Monitoring SCC Performance During Production and Determining Adjustments

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Presentation Outline

• Mixture development process
  – Considerations
  – Testing
• Relationships between measured SCC properties
• Rheological impact of certain proportioning variables
• QC testing
• Adjusting
SCC Mixture Development Process

• Project Details
  – Job size
  – Hardened performance targets
  – Element characteristics
  – Placement technique
  – Delivery schedule, distance, timing

• Laboratory & Field Trials
  – Qualify performance
  – Establish QC parameters
As part of the Process We Test

- Slump Flow and T 50
- J Ring
- Column Segregation
- Visual Stability Index
- Penetration Test
- V Funnel

The Concrete Convention and Exposition
Relationships Exist Between SCC Properties

• Stability in the Field
  – As slump flow (fluidity) increases maintaining stability requires greater attention
  – As mixture viscosity increases, stability increases
T50 time and Viscosity

- In a general sense, slump flow and T50 time can give us insight into batch to batch stability.

- For a given mixture, as slump flow increases or as T50 decreases, the mixture moves toward instability.
Final stage of mixture development – laboratory testing with QC process in mind

Run mixture with
1 – More or less HRWR
2 – More or less water

Tie to these points
- Column segregation
- VSI
- Penetration
- J-Ring
- Other

Source: Daczko, Joseph A., “Self-Consolidating Concrete: Applying What We Know”
How much of an adjustment do I make?

The graph shows the relationship between Slump Flow (mm) and HRWR Product Dosage (ml/100kg). The data points are differentiated by PCE 1, PCE 2, and PCE 3.
How Materials and Proportions Influence Rheology

Source: Wallevik, O. "Rheology: A Scientific Approach to Develop Self-Compacting Concrete"

Figure 2. Illustration of the effects of water, air, SP and silica fume on the flow behavior of fresh concrete.
Materials Influence SCC Test Results

Figure 2: Illustration of the effects of water, air, SP, and silica fume on the flow behavior of fresh concrete.

- **Slump Flow**
  - High
  - Low

- **T50 time**
  - Fast
  - Slow

- **Ingredients**
  - Air
  - Water
  - SP
Practically Considering What Could Happen

Source: Daczko, Joseph A., “Self-Consolidating Concrete: Applying What We Know”
Use data leads to make adjustments

Source: Daczko, Joseph A., “Self-Consolidating Concrete: Applying What We Know”
Conclusions

• During the mixture development process the QC plan and strategy is developed
• A producers ability to make adjustments depends on the data collected on site
• Water or admixture additions will be mix and material dependent