Waste 2 Resources

Prepared for Calko Group

CALKO GROUP

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Life Cycle Assessment Summary Report

100% post-consumer recycled polyester fiber hockey laces

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Document prepared by: Leila Nattagh,
W2R Founder & CEO

Summary

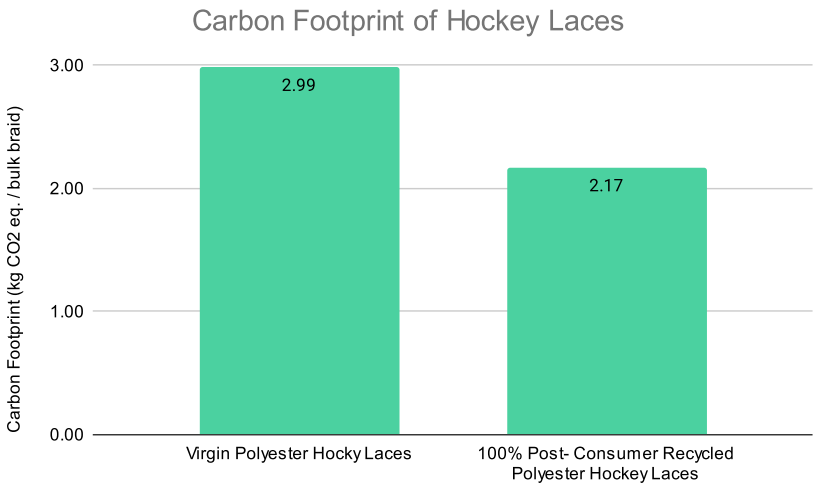
100% POST-CONSUMER RECYCLED POLYESTER YARN IN HOCKEY LACES PROVIDES

27%

REDUCTION IN CARBON FOOTPRINT COMPARED TO HOCKEY LACES MADE WITH VIRGIN POLYESTER YARN*

Using a life cycle analysis approach, the carbon footprint of two types of hockey laces were analysed by assessing the life cycle stages of raw material extraction and processing.

In one scenario, the impact of hockey laces made with virgin polyester is measured. In another scenario, post-consumer plastic bottles are processed into polyester yarn to make 100% recycled hockey laces.



32,030 kg

CO_2 EQUIVALENT AVOIDED BY USING RECYCLED CONTEN IN HOCKEY LACES, BASED ON YEARLY PRODUCTION RATES**

WHICH TRANSLATES TO...

7 vehicles

POWERED BY GASOLINE, REMOVED FROM ROADS FOR ONE YEAR***

*Based on open-loop end-of-life modelling approach
**Based on full production rate of 75,000 lbs / year
*** Using EPA's Greenhouse Gas Equivalencies Calculator

Background

Polyester is the most widely used fiber in the textile industry, accounting for around 52% of the total volume of fibers produced globally (Textile Exchange). As of 2020, about 15% of polyester comes from recycled inputs, predominately from post-consumer PET bottles (Textile Exchange Preferred Fiber & Materials Market Report 2021). Recycled polyester has a significantly lower carbon footprint than conventional polyester made from petroleum inputs. This conventional polyester is known as “virgin” polyester, indicating the use of raw materials from fossil fuels rather than recycled materials.

As committed stewards of the environment, Calko Group is constantly implementing sustainable practices within its operations. The use of recycled content in products is one of these initiatives. Recently, as part of an internal research project, Calko Group has procured 100% post-consumer recycled polyester yarn as a replacement for virgin polyester yarn. This document summarizes the benefits of this change, should clients want a low-carbon option.

Goal

The goal of this document is to compare the environmental impacts of hockey laces made with 100% post-consumer recycled polyester yarn compared to the virgin polyester alternative with no recycled content. For this study, the environmental impact measured is carbon footprint (kg CO2 eq.) to inform the product's potential contribution to climate change.

This document analyses the following scenarios:

Scenario 1: Hockey laces made with 100% post-consumer recycled polyester yarn from PET bottles.

Scenario 2: Hockey laces made with virgin polyester yarn

Scope

This study used life cycle methodology to quantify the carbon footprint (global warming potential) in terms of greenhouse gas emissions. In life cycle assessment, global warming potential is used to describe the carbon footprint, expressed in kilograms of CO_2 equivalent or kg CO_2 eq.

The emissions included in this document are for 100% post-consumer recycled and virgin polyester yarn production, including extraction of raw materials, processing and recycling, fiber production, and final yarn production.

Methodology

To determine the carbon footprint of each hockey lace, a life cycle analysis approach was used. In this document, the life cycle stages of raw material extraction and processing were analysed. The primary data used comes from Calko Group. The secondary data in this document comes from various published studies by research groups, consultancies, and educational institutions. All sources used in this document are cited under Sources.

To evaluate the environmental impacts stemming from process-related activities, a life cycle impact assessment phase is completed. In this study, the IPCC (2013) GWP 100a method was used as the environmental assessment method. This method is based on data published by the Intergovernmental Panel on Climate Change. By using this method, the emissions of greenhouse gases generated are expressed in kilograms of CO2 equivalent, over a horizon of 100 years.

Figure 1: Exemplary model of hockey laces made with 100% post-consumer recycled polyester yarn

Functional Unit

A functional unit is required to compare the life cycle environmental impacts of the 100% post-consumer recycled polyester yarn hockey laces to the virgin polyester yarn products. **The functional unit used for this assessment is the bulk braid of laces which is 1.92 lbs, equal to 144 yards.**

End-of-Life Modelling

In studies where recycled content is part of the product, a few allocation approaches can be considered. In this assessment, the open-loop approach is used. In this method, the burden for virgin polyester production, recovery and recycling, and ultimate disposal of recycled polyester are shared among all the sequential useful lives of the material. This analysis assumes two useful lives for the polyester; once as a PET bottle and another as hockey laces, with no projections about any further recycling after being used in hockey laces. Thus, half of the burdens for virgin polyester production, post-consumer recovery, and reprocessing are assigned to the first use of the resin and half is assigned to its recycled use.

This modelling approach was use because the polyester quality degrades over consecutive life cycles and the number of useful lives for the polyester is known in this case. Meaning, there is no recycling or reuse option for the hockey laces at time of this report and the number of lives for the polyester is two (2). As well, the recycling content in the hockey laces is high (Earth Shift Global).

System Boundary

This document considers the impact of the hockey laces from resource extraction to processing. In other words, it considers the impacts associated with extraction and use of resources such as natural gas and crude oil to produce resin and various chemical and energy inputs for the processing and recycling stages. All processes included as part of this study's analysis are visualized in the diagrams below.

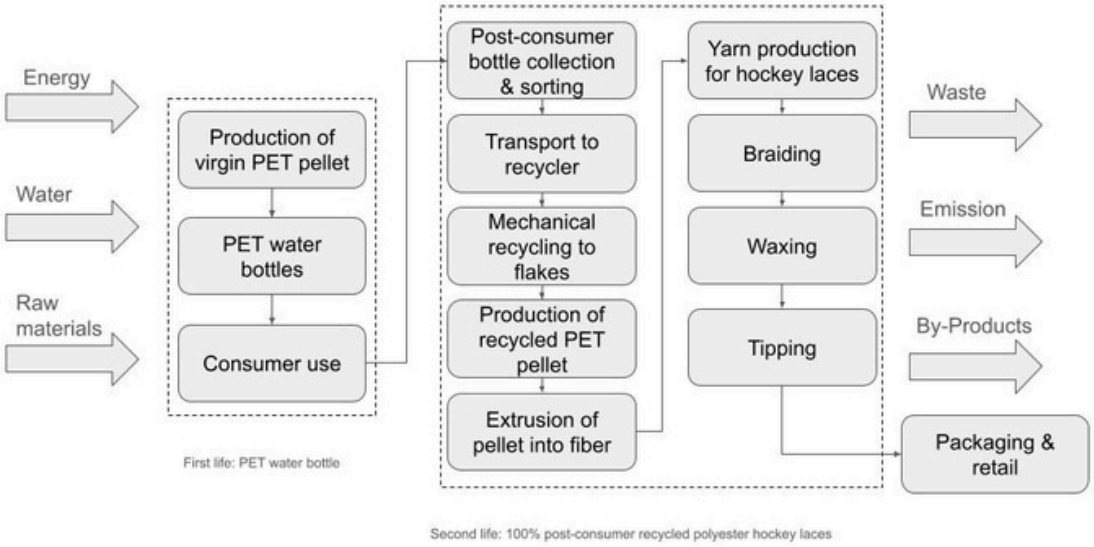


Figure 2: System boundary of Scenario 1: hockey laces made with 100% post-consumer recycled polyester/PET yarn

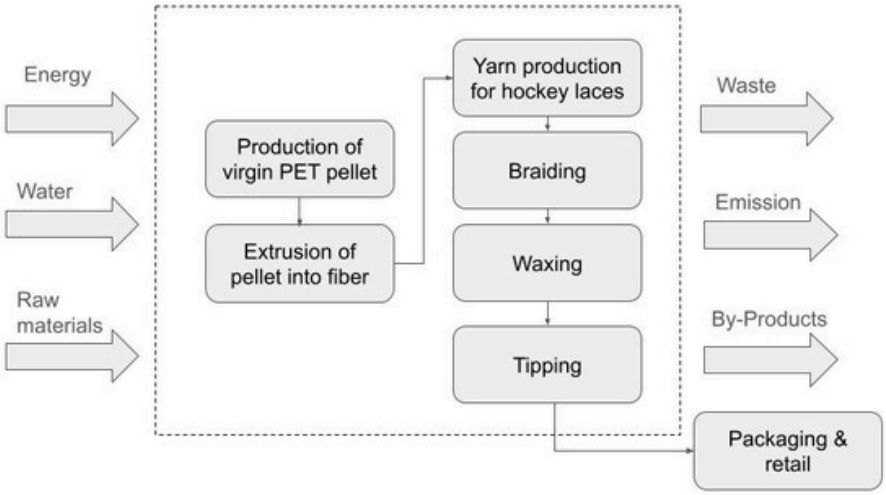


Figure 3: System boundary of Scenario 2, hockey laces made with 100% virgin polyester/PET yarn

Results

After assessing the carbon footprint of various stages in the hockey lace production, the results indicate a lower carbon footprint for the 100% post-consumer recycled hockey laces. This represents a 27% reduction in greenhouse gas emissions compared to the virgin polyester alternative.

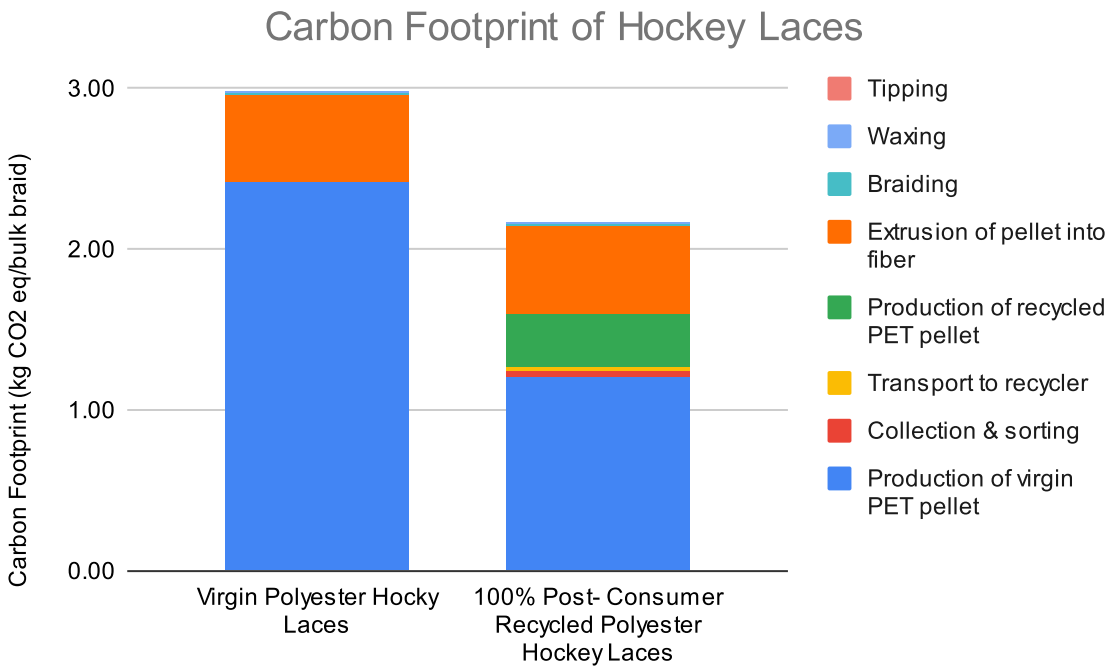


Figure 4: Total carbon footprint of virgin and 100 % post-consumer recycled polyester hockey laces

The virgin polyester hockey laces have a carbon footprint of 2.99 kg CO2 eq per bulk braid compared to 2.17 kg CO2 eq. for the 100% post-consumer recycled version. Based on the annual production rate of 75,000 lbs, these greenhouse gases avoided by using recycled content, sum to a total of over 38,000 kg of CO2 eq. According to the EPA's greenhouse gas equivalency calculator, this emission number equates to approximately 7 gasoline-powered vehicles removed from the road for one year.

Assumptions

General assumptions were made in the absence of representative data to allow a fair comparison between both scenarios. The following are the assumptions used in this study:

- The carbon footprint of each of the three yarn types in both cases are identical.
- The carbon footprint of transporting pellets in both scenarios to the fiber and yarn making facility is identical.
- The carbon footprint of transporting the final yarn to Calko Group is identical in both scenarios.
- For the recycled polyester hockey laces, the only end-of-life disposal option is disposal in a landfill.
- The recycling facilities within the sources cited use mechanical recycling techniques.

Sources

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