

2 Environmental Conservation Activities

Life Cycle Assessments (LCAs)

Toyota Industries is committed to establishing a reliable and efficient LCA methodology in order to develop products that are environmentally conscious.

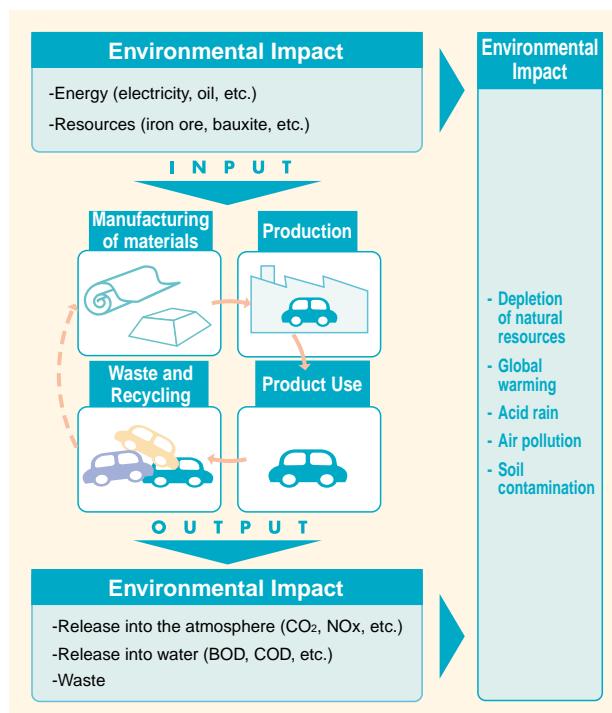
LCAs are used for quantitative analysis and assessment of a product's environmental impact throughout its entire life cycle, which includes the manufacturing of materials, production, product use, disposal and product recycling. LCAs also encompass the energy and resources expended at each stage of the life cycle, as well as the environmental impact on the air, water and soil quality throughout the product life cycle.

Toyota Industries' Product Technology Subcommittee is responsible for promoting activities that incorporate LCAs. The Subcommittee first began studying possible application of LCAs during the second half of FY 1999. In subsequent years, the Subcommittee has conducted LCAs for engines and forklift trucks in FY 2000 and FY 2001 respectively. For more information about these assessments, please refer to the Environmental Report 2001 and the Environmental Report 2002.

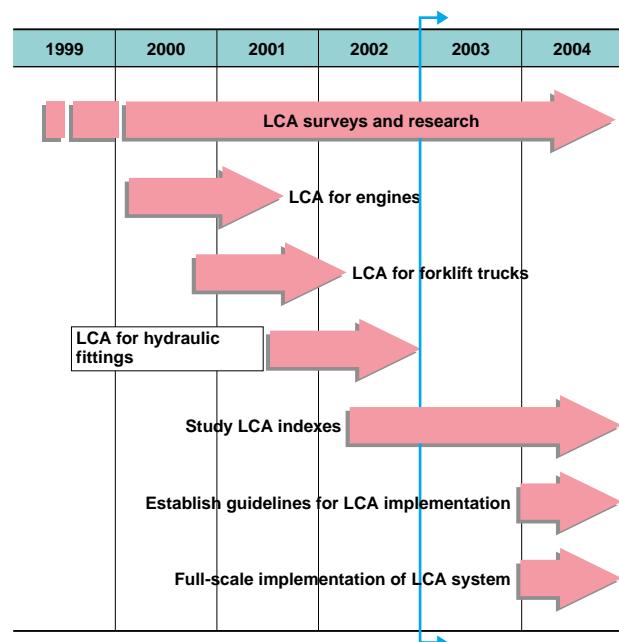
LCAs were originally intended to be used for finished products in order to assess and quantify the environmental consciousness of a product. However, LCAs are increasingly being used as the basis for Design-for-Environment programs (DfE), in which environmental considerations are systematically integrated into the product and process design.

LCAs can be time-consuming to implement as part of the product development process. Consequently, Toyota Industries is working to create an LCA methodology that can be quickly and reliably implemented within the available time frame for development.

The LCA Concept



Time-line for LCA Activities



● FY 2002 Measures

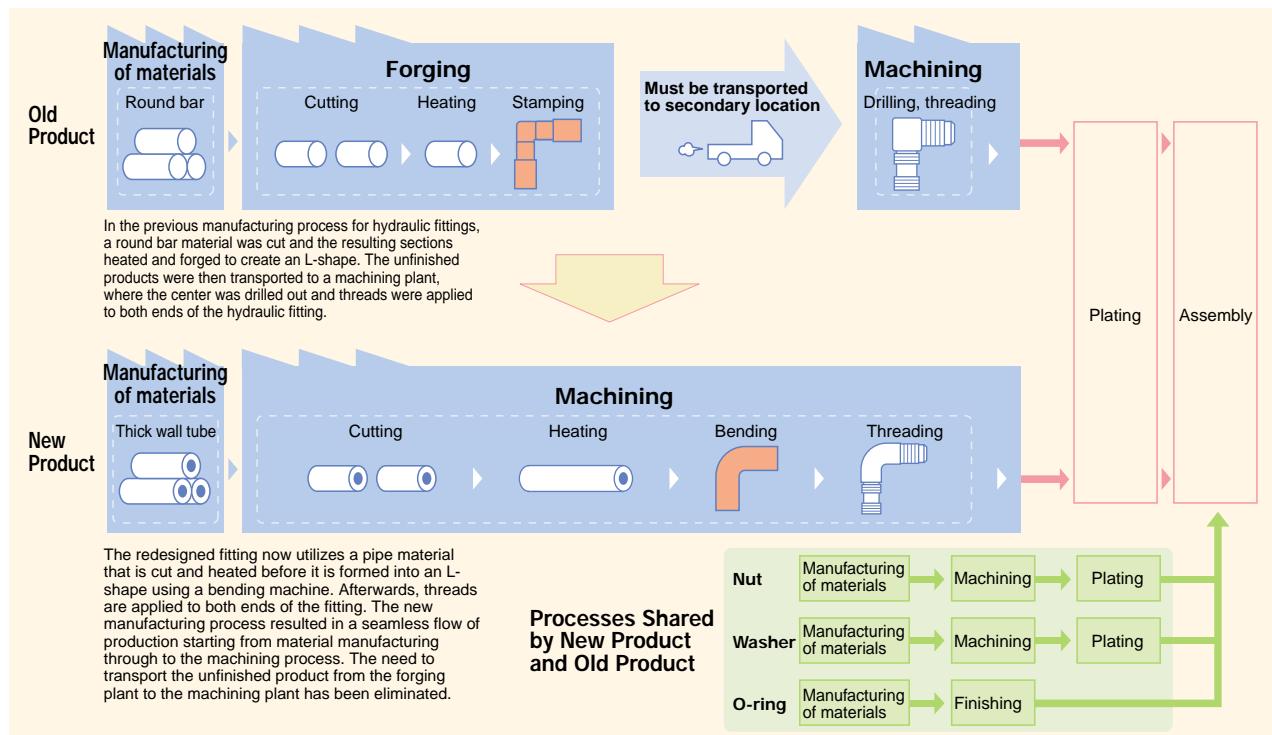
In FY 2002, Toyota Industries conducted life cycle assessments focused on the manufacturing phase for both old- and new-style hydraulic fittings (see below) used in forklift trucks, assessing the amount of reduction in pollutants released into the air in the manufacturing process for the new-style fittings.

Hydraulic Fittings



LCA of Hydraulic Fittings

Comparison of Manufacturing Processes



Hydraulic Fitting Assessment

The life cycle assessment for hydraulic fittings was restricted to the manufacturing stage, commencing with the manufacturing of materials used for the fittings. Toyota Industries chose to focus the assessment on the manufacturing stage due to its impact on the cost of manufacturing the product. The assessment precluded the non-manufacturing stages of the product life cycle such as the product use, disposal and product recycling stages.

In order to assess the processes used in common by the old and new products, Toyota Industries made use of both published values and database values that are included in commercial LCA software. In contrast, all unique processes were assessed and compared using the following three assessment methods, due to the potential cost reduction and their impact on the overall assessment results:

Method A: Assessment based on survey of actual energy consumption

Method B: Assessment based on functional unit* used for household appliances

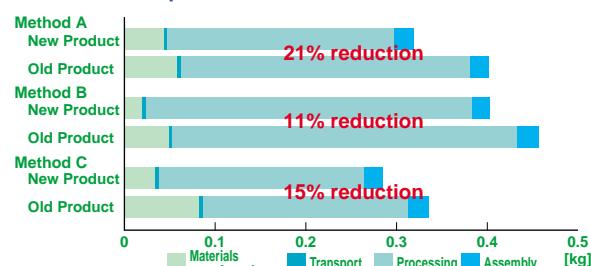
Method C: Assessment based on functional unit used for automotive parts

*Functional unit: CO₂ emissions per material mass in a production process.

Assessment Results

The Method A assessment resulted in the greatest difference between the new and old products. The difference was smaller when using the Method B and Method C assessments despite the process change from forging to bending, which significantly reduces the overall energy consumed in manufacturing the new product. The variation between the various assessment results was caused by the absence of a functional unit for the forging process, which resulted in its exclusion from the assessment results for the Method B and Method C assessments. Therefore, the absence of a functional unit resulted in an over assessment of CO₂ emissions in the Method B assessment and an under assessment in the Method C assessment.

CO₂ Emissions per Product



*Percentages represent the difference in CO₂ emissions between the new and old products.

Future Activities

Toyota Industries will focus its future efforts on identifying functional units to be used in future life cycle assessments, which will help it to conduct assessments more efficiently within the available time frame for development of the product.

In order to achieve this goal, the company will measure the actual environmental impact when the functional unit used has a significant impact on the LCA results. In terms of using existing functional units, Toyota Industries will determine the source of the functional unit and establish a system that will allow it to verify the assessment results.

Furthermore, Toyota Industries will concentrate on creating an efficient and reliable LCA methodology that builds upon previous assessments and research. The company will establish a system so that life cycle assessments can be rapidly conducted at the product development stage, with the aim of assessing the environmental impact of the product throughout its life cycle.