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Application of Neural Networks for Properties Control of Injection Molded Products

S. Kenig (a), *A. Cherkassky(b), E. Bumagin(b) and M. Omer (a)*
(a) Israel Plastics & Rubber Center, Shenkar College, Ramat Gan, Israel
(b) Shenkar College, Ramat Gan, Israel

The properties of molded articles are determined by the process parameters. In most cases the control of the process is based on a feedback control systems that uses the measurement of the current values of the process parameters and the calculated differences between the measured and the predetermined desired values. A more effective way for choosing the process parameters can be realized by applying a model of the technological process, which relates the process parameters and the property of the molded article. Such a model can be used to control the properties of the molded articles rather than the process parameters. In the current study the modeling of the injection molding process has been based on a Neural Networks (NN). Furthermore, the model has been integrated into a control system and provided the basis for determining the process parameters according to the optimal properties of the molded product. It has been assumed that the basic process parameters that affect the quality of the finished goods are the melt temperature, the mold temperature, the injection velocity, the packing pressure, and the packing time. The NN that has been developed controls the product quality and contains a decision- making module that changes the process parameters to meet the desired properties. This novel concept was applied in a system for controlling the elastic modulus and breaking strength of molded polycarbonate. Experimental results have shown that the NN adaptive control system can predict the resulting controlled elastic modulus of polycarbonate with a correlation coefficient of 0.908, while that of breaking strength with a correlation coefficient of 0.933.

Specific software for implementation of the NN system has been developed. It contains a main module that is responsible for interactions with a specific graphical user interface, a NN module and a decision-making module.