

Article

Hearing Aid Vacuum Pumps – The Straight Story

Hg Readings – What do they mean?

I got a call one time from a local hearing health provider who wanted to know about our vacuum pump systems for cleaning hearing aids. She admitted she wasn't very familiar with this type of equipment, and had just received a model from one of our competitors. She was disappointed in the performance of this suction system and was wondering if I would be willing to come to her office and demonstrate our models. Well I was honored, and I'll tell you what happened in a minute.

Not Uncommon Questions – But Necessary Equipment

First of all, this situation is fairly familiar. You know you need to get a vacuum pump / suction system for your office. It has been proven over and over how using suction is an effective means of removing cerumen and debris from the sound outlet port of the hearing aid, often restoring sound and performance to near original conditions. But the big question is how do you know how much vacuum you need? What features are important? So you look at specs and call suppliers who are going to try to sell you their product anyway – and it gets confusing.

So What's "Hg Anyway?

Well here it is, that vacuum specification that gets thrown around our industry so much it has become the standard by which we judge every suction product - inches Hg. What does this mean? Well, Hg is the Periodic Table of Elements symbol for Mercury (remember chemistry class?), and combined with inches is a measurement of the level of atmospheric pressure given in a unit area. It was derived from an experiment done by Torricelli, a student of Galileo, and has to do with using mercury and gravity to produce a measurement for vacuum. The original measurement was Torr, but has been converted to several measurement systems, including inches. This is really the same measurement used by your local meteorologist when giving the barometric pressure during a weather forecast. When they say, "The barometric pressure is 29" and falling", they are really saying 29" Hg, or Mercury.

Now we are talking about vacuum here, which is the opposite of air pressure, so you need to think in negative numbers. When you see a vacuum spec that is measuring 20" Hg Vacuum, that actually means -20 inches of mercury, or a barometer reading of -20". We get away with not using negative numbers by specifying it is a vacuum measurement.

Why is this important to me?

Well, it might not be if you live near sea level. Remember barometric pressure decreases as you increase in elevation from sea level, and because vacuum is the opposite of pressure and is really a negative number, readings will increase approximately 1" Hg vacuum for every 1000 feet in elevation. So if you live in Denver you can expect to achieve 5" Hg less from your vacuum pump than someone in San Diego.

Now, The Big Misconception

Don't get me wrong, inches Hg is an important reading because it indicates what the vacuum pump is capable of in terms of the level of vacuum it can produce. Let's say you want to remove as much air as you can from a jar. You find a way to connect your vacuum pump to this jar and turn the pump on. The vacuum pump is going to remove air from the jar until the Hg reading inside the jar reaches the vacuum rating of the pump. If you have a pump that is rated at 20" Hg, then it will pump until the reading inside the jar is 20" Hg, and no matter how long you run that pump you will not be able to go beyond that. If your pump is rated at 25" Hg then you will achieve 25" Hg and no more. This is the maximum rated vacuum capacity of the pump you are using, but it is not the only important specification when choosing a vacuum pump for cleaning hearing aids.

Our industry has been confused. Advertisements have been telling us inches Hg is the only measurement that matters. In other words the higher the vacuum capacity rating, the better your results will be - and that is simply not true. Let's revisit our fictional experiment with the jar and look at another specification called Open Flow.

What is Open Flow?

Without getting technical, Open Flow refers to the amount of air the vacuum pump is capable of moving when not under a load. It is usually given in area per minute, such as liters per minute (lpm) or cubic feet per minute (cfm). When we think of cleaning hearing aids, this is a very important spec because vacuum itself doesn't remove debris – air flow does. Think about our virtual experiment when we removed air from the jar. Lets say we look at another variable and how long it takes for the vacuum pump to reach a certain Hg reading. Now the longer it takes for this to happen, the less flow the pump has, and therefore the less air (and debris) it will move – and this is exactly why I got that phone call from our local hearing health provider...

The Vacuum Rating Fooled Her

I arrived at her office with a couple of our pumps for comparison and a gauge for measuring. This was the first time I had done any spying on another product, and I was very anxious to see how our pumps stacked up. I began by turning her pump ON and measuring the maximum vacuum. This can be done very easily, especially if the pump has a gauge like this one did. Just plug the open end of the suction device with a finger until it reaches max vacuum. This particular pump measured 22” Hg vacuum, which should be plenty if that's all we look at. Now, one of the pumps we carry has a max rating of 25” Hg, and the other 15” Hg. But one thing I noticed about her pump was it seemed to take forever for it to reach max vacuum. I didn't have anything to measure the open flow, but it couldn't have been much. Even our smaller unit outperformed her model when it came to picking up debris. She ended up buying our larger model and returning the other one.

So, What Should I Look For?

Max vacuum rating is important because it reflects the level of vacuum the pump is capable of achieving, but you need to also look at the Open Flow rating of the vacuum to see what kind of air it can move. 15” Hg is plenty if you have a good flow, like around 1 lpm. 1 liter might not seem like much, but try sucking 1 liter of air through a small needle tip – you'll change your mind. Now you can get more power and flow than this, which will mean the ability to draw out more debris, but you'll likely pay quite a bit more for it. Typically, the higher the “Hg reading the more expensive the product because the pump motor needs to be bigger and more powerful to handle the vacuum capacity. 25” Hg is a very powerful pump and a flow of at least 1 cfm should be expected for this kind of capacity.

What's Next?

Next time, we'll look at vacuum desiccators and how they work for drying hearing aids.

About the Author

Chris Perkins is the owner of Lightning Enterprises, and facilitates the Lightning Enterprises newsletter. He has worked in the hearing aid industry since 1991 in hearing aid manufacturing and product development, as well as equipment and process consulting.