Central Vacuum Definitions and Terms

CFM (Air Flow)

Cubic Feet (of air) per Minute.

Wonder why that pebble won't vacuum up but stays rattling in the end of your vacuum wand? Basically, without sufficient air moving around it, it's going nowhere. Even a feather won't budge without any air moving past it. Therefore, CFM (air flow) is crucial for deep carpet cleaning. Some vacuums may be able to lift bowling balls, but the cleanest homes have central vacuums with a lot of CFM. CFM becomes more important as the air opening size gets larger. For example, you can feel the air rushing in to a straw when you inhale, but you wouldn't feel a thing if you inhale through a two-inch pipe. If you want to vacuum through a larger opening, you'd need more CFM.

The CFM (air flow) is measured by how much air is taken in through a round opening ranging from two inches to completely closed. Of course, there is zero CFM at no opening and maximum CFM at a two-inch opening.

Water-lift

Central vacuums don't vacuum the wet stuff, but this benchmark specification is calculated using water. The calculation is obtained by how many inches up a tube the vacuum motor's intake can pull up water. This is in contrast to CFM which measures how much air flows into the same intake. For the water-lift test there is no air moving through the motor. It is a "sealed suction" measurement to find the pure suction force of the motor. The water-lift of a vacuum is what is used when lifting a bowling ball, as seen in some commercials. It is amazing what you can do when all the power of the vacuum is focused on one surface.

The water-lift measurement is not the only key to effective vacuuming. A vacuum may have amazing water-lift, but without it spinning fast and pulling in a lot of air, it will hardly move anything toward the vacuum's filter. That is why CFM is so important as well. But they work together. Water-lift is important to keep the air moving, especially over long distances or when the tool being used to vacuum has a small air opening such as in a turbine brush. One such example is the TurboCat. The air opening is reduced to a 5/8 inch square and is located next to the turbine. The suction makes the turbine spin incredibly fast, which then engages the belt, which then engages the roller brush for grooming the carpet. When the opening is reduced, it is the water-lift that forces the air through that hole at a greater speed.

Water-lift measurements will fluctuate based on the actual amount of voltage the motor is receiving, the altitude, air temperature, and the barometric pressure.

Air Watts

Central Vacuums in North America are measured by CFM and waterlift. Each of these measurements are in themselves inadequate because a vacuum is working somewhere in between these opposite maximums. A vacuum is not operating with sealed suction or at a two inch vacuum opening but somewhere in between. When you read the CFM and waterlift specifications of a vacuum, remember you are reading their maximum values. These values are never at that measurement at the same time in an operating vacuum.

Air watts is a calculated measurement taking into account both CFM and waterlift in real time at the operating end of the vacuum hose, tool, or brush. You have to know the curve created by both CFM and waterlift as the opening changes from zero to two inches. Somewhere along this curve the calculation for air watts will maximize. Different motors have different curves and thus differing peak performance operating orifices (otherwise known as the maximum air watt). For the 116765 motor, the peak performance is at a 3/4 inch diameter opening. At that point it has 68 inches of waterlift and 59 CFM which adds up to about 472 air watts. The formula is CFM X WATERLIFT / 8.5 = AIRWATTS. (Electrical consumption is not part of the equation.)

Going a little deeper: Air watts is a good measurement to use only if the peak air watt given

corresponds to your most important vacuum tool's air intake size. In our experience this is most crucial for one type of tool. When using a non-electric, air-driven power brush (such as the TurboCat) the air watt peak should be for an opening at or below 3/4 inch. This will guarantee that the turbine in the brush will be spun with enough force to get good carpet grooming. This is most common with motors with three fan stages or with some of today's powerful two stage motors (such as ones in the SilentMaster S44 and Flo-Master M85).

Air Pressure

The air around us constantly exerts a pressure of about 400 inches of water. That means that every exposed surface has the equivalent of 400 inches of water pushing on the surface. A vacuum cleaner doesn't actually create a vacuum, but it does lower air pressure inside the vacuum unit. Since the outside air is at normal pressure it rushes inward in a controlled airflow which creates the cleaning effect.

AMPS

Amperage current draw of electricity required to operate the vacuum motor. A motor that uses more electrical current does not always mean the current is being used more efficiently.

Armature

The center part of the motor that rotates, making the transfer of electricity across the motor, enabling the motor shaft to spin. A quality armature is mounted on ball bearings, and protected from incoming vacuum air that has been heated and dirtied.

Bypass Cooling

A separate stream of air that cools the motor, different from the air that draws in dirt from the home. In a bypass motor, air being vacuumed does not actually flow through the electrical components of the motor. Normally these motors have a separate fan to provide cooling air to the motor.

Watts to Amps (Conversion)

The conversion of watts to amps is governed by the equation Amps = Watts / Volts. So if a motor draws 2000 Watts at 220 Volts it will pull 9.09 Amp. If you know the amps and volts you can multiply them to get the watts.

Cyclonic Action

Cyclonic action describes the natural action found in a tornado. In a vacuum with cyclonic filtration, the air carrying the dust and debris moves through a tornado action. The air swirls downward in a cone-shaped pattern. At the bottom of the cone, it starts swirling upward again, inside the downward cone. Thus this is sometimes called a "reverse" tornado action or "dual cyclonic action." The vast majority of the debris separates from the air stream as air reaches the bottom of the swirl, and is deposited in the dirt container. A fraction of the debris remains in the air, to be removed by the secondary filter, if there exists any secondary filters, otherwise it exits through the exhaust.

Fan and Fan Stages

The fan is a combination of blades that spin to create airflow that produces the vacuum. Fans are flat impellers, and there are often two or three layers of fans on each motor, called fan stages. A motor with two fans is called "two-stage," if it has three fans it's "three-stage." Each fan layer increases the waterlift or sealed suction measurement and decreases CFM. Air driven power brushes work better with a motor with more fan stages.

HEPA

HEPA stands for High Efficiency Particle Arrestor, used to reduce the number of contaminants in indoor air. A HEPA filter will arrest or stop 99.97% of all particles .3 microns or larger. HEPA filters - used in "clean rooms" - are essential in medicine and in the manufacture of computer components. However, they have limitations in vacuums, and only a handful are truly "HEPA Certified," while many filter material which is "HEPA" level. These vacuum filter applications tend to leak because HEPA was hardly intended to be used as small, portable filters. Also, they are expensive and must

be discarded, as they cannot be cleaned. These filters clog quickly and strangle airflow, so be aware of what a vacuum claims to be able to filter and what the long-term performance will be.

Horsepower

There are three different "Horsepower ratings:"

The first, "peak horsepower," is measured when you take everything off the motor that restricts it and then you put as much electricity into the motor until it virtually explodes. Many portable vacuums use this measurement to make the performance sound really impressive.

The second rating, "input horse power," is the maximum watts used by the motor divided by 746. A top-of-the-line portable might pull 700-800 watts or about 1 horsepower. Our SilentMaster S2 pulls a max of 1836 watts or 2.5 horsepower.

Lastly, the truest measurement, in our opinion, is the "operating horsepower." That is, the watts used at the operating orifice divided by 746. Our S2 would operate at 1770 watts with an electric power brush, thus it would achieve 2.37 horsepower.

Unfortunately many manufacturers provide misleading information regarding horsepower. Therefore we do not use it as a standard rating in our industry. Another combination measurement of Waterlift and Air Flow is called Air Watts, which has become more standard for the central vacuum industry.

This is recognized by the American Society of Testing and Materials (ASTM) as the best way to measure the actual cleaning power of a vacuum system. Most manufacturers provide statistics for the maximum air watts that may not be the actual amount produced under the conditions most often used. Make sure you know the opening size of the attachment most often used and then find the vacuum's air watts at that exact opening size.

Motor Speed

Measured in revolutions per minute (RPM).

Overall Efficiency

Otherwise known as the "Measure of Fan Efficiency" is Air Watts / Input Watts.

Paper Filter Bag

A collection device for dust and debris used by few vacuum cleaner manufacturers. Paper bags, in our opinion, are the best way to filter debris, have a safe and healthy disposal, and a very clean exhaust.

PVC (Poly Vinyl Chloride)

A common plastic polymer that provides excellent appearance and longevity with good flame retardence at an attainable price. All of MD Manufacturing central vacuum fittings are made from virgin PVC.

Sealed Bearings

Often used in high quality motors to prevent dust and debris from entering the motor bearing area. All MD motors have sealed bearings.

Soft Start

An electronic means of slowly starting vacuum motors to reduce initial in-rush voltage spikes. It starts the motor at a slower voltage, slowly ramping up to operation voltage. No tests by the motor manufacturer Ametek or any other agency have produced quantifiable measurement of this extending a motor's life. It does, however, allow the manufacturer to utilize a smaller capacity of relay, which is less expensive.

Thru-Flow Motor

In some less-expensive motors, the air drawn from the home flows right through the motor to cool it. Unfortunately this air is laden with the dust from the home which dirties and contaminates the motor. This air is also warmed by friction as it moves through hoses and piping, and is substantially

warmer so it is less able to cool the motor. Thru-flow motors will overheat if they are run for long periods of time without adequate air flowing through the system.

Watts

Electrical power consumption of the motor.
