

PRODUCT CARBON FOOTPRINT OF INHALERS

During the financial year 2023-24, Cipla carried out Product Carbon Footprint (PCF) assessment of 4 anaesthetic inhaler products i.e. Sereflo Ciphaler DPI 500mcg inhaler, Sereflo pMDI 125/25mcg inhaler, Kelhale pMDI 100mcg inhaler and Becloformo pMDI 100mcg inhaler manufactured across 2 of its manufacturing units in India, namely, Indore and Goa. The Product Carbon Footprint along with Life Cycle Assessment (LCA) was carried out in accordance with **ISO 14067 and ISO 14040/44** standards including the four phases i.e. goal and scope definition, life cycle inventory analysis, life cycle impact assessment and life cycle interpretation.

The function of an inhaler is to deliver the APIs to the lungs either by dispersing it in a high vapour pressure propellant (pMDI) or by releasing a sealed dose of powdered medication (API) by breath-activation directly into the lungs (DPI). In this study, the functional unit for each inhaler product was taken to be 1 dose of inhaled medicine (API).

Three pMDI inhalers (Sereflo pMDI 125/25mcg, Kelhale pMDI 100mcg and Becloformo pMDI 100mcg) contain an aerosol propellant to distribute their respective APIs while the DPI inhaler (Sereflo DPI 500mcg) distributes its APIs as a dry powder.

The objective of the assessment was to quantify the life cycle greenhouse gas emissions covering **cradle to grave** stages of the 4 anaesthetic inhaler products, identify the hotspots and mitigative actions as well as communicate them to the external stakeholders.

The impacts categories covered under the LCA study as per CML – Aug 2016 are Abiotic Depletion (elements and fossils), Acidification potential, eutrophication potential, global warming potential (GWP 100 years), Global warming potential (GWP 100 excl. biogenic carbon, human toxicity potential, ozone layer depletion potential, photochem. ozone potential, primary energy demand from renewable and non-renewable sources, blue water consumption,

The impact categories covered as per ISO 14067 (based on IPCC AR6) are Aircraft emissions, biogenic GHG emissions, biogenic GHG removal, emissions due to land use change, fossil GHG emissions.

The Cradle to Grave system boundary consisted of the production phase, distribution phase, use phase and end of life phase. The production phase includes the production of the raw materials, auxiliary material production, upstream transportation, manufacturing process of the final product and its packaging. The distribution phase includes the transportation of packaged product to the respective markets. The study considers two scenarios, the first scenario where the products are being transported only to the UK market and the second scenario where products are transported to a Global market comprising of Australia, South Africa, United Kingdom, and the United States of America. The End-of-life phase includes waste processing for reuse, recycling, and disposal.

Comprehensive data collection efforts were undertaken to gather information on energy consumption, material inputs, transportation, and other relevant factors at each stage of the product life cycle. This data formed the basis for a detailed inventory analysis, ensuring accuracy and reliability of results.

The assessment followed a rigorous methodology, incorporating industry standards and guidelines to assess their carbon footprint. By systematically evaluating the environmental impacts across the product life cycle, valuable insights were gained to support sustainability efforts and informed decision-making.

In the case of pMDI inhalers, majority of the emissions associated with these products arises from their use phase due to the propellant's global warming potential when released into the atmosphere. This is followed by impacts from the cradle to gate phase which were predominantly due to the manufacturing process.

Similarly, in case of DPI inhalers, majority of the emissions arise from the cradle to gate phase due to the consumption of electricity followed by the emissions due to downstream transportation of the product to the market.

A creditable third party supported the assessment through their consulting expertise and the use of Sphera's LCA FE (GABi) Software and Managed Life Cycle Databases.