Optimal Design of Side-Feed Spiral Mandrel Die for Blown Film Extrusion Process

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Abstract

Side-feed spiral mandrel die was designed to overcome the disadvantage of central-feed spiral mandrel die. The production rate can be improved and the possibility of forming the poor surface appearance and the warp problem can also be avoided using this type of die. Especially, the possibility of material degradation, which causes the decrease of mechanical properties, can be eliminated via this type of die when the layers of film increase. In addition, this type of die possesses the characteristics of small metal body, which results in a decrease of die cost, and easily taking apart of the die or

changing the processing material. Recently, this type of die, thus, has attracted the attention of the foreign equipment suppliers. Therefore, this thesis first employees a flow model of two dimensional control volume method to simulate the flow behavior in the side-feed and spiral mandrel sections. Under this circumstances, the non-Newtonian fluid is assumed to be in the isothermal condition and the flow behavior in these sections will be simulated. In addition, we use the Taguchi method to search several optimal sets of die geometric parameters by assessing the flow uniformity and mixing degree. Finally, under non-isothermal condition, the geometry of die will be extended. This will allow us to simulate the flow behavior and performance of entire die.