

How to get Modern Concrete Pumped to the Right Floor

Consistency Via In-transit Concrete Management
Aiding Contractors in Reducing Jobsite Delays

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GCP Applied Technologies

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Advantages of Pumps

- Conveying concrete from central discharge point to formwork.
- Pipelines take up little space and can be readily extended. Delivers concrete in continuous stream. Pump can move.
- Constant supply of freshly-mixed concrete is needed without any tendency to segregate.



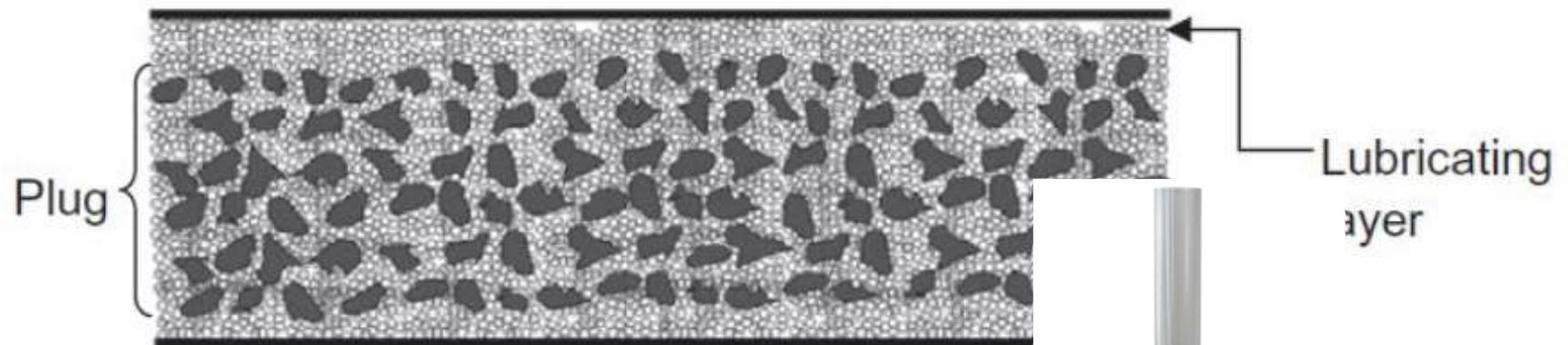
The Challenge-

Pump Job Downtown Chicago

- Mix Strength Requirements 4k,8K, 15K, 20K or High MOE
- 70 yards an hour in downtown Chicago
- 200 yrd pour or more
- Might be pumped 60 stories

Mix Optimization

Basic Concept Inside a Concrete Pump Line



Better Pumping Mix:

- Proper Proportioning
- Specialty Admixtures to improve Pumpability
- Tools to predict Pump Pressures
- Electromagnetic currents used to ease lubrication layer formation
- Slump Retention prediction and trial
 - Temperature, hydration Stabilizers, Ice



Problem: The Mile in the Middle

The industry has a challenging business paradigm: The ready mix producer sends their concrete to be delivered to their customer with no visibility into the concrete properties



- Manual slump measurements are performed infrequently
- “I can see slump” and “I can hear the slump” are not reliable approaches to measuring slump

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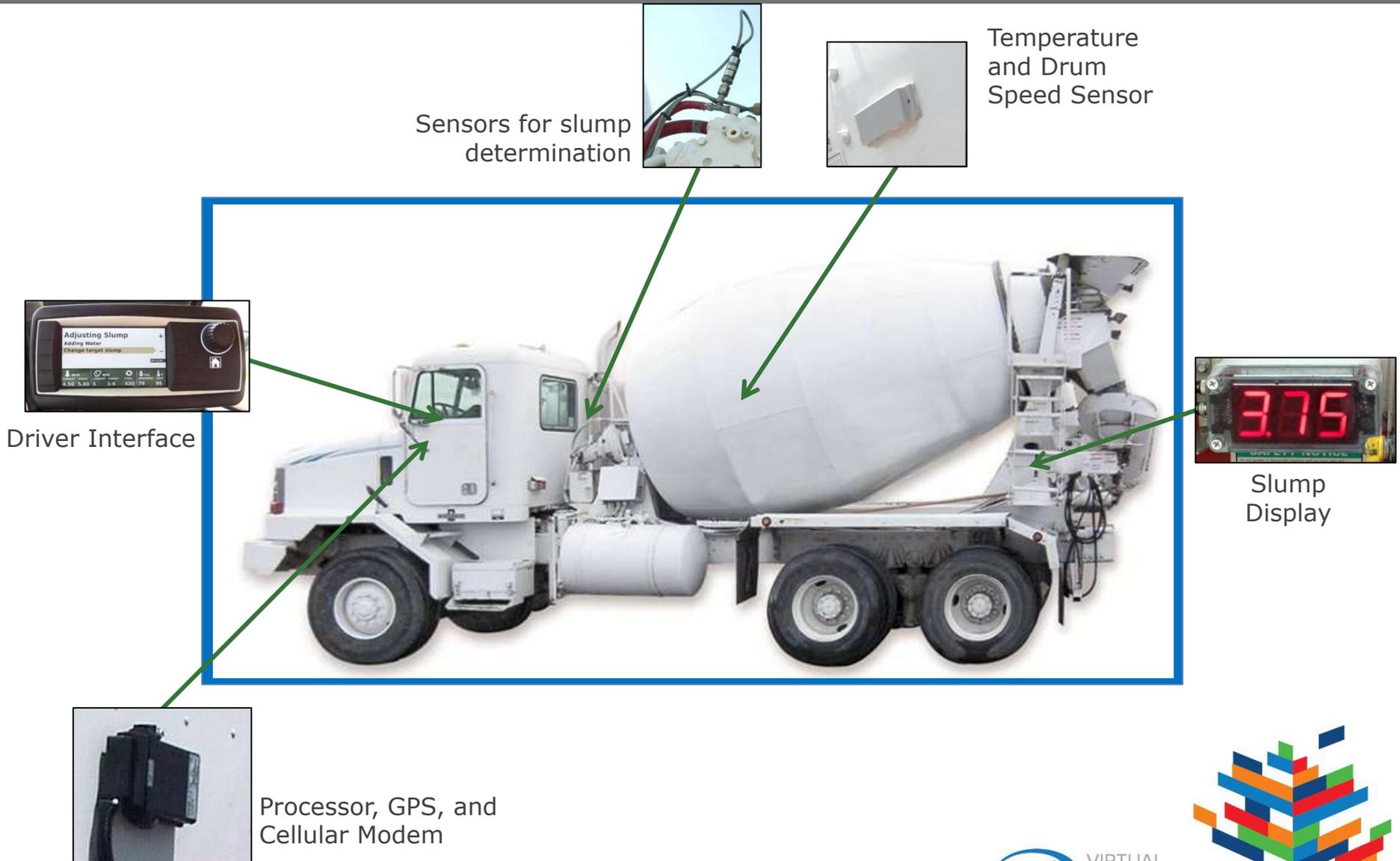


Intransit Slump Measurement Basics

- A solution installed on the ready mix truck to control concrete properties while in transit
 - **Monitors:** Reports in real time the location and status of each truck and its concrete to all functional teams at the ready mix producer
 - **Measures:** Continuously measures the concrete slump / flow replacing the time consuming and imprecise manual test



Truck Components



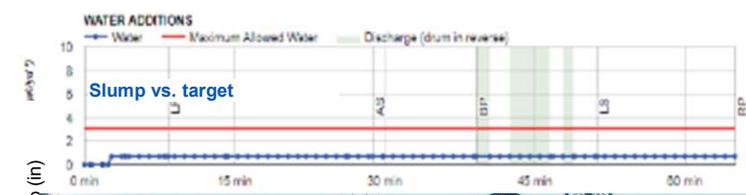
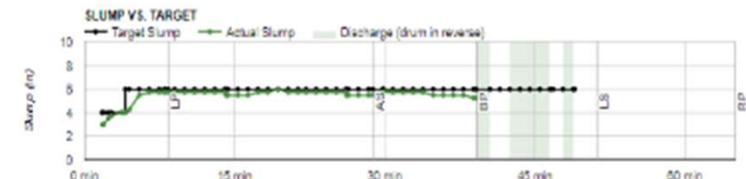
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In-Transit Measuring: live visibility into truck status and load properties

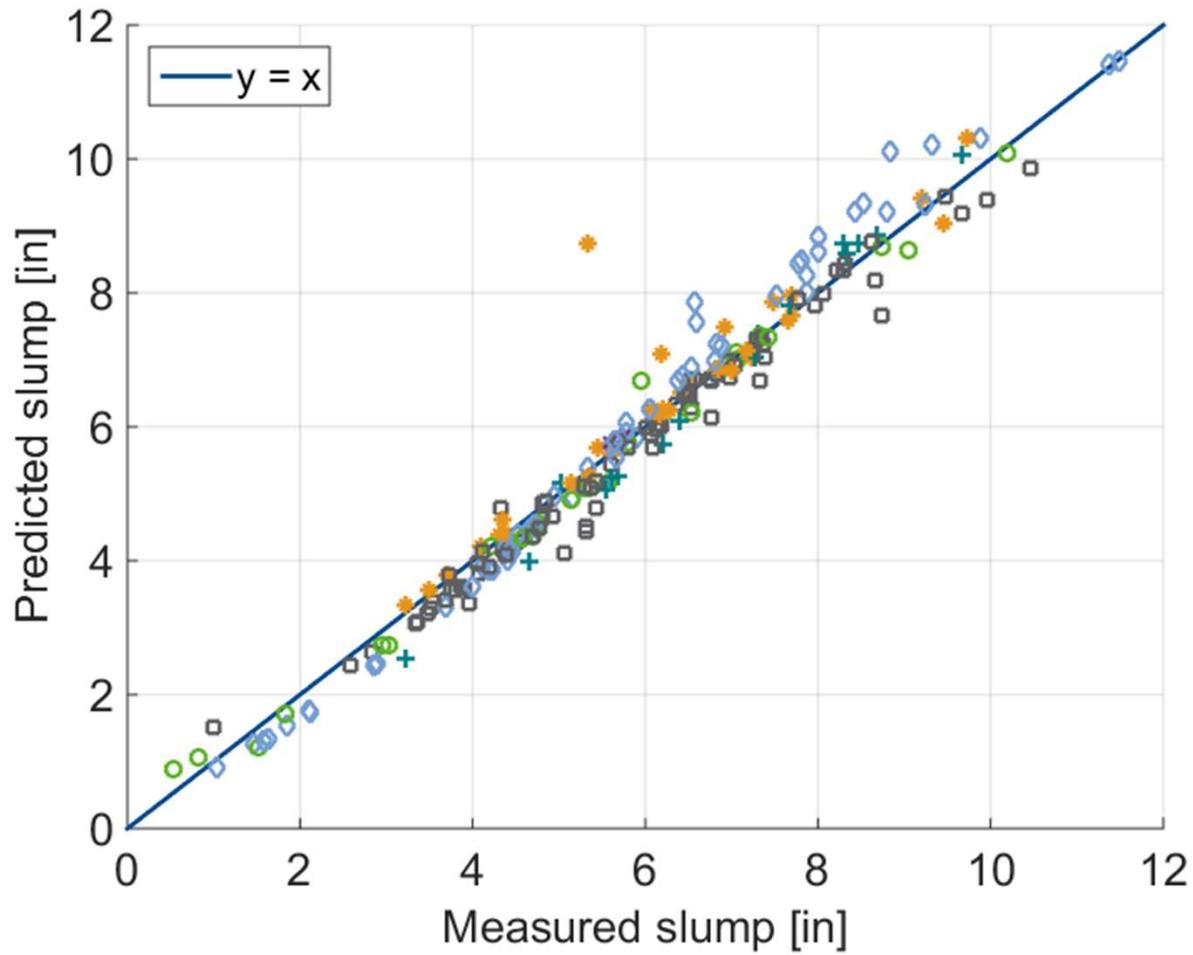


BATCH INFORMATION						AT PLANT			AT ARRIVAL		
Date	Time	Truck	Driver	Wic ID	Ticketed Slump (in)	Size (yd ³)	Initial Slump (in)	Initial Slump vs. Target (in)	Leave Plant Slump (in)	Arrival Slump (in)	Arrival Slump vs. Target (in)
02/12/19	02:46:11 AM	15845523	Colin Allen	9279	8.00	9.0	8.00	0.00	8.00	8.00	0.00
02/12/19	02:44:35 AM	15271019	Denise DeJong	7614	5.00	10.0	4.75	-0.25	5.75	5.00	0.00
02/12/19	02:44:03 AM	11313610	Mozzy W. Fokk	1614	5.00	10.0	4.00	-1.00	5.25	4.50	-0.50
02/12/19	02:43:04 AM	11307102	Whitstone Colek	1027	3.00	10.0	6.75	3.75	5.75	4.75	-0.25
02/12/19	02:43:23 AM	12110213	Reeves Hubert	8479	5.00	10.0	5.25	0.25	5.25	3.75	-2.25
02/12/19	02:43:21 AM	15839572	WMA Randy	8296	2.00	10.0	2.50	0.50	3.50	6.75	4.25

LOAD LIFECYCLE



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Problem: Last minute adjustments



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The Challenge- Pump Job Downtown Chicago



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Problem: Last minute adjustments



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Transporting: Mobile Batcher Mixers

- Intermittent production of concrete at jobsite, or small quantities.
- Combined materials transporter and batching and mixing system. One-man operation.
- Good preventive maintenance program. Materials must be identical to those in original mix design.

- More trucks required
- Driver must be QC
- Not for 8K-20K mixes
- Extra Testing



Intransit Slump Management Basics

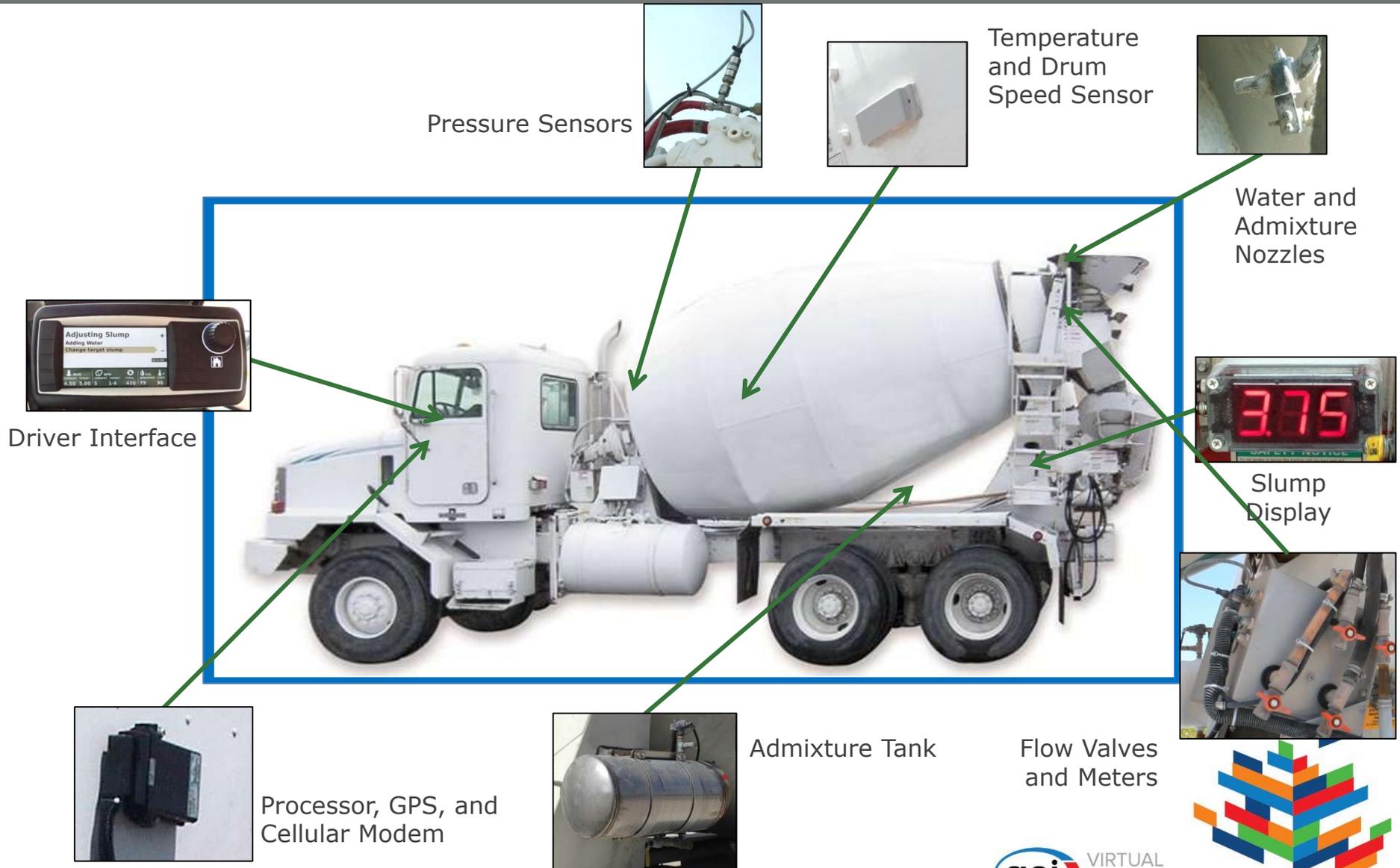
- A solution installed on the ready mix truck to control concrete properties while in transit
 - **Monitors:** Reports in real time the location and status of each truck and its concrete to all functional teams at the ready mix producer
 - **Measures:** Continuously measures the concrete slump / flow replacing the time consuming and imprecise manual test
 - **Manages:** Adds water and or admixtures in transit so the truck arrives at the job site in spec and ready to discharge



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Truck Components



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In-Transit Management: live visibility into truck status and load properties

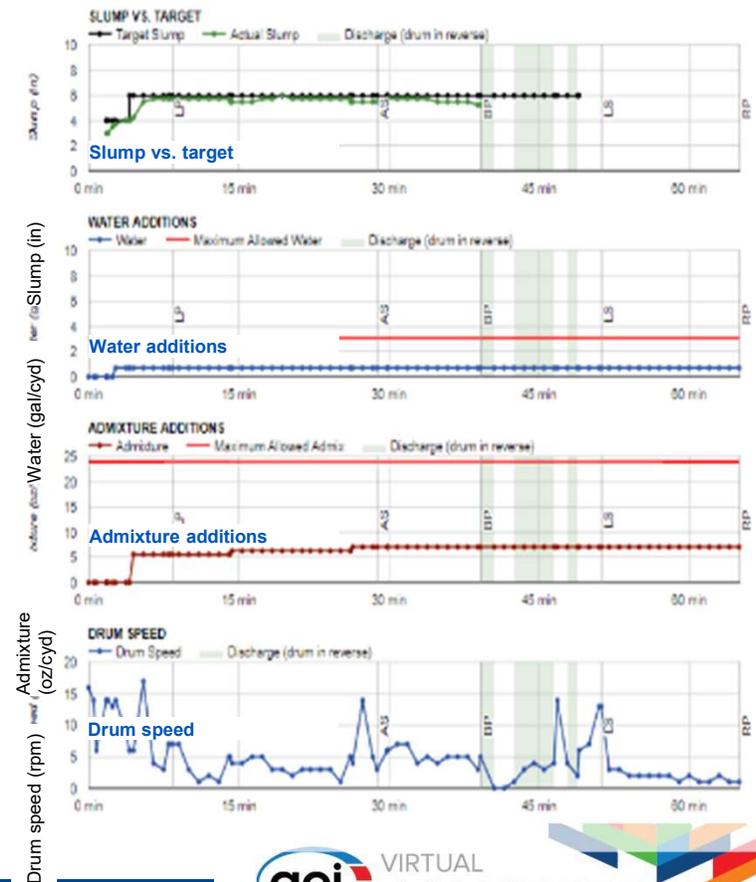
Detailed view into truck location and status during batching, in-transit & at jobsite

Information on slump, water additions, admixture additions, and drum speed



BATCH INFORMATION					AT PLANT			AT ARRIVAL			
Date	Time	Ticket	Driver	Wk ID	Traveled Slump (in)	Size (yd ³)	Initial Slump (in)	Initial Slump vs. Target (in)	Leave Plant Slump (in)	Slump (in)	Arrival Slump vs. Target (in)
02/12/19	08:46:11 AM	12445223	Colten Allen	9279	8.00	9.0	8.00	0.00	8.00	8.00	0.00
02/12/19	08:44:05 AM	12371009	Genes DeRose	7674	5.50	10.0	4.75	-0.25	5.25	8.00	9.00
02/12/19	08:44:05 AM	12365510	Mokey III Polk	7674	5.00	10.0	4.00	-1.00	5.25	7.50	-0.50
02/12/19	08:40:04 AM	11807100	Whitstone Derek	1027	8.00	10.0	6.75	-1.75	6.75	4.75	-0.25
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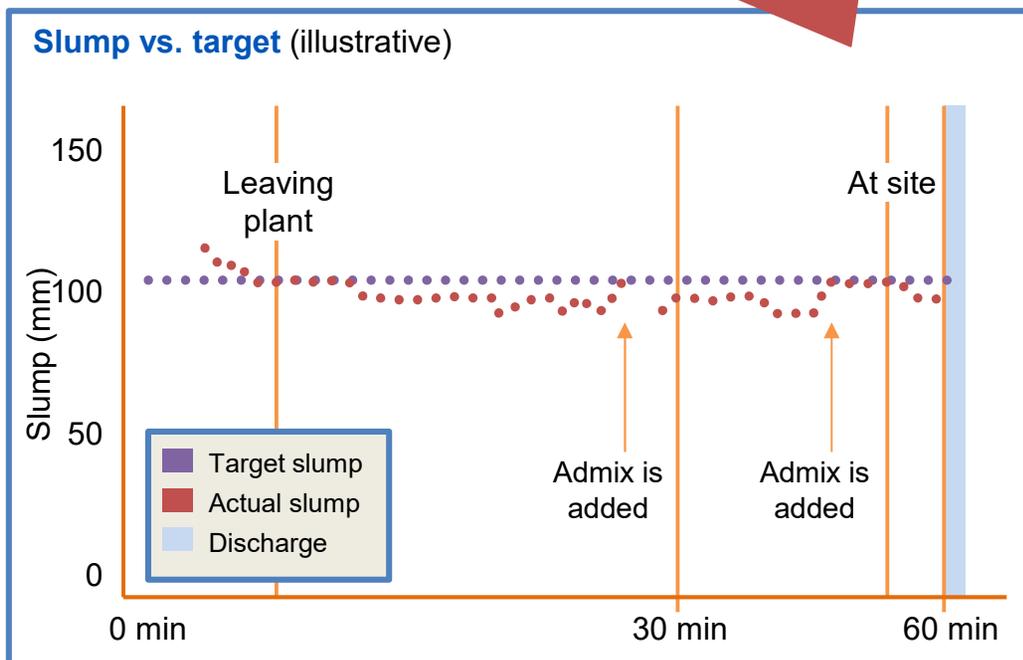
LOAD LIFECYCLE



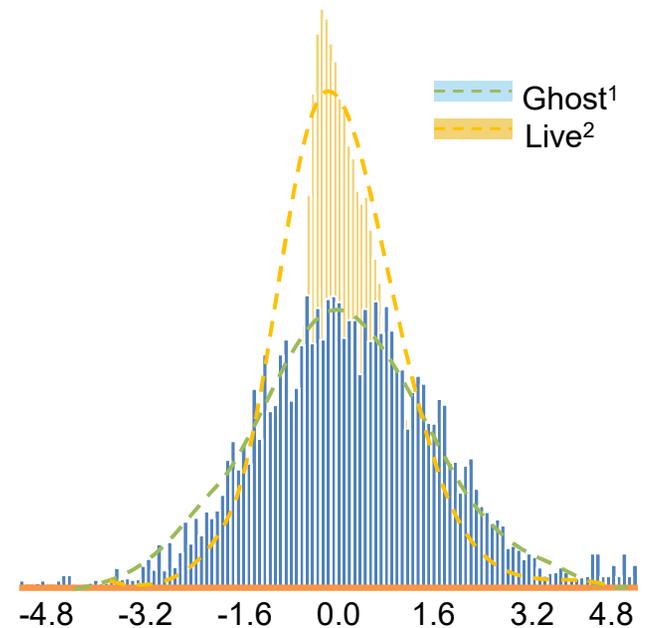
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In-Transit Systems Provide Precise slump control using water & admixture

Slump is continuously measured and managed with admix or water throughout the delivery process



Histogram of average discharge slump



Slump is continuously measured and managed with admix or water throughout the delivery process

Industry Changes

ASTM C-94 update

What Changed?

ASTM C94 now allows water additions in transit on trucks equipped with automated slump and water management systems. The maximum w/c cannot be exceeded.

Why Did This Change?

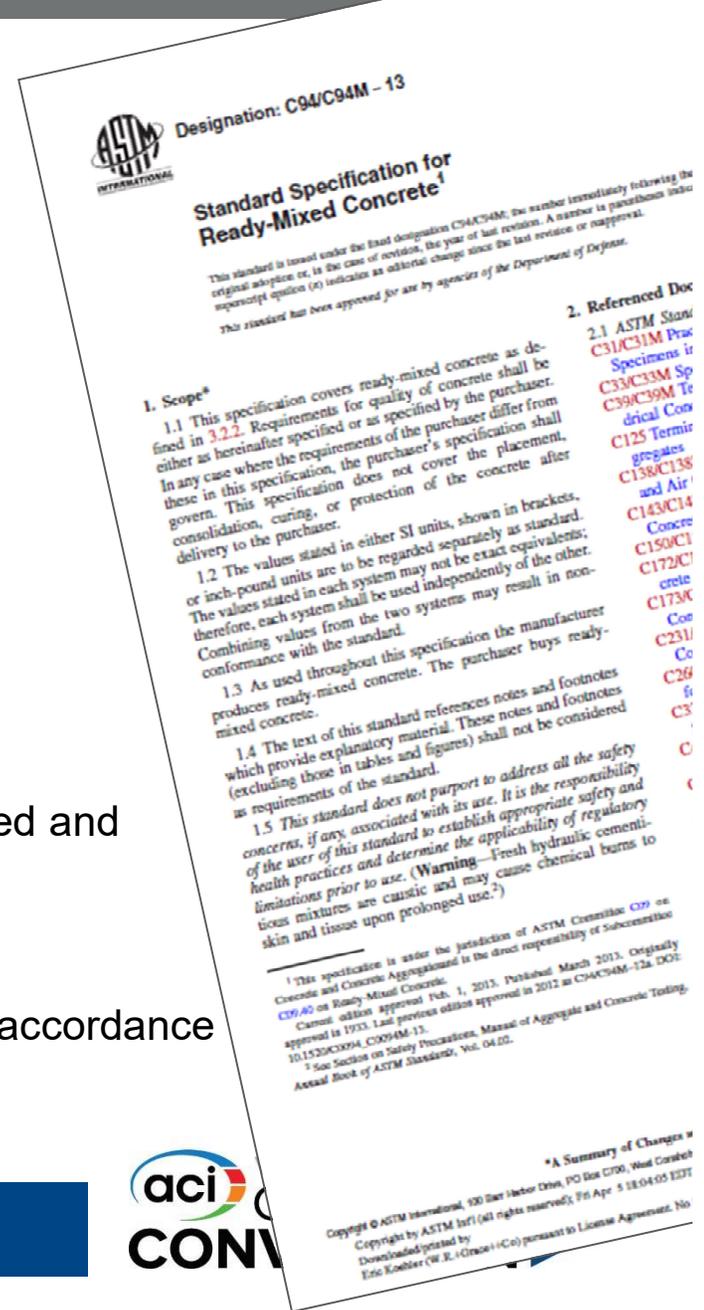
Previously, any water added on the truck needed to be added at the jobsite so that an inspector could be present.

What Are The Benefits?

Concrete arrives ready to pour. Water additions are automated and documented, on every load.

What Can I do?

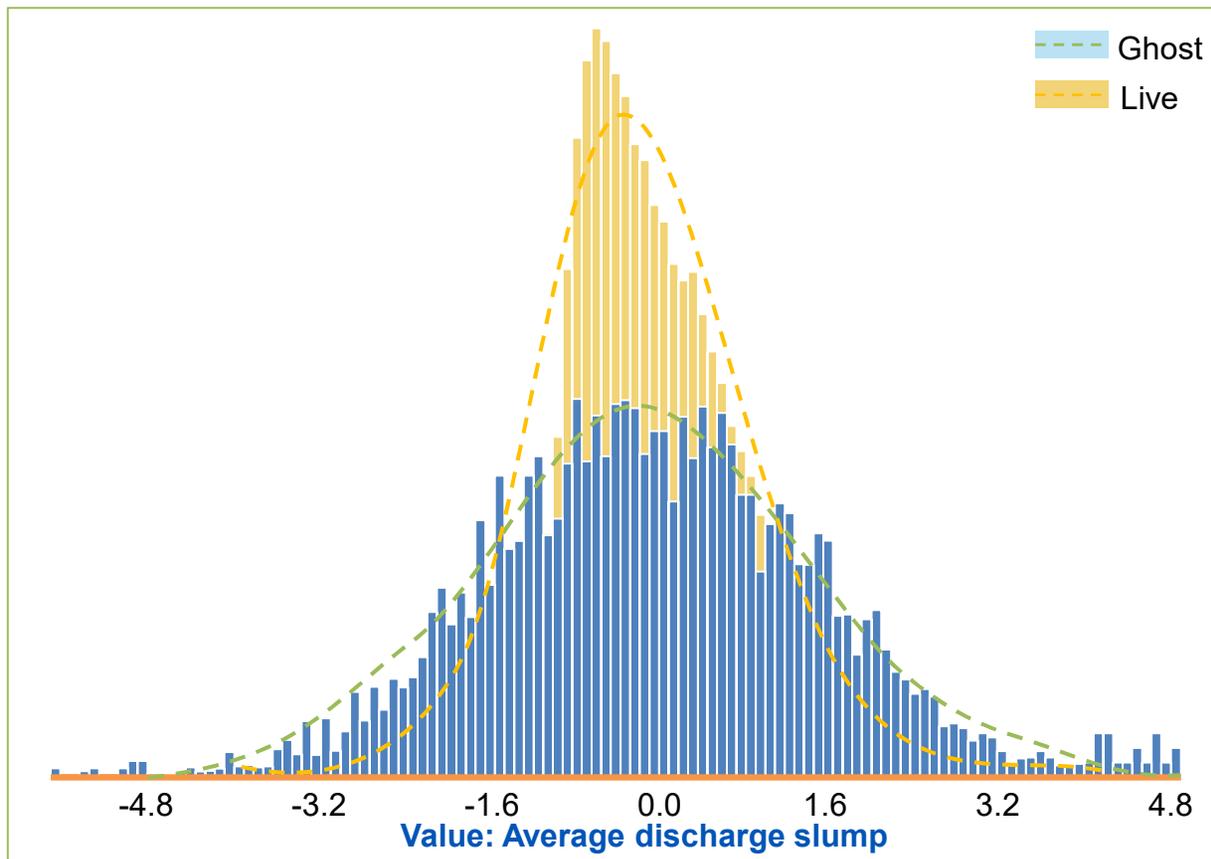
Ensure specifications indicate that: "Water shall be added in accordance with ASTM C94."



In-Transit Systems

Can help you reduce rejected loads

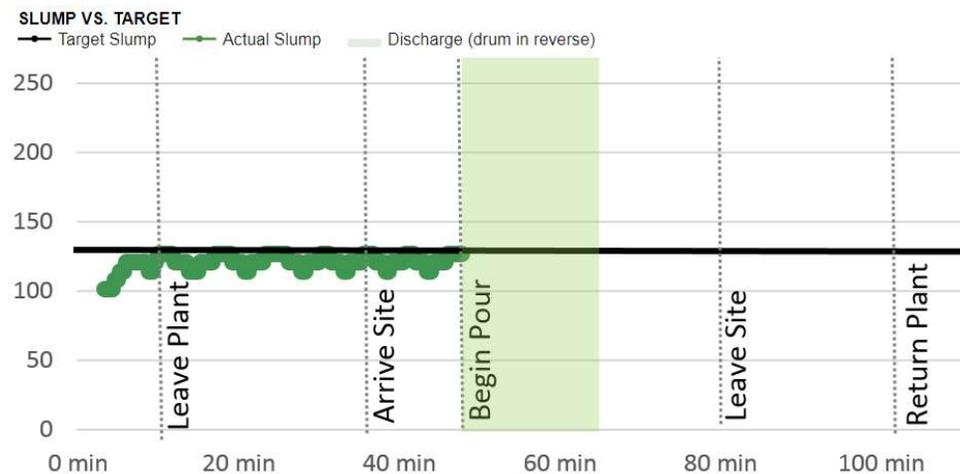
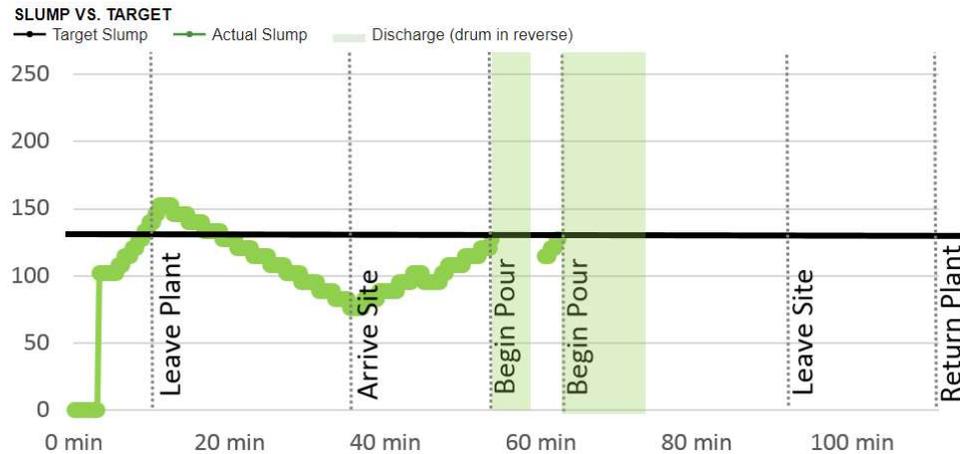
Histogram of average discharge slump



- **Reduce the number of loads rejected** for being out of tolerance for slump or w/c ratio
- Eliminating manual water additions at the batching plant also **reduces delivery time**, and thereby reduces rejections due to late arrival at the job site

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In Transit Systems Helps reduce delivery time



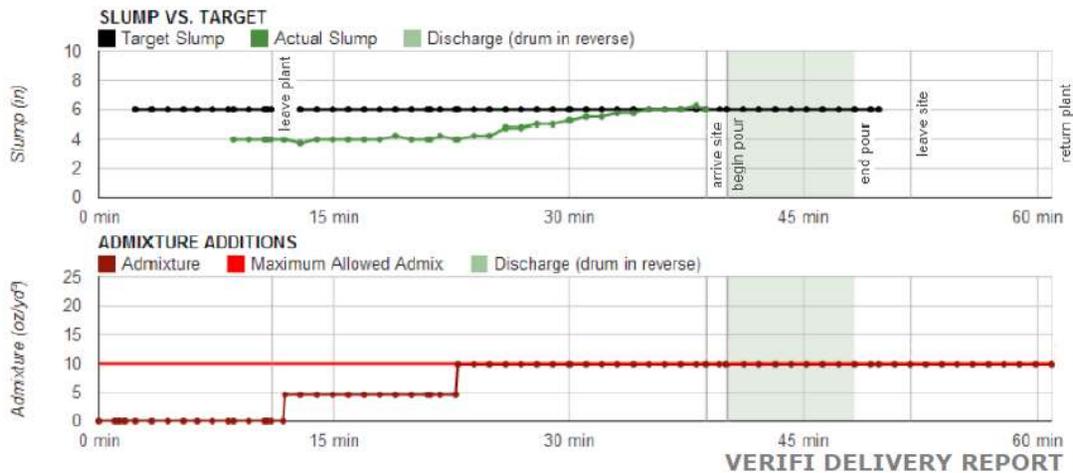
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Lake St. Case Study

Challenge

The contractor requested 70 cubic yards an hour. However, the project's location in congested downtown Chicago made ensuring that trucks arrived ready to pour a challenge. Variable traffic can cause trucks to arrive sporadically with different transit times, which if not properly managed can result in variations in concrete properties, such as slump.



- All trucks arrived in spec ready to pour
- Time on site per truck was reduced 10%
- Overall labor time was reduced by up to 25-30 minutes

“The project had a very limited staging area and we needed concrete to be consistent to prevent delays and to get trucks in and out of the site quickly. Having concrete show up with the right slump was a huge plus to minimize the number of times the pump had to stop. We found that there were fewer delays without concrete at the pump when Verifi was used and that Ozinga was able to perfectly coordinate the delivery schedule. We experienced 25 to 30 minutes less time over each of the 200 yd³ pours when Verifi was used. I would like to use Verifi on every pour.”

Robert J. McGee Jr.
President/Chief Operations Manager
II in One Contractors, Inc.



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