

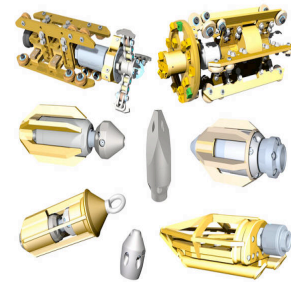


## GET OPTIMUM PERFORMANCE ON THE JOB FROM YOUR COMBINATION MACHINE WHILE SAVING MONEY

In this day and age, combination machine manufacturers have tapped existing and developed new technologies to make their machines more efficient. Systems that were developed 20 years ago, like hydrostatic drive, have been refined and made even more cost-effective by reducing fuel consumption by 40 percent. A multiplexed control system has eliminated hundreds of splices and countless hard-wired switches to minimize potential problems and increase efficiency in the field. Everyone has heard the quote “if it isn’t broke, don’t fix it.” In our industry if you wait until it’s broken, it’ll cost you time and money.

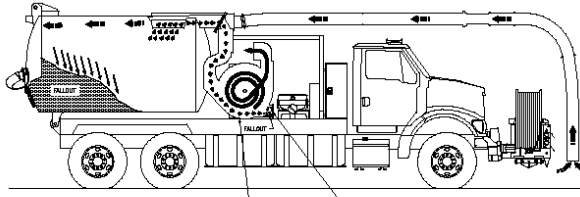
The proper machine for the application will allow your team to operate more efficiently. You’re not going to enter a school bus to compete in the Daytona 500; likewise you don’t want to use a machine that isn’t suited for the application in which you’re working. If a majority of your work consists of 8- to 12-inch pipe, 80 gpm is excessive. In a smaller line, pressure actually does a better job cleaning than flow. As mentioned in NASSCO’s periodical *Tech Tips*, “The general rule of thumb in jetting and cleaning is this: In smaller pipe, pressure is more important than flow; in larger pipe, flow is more important than pressure.” If your application requires both large and small pipe, then a piece of equipment with variable flow is an option you may want to look into. A nozzle suited for the type of cleaning you are performing will increase efficiency too.

There are many nozzles offered by several manufacturers that can be custom tailored not only to your machine but also to the type of material you are cleaning. Nozzles these days are made to handle everything, including normal maintenance-type cleaning, removing tree roots, grease nozzles, even milling concrete from mainline sewers that in the past would have to be excavated and replaced. While these nozzles are an excellent way to increase efficiency, you must remember they are flow, pressure, and sewer hose length specific; keep this in mind if you run multiple machines in your fleet and each have different flows and pressures.



As material is drawn back to the manhole, the condition and cleanliness of your entire vacuum system will determine the rate at which you remove it. The condition of your vacuum generator (either centrifugal compressor or positive displacement blower) should be determined by your local equipment dealer annually. They have the proper tools and training to determine if these major components are working to their full potential. Unless you see signs of material carryover (a machine covered in material from the exhaust outlet of your vacuum unit) you should have no reason to suspect the performance of the

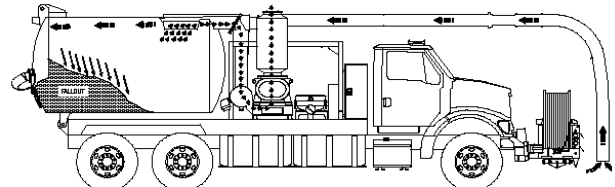
vacuum source. You will find more common than not, the reason for poor vacuum can be a leak or clog in the suction piping on your machine. As you can see below, it does not matter if your vacuum system is a centrifugal compressor or a PD; air leaks and/or airflow restrictions will cause poor vacuum performance.



AIR FLOW LEGEND  
 ● AIR AND MATERIAL  
 ○ MATERIAL ONLY  
 ◐ AIR AND THE MATERIAL  
 ◑ AIR ONLY

How The System Works

- Tornado type atmosphere in tank
- Pulling debris, rocks, bricks, water etc. through the 8" tube opening
- Displacing debris in tank
- Exhausting air through inlet screens, vacuum breaker, centrifugal separator then through each fan chamber



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- Displacing debris in tank
- Exhausting air through inlet screens, vacuum breaker, final strainer then through silencer.

In **Figure 1** you will see several areas to inspect for clogging or wear causing poor vacuum on any machine.

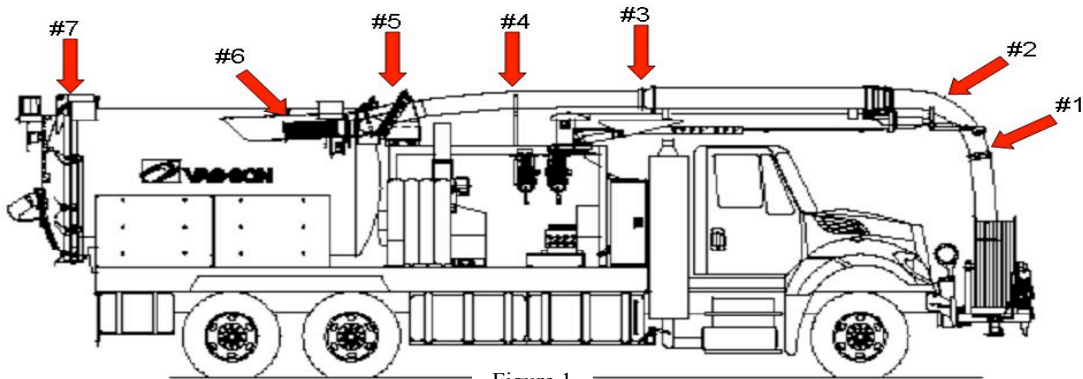


Figure 1

**Area #1 and #2, the boom hose and boom elbow** – This area is susceptible to airflow restriction for two reasons. If your operator exerts excessive down force on the suction hose it can cause the hose to collapse; creasing it and causing a permanent restriction (like trying to breathe through a straw that is bent in half). The only way to correct a collapsed suction hose is to replace it. Second, make sure there is not a hole worn into the elbow or there is no material lodged. Again, material will restrict the amount of air that can move through the tubing causing a decrease in performance.

**Area #3, boom reducer** – Material and air transition from a fixed metal tube into a flexible rubber hose allowing the boom to travel to either side of the machine. This transition is an area that can wear depending on the type of material that is being conveyed.

**Area #4, hose between boom and debris tank** – Some manufacturers' booms are capable of rotating 270 degrees. This rotation is a huge benefit due to the amount of area the boom can cover without the addition of extension hoses and attachments. To increase hose life, periodically rotate the hose to distribute the wear area over the entire inner radius. Also, check for any holes or restrictions that can cause poor vacuum performance.

**Area #5, body to boom transition** – Any debris body that dumps will have seals that keep the material from leaking out of the inlet piping and keep air from leaking into the suction piping. Whenever you dump, be sure to inspect that the seals are in place and have no cuts or tears. If material leaks out of the inlet piping it could leak onto the ground causing a potential environmental issue. If air leaks in, your vacuum performance will suffer.

**Area #6, debris body screens and filters** – All machines filter the air as it leaves the debris body. The purpose of the filters is to minimize the amount of material that is carried over to your vacuum system. These filters are similar to an air filter on your automobile (they keep foreign material from causing wear). While vacuuming on a combination machine you should use water whenever possible. If you are vacuuming a material that is dry, you have a higher chance for carryover because the material is not heavy enough to drop out of the air stream. Also, much like the automobile reference made earlier, if your air cleaner gets clogged you lose mileage because the proper amount of air cannot pass through the filter element. In a combination machine if the filters are clogged they cannot pass the proper amount of air causing a loss in vacuum performance.

**Area #7, rear door seal** – Again, any debris body that dumps will have a rear door that is sealed with a rubber gasket. Generally, if the rear door seal leaks it is easily detectable by the material dripping on the ground. That is an issue unto itself as the EPA will not be tolerant of your machine driving down the interstate while leaking material on the ground. One area that many people overlook is the very top of the body sealing area. When the rear door is not properly sealed a vacuum leak can occur, causing poor vacuum system performance.

The capacity of your debris body (much like the capacity of your water system) will determine how much time you have to vacuum. Different applications and material will cause the debris body to fill at different rates. In a sewer application it is common to see the body load as fast as a cubic yard per minute. Everyone knows that holding water in your debris tank is wasted space. The object is to load the body with as much material as possible while putting the water back where you got it. "Decanting" is transferring the water from the debris tank back to the manhole from which you got it. Typically, decanting is time consuming because you have to remove the suction piping from the manhole, remove your jetting hose, drive the unit forward, install the drain hose from your debris tank and lift the body. When you have drained the water back into the manhole you perform all of those steps in reverse and then continue your work. These days there are options that allow you to offload the water back into the manhole at a much higher rate than gravity is capable of producing, sometimes without even moving the truck. A *pump off* is the most common and is available at flow rates in excess of 500

gpm. Another option that can be used by itself or along with a pump off is a *gravity drain*. A gravity drain is piping that is permanently mounted to the truck and travels to the operator's station. The operator can drain the water back into the same hole from which they got it without ever moving the truck or even removing any tubes or jet hose.

The age-old question, "What's better, a centrifugal compressor or PD?" should always be answered with, "What are you going to be doing with the machine the majority of the time?" Centrifugal compressors work on airflow. They move a great deal of material on an air stream, depositing the material in the tank. A common misconception is that they cannot vacuum underwater; this is totally untrue. A centrifugal compressor has a finite lifting capability when air is totally depleted — just like a PD. When a centrifugal compressor or a PD's lifting capacity is reached, fluidizing is necessary to convey material. Fluidizing induces air into the suction pipe at the water level, grabbing the material and conveying it to the holding tank. Fluidizing is not necessary if you plan to vacuum from the top of the material or water.

The ultimate way to get optimum performance on the job from your combination machine and save money at the same time is how you prepare for daily operation. Operation methods differ greatly from municipal entities to private contractors but one simple method called the **P.R.E.P.A.R.E.** method can help increase efficiency and safety.

**Preparation** – Make sure all of the necessary tools to perform the job are available for the operator. Simple things like a manhole hook or a pipe wrench to tighten nozzles are tools that, in a multiple unit fleet, are easily taken from one machine to be used on another and not replaced. Always prepare each day by doing a quick check to make sure the tools you use on a daily basis are on the machine. It is also important to make sure the machine is equipped with all of the necessary Personal Protection Equipment (PPE) for the operator(s). The operator is generally responsible for maintaining items that are personally worn but items such as latex gloves, gas meters, confined-space entry (if applicable), sanitizer, etc., are generally stocked on the machine. A quick check to be sure all of the necessary PPE is on board is essential for safety.

**Research** – The proper research will eliminate wasted time traveling back to the shop to get items that may have been forgotten. Take five minutes each day to go over the day's assignments to ensure your combination machine is equipped properly for the job at hand. For example, if the machine is going to be used for storm drains and it was last used for sanitary sewers chances are the proper nozzle will not be on the machine. A nozzle such as a floor cleaner is much better suited to clean storm drains because all of the rearward facing jets are directed at the bottom instead of the entire circumference of the pipe. While a sanitary nozzle may work in this application, it will take much more time and water than a nozzle that is specifically designed for storm applications. Determine the best places to fill your machine with water. If the machine is performing maintenance cleaning and will be operating in fixed vicinity for an extended period of time, find a water hydrant that is in close proximity of the job. Generally, if a municipality is contacted prior to starting a job they are willing to provide a meter to be

used on hydrants within their jurisdiction. Checking with municipalities for meters can save time and fuel otherwise used searching for hydrants.

**Ease** – Work smarter not harder. These days, equipment manufacturers are offering options that allow the operator to use the machine much more efficiently and safely. Items such as magnets that are capable of lifting over 1,000 pounds for grates, CANbus operating systems that offer total control of the machine, and Lazy Susan pipe racks that allow you to store multiple pipes in a compact area are just a few things that are making machine operation much more efficient while decreasing the operator's exposure to injury.

**Practice** – Race teams have been able to shave the time it takes to change four tires, add 22 gallons of fuel, and make any necessary adjustments to the car from 20 seconds to fewer than 12 by simply practicing the choreography of the pit stop. A combination machine crew is capable of doing the same thing. Observe how your crew currently sets up in different applications. Is there idle time? Perhaps by changing the sequence that your crew assembles pipe, retrieves nozzles, or even how they set up safety devices can add efficiency to the operation. Always remember that safety is first and never allow anyone to remove safety from the equation no matter how much time it will save.

**Awareness** – Preach awareness to your crews. They must always be aware of their surroundings. They need to know when a manhole is open, when a nozzle is live, where a nozzle is in a line, and most importantly who or what is around the job site. Workplace injuries are all too common, especially when working in the sewer cleaning industry. Each time a combination machine is being used there is potential for not only the operator being injured but also for people who are simply passing by. Consider a list of things that the operator needs to be aware of that could end up costing your operation money if not addressed:

- Traffic safety – Where is traffic?
- High-pressure water from the nozzle.
- Is there an electrical line overhead that my boom or debris body can hit?
- Is the manhole protected so no one can fall in?
- Are there any curious onlookers that can be injured?
- What does the machine weigh?
- How much pressure can this line handle?

This list is only a few of the hundreds of things your operator needs to be aware of each time your machine operates. Make sure your staff takes the extra time to account for all liabilities on a job site.

**Repair** – On any combination machine there are several systems that can be used independently or simultaneously to complete any task at hand. To get optimum performance from your machine it must be kept in good working order. All too often an operator will discover something that seems as innocent as a small water leak at the hose reel. The common misconception is that the operator can run the unit until the end of the

job and then address the leak when in reality if a simple adjustment were made when the leak was discovered further damage and expense could have been avoided. You must impress upon your operators that they are dealing with high-pressure water that is capable of boring through material in sewer lines and vacuum that is capable of lifting manhole covers that weigh in excess of 100 pounds. As mentioned in the first paragraph of this publication, “if you wait until it’s broke, it will cost you money.”

**Emergency Contacts** – While it is always important to keep the police and fire departments’ phone numbers on hand, the emergency contacts we are referring to are different. Your local equipment dealers, the local tire representative, and the local parts store are all contacts that should remain in arms reach in the event of a failure. The sewer cleaning hose on the front of the truck will eventually become damaged or even stuck in a sewer line and will ultimately need repair. By making contact with your hose supplier you can make sure that he has the parts in stock necessary to repair your brand of sewer cleaning hose resulting in less downtime.

Buying the correct machine for the work you are performing, making sure you have the correct tools on board, and using these tools correctly will pay dividends for your operation. By training your personnel to **P.R.E.P.A.R.E.** will allow them to operate more efficiently and safely — saving you money.