

Off-Line Charging Measurements



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Contributing Editor

Customer requirements are constantly changing. Suppliers work hard to gain a performance edge or a cost advantage. The pace of change is fast, and the market rewards speed and creativity.

When developing a new product or when benchmarking alternative materials with existing products, off-line testing is valuable because running tests on a production line is costly. Screen alternatives off-line, and save production testing for the final selections.

Measuring the static charging performance of materials is challenging. While there are standards for measuring the electrical resistivity and static dissipation time of plastic sheets, I am not aware of any standards for measuring triboelectric charging performance. If you know of such standards, I invite you to send me an e-mail!

Of the many “practical” tests for static charging, one of the best is the “nip roller” test in Figure 1. This test measures the static charge on a sheet from contact with the test rollers. Nip rollers are good for testing because a sheet can accumulate a significant amount of charge in a single pass. Select rollers that represent your production operation or that are typically used by your customers.

Static charge on the sheet is measured using a Faraday cup. The Faraday cup must be big enough to hold the test sheet.

Large Faraday cups may be made using metal pails or steel drums.

The inner electrode (the red electrode in Figure 1) must be electrically insulated from the outer grounded electrode. I have used plastic blocks or a quarter-inch-thick sheet of PVC to separate the two electrodes in a large Faraday cup. Coulomb meters used to measure charge are commercially available from several good vendors.

The amount of charge on the sheet depends on the sheet composition and on the roller materials. The primary goal of the nip roller test is to measure the triboelectric charging between the sheet and the rollers. However, the sheet charge depends on a number of other things.

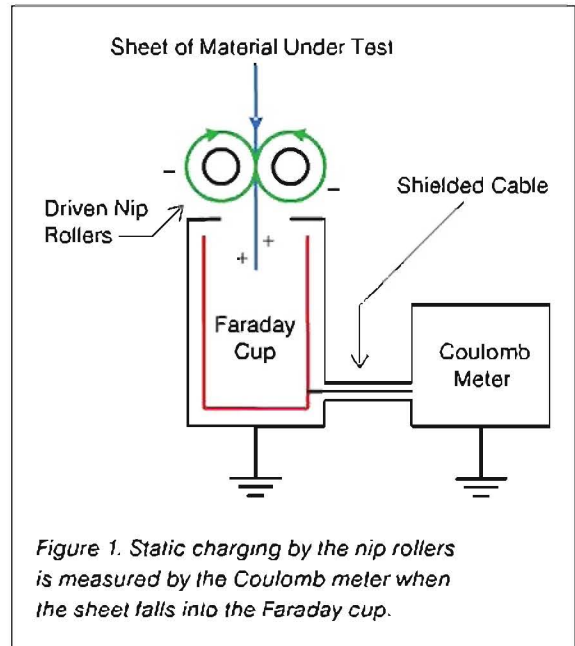


Figure 1. Static charging by the nip rollers is measured by the Coulomb meter when the sheet falls into the Faraday cup.

For example, the charge increases with sheet size. Divide the measured charge by the sheet area to find the charge density or charge per unit area.

Charge also depends on process parameters like the nip engagement pressure and roller drive

speed. So, plan on using a feature/check type test where you measure the differences in charge between the feature samples and a standard check sample. For example, pick a check material with good static performance...one that does a good job for your customers. Your feature materials may be a series of prototype materials. The goal of

the nip roller test is to determine which of the feature materials is closest to the check.

Off-line testing provides good information without having to dedicate valuable production machine time to testing. Results help guide product designs to have good static performance, and off-line testing can be fast.



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