

Sataporn Sridowtong 2011: Life Cycle Environmental Impact Comparison of Juice Packaging.
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In this research, the life cycle environmental impact comparison of juice packagings, i.e. PET bottles, aseptic cartons, aluminium cans and clear glass bottles, were compared using life cycle assessment (LCA) technique. The functional unit was defined as 18,000 milliliters (mL) of juice packaging, which is equivalent to 60 units of 300 mL PET bottles, 100 units of 180 mL aseptic cartons, 75 units of 240 mL aluminium cans and 72 units of 250 mL clear glass bottles. SimaPro program version 7.1 with CML 2 baseline 2000 method was used in calculation according to the ISO 14040.

To compare the environmental impacts among four packagings, the data of juice filling (excluding juice production) from the Royal Chitralada projects and products distribution from the distributor were used. The data of waste management composed of recycling, incineration, landfill and reuse (for glass bottles only), were obtained from Thai waste management scenario. It is found that the environmental impact, in descending order, of clear glass bottles, aluminium cans, PET bottles and aseptic cartons were 0.047, 0.026, 0.022 and 0.016 nano-Points (nPt) respectively, mainly from the packaging production step. The main environmental impact was from crude oil and natural gas consumption as fuel in electricity production except for aseptic cartons, which was from aluminium consumption in aluminium foil production.

The appropriate waste management method for PET bottles, aseptic cartons and aluminium cans is recycling. If the recycling rates have increased from 25.07, 13.48 and 52.98 to 51.00, 31.00 and 96.50%, which are the maximum recycling rates from foreign countries, the environmental impacts will be reduced by 6.88, 8.40 and 63.65 %, respectively. The most appropriate waste management method for clear glass bottles is reuse. If the reuse rate has increased from 12.02 to 60%, the environmental impact will be reduced by 29.26%. If there is a campaign to increase the rates of recycling and reuse to match the maximum rates of foreign countries, the environmental impact, in descending order, of clear glass bottles, PET bottles, aseptic cartons and aluminium cans would be 0.033, 0.021, 0.015 and 0.009 nPt, respectively. The sensitivity analysis of PET bottles and clear glass bottles is studied by changing the dataset of packaging production. It is found that the environmental impacts have changed not more than 1.32 and 2.53%, respectively.

Student's signature

Thesis Advisor's signature