Claims

1. A method for coordinating delivery of concrete loads from batch plant to job site, comprising:

(A) providing at least three delivery trucks, each having a mixer drum containing a concrete load and a processor-controlled system on board the concrete delivery truck for monitoring a rheology property chosen from slump, slump flow, and yield stress of the concrete load contained in the delivery truck mixer drum and at least one set time value or value range relative to the concrete load contained in the delivery truck mixer drum, the processor-controlled system on board the concrete delivery trucks being programmed to perform functions comprising:

> i. accessing at least one stored set time value or value range assigned to concrete loaded in the delivery truck mixer drum for delivery of the concrete load to ~~a~~ the job site;
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> ii. calculating at least one current set time value or value range for the concrete load being delivered to the job site based on monitored hydration over time during the delivery of the concrete load to the job site; and
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> iii. comparing the at least one stored set time values or value ranges assigned to the concrete loaded in the delivery truck mixer drum with the calculated at least one current set time values or value ranges relative to the concrete load being delivered to the job site in the delivery truck mixer drum; and

(B) adjusting current set time value(s) or value range(s) by introducing a set accelerator, set retarder, or mixture thereof into at least one of the at least three delivery truck mixer drum concrete loads to effectuate or to modify the sequential placement, finishing, demolding, formwork removal, or compressive strength phases of the concrete loads poured from the at least three delivery truck mixer drums at the job site.

2. The method of claim 1 wherein both the stored set time value or value range and the current set time value or value range are adjusted.

3. The method of claim 1 wherein the stored set time value or value range is calculated based on factors which include the estimated age of the concrete at pour time.

4. The method of claim 1 wherein set time values or value ranges are chosen from time values for (a) initiation of finishing; (b) completion of finishing; (c) removing formwork or mold from the concrete; (d) allowing foot traffic or car traffic on the concrete; (e) releasing tensioned cables from jacks (as used in pre-stressed concrete applications); (f) anchoring or grouting post-tensioned cables (as for post-tensioned concrete); or (g) casting further concrete on top of previously poured concrete.

5. The method of claim 1 wherein the stored set time value or value range accessed by, or accessed and adjusted by, at least one of the delivery truck processor-controlled systems is derived from (a) ticket information provided by a batch plant which sourced the concrete in the truck mixer drum; (b) foreperson at job site where concrete from the truck mixer drum is to be poured; (c) a processor that receives data signals from humidity, moisture, and/or temperature sensors embedded within, positioned against the surface of, or embedded within concrete poured or placed at the job site or another job site; or (d) a processor monitoring of another concrete delivery truck having a processor-controlled system for monitoring rheology and set time value or value range of the concrete load.

6. The method of claim 1 further comprising adjusting the at least one stored set time value or value range, and providing a report or indication of adjustments made to the at least one stored set time value or value range.

7. The method of claim 1 wherein the current set time value or value range is compared to stored set time value or value range in terms of at least one factor chosen from temperature of concrete, rate of temperature change in the concrete, batch amounts or mix design of the concrete, adjustments in water or chemical admixture added into the concrete load, rheology, or other property of the concrete.

8. The method of claim 1 wherein at least one of the concrete loads in one of the at least ~~two~~ three delivery trucks is returned concrete, and further wherein the comparison of stored and current set time values or value ranges includes consideration of the age of concrete from the initial batching of the concrete which was returned from the job site.

9. The method of claim 1 wherein a first concrete load from a first delivery truck is poured into place, and a second concrete load from a second delivery truck is poured on top of the first concrete load while the first concrete load is in a plastic state, and wherein the first load and second load have overlapping set time values or value ranges.

10. The method of claim 1 wherein the stored set time value or value range for concrete previously delivered and placed at the job site is obtained or derived from data signals generated by at least one sensor in the nozzle, hose, or other conduit of concrete during deposition or spraying of the concrete through the nozzle, hose, or conduit at a job site.

11. The method of claim 1 wherein a portion of the concrete load in at least one of the delivery trucks is poured at a first job site, and, within fifteen minutes and more preferably within ten minutes of the pour, a dose of set retarding agent is introduced into the remaining portion of the concrete load in the delivery truck, and the remaining portion containing the dose of set retarding agent is transported by the delivery truck to a second job site and poured into place at the second job site.

12. The method of claim 1 wherein at least five delivery trucks are provided in accordance with step (A) having concrete loads whose set time values or value ranges are adjusted in accordance with step (B), said adjustments being made using

set time value or value range calculations based on signal data obtained or derived from at least one sensor for monitoring hydration over time of placed concrete at the job site.

13. The method of claim 1 wherein, in step (A), at least six delivery trucks are provided, each having a mixer drum containing a concrete load and a processor-controlled system for monitoring rheology and set time value or value range of the concrete load in the drum, wherein the processors perform functions (i), (ii), and (iii); and adjust the stored set time value or value range or the current set time value or value range of the concrete.

14. The method of claim 12 wherein at least ten delivery trucks are provided in accordance with step (A) having concrete loads whose set time values or value ranges are adjusted in accordance with step (B), said adjustments being made using set time value or value range calculations based on signal data obtained or derived from at least one sensor for monitoring hydration over time of placed concrete at the job site.

15. The method of claim 1 further comprising:
moving at least one aerial drone over a plurality of concrete placement locations at a job site, which plurality includes the at least three concrete mix load delivered and poured by the at least three concrete delivery trucks, the at least one aerial drone having at least one sensor for monitoring hydration over time of the placed concrete to obtain data signals indicative of hydration;

comparing the obtained data signals with previously stored data signals to obtain set time values or value ranges correlated with the hydration over time data obtained from the at least one sensor; and

generating a pictorial diagram or map of the plurality of concrete placement locations along with set time values or value ranges, or suggested sequence priorities based on set time values or value ranges, thereby to provide indication of placements that are amenable to sequential treatment with respect to (a) initiation of finishing; (b) completion of finishing; (c) removing formwork or mold from the concrete; (d) allowing foot traffic or car traffic on the concrete; (e) releasing tensioned cables from jacks; (f) anchoring or grouting post-tensioned cables; or (g) casting further concrete on top of previously poured concrete.