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A Study of the Carbon Footprint from a Liquid Silicone Rubber Compounding Facility in Malaysia

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Abstract : In modern times, the push for a low carbon footprint entails achieving carbon neutrality as a goal for future generations. One possible step towards carbon footprint reduction is the use of more durable materials with longer lifespans, for example, silicone data cableswhich show at least double the lifespan of similar plastic products. By having greater durability and longer lifespans, silicone data cables can reduce the amount of trash produced as compared to plastics. Furthermore, silicone products don't produce micro contamination harmful to the ocean. Every year the electronics industry produces an estimated 5 billion data cables for USB type C and lightning data cables for tablets and mobile phone devices. Material usage for outer jacketing is 6 to 12 grams per meter. Tests show that the product lifespan of a silicone data cable over plastic can be doubled due to greater durability. This can save at least 40,000 tonnes of material a year just on the outer jacketing of the data cable. The facility in this study specialises in compounding of liquid silicone rubber (LSR) material for the extrusion process in jacketing for the silicone data cable. This study analyses the carbon emissions from the facility, which is presently capable of producing more than 1,000 tonnes of LSR annually. This study uses guidelines from the World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) to define the boundaries of the scope. The scope of emissions is defined as 1. Emissions from operations owned or controlled by the reporting company, 2. Emissions from the generation of purchased or acquired energy such as electricity, steam, heating, or cooling consumed by the reporting company, and 3. All other indirect emissions occurring in the value chain of the reporting company, including both upstream and downstream emissions. As the study is limited to the compounding facility, the system boundaries definition according to GHG protocol is cradle-to-gate instead of cradle-to-grave exercises. Malaysia's present electricity generation scenario was also used, where natural gas and coal constitute the bulk of emissions. Calculations show the LSR produced for the silicone data cable with high fire retardant capability has scope 1 emissions of 0.82kg CO2/kg, scope 2 emissions of 0.87kg CO2/kg, and scope 3 emissions of 2.76kg CO2/kg, with a total product carbon footprint of 4.45kg CO2/kg. This total product carbon footprint (Cradle-to-gate) is comparable to the industry and to plastic materials per tonne of material. Although per tonne emission is comparable to plastic material, due to greater durability and longer lifespan, there can be significantly reduced use of LSR material. Suggestions to reduce the calculated product carbon footprint in the scope of emissions involve 1. Incorporating the recycling of factory silicone waste into operations, 2. Using green renewable energy for external electricity sources and 3. Sourcing eco-friendly raw materials with low GHG emissions.

Keywords : carbon footprint, liquid silicone rubber, silicone data cable, Malaysia facility
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