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LCA (Life Cycle Assessment) Technology

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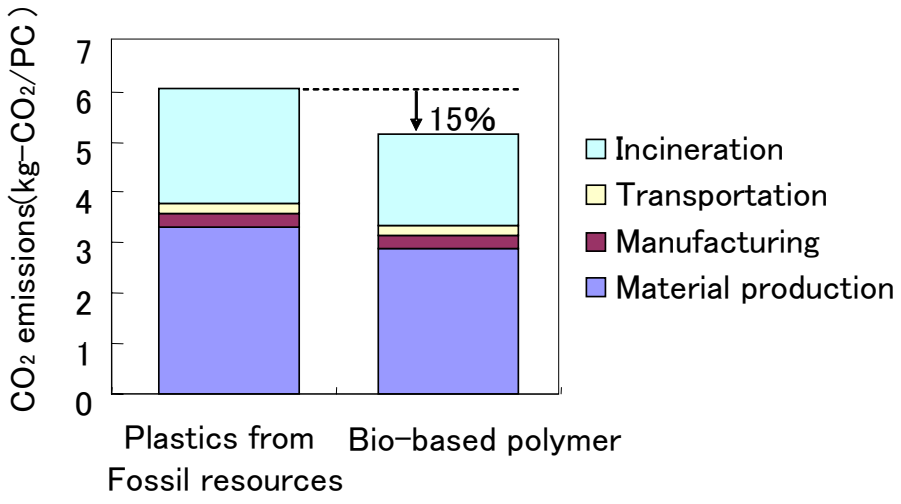
Abstract

At Fujitsu Laboratories, life cycle assessment (LCA) is executed during the product design and development phase in order to create a product and technology with reduced carbon dioxide (CO_2) emissions, a factor that has a large influence on global warming. Various sources of energy and materials are used in the the resource mining, manufacturing, usage, transportation, waste, and recycling stages of a product's life. We are constructing a data base of product materials based on LCA information, in an effort to assess and reduce the environmental burden of the materials used in the life cycle of a product.

Technology

The data base of product materials and their environmental burdens has been constructed by calculating the effects of fuel consumption (such as oil) during the product life cycle based on the inter-industry relations table that covered the business relation between the overall industries of Japan-domestic. Furthermore, we can quantitatively asses the environmental burden at the life cycle of the product that applies new material & new technology that our company originally developed by maintaining the data base and expanding it with information such as electric power consumption in the production line. We found that the CO_2 emissions during a product's life cycle was reduced by 15% when a bio-based polymer, made from corn crops, was used in the housing of notebook PCs instead of plastics from fossil resources.



Life cycle assessment of housing for notebook PC made from the bio-based polymer

Application Examples

- Life cycle assessment of recycling technology of Mg alloy housing for notebook PC
- Life cycle assessment of housing for notebook PC made from the bio-based polymer
- Life cycle assessment of LSI packing materials made from the bio-based polymer

Recycling technology of Mg alloy housing for notebook personal computer

The used Mg alloy generated during the housing's production process and collecting from the user after used can be reused as raw materials for new housings by stripping the coating on the surface and adjusting the Mg alloy element. We assessed the CO_2 emission for 1kg of Mg alloy housing in each life-cycle processes. Smelting of Mg has the highest CO_2 emission, and it constitutes over 85% of the total emission of the entire life cycle. This is because a coal furnace is used for smelting. The CO_2 emission from using a reducing agent such as silicon iron is also high. On the other hand, the emission produced during production and recycling is low. The molding and painting processes during manufacturing the housings emit about 10%, and the emission in the recycling process is low. It constitutes of about 2.5% of the total emission of the life cycle.
By applying this recycling technology the CO_2 emission was 1/5 of that of disposal. Therefore, recycling significantly reduces CO_2 emissions in the Mg life cycle.

LSI packing material made from bio-based polymer

Fujitsu Laboratories assessed the life-cycle of packing materials designed to protect large-scale integration devices from shock and static electricity when they are transported from semiconductor factories to printed-circuit-board factories. Fujitsu applied the bio-based polymer to this LSI packing material.
In terms of agricultural production, the use of pesticides, fertilizers, water, and heavy oil impacts on the environment by emitting CO_2. However, this CO_2 is absorbed from the atmosphere by growing corn crops during photosynthesis. Extracting starch from corn and synthesizing it into a bio-based polymer requires electricity and fossil fuel for energy. The CO_2 emissions from material production was estimated by deducting the CO_2 absorbed from the atmosphere during crop photosynthesis from the CO_2 emitted during synthesis of the material. We found that the CO_2 emitted during the life-cycle of packing material was reduced by 11% when the embossed plastic tape packing made from non-renewable sources was replaced by material made from bio-based polymer.