CHAPTER I

INTRODUCTION

1.1 General introduction

Packaging is the largest user of plastics[1]. They have become commercially attractive material because of their advantages on physical properties such as durable, flexible, tough, long-live, light weight as compared with glass or other material and less in cost. As a result, there is a rapid growth in the application of plastics.

Polyethylene is now the most accepted plastic among all types of plastic resins and the most usage is in packaging. At first, polyethylene was produced by free radical polymerization of ethylene using oxygen or peroxide as the initiator and referred to as low density polyethylene (LDPE) or high pressure polyethylene[2]. The majority of LDPE product is used as thin film for packaging. In 1953 Dr. Karl Ziegler invented a process for producing polyethylene using a catalyst, titanium tetrachloride and triethyl aluminium. This process could work at normal atmospheric pressure and room temperature and the product shows different property from the low density polyethylene, the product is called high density polyethylene (HDPE) or low pressure polyethylene. Latter, linear low density polyethylene (LLDPE) was developed using gas phase technology, this new grade is low to medium density which is the linear backbone with short side branches, shorter than LDPE. Today, LLDPE represents approximately one-third of the world production of LDPE and LLDPE[3].

The properties of each of polyethylene chain, depends on the molecular weight range, the morphology and the degree of crystallinity of the polymer and these in turn are largely determined by the method of producing it[4]. Nowadays, more than 40 billion kgs. are being produced with the Ziegler-Natta technology[5]. By this technology, the chains can still vary in their molecular weight, produce material with variable molecular weight distribution and a randomly incorporation comonomer due to multiple active sites of catalyst[6].

Recently metallocene catalyst which is the single site catalyst, is interested by polyolefin makers. Polymers are designed with only one reactive site on their molecules. With this new generation catalyst, the monomers can react in very limited way and consequently polymerization takes place in a very defined pattern. The product materials with narrow molecular weight distribution of metallocene resin based is to produce the bags.

Generally, there are two kinds of large dimension bag, liner bag and industrial bag. For the industrial bag, strength and softness of the film are an important property combination. In general, it was produced by blending high density polyethylene (HDPE) with linear low density polyethylene (LLDPE) due to rigidity and low elongation of HDPE and high dart impact strength of LLDPE to make the film. The resulting film from this blend will have high strength and softness. Recently, Dow Chemical presents the properties of LLDPE produced by using metallocene, abbreviated as MLLDPE, which has the excellent film impact and dart impact. These properties are better than the corresponding properties of Ziegler-Natta LLDPE, abbreviated as Z-NLLDPE. It is thus interesting to

investigate the improvement of the properties of industrial film by blending HDPE with MLLDPE.

1.2 The purpose of the research

This research aims to investigate the properties of HDPE/MLLDPE film for industrial bag production by comparing with HDPE/Z-NLLDPE film.

1.3 Scope of research

This research will focus on the blending of HDPE with MLLDPE at various ratio. Properties of the HDPE/MLLDPE will be investigated as both pellet and film and also compared with HDPE/Z-NLLDPE which will be used as a reference.