Optimal Operating Point a Tribo-Aero-Electrostatic Separator with Rotating Disk Electrodes

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***Abstract*—Waste electrical and electronic equipment (WEEE) contains a wide variety of materials including toxic substances but also valuable materials. According to the latest data, 41.8 Mt of WEEE have been discarded worldwide. Less than a sixth of this waste has been properly recycled. The treatment of this waste is delicate especially because of the diversity of its composition.**

The main objective of this work is the design and implementation of an electrostatic separating system with disk electrodes intended for the separation of powdery mixtures of insulating materials. This installation comprises two main parts: two rotating disk electrodes set at the high voltage and a fluidized bed for the tribocharging of the products.

The experiments were carried out on a mixture composed of two different plastic materials, the PC and the PP, of particle size class 250 µm - 500 µm. The particles were loaded into the fluidized bed and the disc electrodes attracted them according to their polarities and evacuated them in their rotational movement thus allowing the separation. Virtual instrumentation using the LABVIEW software was used to have the continuous measurement of the mass and electrical charge of the collected products. Recovery and purity of the separated materials were then determined.

The experimental design methodology with a 3-variable composite design (voltage, fluidized bed airflow and tribocharging time) was used to determine the optimal operating point of this new separator. The results obtained show a good efficiency of this facility for the treatment of micronized plastic wastes.