

PVC GLUE VERSUS HOT HIDE GLUE

(See addendum, bottom of article)

By Craig Brougher

Bob Taylor has offered yet another untested and uncorroborated opinion to the MMD regarding the gluing of nylon pneumatic cloth. I am not going after Bob personally. It's just that he has yet to consider any expert, well-documented opinion or refer to it, even when this information has been so well-documented now and in print for 12 years in a well-known internationally marketed book, "The Orchestrion Builder's Manual and Pneumatics Handbook."

I think this is important enough to address again, and this time, remind all who are interested that the question has been answered authoritatively, from the world's foremost experts of hide glue—the Hudson Glue Company, now Milligan and Higgins. They manufacture all the hide glue made in this country!

First of all though, let's read what Bob wrote in the MMD, digest # 030317, "Nylon Coated Pneumatic Cloth & PVC-E Glue." We read in part:

"So, after being on my soapbox, Spencer is correct in stating that PVC-E can be used very effectively. In fact, it is the best adhesive for nylon coated pneumatic cloth. The removal of old PVC-E glue is no big deal -- like Spencer said, it can be scrapped off. It can also be removed completely with acetone."

Now the question is, How do we prove that Bob Taylor is wrong? Can he not also be correct? Well, I'll let you decide. Here are the facts. Corroborate this with pp. 187-188 of the Orchestrion Builder's Manual and the published letter from the Hudson Glue Co (presently Milligan & Higgins who bought Hudson a few years later). Jacob Utzig signed the letter and still works for Milligan & Higgins at this writing.

In order to document what might seem to be bad information to some regarding the gluing of nylon cloth to wood, I sent 1 lb of glue crystals and a number of pneumatics and cloth strips back to the glue manufacturer to be tested. They were able to test the glue adhesion I was getting, normally, with the adhesion they were getting, using both my own glue and theirs. The letter I received back states in part, "We have found the strength of the bond to be excellent."

So have I, frankly. When peeling off this cloth several years later, I discover that often, the polyurethane sealant is left on the wood, ripped right out of the fabric itself. It has even shredded the nylon edges and some strands of nylon are still stuck as well. That's as tight as you can get! That is why Jacob Utzig characterized the bond as "excellent." His company's reputation was on the line, as I also told him that I was going to publish his letter in my upcoming book.

PVC-E glue is used in player piano work legitimately for one main reason— to glue porous materials to non-porous materials. For example, you cannot beat PVC glue for bonding leather pallet seals to flat springs for use as finger-operated pallets under the key beds of player pianos.

On the other hand, you do NOT ever use PVC glue legitimately on the bellows of any device in player work unless those bellows are synthetic or metal and cannot be glued with hot hide glue.

The reason professional rebuilders who know better steer away from PVC-E glue for bellows construction is simple. It is highly elastic. It has a factor called “creep” which allows a bond under enough pressure to gradually slide off. Now this doesn’t happen to pneumatics because there isn’t enough constant pressure to do it. But the covers of pneumatics are totally responsible for the stability and rigidity of the pneumatics over its useful life. Because PVC glue is not rigid but rubbery, being an uncured plastic, there is very little support given for the hinge end. The leaves of the pneumatics therefore have a certain amount of side play as a result of being joined with sticky rubber. Since many pneumatics in “playerdom” do not drive their load on their action centerline but are offset as much as the far edge of the pneumatic itself, a considerable torque is put on the pneumatic which tends to crank the pneumatic open at the hinge as it closes. This is particularly true with reproducing pianos whose vacuum may rise above 50 inches. On those particular pneumatics, the cloth will be intact, and the pneumatic leaf’s hinge end will actually be pulled right out of the cover.

Regarding the removal of plastic glue, it is impossible to remove it completely out of the wood because half of it remains behind in end grain. I have had to soak pneumatics for 3 days in lacquer thinner just to get them clean enough to reuse. I would simply make all new pneumatics and throw the old ones away, had these not been simplex pneumatics whose valves are built into the unit. Believe me, it was an exasperating, grueling, slimy mess which I charge extra for. “No big deal, huh?” Try rebuilding an entire player that has been glommed up with PVC, as Bob advises.

The reason hot hide glue must be used for pneumatics (if you want to do it the right way), is because it is the only glue that not only dries airtight in all instances, but it is the only glue with zero creep factor, which permanently supports the hinge end of every pneumatic to the full strength of the cloth itself. It can be removed and rebuilt, just like the original, and it will not get whopper-jawed after awhile on those pneumatics whose striker fingers are far offset from the center of their pneumatics.

Hot hide glue sets by gelling. PVC glue sets by water evaporation and absorption into the material it is bonding. Regardless of anything else about the two kinds of glue, any glue which relies on removal of water to set cannot, in all instances, be an airtight bond— particularly in end grain. And let’s face it, 2 of the 4 sides of every pneumatic is end grain. So although hot animal glue of correct consistency when applied 100% to end grain remains a perfect bond, PVC-E glue when applied the same way, has no guarantee that it will be tight. It also is not a strong bond, like hot hide glue. PVC glue is relatively weak and was used primarily for the greeting card trade, and later to the hobby industry. It is not designed to give support but merely to make attachments to porous materials. Used correctly, it is indispensable. Used incorrectly, it will sabotage you. I strongly urge you to use PVC-E glue for the things it was designed for, and do not listen to hobbyists and self-appointed experts who would steer you off course. Stick to the basics with the right “stick-um.” And then— stay there.

Addendum: May, 2003.

Since reordering a new batch of nylon cloth recently from Schaff Piano Supply Co, after American Piano Supply Co went out of business, I noticed that the new cloth felt a little differently, so I ran some tests on its gluing properties. The new cloth apparently has a mold release agent on it that resists gluing, with anything! Since I am doggedly determined to use it because it's still the best pneumatic cloth there is, I tried scrubbing it down by hand with different solvents and cleaners. To date, one satisfactory cleaner is straight ammonia. So if you are using this later version of nylon, I strongly suggest cleaning it first. Use straight ammonia and scrub both sides, using a green 3M abrasive pad or something similar that will cut in. I also advise using a mask for your nose if you're sensitive to ammonia fumes. If you buy it in the bulk, I would suggest cutting large sheet-sized pieces and laundering them well, first. Do use any of it that you haven't cleaned off. Then test it, always alongside a piece that hasn't been cleaned, for comparison.

You might find a better cleaner by experimentation. If you do, I hope you will send me the name, and I'll try it and possibly post it. This mold release agent is also irregularly distributed on the cloth, so it's sometimes difficult to tell there's any problem. The bottom line is always, "Test first, and don't take anything for granted."