CLAIMS

1. A process for managing a plurality of mix designs within the mix design catalog of a concrete producer, comprising:

collecting slump curve data obtained during monitoring of individual concrete loads made from a plurality of various mix designs, wherein each mix design is identified by a different identification code regardless of whether the mix components are different or are identical, and further wherein the slump data curves are established using sensors for measuring force associated with rotating concrete mixes in a rotating mixer drum;

clustering slump curve data having same movement characteristics into at least two slump curve data clusters;

associating each mix design within the slump curve data cluster to an assigned strength value; and

selecting a mix design to produce, to display, or both to produce and to display, from among the two or more individual mix designs within the same slump curve data cluster, the selection being based on same assigned strength value and on at least one selection factor chosen from cost, performance, physical aspect, quality, or combination thereof.

2. The process of claim 1 wherein, in selecting the mix design, the at least one selection factor is chosen from (a) material cost of the mix design; (b) material cost of any of the mix components; (c) number of previous deliveries; (d) total volume delivered of a particular concrete mix design; (e) number of strength test results available; (f) submittal approval statuses; (g) source of materials used in the concrete mix; (h) a characteristic or property of an aggregate material used in the mix design; (i) a characteristic or property of hydration of cement used in the mix design; (j) a characteristic or property of packing density within the concrete mix; (k) a characteristic or property of the durability or reactive nature of the concrete mix; (l) a characteristic or property of the placement of the concrete mix; (m) chemical admixture used in the concrete mix; (n) air characteristic of the concrete; (o) diameter of hose or pipe used for conveying concrete from delivery truck, mixer, or

pump to the actual placement site at the construction location; or (p) a combination of any of the foregoing factors.

3. The process of claim 1 wherein, the cluster comprises slump curve data sets associated with different mix designs whereby the slump predictions from the slump prediction relationships derived from each individual slump curve data are within a pre-defined tolerance.

4. The process of claim 1 wherein, in collecting slump curve data obtained during monitoring of individual concrete loads made from a plurality of various mix designs, the slump curve data are derived from jump speed data wherein slump, drum rotation speed, and force associated with rotating the concrete mix in a rotating mixer drum are obtained before and after jumps in drum speed, wherein the jump in drum speed is at least three drum revolutions per minute difference.

5. The process of claim 1 wherein said force sensors being chosen from hydraulic pressure sensor, stress or strain gauge device located within the rotating mixer drum, or both.

6. The process of claim 1 wherein, in collecting slump curve data obtained during monitoring of individual concrete loads made from a plurality of various mix designs, the slump data curves are established using hydraulic pressure sensors comprising a first sensor for measuring hydraulic pressure when the mixer drum is rotating in the charge direction, and a second sensor for measuring hydraulic pressure when the mixer drum is rotating in the discharge direction.

7. The process of claim 1 wherein, in collecting slump curve data obtained during monitoring of individual concrete loads made from a plurality of various mix designs, the slump data curves are established using a stress or strain gauge device located inside the mixer drum.

8. The process of claim 1 wherein, in collecting slump curve data obtained during in-transit delivery monitoring of individual concrete loads made from a plurality of

various mix designs, the slump data curves are established using a drum speed sensor that comprises an accelerometer, a gyroscope, or combination thereof.

9. The process of claim 1 wherein, in the step of clustering slump curve data having same movement characteristics according to assigned strength value, at least two different mix designs are used to make concrete mix loads from which slump curve data is obtained to define the same slump curve and hence define a slump data curve cluster.

10. The process of claim 1 wherein the assigned strength values are based on physical strength, modulus of elasticity, water content, cement content, maturity testing, or combination thereof.

11. The process of claim 1 wherein, in collecting slump curve data obtained during in-transit delivery monitoring of individual concrete loads made from a plurality of various mix designs, slump curve data establishes at least three different slump curve data clusters; and are correlated with at least three assigned strength values.

12. The process of claim 1 wherein a concrete mix design is selected from a cluster of slump curve data for an assigned strength by operation of computer processor, and a concrete mix is generated.

13. The process of claim 1 wherein a histogram or chart is generated to depict graphically, on a monitor screen or other visual display, the slump data curve clusters for each assigned strength value.

14. The process of claim 13 wherein the histogram or chart displayed on a monitor screen is a GUI (graphical user interface) allowing a user to click to view a list of mix codes for a given cluster of slump curve data.

15. The process of claim 1 wherein, after selecting a mix design to produce, to display, or both to produce and to display, from among the two or more individual mix designs within the same slump curve data cluster, at least one mix design is removed from the same slump curve data cluster.

16. A system of the invention for managing a plurality of mix designs within the mix design catalog of a concrete producer, comprising:

a plurality of concrete ready-mix delivery trucks each having a computer processor unit (CPU) communicative with a first sensor or sensors for measuring the energy associating with rotating a concrete mix load within a rotating mixer drum and communicative with a second sensor for measuring the rotational speed of the mixer drum, wherein the CPUs are programed to store into CPU-accessible memory a plurality of slump curve data obtained during in-transit delivery monitoring of individual concrete loads made from a plurality of various mix designs; and

a computer processor unit which is programmed

(a) to collate the slump curve data that were obtained during and from in-transit delivery monitoring of individual concrete loads made from a plurality of various mix designs according to assigned strength values; and

(b) to select, to display, or both to select and to display a preferred mix design chosen from the collation of a plurality of slump curve data at a given assigned strength value, based on at least one selection factor.

17. The system of claim 16 wherein, in selecting the mix design, the at least one selection factor is chosen from (a) material cost of the mix design; (b) material cost of any of the mix components; (c) number of previous deliveries; (d) total volume delivered of a particular concrete mix design; (e) number of strength test results available; (f) submittal approval statuses; (g) source of materials used in the concrete mix; (h) a characteristic or property of an aggregate material used in the mix design; (i) a characteristic or property of hydration of cement used in the mix design; (j) a characteristic or property of packing density within the concrete mix; (k) a characteristic or property of the durability or reactive nature of the concrete mix; (l) a characteristic or property of the placement of the concrete mix; (m) chemical admixture used in the concrete mix; (n) air characteristic of the concrete; (o) diameter of hose or pipe used for conveying concrete from delivery truck, mixer, or pump to the actual

placement site at the construction location; or (p) a combination of any of the foregoing factors.

18. A process for creating a new concrete mix design, comprising:

collecting slump curve data obtained during monitoring of individual concrete loads made from a plurality of various concrete mix designs, wherein each concrete mix design corresponds to a different identification code regardless of whether the mix components are different or are identical;

clustering slump curve data having same movement characteristics into at least two slump curve data clusters;

associating each mix design within the slump curve data cluster to an assigned strength value;

inputting a target strength and rheology;

interpolating mix design components based on at least two existing mix designs wherein the strength and rheology targets are satisfied; and

creating a new mix design to produce, to display, or both to produce and to display, based on the mix design components interpolated from the at least two existing mix designs.