

Small Shop - Big Results



Field Test of Brushed-On Finishes

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When first asked to consider researching the various brushed-on finishes available for use in conjunction with my series of articles on refinishing, I didn't expect to find much difference between the assorted products available. I naively assumed that all finishing products were pretty much created equal. As I found, however, this is not at all the case. Looking closely at six different types of finishes, and comparing them to my finish of choice (Minwax polyurethane) I discovered that while there was no one clear winner in every category of performance that I looked at, there were areas of strength for most of the products tested.

Again, if you missed last month's installment of the Small Shop series, the six products tested were:

1. BullsEye **Shellac**, by Zinsser®
2. Clear Brushing **Lacquer**, by Watco®
3. Helmsman **Spar Urethane**, by Minwax®
4. Water based **Polycrylic**, also by Minwax®
5. BullsEye **Spar Varnish**, by Zinsser®
6. Satin **Polyurethane**, by Cabot®

(In addition, Minwax polyurethane was also tested in the process).

These products were applied to a variety of piano case surfaces (endblock, music desk, fallboard, kneeboard and lid) using the same procedures we use on a day-by-day basis to refinish the pianos that come into our shop. As I worked with each of the finishes in the application process, I kept notes pertaining to differences between the products. After the application process, a battery of tests pertaining to durability was performed in as scientific of fashion as possible to ascertain how each of the finishes might hold up in a real world environment.

One thing that must be clearly understood is that in relative terms, this was a small test. One can of each product was purchased, with a small amount of finish from each can applied to several concise surfaces by one refinisher (myself). The results of this test should in no way be compared to the type of exhaustive testing that a company might conduct in development or evaluation of a product. That being said, I do come into this process with considerable experience, having personally refinished 100+ pianos over the course of my career. I kept an open mind during the process, and kept detailed notes of all my observations. I am not promoting any one product over another, and indeed have to admit that in some respects, the product I have used for years is not the best choice.

The first evaluations I made concerned aspects of the use of the products in question.

Stirability: Opening the can for the first time after it has sat on the shelf for an extended period, how difficult is the product to stir?

There was a big difference between the finishes. Spar urethane, polycrylic and shellac stirred easily, seemingly ready to go when the can was opened. The lacquer immediately changed in color when stirred, turning whitish, indicating some settling of components had occurred. The polyurethanes (especially the Minwax) both had a layer of amber-colored gel at the bottom of the can that stuck to the stir stick and needed to be blended in - a minute or two of gentle stirring did the trick. The spar varnish was clogged with thick sludge at the bottom of the can which took a great deal of stirring to eliminate.

Odor: Applying the finish, to what extent was the odor of the product an issue?

The smell of the lacquer was very strong, so much so that breathing apparatus would certainly be required if an entire piano were being refinished. Even with the small areas I was working with for these tests, I felt I should be wearing some filtering device. Shellac has a distinct, though not unpleasant, odor. The other finishes were very tame by comparison, although I know from experience that working with polyurethane can leave one feeling a bit light-headed if ventilation is not adequate. Generally, I have a fan blowing a gentle cross breeze past the work station, which seems to help greatly.

Brushability: In applying the finish, how easy was it to work with?

For me, this is the biggest issue in the application process. If a finish is difficult to apply, unsatisfactory results are more likely, as frustration leads to errors. Of the finishes tested, lacquer was far and away the most difficult to work with, in that it dried entirely too quickly. Even on the small test areas, the brush marks would begin to set up before I could cover the entire area. If I brushed cross grain on the edge of the piece to ensure coverage, then tried to finish with a stroke going with the grain, the cross grain brush marks would have already begun to dry. On a piano case with a lot of detail involving careful brushwork, lacquer would be a nightmare to work with.

Shellac dried quickly also, but seemed a bit easier to work out. I personally have much more experience with shellac, in that it is what we refinish soundboards with, so I know that one needs to work quickly and efficiently. Again, I would hesitate to use shellac on highly detailed work involving areas that would require a delicate touch, in that too quick of a drying time would prove to be a problem.

Of the remaining finishes, the best of the lot was the spar urethane. It flowed on like a dream, easily brushing out and correctable without hurry. The polyurethanes were nearly as good, both very easy to use. The polycrylic went on easily, but I really didn't like it - it had a milky, somewhat bubbly consistency that I found disconcerting.

Buffability: Once applied and allowed to dry, how easy was the buffing process?

The clear winner in this category was shellac. It buffed out super easy to a clear, hard finish that I loved. Of the rest of the pack, the spar urethane, polycrylic and polyurethanes all buffed out satisfactorily, but with much more elbow grease. The spar varnish never really hardened to the point where it could be buffed to a smooth finish, even after curing for several days. The lacquer buffed out, but the cross-grain brush marks remained visible, even after considerable work with the steel wool pad.

Appearance: With 3 coats applied and buffed out, how do the finishes look and feel?

The look and feel of the shellac finish would be my pick, followed closely by all the others, except for the spar varnish, which had a dull and lifeless look.

With the application process out of the way, the durability testing commenced. The results, I discovered, revealed important differences in how the various finishes would hold up under real world conditions.

Over-watered flower pot / spilled mixed drink tests:

Flower pot rings on the lid of a piano are a headache for every refinisher. Sometimes the damage extends to deep into the structure of the wood, resulting in separation of the veneer from the crossbanding, and the crossbanding from the core wood. Glasses with iced beverages also occasionally do damage, with the moisture formed from the sweating glass puddling around the base of the glass.



Photo 1: Drinks, anyone?

These two tests (Photo 1) were designed to discover any difference between the finishes in warding off damaged caused by exposure to water and/or alcohol. For the tests, an actual piano lid was partitioned off into eight sections – two for each of the seven finishes, and two with the original finish untouched to serve as a control. For the potted plant test, the plants were watered until an excess welled up around the base of the pot. For the spilled drink test, alcohol (bourbon on the rocks) was added for good measure (in that alcoholic beverages and good times around a piano at a party might very well go hand-in-hand), and the contents of the glass were sloshed a bit onto the surface of the wood before the glass was set in place.

The mixed drinks were allowed to sit for 12 hours before being removed on the theory that the host or hostess of a typical party where drinks were served would probably be cleaning up the resulting mess on the morning after. The glasses placed on the shellac and the polycrylic, plus to a lesser degree the one placed on the control

(untouched) area, stuck to the finish and had to be pried off - most noticeably the one on the shellac finish. The polycrylic and the shellac finish were both damaged by the exposure to the liquid, with a whitish, rough area left even after cleaning and polishing with Old English® furniture polish. Based on this result alone, these two finishes would be ruled out, in my mind, as potentially useful for a piano finish. The other finishes (except, of course, for the spar varnish, which was unsatisfactory to begin with) held up well to the test, with a clean bill of health after a swipe with a paper towel, and a gentle cleaning with the polishing cloth.

For the over-watered flower pot test, the pots were allowed to sit undisturbed for several days on the premise that oftentimes the offending over-saturation is not discovered right away, in that the pot is where it's supposed to be, and also in that the foliage of the plant might very well conceal any excess water. Even with the extended exposure, however, the resulting damage was far less for this test than with the mixed drink test, with a faint ring showing on the control spot, and also on the polycrylic and shellac test sites. The damage seen on pianos in the shop for refinishing indicate that chronic over-watering of plants must have occurred for months or years to produce the pronounced rings one so often encounters and must repair.

Burning cigarette test:

Cigarettes left on endblocks to burn themselves out are another cause for frustration for piano refinishers. When one sees a piano with such damage, it is often in multiple spots, indicating that a die-hard smoker / pianist at one time owned the piano.



Photo 2: The slow burn.

For this test (Photo 2), an actual endblock was again partitioned, with each test site finished with its own type of finishing product. The cigarettes allowed to burn themselves out were unfiltered, to get the full effect of burning right up to the end. Once the damage was done, the block was cleaned off and turned upside down to carefully

sand out on a sheet of 100-grit sandpaper placed face up on a flat surface. The idea was that the areas with the least amount of damage would sand out first.

Honestly, I expected there to be no difference, thinking that no finish would stand up to the intense heat of the smoldering cigarette. Indeed, all eight of the test sites were charred. However, when I carefully sanded through the damaged, the burn on the site finished with spar urethane sanded out first. Granted, the veneer remaining was paper thin, but it was obvious that a greater degree of protection had been afforded by that one particular finish. All the rest of the test sites required sanding clear through the veneer and down into the core wood underneath to remove all traces of the burn.

The fingernails on the fallboard test:

Scratches to the lower half of the fallboard are a common occurrence when the pianist has long fingers, moderately long fingernails, and a forceful touch. Although the damage ordinarily goes no deeper than the finish itself, it detracts from the appearance of the piano in that it is in such a prominent location. When such scratches begin to show up on a newly refinished piano, it is particularly disheartening.

Oftentimes the people who own pianos with such damage claim that they're not to blame – even if they have been the sole owner of the piano and the primary person to play the instrument. I point out my observation that the pianist often is not cognizant of the contact made between his or her fingernails and the lower portion of the fallboard. When a strong chord is struck on the piano where the fingers go deep, the contact is so fleeting as to be nearly impossible to take note of. To illustrate this concept, open the lid of the piano, have the pianist watch a single hammer as a hard blow is struck, and ask if it's possible to “see” the moment of impact between the hammer and the string. Also, while one is playing a musical composition, one's mind on music, not on one's fingertips.

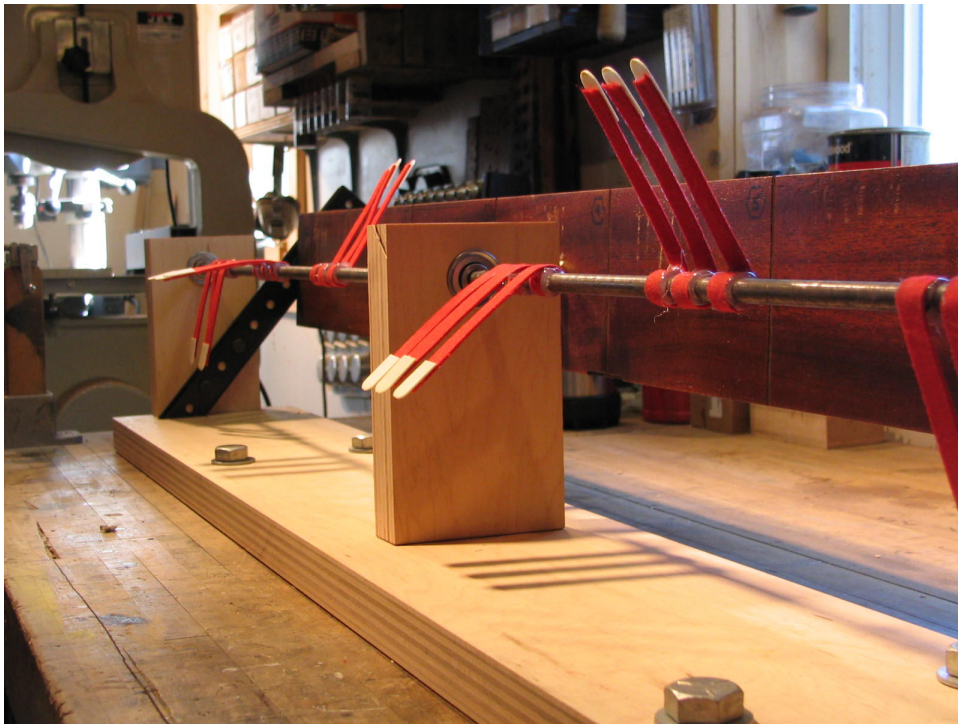


Photo 3: Scratch test

To test the resistance of the various products to scratching, I refinished the front of an actual fallboard, sectioned as in the flowerpot and cigarette tests, and constructed a

device to simulate the damaging action of fingernails continually striking the surface of the various finishes (Photo 3). Using felt 'fingers' stiffened with shellac, and 'fingernails' cut and shaped from ivory keytops, all attached to a freely rotating steel rod and a variable speed motor, I was able to approximate the downward, glancing blow that the pianist's fingers impart to the front, lower portion of the fallboard or upstop rail. I estimated that a rotational rate of 3 revolutions per second would approximate the speed that the fingers travel at on a hard blow to the keys. My hunch going into to this test was that the harder the finish, the more resistance there would be to this type of damage, in that the fingernails would tend to skate across the surface instead of digging in.

Upon commencement of the test the control (original) finish scratched almost immediately, followed swiftly by the spar varnish. I continued the testing for a period of time, stopping at regular intervals to inspect the results. By the end of 10 minutes of testing, the shellac, the polycrylic and the lacquer were also all heavily scored by the 'fingernails'. The scratches in the Minwax polyurethane and the spar urethane were much less noticeable. The finish which fared the best of them all was the Cabot's brand polyurethane, with scratches that were barely discernable at the end of the timed trial.

The forceful impact test:

The impact test was conducted not to see if any of the finishes would prevent damage to the case upon a hard impact (which would rather be like expecting a sheet of aluminum foil over a mattress to deflect a bowling ball dropped on it), but instead to note the results on the finish itself in the case of a dent caused by a blow to an area such as the side of the piano. In this situation one might expect that the harder the finish, the more likely there to be damage to the, if a blow sufficient to compress the veneer and core wood of the case - a more pliable finish might fare better.



Photo 4: A heavy blow!

For this trial I used a test square of kneeboard material for each finish, attached one by one to the side of a complete piano to provide the correct amount of resistance. The blows for each test square were delivered via a pendulum, outfitted with a trailer hitch ball and an attached 20 lb. weight. The weighted ball was swung into the side of

each test square from increasingly high release points (with a starting point of 12 inches away from the side of the piano) to ascertain the amount of abuse each finish could withstand before beginning to break up (Photo 4).

After each impact, the ball was drawn back for an inspection of the surface of the finish. A laser light was swiveled across the surface where the contact took place (Photo 4 inset), and the reflection on an adjacent piece of drywall was noted. If the movement of the beam was smooth as it pivoted across the dent, the elasticity of the finish allowed it to follow the new contour. A choppiness of the beam's reflection would indicate fissures in the finish.

Unexpectedly, the best performer for this test was again the Cabot's brand of polyurethane, which I assumed would not do well because of its apparent hardness in the scratch test. Apparently hardness and elasticity are not mutually exclusive when it comes to finishes, at least in the case of the tests as conducted. The spar urethane finish and the lacquer product did well, with very little breaking up of the finish, as did the spar varnish (although because of its very low luster, the laser test did not work well, and I had to rely on a simple visual inspection instead). The 3 worst performers for this test were the Minwax polyurethane, the polycrylic and the shellac, in that order. All of these products had multiple fissures after a moderate blow. In a real world situation, the finish at the impact point would over time flake away and leave the wood underneath exposed.

The ultimate endurance test:

How does one telescope decades of wear and tear on a piano's finish into a relatively short amount of time. The answer? Bolt test samples to the bumper of one's business car (Photo 5) and subject said samples to the extremes of Iowa weather.



Photo 5: Why must people point and stare – don't they understand science?

The day after the installation of my glorified bug deflector (Photo 5), the temperature in Boone plummeted to a record setting -26 degrees. The next day on my tuning rounds I put in a 20 mile stretch on I-35 in blizzard conditions behind a sand truck. My plan is to leave the device on for a month's worth of Iowa winter, then put it on again in the middle of the blistering Iowa summer. That should give a good idea of which finishes can take whatever is dished out, and which can't. I'll watch for the progressive deterioration of the finishes, to see which products begin to show signs of stress first, and which are longer lasting. I'll ignore the stares and rude comments of the local populace.

Conclusions:

Based on my research thus far, there are more finishes that I would rule out for one reason or another, than finishes I would recommend. In order then, from worst to best, are my recommendations:

Spar varnish – As I made quite clear, this finish seems totally unsatisfactory for use on a piano. It doesn't cure well, looks dull and lifeless on the wood, and is more work than it's worth to stir in the first place. Don't bother with it. Since beginning the test I have purchased quarts of Sherwin Williams oil varnish and polyurethane varnish, which I will be testing at a later date.

Lacquer – The extremely strong odor and very rapid drying time rule out this finish as well. The only use I see is if one were to bring a single, simple piece into the shop for repair (such as the lid) and one wanted to use a hurry-up finish to get it back to the customer as soon as possible. The end result looks the same as a polyurethane finish (except for brush marks if applied cross grain), and the protective qualities seem about the same.

Polycrylic – Unsuitable, owing to its very poor performance when subjected to exposure to alcohol. One spilled mixed drink on the lid would ruin its appearance.

Shellac – Although easier to brush than lacquer, its poor performance when subjected to alcohol rule it out as a finish, except where used as a base coat to be followed by another type of top coat. Too bad, considering the ease of buffing.

Polyurethane – Very good finishes overall - both brands tested. More work to buff out than shellac, but much more resistant to damage from either alcohol or water than shellac or polycrylic. . The Minwax brand did not do well in the impact test - on a piano subjected to frequent moving about (as a school instrument might be), it might not be the best choice. The Cabot brand was the best of all the finishes in terms of scratch resistance and impact resistance as well

Spar urethane – My top pick. The easiest to brush out. Just as resistant to damage from liquids than the polyurethanes tested (perhaps more so), and touted as especially resistant to sun damage. Good resistance to both scratching and impact. In light of problems I've seen with refinished pianos placed in locations where sunlight falls directly on the finish, this is a finish I intend to experiment more with.

Hopefully, the results I've come up with are helpful. Do keep in mind the limited scope of the testing, and conduct your own experimentation if you want to see for yourself how these finishes would work for you. Enjoy the process.

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