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 ~~a~~ the reduced recalcitrance lignocellulosic material;

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

fermenting the sugar solution with a microorganism in a vessel, to produce a product selected form 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 the recalcitrance of the lignocellulosic material has been reduced by irradiating the lignocellulosic material.~~

~~3~~ 2. The method of claim ~~2~~ 1 wherein irradiating the lignocellulosic material comprises exposing the lignocellulosic material to an electron beam.

~~4~~ 3. The method of claim 2 ~~or 3~~ wherein irradiating the lignocellulosic material comprises delivering a dose of at least 5 Mrad to the lignocellulosic material.

~~5~~ 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.

~~6~~ 5. The method of any one of the above claims further comprising densifying the reduced recalcitrance lignocellulosic material prior to wet milling.

~~7~~ 6. The method of any of the above claims wherein wet milling is performed using a rotor/stator head.

~~8~~ 7. The method of claim ~~7~~ 6 wherein the rotor and stator include nesting rings of teeth.

~~9~~ 8. The method of claim ~~8~~ 7 wherein the stator comprises two or more concentric rings of teeth.

~~10~~ 9. The method of claim ~~9~~ 8 wherein the rotor comprises a ring of teeth configured to fit between adjacent rings of teeth of the stator.

~~11~~ 10. The method of claim ~~7~~ 6 wherein the clearance between the rotor and stator is from about ~~0.01 to 0.25 inches (~~0.25 mm to 6.4 mm~~)~~.

~~12~~ 11. The method of claim ~~8~~ 7 wherein the spacing between the teeth in each ring of teeth is from about ~~0.1 to 0.3 inch (~~2.5 mm to 7.6 mm~~)~~.

~~13~~ 12. The method of claim ~~7~~ 6 wherein wet milling is performed using a plurality of rotor/stator heads.

~~14~~ 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}.

~~15~~ 14. The method of claim 1 wherein wet milling is performed in-line.

~~16~~ 15. The method of claim 1 wherein a jet mixer is applied during wet milling.

~~17~~ 16. The method of claim 1 further comprising adding an enzyme to the reduced recalcitrance lignocellulosic material ~~before,~~ during or after wet milling.

~~18. The method of claim 17 further comprising adding a microorganism to the lignocellulosic material or a sugar derived from the lignocellulosic material.~~

~~19. The method of claim 18 wherein the microorganism is added after wet milling has been completed.~~

~~20. The method of claim 18 wherein the microorganism converts the lignocellulosic feedstock or sugar to a product selected from the group consisting of alcohols, organic acids, sugars, hydrocarbons, and mixtures thereof.~~

~~21. The method of claim 20 where a jet mixer is operated during conversion of the feedstock or sugar to the product.~~

~~22~~ 17. A wet milling system comprising a wet mill disposed in a fluid having a biomass material dispersed therein.

~~23~~ 18. The system of claim ~~22~~ 17 wherein the biomass comprises a lignocellulosic material.

~~24~~ 19. The system of claim ~~23~~ 18 wherein the recalcitrance of the lignocellulosic material has been reduced by irradiating the lignocellulosic material.

~~25~~ 20. The system of claim ~~24~~ 19 wherein irradiating comprises exposing the material to an electron beam.

~~26~~ 21. The system of any one of claims ~~22~~ 17 through ~~25~~ 20 further comprising a jet mixer disposed in the fluid.

~~27~~ 22. The system of any one of claims ~~22~~ 17 through ~~26~~ 21 wherein the wet mill comprises a rotor/stator head.

~~28~~ 23. The system of claim ~~27~~ 22 wherein the rotor and stator include nesting rings of teeth.

~~29~~ 24. The method of claim ~~28~~ 23 wherein the stator comprises two or more concentric rings of teeth.

~~30~~ 25. A system comprising a tank, a jet head and a wet mill.

~~31~~ 26. The system of claim ~~30~~ 25 wherein the jet head and wet mill are disposed within the tank.

27. 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 the reduced recalcitrance lignocellulosic material;

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

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

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