

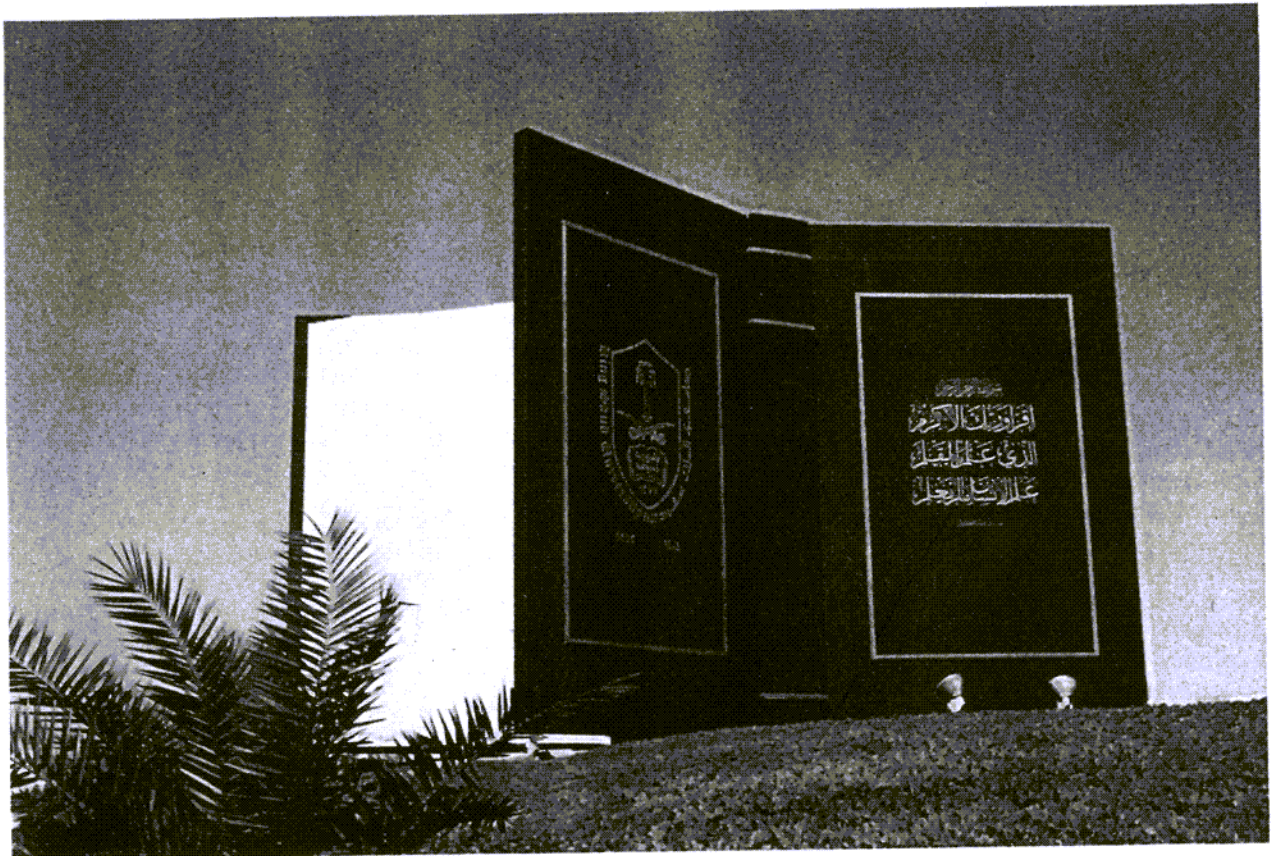


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DEVELOPMENT OF POLYETHYLENES BY BLENDING TECHNOLOGY USING LOCAL POLYMERIC RESINS

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ABSTRACT

Linear low density polyethylene (LLDPE), which is produced by low pressure catalytic gas phase or slurry/solution process, has performance characteristics lying between those of low density polyethylene (LDPE) and high density polyethylene (HDPE). Therefore, the blending of LLDPE with LDPE and HDPE has resulted in optimization of end-use properties in selected applications. The present paper summarizes the recent technological advancements that have been made in LLDPE/LDPE and LLDPE/HDPE blends. It concentrates on the feasibility and importance of research in this area from the perspective of the Kingdom of Saudi Arabia's requirement, and describes a viable R&D program. It is highly expected that the materialization of the proposed R&D program will build the Kingdom's own polyethylene blending technology.

INTRODUCTION

Polymer blending has recently become one of the major approaches to designing new plastic materials.^{1,2} Varieties of blended plastic materials are available on the world market while new ones are under development. The blending technology consists of physically combining/mixing two or more polymeric materials which may be of similar or different types and structures.

The premier reason to the successful, rapid growth of the blending technology lies in the fact that a polymeric blend is more economic to produce, and generally has a lower technical risk than developing a new polymer or polymer grade. It offers a cost effective means to fill the gap in performance of existing materials, and improves the critical properties required for end use. New materials, with properties either unique or intermediate between those of the blend components, are produced. It presents an easy way for commodity plastic producers to enter the

lucrative speciality segment of the business.³⁻⁶ Also, waste plastic materials (both primary and secondary) may be turned into useful products by blending them with similar or different resins/plastics.^{7,8} Plastics having various degrees of stabilities may also be produced.^{9,10}

Consumption of polyethylenes is increasing in the Kingdom of Saudi Arabia with its overall development. Saudi Basic Industries Corporation (Sabic), currently a leading polymer producer, is producing different grades of linear low density polyethylene (LLDPE), and high density polyethylene (HDPE). On the other hand, the Kingdom is also importing low density polyethylene (LDPE) produced by Qatar Petrochemical Company (Qapco). The local film manufacturers are customarily blending the above polymers in the form of two principal blends: LDPE (from Qapco)/LLDPE (from Sabic), and HDPE/LLDPE (both from Sabic). The resin producers and the film manufacturers, as complementary elements to each other, need to generate a complete profile of information on the rheological and viscoelastic properties of the resins, and the potential polyethylene blends, as well as fully characterize the end products depending on the nature of application. No research has yet been undertaken in the Kingdom in the area of polyethylene blends. Therefore, the present paper will focus both on the necessity and advantages of blending the locally available polyethylenes from a scientific point of view. The recent technological development made in polyethylene blending technology will be reviewed and the results will be reported. The polyethylenes produced by Sabic and Qapco do not necessarily match those produced by other resin manufacturers. Therefore, it will be emphasized the need of developing a research program based on the overall advancement achieved in this area with a view to producing polyethylenes having better and wider applications. The feasibility and scope of such a research and development program will be highlighted from the perspective of the existing and forthcoming technological requirement of the Kingdom.