

Precision in Plastic Manufacturing: The Role of Temperature Control in Injection Molding

Chirag Kolambe¹, Dr. Jayant H. Bhangale², Dr. Pratap R. Sonawane³

M.E Heat Power Engineering, Matoshri College of Engineering & Research Centre, Eklahare, Nashik, India¹

M.E Heat power Engineering, Matoshri College of Engineering & Research Centre, Eklahare, Nashik, India^{2,3}

Abstract: Injection molding is an efficient process for producing parts with intricate geometries and consistent quality, significantly influenced by temperature control. This paper reviews the role of temperature control in achieving high precision in plastic manufacturing. It classifies recent advancements into four sections: measurement techniques, influencing factors, prediction models, and control strategies. The review explores how temperature management affects material properties, mold design, cycle time, and product quality. Innovations in dynamic mold temperature control, advanced sensors, and real-time monitoring systems are highlighted for their contributions to process stability and part consistency. The paper also addresses challenges like warping, shrinkage, and residual stresses, evaluating strategies to mitigate these issues. Proposing future research directions, this review aims to inform researchers and practitioners about the critical importance of thermal management in precision plastic manufacturing and encourage further innovations in temperature control methods.

Keywords: Injection Molding, Temperature Control, Thermal Management, Product Quality, Measurement Techniques

