Paving the Way to a Greener Future: Sustainability from Concept to Market

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Poster 214

Introduction

Tackling the environmental impacts of climate change is one of the most pressing issues of our lifetimes.[1] Indeed, the amount of carbon dioxide (CO_2) in the environment only recently passed 400 ppm (parts per million), a threshold that has never been crossed in the history of our species.[2] Despite the overwhelming evidence in the literature [3,4] – not to mention the disastrous environmental impact we see with our own eyes with increasing regularity, from floods and fires to extreme drought – neither world governments nor industry have taken serious action to combat this emergency.[5] In fact, despite high-profile pledges to tackle climate change by reducing carbon emissions relatively slowly over time as set out by the Paris Agreement in 2015,[6] many countries are already reporting that they will miss these targets, an unbelievable dereliction of duty. In North America alone, Canada is projected to miss its 2030 greenhouse gas emissions (GHGE) target by 30%, while the US is projected to miss its 2025 targets by up to 1,800 million metric tons of CO_2 equivalent (MMt-CO_2e).[2]

While the failure of governments to meet their promised goals on carbon emissions is rightly lambasted within the media and academic circles, the contributions of industry to climate change are just as damaging. It is also clear that the major players in the public and private sectors are not doing nearly enough to tackle this threat. As such, it is up to smaller businesses and players to innovate and bring positive change to how they conduct business in an environmentally sustainable fashion.

Here, we present ways in which we have sought to tackle the issue of sustainability in the pharmaceutical industry. Our approach is innovative as it looks at the issue of sustainability from an all-inclusive angle, so that each and every part of our various processes – from product inception right through to development, production and packaging – is reworked to reduce carbon emissions by as much as possible. With this approach, we can generate a sustainability 'blueprint' for the pharmaceutical industry to show how we can all help to save our communities and our planet.

Materials & Methods

Energy Use and Operations

At our manufacturing site, the majority of our energy consumption comes from water purification, air compression, the operation of production machinery, waste water treatment, and services including heating, ventilation and air conditioning (HVAC), cool storage and lighting. To ensure that these processes are as efficient and sustainable as possible, we have undertaken a major refurbishment of our infrastructure (dubbed 'The Green Core') by installing LED lights and solar panels, and upgrading HVAC.

Water Use

We have overhauled our water processing to reuse retentate for further use within production, and we have installed 26 rain water tanks with a total capacity of 96,000L throughout the site for use in non-potable applications such as toilets and ground works. Waste water is treated onsite to remove zinc and bulk particulates using magnesium hydroxide, which itself is removed from our waste water for treatment.

Culture

We have implemented a modern slavery policy to outline our moral and legal responsibilities and set out the standards to which we will adhere as a business, and expect our business partners to adhere to also. We have also committed to maintain our annual Workplace Gender Equality Agency (WGEA) report to ensure that we are compliant in reducing the gender pay gap, ensuring pay equity, promoting women in leadership, and allowing flexible parental leave.

Packaging

Ego has joined the federally-backed Australian, New Zealand and Pacific Island Pact on Plastic (ANZPAC PACT) where we have pledged to purchase and reuse a % of recycled plastic in the form of post-consumer resin, which is converted into reusable resin that can be combined with and reduce the dependence on virgin resin, in order to support the developing circular economy.

Solid and Trade Waste

By 2024, we will have completed a waste audit review of product waste processes, including filling trials, product campaigns and stability trials. We will also review packaging waste processes such as printed packaging, PVC/PET/HDPE, transport packing material and label backing, and ensure that we have a replacement for single use plastic. We will also conduct reviews of ancillary consumables and other recycling opportunities. To tackle trade waste, we have focused primarily on reducing the total amount of discharge, as well as reducing the use of magnesium hydroxide to remove zinc from waste water. In addition, we are planning on redesigning our trade waste system to better handle trade waste and improve sustainability.

Products: etch&ethos™

The first practical end-user output from the five initiatives above is our new etch&ethos™ range, which has been designed to be as sustainable as possible in all aspects of its formulation, production and packaging. The products use ingredients that are as naturally-derived as possible, according to the ISO 16128-1 and 16128-2 Standards. The packaging used for the etch&ethos™ products has been designed to be recyclable, and are made from recycled plastic containing 50% of post-consumer resin, specifically Australian milk bottles.

Results & Discussion

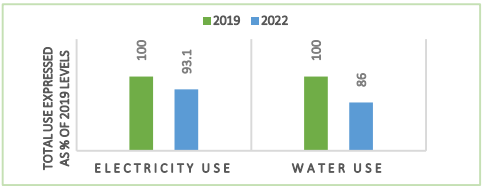

Figure 1: Total electricity and water use in 2022 expressed as % of 2019 levels

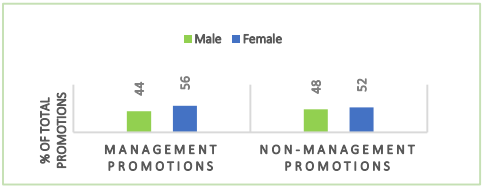

Figure 2: Percentage of male vs female management and non-management promotions according to latest WGEA report

Ingredient	% in formulation		Natural Index		% naturally-derived
Water	60	X	1	=	60
A	20	X	0.7	=	14
B	10	X	1	=	10
C	10	X	0.8	=	8
D	5	X	0.4	=	2
E	5	X	0	=	0
Total % of naturally-derived content in the formulation				**=**	**94.0**

Table 1: Example of the ISO 16128-2 Standard to assess the natural content of a cosmetic

By investing in solar power and more efficient infrastructure such as LED lighting and HVAC, we were able to eliminate the creation of more than 66 tonnes of CO_2 in 2020 alone, with a further 231 tonnes projected to be eliminated just in 2022. The efficiencies created by this new initiative have also reduced our total energy expenditure by just under 7% in 3 years (**Fig. 1**), a significant result in a relatively short amount of time. Taken together, these results show that renewable energy is a viable alternative to fossil fuels for a production-heavy industry.

Similarly, our investment in more efficient and sustainable water usage and saving initiatives has decreased our total water use by 14% in only 3 years (**Fig. 1**), another significant achievement given the ubiquity of water in our products and processes. Water is itself becoming a scarce commodity,[7] so the ability of industry to meaningfully reduce our use of it will have hugely beneficial impacts on the environment.

In addition, our commitment to workplace gender equality has resulted in more female promotions (in both managerial and non-managerial positions; **Fig. 2**) than male, figures that are far above the industry standard.

The first packaging created through our sustainability initiatives uses a significant amount of recycled materials in its construction. This 50:50 mix of recycled and virgin resin in a high-quality pack is a novel achievement, as standard recycled packaging usually contains no more than 30% recycled resin given its fragility. Each of the products in the etch&ethos™ range uses naturally-derived ingredients where possible to help reduce the carbon footprint of the range. Indeed, 94% of each of the products can be said to be naturally-derived according to the ISO 16128-1 Standard, which is the only internationally-recognised standard for assessing the natural content of a cosmetic product.[8] The ISO 16128-2 Standard provides a method for calculating the natural content of ingredients, where each raw material is assigned a score between 0 and 1—called the Natural Index. A score of 0 means the ingredient is completely synthetic, while 1 means completely natural origin. According to the ISO 16128-2 Standard,[9] each of these indices are then multiplied by the concentration of that ingredient in the formulation, and added together, giving a total score out of 100%. An example of the ISO 16128-2 Standard calculation is included as **Table 1**. Crucially, we were able to create these products without compromising on quality, cosmetic efficacy or safety: the etch&ethos™ products passed all tests that are carried out as normal on such products, including 24-hour hydration, transepidermal water loss (TEWL), repeat insult patch testing (RIPT) and preservative efficacy testing. The almost completely naturally-derived formulation of these products, coupled with their sustainable packaging and uncompromised quality, is an example of high quality sustainable cosmetics that provide for consumers and the environment alike.

Conclusions

In this work, we present a sort of 'blueprint' for the pharmaceutical industry that shows what can be achieved in a relatively short amount of time. By recognising the issue of climate change, and by investing time, money and critical thinking into the idea of sustainability in all areas, from manufacturing to market, we can make a positive impact on the environment without compromising on production or product quality, cosmetic efficacy or safety.

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