Casting is a solidification process in which the liquid metal is poured into a mold and then allowed to freeze into the desired final shape. Most of the structural features that ultimately control properties are developed during solidification. In cast iron, solidification takes place by two consecutive steps, primary and eutectic phase solidification. Each of these steps includes a nucleation and growth process, which can be monitored on a cooling curve. Changes in the mode of solidification are reflected in changes in the shape of the cooling curve.

In Mg-treated irons it is possible to determine the graphite shape of treated iron for a given process and given composition using standard sand cups and a data acquisition system. Cooling curve data were collected with a data acquisition system and then transferred to a spreadsheet program to calculate the first and second derivative of the cooling curve using numerical differentiation. Statistical regression analysis of cooling curve information found a good correlation between the graphite shape parameter and the cooling rate at the end of solidification. From the experimental results, it was concluded that it is possible to predict the shape of the graphite before casting from the thermal analysis of a typical cast sand cup.