Considerations when buying a corona treater

There are many similarities in treater designs and although visually two competing brands make look alike, technical variations exist that can influence the successful operation, and for that matter, treat level achieved.

A basic treater installation consists of a **generator, a high voltage transformer, a treater station-** consisting of an electrode(s) and some sort of base roll - and an **exhaust fan** to ventilate ozone, which is a by-product of the treatment process. From a long term ownership perspective, successful operation of a treater is 50% electrically, and 50% mechanically dependant. The balance of this document will explore the components used in a typical treater installation and include points to consider when buying a new treater.

Generator- This is really the heart of the treating operation. Generators are usually referenced by size in kilowatts (Kw) and range from 1Kw to 100Kw. A generator is "sized" based on the application, and is related to line conditions. The formula used to specify a generator size is as follows;

Line speed x Web Width x # of sides to be treated x Power factor

The power factor is the watt density required in order to obtain adequate treatment, and is the result of experience and data gathered from years of testing. Today's generators, by comparison to technology of the late 80s and early 90s, are significantly more efficient. Therefore it's not unusual to see smaller generators (by Kw rating) achieving adequate treatment compared to power supplies built 10 or more years ago.

Generator considerations-

The use of IGBTs has become standard in corona generator design.
A properly engineered generator should incorporate the following standard facilities;

- Digital readout of Kw, Volts, Amps, and KHz.
- Auto frequency match.
- Computer interface via 0-10 v or 4-20 Ma.
- Watt density control.
- Digital line speed monitoring.
- LCD status/ diagnostics.
- Power supply enclosure should cool via natural convection NOT forced air (fans) as this tends to contaminate the internal components and cause pre-mature failure.

High Voltage Transformer – The high voltage transformer works in conjunction with the generator and transforms the power supplied by the generator into high voltage electricity.

High voltage transformer considerations

Today's transformers should **Not** require tap settings for rough matching of impedance. Rather, impedance should be matched by the generator automatically through a closed loop circuit. Changing tap settings is time consuming and subject to operator interpretation, often leading to mistakes and possible component failure.

Treater Station- Two basic variations exist: Bare Roll and Covered Roll.
By description, the dielectric on a Bare Roll treater station encapsulates the electrode and on a Covered Roll station it encapsulates the treater base roll. In both scenarios the treater consists of an electrode and a base roll. The electrode is engineered to be in close proximity to the base roll and allows the substrate to be treated to pass between the base roll and electrode. The generator/H.T. transformer energizes the electrode and a resultant corona discharge occurs between the electrode and the base roll. Theoretically a Covered Roll treater is used to treat non-conductive webs, and a Bare Roll treater is used to treat conductive webs. In some instances a Bare Roll treater is specified when a variety of substrates may be treated on the same production line and "flexibility'' is required.

General station design considerations

- Treater should be designed using Ozone resistant components. The use of aluminum and stainless steel is preferred materials for components in close proximity to the corona environment.

- Grounding of the treater base roll should **Not** be done through the roll bearing, but rather through a dedicated grounding brush.

- The treater electrode should be designed using a continuous hinge and allow "easy access" to service the electrode.
  NOTE: utilizing a design using a removable electrode is not a viable option as it tends to interrupt production, be too operator intensive, potentially expose components to damage/failure, and require additional and regular calibration.

- The treater electrode should be designed and positioned giving consideration to web wrap, and to protect the electrode in the case of web break or web carried contaminant.

- The electrode should be held in position at frequent intervals by stand off insulators and provide facility to easily set a consistent air gap by utilizing built in micrometer air gap adjusters.

- Welded construction is preferred, as bolted construction may tend to vibrate loose.

Bare Roll Station Considerations-

- The electrode should **Not** contain aluminum powder or pellets, rather a continuous conductive strip, thus avoiding potential "hot spot voids" that will lead to electrode failure.

- The ceramic should be rectangular in design (7mm x 11mm) and provide excellent corona dwell (contact) time.
  NOTE: Each electrode assembly should contain no more than 2 electrode tubes per assembly, as overheating may occur, causing premature electrode failure.

- Bare Roll treaters are recommended to have a non-conductive ceramic coating to enhance web "purchase" to the roll thus avoiding exposure to back side treatment and to enhance/improve treatment on the substrate being treated.
  NOTE: the nonconductive ceramic should Not contain titanium

Covered roll considerations-

- The application will have influence on the electrode used.
- Segmented electrodes are often used when lane treating is required to leave untreated zones for heat seal purposes.
- Segments are also used where variations in web widths occur and there is a need to deckle down the overall treat width.
- Segments should be offset (angled) so as to avoid the stripy treatment associated with segments.
- A continuous electrode is often used when treating films for vacuum metalizing so as to avoid zones of irregular treatment.
- Dielectric coverings can vary with applications and can have great influence on the overall cost of a treater.
- Ceramic coverings are preferred and are typically guaranteed for 2 years.
- Silicone coverings are an in-expensive alternative and can be vulcanized to the backing roll or be sold as removable sleeves.
- Application again will influence the dielectric chosen as sleeve becomes impractical for roll diameters beyond 8", roll faces beyond 80", and for high speed lines.

Extraction fan

The nature of this application means the fan components will be subjected to an ozone rich environment. The fan assembly, therefore, must be protected from corrosion. Typical fan construction includes an aluminum housing and impeller. Alternatively, the components can be epoxy coated. In addition to fan design, the ducting used should also be smooth bore (no ribbed elephant ducting) and should also be resistant to the effects of ozone.