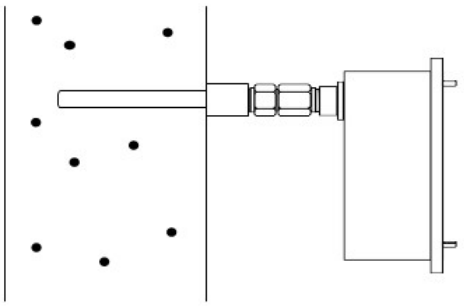
Dust Monitoring with AC Coupled Dynamic Induction™ Technology

The heart and soul of dust sensors is Dynamic Induction™ technology. Dynamic Induction uses a select portion of the AC signal generated by dust as it passes near the sensor's probe. This is not a new concept. It has been around for years by other names, such as AC Tribo or ElectroDynamic™. However we have the advantage of creating a sensor with all of the current advancements in electronic circuit design and chip manufacturing.



Dust flowing in a gas stream collides and produces a static charge on the surface of each particle. Over the years this charge has been monitored in different ways. The original monitoring technique was using the DC portion ("triboelectric") of the signal. Therefore the term triboelectric is commonly used for charge-based dust monitoring applications, such as bag filter performance/leak monitoring, cyclone performance monitoring and many other general dust or particulate monitoring applications. However, monitoring a portion of the AC signal is not that same as directly monitoring a triboelectric or DC signal. The "triboelectric effect" is related to the static charge buildup on particles as they collide in the gas stream. The total charge on the particles can vary with velocity and other process changes.

The Dynamic Induction technology eliminates or filters out the DC portion of the signal and utilizes only a selected frequency range of the AC signal for dust indications. The AC filtering results in numerous benefits over traditional Tribo or DC technologies.

Benefits of Dynamic Induction Technology

The biggest benefit is a more reliable indication of dust or particulate in a process gas stream. But this overall benefit is achieved through numerous technical advantages.

Linearity & Bias

The AC signal does not have the bias to velocity that the DC portion of the signal has. In fact, testing has shown that the AC signal is linear over normal process velocities.

Measurement Zone

The AC technology monitors particles that pass near the sensing rod that is inserted into the process. The DC signal relies on the direct transfer of charge. Therefore, the AC technology monitors a larger area versus the width of the rod for DC technology, thus providing a more representative indication of dust concentrations and process performance. It should be noted that there are signal transmission losses for dust farther away from the sensing rod, but in-house testing indicates that an area 12 – 18 inches on either side of the rod is a reasonable measurement zone.

Build-up on Sensing Rod

It should be noted that the transfer rate of the DC signal can be affected by build-up on the rod. Build-up on the rod does not affect the AC reading. All electro-based monitoring techniques are affected when build-up on the rod reaches the point where it creates a short-circuit to the process wall. This allows the signal from the dust or PM to transfer directly to ground and by-pass the electronics, resulting in no readings or indications.

Coated probes may seem like the answer to rod build-up. However, they can create different problems. If the build-up on the outside of a coated probe reaches the point where it creates a short-circuit to the process wall, it can then create a Faraday's cage on the outside of the probe coating which could shield the inner sensing rod

from receiving part or all of the process dust signal. In very low dust application the coating material has been shown to build-up and release a static charge periodically, which produces false dust readings.

Minimum Velocity

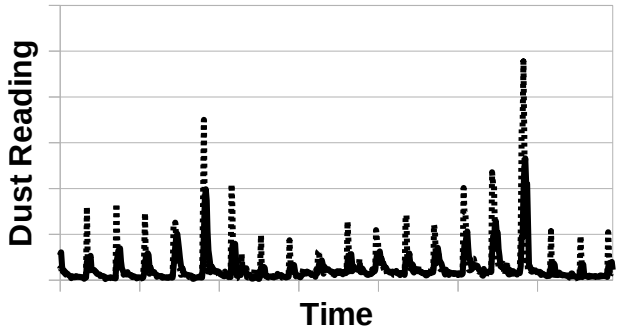
You will find references that state a minimum velocity of 5 m/s is required. However we have successfully applied Dynamic Induction to sources with much less velocity, 2 – 3 m/s. Applying it to sources with very low velocity can be very site specific and does require extensive knowledge of the process and application to insure it will work properly.

Advanced Features

Advanced features allow you to get the most out of your application. The following is a list of available features:

Rolling Averages & Alarming

The Titan & Atlas sensors can be configured to handle all of the real-time rolling average calculations and alarming. This includes alarm delays. This capability eliminates programming effort for the user to get the same results. Through serial or Ethernet communications the user can also gain access to the instantaneous dust reading as well as the rolling averages. This allows you to see both immediate changes as well as see trends in noisy applications.



Alarming Status

The system has the ability to continuously monitor each dust channel and provide immediate indication of high dust conditions. This functionality in the sensor reduces programming requirements for in a PLC/DCS.

Electronic Drift Check

Both the Atlas and Titan sensors have options to include the ability to conduct an internal drift check of the sensing electronics by conducting an electronic drift check (EDC), which is required under many of the EPA MACT Rules. The drift check can be fully automated or manually forced by the user. The results of each EDC are recorded and marked with the current sensor clock time-stamp for monitoring and logging. Both sensor have the option of conducting either a zero/span check only or a full linearity check, verifying each channel or range, versus a single point check.

Probe Isolation Check

Both the Altas and Titan sensors can be equipped to utilize Dust Company's Patented rod isolation check. Other companies refer to this as a Contamination Check. However our conducts a true measurement of the resistance between the sensing rod and the process connection. If build-up, condensation or any other unknown situation, reduces the isolation of the sensing rod to a point where it may affect the quality of the dust signal, the system provides an alarm indicating the situation. So the sensor actually tells you when it need to be cleaned. This feature is patented by DustCo in the USA as well as many other countries.

Internal QA Checks

Both the Titan and Atlas models come with internal temperature and vibration monitoring. These additional sensors have little to do with the dust monitoring, but they provide valuable feed-back relative to the sensor's installation. These internal sensors can help reduce premature sensor failure by helping users understand the ambient conditions of the installation.

Diagnostic Dust Reading

Only the Titan sensor provides the user with a fifth channel of dust information. The "diagnostic" dust reading is updated each second. The diagnostic reading can not be used to indicate dust concentration, but the amount of variation in the dust signal during the previous second. This reading is extremely useful in identifying leaking poppet valves, sticking solenoids and other quick response process changes.