Pumpbox Exhaust Filter for Carbon Vane pumps

Overview

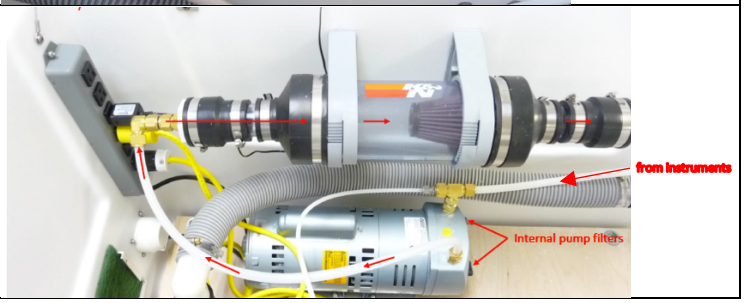
Carbon vane pumps generate small carbon particles as the vanes inside the pump rotate to create the vacuum pulling air through instruments. To ensure that the aerosol measurements do not sample these particles we place a filter at the outlet of the carbon vane pump to capture them. The filter we use was designed to filter particles from a diesel vehicle.

We order the filters from:
K&N Engineering Inc.
https://www.knfilters.com
P.O. Box 1329, Riverside,CA 92502 USA, Ph:951-826-4000

Universal Clamp-On Air Filter - part#: RA-0500 (*discontinued: RU-1200*)
Air Filter Wrap - part#: RU-0500PK (*discontinued: 22-8029PK*)

The wrap protects the filter and extends the life of the filter.

To put the filter in-line with the carbon vane pump exhaust we enclose it in a plexiglas cylinder so that the entire exhaust flow passes through the filter before being emitted to the air (Figure 1).

Fig 1a. Filter in plexiglass (filter is covered by protective wrap).	
Fig 1b. Flow path (red arrows) in typical pumpbox (filter is not covered by protective wrap in this photo).	

Over time, particles will build up on both the wrap and the filter. If the build-up is thick enough the pump exhaust will not be able to push through the filter materials and out to the outside air. When this happens, backpressure in the cylinder will increase until one of the rubber endcaps on the cylinder pops off to relieve pressure. At this point untreated, particle laden pump exhaust will be spewing into the pumpbox which not desirable. To avoid this, we recommend cleaning the filter annually. Ideally, we recommend replacing the filter wrap annually, although the wrap can probably last a couple years.

Cleaning the pumpbox filter and filter wrap

Tools needed: straight head screwdriver, running water and/or air compressor, paper towels

Warning: this can be a messy job - if you have disposable gloves you may want to wear them. Also consider wearing clothes you don't mind getting dirty!

1. Add note to CPD aerosol log that work is beginning. (There is no need to turn off the instruments or computer - we will know from the note that the data are invalid during this time.)
2. Unplug aerosol pump.
3. Remove filter assembly from mounting brackets.
4. Remove end cap from filter assembly
5. Remove filter+filter wrap
6. Clean filter - I would first knock off any loose stuff by rapping it against something, and then use water to clean - you can just run water into the inside of the filter and let it flow out the side that the particles impact on. you can also use ethanol to help. Let dry for a while so it is not completely wet. The KN website recommends against drying with compressed air. The KN website also suggests some cleaning and oiling fluids for the filter - we don't use those.
7. Clean filter wrap if not replacing - use water and soap and let dry
8. Clean inside of plexiglas cylinder with damp paper towel.
9. Re-install filter components as shown in Fig 1.
10. Replace end cap.
11. Reinstall filter assembly into mounting brackets
12. Plug aerosol pump back in.
13. Add note to CPD aerosol log that work was completed.

Typically filters and wraps will last for several years if they are cleaned annually. If there are holes in the wrap or if the elastic is degrading so that it's not holding the wrap securely on the filter then it is definitely time to replace the wrap.

Replacing a used filter with a new filter follows the same procedure but skips step 6. Replacing a wrap follows the same steps but skips step 7.