CASE STUDY

NYS P2I | New York State Pollution Prevention Institute

NYSP2I Performs a Greenhouse Gas Evaluation of Green Sulfcrete Corp's Sulfcrete™ Cement Pellets

Challenge
Green Sulfcrete Corp. wanted to estimate the amount that their Sulfcrete cement pellets could reduce greenhouse gas emissions by displacing Portland cement used in New York State.

Solution
Green Sulfcrete Corp. requested assistance from NYSP2I to estimate the greenhouse gas emissions reduction potential (GHG ERP) associated with their projected product use in New York State as compared to a conventional product or "baseline."

Results
Considering the raw material extraction and production phases, it is estimated Sulfcrete cement pellets have the potential to reduce greenhouse gas emissions by 564 kg CO2e per tonne of pellets (76%), as compared to blended hydraulic cement, and 744 kg CO2e per tonne of pellets (80%) as compared to Portland cement.

The projected use of Sulfcrete cement pellets in NYS may reduce GHG emissions by 20,466 - 26,998 tonne CO2e per year.

Green Sulfcrete Corp.

"We've had a great experience working with the knowledgeable and detail-oriented NYSP2I team and we look forward to future collaborations."
William Biamonte, Sulfcrete Co-Founder

Green Sulfcrete Corp., based in Longbeach, NY, was formed for the purpose of licensing, developing, and commercializing the sulfur polymer concrete technology that was invented, developed, and patented by Brookhaven National Laboratory (BNL) and a team of BNL scientists. Sulfur polymer concrete is an alternative to traditional concrete, in which a sulfur polymer fully or partially replaces traditional cement, an energy-intensive ingredient in concrete. Sulfur polymer concrete has historically been expensive to produce, but the BNL process provides a way to produce it at costs comparable to those of traditional concrete. GSC intends to commercialize Sulfcrete™ cement pellets, which can then be sold to concrete manufacturers and incorporated into concrete. GSC's product is initially intended for use in concrete with non-structural applications (e.g. pipes, septic tanks, retaining walls, etc., rather than roads and highways), to eliminate the potential for fire exposure.

Challenge

Green Sulfcrete Corp. believed that their Sulfcrete cement pellets had much lower carbon emissions than Portland cement, and wanted to estimate how much their product could reduce GHG emissions by displacing conventional cement used in New York State.

Solutions

Green Sulfcrete Corp. requested assistance from NYSP2I to estimate the GHG emission reduction potential (ERP) associated with their projected product use in New York State as compared to a conventional product or "baseline." To this end, NYSP2I worked with GSC to select Portland cement and a blended hydraulic cement as baselines for comparison. The GHG impact of one ton of each baseline material was first estimated, focusing just on the raw material extraction and manufacturing life cycle phases. GSC then supplied information related to the energy use, transportation, and material inputs to their Sulfcrete cement pellets, and NYSP2I estimated the GHG impact associated with both life cycle phases. The estimated impacts of the baselines and new product were then compared to determine the potential reduction in GHGs on a per ton, and annual basis. In addition, NYSP2I performed secondary research and provided a qualitative summary of additional potential benefits associated with Sulfcrete™.

Results

The analysis resulted in an estimated GHG ERP of 564 – 744 kg CO_2e per tonne of Sulfcrete cement pellets, or 76%-80% reduction as compared to blended hydraulic cement and Portland cement respectively. Considering the projected market volume in New York State, NYSP2I estimated an annual GHG ERP between 20,466 tonne - 26,998 tonne CO_2e per year. The analysis also revealed that approximately 99% of the impact of the Sulfcrete cement pellets is attributed to the use of Sulfcrete's proprietary modifier (74%) as well as transportation of the raw materials (25%). GSC is working on developing new partnerships to reduce transportation distances as well as scalable processes for utilizing waste oils in their product manufacturing rather than virgin oil. If either or both of these changes are implemented, the GHG impact of Sulfcrete cement pellets may decrease significantly.

Additional potential benefits of sulfur polymer concrete identified in the literature include improved strength and durability; better resistance to water, frost, acids, and salts; reduced water consumption; and faster cure time.

The estimated GHG emissions impacts calculated by NYSP2I at RIT are based on information and claims provided to NYSP2I by GSC relative to their product and the baseline technology. Additionally, this analysis considered the raw material extraction and production phases only and did not consider use, distribution, or end-of-life life cycle phases. The phases that were not considered are not necessarily equivalent for GSC's technology and conventional cement. For example, a key difference is that producing precast concrete using GSC's technology requires re-melting the Sulfcrete cement pellets, whereas this step is not required for conventional cement. It should be noted that the results described here are an order of magnitude estimate of the GHG ERP of the GSC Sulfcrete cement pellets, and GSC may consider updating the GHG ERP analysis if any components change significantly.

Partners

RIT · Binghamton University, State University of New York · Clarkson University · Cornell CALS, College of Agriculture and Life Sciences · Rensselaer · New York Manufacturing Extension Partnership

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