CHAPTER I
INTRODUCTION

At present, the world market is in a highly competitive situation. Manufacturers have been forced either directly or indirectly to be more concerned on the environment than before. Sustainable development of the industry depends on its ability not only to manufacture products with good quality and low prices but also to comply with environmental requirements and regulations. Examples of these environmental constraints are EU-draft-policy papers to promote development of a market for greener products such as the "Integrated Product Policy (IPP)", the "Wastes from Electrical and Electronic Equipment (WEEE)", and the "Restriction of use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)". It can be clearly seen that these directives are developed based on life cycle concept. Life Cycle Assessment (LCA), which was initiated in 1990 by the Society of Environmental Toxicology and Chemistry (SETAC), is an effective tool mentioned in the draft policy papers for quantifying environmental burdens associated with a product, process or activity, which encompasses extracting and raw materials, manufacturing, transportation and distribution, use, re-use, maintenance, recycling and final disposal (Allan *et al.*, 1997).

LCA is widely use for environmental assess, compare environmental impact, and design more environmental friendly of products or processes. Polymers are one of the most important raw materials extensively used in the industries to manufacture many kinds of products. They are for example polyethylene, polystyrene, polyurethane, polypropylene, etc. Polystyrene and polyurethane are in particular very interesting as they are used in many industries strategically important to the country such as electrical and electronics, automotive, packaging, construction, etc. Polystyrene is the 5th of world polymer demand; it is about 9% of all types of polymer demand. In Thailand, polystyrene is the 4th of polymer demand which is about 3.89% of total plastics demand (Taksina, 2003). For polyurethane, Asia-Pacific, Europe and the NAFTA countries are the biggest polyurethane markets where nearly 90% of all polyurethanes are consumed (Kramer, 2000). Thailand is the leading producer of polyurethane in all PU sectors except for coatings, where Australia

dominates (IAL Consultants, 2003). From a great demand and use of polystyrene and polyurethane, the environmental assessment should be considered in all steps from raw materials acquisition, production, and use to disposal. Therefore, it is crucial for the development of green products in the future that life cycle assessment (LCA) be applied to evaluate the environmental impact of these polymers. LCA can show the important environmental burdens in various aspects and categories throughout the polymers' life cycle from raw materials acquisition through their end-of life. So that the modification or optimization can be done at the right points.

This research focused on identifying and quantifying the environmental impacts of polystyrene and polyurethane production using LCA. The scope of the study included polymer production from monomer, transportation, polymer production, energy and materials used in each process, recycle and disposal during production process. For LCA data compilation and analysis, SimaPro 5.1 software was used to assess the environmental impacts of various categories including global warming, stratospheric ozone depletion, acidification, resource depletion, and carcinogenic affect.