

Concrete is perhaps the most eco-friendly, versatile, low-cost and durable construction material.

- Its embodied carbon is 10-20 times lower than that of Glass and Steel\*.
- But because of the huge (14.0 billion m<sup>3</sup> \*\*) and growing global demand...

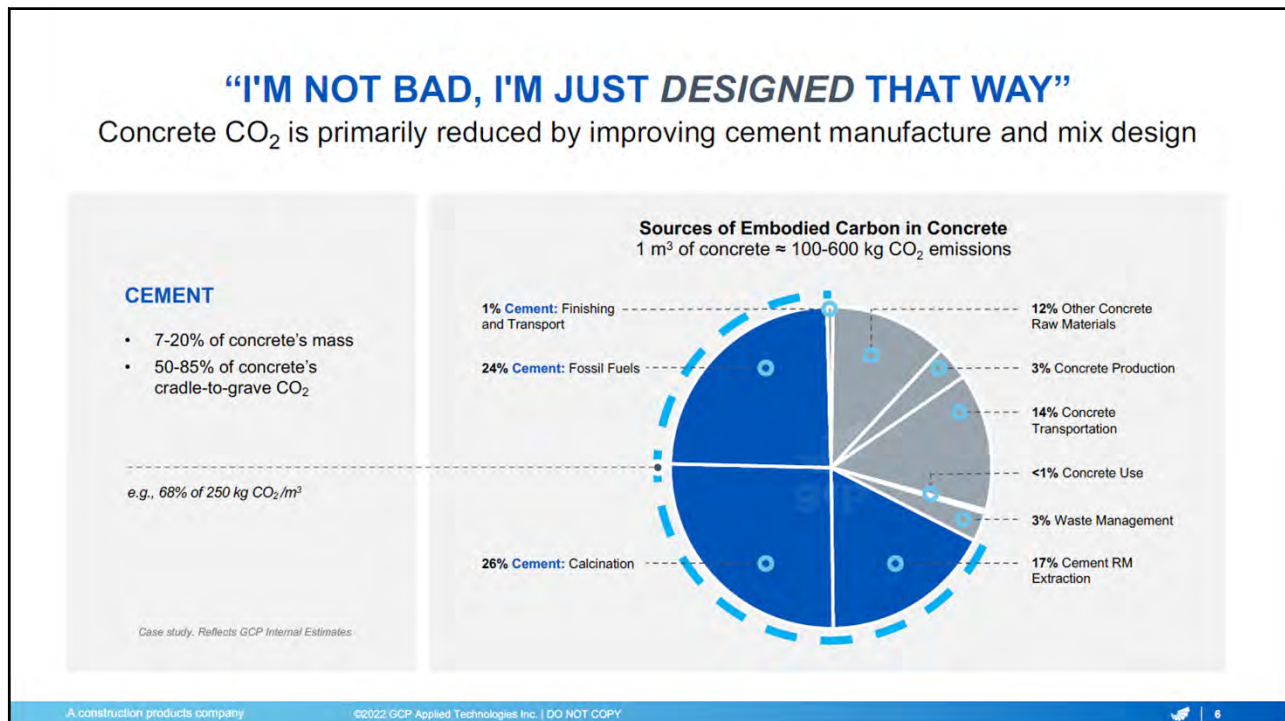
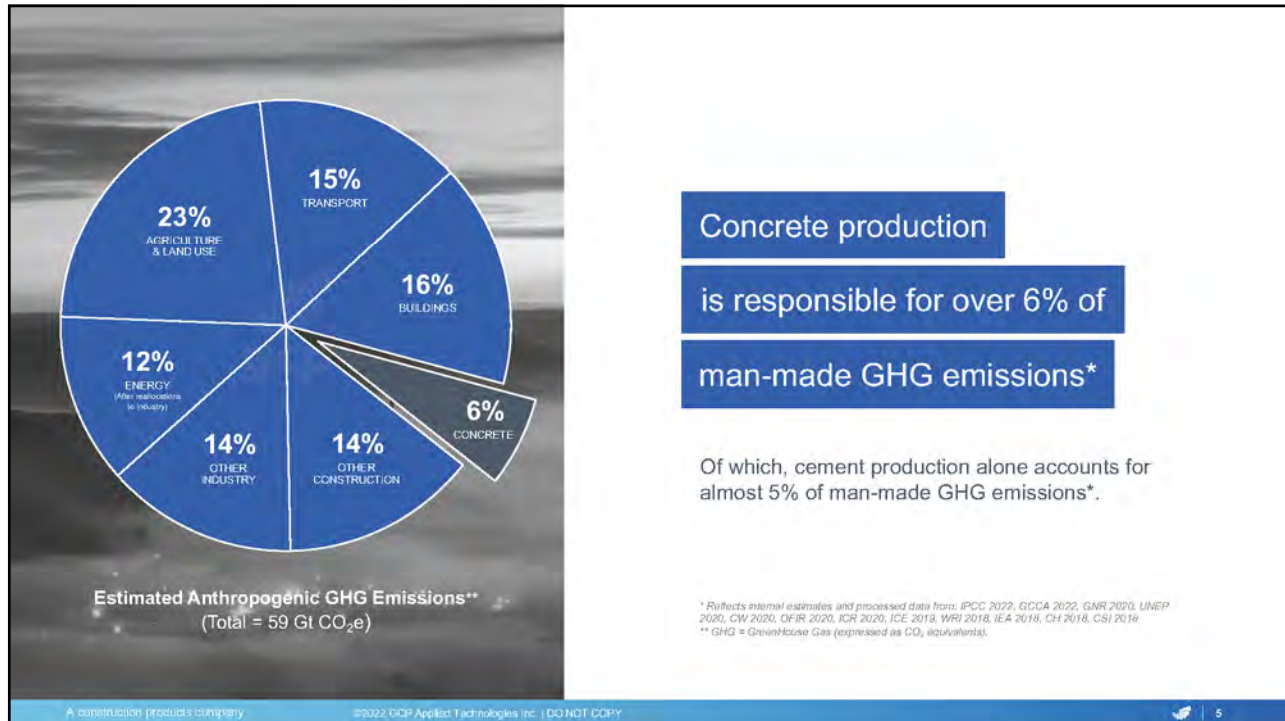
\* Source: ICE database 2019 and internal estimates  
\*\* Source: GCCA's "Concrete Future" roadmap 2021

#### Average kg CO<sub>2</sub>e per kg of material\*

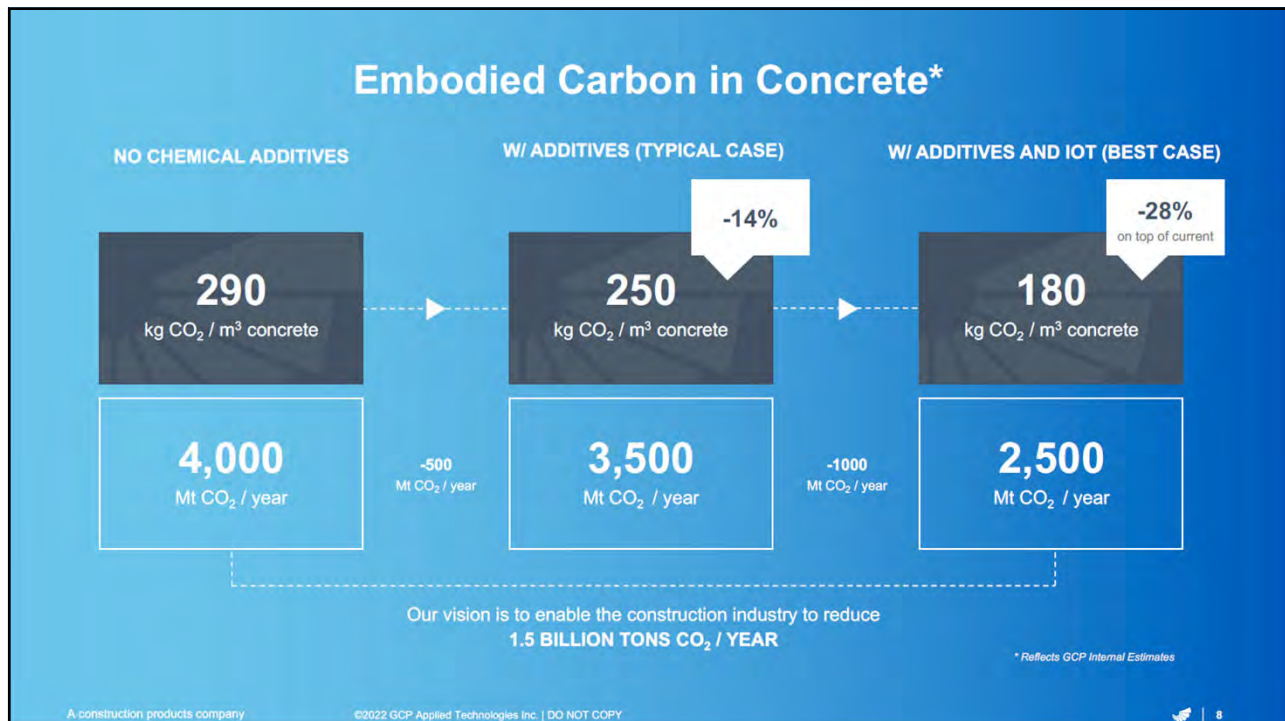
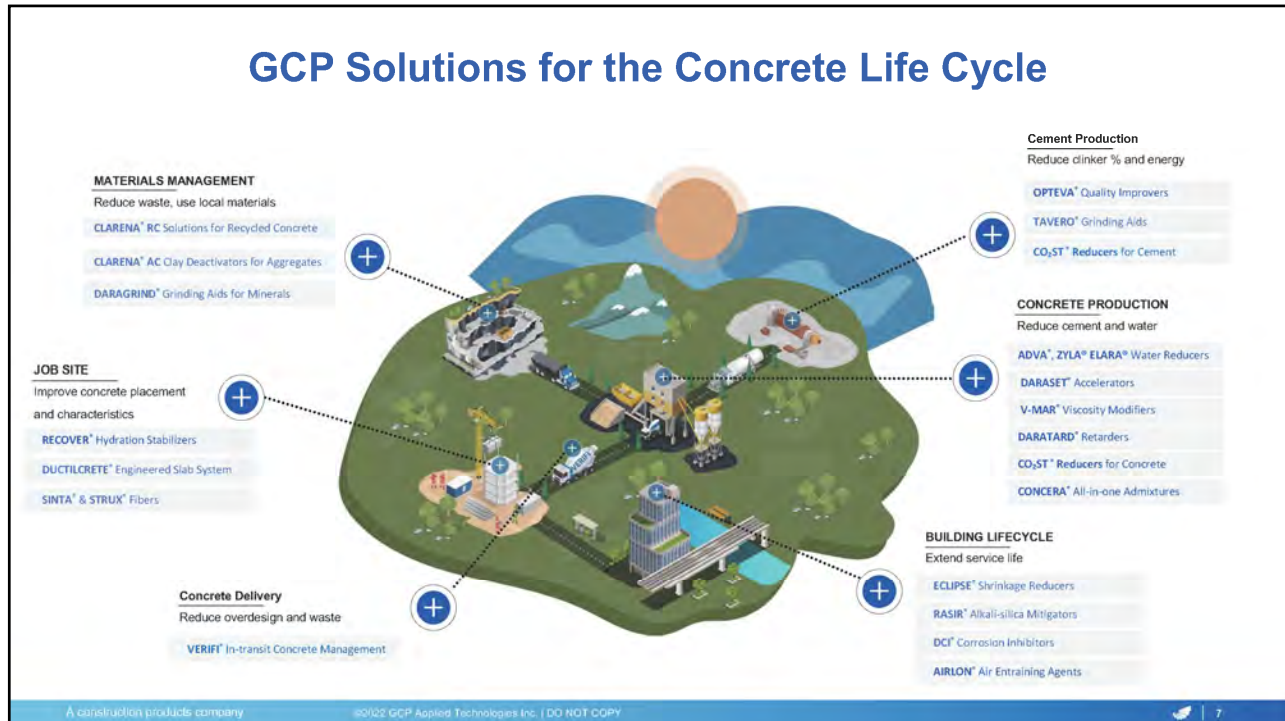
Aluminium	12
Plastics	3.3
Paint	2.9
Steel	2.0
Glass	1.4
Paper	1.3
Timber	0.49
Bricks	0.2
Plaster	0.2
Mortar	0.15
Concrete	0.11

250 kg CO<sub>2</sub> / m<sup>3</sup>

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# Can Technology Support A Greener, Faster, Stronger Future For Concrete?

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## What is VERIFI® In-transit Concrete Management?

A system of cloud connected sensors and devices



Monitors the geo location and delivery status of the truck

Measures fresh concrete properties and truck data

Manages the consistency of a concrete shipment (within the w/c) from the ready-mix plant to the job site

The VERIFI® measurement of consistency is representative of the *full load*; manual sampling, at best, can only be a small fraction of the load.

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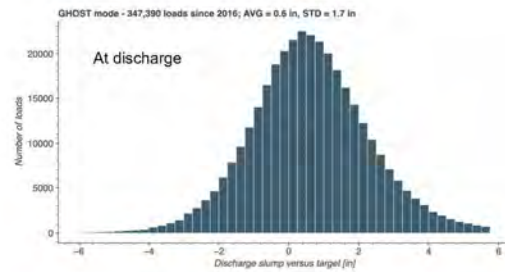
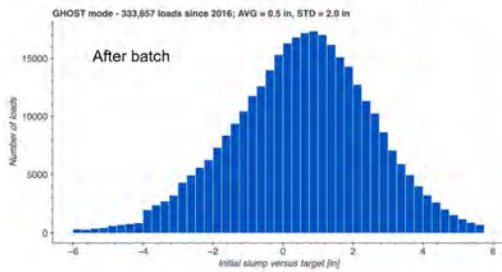
## Today, cement is overused in concrete because there is so much variability in the process of making concrete.

1 yd<sup>3</sup> of concrete ≈ 200-750 lbs CO<sub>2</sub> emissions of which ~ 68% is from the cement

For 80 years the variability has been invisible

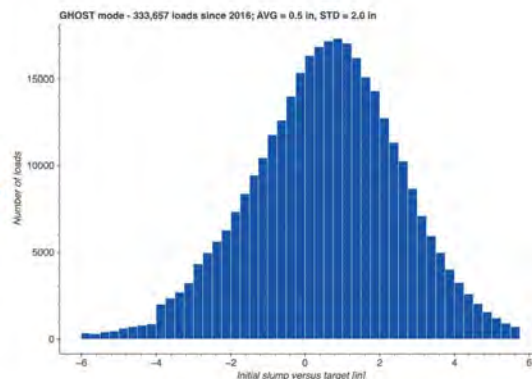
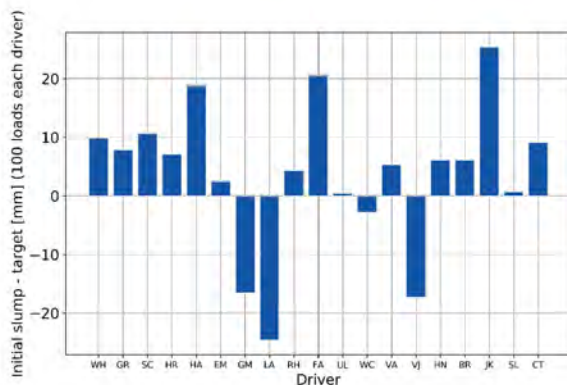
VERIFI's mission is to replace cement with process and data

What does the initial slump on 300,000+ loads of concrete look like?

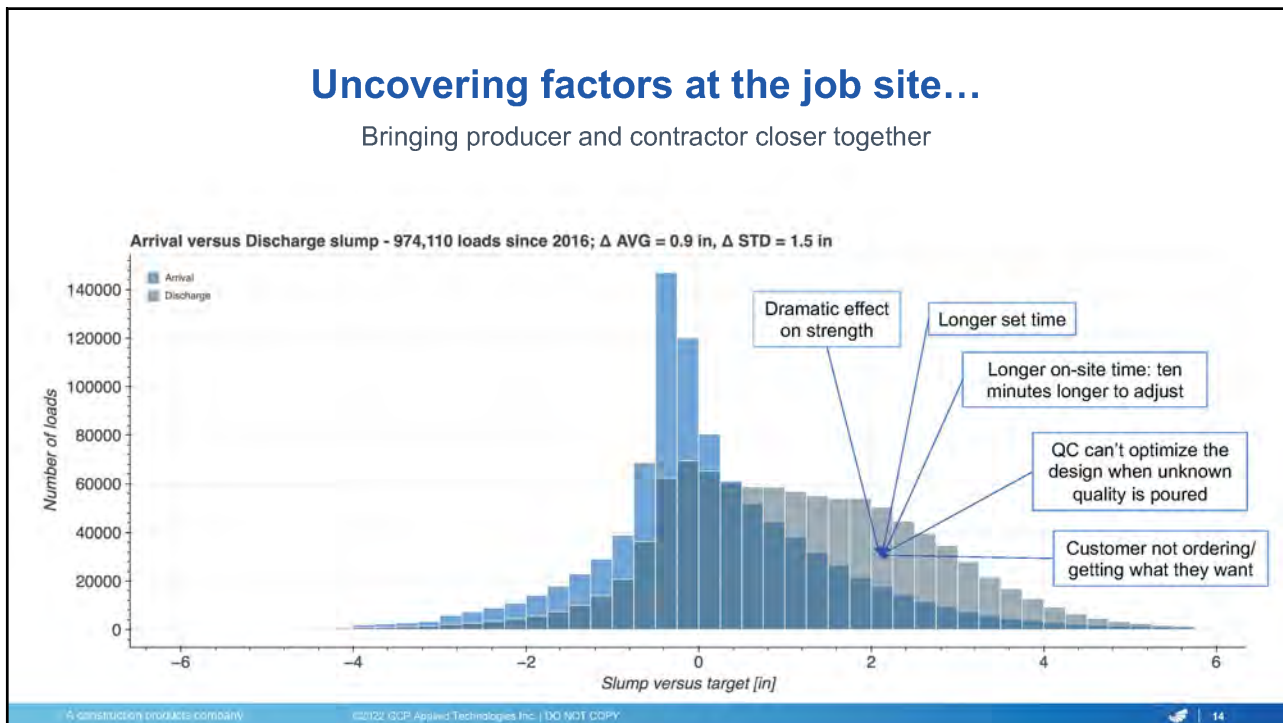
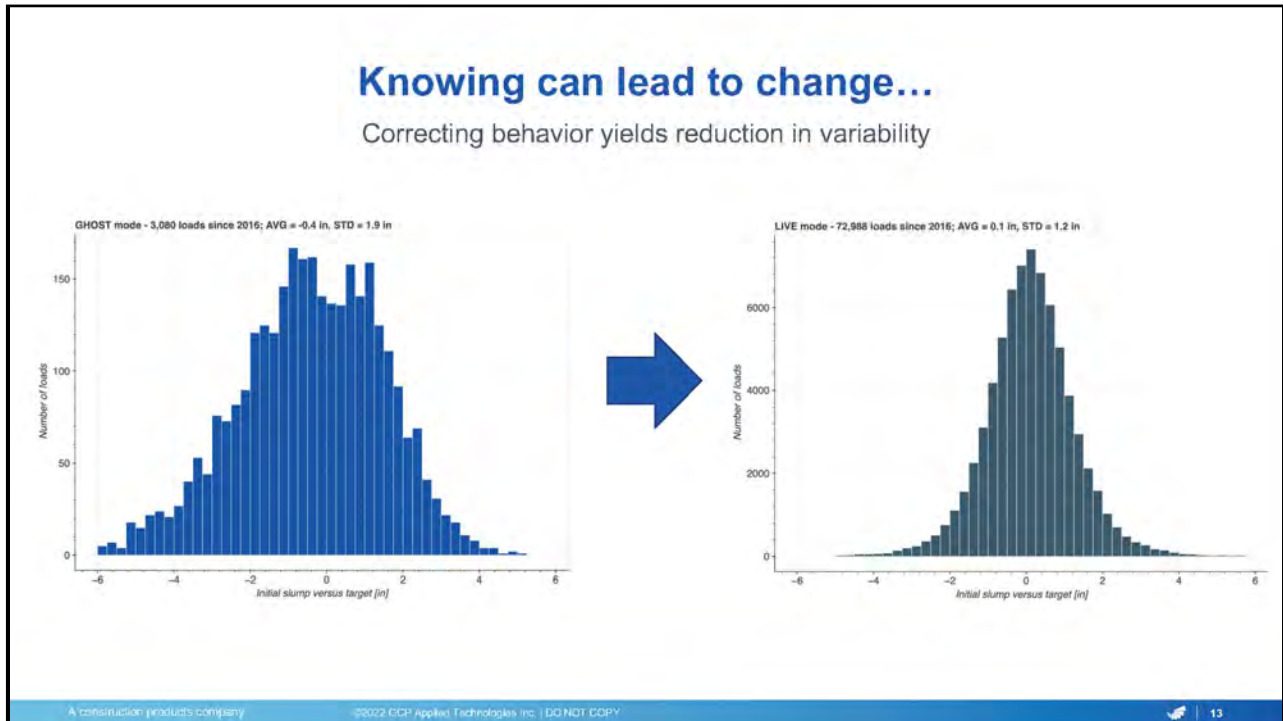


## Data can help uncover underlying factors

The goal is to turn data into information, and information into insight.



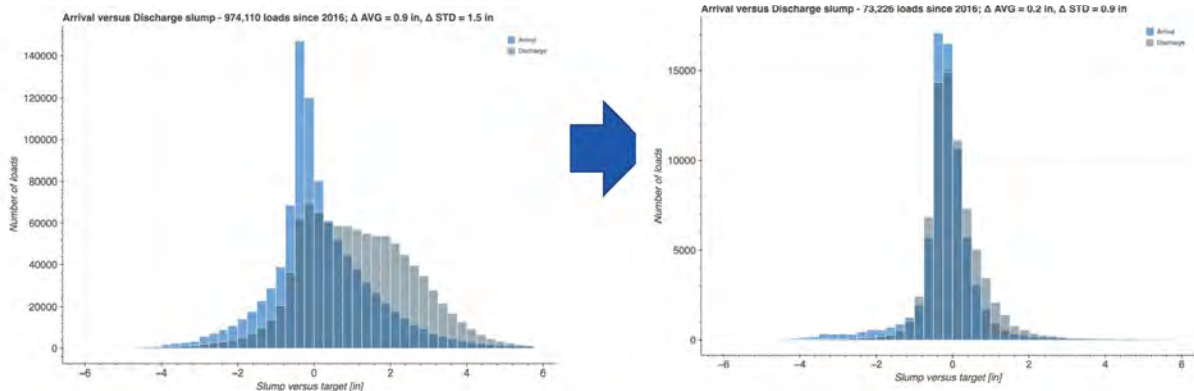
Batching is a team sport! Data allows us to make informed decisions.





## Improving process through IoT and automation

The mission is to replace cement with process and data

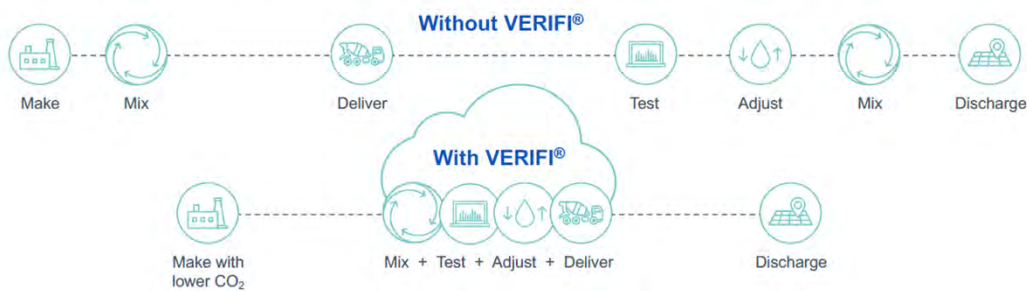


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## VERIFI® Drives Optimized Delivery



### Reduce delivery cycle times

- Complete visibility of cycle times at each stage of the delivery enables bottlenecks to be spotted and resolved
- Waiting to pour and pour time data allows objective conversations with contractors to optimize trucking levels and create flow.

### Mix arrives at the required slump

- Truck can be discharged as soon as it arrives on site
- No need to temper load and mix in water additions
- Verifi ensures the load is homogenous so removes the need for multiple adjustments during discharge. This is a time saving as each adjustment on site takes 10 mins.

### On-site testing is time consuming.

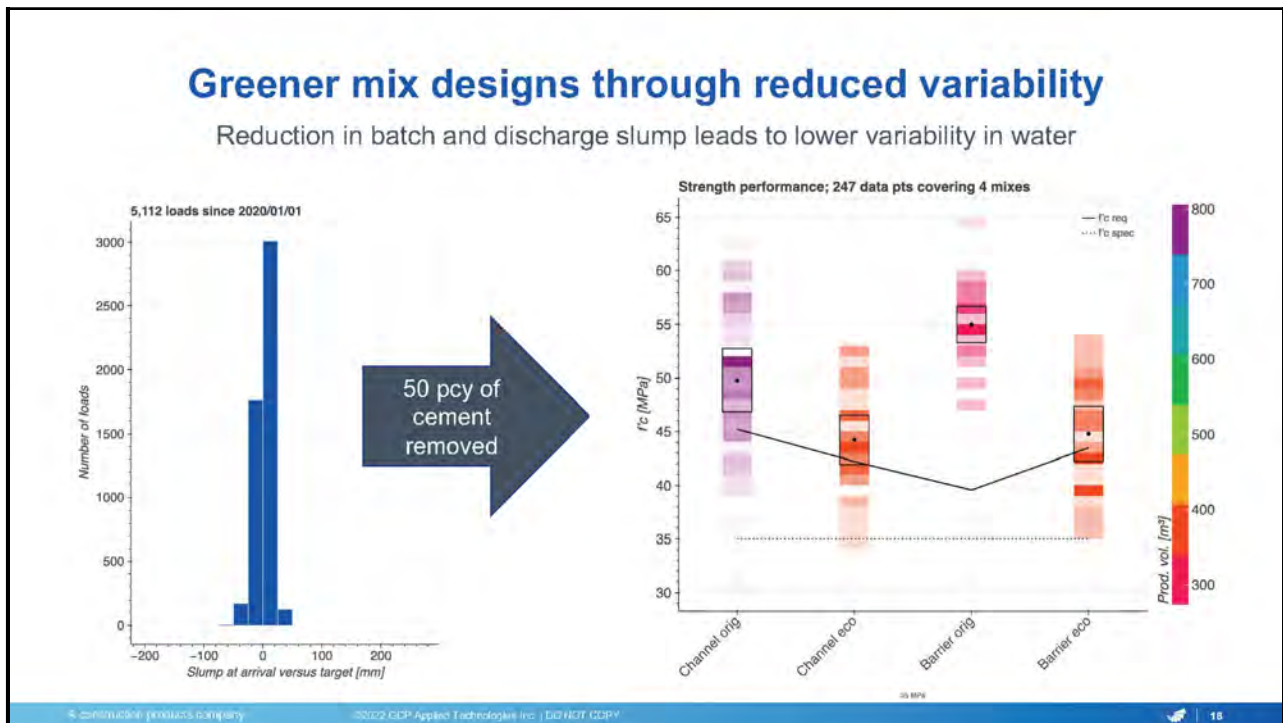
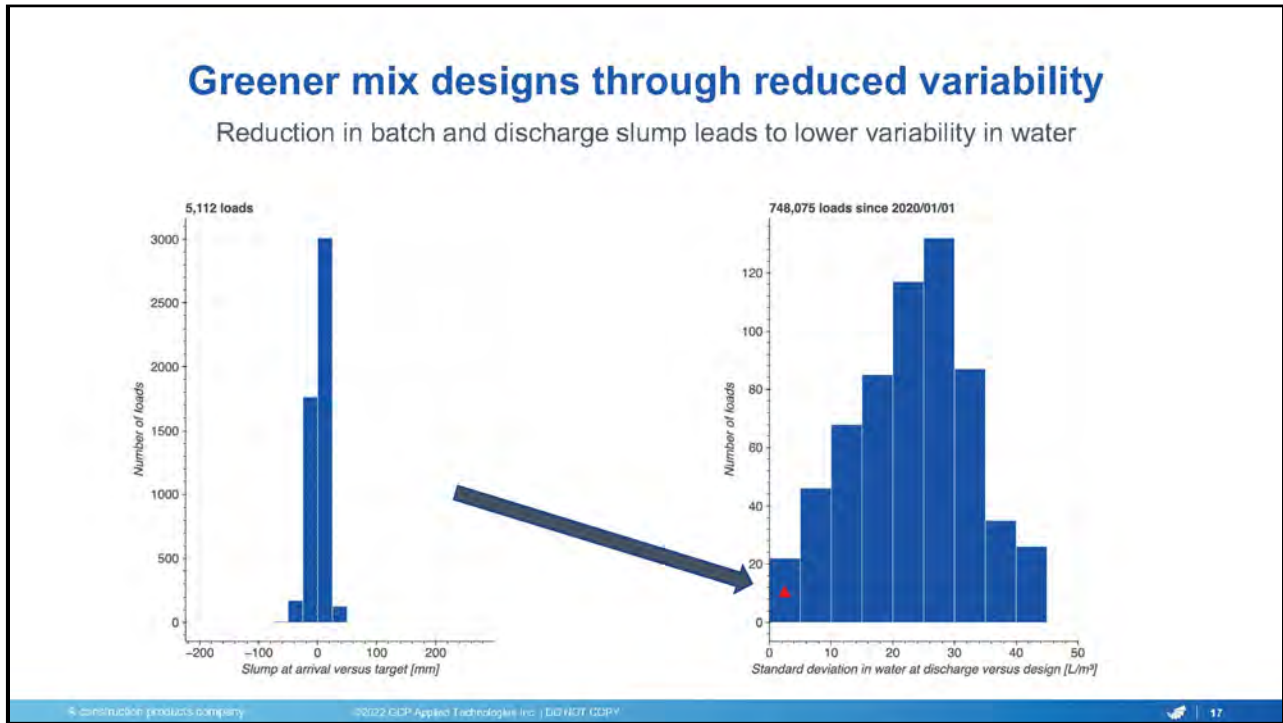
- Use VERIFI® as substitute for onsite testing
- Saves idling trucks while they wait to be sampled and tested – enabling on site time reductions

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## VERIFI® Drives Sustainability – Optimized Mix Delivery

**Reduce rejected loads and returned concrete.**

- 3-5% of concrete is rejected/returned in USA. Over 2.5 million tons of CO<sub>2</sub> reduction in the USA identified. \$1.2B market.
- For the UK the % waste is similar leading to reduction potential of 30,000 tons CO<sub>2</sub>

**Reducing the amount of CO<sub>2</sub> through cement reduction.**

- Reduce mix oversize**
- Process Control through delivery reduces up to 20 kg/m<sup>3</sup>
- 30% of delivered concrete out of compliance. **Excess water and cement**

**High Speed Mixing Revs are a key driver of CO<sub>2</sub>.**

- High speed (>6rpm) reduction.
- 855 kg CO<sub>2</sub> annual savings per truck. 56M kg of CO<sub>2</sub> reduction (savings calculated based on 30 revs/delivery reduction)

**On-site testing wasteful and time consuming.**

- Use VERIFI® as substitute for onsite testing
- Idling trucks – **water, fuel & time reductions**
- HS2 section in central UK would waste 18k m<sup>3</sup> in sample wheelbarrows alone.

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## The IOT makes VERIFI® an effective real-time and data rich Quality Assurance tool, minimizing the need for slump tests at the plant or on site

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## Commitment to Sustainability

Building with the world in mind

- GCP believes that protecting people and the planet is good for business.
- Together, GCP and its customers already reduce 23M tons of CO<sub>2</sub> every year.
- Together, we can reduce cement's and concrete's CO<sub>2</sub> by up to 30%!

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