CHAPTER I
INTRODUCTION

Polyvinylchloride (PVC) is one of the five general synthetic resins and widely used in various fields. The inherent properties of PVC make it valuable for many industries. It has a high strength to weight ratio, does not corrode and is very durable. PVC is chemically stable and does not depolymerize. All these properties and price to performance ratio of PVC make this plastic an especially cost-effective material in economical term across a wide range of applications (Euro Chlor, 2010). However, there are several concerns about the environmental problems of PVC that cannot be ignored. For example, a large amount of solid waste is generated after consumption of PVC products. Landfill of these wastes leads to problems such as land occupancy and soil pollution, while the incineration of PVC wastes may generate detrimental substances (for instance, dioxin) which has a seriously affect human health and eco-system. In this aspect, both mechanical and chemical recycling of PVC products is considered the most promising solutions for reducing of amount of wastes and emission (Zhou *et al.*, 2013).

In order to accurately quantify the amount of PVC wastes and how they are distributed in the country, materials input and output of the system in all pathways must be determined. One effective tool for this analysis is Material Flow Analysis (MFA). Material Flow Analysis (MFA) is a systematic assessment of flow and stock of materials within a temporal and spatial system (Brunner and Rechberger, 2000). This tool can be used to identify and analyze the flow of materials added in and removed out from the system. It is suitable method for directly identifying of environmental problems that related to the material or formulating efficient policy alternatives. A MFA outcome can be used as an indicator for analyzing the flow and stock throughout the life cycles of target materials and increasing the efficiency of material usage. MFA can be conducted by either considering all resources (or materials) within the system (Kleijn *et al.,* 2000) or focusing on individual materials such as steel (Park *et al.*, 2011), copper (Bonnin *et al.*, 2012), and also PVC products (Zhou *et al.*, 2013).

Therefore, the main objective of this work is to perform a MFA of selected PVC products in Thailand based on a life cycle approach (LC-MFA) in order to assess the overview picture of PVC flow in Thailand. In this study, MFA was performed on selected PVC products (both hard and soft, including pipe, profile, cable, floor tile, floor covering, shoes, and hose) covering from materials and products production, use, and disposal. Actual production data in the past several years from manufacturers were used along with the annual domestic consumption of selected PVC products. The average service life time of individual product obtained from industrial association was used. After use period, normal distribution was applied to the average service life time of the products in order to estimate annual amount of product being discharged/disposed into the system and the environment at different years. For end-of-life, the PVC wastes were assumed to undergo either landfill, incineration or recycle at different amounts. Dynamic models of input and output of the system were constructed and used to calculate and predict of the amount of PVC material flow in different pathways at different years in the past, present, and future. The results from the LC-MFA model were compared with actual data collected at waste collection sites, disposal sites, and recycle shops. Lastly, scenario analysis was performed to simulate practical or real situation in Thailand in order to suggest proper management of PVC wastes.