THE FABRICANT

PEAK PERFORMANCE DIGITAL SAMPLE CASE

Performance without impact.

Peak Performance has teamed up with The Fabricant to replace their physical samples for digital ones improving the marketing process while eliminating unnecessary waste and allowing for internal quicker decision-making on colors and fit. The environmental impact reduction is estimated to be -96% decrease in carbon emissions from one physical sample to one digital equivalent.

This case study seeks to compare the environmental impact of one of the products from Peak Performance's collection, the Alum Light Long Sleeve shirt and a comparable athletic shirt of similar material. We used the Life Cycle Assessment (LCA) methodology, accounting for impact from raw materials, logistics and disposal, and demonstrating how 3D technology can reduce carbon emissions in the replacement of physical sales samples for digital ones.

General Methodology

In September 2020, The Fabricant partnered with world-leading science and engineering university Imperial College London to conduct the first-ever assessment on the environmental impact of digital fashion and the potential benefits of 3D sampling in reducing carbon emissions in the design and production processes of physical garment creation. The paper[1] was the first of its kind to analyze the environmental impact of digital clothing and compare it to that of its physical counterpart. Data used to estimate the environmental impact of the digital shirt is based on both the Fabricant and Imperial College London's paper[2].

In addition, we used various peer-reviewed literature on Life Cycle Assessment (LCA) of typical athletic wear as base data to compare the estimated environmental impact of a typical physical performance shirt. Notes on limitations of the case study analysis are mentioned at the end of this study.

Assessment of environmental impact of digital athletic shirt

When analyzing the impact of Peak Performance's digital athletic shirt, the main 3 phases are taken into consideration: design phase (design of shirt through software), stitching and uploading (production), and disposal. To calculate the carbon footprint, the study takes into

[1] "The comparative LCA of digital fashion and existing fashion system: is digital fashion a better fashion system for reducing environmental impacts?" by Yihan Xiong, September 2020.

[2] The ICL paper implements Life Cycle Assessment, an environmental management technique that assesses the environmental impacts generated from the entire life cycle of a product.

consideration the electricity consumption of usage of digital devices during each process and the equivalent in kilograms (kg) of CO2 (kg of CO2-eq).

The methodology to calculate a carbon footprint of the digital garments takes into account the electricity consumption of a major ICT (Information and Communications Technology) user[3] and the networks and data centres that allow internet access. It is estimated that the equivalent in kg of CO2 per hour of the ICT user is 0.10.[4]

A total of about 4 hours were spent on the design of the digital product[5].

Image 1: Peak Performance 3D Alum Long Sleeve Shirt Image
Source: The Fabricant

2: Physical Peak Performance Alum Long Sleeve Shirt
Source: Keller Sports NL

[3] This is based on the Ericsson report "A quick guide to your digital carbon footprint. Deconstructing Information and Communication Technology's carbon emissions", Feb 2020. 3 types of ICT users identified: 1) **major ICT user** - playing games on a powerful gaming computer with a large screen 2) **intermediate ICT user** - average user who uses a smartphone, laptop and tablet during the day 3) **minor ICT user -** only connected through her smartphone

[4] The **carbon footprint of the production of a digital garment or footware** can be compared, in terms of energy use, with a major ICT user; a major ICT user is estimated to emit 0.105 kg CO2 equivalent per hour. The ICL paper estimates that the 3D designer emits about 0.09 kg CO2 equivalent per hour. For accuracy, this case study takes an average of both data points.

[5] A more experienced 3D designer would take about 2 hours to design this digital item. For the purposes of this study, we are using 4 hours for a more inclusive time frame.

Assessment of environmental impact of physical athletic shirt

According to a study conducted by Royal Melbourne Institute of Technology (RMIT),[6] the environmental impact of a Polyester T-Shirt with a weight of 0.18 kg is about 20.56 kg CO2-eq throughout its life cycle. We assume that the Peak Performance Alum Long Sleeve Shirt has twice the amount of additional fabric for the sleeves and have estimated that it weighs about 0.36 kg. Therefore, this case study assumes that the estimated carbon footprint of the physical Peak Performance Long Sleeve Shirt to be 41.12 CO2-eq, when considering in-use impact. When excluding in-use, the impact is 14.51 kg of CO2.

Table 1 below shows the comparison of the environmental impact in kg CO2 equivalent of the digital versus physical item.

Table 1: Environmental impact of physical versus digital shirt (kg CO2-eq)

	Physical Shirt (kg CO2)	Digital Shirt (kg CO2)
Design	0.195	0.39
Production	13.22	0.15
Transportation	0.89	0
In-use	*Not applicable for sales samples*	*Not applicable for sales samples*
Disposal	0.211	0
TOTAL EMISSIONS	14.51	0.54

Description of the phases

Physical

Design: Electricity consumption of time spent designing on a desktop or laptop

Production: Polyethylene Terephthalate production, spinning, knitting, pretreatment, dying and finishing, cutting, sewing

Transportation: Within manufacturing process and transport to port

In-use: Consumer washing and drying (not applicable for sales samples)

Disposal: Landfill

[6] https://doc.global-sci.org/uploads/Issue/JFBI/v11n1/111_1.pdf?1591934442

Digital

Design: Electricity consumption of time spent on software designing shirt

Production: Stitching and uploading

Dressing: Placement of digital item on picture

In-use: User using digital item,10 min. of electricity consumption (not applicable for sales sample)

Digital versus Physical: Environmental impact

Based on the assessment, the estimated environmental impact of the physical sales sample shirt is about 14.51 kg CO2-eq. The estimated environmental impact of the digital shirt is 0.54 kg CO2-eq. Based on this data, there is a 96% decrease in carbon emissions from 1 physical shirt to 1 digital equivalent.

Since every physical showroom requires one physical sample, a brand with 10 showrooms across the world, will increase their footprint by ten-fold, while only one digital item is required to inform the entire sales process.

While most of the impact for the digital shirt is in the design phase which is reflected in energy consumption, it is useful to note that the more efficient and experienced a designer is, the more carbon emission efficient the process will be.

In addition, the use of 3D assets can be used indefinitely. This is particularly useful when core products and styles carryover into future seasons. The reuse of 3D assets allows for reduced waste in the sampling process and more streamlined decision-making in the selling process.

Limitations of study and notes to consider:
Specific data on the sourcing, manufacturing and carbon emissions of the Peak Performance Alum long sleeve shirt were not available at the time of this study, and therefore data used from the 2018 RMIT study was used for comparison purposes. The RMIT study examined the carbon footprint of a 100% polyester t-shirt assumed to have been produced in Shanghai, China and shipped to Australia. In addition, data on the carbon footprint during the design phase of the above was not included in the study. For purposes of this case study, we assumed that it took a total of 2 hours to design the shirt.

It is also useful to note that Peak Performance uses recycled materials for the physical shirt with the help of the European Clothing Action Plan[7]. For a more accurate study, it would be advisable to take into consideration the carbon footprint of the recycled materials used and its associated production processes.

Additional notes

Beyond CO2 emissions, other footprint components - not measured in this study - demonstrate a positive impact for the digital item versus the physical version.

Water Consumption

The only water consumed while producing a digital item is the water our team drinks during a day. Which is about 2 liters per person per day.

Water Pollution

As per our research, no water is polluted during the process of creation of a digital item.

Land

As per our research, soil is not degraded during the process of creation of a digital item.

Waste

Digital clothing does not create physical waste. To decompose digital clothes, you just need to archive its picture in your feed.

Microplastic

The production of digital clothes and their decomposition do not create microplastics.

[7] Peak Performance Sustainability Report 2019: https://www.peakperformance.com/on/demandware.static/-/Library-Sites-PP/default/dwb2b71fe0/materialguide/Sustainability_Performance_Report_2019_FINAL.pdf