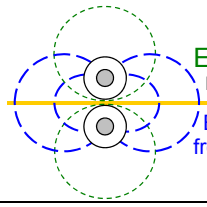

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Static Dissipator Neutralization Efficiency

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Abstract

Static charges can cause a number of problems including sparks that ignite fires, shock people, and cause logic errors. Static charges cause sheets to stick and attract airborne contaminates. Many static dissipators are commercially available for controlling static on webs and sheets. The performance of a static dissipator used to neutralize the charges on the web is analyzed. 3 key parameters determine the neutralization efficiency;

1. the number of corona ions n_{ION} produced by the static dissipator (our static bar),
2. the length of the web L_{ION} within the ionization field of the ionizer (our installation), and
3. the web speed U_{WEB} (our process).

The neutralization efficiency $\eta_{DISSIPATOR}$ in (1) depends on the electric Reynolds number Re (2), the ratio of the time T_{WEB} that the web is exposed to ions from the static dissipator to the dissipator time constant $\tau_{DISSIPATOR}$ that is determined by the number of ions produced by the static dissipator.

$$\eta_{DISSIPATOR} = 1 - e^{-\left(\frac{1}{R_e}\right)} \quad (1)$$

$$R_e = \frac{T_{WEB}}{\tau_{DISSIPATOR}} = \left(\frac{eb}{\varepsilon_0}\right)\frac{n_{ION}\, L_{ION}}{U_{WEB}} \quad (2)$$

A key result is that the performance of the static bar does not depend on the gap between the static bar and the web. Rather, the web distance L_{ION} that is exposed to ions from the ionizer is the key parameter.