



**Ingevity Net Product Benefits
Project Summary – Evaporative Emissions Control Products**

ERM conducted a third-party evaluation of evaporative emissions control products manufactured by Ingevity. The use of evaporative emissions control products enables vehicles to reduce the loss of gasoline vapors to the atmosphere, and thus conserves fuel during automobile operation. The objective of this study was to develop a quantitative estimate of the greenhouse gas (GHG) impact associated with production and transportation, as well as the GHG benefit associated with use of the products. Our approach was consistent with ISO 14040 principles and framework for life cycle assessment.

- **Impacts:** Using SimaPro modelling, we considered the life cycle impacts of raw material inputs to the manufacture of the evaporative emissions control products, as well as the canisters used to house and deliver the products into the automotive assembly process. (Note that this canister manufacturing and assembly takes place outside of Ingevity’s direct footprint.) GHG emissions from transportation of raw materials, intermediates, and finished products were also included. For the GHG impacts associated with energy use in the manufacturing process, we used Ingevity’s calculated 2019 Scope 1 and Scope 2 GHG emissions from the relevant facilities. In addition, we estimated Scope 3 emissions associated with energy (primary fuel extraction and processing, and electricity transmission & distribution losses).
- **Benefits:** Ingevity provided ERM with calculations for the amount of gasoline consumption avoided through the use of the amount of evaporative emissions control products manufactured in 2019, based on regulatory frameworks mandating use of this technology in various parts of the world. ERM confirmed the reasonableness of Ingevity’s calculation methodology. We used life cycle emission factors from SimaPro to quantify the GHG benefits associated with avoiding the extraction and processing of the specified volume of gasoline. Benefits were calculated for the use of evaporative emissions control products manufactured in 2019 and realized across the lifetime of product use.

Summary of Results

2019 GHG Impacts and Benefits (in metric tons CO₂-equivalent)

Activity	GHG Impact	GHG Benefit
Materials – Carbon Products	42,645	
Materials – Canisters	176,917	
Energy Consumption from Manufacturing (Scopes 1 and 2)	197,754	
Energy Consumption from Manufacturing (estimated upstream impacts of energy sources)	29,417	
Sawdust Transportation	4,204	
Carbon/Honeycomb Transportation	10,437	
Canister Transportation	7,439	
Total	468,813	
Avoided Gasoline Consumption		5,090,000
NET BENEFIT		4,621,187

Impacts = 10.6 kg CO₂e per kg of product

Benefits = 115.2 kg CO₂e per kg of product

ERM's evaluation is based on the following assumptions and limitations:

- We relied upon Ingevity's data for 2019 raw material inputs, production figures, Scope 1 and Scope 2 GHG emissions, modes of transportation used, and distances travelled.
- The analysis accounts for the significant categories of Scope 3 GHG emissions associated with the products under consideration. GHG emissions associated with raw material input and transportation both upstream and downstream, and all fuel- and energy-related activities are included. Scope 3 categories that were not estimated include waste generation, business travel and employee commuting, and capital expenditures; none of these categories would be expected to contribute materially to the GHG impacts.
- The activated carbon in the product is derived from sawdust that is a waste product from wood product processing. This renewable carbon resource is excluded from the estimate of life cycle GHG emissions because the carbon burden of the sawdust arose originally from the trees' CO₂ uptake from the atmosphere. ERM did account for transportation impacts associated with tree harvesting and sawdust delivery.
- ERM's analysis used published life cycle emission factors from the inventory database US LCI, which is relevant for a U.S. context, in SimaPro model software. The ecoinvent 3 database was used to fill any data gaps for specific materials, and for transportation-related emission factors. Efforts have been made to ensure that the emission factors from both database sources are compatible.
- We researched the global warming potential of gasoline vapors; however, based on guidance from the U.S. Environmental Protection Agency, the global warming potential of such vapors was determined to be negligible. Therefore, ERM did not calculate any direct GHG benefit associated with preventing the atmospheric release of gasoline vapors.