the jet head and wet mill are disposed within the tank.~~

~~27.~~ 23. A method for producing a sugar solution from lignocellulosic material, comprising:

reducing the recalcitrance of the lignocellulosic material by irradiating the lignocellulosic material, thereby making a reduced recalcitrance lignocellulosic material;

wet milling and simultaneously jet mixing the reduced recalcitrance lignocellulosic material using a wet milling system comprising one or more jet mixers and one or more wet mills, wherein one or more jet heads and one or more wet milling heads are disposed in a tank containing a fluid having the reduced recalcitrance lignocellulosic material dispersed therein, thereby making wet milled lignocellulosic material;

saccharifying the ~~reduced recalcitrance~~ wet milled lignocellulosic material with a saccharifying agent, thereby producing a sugar solution.

~~28.~~ 24. The method of claim 1 or claim ~~27~~ 23 further comprising jet mixing the reduced recalcitrance lignocellulosic material during saccharifying.

~~29.~~ 25. The method of claim 1 or claim ~~27~~ 23 wherein the sugar solution produced after saccharifying has a final concentration of glucose that is greater than 10% by weight.