



Energy and Environmental Impact of Recovered MRF Glass and CRT Panel Glass Pozzolans in Concrete

Urban Mining Northeast (UMNE) is a licensed manufacturer of Pozzotive[®], a high performance pozzolan and functional industrial filler. Made from postconsumer glass, Pozzotive[®] is used in a multitude of applications including as a replacement for cement in concrete.

Challenge

With the growing concern over global sustainable development and the depletion of fossil fuel resources, and given the large energy demands to produce Portland cement, it is beneficial to find alternatives that can replace portions of cement at a lower environmental burden while still providing the functional performance. As a result, UMNE was interested in quantifying the environmental impacts of Pozzotive[®] and communicating these impacts to customers. Additionally, UMNE was interested in quantifying the environmental impacts of an alternative feedstock for Pozzotive[®], namely cathode ray tube (CRT) panel glass.

Solution

In collaboration with the Staples Sustainable Innovation Laboratory and Electronic Recyclers International (ERI), the New York State Pollution Prevention Institute (NYSP2I) quantified the environmental impacts of Pozzotive[®] as a replacement for cement in concrete. NYSP2I completed an ISO 14040/14044 compliant life cycle assessment (LCA) of Pozzotive[®] using various feedstocks. The LCA was performed in accordance with ASTM International, Product Category Rules.¹ The goal of this study was to quantify the cradle to gate environmental impacts of one metric tonne of cement composed of:

- 80% ordinary Portland cement (OPC) and 20% of Pozzotive[®] consisting of material recovery facility (MRF) post-consumer recycled container glass,
- 80% OPC and 20% Pozzotive[®] consisting of 85% MRF post-consumer recycled container glass comingled with 15% CRT panel glass.

Results

The results of the LCA suggest:

- Pozzotive[®] has significantly less impact than OPC. Replacing 20% of OPC with Pozzotive[®] yields approximately 20% reduction in evaluated environmental impacts.
- The manufacturing of Pozzotive[®] uses 80% less energy than OPC.
- For every metric tonne of OPC replaced with Pozzotive[®], nearly one metric tonne of CO₂e emissions are reduced.

CHALLENGE

- Urban Mining Northeast wanted to evaluate the environmental impact of Pozzotive[®] in cement using Life Cycle Assessment (LCA)

SOLUTION

- NYSP2I completed an ISO 14040/14044 compliant LCA of Pozzotive[®] using material recovery facility (MRF) post-consumer recycled glass and cathode ray tube (CRT) panel glass

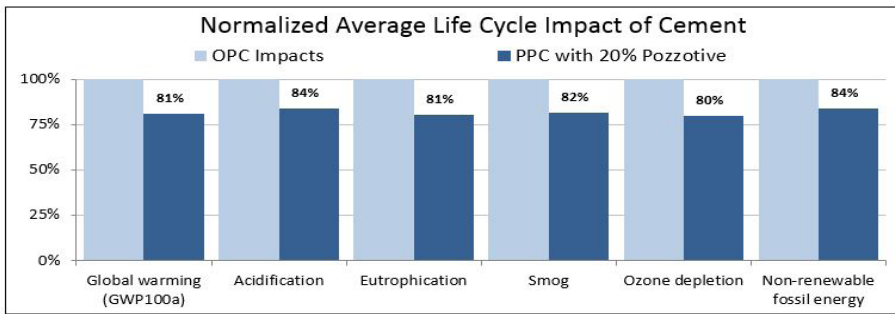
RESULTS

- Replacing 20% of OPC with Pozzotive[®] yields approximately 20% reduction in evaluated environmental impacts
- The manufacturing of Pozzotive[®] uses 80% less energy than OPC
- For every metric tonne of OPC replaced with Pozzotive[®], nearly one metric tonne of CO₂e emissions are reduced
- Replacing 20% of OPC with comingled Pozzotive[®] (17%) and CRT panel glass (3%) has between 15% and 20% reduction in impacts compared to OPC across all evaluated categories



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- Replacing 20% of OPC with comingled Pozzotive® (17%) and CRT panel glass (3%) has between 15% and 20% reduction in impacts compared to OPC across all evaluated categories.



Note: OPC: ordinary Portland cement; PPC: Pozzotive® Portland cement

Pozzotive® from post-consumer recycled glass and recycled CRT panel glass has a smaller environmental footprint than OPC and extends the life of glass that would otherwise end up in a landfill.

“While at the Google headquarters in Mountain View, California, we were challenged to find a solution to the problem of CRT glass disposal. With the cooperation of Electronic Recycling International and the support of Staples Office, we worked with NYSP2I to quantify the environmental impacts of cement using CRT glass. The results have assured us that this is a winning solution for the electronics, recycling and building industries: eliminating a growing waste glass problem and creating a superior product for green building.”

– Louis Grasso, Jr., Managing Partner;
Urban Mining Northeast

NYSP2I PARTNERS

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Funding provided by the Environmental Protection Fund as administered by the New York State Department of Environmental Conservation. © 2018 Rochester Institute of Technology. Any opinions, results, findings, and/or interpretations of data contained herein are the responsibility of Rochester Institute of Technology and its NYS Pollution Prevention Institute and do not represent the opinions, interpretation or policy of the State.

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1. ASTM International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended, Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, September 2014 (UN CPC 3744)

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