

Development of Risk Assessment Methodology for A Product System

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The purpose of this study is to develop the risk assessment (RA) methodology for a product system throughout its life cycle. While the conventional RA method is limited to evaluate human toxicity or eco-toxicity from chemical substances emitted from a specific region or process, the risks from the chemical substances associated with the entire life cycle of a product system are considered in this study. Therefore, the life cycle inventories of chemical substances for a given product are compiled by using the hybrid IO method in order to extend the scope from some process to product's life cycle. And the chemical substances related with the use and end-of-life stages are added by considering the composition of the product and scenario on consumption patterns.

Then, the exposure analysis and risk characterization are carried out to evaluate the potential risks of a given product system. For exposure analysis LADE (lifetime average daily exposure) and PEC (predicted environmental concentration) are selected as category indicators of human cancer & non-cancer and eco-toxicity, respectively. For pre-manufacturing stage indirect exposure is analyzed and exposure factors are developed for 146 chemical substances which are included in Korean PRTR program. On the other hand, direct exposure analysis is conducted for the use and end-of life stages by assuming consumption patterns, average body weight, and average life year and so on. For risk characterization CR (cancer risk), HI (hazardous index) and PEC/PNEC are used as category indicators for human cancer, human non-cancer and eco-toxicity, respectively.

Since the life cycle risk assessment (LCRA) methodology developed in this study attempts to evaluate the potential risks associated with a product system throughout its life cycle, it can be effectively used to manage chemical products to reduce the risks associated with them.