TROUBLESHOOTING FREQUENTLY ASKED QUESTIONS [HD SYSTEMS]:

HD Systems Troubleshooting

The following troubleshooting steps are exclusively for BaseVac HD Systems and vacuum pumps. This section should be referenced for issues related to vacuum system installations, operations, and maintenance. Do not use this section for compressor-related queries. Only use the Text under "Compressors Troubleshooting" Section for those issues "

BELOW QUESTIONS ARE FOR A NEW INSTLLATIONS OF BASEVAC VACUUM SYSTEMS FOR BRAND NEW INSTALLATION

I HAVE HOOKED EVERYTHING UP AND IT WON'T START.

- Most of the BaseVac Systems are 220 volt 1 phase. Most should be wired to an external breaker or fuse panel. Check the breaker or fuse panel to insure they are active.
- Second check the breaker in the BaseVac control panel and reset if necessary.
- The BaseVac panel has a fuse check and replace with the spare taped inside if necessary

- Check to insure the high level float switch in the air water separator is wired correctly to the BaseVac control panel. View the switch and insure it is free to move up and down.
- Check if remote switch is installed correctly, if not a jumper wire should be installed between terminals 10 and 11 to allow manual start.

WHEN I TURN IT ON IT MAKES A SLOW RUMBLE AND CLICKING NOISE.

- The BaseVac System requires between 215 and 240 volt power to start up and run at full speed. Check incoming voltage at the BaseVac panel and add a buck/boost transformer if necessary
- The noise is a low RPM noise normal associated with low voltage
- Check the exhaust air blow off valve located at the back of the system at the aluminum fitting. BaseVac systems are shipped with a grey schedule 80 plastic pipe adapter. The adapter must be used. It allows internal space for the blow off valve to fully open and allow air out of the pump. If this is not correct the pump cannot start up to speed due to excessive back pressure.

IT WORKS BUT NOT VERY WELL I CAN ONLY USE 1 HVE

- The BaseVac System is very strong 25" Hg compared to 12 or 15" Hg. When first installed it has the power to clean years of debris from the lines. This debris can clog piping bends and amalgam separator. We have had the experience of buckets of debris being pulled through the lines. Clean and flush the lines completely and restart the system.
- Check all fittings and connections for leaks. Stronger suction can open cracks that would otherwise not be a problem.
- Check that the regulator valve is adjusted properly, close for more vacuum (clockwise rotation)

IT'S NOT VERY STRONG AND THE PUMP AND ROOM SMELLS VERY HOT.

- This normally is a sign that the exhaust blow off valve is not functioning properly and not letting the air out of the pump
- Check to insure the original BaseVac plastic pipe adaptor was used.

- Check to make sure the exhaust valve is working properly.
- If the BaseVac system operates on incoming voltage less than 215 volts the motor will fail over time. We have examples of 1 to 2 running years before motor fails. Check voltage and amperage to determine if the motor is failing.

THE VACUUM SEEMS TO COME AND GO LIKE WAVES.

- This normally indicates a piping system blockage. Debris move around blocking flow intermittently.
- The wave scenario may also be associated with the draining of the air water separator. When full the switch shuts the system off for 3½ minutes while the tank drains. Depending on the piping system there may be minimal suction during this time.
- This scenario may also occur in high vertical lift piping systems (over the wall) to correct wave action increase the vacuum to a higher level on the built in valve.
- Also check the air water separator drain check valve to ensure it is not blocked open with debris.

ALL OF A SUDDEN I GET POOR SUCTION, I TURN IT OFF AND ON AND IT WORKS BUT LATER ITS POOR AGAIN.

- This is normally a piping system problem. Solid debris, flakes may be floating in the system and eventually blocks the line. Turning the pump off allows the blockage piece to fall to the bottom of the pipe. Later with the combination of high flow and liquid the blockage can re-occur. Clean the lines thoroughly until problem stops.
- Check the air water separator drain check valve to make sure it is closing properly.

WHEN I OPEN UP ALL THE HVE AND SE THE SUCTION IS NOT ENOUGH.

- This is normal. The BaseVac system is not a high flow system but at the operating vacuum of 10” Hg its flow is equal to all other systems. The advantage of the higher suction BaseVac system is that it can evacuate the

piping system to a deeper vacuum operating vacuum reservoir. When the clinic starts up not all users have open flow at the point the BaseVac system will suck more air out of the system (more suction power) this helps to balance the flow when multiple users come on and off line.
- In a busy multiple user system it is best to start the BaseVac vacuum valve at full vacuum.

I HAVE TOO MUCH SUCTION WHEN IT'S JUST ME WORKING.

- This is because the BaseVac was shipped with the vacuum valve set at full power 25 Hg". In a small clinic it is wise to adjust the valve to a level that works best for every situation.
- In a multiple user or heavy use clinic the system works best set at full suction. When only one user is working you can adjust the vacuum valve setting or open a single HVE in another suite to lower the system vacuum

WHEN I FLUSH THE LINES AT NIGHT IT STOPS WORKING AND AFTER A WHILE STARTS AGAIN.

- This is normal most BaseVac systems have a built in high liquid level switch installed in the air water separator. Flushing the lines may fill the tank and trigger the switch which shuts the vacuum off for 3 minutes when the tank is automatically drained the vacuum will restart.
- This extra 3 minutes may help you line cleaner to work in a full pipe scenario.
- Every time the BaseVac system is shut off it drains the air water separator automatically. If you shut the system off prior to flushing the lines you start out with an empty tank, it will fill and drain when the system is shut off, ready for the next day.

QUESTIONS AND ANSWERS FOR COMMON TROUBLESHOOTING ISSUES: AFTER A FEW MONTHS OPERATION – PART 1

BaseVac is recognized as the provider of the strongest suction in the Dental Industry. With that power and unique vacuum profile, there tend to be questions about our vacuum units and how they function. For this reason, BaseVac has created this series on commonly asked questions.

To date, we have discussed common questions before purchasing a BaseVac and questions when the system is first installed. Today is the start of the two-part series regarding questions commonly asked during the first few months of owning a BaseVac.

Questions

Today, we will be looking at suction drop off and long durations of vacuum shut-down.

I had great suction at the beginning, but it seems to have dropped off

· The BaseVac system vacuum pump has an internal filter cartridge to protect the pump from any debris in the piping system. Over time, this filter may get moist or wet, and it clogs, restricting airflow resulting in a gradual loss of flow and suction.

· Replace the filter; this should help restore the vacuum strength.

The unit won't start the motor; it just hums

· This is the result of a failed motor capacitor. The capacitor may fail if the system is shut on and off more than six times per hour or if the voltage is below 208 volts or above 240 volts.

· The capacitor can be replaced to solve the problem.

· This scenario also occurs if the vacuum pump has been exposed to water either from a failure in the air/water separator or from condensation at the exhaust. The pump may be rested inside and stuck. If this is the case, open the pump and use an Allen key on the shaft end bolt to free the rotor. Clean out the rust and ensure the vanes move freely. Use brake cleaner and 80 grit and paper to clean out rust.

· The cause of water in the pump has to be corrected. Check to ensure high-level float is wired to the panel and ensure the drain gate valve is open.

· If the water is from condensation at the exhaust, the piping changes must ensure no water runs back to the vacuum. You may want to consider upgrading your exhaust to BaseVac's new double drip leg system. This will help minimize condensation from entering the pump from the exhaust.

There is a bad smell when we run the suction

· All dry-vacuum dental suction units have to vent outside the building. The vent piping must be checked for breaks or obstructions. If the pipe is damaged, a repair should solve the issue.

· If the bent is in a plumbing vent stack, ensure it has followed local plumbing codes.

· A dry-vacuum cannot be vented in a floor drain as it creates pressure and a potential for reversal of airflow and smell.

It sometimes just stops, and then after a half-hour, it starts again.

· This is the result of a built-in motor high-temperature switch. If the motor gets too hot, the internal overload switch opens. When the motor cools, the switch closes and the vacuum automatically restarts.

· Depending on the manufacturing batch, the internal thermal overload switch may not have been bypassed at the factory. The switch is not vital to the system and can safely be bypassed. Consult with our BaseVac team for an easy to follow wiring change that bypasses the switch function.

· The BaseVac system is protected by the breaker in the control panel and is compliant with all electrical codes.

QUESTIONS AND ANSWERS FOR COMMON TROUBLESHOOTING ISSUES: AFTER TWO OF THREE YEARS

Questions

Today we will be discussing commonly asked questions during the first two to three years of owning a BaseVac unit.

The suction is intermittent

· This normally indicates a piping system blockage. Debris moves around, blocking flow intermittently.

· The wave scenario may also be associated with the draining of the air/water separator. When full, the switch shuts the system off for 3.5 minutes while the tank drains. Depending on the piping system, there may be minimal suction during this time.

· This scenario may also occur in high vertical lift piping systems (over the wall) to correct wave action, increase the vacuum to a higher level on the built-in valve.

· Also, check the air/water separator drain check valve to ensure it is not blocked open with debris.

· The inline inlet check valve may have stuck partially, restricting the airflow.

The Suction shuts off and won't restart for up to an hour

· This is often the result of a built-in motor high-temperature switch. If the motor gets too hot, the internal overload switch opens. When the motor cools, the switch closes and the vacuum automatically restarts.

· Depending on the manufacturing batch, the internal thermal overload switch may not have been bypassed at the factory. The switch is not vital to the system and can safely be bypassed. Consult a team member at BaseVac for easy to follow wiring change that bypasses the switch function.

· The BaseVac system is protected by the breaker in the control panel and is compliant with all electrical codes.

QUESTIONS AND ANSWERS FOR COMMON TROUBLESHOOTING ISSUES: AFTER 5 YEARS - PART 1

The motor runs but I get no suction

· This is normally a sign that the vacuum pump vanes have worn to the point they have broken. The vanes have an 8,000-hour normal life span.

· New vanes properly installed will correct the problem.

· The inline inlet check valve may have rusted closed, restricting the air flow.

The suction is much noisier than before

· This is normal after four or five years of operation. It is a signal that the vanes have worn and should be replaced. The vanes have a normal 8,000-hour life expectancy. Scheduling a change of vanes will prevent unexpected failure of your vacuum pump.

· The blow off exhaust valve may have stuck partially closed, restricting the air flow. A simple replacement of the inexpensive valve can help the system function more efficiently.

The suction is intermittent

· This is normally indicating a piping system blockage. Debris moves around, blocking flow intermittently.

· The wave scenario may also be associated with the draining of the air/water separator (AWS). When full, the flow switch within the AWS tank will shut the system off for 3.5 minutes while the tank drains. Depending on the

piping system, there may be minimal suction during this time. This process is a protection mechanism to prevent water from entering into the motors. If the tank is regularly filling, there may be a clog preventing proper draining of the ASW or you may need to upgrade the tank with a BaseVac tank extender.

· This scenario may also occur in high vertical lift piping systems. To correct the wave action, increase the vacuum to a higher level on the built-in valve.

· Additionally, check the AWS drain to check the valve to ensure it is not blocked open with debris

· The inline inlet check valve may have stuck partially closed, restricting the airflow.

The system runs, but the suction is weak

· If the lines are clean and a system check for leaks shows no problems, check the internal BaseVac filter. If it is dirty, replace it. Removing the filter temporarily will increase suction without damaging the pumps.

· The vanes may be chipped and should be replaced. BaseVac vanes have an 8,000-hour normal life expectancy.

· The blow-off exhaust valve may have broken and will allow the disk to be wedged against the outlet, reducing airflow and suction. This is typical wear and tear item and an inexpensive part to be replaced roughly every five years.

· The inline inlet check valve may have stuck partially closed and is reducing the airflow. Simply checking and replacing this valve will improve vacuum levels.

The pump seems to be very hot

· After five years of operation, a hot pump may be a simple as a failed room exhaust fan or ventilation filters require a change.

· The exhaust blow-off valve may be rusted closed creating back pressure or alternatively, it has broken and parts are blocking the exhaust, causing heat from the backpressure.

TROUBLESHOOTING FREQUENTLY ASKED QUESTIONS [COMPRESSORS]:

Compressors Troubleshooting

This section is dedicated to troubleshooting BaseVac Compressors. Refer to these guidelines for problems specifically related to compressor functionality, including pressure issues and maintenance. This section is not applicable for HD Systems or vacuum pump inquiries."

BELOW QUESTIONS ARE FOR A BASEVAC COMPRESSORS

ITS TAKING A REALLY LONG TIME TO FILL UP THE COMPRESSOR

the issue is most likely caused by a broken gasket in one off the motor heads, the broken gasket is causing it to leak while building up the pressure and taking a longer time than usual to fill up the whole compressor, this vac is already on top of this issue and will supply you a new gasket to solve the problem as soon as possible and get you up and running. Please find the link to a compressor replacement video here where you can see how to inspect and replace the gasket if you already have a replacement with you.

DENTAL VACUUM VENTILATION SERIES

The future of dental vacuum is the dry-vacuum systems as they are more efficient and cost less to run overtime. One of the biggest hurdles to upgrading to a dry-vacuum system is installing a pump exhaust. Generally speaking, the building code requires ALL Dental Vacuum Systems to exhaust to an outside ventilated space. Unfortunately, somehow in many areas, old wet-vacuum systems were allowed to ventilate into a mechanical room. Though technically not to building

code, these systems continue to vent into a mechanical room space, reintroducing the dirty air from the clinic's vacuum lines back into the clinic.

Today we start a series that will emphasize the importance of properly ventilating your Dental Vacuum to external space and the non-ideal options in ventilation others have pursued. Each segment of this series will be broken up into the following;

1) Reasons for proper ventilation of a Dental Vacuum, wet or dry

   i. Removing heat from the mechanical room

   ii. Contaminated air

   iii. Nitrous gas removal

2) How and where to properly vent your dental vacuum to ensure the best performance

   i. Options in external ventilation

   ii. Proper sloping and condensation prevention

   iii. Weather/wildlife proofing of exhaust piping

3) The disadvantages of alternative options that have been considered for Dental Vacuum system exhausts.

   i. Internal Exhaust systems

   ii. The use of Plumbing ventilations

Over the next several weeks, we will be breaking down the above information, providing detailed reasons for the proper installation of a Dental Clinic's Vacuum System. BaseVac intends to provide this information to the Dental Industry as a guide to ensure Dental Clinics are set up to building code, safe for their staff, safe for their patients, and ensures the most efficient service from their mechanical room equipment.

Should you have questions about your current or future mechanical room installations, please do not hesitate to reach out to BaseVac's Mechanical Room experts at info@basevacdental.com or 1-800-668-8736.

Dental Vacuum Systems are an important piece of equipment in a Dental Practice, often referred to as the “Heart of the Clinic.” Manufacturers of Dental Vacuum Systems design the installation requirements of this essential piece of equipment based on the demands of a Dental Clinic and the building code that governs them.

BaseVac recognizes that a Dental Mechanical room is often an afterthought in Clinic Design, typically shoved in a small inadequate space. The “afterthought” mechanical room is often the cause of clinics being shut down due to equipment failures. Arguably, the most important equipment of the clinic ends up in the mechanical room, and if any equipment in that room fails, the clinic cannot run. BaseVac has started this series to help highlight the importance of proper ventilation for optimal service from a Dental Vacuum system.

This segment of the series will be reviewing the purpose of proper ventilation for Dental Vacuum systems. The top three reasons we will be discussing are the following;

i. Removing heat from the mechanical room

ii. Contaminated air

iii. Nitrous gas removal

Today we will be focusing on the removal of heat from a mechanical room.

Removing Heat from the Mechanical Room

One of the top causes of failure in a mechanical room is failure due to overheating. On average, the typical sized motor of a piece of Dental Equipment is 2HP. That would be 2HP for the vacuum and 2HP for the compressor. The

estimated heat generated by a 2HP motor is, on average to be 5,000 BTU/Hour. That is a lot of heat to pump into an enclosed space.

Most manufacturers require the ambient temperature of a room to range between 10^0C - 40^0C (50^0F -104^0F). If a mechanical room is not properly ventilated, the temperature can easily exceed the recommended range within hours. The heat often proves to be extra damaging to clinics, as many offices are designed to have their networking stations also located in a mechanical room. The networking stations not only add additional heat to the space but can easily fail due to the high temperature.

Venting the heat from a vacuum pump can significantly reduce the temperature in a mechanical room. To significantly support your efforts in keeping a cool mechanical room, additional improvements to increase airflow will also help immensely;

- Adding an industrial-grade ceiling fan (500 CFM or higher)

- Partner the ceiling fan with adequate air return to allow new fresh air to fill the space that the fan exhausted. (Central AC ventilation, air intake vent, and a portable AC unit are great options)

Contaminated Air

An improperly vented Dental Vacuum Pump will reintroduce air from the clinic's vacuum lines back into the clinic. On many occasions, that same reintroduced air from the vacuum lines will be taken into the clinic's compressor then shot into the patient's mouth.

The best way to avoid the cross-contamination of dirty air between patients and clinic staff is to vent the vacuum system outside of the clinic. In States like California, it is required to have a fresh air intake for the compressor as well. This way, there is no chance of cross-contamination within the clinic.

Some Dental Professionals suggest having a fresh air intake from within a clean space in the clinic, rather than outdoors. If a fresh air intake from a compressor were to pull from a Dentist's personal office or a staff room, the air would be filtered and conditioned by the clinic's HVAC system. Drawing air directly from outside is sometimes argued to introduce foreign items into the compressor.

It is best to follow your local regulator's requirements and the suggestions from your Equipment Manufacturer (assuming they do not contradict the local regulations).

Nitrous Gas Removal

In many clinics where nitrous gases are used in Patient Procedures, it is 100% required to vent the exhaust of a vacuum system outside. Gases allowed to exhaust back into the clinic will pose a significant danger to the clinic staff and patients. There can be exposed to dangerous levels of these gases, as well as a high risk of an explosion.

Any clinic using nitrous gases will also have to choose a vacuum system that is not prone to generate a spark, avoiding any system that is oil lubricated. The vacuum system should also generate high enough inches of mercury to remove the gases efficiently (10-15" of Hg). Though this is commonly handled by the contractor building a clinic, it is worth noting that any vacuum lines handling the removal of nitrous gases has to be specially installed and tested to ensure that the system does not have any leaks.

DENTAL VACUUM VENTILATION SERIES: VENTILATION INSTALLATION TIPS

BaseVac specializes in Dental Mechanical Room Equipment, making us leading experts in the most important room of the Dental Practice. BaseVac started to release blogs as our way to share our knowledge with the Dental Industry in hopes of helping Dental Professionals get a better understanding of dental vacuum and compressed air.

The current series is highlighting the importance of proper ventilation of a dental vacuum system. To date, we have covered the three main reasons why ventilation is important; 1) removing heat from a mechanical room, 2) removing contaminated air from the clinic, 3) removing dangerous gases, like nitrous gas from a clinic.

We will continue this series by providing tips on properly installing a ventilation stack for a Dental vacuum pump. This segment of our series will be broken up into three parts;

i. Options in external ventilation

ii. Proper sloping and condensation prevention

iii. Weather/wildlife proofing of exhaust piping

Today we will specifically be looking at options in external ventilation.

Options in External Ventilation

One of the biggest hurdles in Dental Mechanical Room installations is properly venting the vacuum air to an outside location. There are not many options on where or how to vent outside, and it also varies based on the Building Code of a given area. **PLEASE NOTE: THESE ARE SUGGESTIONS BASED ON APPLICATIONS DONE IN THE PAST; LAWS/RULES MAY CHANGE AND VARY BETWEEN AREAS. CHECK LOCAL BUILDING CODE BEFORE IMPLEMENTING ANY SUGGESTIONS MADE IN THIS POST.**

Common Installations

There are two most commonly used options when venting a dental vacuum to and outside space;

1) Through an External Wall

2) Through the Roof

Both are viable options and solely depend on your access to each location, building code, and building management's restrictions.

If you have an oil-lubricated vacuum (not BaseVac), you may not want to consider the roof installation, as the oil from the vacuum has been known to damage the tar roofs of commercial buildings, causing leaking.

Unique Installations

There have been a couple of options that BaseVac customers have used, which past their local code that could work if you are in a pinch and cannot reach an outside space.

Loading Docks

One option is to vent into a loading dock, one with an air circulator. Because there is a fresh air intake already in the loading dock to exhaust the fumes from vehicles, many inspectors have accepted this as an acceptable location to send your exhaust pipe from your vacuum system. This option will have to be code and accepted by the building manager.

Underground Parking Lot

Similar to the loading docks, underground parking lots have plenty of air circulation and ventilation to allow for a vacuum system to have their stack exhaust into that space. Once again, it has been done in the past and was accepted by inspectors for building code. Before taking this route, it would be worth noting if your local building code would approve of this option.

Proper Sloping and Condensation Prevention

Next to overheating, the other big killer of dental dry-vacuums is moisture entering the pump. There are two ways for liquids to enter a dry-vacuum pump; 1) Through the air/water separator (AWS) or 2) through the exhaust pipe.

Condensation Prevention

Moisture entering from the exhaust pipe is preventable with a couple of techniques. BaseVac has developed a dual drip-leg system to prevent condensation from finding its way back to the vacuum pump. These two pipes are connected with an exhaust hose that reduces noise from the vibrations, as well as acts like another moisture barrier.

One of the drip-legs is attached to the exhaust of the vacuum pump, and this will pull away any moisture formed from the hot air that is being blown out of the motor. The second drip-leg is connected to the external exhaust stack that leads outdoors. The second drip-leg will capture any moisture that enters or forms from humidity on the external pipe. Since BaseVac introduced the new dual drip-leg system, failures due to moisture dropped by 40%.

Proper Sloping

The following suggestion will hurt any plumber reading this, as it will go against anything they have ever been taught. When exhausting a Dental dry-vacuum, it is recommended to have the pipe sloped towards the outside (away from the pump). In external wall applications, will direct the condensation towards the outdoors, away from the vacuum pump. Sloping would be a little more difficult for applications utilizing roof access to exhaust, but it isn't impossible. Adding an additional drip-leg, one that can direct and moisture to a drain, would be ideal.

Sloping towards the outside would also be beneficial if the exhaust pipe was not installed to protect it from the elements.

Weather and Wildlife Proofing

Similar to the exhaust piping in your home, you would want to protect the exhaust pipe from your vacuum pump from the elements and wildlife.

There isn't a wrong way of doing this; as long as rain/snow cannot enter the pipe and a cage is added so that animals can't get in, then you have protected your vacuum system. Most plumbers already know how to do protect against wildlife and the elements. There are many different products on the market that are sold with different esthetic to fit any building décor.

Simply put, you should have the openings of the pipe facing towards the ground to avoid the elements from entering into your mechanical room, as well as a cage the stack so no wildlife like squirrels/birds can enter the pipe.

FOLLOWING IS THE INFO YOU WILL USE TO RECOMMEND A SYSTEM FOR SPECIFIC USER'S DEMAND.

DENTAL SUCTION COMPARISON: SIZING

DENTAL SUCTION COMPARISON- PART 1- WHAT IS THE RIGHT DENTAL SYSTEM FOR YOUR PRACTICE?

More increasingly, the most commonly asked question in the Dental Industry regarding suction, "I have been told if I want to use HVE tips, I need a high flow vacuum system, is that true?" The correct answer is; your vacuum system should be sized to match the demand for vacuum in your clinic. Knowing how to properly size your vacuum will ensure you always have adequate suction at each operatory.

The demand for vacuum in Dental Clinics has increased by an average of 50% post-COVID. For this reason, BaseVac felt it was important to release a number of blogs in a series explaining what is necessary to know when choosing the right sized vacuum pump for your practice's needs.

Series Breakdown

There are many important considerations to note when properly sizing a vacuum pump to a Dental Practice. Throughout this series, BaseVac will highlight each point, in hopes of providing Dental Professionals a better understanding of the science behind choosing a vacuum pump.

SIZING CRITERIA

By the end of our series, you will be able to answer and understand the meaning of the following criteria.

- Number of chairs
- Number of Dentists
- Number of Hygienists
- Type of wastewater collection system

o Size of pipe

o Floor or ceiling run the trunk line

o Line cleaning practices

Before we can jump into the sizing criteria, we will have to look at the following technical points.

FROM THE CLINIC

1) The diameter of the smallest opening in an HVE
2) The diameter of the smallest opening in an SE
3) How many users are in the clinic?
4) How many are using suction at any one time

FROM THE VACUUM SYSTEM

5) Type of pump Wet Ring, Regenerative (Turbine), Rotary Vane, Claw, Windmill

6) The volume capability of each pump at the working vacuum level required

7) Ability of the pump's capacity to balance the vacuum energy level over all the user points.

DENTAL SUCTION COMPARISON- PART 2- CLINIC INFORMATION

Jason Buyukozer

Thank you for following our series on helping Dental Professionals choose the right vacuum for their clinic by comparing the different types of Dental suction units. The goal of this series is to help Dental Professional better understand Dental Vacuum systems, giving better insight when choosing one for a clinic.

Today's segment will be reviewing a few unknown terms in Dental Vacuum, as well as provide a better grasp on the relation of HVE/SE to vacuum strength.

Definitions

User – a High Volume Ejector (HVE) or two Saliva Ejectors (SE).

CFM or Cubic Feet per Minute - is the measure of air flowing through a vacuum system. CFM is the speed of the airflow. CFM equates to a car's **top speed**.

Inches of Mercury- Suction is measured in inches of mercury (hg). This is the measurement of the vacuum's ultimate power. This can be compared to a car's **horsepower**.

Diameter of HVE and SE

The standard HVE suction tool is said to be ½' diameter inlet, but has an internal opening of 5/16" diameter. The maximum amount of air that can enter a 5/16" diameter hole at 5" of Hg is 11.07 cfm and at 10" of Hg is 14.64 cfm.

The standard SE suction tool is said to be ¼" in diameter inlet but has an internal opening of 1/8". The maximum amount of air that can enter a 1/8" diameter at 5" of Hg is 2.04 cfm and at 10" of Hg is 2.55 cfm.

NOTE-

The purpose of HVE and SE evacuation tools is to remove liquids and debris from an oral cavity. As the material enters the suction tips, it reduces the diameter, which reduces the airflow entering the system.

Why is this important to know? When considering a new dental suction pump, it is good to understand users (HVE and SE) and how much they draw on your vacuum power.

Users in Your Clinic

Unless you are in the know, very few Dental Professionals often consider how many users of vacuum are in a clinic. To go further, of those users, how many of them have a completely open valve, using the full 14.64 CFM produced by the vacuum. In a normal clinic, not everyone is using suction tools at the exact same moment. The staggered use makes a huge impact on how much flow, or CFM, a pump has to move.

Some manufacturers of High Flow vacuum systems would have you believe that every handheld suction tool in your clinic is in use and fully open 100% of the time. This is called an open flow demand, which is very unlikely in standard dental procedures. High Flow vacuum systems thrive open flow use, as they require a large influx of air to function at peak efficiency. Though it is common for an Open Flow test to be used when testing the strength of vacuum at each operatory, it isn't a true representation over how vacuum truly works in a Dental Practice. Most Dental Practices would require a Low Flow vacuum system, as they are designed with most dental procedures in mind.

DENTAL SUCTION COMPARISON- PART 3- TYPES OF DENTAL VACUUM

Jason Buyukozer

Today marks the continuation of BaseVac's series on understanding the difference between Dental Vacuum systems and which one is best for your clinic. Thus far, we have covered some dental vacuum definitions, in hopes of giving Dental Professionals enough background on vacuum that it will assist in understanding the rest of this series.

Today, we will be highlighting the different vacuum pump types you will experience in a Dental Clinic.

Vacuum Categories

If it is your goal to replace an existing vacuum system, it is always important to know what type of pump is being replaced. In dental, vacuum pumps fall into one of two categories; high flow and low flow.

High Flow

· **Regenerative (Most Popular High Flow) –** Regenerative pumps are one of the least expensive and simplest motors to produce on the market. In a regenerative motor, an impeller is incased with a high tolerance gapping. These systems are dry-vacuums, so they take the air in through the inlet; as the air enters the channel, the rotating impeller imparts velocity to the gas in the direction of rotation. Centrifugal force in the impeller blades accelerates the air outward, increasing the pressure. Every rotation adds kinetic energy, resulting in a further increase of pressure along the side channel. The side channel narrows at the rotor, sweeping the gas off the impeller blades and discharging it through the outlet silencer where it exits the pump.

· **Centrifugal -** Centrifugal pumps are hydraulically operated machines characterized by their ability to transmit energy to fluids (in particular to liquids) through the work of a field of centrifugal forces.

Low Flow

· **Wet-ring (Most Popular Low Flow)** – Wet-ring or liquid-ring pumps are quickly becoming antiquated technology, as it consumes high volumes of water to function. Liquid ring vacuum pumps are similar to a rotary vane pump, with the difference being liquid-ring pumps use 4L of water/min/pump to generate vacuum. The vanes of the pump churn, creating a seal of water, which compresses the air, creating vacuum.

· **Rotary Vane (BaseVac) -** A rotary vane pump is a positive-displacement pump that consists of vanes mounted to a rotor that rotates inside a cavity. BaseVac has six free-floating vanes that use the rotation of an off-set rotor to shoot out the vanes against the rotor housing, compressing the air, which creates the vacuum. It is the nature of our oil-free vanes that allow our systems to achieve higher than average suction (25" of Hg).

· **Hook & Claw -** A claw pump consists of two rotors, designed to rotate in the opposite direction. As the claw rotates, it sucks air into the compression chamber. The gas is pre-compressed within the compressing chamber and is then discharged.

· **Ejector** - A type of vacuum pump, which produces vacuum by means of the Venturi effect. A Venturi vacuum is created by a pump with compressed air running through it, yet the pump has no moving parts. Compressed air runs through the initial chamber, then a smaller portal that opens into another larger chamber, which is like the first one.

When we consider the demand in the clinic based on airflow through open holes and working holes, we get an idea of how much airflow, Cubic Feet per Minute (CFM), the vacuum pump really needs to move. The Canadian and American Dental Associations state that 5"of Hg is the minimum required vacuum energy required to lift a piece of amalgam. The question now is, at what flow is that energy level required? It is at this point when we have to consider choosing a High-flow vacuum or a Low-flow vacuum.

DENTAL SUCTION COMPARISON- PART 4- HIGH FLOW VACUUM VS. LOW FLOW VACUUM

Jason Buyukozer

Understanding the suction units of a Dental Practice is important for any Dental Professional. It is BaseVac's intent to offer this series to highlight the vital information necessary in understanding the options in Dental Pumps.

Our last blog provided explanations on the different options in High-flow and Low-flow vacuum pumps. Today we will be explaining the ideal vacuum level in a Dental Clinic, as well as laying out the volume capabilities of each pump at the working vacuum level they each require.

Ideal Vacuum Level

For any vacuum to be successful, the pump system must be sized large enough to remove more air from the system than what air can be introduced into the system. If air is introduced into the evacuation lines faster than the pump can remove it, vacuum will not be created.

The ideal vacuum energy level in a clinic is 10" of Hg. Comparing horsepower to horsepower; a 2HP High-flow vacuum and a 2HP Low-flow vacuum is almost identical at 10" of Hg. Something to always keep in mind, at the ideal vacuum power of 10" of Hg, both vacuum systems will perform the same.

The pump with the highest-end vacuum point (25" of Hg like a BaseVac) will produce or move more volume at every point than a pump with a lower end-setting (8" of Hg like other systems).

High-flow Pumps

High-flow pumps are traditionally four times greater in volume than a Low-flow pump at open-air conditions. What does this mean? It means, with an open system and the gauge is showing 0" of Hg, the High-flow vacuum pump can move four times the volume of air. The most important point is that at 12" Hg, the High-flow pumps have 0 flow. In summary, "high flow at no energy, no flow at high energy."

What is interesting about High-flow pumps, the volume capabilities drop off very quickly from the ideal vacuum at 10” of hg to nothing at 12” of Hg.

Low-flow Pumps

Most Low-flow vacuum producers have a safety valve that opens at 12” of Hg, this is to protect the motor from overheating. A BaseVac system can produce 25” of Hg, as the carbon vanes in our system function more efficiently with the higher heat/friction. It is important to note, at 12” of Hg, there is still flow if the safety valve is set much higher (like a BaseVac). In summary, “low flow at no energy level, superior flow at high energy level.”

The interesting thing about Low-flow pumps, they continue to suck the air out of the system until they reach the vacuum safety valve set point at 12” or 15” of Hg. In the case of a BaseVac, we continue to remove air from the evacuation lines up to 25” of Hg.

DENTAL SUCTION COMPARISON- PART 5- UNDERSTANDING VELOCITY

Jason Buyukozer

Last week we got a better understanding of the suction requirements of a clinic based on open holes and the basics of pump performance High Flow vs. Low-flow. We have an understanding that at 10” of Hg, both High-flow and Low-flow systems theoretically should perform the same. Why then do some work better than others? First, let’s define “better.”

Velocity

Before we explore the answer, we must consider velocity and its effect on vacuum system performance. Velocity is the speed with which a given volume of air can pass through a hole. For a given volume and a fixed diameter hole, the velocity increases proportionally to the increase in vacuum energy. Simply put, a drink cup has a fixed volume. If you suck hard through the straw (vacuum energy) you can empty the cup faster than if you don’t suck hard. The volume stays the same; it just moves faster.

Vacuum pumps with higher suction energy can increase the speed with which air moves through the system if they are allowed to operate at a higher vacuum level. Higher than 10” of Hg. It is understood,

the velocity of a given movement of air creates an energy that can be seen as an increase in volume. This may not necessarily be true, for the reason that the volume is determined by the pump capacity. Additional factors, such as hole diameter and vacuum level at intermittent moments in time, will create the induced flow syndrome.

Induced flow is the downward vertical movement of air through the rotor system due to the production of lift, often referred to as downwash. When a vacuum line achieves levels of near-perfect vacuum, there is less ambient air in the vacuum lines to affect flow. The induced flow becomes more noticeable from 10” of Hg to 20” of Hg. Velocity is the hissing sound that Dental Professionals love to hear coming from their HVE and SE.

DENTAL SUCTION COMPARISON- PART 6- EXPLAINING HIGH-FLOW SUCTION

Jason Buyukozer

Thank you for following our series through our other segments. To date, we have already helped explain suction requirements in clinics, as well as velocity. The next few segments will be diving in deeper to provide a better understanding of High-flow and Low-flow vacuum.

Today, we will be providing a better understanding of High-flow systems.

High-flow

The supporters of High-flow systems suggest that maintaining vacuum energy between a minimum of 5” and a maximum of 10” of Hg is ideal. We now know how little air can move through an HVE and SE suction tool. We also know that with an increase in suction, the volume in a High-flow system decreases quickly. We also stated that the induced flow advantage of velocity requires volume levels beyond 12” of Hg.

On the start-up of a system, with a lot of open clear holes, a high flow system works well. These systems typically require a large vacuum line, a minimum of 1.5” as a trunk line. As the system begins to load and the need for flow is replaced with the need for vacuum energy, the High-flow system passes the “magical” point of 10” of Hg and the pump’s volumetric capacity drops off quickly.

The effects of velocity are not realized because the drop in volume cannot be compensated by an increase in vacuum. When the system unloads or clears, the vacuum level drops, swinging the vacuum level towards a minimum again.

In summary, the High-flow vacuum systems work best if the number of open suction tools is high and the average desired suction energy swings from 5” to 10” of Hg. Additionally, the main trunk line for the vacuum has to be large enough to prevent the energy required to move liquids from reaching a level beyond 10” of Hg. Due to this restriction, this reduces the viable use of High-flow vacuums, especially for clinics with small vacuum lines and requiring a vertical lift.

DENTAL SUCTION COMPARISON- PART 7- EXPLAINING LOW-FLOW SUCTION

Jason Buyukozer

The supporters of Low-flow vacuum systems report an average vacuum level in the system of 10” of Hg is desirable, with 8” of Hg being a minimum.

In a Low-flow system, the vacuum pump continues to move air from 10” to 15” of Hg, and in the case of a BaseVac system, up to 25” of Hg. The real advantage is in the form of increased velocity. As the system loads with liquids, the vacuum energy required increases beyond 10” of Hg, but the volume does not drop off as dramatically as it would in a High-flow system. The higher the vacuum with the least amount of drop-in volume equates to an increase in velocity.

The next two segments of our series will be looking at how Low-flow systems works, as well as their benefits.

Added Benefit – Stored Volume

A new feature occurs in a Low-flow system that is called a stored volume. As the users open and close the suction tools and the average vacuum goes beyond 10” of Hg. The high suction capacity of Low-flow pumps allows them to suck more air out of the piping than can enter. When this happens, it creates a suction or volume reservoir. When the Dental Professional goes to use their HVE or SE, they get instant vacuum power as they fill the reservoir with air. The amazing thing however, the average vacuum stays above 10” of Hg, not below. The higher the suction power, the more space you can create in the vacuum reservoir, utilizing the air gaps in the air/water separator tank and vacuum lines. The higher the vacuum the higher the induced flow effect from velocity.

Another way of putting it, think of a BaseVac as a reverse compressor; instead of creating and storing compressed air, we create a reservoir of vacuum.

Diversity of the Low-flow

The Low-flow systems traditionally have higher-end vacuum points. This allows for a more diverse installation capability, such as vertical lift appliances and smaller piping systems. The BaseVac system, with its industry-leading 25” of Hg, can easily overcome any sized pipe and excels at small pipe applications because of the added suction capability. The smaller piping allows fr increased velocity and higher average vacuum level due to an increased ability to share a larger vacuum (volume) reservoir.

With BaseVac’s high suction capacity, as the system loads, the vacuum level increases beyond 12” of Hg. The continued volume moves through the high-efficiency vacuum pump increasing the velocity over the entire system.

When choosing a vacuum for a clinic, determining the size of the system you require is the most important step. To determine the size, you will have to understand the term Dental User. Today we will explain the importance of sizing a vacuum based on the user's demand for vacuum.

Number of Users

As we described in the definition segment of this series, a user is a High-volume ejector (HVE) or two Saliva ejectors (SE). When sizing your vacuum pump, something to consider is the number of users. A quick way to calculate this is knowing the following; Number of chairs, number of Doctors, and number of Hygienists. When you determine the number of users, you now have to figure out the size of the vacuum.

Typically, the rule of thumb when sizing a vacuum; for every user, you need a 1/2 horsepower pump.

EXAMPLE –

Number of Chairs = 6

Number of Doctors = 2

Number of Hygienists = 4

The clinic above is a six chair, four user clinics. This means they will need a vacuum system that is a minimum of two horsepower.

If the Hygienists were to follow the recent post-COVID procedures of using HVEs or if the Dentists use more HVEs, then the dynamic changes. As long as it is remembered, for every HVE that is in use, there needs to be 1/2HP in the pump's motor, then the clinic will never need for more vacuum.

Today marks the end of our Suction Comparison series. Throughout every segment, we have provided Dental Professionals a better understanding of vacuum terms, how vacuums function, and which type of vacuum system is best for specific applications. Today, we will attempt to share how the information provided over these past eight weeks will assist Dental Professionals in choosing the right system for the specific needs of a Dental Clinic.

We will end this series by discussing the clinic's future or current infrastructure and choosing the right vacuum system based on the limitations of the clinic.

Clinic's Infrastructure

When deciding which vacuum to install in a clinic, one must consider the clinic's existing or future infrastructure.

WATER CONSUMPTION

If the clinic is in a rural area with a well and septic, there is no question a Dry-vacuum is the right choice. If the clinic pays for their water consumption, and the clinic can vent the pump's exhaust outside, then a dry-vacuum is also the most economical choice.

VACUUM TRUNK LINE

As we discussed in our series, not all Dental Vacuum units are ideal in all applications. If the clinic has existing suction lines or restrictions on plumbing vacuum lines, it can affect the type of vacuum you can install in a clinic.

Above Grade or Below - For Dental Clinics, the ideal plumbing is below grade, as the pumps do not have to pull the material up several feet. Unfortunately, in some instances, a vacuum line has to be run through a ceiling instead of underground.

Above Grade (ceiling)– wet-ring pump, or Low-flow dry-vacuum pump (Capable of high inches of Hg)

Below Grade (floor) – All types work with this application.

Diameter- Some older clinics have smaller vacuum lines, in many cases smaller than 1.5". For most dry-vacuum pumps, they cannot generate the velocity necessary in evacuation lines smaller than 1.5". Only BaseVac has the capabilities to service vacuum lines as small as a half-inch.

Less than 1.5" – Wet-ring pump and BaseVac Dry-vacuum

1.5" or higher – Any time of dry-vacuum pumps

DENTAL SUCTION COMPARISON- PART 8- EXPLAINING LOW-FLOW SUCTION (CONTINUED)

Jason Buyukozer

Thus far, if you have just joined our series, we have provided an understanding of velocity in dental vacuums, types of vacuums, High-flow systems, and standard terms in Dental Vacuum. Today, we will be continuing forward, providing more information about Low-flow systems, as well as highlighting the keys to BaseVac's success.

BaseVac's Key to Success

The key to why BaseVac systems outperform all other systems in the Dental Industry, we understand the importance of critical flow. Science dictates at 15" of Hg, you reach the point where no more flow can pass through a hole. In a vacuum system that can create suction beyond 15" of Hg and maintain it, the flow in CFM through any hole in the system is at its maximum. Our secret, BaseVac can produce up to

25” of Hg. By setting the safety valve at a level beyond 15” of Hg, we begin to utilize the concept of stored vacuum capacity.

In simple terms, as long as the average vacuum is above 15” of Hg, the flow through every hole in the system is at its maximum. It is this fact alone that makes BaseVac perform better than all other systems, as we can exceed the maximum require vacuum, allow a reservoir to build. The reservoir of vacuum is how we provide the highest average suction in the entire industry.

In Summary

There isn’t one perfect pump for every application. The fact that 10” of Hg is the ideal vacuum level for Dental Practices Low-flow systems has more advantages in fluctuating use clinics.

When upgrading from a wet-ring pump (Low-flow), the BaseVac system is the only system on the market that can make a seamless transition, due to our vacuum strength (25” of Hg). When upgrading from High-flow dry-vacuum to a BaseVac, the high suction capabilities of a BaseVac allows for less vacuum fluctuation by creating a vacuum (volume) reservoir in the oversized piping.

BaseVac is a unique product, one that is diverse and a solution to many of the Dental Vacuum needs.

DENTAL SUCTION COMPARISON: SIZING CRITERIA – PART 1

Jason Buyukozer

Today, we are beginning wrapping up our series on comparing the different types of Dental Vacuum systems on the market. The next two segments will be summarizing the information we discussed over the series by using our new knowledge to determine which vacuum we need based on specific information about a clinic.

When choosing a vacuum for a clinic, determining the size of the system you require is the most important step. To determine the size, you will have to understand the term Dental User. Today we will explain the importance of sizing a vacuum based on the user’s demand for vacuum.

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DENTAL SUCTION COMPARISON: SIZING CRITERIA – PART 2

Jason Buyukozer

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BASEVAC DENTAL OFFERS S SERIES, D SERIES AND X SERIES COMPRESSORS FOR A VARIETY OF APPLICATIONS AND CLINIC SIZE, HERE'S AN OVERVIEW OF ALL OF THEM:

1.) S-SERIES

1-3 Users

Model	S0.75	S1.5	S2.0
Users	1.5	3	4
Hp	0.75	1.5	2.0
CFM	3.10 @ 80PSI	4.96 @ 80PSI	6.57 @ 80PSI
Tank	6 Gal	13 Gal	13 Gal
Electrical	115V / 1 / 60Hz / 7.8A	220V / 1 / 60Hz / 8.5A	220V / 1 / 60Hz / 9A
dB	70	72	74
L" x W" x H"	26" x 16" x 28"	25" x 22" x 28"	24" x 23" x 30"
lbs	110	132	154
Part #	2880103	2880106	2880109

Small, powerful & *Perma Dry.*

You've grown to love the power, efficiency & dependability of our dry vacuum systems. Now it's time to see how we have brought that engineering to our oil-free compressors. Our engineers have designed our compressors for years of reliable service with performance you can trust. A heavy duty block, durable cast cylinders, forged steel connecting rods, and precision machined aluminum pistons means you'll get the longevity you deserve from a compressor. And with a

100% oil free design and our patented **Perma Dry** self purging desiccant dryer you'll get the high-quality air you need.

Sound Enclosure (optional):

- Reduces noise by 20 dB for ultra-quiet operation.
- Sturdy steel panels with sound absorbing foam insulation.
- Ventilation ensures adequate cooling air flow.
- Easy service access.
- Only available for S0.75, S1.5 & S2 compressors.
- **Must be ordered at initial order. Cannot be retrofitted.**

WEB URL (LINK) FOR S0.75 compressor SPECS OR SPECIFICATIONS :
https://www.basevacdental.com/s/BV-0063_D15-Compressor.pdf

WEB URL (LINK) FOR S1.5 compressor SPECS OR SPECIFICATIONS :
https://www.basevacdental.com/s/BV-0063_D15-Compressor.pdf

WEB URL (LINK) FOR S2 compressor SPECS OR SPECIFICATIONS :
https://www.basevacdental.com/s/BV-0063_D15-Compressor.pdf

2.) D-SERIES

4-8 Users

Our engineers have designed our compressors for years of reliable service with performance you can trust. A heavy duty block, durable cast cylinders, forged steel connecting rods, and precision machined

aluminum pistons means you'll get the longevity you deserve from a compressor. And with a 100% oil free design and our patented **Perma Dry** self purging desiccant dryer you'll get the high-quality air you need.

Model	D1.5-220	D2.0-220	
Users	5-6	7-8	
Hp	3	4	
CFM	10 @ 80PSI	14 @ 80PSI	
Tank	20 Gal	20 Gal	
Electrical	220V / 1 / 60Hz / 17A	220V / 1 / 60Hz / 18A	
dB	72	74	
L" x W" x H"	35" x 24" x 35"	35" x 24" x 35"	
lbs	231	242	
Part #	2880116	2880111	

WEB URL (LINK) FOR D1.5 SPECS OR SPECIFICATIONS : https://www.basevacdental.com/s/BV-0063_D15-Compressor.pdf

WEB URL (LINK) FOR D2.0 SPECS OR SPECIFICATIONS: https://www.basevacdental.com/s/BV-0073_D20-Compressor.pdf

WEB URL (LINK) FOR D2.5 SPECS OR SPECIFICATIONS: https://www.basevacdental.com/s/BV-0083_D25-Compressor.pdf

X-SERIES

12-25+ Users

You've grown to love the power,efficiency & dependability of our dry vacuum systems. Now it's time to see how we have brought that engineering to our oil free compressors.

Our engineers have designed our compressors for years of reliable service with performance you can trust. A heavy duty block, durable cast cylinders, forged steel connecting rods, and precision machined aluminum pistons means you'll get the longevity you deserve from a compressor. And with a 100% oil free design and our patented **Perma Dry** self purging desiccant dryer you'll get the high-quality air you need.

Model	DX 5.5
Users	25
Hp	11
CFM	34.24 @ 73PSI
Tank	130 Gal
Electrical	220V / 3 / 60Hz / 22A
dB	74
L" x W" x H"	74 x 26 x 50
lbs	573

Part #	2880114

BASEVAC BRAND COMPRESSORS ARE NOT FOR SALE IN CANADA SUBJECT TO HEALTH CANADA CLASSIFICATION. BASEVAC BRAND COMPRESSORS ARE AVAILABLE IN THE USA FOR IMMEDIATE DELIVERY.

WEB URL(LINK) TO X-SERIES BROCHURE : https://www.basevacdental.com/x-compressors