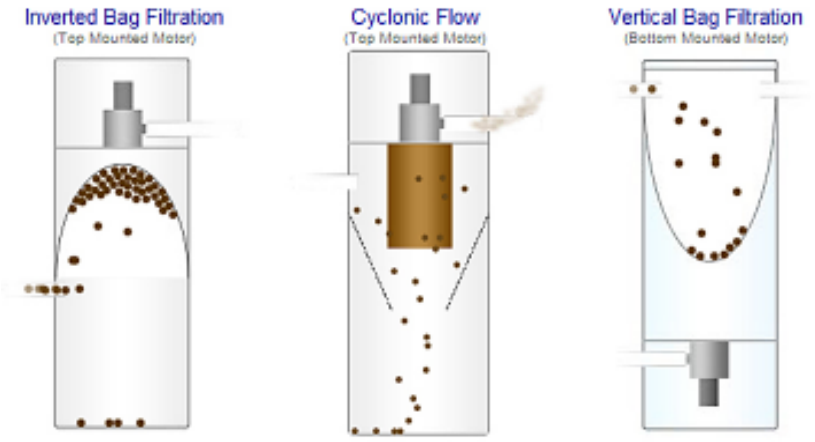
Filtration Analysis and Education

In a world of options, it is hard to choose between the many central vacuum brands in existance. A significant difference among brands is their filtration method. The major types include Cyclonic and Filter Bag filtration. There are many claims to ultra-efficiency and cleanliness, but be careful not to fall victim to clever marketing such as claims ranging from "true cyclonic", "100% efficiency at all times", "guaranteed never to clog", and filters with "no resistance to the air".

Here at MD, we are willing to show you the different types of filtration mechanics, and let you choose which is best. We hope to prove that the MD style of filtration works best (Vertical Bag Filtration). The three animations below show the differences between Inverted Bag Filtration, Cyclonic Flow, and Vertical Bag Filtration. Remember that the term "Cyclonic" simply refers to the flow of air within the unit. It does not refer to the efficiency or cleaning power of the unit.



Ametek, the manufacturer of the motors in most systems on the market states specifically in their warranty "typical signs of abuse [including] dirty motors, failure of which was caused by inadequate filtration will not be considered in-warranty failures". In other words, the designers of central vacuum systems are required to adequately protect the fan blades of the motor from debris or risk being out of warranty.

Bottom Line: How do you provide adequate filtration to protect your motor without reducing vacuum performance through restricting airflow? What are the implications both short term and long term? Your investment decision should be influenced by these all-important facts.

Cyclonic Filtration

Contrary to what a few manufacturers claim, none achieve a "true cyclonic", in which ALL filtration is achieved by centrifugal force and gravity to separate the impurities from the intake air. Vacuflo and Vac-U-Maid come very close to being "true cyclonic", but both have some type of additional filter, as mentioned in their service manuals. Vacuflo says, "A guard screen is located directly above the dirt pan inside the power unit. It should be inspected and cleaned occasionally. This is to prevent such things as carpet fiber, cloth, etc. from getting into the motor's impeller blades. A buildup of dirt or other larger, clogging-type material may result in loss of vacuum." Their service manual goes on to say that, "much excessive, loose lint and nap, normal in all new floor coverings, is removed in these early cleanings, and some will tend to settle on the screen, allowing a buildup that will impair the suction power unless removed." Thinking they are buying a "true cyclonic" system, many homeowners don't properly maintain the added filters. This severely limits the efficiency of the vacuum and the life of the motor.

In their sales literature, Vac-U-Maid states that they do have a metal screen but, "the pores of this metal screen are sufficiently large to insure that no plugging results from normal use. Therefore, you have constant airflow and no loss of cleaning ability." This sounds impressive but their service manual says, "if the screen becomes clogged with lint and rug fibers, it will decrease your vacuum power to a point where you are unable to clean properly due to the decrease in air flow." Systems sold as cyclonic are still using filtration to protect the motor. Let the buyer beware, this confusion has lead to owners of these systems being dissatisfied with their system's power and the motor's life.

While cyclonic action does remove the heavy particles, the light fibers and dust are emitted through the fan blades creating havoc with the motor and decreasing its life. Vacuflo claims that their system will "maintain up to 98% efficiency. The remaining 2% consist of small particles which are exhausted outside". That's why their service manual states that when low suction exists, "the exhaust line may be clogged." Their manual also states that "overfilling of the unit may cause motor damage."

Again, VAC-U-Maid's manual states, "overfilling could cause debris to be drawn into the impeller blades which may severely damage your power unit." In all the literature, the one stated advantage of cyclonic filtration is that there are no replacement filters or bags to buy. However, $15.00 per year is a lot less than the cost of replacing or repairing the entire unit prematurely.

Be they cloth, foam, geotextile, self-cleaning, or never-clog cloth, all cyclonic systems use filters to try to protect the motor. The cyclonic action does eliminate a high degree of the debris; but fine dust and lint need to be kept from the motor for thorough protection.

To maintain maximum performance, some manufacturers like Hoover recommend that "the filter should be cleaned every time the dust container is emptied." Easy-Flo suggests, "To extend the life of your vacuum change your filter." Beam states, "it is recommended that once a year the filter should be cleaned thoroughly." Again, in the trouble-shooting section of Beam's manual you will see as the number one remedy for loss of suction, "clean out dirt receptacle. Inspect and brush off filter."

Finally, most cyclonics must be vented outside the living areas, "because it eliminates the very fine dust and bacteria not trapped by the system's filter." Let's look again at what Ametek says: "If their filter is too porous, dirt and other foreign material can build up on the fan blades over time." "A motor can handle a certain amount of this," says Stormy Greer of Ametek, "but what really causes a problem is when this material breaks away unevenly. When this happens, the vibration in the motor increases. The high-speed operation of the motor makes balance critical and as vibration increases, premature motor failures can result. This is one reason we are so concerned about adequate filtration. The amount and rate of dirt build-up on the fans in an inefficient design or unmaintained system can cause problems sooner than a customer expects. When this happens, we all have a problem."

The build up of foreign material in the motor over a period of time is a fact often ignored by the big-name manufacturers. The main reason for this is that they expect their systems to only last five or six years. At M.D. Manufacturing, we maintain that normal, residential usage should provide at least twice that motor life.

Filtered Systems

It should be noted that filtered systems are, in theory, more restrictive of airflow than cyclonic systems. As the trash receptacle fills up with debris, airflow will diminish - despite one manufacturer's claim of a unit "designed to permit full air flow and full cleaning power at all times." The key to filtered system's superiority is designing a unit that protects the motor from damage while maximizing vacuum power.

Some filtered systems cause loss of performance far quicker than others. Those with longer continuous power often support a paper bag with a cloth bag, which allows the paper bag to be made lighter and more breathable. This is the method used by M.D. Manufacturing. Others, such as Nutone, use a heavy porous paper bag which, "if the bag is filled, you will notice a complete loss of vacuum." For added filtration; secondary filters are often incorporated which act as a safeguard against bag breakage. Inadequate primary filtering may require that you "clean secondary filters each time the bag is replaced."

The filtration system used by M.D. Manufacturing is a paper bag supported by a tapered cloth bag. The tapering adds surface area for greater particle distribution and less vacuum loss. Tests with twenty pounds of flour did not significantly impede the flow of air (625k PDF). In fact, many of our dealers have reported servicing units where the tank was filled to the lid and still had good suction! Undoubtedly, there was airflow loss but because no debris was getting to the motor, no damage was done to the unit!

Further observations of testing with twenty pounds of flour revealed a turbulent airflow pattern created as debris entered the trash receptacle. This means the filter actually "cleaned itself" as the air swirled around. (You might like to try this yourself with our Acrylic Lid, Part #97C. It's absolutely fascinating!)

We at M.D. will be the first to admit that our bag filtering system will effect performance as the paper bag fills up but we qualify that statement with the fact that properly maintained bag filtration systems are the best for the performance and life of your system. Semi-annual replacement of a paper bag makes a lot more sense than the loss of performance and motor replacement costs on cyclonic systems.

For super-filtration, where extremely fine particles are being picked up (such as aluminum oxide in dental labs, plastic dust in circuit board manufacturing, or sanding debris in auto body shops and marble polishing), a combination of the above systems has proven most effective. A cyclonic separator is first installed to remove the large debris and then a separate paper bag filtration unit catches the fine particles. A "micro-filter" can also be installed which filters down to .1 micron at a 99.7% efficiency. This will certainly minimize motor failure. Obviously, however, the finer the filter, the quicker the loss of performance.

MD Central Vacuum Vertical Bag Filtration

1. Air/debris intake. Central vacuum tubing from the wall inlets terminate at this point.

2. 12-gallon tapered dirt receptacle only needs to be emptied around twice a year.

3. M.D. Manufacturing's primary filtering consists of a 3-ply HyperFlow disposable bag and then two secondary filters. HyperFlow has over 1500 square inches of surface area for maximum airflow and highly effective.3 micron filtration. The filter bag is supported by a porous heavy-duty cloth secondary filter (blue). Notice the taper of the bags, which allows maximum surface area for maximized airflow.

4. The air in this open area around the bag and near the motors is tremendously cleaner than cyclonic models, thus protecting the fan blades from build up which causes early failure.

5. The last stage of the secondary filtering is made of breathable foam/plastic mesh.

6. High performance motors in motor compartment are kept clean by the filtration system above it.

7. Exhaust. While cyclonic models normally need to be vented outside, this filtration system keeps the exhaust much cleaner without any need for venting outside.

To summarize, every central vacuum system needs a filtration system to protect the motor. And any filter you install (screen, cloth, foam, paper, etc.) will impede airflow in some manner. What makes one system better than another is its ability to minimize debris around the motor while maximizing airflow for vacuum power. At M.D. Central Vacuum, we believe we have designed a superior system that is the most powerful, efficient and longest-lived. We hope you'll give us a chance to demonstrate that to you.

Questionnaire for central vacuum buyers to use before purchasing:

To maximize your investment in your central vacuum system, and to help you determine which system best suits your home, we have provided a list of important questions to ask your central vacuum local dealer. Go here to locate the M.D. Dealer in your area - Dealer Finder:

1. Which of the above filtering types do they favor and why?
2. What happens if the system is overfilled?
3. What annual and/or maintenance expenses can be incurred on this product? (Foam filter, bags, cost for new motor, motor-life expectancy?)
4. Is exhausting the unit outside necessary? Why?
5. What would twenty pounds of fine dust (like drywall dust) do to the system? How much of it would be caught in the filter system and how much would be blown through the motor impeller blades out the exhaust?
6. If manufacturers of automobiles and central air conditioners feel it necessary to install air filters to filter the air you breathe every day, should it be more important to filter the air that is combined with trash and dirt before it exhausts through your vacuum motor and back into your home/garage? Or, outside?
7. How messy is it to empty the canister and clean the filter? (Including screen, cloth, foam, or paper bag.) Have them actually change a dirty one right before your eyes.

With these questions you can arm yourself with a more thorough knowledge of how each manufacturer rates on filtration and therefore on system longevity and efficiency. Know the product you are buying. Be assured of its performance and intelligently evaluate the other products on the market!

We are confident at M.D. Central Vacuums that you will find our products and service tops in the industry. Please contact us for any further information or advice.

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