

CONCRETE OPTIMIZER

2011 Nova Award Nomination 19 CONCRETE OPTIMIZER

SensoCrete Inc.'s innovative Concrete Optimizer™ is a comprehensive system that measures vital information from inside a readymix truck mixer drum and relays this information to the concrete mixing plant operator, dispatch system operator, and QA/lab technician. This improves the quality of the concrete and the entire delivery process, and it provides significant savings of time and money. The Concrete Optimizer was developed by SensoCrete, Inc. of St. Lazare, Quebec, Canada.

The Concrete Optimizer measures concrete slump, temperature, and volume directly from inside the truck mixer drum. In addition, from this data Concrete Optimizer calculates concrete mixing quality, segregation, and uniformity. It also measures number of drum revolutions and captures and records any water, admixture, fiber, or other additions. All this information is captured for each drum revolution by the measuring sensor installed on the truck mixer drum *in direct contact with the concrete*, so users can monitor changes relative to time and any possible additions. The data is collected through a built-in communication system and is displayed on two truck mounted displays, an external display behind the truck cab and a touch screen display inside the cab. All the captured data is then transferred via GPRS (General Packet Radio Services) to SensoCrete's application server from which the real-time data can be accessed remotely by all users with any web browser. Coupled with GPS, GPRS transmits a record of truck location, speed, and heading, which provides geographic dimension to any information, including truck trip tickets, such as where admixture was added or where and when concrete was poured (see below).

The Concrete Optimizer is a total solution consisting of the SensoCrete Mobile Unit (SMU) installed on the truck mixer to measure the data and the SensoCrete IT infrastructure (SIT) used to capture, store, all information received from the truck mixer and communicate the information to users. The SMU has three subsystems: (1) Onboard computer with touch screen, equipped with GPS and GPS modem to communicate with the application server, (2) Truck Sensor Unit installed on the inner side of the truck mixer drum access door with electronic board that transmits data to the on-board computer, and (3) truck control unit interface between the onboard computer and the sensor, which receives operator input, reads RFID tags to allow admixture additions and electronic signatures, and measures and controls added admixtures. The Concrete Optimizer's bi-directional messaging system also allows communication between the dispatch system or concrete mixing plant operator and the driver (text messages, canned messages and pre-defined audio messages). The system is easily retrofitted on current trucks and it is easy to calibrate and use.

Quality Improvements – The system provides such data as slump, temperature, volume, mixing quality, segregation, and admixture additions that allows correct decisions and reduces variance. It shifts responsibility from the driver to the quality assurance process. It provides detailed reports relating every event to the geographical data through GPS, with electronic signatures, with no unnecessary or undocumented admixture, water, or other additions. Concrete is always supplied at desired temperature and workability. Feedback is available for improving mix design of future batches.

Cost Savings – Accurate slump measurement saves extra cement and back charges for incorrect slump. Documentation of admixtures, water, and other additions also reduces back charges. The system identifies over and under yielding. It also saves time and mileage, enables multi-drops and use of returned concrete, and minimizes operating and maintenance costs. Concrete Optimizer has been shown to significantly decrease mistakes that lead to liability claims. The database also provides information for trouble shooting and improving the entire delivery process. Perhaps most important is SensoCrete technology's ability to usher in a new era of trust between concrete suppliers and customers.

Truck Trip Ticket Data:

	Date+time	Event	New Status	Slump	Temp.	Qty	Added Water	Source	Added_water	Location	RevData	MapLink
1	11/3/2009 9:00:26 AM	Recv ticket	Ready to Load				89.7	3	Added Wtr	41.8514.-87.6430	MsrData	Trak
2	11/3/2009 9:01:55 AM	Mixing Concrete	Start Loading	5.28	58		.0	2	Added Wtr	41.8514.-87.6430	MsrData	Trak
3	11/3/2009 9:09:47 AM	Mixing Concrete	Start Loading	4.6	60	9.29	.0	2	Added Wtr	41.8505.-87.6443	MsrData	Trak
4	11/3/2009 9:10:48 AM	Leave plant	On the way to the job	4.12	61	9.11	.0	1	Added Wtr	41.8541.-87.6445	MsrData	Trak
5	11/3/2009 9:25:08 AM	Arrive on job-manual	Staging	4.02	60	9.08	.0	3	Added Wtr	41.7739.-87.6254	MsrData	Trak
6	11/3/2009 9:33:44 AM	Mixing Concrete	Staging	3.58	61	8.84	.0	2	Added Wtr	41.7734.-87.6254	MsrData	Trak
7	11/3/2009 9:40:04 AM	Start pouring	Pouring	3.58	61		7.9	2	Added Wtr	41.7737.-87.6254	MsrData	Trak
8	11/3/2009 9:47:38 AM	End pour	Washing		62		7.9	2	Added Wtr	41.7736.-87.6254	MsrData	Trak
9	11/3/2009 10:31:33 AM	Mixing Concrete	Staging	5.61	64	9.78	.0	2	Added Wtr	41.7767.-87.6245	MsrData	Trak
10	11/3/2009 10:32:33 AM	Leave job	Returning to plant	5.61	64	9.78	.0	1	Added Wtr	41.7796.-87.6253	MsrData	Trak
11	11/3/2009 10:32:49 AM	Return to plant	Back in plant		64		.0	3	Added Wtr	41.7800.-87.6248	MsrData	Trak
12	11/3/2009 10:32:54 AM	Ready to deliver	Ready to Deliver				.0	3	Added Wtr	41.7800.-87.6243	MsrData	Trak

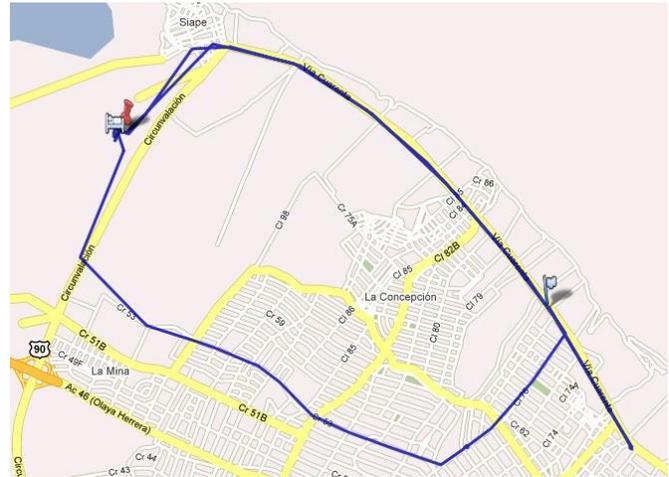
CONCRETE OPTIMIZER

External Display, Showing Different Variables



2011 Nova Award Nomination 19

Route on SensoCrete Web Server



Onboard Computer with Touch Screen inside Truck Cab, and a Sample Screen View



On the way to the job:1:341

Job	1:341:*****	Dist:	9999
Mix:	N1403000000-2000-CONC NORMAL TMN 3/4"		
Qty (M3)	Slmp (")	*+*+*+*	Add Added
Msrd: 7.11	3.50	Water (Lt):	0 0
Req: 8.00	4.00	AdMix1	0
Rev #: 44	RPM: 3.0	AdMix2	0
Temp: (c): 31.3	Dur: 0:07	AdMix3	0
Mix Quality: 99	Uniformity: 90	AdMix4	0
Viscosity: .011	Validity: S:5/Q:5/	Optimization Recommends	
		Change Status	Msgs
		Maint	

7/31/2010 9:24:03 PM,C:9,N:2,R:2,GPS_Active,ReActivate(TCU_Active|Mixer_mixing_loaded)

Truck Sensor Unit Panel Before and (External and Internal View) After Mounting



Sample of Variables Recorded in Database

#	Time	REV #	SLUMP (cm)	Measured QTY	Measure Quality	Uniformity	Diff Entry	Diff Exit	RPM
11	12:56:54 PM	148	0	3.6	0	55	0	0	3.2
12	12:58:11 PM	152	0	3.7	0	59	0	0	3.2
13	12:58:31 PM	153	0	3.7	0	51	0	0	3.2
14	12:59:12 PM	155	0	3.6	0	63	0	0	2.9
15	1:01:36 PM	175	7.6	6.4	0	80	-0.3	-0.1	4.2
16	1:01:51 PM	176	7.4	6.4	0	73	0	0	4.2
17	1:02:05 PM	177	7.6	4.5	97	97	-0.7	0.4	4.2