

# **Influence of Particle Size on Melting and Energy Consumption during Compounding: Does the Effect hold at Scaled-Up Conditions?**

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## **Abstract**

A number of studies have shown that differences exist in the melting behavior of polymers in twin screw extruders (and also continuous mixers) when the feed is in a granular form as opposed to a pelletized form. Specifically, small particle melting is influenced by frictional heating while larger particles undergo extensive plastic deformation before melting. These differences also have an impact on energy consumption and melt temperature. The data reported in previous studies were generated on small scale laboratory equipment and it is not clear if and how the reported differences in melting behavior, energy consumption and melt temperature would vary as equipment size increases to those used in commercial scale polymerization facilities.

This paper presents results of experiments conducted on a twin rotor continuous mixer (Kobe LCM-100G) using a high density polyethylene (HDPE) resin in a granular form and in a pelletized form. We have also investigated the impact of adding granular material to the pellet feed at various concentrations. Results include temperature profiles in the melting section of the continuous mixer as recorded by strategically located thermocouples as well as overall impact on key process parameters such as energy consumption and melt temperature.