Material Flow Analysis (MFA) of Mercury in Fluorescent Lamps in Korea

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ABSTRACT

With International Minamata Convention on Mercury agreed in 2013, the chemical is gaining global concerns due to its persistence in the environment and negative effects on human health. Thus, it is important to properly manage mercury-containing products such as fluorescent lamps after use. In 2013, approximately 150 million units of mercury-containing fluorescent lamps were put on the market in Korea. However, only 42 million units of fluorescent lamps were collected and properly disposed in the same year. Often times, it is very difficult to determine the distribution channels and disposal pathway of fluorescent lamps. In this study, we studied mass flow of mercury in used fluorescent lamps that are regulated by the extended producer responsibility (EPR) system in Korea. Substance flow of mercury in the lamps was estimated by material flow analysis (MFA). The MFA methodology is an analytical method of quantifying flow and stocks of materials or substances in a well-defined system based on mass balance approach. The data required for this study was collected from literature review, available statistics developed by the Korea Ministry of Environment (Korea MOE), discussion with the experts, survey and field visits to local government and recycling facilities in Korea. Based on the result of this study, it was estimated that in 2013 approximately 2.3 tons of mercury in fluorescent lamps was distributed into household sectors and industrial sectors. In case of household sectors, 2.7 tons of mercury was stocked and 0.7 tons of waste mercury was generated from households. Among the household generation of mercury, 0.6 tons was collected and recycled, while 0.1 tons was incinerated or landfilled. In case of industrial sectors, approximately 1.6 tons of mercury in fluorescent lamps was distributed; 0.1 tons was collected and recycled. The result of this study would be utilized as baseline data for improvement plan of fluorescent lamp recycling and proper management of mercury in waste fluorescent lamps.