

Thesis Title A Study of the Rheology and Properties of Blow
 Moulded High Density Polyethylene

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ABSTRACT

Studies have been made on the mechanical and rheological properties of virgin and recycled HDPE blow moulded bottles. They were divided into 3 parts in this work : Part 1 The processing conditions were optimized to obtain a suitable wall thickness variation given that for good property bottles a low thickness variation is essential. The optimum conditions were 190 °C of melt temperature and 40 rpm of screw speed. In addition, the conditions were optimized too.

Part 2 The study was on recycling of HDPE bottles to reduce waste problems in the environment and to save costs of production in industry. It will be effective or not depending on whether the bottle properties deviate greatly from the virgin HDPE's properties. The results showed that the mechanical properties ; drop impact strength, tensile strength and wall thickness variation changed. Recycled HDPE exhibited lower drop impact strength and significant variation in thickness of bottles with increasing number of recycling cycles. Blends of virgin HDPE with recycled HDPE

were done to improve these properties. However, blends' properties were not as good as the virgin HDPE. This was due to the lower MW of the blends. The number of times of recycling and the amount of virgin HDPE in blends affected the bottle properties.

Part 3 Rheological properties of parisons were investigated because they affected the properties of blow moulded HDPE bottles. There are 2 important effects ; swelling and sagging. A pinch-off mould was utilized to study the weight distribution of the parison and applied to find the tensile viscosity in processing. The results indicated that die swell was dominant during parison formation, while MFI, a simple type of equipment, was applied to find the tensile viscosity and rupture stress in the laboratory. The results indicated that the same trends occurred for both the tensile viscosity in processing and that in the simulated condition. Furthermore, the quality of recycled bottles showed correlations with MFI, rupture stress, and especially tensile viscosity. In contrast, shear viscosity curves were hardly affected.