The changes in temperature distributions of flowing polypropylene melt in the barrel of an injection molding machine were investigated using a designed experimental rig coupled with a temperature sensing device. The main objective was to study the effect of injection speed on melt temperature measurement. In the course of the study, the temperature of the melt changed continuously with injection time, which was associated with a number of factors, such as shear heating, heat conduction, residence time, and the flows occurring in the barrel. The experimental results obtained differed from theoretically calculated results.