

KLAW Industries Evaluates GHG Emissions Reduction Potential for Cement Replacement Product



Challenge

Estimate the market volume, amount of available raw material, and potential GHG reductions involved in the manufacturing and implementation of Pantheon™ as a cement replacement.

Solution

- NYSP2I performed a market analysis to estimate the quantity of raw material available for the production of Pantheon™, and to understand the geographical locations of the material.
- A comparative analysis of GHG impacts was performed between concrete produced with 0% and 30% cement replacement rate of Pantheon™.

Results

- There is enough MRF glass produced in NYS to support KLAW's projected manufacturing rate of Pantheon™
- The per-unit GHG emission reduction potential (ERP) of Pantheon™ is approximately 60 kgCO₂e/yd
- At the projected manufacturing volume, NYSP2I estimates KLAW's annual GHG ERP will be approximately 35,000 MT CO₂e/yr

KLAW Industries

Located in Binghamton, NY, KLAW Industries (KLAW) is developing a novel process to repurpose glass from material recovery facilities (MRFs), otherwise destined for landfill, into a core component of concrete. The patent-pending process repurposes waste glass into a cement replacement called Pantheon™ that can be sold to concrete manufacturers. Pantheon™ has the potential to lower the expense of both waste glass disposal and concrete production.

"It has been a great opportunity for us to partner with NYSP2I to research the environmental impact of Pantheon production. We now have accurate, thorough GHG emissions data that will help support the adoption of this emerging technology for use across New York State. Thank you Ava and Kim for all of your hard work!"

Tanner Wallis, CTO, KLAW Industries

Challenge

KLAW sought to refine existing estimates of raw material sources of MRF glass in New York State. Additionally, KLAW was interested in understanding the greenhouse gas emission reduction potential (GHG ERP) of Pantheon™ as compared to cement in concrete.

Solutions

KLAW requested assistance from New York State Pollution Prevention Institute (NYSP2I) to better understand the amount of MRF glass available in New York State for use as raw material in their manufacturing process, and to quantify (GHG ERP) of their product when used as a partial cement replacement in concrete manufacturing. NYSP2I used data from Recyclables Handling and Recovery Facility (RHRF) Annual Reports to complete the MRF glass assessment. The GHG ERP analysis was completed by calculating the GHG impacts of 1 cubic yard of concrete manufactured with 0% replacement and 30% replacement of cement with Pantheon™. Processes in the ecoinvent database were modified using concrete mix design data provided by KLAW to complete the analysis.



Image: Pantheon™ is a partial cement replacement for concrete created from post-consumer glass.

Results

NYSP2I's analysis of KLAW's Pantheon™ determined:

- The annual production of MRF glass in NYS is roughly 445,000 tons. This material is currently either recycled, landfilled, used as alternate daily cover (ADC), or repurposed under a beneficial use determination (BUD).
- Of the annual amount of MRF glass that is produced, approximately 78,000 tons of the glass is sent to landfills for ADC, BUD, or disposal.
- The raw material assessment confirmed there is enough MRF glass produced in NYS to support KLAW's projected annual manufacturing rate of 50,000 tons of Pantheon™.
- KLAW's Pantheon™ has a per-unit GHG ERP of approximately 60 kgCO₂e/yd³, at a 30% replacement rate, which is about a 27% reduction as compared to the baseline.
- KLAW's annual GHG ERP will be approximately 35,000 MT CO₂e/yr assuming 50,000 tons of Pantheon™ is produced and used in concrete production.

The estimated GHG emission impacts calculated by NYSP2I at RIT are based on information and claims provided to NYSP2I by KLAW relative to their product and the baseline technology. It should be noted that this analysis considered main aspects of the raw material extraction, manufacturing and use life cycles phases. The end-of-life life cycle was not considered. Moving forward, KLAW may consider a more comprehensive life cycle assessment to validate energy, GHG and other environmental impacts.

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