

## **Microwave processing of PET using solid state microwave generators**

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### **Abstract.**

Heating of Polyethylene terephthalate (PET) is a preliminary step for many forming process, like extrusion and blow molding. Usually solid PET granules or preforms are re-heated in order to impart the final shape. Due to its low thermal conductivity and optical properties, conventional heating, including infrared heating, suffers from lack of efficiency and homogeneity. In this framework, the use of dielectric heating, and in particular of microwave heating, can play a crucial role to speed up the process and improve the final product quality. This approach is already in use in some industrial fields, like PET bottle stretch blow molding (Krones' FlexWave technology), and some of the authors already devised in the past special microwave applicators for the same purpose [1]. The present study addresses the possibility of using a frequency-controllable microwave source, i.e. a solid state microwave generator, to rapidly and efficiently heat PET. Based on dielectric properties measurement of PET, numerical simulation has been used to model dedicated microwave applicators, suitable for the rapid re-heating of PET granules or preforms. Numerical simulation, validated by experimental activity, demonstrate that using the proper frequency change as PET is being processed allows to maximize heating efficiency or homogeneity. Two examples of microwave applicators, one for small scale and the other for large scale production are presented, specially addressing the issue of metals usable for the construction of the microwave cavity.

[1] P. Veronesi, P. Pagliarini, EP2647485, Device and method for heating a preform in plastic material, 2013