

## **TOWARD A BETTER UNDERSTANDING OF THE PLACEMENT OF SHOTCRETE: NOZZLES AND VELOCITIES**

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A lot of developments and improvements seen in the shotcrete industry over the last few decades have mostly arisen through the improvement of mixture designs and admixture efficiency. Unfortunately, limited efforts have been put into the modelling and optimization of one of the most important portions: the acceleration of the material through the nozzle and its subsequent travelling toward the surface. The paper first presents a clear explanation and demonstration, based on spray patterns analysis, of the differences between dry-mix and wet-mix shotcrete. It then follows with practical examples of ways to improve the technology behind the nozzle (for both processes) along with unique experimental results. The paper offers a discussion on where our efforts should be put to further reduce losses due to rebound and increase in-place shotcrete homogeneity to promote strength and durability.