CHAPTER I

INTRODUCTION

1.1 General Introduction

In recent years, the growth of plastics usage has led to the generation of more solid waste. A consideration has come into play: What does the manufacturer or the consumer do with the product after it passed processing or it has served its useful life?

Industrial or in-plant recycling of plastic materials has been tried by various segments of the plastic industry since the first commercial products were introduced. In fact, the ability to reduce waste by reusing or recycling processed materials has often meant the difference in achieving a competitive edge, whether at the resin supplier or at the fabricator level.

One way to visualize the current approaches to plastics recycling and resource recovery, as well as the complementary nature of the various technologies, is through a simplified schematic of the plastics production process known as the "value chain". The plastics value chain, as shown in Fig 1.1 [1], illustrates how various recycling technologies can move recovered materials back into the plastics production process. It also illustrates how diverse technologies and the industry segments that practice them can all be integrated into resource-management systems for polymer-based materials.

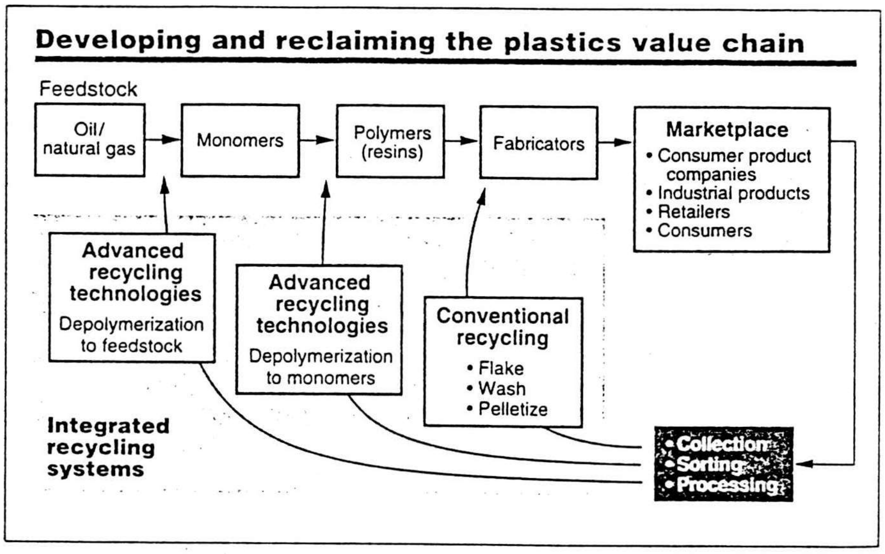

Figure 1.1 : Developing and reclaiming the plastics value chain.

The different alternatives for plastics recycling are land-fill dump sites, incineration, pyrolysis, hydrolysis, composting, biodegradation and recycling. The last route is the present study's main concern. Literature surveys have shown heretofore several attempts to restore or improve properties by the inclusion of some additives. They were tried as attempts to improve the performance of the recycled plastics by enhancing their strength and toughness. It is believed that the mechanical properties of post consumer plastic waste may be improved through the addition of fillers and reinforcements.

Generally, wastes occuring in the plastics processing and fabricating are of particular interest because of the known condition of loading, type restriction, readily availability and cleanliness.

1.2 Polystyrene (PS)

Figure 1.2 [2] shows the out-look for world commodity plastics capacity in 1995. Polystyrene capacity in the Pacific Rim is about 12,456,000 tonnes.

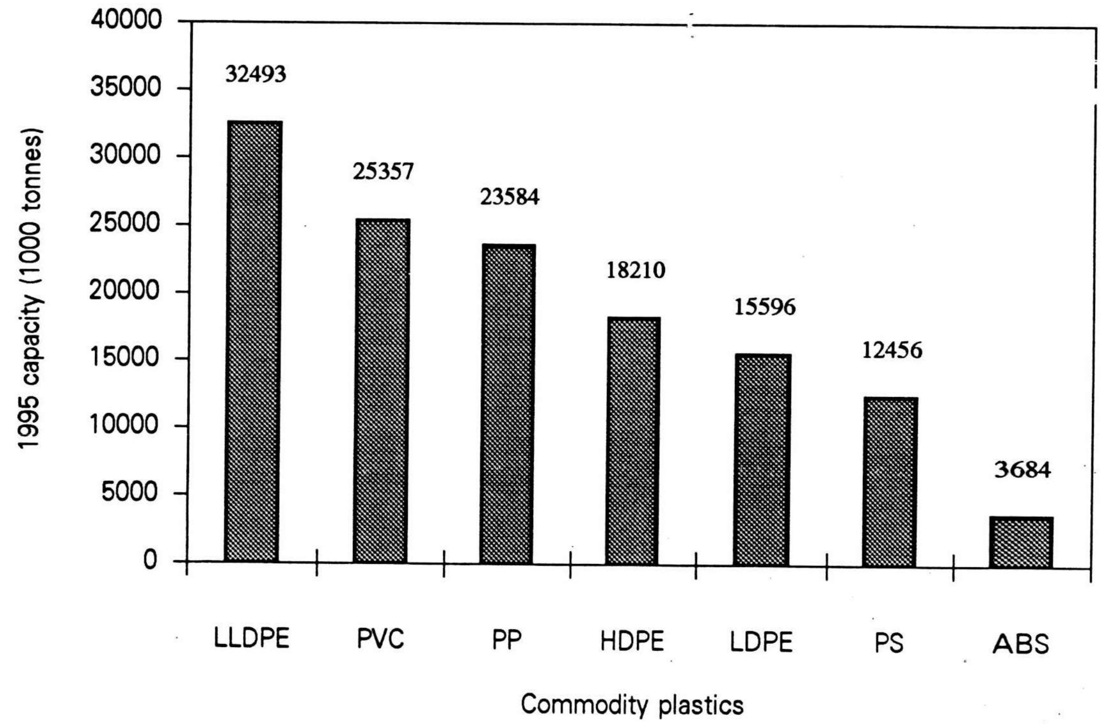

Figure 1.2 : The out-look for world commodity plastics capacity in 1995.

Recycled resins can have valuable physical properties which could be recycled into products that may have high volumetric usage. The background on high impact polystyrene discussed in Chapter II is general. What will be focused on in the present study is the property improvements and possible uses for the recycled resin other than taking up space in a landfill.

Chemical modification of a polymeric material after it has been made will change its processing and end-use properties. The fabrication steps themselves introduce some modifications into thermoplastics, these modifications are usually degradative changes. Material recycling is questionable whenever the wastes are mixed, contaminated with foreign matters and damaged to an uncontrolled extent. As a consequence, the possibilities for recycling this kind of waste material can be limited. Industrial scrap of high quality is more easily reused than discarded post consumers' end products.

Unlike in-process waste materials, post-consumer plastic waste sources vary widely by resin type and quality. They are also frequently contaminated to some degree and may be difficult to obtain with predictable quantities. The plastic industry, both collectively and as individual companies, is developing a wide range of technologies to help various market segments meet their recycling and resource needs.

Disposal of post-consumer plastics is increasingly being constrained by legislation and escalating costs, there is considerable demand for alternatives to disposal or landfilling. Among the alternatives available are reuse, recycling, and recovery of the inherent energy value through waste-to-energy incineration. Each of these options potentially reduces waste and conserves natural resources.

1.3 Known Approaches to Recycle Mixed Plastic Wastes

There are two basic possibilities of recycling. The first one is the separation of the components with an aim at recovering one or more fractions as high grade recycled material or to extract unwanted components from the mix. The second one is known as the thermoplastic processing of the mixture, with non-plasticizable components being suitable for use as fillers or reinforcing material and combination-promoting agents or measures having a positive influence on the application properties.

The low level of property of used plastics processed in the mixed state is attributed to their thermodynamic incompatibility, the differences in melting points and viscosity, inadequate dispersion and a content of foreign substances. The plastics manufacturing industry is concentrating intensely on the task of managing the total plastics waste arising from its activities and seeking to do so without any additional burden on environmental resources. It is clear that the plastics industry is being asked, like many other industries, to re-examine its activities which impact on the environment including product management through to ultimate final disposal. The following actions can be an option:-

(a) the prevention and reduction of waste arising at sources,

(b) the increased use of recycling and re-use of materials wherever possible, and

(c) the safe disposal of unavoidable waste.

Recycling, as applied to plastics, means recovery into similar or secondary products as the first priority, a recovery of the energy content is important but of the second priority.

1.4 The Purpose of the Present Study

The fabrication steps introduce some degradation to High Impact Polystyrene (HIPS). One of the present study objectives is to investigate the changes in the properties of the HIPS waste generated after processing. HIPS was chosen for the study because of its vast quantity generated as fabrication waste by the industry for electrical appliance parts in Thailand. It has a low absorption of moisture. Last but not at all least, it is also chosen for its ease of processing and storage.

In the present study, post fabricated HIPS will be mixed with virgin HIPS. The growth of HIPS use has led to the generation of more waste and causes more considerable effort to utilize or reuse these waste. Adding additives as property modifier for HIPS seems a considerable method of property enhancement for this study. Reliance on impact modifier to boost the performance of resins beyond their inherent physical properties is a trend now being fueled by an increase in recycled plastics. Thermoplastic rubber can also be used at a low concentration as a blending agent to increase impact properties in polymeric materials. In this study, SBS block copolymer is chosen as an impact modifier for improving the impact strength of HIPS scraps. The objective of this study is to investigate the use and the effect of SBS block copolymer to the impact strength of the industrial HIPS scraps.