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Introduction

This research is to develop prescriptive concrete mix designs that meet modern high- performance durability requirements while being practical to manufacture in New England. These innovative Performance Concrete or High Performance Concrete (HPC) mix designs use graded aggregates, silica fumes, slags, fly ash, fibers, and other admixtures.



Figure 1. Concrete cylinders undergoing performance testing (Left)
Frequency testing for stiffness, (Right) Freeze thaw damage

Objectives

The overall deliverable is a prescriptive concrete mix that suppliers can use with New England sourced materials for performance concrete. This project is using machine learning to predict the performance of new mix compositions, test the performance in benchtop scale mixes, and then in a pilot batch run at a concrete producer's facilities.

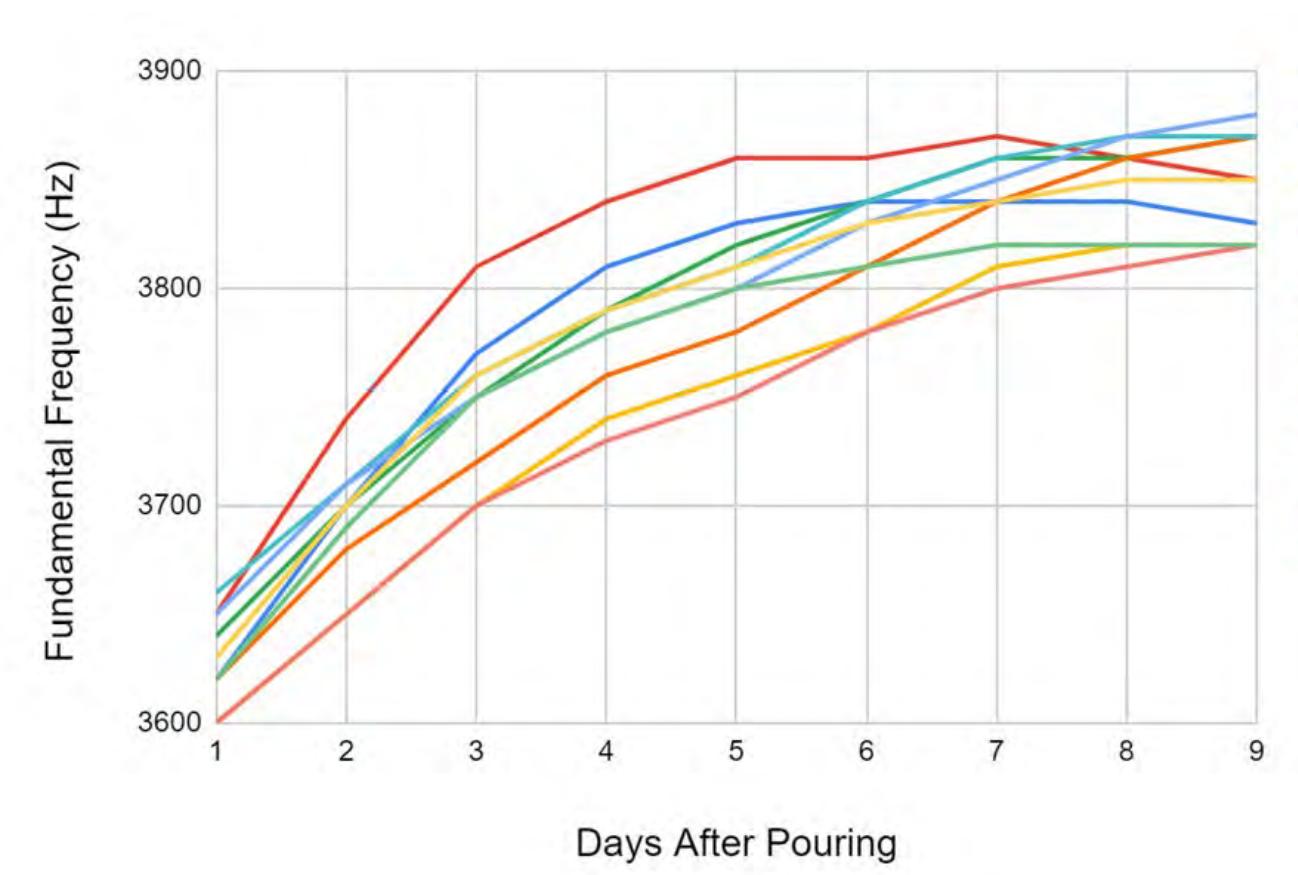
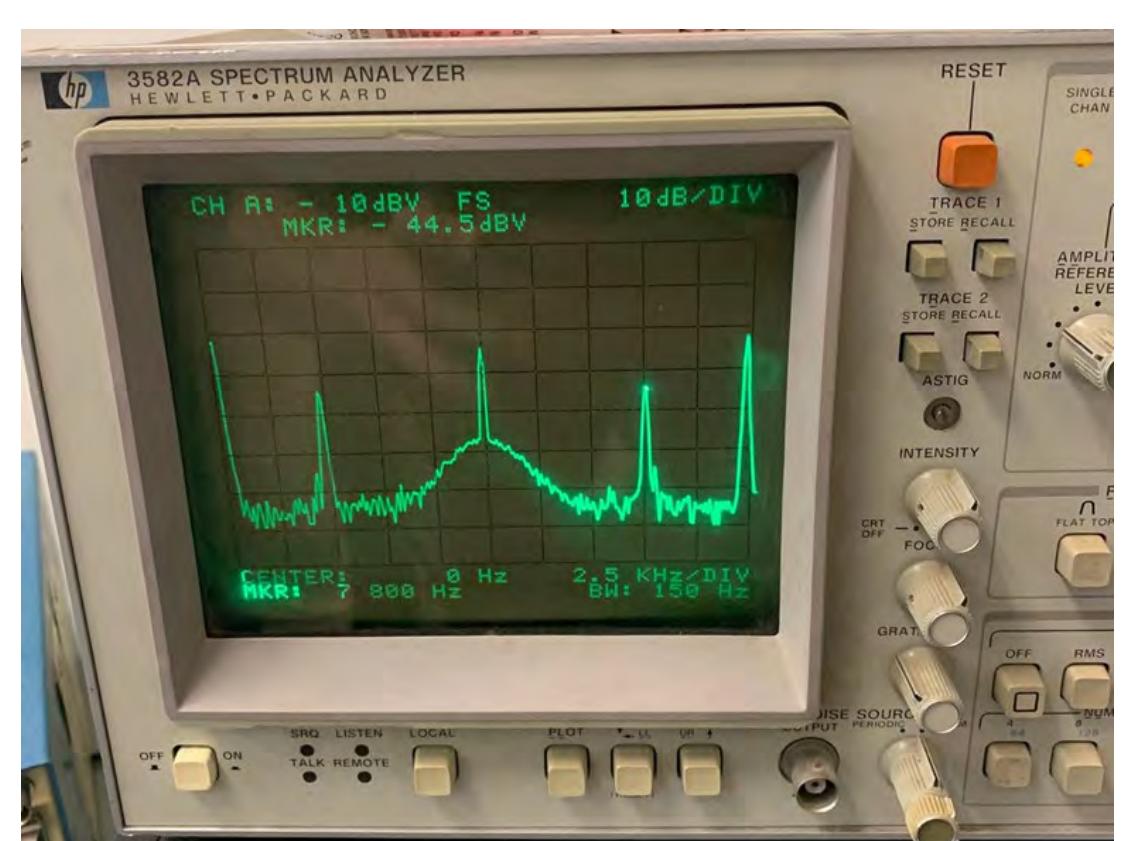


Figure 2. Results from frequency testing of cylinders (Left) Spectrum to determine resonant frequency (Right) Increase of resonant frequency and stiffness versus time of cure

Methodology or Action Taken

The project is at an early stage. Primary actions have been to line up test equipment and meet with concrete suppliers. Figure 1. shows concrete cylinders undergoing performance tests. Figure 2. shows results of frequency testing of stiffness versus cure. Figure 3 shows test instruments available at VTrans.



Figure 3. Test equipment available at VTrans (Left) Multichannel Wenner probe test of water permeability (Right) Shrinkage ring crack tester

Conclusion and Future Directions

The overall deliverable is a prescriptive concrete mix that suppliers can use with New England sourced materials for performance concrete. The development of prescriptive formulations of concrete mixes that meet performance specifications has the potential to increase the flexibility in delivery options from local suppliers, reduce costs, while maintaining or even increasing strength and durability.

Acknowledgments

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References

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