METHODOLOGIES AND SYSTEMS FOR GLASS BATCH FORMULATION INCLUDING MIXED CULLET AND GLASS MANUFACTURING

Abstract: A system for and method of analyzing a cullet stream prior to batch formulation in glass manufacturing. Cullet is fed onto a conveyor where a real-time composition analysis is performed. Contaminants are optionally removed, and a determination is made as to whether the cullet batch color is consistent with a predetermined tolerance threshold. If necessary, the glass batch formulation is modified in view of the cullet analysis. Virgin raw materials requirements of the modified glass batch formulation may then be communicated to the batch controller before sending batch ingredients to the mixing stage and completing the overall glass manufacturing process.
1. A method of creating recycled glass products comprising the steps of:
   - determining constituents of a supply of mixed cullet;
   - real-time modification of a glass batch formulation based on at least said determined mixed cullet constituents;
   - determining a quantity of virgin raw materials based upon said modified glass batch formulation; and
   - producing at least one recycled glass product in accordance with said modified batch formulation.

2. A method of manufacturing recycled glass products comprising the steps of:
   - providing a supply of mixed cullet;
   - determining constituents of said mixed cullet prior to providing said mixed cullet to a mixer;
   - providing a glass batch formulation;
   - modifying said glass batch formulation, in real-time, based on at least said determined mixed cullet constituents; and
   - determining a quantity of virgin raw materials based upon said modified glass batch formulation.

3. The method of claim 2, wherein the supply of mixed cullet is provided to a conveyor, further comprising the steps of:
   - mixing the mixed cullet with virgin raw materials in said mixer; and
   - producing at least one recycled glass product in accordance with said modified glass batch formulation.

4. The method of claim 1, 2, or 3, further comprising the step of comparing the determined constituents of said mixed cullet to a desired tolerance threshold.

5. The method of claim 4, further comprising the step of selectively diverting at least one of said constituents that does not satisfy said tolerance threshold.

6. The method of claim 5, wherein said diverting is performed by an air jet device.
7. The method of claim 4, wherein the tolerance threshold comprises a cullet supplier specification.

8. The method of claim 4, wherein the tolerance threshold comprises at least one of a preset and a user-determined specification.

9. The method of claim 1, 2, or 3, further comprising the step of operatively communicating said modified batch formulation to at least one location for review by a user.

10. The method of claim 9, wherein said user authorizes the production of at least one recycled glass product in accordance with said modified batch formulation.

11. The method of claim 1, 2, or 3, wherein the determination of said mixed cullet constituents comprises determining at least one of number percent per color, number percentage per color, weight per color, and weight percentage per color data.

12. The method of claim 1, 2, or 3, wherein the determination of said mixed cullet constituents is used as a quality control metric.

13. The method of claim 1, 2, or 3, wherein the step of determining constituents comprises analyzing with a device capable of determining the composition of at least one constituent of said mixed cullet.

14. The method of claim 13, wherein said device comprises an optical imaging device.

15. The method of claim 13, wherein said device comprises a device capable of measuring color of at least one constituent of said mixed cullet.

16. The method of claim 13, wherein said device comprises a device capable of measuring at least one of optical transmission properties and optical reflectivity properties of said mixed cullet.
17. The method of claim 1, 2, or 3, wherein said mixed cullet comprises at least one of amber, green and flint glass.

18. The method of claim 1, 2, or 3, wherein said recycled glass product is a beer bottle.

19. The method of claim 13, wherein said device comprises an X-ray spectroscopy device.

20. The method of claim 13, wherein said device comprises at least one of an infra-red and a Raman spectroscopy device.

21. A cullet processing system comprising:
   a conveyor suitable to convey mixed cullet;
   a feeder for providing a supply of mixed cullet to said conveyor;
   an analyzer capable of determining the constituents of said mixed cullet as said mixed cullet passes said analyzer on said conveyor;
   batch formulation software, in operative communication with said analyzer, capable of modifying at least one glass batch formulation in real-time; and
   a feeder that provides a quantity of virgin raw materials, said quantity being in accordance with said modified glass batch formulation; and
   a mixer that mixes said mixed cullet with said virgin raw materials.

22. The system of claim 21, wherein the mixed cullet comprises at least one of amber, green and flint glass.

23. The system of claim 21, further comprising a diverting device that selectively diverts at least one constituent of said cullet from said conveyor so as to bring the conveyed mixed cullet into compliance with a tolerance threshold.

24. The system of claim 23, wherein said diverting device is an air jet device.

25. The system of claim 21, wherein said analyzer comprises an optical imaging device.

26. The system of claim 21, wherein said analyzer comprises an X-ray spectroscopy device.
27. The system of claim 21, wherein said analyzer comprises at least one of an infra-red and a Raman spectroscopy device.

28. The system of claim 21, wherein said analyzer comprises a device capable of measuring at least one of optical transmission properties and optical reflectivity properties of said mixed cullet.

29. The system of claim 21, wherein said analyzer comprises a device capable of determining color of at least one constituent of said mixed cullet.

30. The system of claim 21, wherein said batch formulation software compares the output of the analyzer to a tolerance threshold.

31. The system of claim 23, wherein said batch formulation software operatively communicates with said diverting device.

32. The system of claim 23, wherein the said tolerance threshold comprises a cullet supplier specification.

33. The system of claim 23, wherein the tolerance threshold comprises at least one of a preset and a user-determined specification.

34. The system of claim 21, wherein said batch formulation software operatively communicates at least one modified batch formula to at least one location.