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“H.C.U.’s” HOT CLEANING UNITS - A TRUCK MOUNT PERFORMANCE MEASUREMENT MECHANISM

INTRODUCTION

Professional cleaners and restorers are inundated with complicated specifications when they are comparing truck mounted carpet cleaning equipment. With all due respect to the “Tim-the-Tool-Man-Taylor” philosophy of more power, one must recognize that this power is only useful if it can be controlled and applied to the technology of carpet cleaning. A good example of how easy this power can be misapplied comes in the “spec-sheet” ratings of truck mounted vacuum blowers used in this industry. Many vacuum blowers used on truck mounts have cfm (air movement) ratings on marketing materials that simply cannot be achieved during carpet cleaning. In other words, they might be able to move that much air, but not under carpet cleaning or deflooding conditions.

In the pressure washing industry, a performance measurement mechanism that has long been applied to rating the cleaning performance of pressure washers is the calculation of Hot Cleaning Units, hereafter referred to as HCU's. Hot Cleaning Units (H.C.U.'s) are a measurement mechanism so that you can compare the relative cleaning power of truck mounts and high performance portables side-by-side. H.C.U.'s are calculated by multiplying three performance characteristics of a truck mount together. Multiply the recommended cleaning solution pressure for carpet cleaning (usually 450 psi on any truck mount), by the water flow of the pump system (in gallons per minute - gpm) at that solution pressure, by the maintained cleaning solution temperature (in degrees).

APPLYING THE FOUR FUNDAMENTALS OF SOIL SUSPENSION

Before we get too far in our discussion of how to calculate and measure H.C.U.'s, let's first analyze why we would even want more hot cleaning units in carpet cleaning. To do this, we can recall the application of the four fundamentals of soil suspension (often referred to as the cleaning pie chart) as taught in most industry carpet cleaning classes and as discussed in the IICRC Carpet Cleaning Standard S001. The four fundamentals of soil suspension are chemical action, agitation, temperature and time. When we safely maximize the application of any one or all these four fundamentals, we increase the capacity for soil suspension. But we also know that time is money. Therefore, our job is always to do the most complete, safe and effective cleaning job in as minimal of time as possible. Therefore, we usually concentrate on safely maximizing the principles of chemical action, temperature and agitation.

Chemical action is a function of our selection of cleaning solutions based upon soiling conditions as well as the fiber content and construction of the carpet. This part of carpet care training is extremely important and can be learned at any approved IICRC training school for carpet cleaning. Once the proper cleaning solution has been selected, we can move onto making our cleaning chemistry and technique more effective through the application of agitation and solution temperature.

Agitation can be accomplished through a number of means; including the use of groomers or brushes for pre-conditioner distribution; the use of rotary action in bonnet cleaning with a shampoo brush, or with a rotary jet extractor; or the use of a cylindrical brush as with some absorbent compound agitators, power wands, or dry foam shampoo machines. It is generally recognized that the safest and most desirable form of agitation, particularly as it relates to the hot water extraction carpet cleaning method, comes through the application of water pressure and flow. This type of agitation provides the safest, most effective mechanism for dislodging impacted soils without directly rubbing the carpet or untwisting carpet fibers.

The temperature fundamental is maximized through the application of hotter cleaning solution temperatures. The conscientious cleaner must pay more attention to what temperature the cleaning solution strikes the carpet fiber at than what the temperature gauge on the machine says. Hotter cleaning solution temperatures reduce chemical usage, make most carpet cleaning solutions more active, reduce surface tension on synthetic carpet fibers, refresh carpet texture, create faster drying times, and help in dissolving stubborn greases and oils. Perhaps the most important benefit of using hotter cleaning solution temperatures though, were demonstrated by E.P.A. sponsored testing on the effects of carpet cleaning on indoor air quality, in 1991 and again in 1994. This testing demonstrated that hotter cleaning solution temperatures have a significant impact on reducing the levels of microorganisms and bacteria in carpeting.

WHEN WOULD WE NOT WANT TO MAXIMIZE H.C.U.'S?

There are a few circumstances in carpet cleaning where we would not maximize the use of water pressure agitation and cleaning solution temperature. First, it is a generally accepted industry standard that cleaning solution pressure should not exceed 450 psi. Secondly, plush, cut pile residential carpets with little or no heat setting on the twist of the carpet fiber need to be cleaned with lower solution pressures (150 psi) and lower temperatures (140 -160°F). Third, some carpets should generally be cleaned with lower cleaning solution temperature (140 - 160°F). Wool carpet, and acrylic carpet fall into this category. As you can plainly see, there are only a few exceptions to our desire to maximize agitation, water flow, and cleaning solution temperature.

WHAT IS WATER FLOW?

Water flow is rated as the amount of water, measured in gallons per minute, being applied by the solution pressure system at a specified solution pressure. This solution pressure is generated in conjunction with the orifice sizes in the cleaning jet or jets of the wand. While most truck mount solution pumps used in our industry are capable of water flow between 3 and 5 gallons per minute, that is not what they would produce in typical carpet cleaning applications. Seeing that the industry standard for maximum solution pressure is 450 psi, the water flow rate can be determined by the cleaning technician using the wand he/she plans to use on the job site. An easy way to measure this is to set your pressure at 450 psi and spray your wand into a five gallon bucket for a timed interval of one minute. Then measure the amount of water in your bucket with a precise measuring cup that will give you your water flow in gallons per minute. When comparing units side-by-side always make sure you are using the wand and jet size recommended by the equipment manufacturer.

It just makes plain common sense that more water flow is desirable from a cleaning, soil and residue flushing, dislodging, and soil removal standpoint. But what about from a drying time standpoint? Wouldn't more water flow just leave wetter carpets? This is where real world performance steps in. First, more water flow **does** have to be balanced with the proper amount of vacuum recovery capability. This balance is especially crucial on portable extraction equipment. With most truck mounted equipment, this balance between water flow and vacuum recovery is almost always there. The positive displacement blowers used on most truck mounts are fully capable of recovering 94 - 97% of the water put onto the carpet. However, when doing large amounts of water damage restoration, or when operating 200 feet or more away from the machine, larger blower sizes may be more desirable.

The truth about the cleaning power of water flow lies in evaluating real world cleaning. The applied fact is that with hotter water, and more of it, less wand passes are required on heavily soiled carpet. Generally, with truck mounts or high performance portables, one cleaning pass (often referred to as a wet pass) and one dry pass are sufficient. Even with heavier soiling, two wet passes and two dry passes are effective. If you use less water flow, that is usually not the case. Often, you will need 2 to 5 wet and dry passes to clean a soiled carpet. For comparison purposes, let's just say a portable that creates 300 psi, but only flows .5 gpm of water is compared to a truck mount that flows 1.9 gpm of water at 450 psi. If the portable requires four wet and dry passes to clean the carpet, and the truck mount one, then the carpet actually gets wetter from using the portable. More water is put into the carpet. Not only that, the truck mount technician is cleaning four times faster.

Now that we have closely examined the application of the cleaning power of solution pressure, water flow, and cleaning solution temperature, we are ready to learn how to calculate H.C.U.'s as a performance measurement comparison mechanism.

CALCULATING HOT CLEANING UNITS

Hot Cleaning Units (H.C.U.'s) are a measurement mechanism so that you can compare the relative cleaning power of truck mounts and high performance portables side-by-side. H.C.U.'s are calculated by multiplying three performance characteristics of a truck mount together. Multiply the recommended cleaning solution pressure for carpet cleaning (usually 450 psi on any truck mount), by the water flow of the pump system (in gallons per minute - gpm) at that solution pressure, by the maintained cleaning solution temperature (in degrees). Let your machine run under those conditions for 5 minutes, then take your measurements. If

need be, take an average of the cleaning solution temperature if it fluctuates greatly while the wand valve is engaged. That will give you more realistic measurements under typically demanding cleaning conditions. When you multiply those three numbers together, you get your H.C.U. rating. Then you can determine the H.C.U.'s of another truck mount you might be comparing. You already know that hotter cleaning produces faster drying times, reduces chemical usage, achieves sanitizing characteristics, and refreshes carpet texture. Now you can determine for yourself who has the most H.C.U.'s.

For example, lets compare two similarly priced and truck mounts with what appear to be similar specifications. One uses a heat exchanger, the other a fuel oil burner heating system. Measured at the five minute interval, the following measurements were taken:

Heat Exchange Unit

450 psi (Solution Pressure) x
1.5 gpm (water flow) x
190°F (Solution Temperature) =
128,250 HCU Rating

Fuel Oil Burner Unit

450 psi (Solution Pressure) x
1.7 gpm (water flow) x
210°F (Solution Pressure) =
179,550 HCU Rating

Obviously, there are many factors to consider when comparing truck mounted and portable equipment. Since so many performance characteristics on equipment specification sheets appear to be so similar the H.C.U. rating gives the cleaner an easier, more accurate way to compare. H.C.U. ratings are an excellent mechanism for comparing truck mounts equipped with heat exchangers. With some less efficient heat exchangers, the water flow is restricted by the size of the cleaning jet or jets being used, this gives the appearance that the unit can maintain the same temperature as a similar heat exchange truck mount. In reality though, the second unit may have a more efficient heat exchanger, because it maintains the same solution temperature with more water flow. One final reminder, if you really want accurate, usable measurements, ignore what the specification sheets say for the solution pump and heating systems and measure it for yourself, or ask the salesperson demonstrating the machine to measure it with you while you are there.

About the author:

Jon Mueller is the Executive Vice President for Steam Way International, Inc. Jon joined Steam Way after a long career in the pressure washing equipment industry, where he was employed by two of the major pressure washing equipment manufacturers. Jon coordinates Steam Way's national accounts and works with Steam Way Distributors throughout the Eastern United States and Canada. Steam Way International, Inc manufactures a complete line of truck mounted and portable carpet cleaning equipment and a full line of cleaning and restoration chemicals. Steam Way can be reached by calling 1-800-447-8326 or accessing their web site at www.steamway.com