Comparing AC & DC Ionization

1. What are the key differences between AC and DC static eliminators?

Corona static eliminators fall into two categories, AC and DC, according to the high voltage waveform applied to the emitter pins. AC static eliminators are divided into high frequency and ordinary AC. DC static eliminators are classified into steady-state DC and pulsed DC.

The most obvious difference between an AC static eliminator and a DC, broadly speaking, is that the same emitter pin of an AC static eliminator can emit both positive and negative ions. The emitter array is composed of emitter pins and grounding poles. On the other hand, a grounding pole in unnecessary when using a DC static eliminator; its emitter electrodes are composed of independent, polarity dedicated emitter pins. DC static eliminators can project ions further in distance than AC devices when airflow is limited. For this reason, DC technology is widely employed in manufacturing room ionization products.

A significant difference between an AC static eliminator and a DC one is the stability of the ion balance. AC static eliminators have better ion balance performance because the emitter pins emit both positive and negative ions and because the emitter pins do not degrade significantly over time (unlike the DC devices). DC static eliminators generally demonstratehigher offset voltages close to the device because of their independent positive and negative emitter pins. DC ionizers also depend more on airflow to create an acceptable ion mix. Hence, most DC blowers mount emitter points behind the fan. This design reduces decay efficiencies and makes balance contingent the fan. In addition, ion balance of a DC static eliminator is subject to other environmental factors, including emitter pins contamination.

The ion balance of DC static eliminators is further compounded because the positive and negative emitter pins wear at different rates. Some DC static eliminators mitigate these problems by using active sensors and feedback loops to help control balance. They can be effective, but they are usually costly and require periodic calibration. Another DC static eliminator technology uses isolation of the secondary coil winding to stabilize the product. These products are relatively affordable, but the balance performance is limited to about 20 volts and rapidly degrades when the emitter pins become dirty.

Frequent and periodical cleaning of emitter electrodes is crucially necessary because static elimination performance and ion balance are affected by contamination. More frequent cleaning of a DC static eliminator should be done because its emitter pins are prone to contamination. Regular check up of ion balance is indispensable as a result of different wear rates of positive and negative emitter pins. Replacement of emitter pins is required after they are badly worn.

2. What are the key differences between AC high frequency (68 Khz) and ordinary AC?

Normal commercial frequency (50 Hz/60 Hz) AC static eliminators typically use a coil core transformer. This technology is widely used due to its simple structure, low cost and ease manufacture. The large size and heavy weight of the coil core transformer make the static eliminator very bulky. Many companies prefer to use small and light static eliminators. Having these attributes, high frequency static eliminator are becoming much more widely used. However, manufacture of a high frequency (68 Khz) static eliminator is not simple. The design is more complex because it requires consideration of voltage rise times, symmetry of output waveform and load matching via the electrode(s).

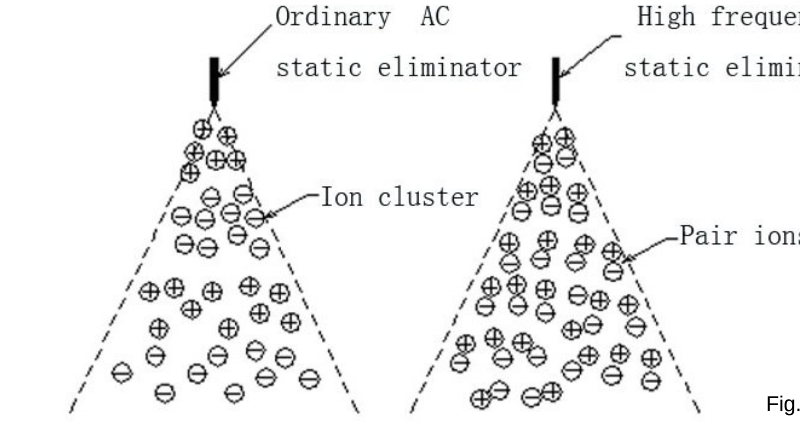

Fig.1

High frequency (68 Khz) static eliminators are not only small and light but also rich in ion density and extremely homogenous in ion output (See Fig.1). Stability and durability exceed ordinary commercial frequency (50 Hz/60 Hz) AC static eliminators. Additionally, their output is more suitable for long distance ionization, neutralizing fast moving objects and applications with restricted space. Experiments have also shown stations generated by a DC static eliminator and an commercial frequency (50 Hz/60 Hz) AC one cannot be transmitted efficiently through tubing. High frequency (68 Khz) AC does not have this limitation.

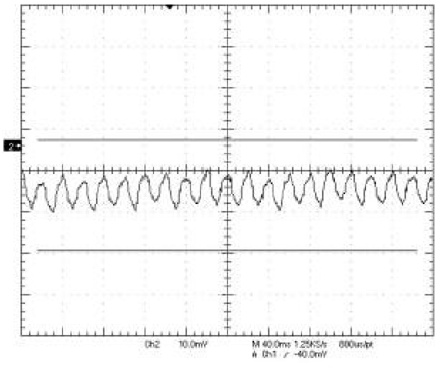

Fig.2

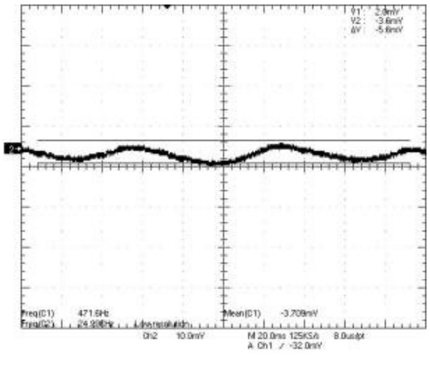

Fig.3

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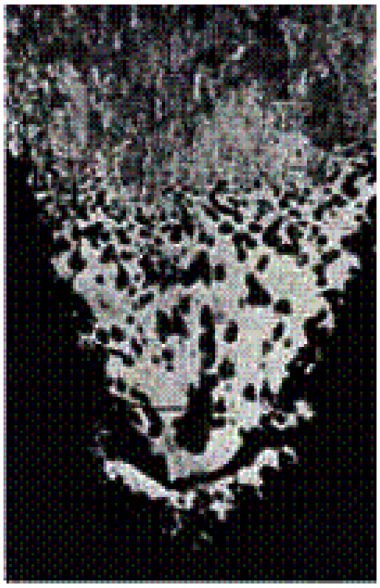
High frequency (68 Khz) static eliminators offer superior ion balance than ordinary commercial frequency (50 Hz/60 Hz) AC static eliminators. Using a charged plate monitor to test ion balance, comparisons show that high frequency (68 Khz) static eliminators have marginal voltage fluctuation. They are suitable for protecting products with the most demanding requirements for an ion balance. The figure above shows the waveform curve after connection of charged plate monitor and an oscilloscope. Fig.2 shows the results of an ordinary commercial frequency (50 Hz/60 Hz) AC static eliminator. Fig.3 shows the superior balance of a high frequency (68 Khz) static eliminator.

Additionally, the high voltage output of an ordinary commercial frequency (50 Hz/60 Hz) AC static eliminator is usually more than 4000V, while the high voltage output of a high frequency (68 Khz) static eliminator is just a little more than 2000V, so it is safer, energy efficient, economical and free from EMI.

3. What kind of emitter pins perform better?

Emitter pins are made of chemical resistant metal such as stainless steel (SUS), Ge, Ni, Ti, and W and so on. Stainless steel is widely used because of cost. W is also widely used because it is wearable and pin chemical resistant.

Nstat Esd Control makes use of new alloy emitter pins on the basis of long research and development. The new alloy emitter pin is more wearable and chemical resistant than tungsten one, which stabilizes its ionization performance and ion balance.



Tungsten emitter pin

New alloy emitter

The pictures (above) shows the tip of an emitter pin made of tungsten and our tungsten alloy after use.