Claims

1. A method for dosing concrete, comprising:

monitoring the slump, on an automated basis using a processor unit, of a concrete slurry while in a rotatable mixer drum during transit from a mix plant to a construction site to which the concrete slurry is being delivered, the concrete slurry comprising a cement binder, water, aggregate, and clay which, in the absence of a clay mitigation agent, absorbs chemical admixture, and which clay is present in the concrete slurry in an amount sufficient to diminish the dosage efficiency of a cement dispersant or other chemical admixture added into the concrete slurry;

wherein the processor unit

(i) measures loss of slump (dS) of the concrete slurry in the rotatable mixer drum over a period of time (t) during transit to obtain a measured dS/dt value,

(ii) compares the measured dS/dt value with a threshold dS/dt value stored in a memory location which is accessed by the processor unit, and

(iii) detects when the measured dS/dt value meets or exceeds the stored threshold dS/dt value; and

whereupon the processor unit, once the measured dS/dt value meets or exceeds the stored dS/dt threshold value, initiates administration of a controlled dosage of clay mitigation agent (CMA) into the concrete within the rotatable mixer drum during transit, the CMA administered being effective to decrease the dS/dt value as measured by the processor unit.

2. The concrete dosing method of claim 1 wherein the processor unit initiates repeating-of-steps (i), (ii) and (iii) whereby the controlled dosage of the clay mitigation agent is administered into the concrete on at least two staggered instances during transit.

3. The concrete dosing method of claim 2 wherein the processor unit initiates administering the controlled dosage of the clay mitigation agent (CMA) into the concrete, whereby at least 21% and up to 100% of the controlled dosage of the total volume of CMA dosed into the concrete slurry is dosed during transit rather than at the mix plant where the concrete was batched into the rotatable mixing drum.

4. The concrete dosing method of claim 2 wherein the processor unit initiates administering the controlled dosage of the clay mitigation agent (CMA) into the concrete, whereby at least 51% and up to 100% of the controlled dosage of the total volume of CMA dosed into the concrete slurry is dosed during transit rather than at the mix plant where the concrete was batched into the rotatable mixing drum.

5. The concrete dosing method of claim 2 wherein the processor unit initiates administering the controlled dosage of the clay mitigation agent (CMA) into the concrete, whereby at least 81% and up to 100% of the controlled dosage of the total volume of CMA dosed into the concrete slurry is dosed during transit rather than at the mix plant where the concrete was batched into the rotatable mixing drum.

6. The concrete dosing method of claim 2 wherein, after each of the at least two post-batching doses of CMA into the concrete slurry, the processor unit initiates additions of a controlled amount of water or at least one chemical admixture other than a CMA into the concrete slurry.

7. The concrete dosing method of claim 6 wherein the processor unit initiates separate additions of a controlled amount of at least one chemical admixture into the concrete slurry, the at least one chemical admixture being selected from the group consisting of cement dispersant, air entraining admixture, air detraining admixture, and a mixture thereof.

8. The concrete dosing method of claim 7 further comprising storing into processor unit-accessible memory the transit history of the concrete slurry (i) before and after the at least two additions of CMA into the concrete slurry; (ii) before and after the at least two additions of the at least one chemical admixture into the concrete slurry, and (iii) the transit histories of both (i) and (ii).

9. The concrete dosing method of claim 8 wherein the processor unit initiates graphically illustrating the transit histories of both (i) and (ii).

10. The concrete dosing method of claim 1 wherein the processor unit initiates administering into the concrete during transit at least one other chemical admixture, in addition to the controlled dosage of the CMA, on at least two different instances during transit.

11. The concrete dosing method of claim 10 wherein the at least one other chemical admixture is a cement dispersant selected from a mid-range water reducer or high-range water reducer.

12. The concrete dosing method of claim 11 wherein the processor unit initiates dosing of the cement dispersant simultaneously with initiating the controlled dosing of the CMA on at least two staggered instances during transit.

13. The concrete dosing method of claim 11 wherein the processor unit initiates dosing of the cement dispersant after initiating controlled dosing of the CMA during at least two staggered instances during transit.

14. The concrete dosing method of claim 1 wherein the processor unit initiates measuring temperature of the concrete slurry during transit and obtaining temperature data, and adjusting the stored threshold dS/dt value based on the obtained temperature data.

15. The concrete dosing method of claim 1 wherein the processor unit initiates monitoring of air content of the concrete slurry during transit and obtaining air content data, and initiates adjustment of the stored threshold dS/dt value based on the obtained air content data.

16. The concrete dosing method of claim 1 wherein the rotatable mixer drum has an inner wall upon which are spirally-mounted at least two mixing blades for agitating the concrete slurry during rotation of the mixer drum.

17. The concrete dosing method of claim 1 wherein the CMA is selected from the group consisting of a quaternary amine, polyquaternary amine, polycondensate of dimethyl-amine and epichorohydrin, functionalized amine, carboxy-late graft polymers, cationic copolymers, and mixtures and derivatives thereof.

18. The concrete dosing method of claim 1 wherein a portion of the cumulative total amount of CMA added into a given concrete load contained in the mixer drum is added at the mix plant, the portion being added at the batch plant comprising no greater than 49 percent of the cumulative total amount of CMA.

19. The concrete dosing method of claim 1 wherein the CMA has minimal or no water-reducing capability by itself in the absence of clay when administered alone into a fresh concrete (in accordance with standard specification for water reducers in ASTM C494-13).

20. The concrete dosing method of claim 1 wherein the processor unit initiates

adding a polycarboxylate high range water reducing (HRWR) admixture into the concrete slurry during transit;

monitoring for an increase in the slump of the concrete slurry (dS) over a period of time immediately following addition of the polycarboxylate high range water reducing admixture to obtain a dS value for the period after said addition of the HRWR; and

comparing the obtained dS value with a second threshold dS value stored in a memory location which is accessed by the processor unit;

detecting when the obtained dS value fails to meet or exceed the stored second threshold dS value stored in the memory location; and, upon detection that the second threshold dS value is not met,

adjusting the stored threshold dS/dt value described in (ii) of claim 1, adjusting the controlled dosage of clay mitigation agent (CMA) to be administered into the concrete slurry, or both.