

Dealing with Moisture in Air Inlet Filter Houses

It should be no surprise that dirt and moisture are not particularly positive atmospheric elements to combine and expect maximum air filter performance. And yet every air inlet filter system is exposed to some level of these contaminants and it impacts filter performance throughout their life cycle.

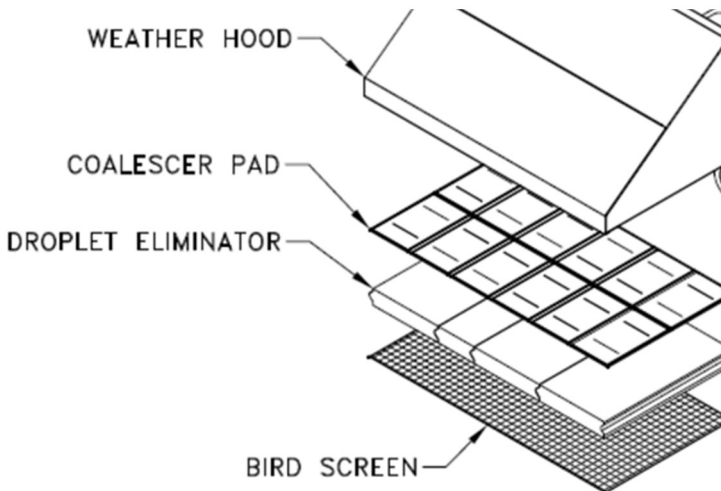
To understand the impact of moisture on filter performance it's helpful to have an understanding of the types of moisture encountered. Effectively addressing moisture is one of the single most important factors that impacts filter performance and life.

In droplet form, moisture impacts the filter much like a particulate. The smaller the droplet size, the more difficult it is for a filter to deal with it. Generally speaking you can break down moisture into five categories:

- Rain** - water in liquid form: Droplets: ≥ 800 microns
- Mist** - water in liquid form: Droplets: 8 to 800 microns
- Fog** - particulate form: 0.7 - 250 microns
- Humidity** - Gaseous form: Negligible
- Frozen Precipitation** - Snow/Ice/Frost

Multi-Stage Filtration

Weather Hoods - Many air inlet systems are configured to provide separate stages to address moisture or particulate. Most designs address droplet elimination within the weather hood section. This is originally addressed by keeping the upwards velocity of air flow into the system between 500 - 600 fpm. Large droplets will normally not be able to remain in the upwards flow and drop out. However, windblown driving rain can easily overcome that and enter the dirty air section of the filter house unabated. To further address water from entering the filter house, the weather hoods can be designed to include either horizontal droplet eliminator panels or inlet vane separators.



Coalescing Stage - Systems can be equipped with a separate stage of coalescing filtration, typically either directly downstream of the vertical entry from the weather hoods, or as a completely separate section between the hoods and the first stage of particle filtration. Coalescing efficiency can be improved through use of wire mesh media installed in permanent metal frames, or through the use of synthetic pads or pleated media installed in semi-permanent frames. If moisture is a significant factor throughout the year it is recommended to design troughs to channel water from the coalescing section outside of the filter house.



Coalescing Pads, Roll Media, Filter Socks - A convenient and less expensive method to address mist and moisture is to install a moisture barrier on, in front of or around the filter elements themselves. Synthetic high loft coalescing media can be purchased in rolls and hung directly in front of conventional V-Cell static filters. It can also be cut and sewn into filter sleeves that fit over cartridge final filters. Although not re-useable, the coalescing media can be quickly replaced to address upset conditions online without damaging the final filters.



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Frozen Precipitation - many inlet systems in the Northern USA have been equipped with Anti-Icing systems. But most are located downstream of the filters and do nothing for frozen precipitation impacting your inlet filters.

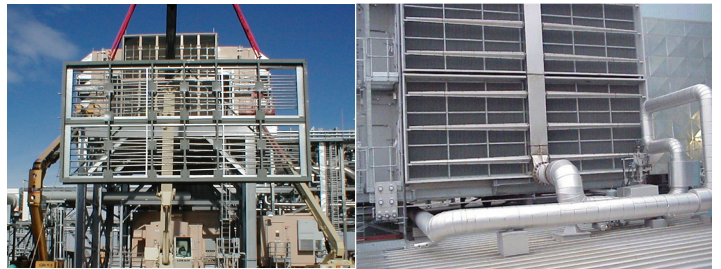
But you don't need to be located in North Dakota or the Upper Midwest for your inlet filters to be impacted by these events. Those of you who have experienced a significant snow storm, or sudden moisture ingestion (such as drift from an adjacent cooler tower) just add cold temperatures and some wind and your filters can become completely blinded in a matter of minutes.



Regardless of your style of filter house, self-cleaning Pulse or barrier style static system, frost, ice and snow can quickly load onto your filters and impact your airflow and choking off needed airflow to your turbine.



Inlet Heating - There are several options for air inlet heating which can more readily be accomplished if you already have downstream heating near the turbine bell mouth. High or low pressure heat and or steam from your turbine can be routed to the front side of your air inlet. Configurations differ based upon the delivery pressure and type, but modules designed to bolt directly onto the main inlet of the filter housing can provide automatic and effective heating to eliminate those events.



For users who have infrequent events and where capital project funding is not justified for a formal air inlet heating solution, there are effective ways to mitigate the affects through manual methods.

For Static Style filter systems an inexpensive "Roll Media" can be placed in front of the first pre-filter stage. It requires minimal support and can be removed and installed quickly.



For Pulse systems, a fully sewn synthetic "over bag" is can be installed and removed on line to address frozen precipitation.

