



An Life Cycle Impact Reduction Action Plan based on a product specific LCA using EN 15804 or ISO 21930 to mitigate or reduce life cycle impacts of 1 m² of floor covering manufactured from post-consumer recycled California tire rubber in varying thicknesses by U.S. Rubber Recycling Inc. in Colton California

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U.S. Rubber’s Product Specific Impacts Measured in kg CO₂e

A life cycle analysis is a tool to help manufacturers understand their environmental impacts but not all impacts are easily changeable in the scope of product manufacturing. For this reason, a contribution analysis is performed to help the manufacturer understand the impacts and how they relate to each other. For this analysis the TRACI 2.1 Global Warming impact was chosen, measured in CO₂e. When examining this impact, the focus is on the “why” of the numbers but also the reality of what can be adjusted to lower the overall impact of the products. Global Warming Impact is used because its hotspots are typically due to energy usage. Where energy is consumed, money is being spent to buy that energy in some form.

In their third-party, critically reviewed LCA for the creation of their EPD (U.S. Rubber discovered their products’ average greatest impact was in manufacturing through purchasing electricity. This EPD and the LCA were created using the EPD Product Category Rule (PCR) *Construction Products and Construction Services* v2.3 2012:01 and Sub-PCR-F *Resilient, Textile and Laminate Floor Coverings* 2012:01; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework and EN 15804 or ISO 21930 (*as part of the PCR requirements*). They were created using OpenLCA software with the ecoinvent 3.4 database. The table below outlines the impacts of U.S. Rubber’s products using the TRACI 2.1 method. Global Warming is the greatest impact numerically therefore, this is the impact that U.S. Rubber focused on for reduction thorough this Life Cycle Impact Reduction Action Plan.

Table 1: LCI Impact results using TRACI in Open LCIA Methods for each of U.S. Rubber’s products studied.

Results (A1-A3) for 1 m2 of flooring covering manufactured from post-consumer recycled tire rubber in varying thicknesses (TRACI)					
	Acidification	Eutrophication	Global Warming	Ozone Depletion	Photochemical ozone formation
Product	kg SO2 eq	kg N eq	kg CO2 eq	kg CFC-11 eq	kg O3 eq
Underlayment, 2mm	2.66E-03	1.15E-03	1.26E+00	7.46E-08	3.83E-02

Underlayment, 3mm	3.99E-03	1.74E-03	1.90E+00	1.12E-07	5.77E-02
Underlayment, 5mm	6.64E-03	2.89E-03	3.15E+00	1.87E-07	9.59E-02
Underlayment, 6mm	7.98E-03	3.47E-03	3.79E+00	2.24E-07	1.15E-01
Underlayment, 9mm	1.20E-02	5.20E-03	5.68E+00	3.36E-07	1.73E-01
Underlayment, 10mm	1.33E-02	5.78E-03	6.31E+00	3.74E-07	1.92E-01
Underlayment, 12mm	1.60E-02	6.94E-03	7.58E+00	4.48E-07	2.30E-01
Underlayment, 4mm	5.32E-03	2.31E-03	2.53E+00	1.49E-07	7.68E-02
Underlayment, 7mm	9.32E-03	4.05E-03	4.42E+00	2.62E-07	1.34E-01
Underlayment, 8mm	1.06E-02	4.63E-03	5.05E+00	2.99E-07	1.54E-01
Underlayment, 11mm	1.46E-02	6.36E-03	6.95E+00	4.11E-07	2.11E-01
Underlayment, 13mm	1.73E-02	7.52E-03	8.21E+00	4.86E-07	2.50E-01
Underlayment, 14mm	1.86E-02	8.09E-03	8.84E+00	5.23E-07	2.69E-01
Underlayment, 15mm	2.00E-02	8.67E-03	9.47E+00	5.61E-07	2.88E-01
Underlayment, 16mm	2.13E-02	9.24E-03	1.01E+01	5.97E-07	3.07E-01
SportFloor, 3mm	2.24E-02	1.26E-02	5.46E+00	7.70E-07	2.75E-01
SportFloor, 6mm	4.49E-02	2.51E-02	1.09E+01	1.54E-06	5.50E-01
SportFloor, 8mm	6.39E-02	3.58E-02	1.56E+01	2.19E-06	7.84E-01
SportFloor, 9mm	7.90E-02	4.42E-02	1.92E+01	2.71E-06	9.68E-01
SportFloor, 12mm	8.98E-02	5.02E-02	2.19E+01	3.08E-06	1.10E+00
Confetti, 3mm	5.36E-03	2.38E-03	2.44E+00	1.38E-07	7.69E-02
Confetti, 6mm	1.07E-02	4.76E-03	4.89E+00	2.76E-07	1.54E-01
Confetti, 8mm	1.53E-02	6.77E-03	6.95E+00	3.93E-07	2.19E-01
Confetti, 9mm	1.89E-02	8.37E-03	8.60E+00	4.85E-07	2.71E-01
Confetti, 12mm	2.15E-02	9.51E-03	9.77E+00	5.51E-07	3.08E-01

QuietSound Acoustical Underlayment has the lowest impact of the three products studied: QuietSound, Survivor SportFloor, and Confetti. This is because it has the lowest amount of raw materials (kg) per functional unit (m2), it has a 94.99% recycled content of both post-consumer and postindustrial rubber, and the distance the recycled tire rubber travels to reach the U.S. Rubber facility is less than six miles. The second lowest impact was for Confetti flooring for the same reasons as the QuietSound except Confetti has a higher density therefore more material (kg) per functional unit (m2). Lastly was the Survivor SportFloor. This product has the same amount of material per functional unit as Confetti but lacks post-industrial recycled content; it is still composed of post-consumer recycled tire rubber but contains no waste rubber from U.S. Rubber’s manufacturing operations. In addition, it has the greatest travel distances in its supply chain. The crumb rubber for the Survivor SportFloor is sourced from a facility in Sacramento adding 200+ truck miles to the impact. The product also uses up to 80% EPDM which is sourced from Malaysia. This has both truck miles and ocean transport contributing to its overall impact.

Table 2: Contribution analysis for 1 functional unit of QuietSound, 5 mm, Confetti 5mm, or Survivor 5mm using TRACI 2.1 Global Warming Impact in CO2e

Contribution analysis for U.S. Rubber’s Products Using TRACI 2.1 Global Warming Potential, measured in kg CO2e for 1 functional unit, m2 of finished product, 12 mm, ready to ship						
Product	A1					
	Raw Materials	Packaging	A1 Total	A2	A3	TOTAL
QuietSound	2.28	0.04	2.32	0.08	5.18	7.58
	30.0%	0.51%	30.6%	1.10%	68.3%	100%
Confetti	2.43	0.05	2.49	0.03	7.25	9.77
	24.9%	0.64%	25.5%	0.31%	74.2%	100%
Survivor	10.7	0.05	10.7	3.77	7.36	21.9
	48.9%	0.32%	49.1%	17.2%	33.7%	100%

The contribution analysis displays the impacts of three major factors affecting the overall impact of the products. First is the use of EPDM purchased from Malaysia. This two-part factor has one part that is

inherent in the product. EPDM has a higher impact than postconsumer recycled tire rubber. This does not change significantly based on supplier. The second part of the impact is the product's origin, Malaysia. U.S. Rubber has not chosen to address this impact at this time. There are greater impacts where they can positively affect their Global Warming impact first.

The largest impact to Global Warming for QuietSound and Confetti is the electricity used for manufacturing. This is also a large percentage of Survivor's impact but because the percentages are relative and its high raw material impact previously discussed, it is not a majority but a major contributing factor. Electricity usage is high throughout the products' cradle-to-gate life cycle. This starts with the recycling process to turn tires into useable crumb rubber as this is a completely mechanical process using eclectic powered machines. (Part of the raw material processing) Then the actual manufacturing of the products from the recycled rubber (crumb rubber) adds another layer of impact from electricity usage. The biggest impact from electricity usage by U.S. Rubber is not just to the environment but to the company's bottom line. Every dollar spent on utilities is money not invested in the company's competitive future. This can negatively affect U.S. Rubber's competitiveness in the marketplace because of the high overhead.

The first project is a lighting retrofit which will save 45,595 kWh/year. All florescent lighting fixtures and lamps in the factory and office areas will be replaced with LED fixtures and lights. This will reduce the products' impacts 2-4%, saving a minimum of .33 kg CO₂e per year/per product. The timeline for this project is completion by 12/31/2019. The modeled savings, using OpenLCA and TRACI 2.1 impact Method are in the table below.

Table 3: Contribution analysis of U.S. Rubber's products after the lighting retrofit project is complete.

Contribution analysis for U.S. Rubber's Products after the lighting retrofit Using TRACI 2.1 Global Warming Potential. Measured in kg CO₂e for 1 functional unit, m² of finished product, 12 mm, ready to ship					
Product	A1	A2	A3	TOTAL	SAVED
	QuietSound	4.03	0.08	3.13	7.25
	55.6%	1.17%	43.2%	100%	-4.40%
Confetti	4.94	0.03	4.34	9.31	-0.46
	53.0%	0.34%	46.6%	100%	-4.72%
Survivor	13.3	3.77	4.34	21.4	-0.50
	62.1%	17.6%	20.3%	100%	-2.28%

The second project U.S. Rubber is intending on performing to reduce the greenhouse gas (GHG) impact of their operations and ultimately their products is a solar panel installation resulting in generating 805, 951 kWh/per year. This is more than their purchased electricity per year resulting in U.S. Rubber purchasing zero electricity from the grid. This reduces their impact both for their operations and products.

QuietSound and Confetti benefit from this energy project the most because manufacturing is a large part of their footprint. The resulting <1% impact is from the use of propane in the tow motors to move the material. Survivor contains EPM sourced from Malaysia so the impact for this product is only 21% of the product’s over impact but still saves 4.79 kg CO₂e per year. The timeline for this project is the completion by 7/1/2020. The projected savings of CO₂e in Global Warming Potential are modeled below in OpenLCA.

Table 4: Contribution analysis of U.S. Rubber's products after the solar panel installation is complete.

Contribution analysis for U.S. Rubber’s Products after the solar panel Installation Using TRACI 2.1 Global Warming Potential. Measured in kg CO₂e for 1 functional unit, m2 of finished product, 12 mm, ready to ship					
Product	A1	A2	A3	TOTAL	SAVED
	QuietSound	4.03	0.08	0.04	4.16
97.0%		2.04%	0.95%	100%	-45.2%
Confetti	4.94	0.03	0.05	5.02	-4.75
	98.27%	0.64%	1.09%	100%	-48.6%
Survivor	13.3	3.77	0.05	17.1	-4.79
	77.7%	22.0%	0.32%	100%	-21.9%

The LEED v4.1 Credit Requirements: MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations, Option 2: Multi Attribute Optimization

The LEED v4.1 Rating System outlines the procedures for reporting the manufacturer's intent to reduce the carbon footprint of their product. Below is the requirements of LEED v4.1 to fulfill this credit option.

Life Cycle Impact Reduction Action Plan (value at 50% by cost or 1/2 product)

The manufacturer has produced a product specific LCA using EN 15804 or ISO 21930 for the product and has provided a publicly available action plan to mitigate or reduce life cycle impacts. The action plan must be product-specific using the specified PCR functional unit, be critically reviewed, and must include the following information:

- ✓ Description of the LCA conducted including the dataset, software or platform used by manufacturer to complete the analysis.*
- ✓ Identification of the largest life cycle impact areas identified in the analysis and a narrative description of the impact areas targeted for reduction in the action plan.*
- ✓ Description of specific steps anticipated in implementation of the action plan. Include proposed changes in formulation or manufacturing processes that are planned as part of impact reduction strategy.*
- ✓ Specific dates and a full timeline for completion of all the steps described in the action plan.*

Summary

This Life Cycle Impact Reduction Action Plan is based on U.S. Rubber's third-party verified LCA for one m2 of floor covering manufactured from post-consumer recycled tire rubber in varying thicknesses. This study was created using OpenLCA and ecoinvent 3.4 database. From this study U.S. Rubber. From this study, U.S. Rubber identified two projects to reduce its largest impact, Global Warming in accordance with TRACI 2.1 methodology. The first project is a lighting retrofit from florescent to LED scheduled to be completed by 12/2019. The second project is a solar panel installation to reduce the company's purchased electricity to zero. This project is scheduled to be completed 7/1/2020.