



# Hydronix

Using Moisture Control  
in Concrete Batching Plants  
to Control Costs and Reduce Embodied Carbon

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June 8<sup>th</sup> 2022







**CONCRETE INNOVATIONS**

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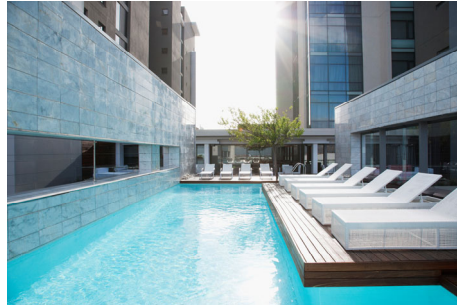
## Who is Hydronix?

-  Committed to excellence
-  Innovation
-  Worldwide expert network
-  Technology



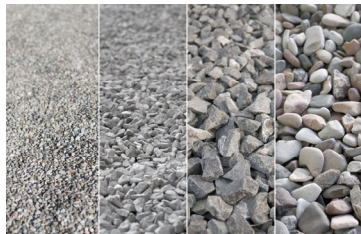
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## The Concrete Environment



## Concrete raw materials

- Aggregate
- Cement
- Water



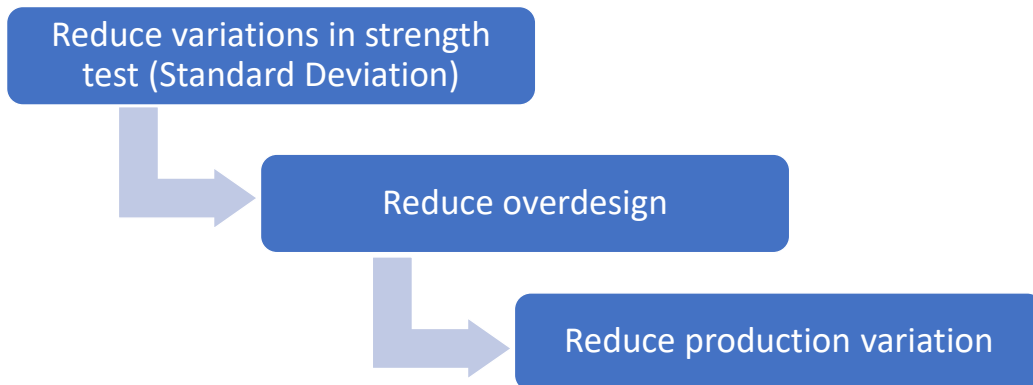
## The Environment

Typical Embodied CO<sub>2</sub> factors:

- Cement - **700** kgCO<sub>2</sub>e/tonne
  - Water - 0.3 kgCO<sub>2</sub>e/tonne
  - Aggregate - 7 kgCO<sub>2</sub>e/tonne
- } • Largest environmental factor  
• Highest cost



## How to reduce cement?

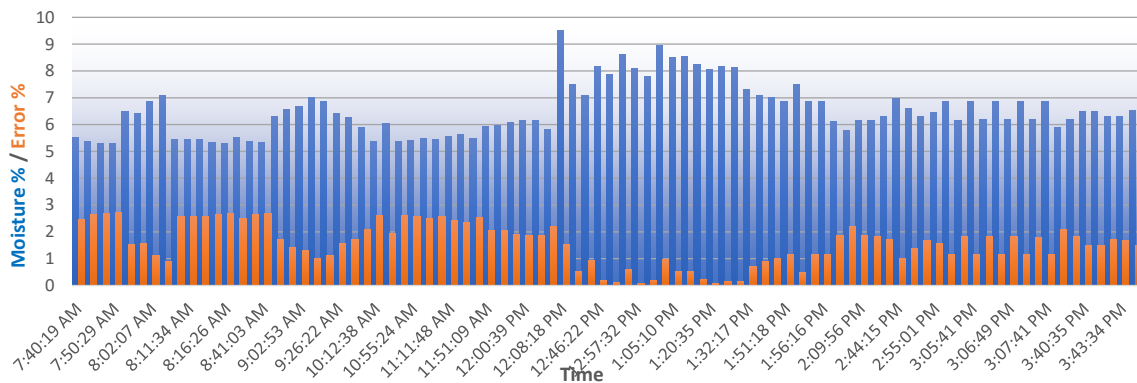


## Sources of Variation

- Accuracy of batching
  - Weigh cells
  - Admixtures
- Batch timing
- Water/Moisture
  - Washed aggregate
  - Storage

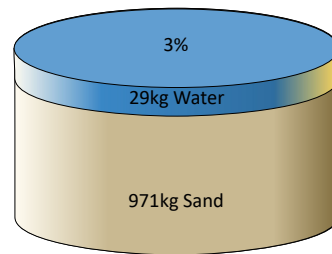


## Testing moisture?



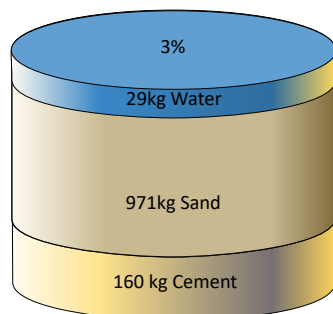
## Batching

- Concrete plants usually batch raw materials by weight
  - When weighing aggregates this includes the weight of the water
- 1,000kg Sand at 3% moisture
  - 971kg Dry Sand
  - 29kg Water

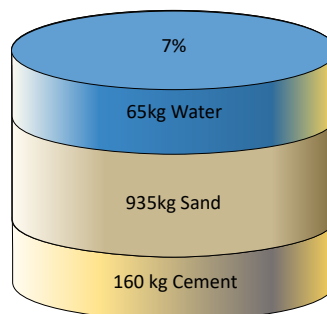


## Batching Problems – Proportioning

- A simple example



A/C Ratio = 6.1



A/C Ratio = 5.8

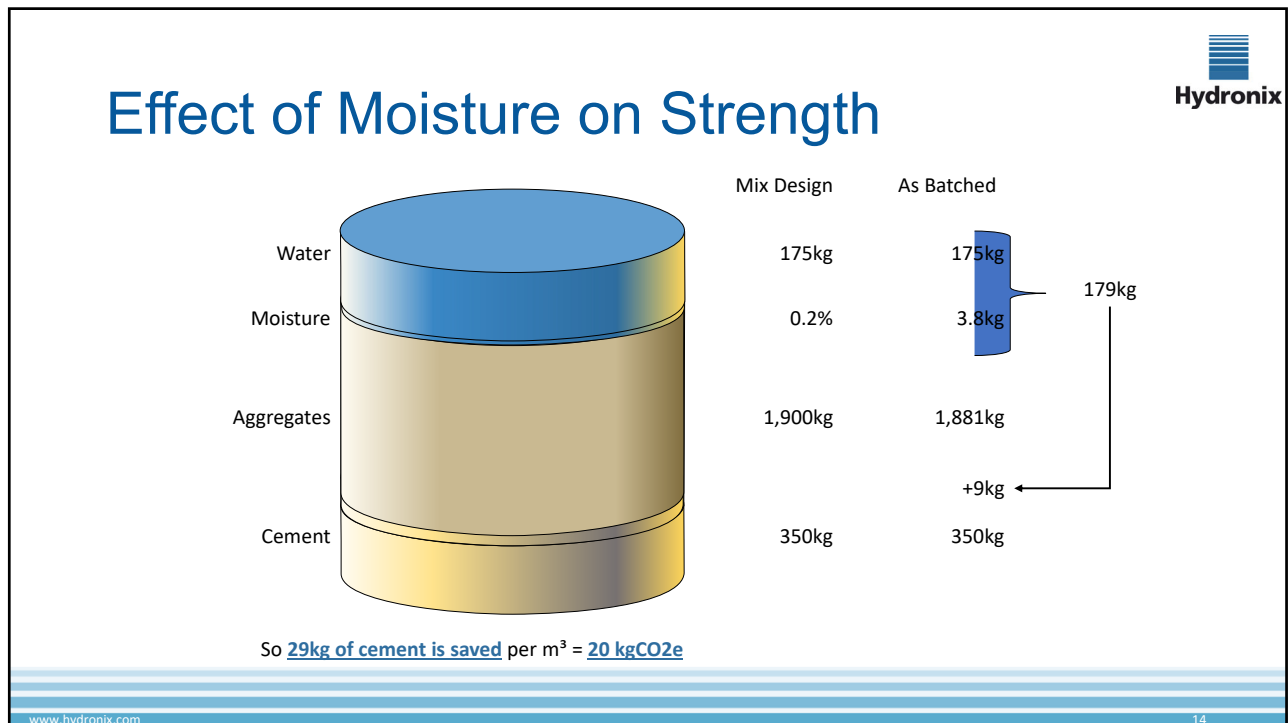
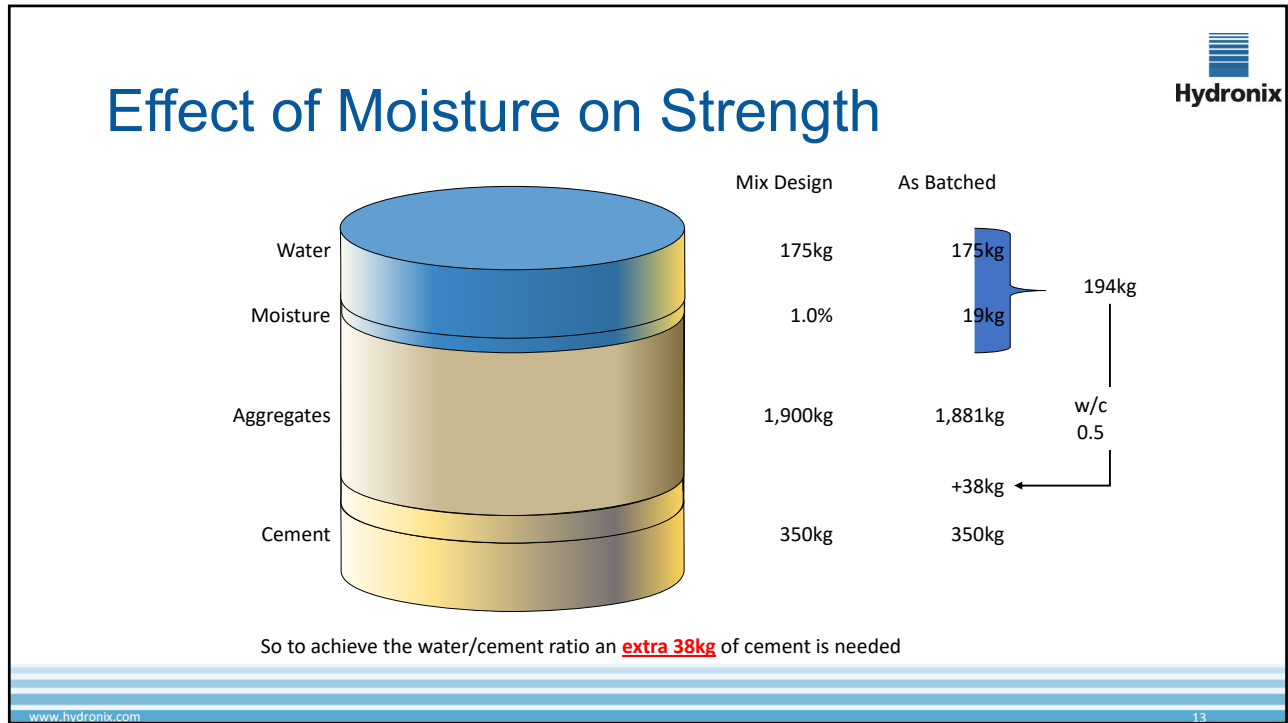
## The problems

- Placement
  - Yield
  - Consistence/Workability
- Performance
  - Strength
  - Durability
  - Colours



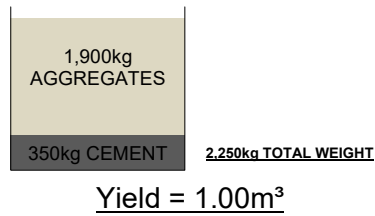
## Effect of Moisture on Strength

- Example Concrete Mix
- Mix Design
  - Cement - 350kg
  - Water - 175kg
  - Coarse Agg - 1,200kg
  - Fine Agg - 700kg
- Total weight - 2,425kg
- Environmental Factors
  - 245 kgCO<sub>2</sub>e (350 \* 0.700)
  - 0.053 kgCO<sub>2</sub>e (0.175 \* 0.3)
  - 13.3 kgCO<sub>2</sub>e (1.9 \* 7)
- 258 kgCO<sub>2</sub>e

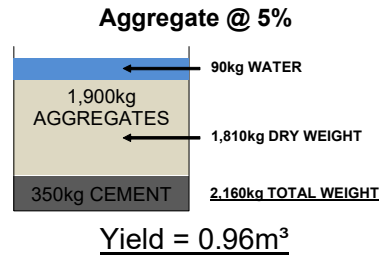


## Effect of Moisture on Yield

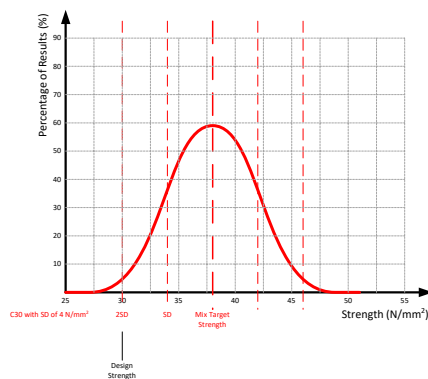
- What you design



- What you batch



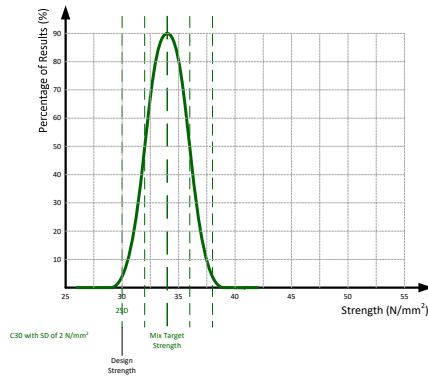
## Concrete Strength – Overdesign



- Use statistical analysis to specify mix target strengths
- UK/EU standards specify design strength is 2 SDs below the mix target strength

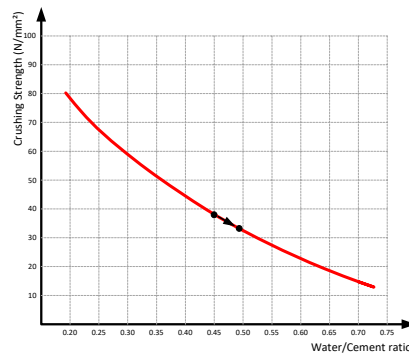


## Concrete Strength – Overdesign



- Reducing the SD reduces the overdesign

## Concrete Strength – Overdesign



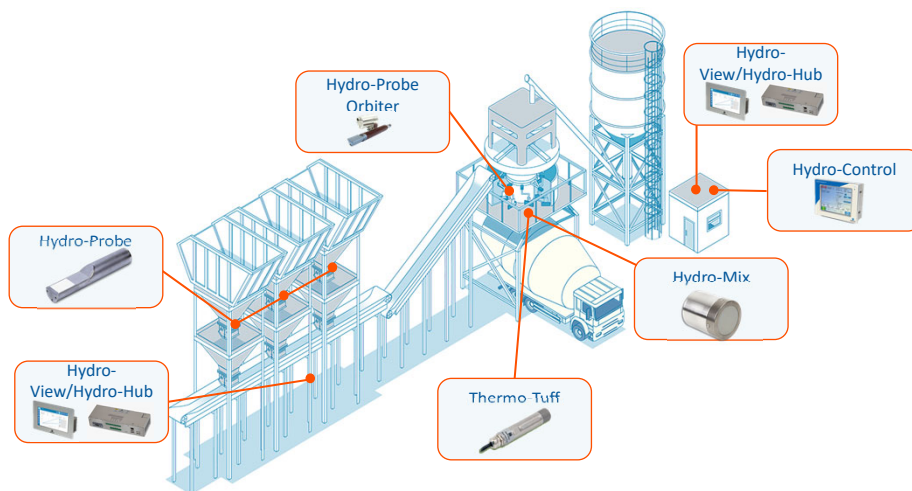
- Reduce the mix target strength
- Increase the water/cement ratio
- Reduce the cement

## The Solution

- Real-time Moisture Control
  - In Aggregates
  - In Mixers
- The savings:
  - Waste
  - Raw Material
    - Cement
    - CO2
  - Time

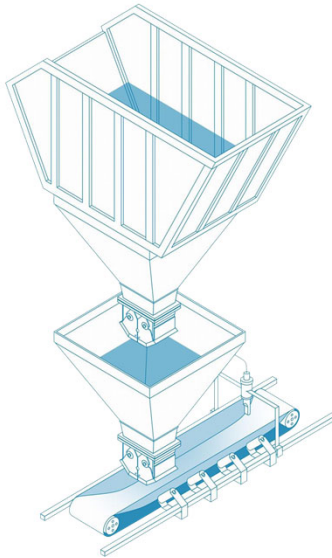


## Where to Install?



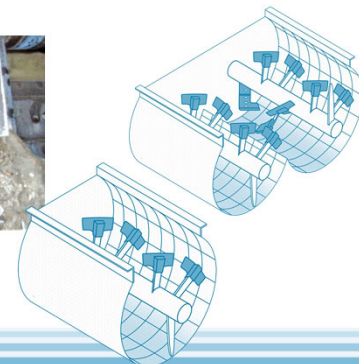
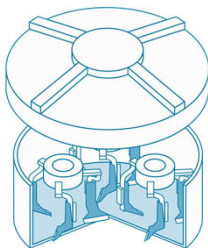
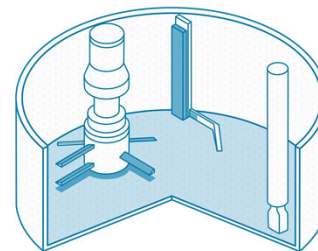
## Bin Sensors

- Hydro-Probe Sensor for Bins, Chutes and Conveyor Belts



## Mixer Sensors

- Water Control for Mixers



# Hydronix Technology – Made to last




- High Precision
  - Unique Digital Measurement Technology
  - High speed
  - Fully temperature stabilised
- Reliable
  - Simple to install and use
  - Long lasting



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# Cost Benefits



- Batch Plant
  - 2m<sup>3</sup> mixer
    - 10 batches per hour
    - 2x shifts with 5 hrs per shift
  - 200m<sup>3</sup> concrete production per day
- Saving 30kg of cement/m<sup>3</sup>
  - 6000kg of Cement per day

**Saving = £300/day => £6,000/month => £18,000/3-month**

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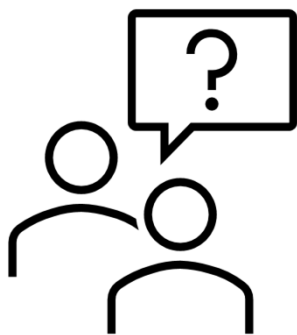


## The Benefits of Moisture Control

- Quality
  - Correct quantities of admixtures and cement used
- Yield
  - Correct batch sizes are made reducing delivery errors
- Cement
  - **30kg/m<sup>3</sup>** - 3 month return on investment = **£18,000 (US \$22,500)**
- CO2 Saving
  - **9% reduction in embodied CO<sub>2</sub>**



## Thank you for listening



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