

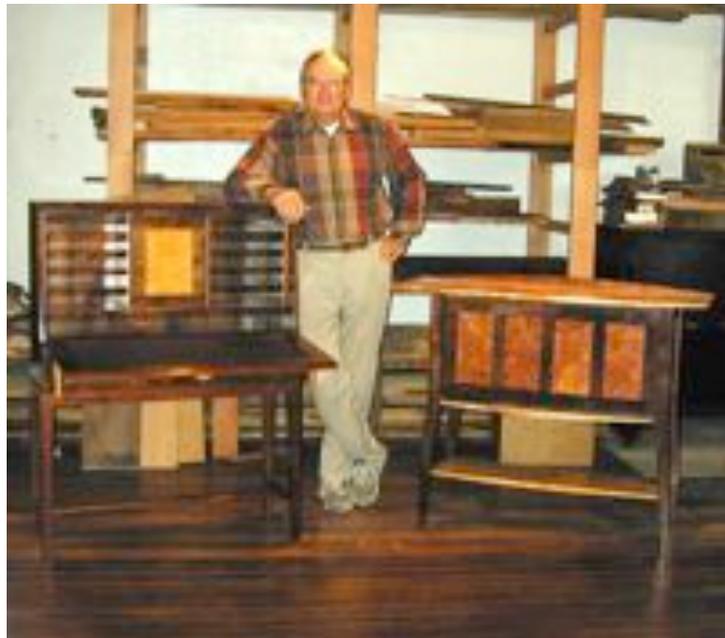
# Getting the Most from Target Coatings, Inc., Water Based Finishes Using HVLP Spray Equipment

Text and photos by Jerry Work

A common question among woodworkers coming into the small studio and gallery where I design and handcraft fine furniture is, “How can I get the quality of finish on my pieces that you do on yours?” They all know that even the most artfully crafted and prepared piece will look downright amateurish with a poorly applied finish or if the finish chosen is simply not the best one for the piece. For many, finishing is a dreaded necessary evil or at best a mysterious process filled with failed experiments. I guess that is why many advanced hobbyists and more than a few professionals revert to lathering on oil based or wipe on poly-in-oil type materials. They may smell really bad and they not like them very much, but they can at least achieve an “acceptable” look most of the time.

I mean no disrespect for these finishes since applied correctly and used on the right pieces they can produce a stunning finish worthy of the finest craftsmanship. However, too often they are the finish of last resort for many and are poorly or inappropriately applied resulting in a far less than desired outcome. A statement I hear often from such visitors is something like, “I really love making furniture, but I really hate the process of finishing it.”

Most have heard about or read about water based finishes sprayed on with High Volume, Low Pressure (HVLP) equipment. They, perhaps like you, intuitively think these finishes and this kind of equipment would help them do a far better job of finishing, but they don't know enough about either to make informed decisions.



When people look at examples like the Oregon Black Walnut and burl pieces shown on the previous page where water based finishes were polished to produce a beautiful soft patina, or other pieces where water based finishes were used to produce a satin look (the piece to the right) or a dead flat look, they find it hard to believe that all of these different looks can be achieved with water based materials.

They also find it hard to believe that the grain on darker woods can be enhanced with water based finishes, or that lighter woods can reveal so much beautiful figure without the yellow or amber colors imparted by most wipe on or oil finishes.

When they see such examples they mistakenly think water based finishes must be monolithic things unto themselves. They don't usually realize that there are



as many different types of water based finishes as there are volatile organic solvent based finishes.

For example, the four shown here from Target Coatings include shellac, lacquer, varnish, and urethane, and these are just a sampling of what is available.

The idea of water based finishes is appealing to most all of us for all the obvious advantages such as greatly minimized environmental assault compared to volatile organic materials, lesser and less harmful odors, easier and safer clean up with just water, and so on. But, the lack of knowledge of how to use them, which to use where and when, and the mystery surrounding applying them have been stumbling blocks for many.

***In this manual I am going to attempt to remove these and other stumbling blocks and try to make water based finishes easier to understand and, hopefully, an important part of your woodworking future.***

It is hard for me to talk about water based finishes without also talking about systems for spraying them on, especially the newer HVLP kinds of spray equipment. I know that others have achieved good results brushing on water based finishes,



but I have not had much success doing so myself. So, in this manual the focus will be on applying water based finishes with High Volume, Low Pressure (HVLP) spray methods.

We will cover the differences between turbine systems and conventional compressors using so called “conversion guns”. We also will explore issues like how many stages a turbine needs to have, or what air cap, needle and nozzle to use, or whether pressure pot guns or gravity guns are best, whether “bleeder” or “non-bleeder” guns are best, whether there is any real difference between the most expensive HVLP systems or the very cheap ones, and so on.



Before we begin, though, a word about the spray environment is in order.

With any volatile organic material the atomized mixture can be very explosive and when released directly into the atmosphere can cause known harmful effects to the environment and those who inhale the fumes. ***An explosion proof, properly filtered spray booth is a must if you plan on spraying any volatile organic compound.***

With water based materials the spray area requirements are very different. The materials themselves are for the most

part environmentally benign. What little over spray there is dries so quickly that it simply falls to the ground as a fine white powder that is easily swept up.

The photo here is of my finish room. I have been spraying water based materials in this room on a nearly daily basis for several years. It is separated from my

studio and small gallery area only by double french doors. I do have a simple filtered exhaust system, but it is there mainly to clear the room of residual over spray quickly because I most often am shooting one piece while building others in the next room.

I do always use a respirator. Even though the water based materials have little odor, I simply don't want to put anything like that in my lungs. I suggest you do the same.

You can see from the picture above that the floor is clean, the walls are not gunked up with old dried finish, and the

two sink areas need no covers to protect them.

Unless you plan to spray pigmented water based materials, you can do so nearly anywhere you can establish a clean, draft free environment to work in.

I traversed the same set of questions you likely now have when I began my process of learning about water based materials and HVLP spray methods. I made more than a few mistakes along the way, mistakes that I hope to help you avoid.

One thing I want to make clear from the beginning: long before I agreed to write this manual for Target Coatings I purchased and used their materials in my own studio enough to become convinced that across the board they make some of the best water based products available. Others may also make fine water based products, but the Target line is the one that populates my finish room day in and day out.

That was not always the case. I am constantly seeking new methods or products that will allow me to build better quality furniture faster so I can offer those ever better quality pieces to my customers at ever lower prices, what I call “increasing the value proposition” for them.

Over the years I have tried a lot of different manufacturers’ finish products. Some I liked a lot at the time and with some others I just could not achieve the result I was after no matter how hard I tried.

The more I used the Target Coatings materials, the better the value proposition I felt I could offer to my customers, so, as I said earlier, they are the ones that populate my finish room today. The red and white with blue stripe cans shown in the

previous picture of my finish room are various kinds of Target Coatings water based finishes I use every day.

## ***Our Task***

The task for this manual is to try to cover five different kinds of water based finishes applied with five different types of HVLP systems (pictured here and on the next page). We will be exploring both three and four stage turbine systems from two different manufacturers, one with a bleeder gun and one with a non-bleeder gun.

In addition, we will explore three different “conversion” guns from Asturo, one of the premier conversion spray gun manufacturers. We will be using two of their HVLP guns, one with a gravity pot and one with a pressure pot. We will also examine one of their latest offerings called a “High Transfer Efficiency” gun with a gravity feed cup.



**Asturo gravity feed HVLP gun (above) and High Transfer Efficiency gun (below)**



**Accuspray three stage turbine and non-bleeder gun**



Whew! All that's before considering the effects of different air cap, needle and nozzle sets for each of these. And, we need to cover this ground without this becoming some ponderous academic study.

We all do woodworking because we enjoy it so I will do my best to keep this light and fun while still answering the questions most of you have.

Strap on your reading belt and let's get started.



**Asturo pressure pot HVLP conversion gun**



**Apollo 4 stage Turbine and Gun as they sit in the compressor locker in my finish room. This is a bleeder gun.**

## What are the differences between these various materials?

Let's start by identifying what we mean when we use terms like lacquer, varnish, paint, shellac, urethanes and sealers. And, what do we mean by "water based?" I am no paint chemist so my definitions will be those that make sense to me. They may not be technically accurate in all respects but hopefully will help you sort this all out.

No one seems to know for sure which kinds of finishes came first, but lacquer, varnish, paint and shellac are all related. They all originally were derived by dissolving either the resins and saps from certain trees or plants, or, in the case of shellac the excretion from an insect, in a solvent.

This mixture was then applied to the surface. As the solvent dried out, the solids remained and formed the "finish."

For example, in the Orient a natural lacquer was derived from the sap of the Japanese Varnish tree dissolved in processed solvents we now refer to commonly as "mineral spirits".

In India and other parts of Asia the resin came from the lac bug which in the larva stage eats the sap of the Lac tree, chemically alters it and then excretes a reddish colored resin which it used to

coat itself and every thing around it. These resins were harvested and dissolved in a solvent, most commonly an alcohol based solvent.

Lacquers were made from compounds of cellulose, resin or lac. Lacquer made from resins is usually mixed with turpentine which evaporates in air leaving the protective coating on the surface. When cellulose or lac is used they are usually dissolved in alcohols or acetates which also "dry" by evaporation.

What are called "spirit varnishes" are made of resins dissolved in some quickly evaporating liquid such as turpentine or alcohol. What are called "oleoresinous varnishes" are made of cooked mixtures

of resins and drying oils dissolved in turpentine or petroleum spirits. They dry by both evaporation and by the hardening of the resin-oil mixture when it combines with oxygen in the air.

More recently other kinds of fossil, natural and synthetic resins have been used to make shellacs, varnishes and lacquers, each with unique characteristics.

For nearly a century synthetically derived resins have been replacing the naturally occurring resins as they are easier and

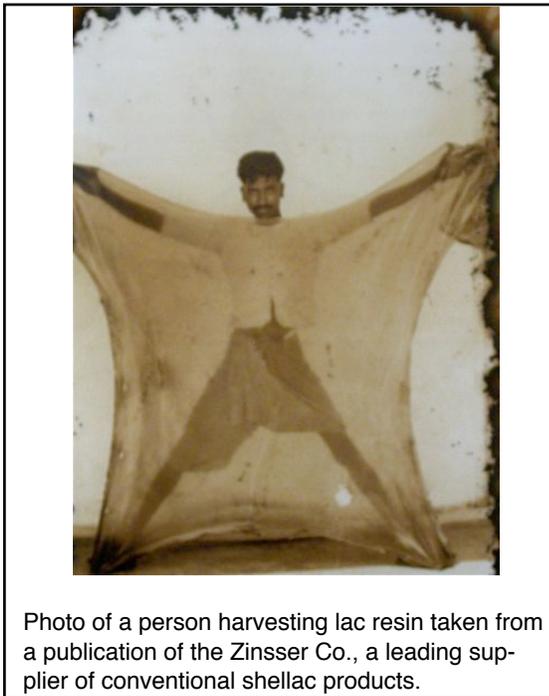


Photo of a person harvesting lac resin taken from a publication of the Zinsser Co., a leading supplier of conventional shellac products.

cheaper to produce and often exhibit more consistent characteristics.

Add pigments to any of these and the result is generically called “paint.”

Confused yet? They certainly all sound similar, don't they? The good news is we don't need to know the intricacies of each, only their properties as they apply to woodworking and furniture making.

**Water based finishes**, whether they are called lacquer, shellac, varnish, urethane or paint are finishes where the synthetic or naturally occurring resins have been dissolved in compounds which themselves are water soluble until cured. The water replaces most all of the volatile organic solvents which frequently are referred to as “thinners,” as in paint thinner, lacquer thinner, and so on.

Once these water based materials cure, that is, they undergo a molecular cross linking to change their fundamental chemical nature, they usually become quite impervious to contact with water. This is unlike alcohol based natural shellacs and volatile organic based non-catalyzed lacquers which both remain highly susceptible to re-dissolving when they come in contact with their respective solvents.

For water based finishes, clean up is also accomplished with water as I am doing here cleaning an Asturo gravity feed HVLP conversion gun. While the water will remove most of the residue, it may be necessary from time to time to clean your spray equipment with conventional solvents if you experience a build up of the dried water based materials. Read the product label to determine whether and

when to use something other than water for clean up.

Be careful not to assume that just because these are “water based” materials that you can thin them with tap water or even distilled water. Often a special reducer is offered which will contain more than just water. Use it when indicated and only in the amounts indicated.

***These are complex formulations and you do not want to disturb what may be careful balances of components by simply diluting them with water.***



Rather than trying to distinguish between the water based shellacs, varnishes, lacquers, urethanes and sealers by composition, let's look at them in terms of their finish properties, durability, and the conditions under which they are best used. You will find a wealth of information on

the Target Coatings web site ([www.targetcoatings.com](http://www.targetcoatings.com)), some of which will be repeated here for clarity.

We will start with shellac. **Shellac** has been used for centuries as the primary protective finish for fine furniture, decorative arts, and a variety of industrial applications. Shellac enhances the natural beauty of wood grains without muting them by obtrusive pigment blends.

Conventional wisdom dictates shellac has to be cut or dissolved into denatured alcohol to form a film and perform as a quality, professional-grade wood care product. It turns out that is not true.

Shellac, even shellac which has had the natural waxes removed, can be cut into a water suspension if handled and processed properly. In fact, shellac has been and continues to be used in water solutions for fabric finishing, paper treatments, medical coatings and food-grade films to ensure that the assigned substrate is well protected and safe from contamination.

According to the Target Coatings literature, Oxford UltraSeal-WB™ Water-Based Shellac Sealer & Barrier Coat (shown above) "...is the first truly successful water dispersed de-waxed shellac

system that looks and behaves identically to alcohol cut shellac in terms of surface wetting, color generation, burn-in and overall depth and feel. Developed to be a drop-in replacement for alcohol cut shellac for finishers who have concerns about the use of alcohol in environments that are not flash-proof, Oxford UltraSeal-WB™ can replace traditional alcohol cut shellac in all applications".

This matches my experience with this product. I simply no longer use the alcohol based shellacs any more. I find the Oxford water based shellac performs as well, pops the grain as well and dries faster and harder than the alcohol based shellacs I used to use. It also seems to me to

have a longer useful shelf life.

This Target Coatings product is a 25% solids cut (slightly higher than a 2 pound cut which is 21% solids) of de-waxed shellac resin dispersed into a water vehicle. It has excellent substrate wetting capabilities, color, depth generation qualities and remarkable adhesion. In the Oxford line it is available in Blonde (clear), Amber (the yellowing that is normally associated with alcohol bases shellacs) and Garnet (which imparts a reddish cast great for some darker and redder woods such as cherry and walnut).



It can be used on wood, fiberboard, sheet-rock, stone, glass and metal surfaces to act as a underlying sealer or barrier coat to ensure proper adhesion of any water-based or solvent-based top-coat system. This is really important when you want to stain wood or use an oil to really bring out the grain on darker woods like Purple Heart. I have had good success with several different non-surface building oils once they dry completely and I over coat them with the Oxford shellac.

This product also works well when you need to seal resinous woods like the blood wood on this figured maple and crotch black walnut chess board with the inlaid blood wood surround, or woods which tend to weep sap, such as pine or fir.

The shellac will raise the grain so it makes for a good sanding sealer as well, although not as good from my experience as the Oxford 8800 sealer which is specially formulated just for that task. In most cases if you are shooting in a 70 degree room, the 8800 sealer can be sanded in an hour. The shellac often takes longer to dry before it sands as well.

If you have any question about the adhesion of your build and final coats due to contamination, or wood type, or previous finishes, I suggest you spray on the Oxford shellac as a first barrier coat since all of the other water based Target coatings will stick very well to the Oxford shellac.

While some have used shellacs as the only finish on wood, and for centuries it was considered a fine finish for furniture, my experience is that the other coatings we will explore in this manual perform far better on furniture than just shellac alone in daily living.



For example, I admire the tenacity of those who laboriously pad on layers of alcohol based shellac in a process called "French polish." Done well the surface can look spectacular, but just don't spill anything with alcohol in it or you might wind up with a mess since the shellac will easily re-dissolve in alcohol even years later.

Water based shellacs are not as fragile, but I don't want that kind of risk for my customers so the shellac remains a barrier coat, not a finish coat for my pieces.

Next let's consider the Target Coatings water based **lacquer** called "Oxford Ultima Spray Lacquer (USL).

This is an ultra clear formulation of acrylic copolymer resins and HAPS-free solvents. That is, it contains no hazardous air pollutants.

It was developed to compete directly with the nitrocellulose lacquers and has a property unique among water based finishes from my experience in that it "burns in" between coats. Most water based finishes sit on top of a previous coat. This material actually "melts" into the previous coat so all subsequent coats build to behave like a single unified coating just as you get with nitrocellulose lacquer.

In fine furniture this means that you can sand between coats to remove blemishes or dust and not worry too much about cutting through an edge on the previous coat. When you apply the next coat, the broken surface simply melts together with the new coat and the area of the coating you knocked off with your overly aggressive sanding just disappears and blends in.

This is NOT the case with many other brands of water based lacquers I have tried. In those cases, if you break through the previous coat it will show through in subsequent coats spoiling an otherwise nice finish.

With those other brands I learned to be very careful when sanding between coats and often would not even approach the edge where the finish is thinner and more fragile. Sometimes I faced a dilemma when a blemish or dust bump was close to the edge. Should I try to sand it out



and risk knocking off the edge or "play it safe" and leave the blemish in place?

Those are the kinds of trade offs that I hate to make on one of my pieces. Remember the discussion earlier about constantly striving to increase the value proposition for my customers (increasing quality at lower cost)?

So, when I first learned about the Oxford USL product I was thrilled to find that I could sand out the imperfection even if it was near the edge because the next coats would burn in and even overly aggressive sanding would not leave a visible mark.

I am not suggesting that you become cavalier about your sanding between coats, just that, if you do happen to knock off an edge, it is not the end of the world.

This is a very forgiving product that is really good to use day-in and day-out.

This product has 30% solids and is stronger than the nitro-cellulose lacquers that for years have been the main stay of commercial furniture manufacturing.

If you are familiar with viscosity rating in terms of how long it takes for a specified amount of this material to flow out of a hole of a certain size, a so called "Zahns cup" shown at right, this material has a Zahns #2 rating of 30 to 35 seconds.



The American National Standards Institute (ANSI) publishes a standardized series of tests that manufacturers can use to rate their products. ANSI Standard **161.19.3** pertains to chemical resistance. Using test procedures which meet this standard, Target Coatings determined that the Oxford USL is resistant to water and most common household chemicals.

Water, glass cleaner, all purpose cleaners, coffee and olive oil left standing for 24 hours had no effect on the finish. Lacquer thinner and orange juice slightly softened the finish but it fully recovered when they were removed. Acetone and denatured alcohol resulted in slight to moderate swelling, but passed the test. When exposed to 120 degree temperatures for two hours, there was no discoloration, blistering or film failure.

This is the "swiss army knife" of water based finishes and a very good one to learn on. Based on my experience with

other manufacturers' water based acrylic lacquer products I would rank this one as top of the heap. You just can't beat that burn in quality.

It also is water clear so you really see the wood itself.

On darker woods it does not blush or leave a gray cast the way other products of this type that I have used do.

Even so, by itself it does not bring out the best in the darker

woods as the clarity leaves them a bit lifeless. I suggest you may want to pop the grain with an oil and/or the shellac first as I did on this gong stand made from Brazilian Cherry, Blood Wood and Black Walnut.



Next let's move to what I think is one of the least well understood finishes, the **Conversion Varnishes**.

Target Coatings calls their water based conversion varnish "Emtech 8000". It is a pre-catalyzed material that is ideal where exceptional water resistance, UV stability and hardness is desired in a clear, non-yellowing finish.



***Do you hear counter tops, exterior doors and marine applications in this description? I surely do and that is where this material really excels.***

Because it is pre-catalyzed there is no need to measure out and add a "part b" or a separate catalyst as other manufacturers' products require. It imparts a soft feel and color tone usually associated with solvent based varnishes that most

find very appealing, especially on darker woods. Even though it is pre-catalyzed, it has a 12 month shelf life.

If you like a piano or guitar like gloss finish, you can't beat this conversion varnish after it has been buffed and polished as we will describe later. It simply will knock your sox off, especially if you apply it to a darker wood like true mahogany or black walnut or any member of the rosewood family. Stunning results can be achieved quite easily.

It has a viscosity about like the lacquer (35 seconds in a Zahns #2 cup) so you can spray it with the same air cap, nozzle and needle making it easy to mix finishes on the same piece. ***Lacquer the horizontal and interior surfaces and use the conversion varnish on the top.*** It also is 32% solids and weighs the same 8.6 pounds per gallon.

Where it really shines is in its water and chemical resistance. ASTM, another standards and testing organization, publishes a chemical resistance standards procedure identified as ASTM D3023-88. Following that measurement procedure the Emtech 8800 conversion varnish scored a 5 (no effect) when subjected to water, glass cleaner, all purpose cleaner, vodka, coffee, coke cola, mineral spirits, and diesel fuel. Iodine and denatured alcohol had a very slight stain/effect. Even such harsh chemicals as acetone and lacquer thinner showed only a slight effect. A permanent black marker did result in a moderate stain.

So, when you talk about resistance to most common household chemicals, this product is hard to beat. It also flows out

wonderfully as we will see in the actual application tests.

Where the surface will take a beating, this is the coating to use, like for the counter tops on the loft kitchen shown in this photo.



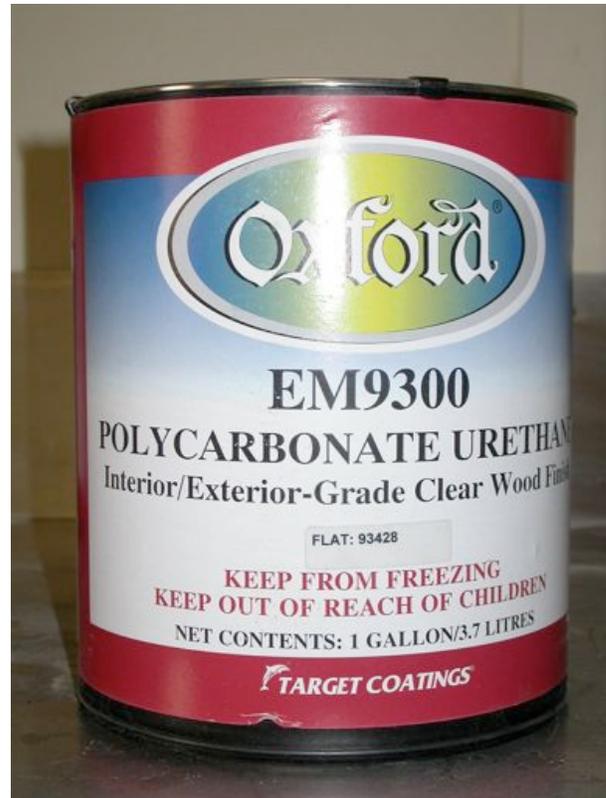
Once cured, it cross links and becomes very hard so it is not easy to remove and takes a lot of sanding later if you plan to refinish.

***Again, think counter tops, exterior doors, lawn furniture and marine applications.***

This brings us to the **Urethanes**. In the Target Coatings line these are called, “9000 series super-clear polyurethane one-part copolymer” materials or the “9300 series Polycarbonate Urethanes.” I dare you to say either of those fast five times!

The 9300 Polycarbonate Urethane shown to the right is the hardest of all the water based coatings with which I am familiar, does not require any additional cross linkers, catalysts or hardeners, and is ideal for use where scratch resistance is the primary objective. It is also very clear, does not yellow, and dries quickly at room temperature. Think of the applications where you previously might have used solvent based polyurethanes (brush marks and all) and consider substituting this product for outstanding results.

You can use it successfully over grain fillers and high solids sanding sealers where you want what is called a “tight finish,” meaning where you want the grain pores and other surface imperfections to



be all filled in for a really smooth glass-like finish. Once fully cured (which can take a couple of weeks or more) it also will buff to a very high gloss, such as you will find on the finest guitar bodies and pianos. It will be similar to the example shown on the left where blood wood and maple burl inlays are set into cherry and the whole thing is buffed to a mirror like shine. It is a knock out finish and one that I guarantee your friends will not be able to resist touching just to see if it really is wood!



I often use this finish on what I call “reflection panels.” These are book matched burl surfaces polished to a high gloss and displayed upright on a stand. They usually are



**A couple of examples of polished burl panels.**

about 12 to 16 inches wide and high. Put a candle in front of them, lower the room lights and the candle flame reflecting off of the surface is almost magic.

Thanks, “9000 series super-clear polyurethane one-part copolymer!”

With the various Target water based coatings now in mind, it is time to move to applying them and testing the five different HVLP systems to see which works best with each different coating.

Before we do, however, we should spend a moment talking about properly preparing the wood to receive the finish. That is what we will do in the next chapter.



## ***Preparing the wood for the finish.***

It is always fun to watch visitors who come into my small gallery and studio as they approach the fine furniture I design and hand craft. Unlike those who stand back to look at flat art or sculpture, those who look at furniture most often move quickly to a piece and invariably move their hands across the surface while they take in the piece with their eyes from up close, just like in this photo. They might pause to ask if it is OK to touch the pieces first, but once they know they can, the tactile urge takes over.

At some point the question is always asked, “what kind of finish do you use?” It does not make any difference if it is an oil and wax finish or a nicely applied water based finish like those we are discussing here, they seem to think the silky tactile feel is somehow accomplished by the application of a magic elixir.

While the choice of finish material is important to achieving the desired overall look and feel, an equally important factor is how the raw wood was prepared before the application of the finish material.

In building fine furniture I find that more than 50% of my time goes into sanding, final assembly, buffing and polishing. This is most often more than twice the amount of time that it took to machine all the component parts of the piece. Yet, scraping and sanding processes, tools and materials are seldom as carefully chosen as are the machines that cut the wood components in the first place.

Scraping can produce outstanding results, but there is a learning curve and

some touch skill required to do it correctly.



I find that most wood workers sand rather than scrape their wood to get it ready for finish. That is what I do most of the time. Contrary to what some say, I have found proper sanding produces just as fine a surface after the finish is applied as scraping and is far more controllable for most, so that is what we will concentrate on here.

Sanding is the use of some kind of hard material to abrade the surface fibers of the wood shearing them off to leave a smooth feel to the surface. Simple to say, but hard to do well. As you abrade the surface, you also scratch the surface. If those scratch marks are large enough, they will detract from rather than add to the appearance of the final product.

So, the trick is to learn how to use smaller and smaller particles of the hard material to remove the larger scratches and leave smaller and smaller scratches until they no longer are visible and to do so in such a way that the entire surface of the finished piece is uniformly treated, corners and all.

Initially, this work was done laboriously by hand by scooping up naturally occurring small rock particles (sand) and rubbing them over the surface with animal skins or cloth. Later, means were found to adhere the sand to a paper or cloth backing and what we today call “sand paper” was born.

Also, various power tools were developed to greatly reduce the manual effort required to move the abrasive over the work piece. Seven different types of



“sanders” that are in use in my studio are shown here. Some move the abrasive in a circular motion like a grinder, some in a linear motion, some in an arc, and some combine various of these to create complex movement patterns, like the so called “random orbit” sanders. The objective is to smooth the surface of the wood while minimizing the scratch marks left behind.

The abrasive particles can be anything from natural materials like garnet and diamonds that have been carefully processed to be as even in particle size as

possible to man made materials like silicon carbide and aluminum oxide engineered with a very high uniformity in particle size.

The backing materials can be various kinds of paper derivatives, or various kinds of cloth materials or man made screens or combinations of all three.

There may be other materials added to the abrasive surface like stearates to help prevent loading of the paper with small particles of wood fibers and the resins that naturally occur in the wood.

Stearates are derived from stearic acid, a white crystalline fatty acid  $C_{18}H_{36}O_2$  obtained by saponifying tallow or other hard fats containing stearin. They're a little bit like soap. The sanding grit and dust does not stick to the stearates so it keeps the paper from clogging longer.

But, there is a very real downside to using stearated sand paper on wood you plan to finish with water based materials.

***No matter how hard you try to clean it off, some of the stearates may remain imbedded in the wood and it most likely will cause fish eyes in the finish that are very hard to remove. If you suspect the wood has been exposed to stearates, then seal it first with shellac before continuing on with any of the other water based materials.***

To add to the confusion surrounding “sand paper”, there are three different “standards” applied to describing the size of the abrasive particles. The US grades are called “CAMI”, the European grades

are identified as “FEPA” and in Japan the grades are identified as JIS.

The table lists how these different size grades relate one to another and the actual size of the particles in microns. In courser grades they are quite close but as you move to the finer grades the differences become greater.

**GRIT COMPARISION CHART**

MICRON	US CAMI	FEPA 'P' (Festool)	JAPAN JIS
500	36	36	36
430	40		
410		40	
350	50		40
320		50	
300			50
270	60		
260		60	
250			60
210			70
197		80	
192	80		
177			80
156		100	
149			90
140	100		
127		120	100
116	120		
97		150	120
93	150		
78	180	180	150
66	220	220	180
60		240	240
52	240	280	280
46		320	320
42	280		
40		360	360
35	320	400	400
30		500	
28	360		500
25		600	600
21	400	800	700
18	500	1000	800
15	600	1200	1000
13	800	1500	1200
10	1000	2000	1500
8	1200	2500	2000
7			2500
6			3000

It is not as important to know these differences as it is to recognize how the abrading materials you are using have been graded. This is important because in order to achieve a desired very smooth final finish you need to progressively “sand” the finish with finer and finer grits both before you apply the finish and often afterwards as well. You don’t want to be inadvertently jumping back and forth between grading standards or you could be moving from a finer to a courser grit without knowing it.

I use Festool sanders as I find them the very best in every category that is important to me and my work so those are the ones you will see in the pictures here. However, many manufacturers make different kinds of sanders so use what you have.

To take maximum advantage of the benefits from each of these ways different sanders move the abrasive, you will want to add different types of sanders to help you achieve the results you are after.

If you can only have one, then the most flexible would be the random orbit style sander. Even better would be a dual mode sander like the Festool RO150 shown here which can be switched between a random orbit motion and a rotary motion with a moving pivot point. You can do a lot with just one of these. In rotary mode it also is a great buffer/polisher, as we will see later.



Other types of sanders will reach into corners better, or do a better job on some surfaces, or may be faster, but, if you only have a random orbit or dual mode sander, it will work just fine for getting your pieces ready for finish.

The way I work, I use different combinations of my sanders depending on what I am doing. In furniture designs where I want to carve out a section like a chair seat, or where I want to instill an Oriental feel by curving the under sides of top or shelf components, a process I refer to as

“boating,” I like to start with a rotary motion sander with grits from 36 to 60 since complex curves can be roughed out easily and quickly. Then the rough shape can be finished with one of the less aggressive random orbit style sanders using grits from 80 progressively up to 220 to 400 on soft woods and up to 600 to 800 on hard woods.

Hard woods show fine scratch marks more than soft woods so you need to go to smaller grits before the scratch marks are no longer visible.

For rail, style and panel work I like to first finish sand the panels up to 600 to 800 grit before a component like a door or side is assembled. I sand the edges of the rail and style pieces after the profile



has been cut but before glue up to 220 grit to make sure all the chips and rough edges are removed. Don't worry much

about the faces until you assemble the R&S component.

Once you do the glue up, now sand the faces to the rail and stile pieces to be flush and flat using a progression of grits from 80 up to 400 to 800 depending on the hardness of the wood. If you have a large flat orbital sander like the one shown here, they work well as it is easier to keep them flat on the R&S faces than to try to keep a random orbit sander flat on such surfaces. They also work well for the edges and to break the sharp 90 degree corner between a face and an edge.

For solid woods be sure to spend much more time on the end grain as it is harder to sand and takes quite a bit longer than the faces or edges. To look and feel right the end grain must be very smooth before you apply the finish.

A good progression for most applications is to use 80 followed by 120 followed by 180 followed by 240 followed by 400 followed by 800 if necessary.

Don't worry about using exactly these grit numbers in your progression, just somewhere in these ranges.

***The trick is to place a strong side light shining across your work piece. This will show up scratch marks and surface imperfections that you cannot easily see with top light.***

Start by removing all the surface imperfections with the 80 and 120 grits. Don't go any finer until all the surfaces are smooth and flat. From

there on all you are going to do is use the next finer grit to remove the scratch marks left by the previous grit.

Don't tip a random orbit sander to make it cut more aggressively or you will make scratch marks that are harder to take out.

In the long run you will actually slow down your sanding process, not speed it up, by tipping the RO sander.

I know most will get impatient as it can take quite a while to really get a piece smooth and flat and ready for finish, but the payoff is worth the effort.

When you are convinced that you can no longer see any scratch marks or other surface imperfections, move your hands over the piece. Your hands can often feel things your eyes miss.

Now blow off or wipe off all the sanding dust. Use a moist rag or paper towel to help, but do NOT use tack rags as they can contaminate the surface and cause the water based finishes to crater or fish eye. Make sure your hands are free of oils as oily finger prints may also disturb the flow out of the water based materials.

The next step is to spray on the sealer coat to raise the grain and create a good bonding surface. Once that dries, re-sand the piece with 220 or 400 grit just enough to get it good and flat. You don't need to sand through the seal coat, just knock off the raised grain and make a nice surface for the build coats to flow out over. Use a moist clean rag or paper towel to remove the sanding dust.

The build coats do what the name implies, they build up the film to the desired thickness. You can sand between coats if you get an imperfection or dust nodules, but you really only need to sand the final

build coat. You want that last build coat to be nice and flat before you put on the final top coat. Wipe with the clean moist rag again. The objective is to get the final top coat to flow out to be as glassy smooth right off the gun as you can make it.

With the prep process in mind, let's talk about the HVLP equipment with which we will apply these finishes.



## HVLP for Applying Water Based Finishes

Commercial High Volume Low Pressure spray equipment was first developed by a French company several decades ago. They were trying to find a way to reduce the over spray problems associated with conventional spraying processes which use relatively high pressure air (40 to 60 or more psi) to atomize the finish and deliver it to the work piece.

High pressure guns do a good job atomizing so are capable of producing a very nice, smooth finish on most materials. Unfortunately, by delivering the atomized finish with that much force, up to 80% of the finish winds up bouncing off of the work piece, or never reaching it in the first place, and instead forms a fog in the air called “over spray.”

If the solvents or the finish materials themselves are toxic, by being finely atomized they can easily be inhaled and damage the lungs of anyone near by. They also easily combine with other elements in the air to form air pollutants which have been shown to be harmful to the environment.

If you simply try to reduce the air pressure used with conventional spray guns. you also reduce the atomization and the result is a greatly degraded surface finish.

Industrial users of spray equipment for decades tried a variety of means to capture the harmful over spray before it was released into the atmosphere or was inhaled by people. Elaborate spray booths

were constructed with a variety of filtering or collection methods. Some used water-falls to capture the over spray in a water bath where it could then be filtered and disposed of. Electrostatic and other kinds of air filters have been used along with many other means of trying to capture the over spray once it was released into the environment of the spray booth to try to keep it from going freely into the atmosphere.



Here is a picture of the finish room we will use for this manual showing the various Target Coatings materials and some of the HVLP equipment we will use.

Obviously, with up to 80% of the material coming out of the gun going into over spray and as little as 20% reaching the intended work piece, the cost of the over spray was also a substantial issue.

HVLP systems try to atomize the finish material with a high volume (100 or so CFM) of low pressure air (under 10 psi at the air cap). The lower pressure means

that up to 80% of the finish material reaches the surface of the intended work piece and only around 20% goes to over spray so the benefits are substantial.

The problem has always been achieving an atomization quality approaching or matching conventional high pressure spray equipment. Until fairly recently that proved to be an illusive goal.

Since the work done by the original French company, a number of firms around the globe have developed their own HVLP equipment, often tracing their roots back to that original innovator.

The innovation was the use of a turbine to generate the high volume of low pressure air instead of a compressor which generates a relatively low volume (6 to 20 cfm) of high pressure air (40 to 100 or more psi).

You can think of a turbine much like the output from a vacuum cleaner. There a motor turns a turbine to generate the suction and the air is exhausted after passing through bags and/or filters which trap the particles picked up in the suction air stream.

In fact, from the 1950's on many canister style home vacuum cleaners offered a simple kind of HVLP spray gun as an option. Usually it was nothing more than a hose that attached to the exhaust port. On the other end of the hose was a bottle with a lid containing a large and small air chamber. Where the transition occurred between the large air chamber to which the exhaust hose was attached and the small air chamber to which a nozzle was attached, a venturi effect was created.

As the air speeded up moving from the large to the small air chamber, fluid would

be drawn from the bottle, mixed with the air stream, and sprayed out the nozzle. Not very elegant, not very effective, but it did work, sort of.

Modern HVLP turbine systems also use a motor turning a turbine but that is about where the similarity stops. In HVLP turbines there may be three or more turbine units all connected to the output shaft of the motor, each boosting the output of the stages before them.

That air flows through a hose and into a specially designed spray gun. These guns have much larger internal air passages than conventional high pressure spray guns, and different means of moving the finish material through the metering needle and out through the nozzle.

The air flows through a specially designed air metering system called an "air cap" which serves two functions. One function is to mix air with the finish material, atomizing it and delivering this atomized mixture to the surface of the work piece.

The other function is to flow through a different pathway to define the shape of the atomized finish material air stream on its way to the work piece. This is called "shaping the fan pattern" since the most common means of delivering this atomized air stream is via a flat wide pattern much like the shape of an unfolded hand fan as is shown in the pictures on the next page.

This fan shape can be directed to be horizontal or vertical and in some guns can also be at any angle. As the spread of the fan is narrowed, the pattern becomes less flat and more like a cone shape. Most guns provide a means of controlling the shape of the fan all the



**Note the difference in fan shapes. The upper flatter fan shape is from the Asturo HVLP conversion gun and the lower, more rounded fan shape is from the Asturo HTE conversion gun. Both are shown spraying water.**



way from nearly a stream to a very flat, very wide fan pattern.

The way the portion of the air stream that is used to atomize the finish material works and the way the portion of the air stream that is used to alter the shape of the fan works is basically how one HVLP turbine gun differs from another.

More recently the companies working to develop efficient HVLP spray equipment that rivals or even surpasses the finish quality of high pressure spray guns have developed special spray guns. These receive high pressure air from conventional compressors and convert this air stream internally into a low pressure atomized stream that reaches the work piece with similar velocity and similar transfer efficiency to the HVLP turbine guns. Not surprisingly these are called, "conversion guns" in the HVLP world.

There are two different ways both the turbine guns and the conversion guns move the finish material into the atomization air stream. One is called "gravity feed" where the the cup that holds the finish material is above the gun so the finish material can flow by gravity into the nozzle chamber and then into the atomization air stream. The other is called a "pressure pot" system. In that case the finish material is held in a sealed cup below the gun and a small amount of the incoming air stream is directed into the top of that cup, pressurizing

the contents and forcing it up through a tube and into the atomization air stream. Both have their advocates and detractors.

In this manual we are going to examine the performance of five different HVLP guns: a 3 stage HVLP turbine and pressure pot gun manufactured by Accuspray,

a 4 stage HVLP turbine and pressure pot gun manufactured by Apollo, a pressure pot HVLP conversion gun manufactured by Asturo, a gravity feed conversion gun from Asturo and one of their latest offerings, what they call a “high transfer efficiency” gun.

Several of these are in use in my studio on a daily basis so these are not photo props, they are working tools and show the scuffs, scratch marks and gunk one would expect would accumulate in real world usage.

Let’s look at the air caps on these different guns to see how each controls the



**Pressure pot gun shown above and a gravity feed gun is shown at left. Both are Asturo HVLP conversion guns.**



atomization air stream and shapes the fan pattern. These become very important in understanding how the different guns perform in terms of applying finish



**This photo shows (left to right) the Apollo turbine pressure pot gun, Asturo HVLP conversion PP gun and Accuspray turbine PP gun.**

to the work piece and doing it well with minimum over spray.

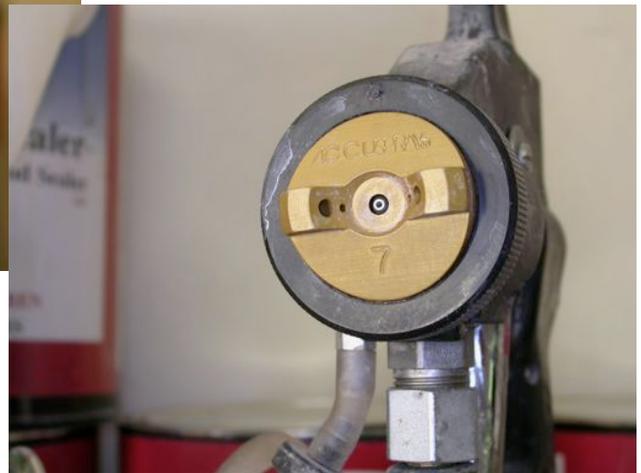
The photo below shows the air cap on the



Apollo turbine gun. Around the center of the nozzle is an opening through which the atomization air flows. Contrast this with the Asturo HVLP gun (below) which uses the eight small holes outboard of the nozzle to atomize the air and the Asturo

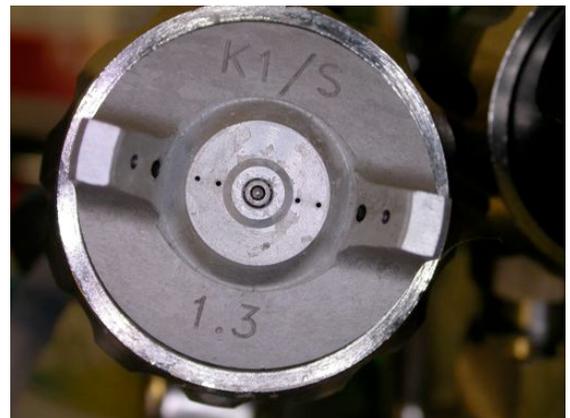
looks much like the Apollo air cap from the front, but we will see in a minute that they are very different from the rear.

These are four different approaches to try to achieve a similar outcome, obviously the result of different engineering approaches and experiences.



HTE gun to the right (marked K1/S) which uses only four small holes outboard of the nozzle.

The Accuspray turbine gun air cap, the gold colored one shown above right,



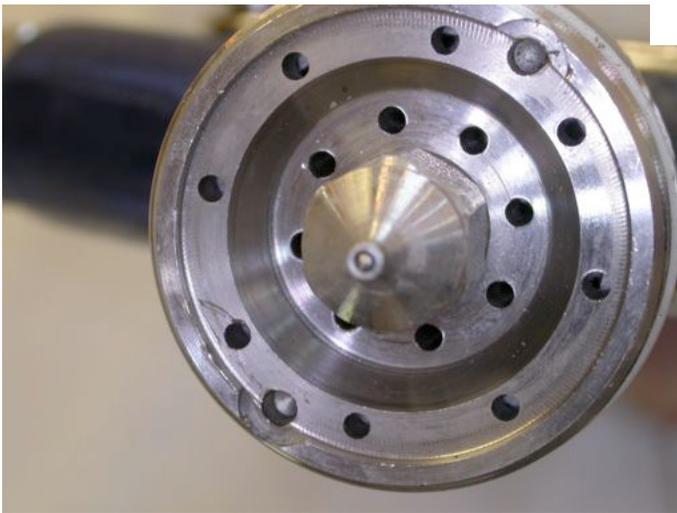
From looking at these pictures it should not be surprising why the cheap HVLP guns, whether turbine or conversion guns which are often just knock-offs of one of these four, usually don't produce anything remotely like the outcomes from one of the guns from these and other premier manufacturers.

If they are just copies without any understanding of the underlying engineering trade offs, the results would likely vary widely, and they do.

Remember the difference in fan shape between the Asturo HVLP gun and the Asturo HTE gun? Could you tell just by looking why one would produce a flat fan and the other a softer, rounder fan? I sure can't.

Let's look at the back side of the air caps and the front side of the guns with the air caps removed to see the incoming air passages.

The picture below shows the business end of the Asturo guns with the nozzle in the middle and the fluid metering needle



at the center of the nozzle. Both the HVLP and HTE guns look similar to this photo.

Above and to the right is the back side of the air cap on the Asturo HVLP gun. See how the eight small holes are formed in milled recesses and how the larger hole inside those recesses seals the air off

from exiting around the nozzle forcing it through these eight small holes.

Now look at how the ring machined into the back side of this air cap that surrounds those eight small holes serves to seal the atomization air off from the fan control air.



Look again at the photo to the left and see how the outer holes provide the fan control air and the inner holes provide the atomization air. No accidental engineering here.

Now look at the Apollo turbine gun pictured on the next page. The back side of the air cap is shown at 11:00 and the front side of the gun where the air cap attaches is shown lower right in the upper photo. The plate with the four dimples and the slots sitting in front of the machine brass housing is spring loaded out against the back side of the air cap which is held in place by a threaded ring which screws onto this brass housing.

The dimples engage either one pair of the six outer recesses or the two air passage holes as the air cap is rotated relative to the gun body. When the air pas-

sage holes are aligned with either the horizontal or the vertical slots in the spring loaded plate, air flows out through the fan control holes on the front side of

the air cap shown here creating a flat fan pattern. The width of the fan is controlled by how much air is admitted through the fan air control valve on the back of the gun.



Back side of air cap above

Apollo HVLP turbine gun

When the air cap is rotated so those air passage holes are blocked by one of the dimples, then no air is admitted to the fan control holes on the front of the air cap and the fan turns into a cone shape whose size is determined by the fan air control valve.

The total volume of air available for either fan control or atomization comes through the hole on the left side of the picture, bottom left (which is actually at the top of the chamber. The gun is shown on its side here.)



Front side of air cap

Here is the same thing for the Accuspray gun. Again this photo is taken with the gun on its side. The air available for fan control passes through the elongated slot at the left side of this photo while the at-



Front of air chamber showing nozzle



omization air flows through the four center slots. A rubber gasket allows the air cap to seal these two chambers off from one another on the back side.

The photo below shows the front side of the air cap. The atomization air flows past and around the nozzle and exits through the large center hole. The fan control air exits through the two small and two larger holes towards the outside of this air cap.

As you change the amount of air coming through the fan control holes with the fan air control valve on the gun body, you change BOTH the shape of the fan - from flat to cone shaped - and the size of the fan.

As we saw, on the Apollo gun the size of the fan is controlled by the fan air control valve on the gun body, but the shape is changed only by rotating the air cap into one of the eight settings established by the dimpled spring loaded plate that is pushed against the back of the air cap.

The result is that with any of the Asturo conversion guns, or the Accuspray turbine gun you can rotate the air cap to position the fan anywhere you want it. With the Apollo gun a flat fan can only be horizontal or vertical since positioning the air cap on either diagonal causes the shape of the fan to change from flat to conical.

When I first saw an Apollo gun, I thought this would be a problem. In real world use it seems to be a non-issue.

From my testing, all five guns provide good fan shape and size control, but the Asturo guns control the fan in a more linear fashion and provide finer control over both shape and size of fan than either of the turbine guns.

I find fan control on the Apollo gun to be a bit better than on the Accuspray gun.

A bigger difference in real world use is the shape and fill of the fans produced by these different guns. Here, the Asturo HTE gun wins hands down in my judgment while the Apollo turbine gun comes in a close second over the two Asturo

HVLP conversion guns. After spraying all five guns, I concluded that the Accuspray gun fan fill was just not as even as with the other four.

I have owned the Accuspray gun longer and used it far more than the others. I wouldn't even want to guess how many

zillion gallons of different materials have passed through that gun. The results have always been acceptable to me so I'm not sure the difference in terms of final finish is as great as I see in terms of the evenness and fill of the fan patterns.

As we will see when we get to the next chapter on the performance of these five guns, clear favorites did emerge.



## How the guns perform in real world use

Over several days I shot test panels of different kinds of hard and soft woods along with baltic birch and oak plywood panels using all five guns, two different sealers, and three different top coats.

I did not shoot every possible combination with every gun but I did shoot enough of them to reach some definite conclusions, both about the guns and about the materials.

To test my opinions I also set up a focus group of people who had never used water based materials or HVLP systems before. They were made up of advanced amateurs and working professionals alike.

Following an hour or so of background explanation on the various water based materials, how the different guns work and how to adjust them, they were turned loose in the finish room with test panels they had individually prepared.

They shot different water based materials with different guns throughout the day. At the end of the day they rated each. I did not tell them ahead of time anything about the conclusions I had reached.

In most cases their consensus opinion was the same as mine, but one very major difference did emerge. I will note this and other differences as we proceed.

### ***All Do a Good Job***

Over all, this was the take away message for me. All of these systems, whether turbine or conversion gun, whether three stage or four, whether “true” HVLP or the

high transfer efficiency type, are capable of laying down an exceptional finish using the Target Coatings water based materials. Personal preference and previous experience enters into why one person likes one spray system better than other, but overall you just can't make much of a mistake no matter which system you select.

### ***Air Matters***

The first observation I would make is that air matters. The more air available for atomization the more controllable the fan and the better the resulting finish.

This played out most dramatically between the turbine systems. It did not matter whether I attached the Apollo or the Accuspray gun, the four stage turbine produced a superior result for me over the three stage turbine. That was not the consensus opinion of the focus group, however. The three stage and four stage systems were very closely ranked by them collectively with half rating the three stage turbine system either first or second.

One of the focus group members brought a new Fuji three stage turbine system so we wound up with two three stage and one four stage turbine for comparison by the focus group. I only used the Accuspray and Apollo units for my testing.

Most turbine manufacturers use the same turbines and motors and I did not have a four stage Accuspray turbine for comparison so I can't say if there is any real difference between manufacturers, only that the four stage unit did a better job than the three stage unit in my hands.

I did put both the Apollo and the Accuspray guns on the three stage Accuspray turbine as well. The performance of both fell off observably for me from what they did when attached to the four stage turbine. But, as noted, the focus group did not reflect that in their preference rankings.

In both cases I found the Apollo gun produced better results than the Accuspray gun. Remember that I have owned and used the Accuspray gun longer and always found the results to be acceptable, but I was really impressed with the results from the Apollo gun across all the finish materials.

It is my choice for the turbine guns and was also slightly the choice of the focus group.

The Apollo gun does have significant drawbacks on paper relative to the Accuspray gun. First of all, it is a "bleeder gun." That means air is passing through the air cap all the time whether you have pulled the trigger to allow finish material to enter the air stream or not.

The Accuspray gun is a non-bleeder gun which means that air only passes through the air cap when the trigger is pulled. When the trigger is not pulled a valve inside the turbine unit itself releases the pressure so as not to over tax the turbine or motor units.

A gun that passes air through the air cap all the time should be a real bummer as it portends the possibility of blowing dust and gunk all over your freshly sprayed work pieces. In actual practice, it turned out not to be the issue I thought it would be.

I did connect the Apollo turbine to a remote control so I could switch it off easily whenever I needed to, but the bleeder issue did not rise to the level of importance where it mattered much anyway.

The second paper disadvantage of the Apollo gun over the Accuspray gun is in fan control. Remember from the earlier pictures that the Accuspray gun allows continuous control over both the shape and size of the fan no matter what the orientation of the fan pattern. The Apollo gun only allows you to select flat or conical fan shapes by rotating the air cap while you can alter the size of the fan via the air valve on the gun body.

Again, in the real world this proved not to be much of a difference, at least to me. The Apollo gun simply performed better in my hands than my old trusty Accuspray gun.

Back to the "air matters" point. When using the three conversion guns (two HVLP and one HTE) again the gun which worked at higher pressures and more air flow - the HTE gun - produced better results for me. But, that was not the conclusion reached by the focus group members. They collectively ranked the HTE gun lower than I did and generally preferred the HVLP gun to the HTE gun.

The difference I observed was not dramatic but it was a difference I could observe across the board with the different finish materials. The fact that I saw that difference and found it mattered and the focus group collectively did not indicate, I think, a difference in our respective experiences with spray on finishes. The focus group members for the most part had little spray experience and none with HVLP.

The difference in performance I observed between the HVLP gun and the HTE gun has a lot to do with the very different fan pattern created by the HTE gun. The fan was rounder, softer and fuller no matter which material I was spraying. Even when I dialed the fan size way down, this rounder pattern remained.



The round, soft and full fan pattern produced by the Asturo HTE conversion gun produced outstanding finish results with all the different finish materials. The Asturo HVLP gun fan pattern, shown below is sharper edged and somewhat harder, but also produced very nice results.



In spraying the various test panels and the furniture pieces I finished as part of

the tests for this manual, that soft pattern laid down a consistently even film with less wetting of the overlap areas than I experienced with the HVLP conversion gun.

The Apollo gun shown below produced a sharp fan that was also well filled in the center. It looks lighter in this photo because I had the fluid delivery turned way down. While it looked less well controlled coming off the nozzle, by the time the material reached the work piece the results were only a shade behind the Asturo HTE gun, about



even with the Asturo HVLP gun and better than the Accuspray gun.

The Apollo gun is the only one that does not require changing air caps when you change nozzle and needle sets. All the others provide recommendations on matching the air cap nozzle and needle sets.

What I found is that by changing the Accuspray gun to a larger air cap than the factory recommends for a given material viscosity, nozzle and needle size, the resulting finish improved noticeably. While I don't know it for a fact, I speculate that this again relates to the "air matters" point as the larger air

cap flows more of the available air than the smaller one does.

I did not find the same thing true with the other guns. With those, I would stay with the recommended air cap sizes for each nozzle and needle set.

***Bottom line, by my subjective opinion the guns finished in order of Asturo HTE, Apollo turbine, Asturo HVLP, Accuspray turbine. The collective opinion of the focus group had the guns finishing in the order Asturo HVLP, Apollo turbine, Accuspray turbine (nearly tied) and Asturo HTE.***

I found a significant preference for the gravity feed guns over the pressure pot guns. Because of the very short fluid pathway, shown by the arrow in the picture to the right, they are faster and easier to clean. You can just unscrew the top from the fluid cup above the gun and empty remaining material right back into its container. Then do a simple water rinse of the cup while it is still on the gun and let water flow through the fluid chamber and out the nozzle either with or without the air hose attached.

Now just filter in the next material, do a quick spray to clear the water out of the nozzle chamber, and you are ready to shoot again. Changing from one material to another couldn't get much easier than this.

The finish material flows by gravity down into the nozzle chamber and out the nozzle when the trigger is pulled. There it is

mixed with the atomizing air and delivered to the work piece.

You can unscrew the cup from the gun to thoroughly clean it when you need to. A short brush makes scrubbing the inside of the short fluid path a simple chore you only need to do once in a while.

Water based materials do not set up in the gun so you do not need to clean the gun until you are through shooting for the day. That really saves a lot of time.

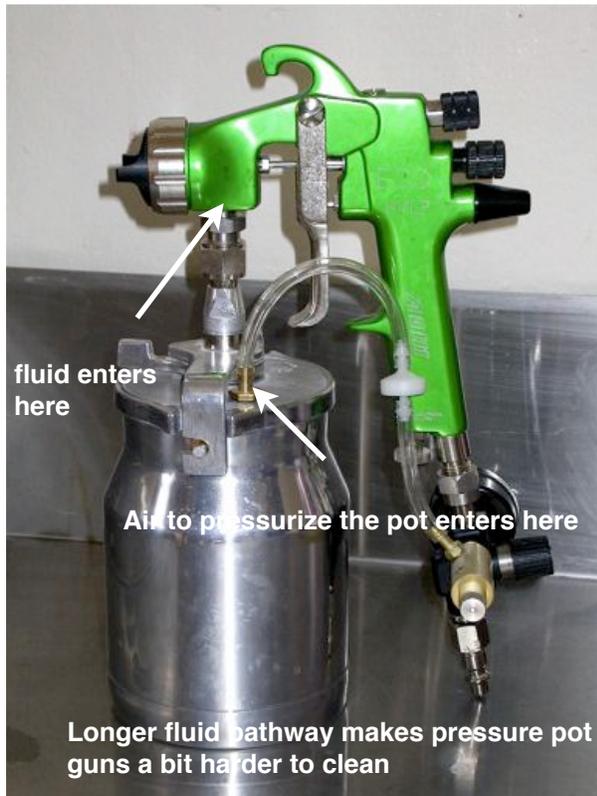
Most of these water based materials will set up fast enough on the work piece to



re-coat after only 20 to 30 minutes so it is common to do all of your finishing on a project in just part of one day.

I also found the gravity feed guns more comfortable to use. They only can be

used for horizontal or vertical surfaces and obviously can't be used upside down or tilted too far over as the lid on the jar is vented to the atmosphere so finish materials could leak out that vent if the gun is inverted too far.



The pressure pot guns are also easy to clean, just not as easy as the gravity feed guns. From the picture above you can see that the fluid is contained in the cup below the gun and the cup is pressurized by the incoming air stream. In the case of this Asturo gun the pressure tube leads from a pressure controller screwed to the inlet port on the end of the handle.

In both the Accurspray and the Apollo turbine guns, pot pressure is taken from a port on the side of the gun itself, a more convenient location than the add on used by Asturo, although the Asturo system

does allow the user to adjust pot pressure which the others do not.

When the trigger is pulled the finish material is forced by the pressure in the cup up through a tube inside the cup and into the bottom of the gun. From there it enters the nozzle chamber where the pressure in the pot forces it into the air stream. There it is atomized and delivered to the work piece.

With a longer fluid path there is more cleaning to be done with these guns.

You first remove the air hose and then remove the pressure pot and empty its contents back into the finish material container. Next you rinse the pot well. To clear the material out of the pickup tube and the nozzle chamber you can refill the pot with water, reconnect the air hose and spray the water through the chamber until all the finish material is rinsed out.

You can also remove the air cap and nozzle, invert the gun under a faucet with the pickup tube aligned with the water coming out of the faucet and that will usually flow enough water to flush out the nozzle chamber. Often a brush will be required to really clean the inside of the pick up tube.

So, while the pressure pot guns are not hard to clean, they do take longer to clean than the gravity feed guns.

### ***Comments about each gun***

In the rest of this chapter I will record my notes on each gun in terms of several criteria. The comments do not lend themselves to an easy table presentation, so just follow along with the narrative to get more detail on my impressions of each.

## ***Accuspray Turbine Pressure Pot Gun.***

As I said earlier, I have owned this system longer and used it far more than the others so I was surprised when it turned up at the bottom of my subjective ratings.



At the same time, I guess I was not surprised to see it finish higher in the rankings by the focus group members. I have used this system with great success and been pleased with its performance so my guess is the focus group members saw the same virtues that drew me to this system in the first place. It is much quieter than the Apollo turbine and about the same or perhaps even a bit quieter than the Fuji three stage turbine as well. That, and the nice packaging will make it an appealing choice for many.

The Accuspray and Fuji turbines can be in the same room with you while you work. The same cannot be said about the Apollo unit as it emits a high frequency whine that is really annoying up close.

For me, the Accuspray gun did not quite lay down as nice a finish as the other guns and is not quite as convenient to use or to clean, both of which moved it down in my rankings. It also looks a bit older in design to me if that means anything.

The pot is pressurized via a port in the side of the handle where the pressure tube is well out of the way. This is the only one of the pressure pot guns that uses a screw-on rather than cam action attachment of the cup to the gun. It has worked well over the years, never leaked and is easy to unscrew. It just takes a bit longer than the cam action attachments on the other two PP guns.

Even when attached to the four stage turbine it does not seem to deliver as much air at the air cap as the Apollo gun does, at least with the factory recommended #5 air cap.

Change to the #7 air cap and that difference subjectively goes away. The finish quality also improves noticeably. If I had been testing this gun with the #7 air cap instead of the factory recommended #5 air cap, it would have scored higher. The focus group used it with the #7 air cap and that might well explain the difference in how they ranked it vs. my rankings which were with the #5 air cap.

I found the fan a bit harder to control than with the Asturo guns or with the Apollo gun. It does offer continuous control from

conical fan to flat fan, but it took more fiddling on my part to get the fan I was after.

As stated earlier, the fan is much better with the #7 air cap than with the #5. The fan pattern with either of these air caps seems wetter on the outer edges and a bit thin in the middle to me. I found this confirmed in the shooting tests as I tended to puddle more at the overlap with this gun than with the others.

This was not the case with one focus group member who commented that for him it produced the most even spray pattern of all the guns.

I did not find the trigger to be as linear as with the other guns. There is less material flow at the beginning of the trigger movement than towards the end. It is not hard to control at all, just different.

This gun is a bit easier to clean than the Apollo gun simply because the supplied nozzle wrench is easier and faster to mate to the nozzle. With this gun I found myself removing the nozzle with every cleaning. With the Apollo I didn't remove the nozzle as often.

Over all I can see why I have liked this gun for as long as I have used it since with practice it is capable of delivering a very nice finish. It also seems to me to leave the least over spray of all the guns, but that is really hard to measure.

I think it suffers mostly from the factory recommended #5 instead of a #7 air cap and likely also a lack of air coming from its three stage turbine as opposed to the Apollo's four stage turbine so it seems to me to be more sensitive to viscosity than the other guns.

I would like to have had a four stage Accuspray turbine to use with this gun as I think that would have made a big difference.

### **Asturo Pressure Pot HVLP Gun.**



I had a hard time warming up to this gun. I found the add on pot pressure contraption awkward even though it does allow individual control over pressure in the pot. I suppose there is an advantage to being able to control the amount of pot pressure which you can do with this gun but not with either of the other two PP guns, but I was not able to really explore this in these tests.

As a side note, the pressure pot and lid supplied with this gun (shown above) simply would not seal properly no matter what I tried. I'm sure this is an issue with

this particular pot and lid and not with the design. To make these tests I had to install the cup and lid off of the Apollo gun on the Asturo HVLP gun.

With a properly sealing pot and lid attached, the performance was very good, a bit ahead of the Accuspray and a bit behind the others. I thought it should have been identical with the Asturo gravity feed HVLP gun since they both use the same air cap, needle and nozzle sets, but I just did not think it laid quite as smooth a finish. Maybe more fiddling with the pot pressure would have improved things a bit.

Not surprisingly the fan pattern and ease of control is the same as the gravity feed HVLP gun. The trigger is just as linear and easy to control as well.

Cleaning is on a par with the other PP guns, a bit more difficult than with the gravity feed guns.

### **Asturo Gravity Feed HVLP Gun.**

This one I liked a lot. Like all the Asturo guns it is finished like a fine watch or a nice piece of metal sculpture. It just feels so good in your hands. It is light, smooth in all its functions, and the ergonomics really work for my hands. The air fan control and the fluid material flow control knobs are easy to turn and stay where you put them. Like the other As-

turo guns, they have convenient markings so you can make fine adjustments even while you spray.

The trigger is very linear and has a light feel that is not tiring to your hands and the finish it leaves is really nice. I judged the Asturo HTE and the Apollo to leave an even better finish, but, if I had not been working with them side by side, I would be hard pressed to call a clear "winner" in this regard.

I said earlier in this chapter just how easy the gravity feed guns are to clean, and I'm sure that biases my opinion in terms of all the other aspects I like about this gun. Everything is well made, well machined, and there are no sharp edges or other perturbances to interfere with a really nice user experience.



The conversion guns did not appear to use a great deal of air. My compressor is only a standard four HP 220 volt cast iron single stage unit with a 20 gallon horizontal tank. It cycled on and off in use a bit but nothing excessive. I think I could use these conversion guns all day long and not over tax this small compressor.

Rated out put on

this compressor is 11.6 cfm at 40 psi and 9.3 cfm at 90 psi. The unit is several years old so I don't know how closely it performs to those specs now, but it had no problem keeping up with any of the three conversion guns.

If you are thinking of buying a compressor to drive an HVLP conversion gun, I would not recommend any of the pancake or small tank units designed for powering air guns. I think they would cycle way too often and could leave you starved for air if you were doing a lot of spraying.

I also have reservations about the oil-less units in this kind of an application for much the same reasons. As we discussed earlier, an adequate supply of air at the air cap is all important to good finishes with HVLP equipment and you don't want your compressor to be the weak link if you elect to go the conversion gun route.

### **Apollo Turbine Pressure Pot Gun.**

If there was a big surprise for me in these tests, it was the performance of this four stage Apollo turbine and gun. I was immediately put off a bit by the fact that it is a bleeder gun - that is, air passes through the air cap all the time whether you are spraying material or not. That seemed to me to signal an older or less sophisticated design. But, that was not the case at all. The bleeder issue was a non-issue. The remote start-stop I added meant that I seldom had air blowing when I didn't want it. It might be more of an issue if you had

to be walking back and forth to the turbine to turn it on and off.

The four stage turbine puts out a lot of air, palpably more than the three stage Accuspray unit. It is a stainless steel unit with two large external filters (one front, shown, and another just like it on the back) that are easily serviced. Spraying water based materials results in lots of fine white powdery dust since what over spray there is dries so quickly that it simply falls to the floor as this fine dust. So, ease of cleaning the incoming air filters is a significant feature and the Apollo approach is very good indeed.



The trade off is, ***this sucker is loud.*** Where a compressor emits a low frequency pounding sound, this Apollo turbine emits a high frequency whine that would be hard to live with if it was in the same room where you were spraying.

The good news is they provide a long air hose with nice machined brass quick disconnects that let you put the turbine in another room, pass the hose through a hole in the wall, and keep the most damaging and annoying high frequency sounds away from your ears.

If you can't get the turbine out of where you intend to spray, plan on using ear plugs.

The Accuspray and Fuji units are in an acoustically designed case that seems to do a good job of trapping the turbine whine. The Accuspray unit is on wheels for ease of moving it about and has on board storage for the extra nozzles, needle tips and air caps. The Fuji unit, like the Apollo, requires you to pick it up by a top handle in order to move it about.

In my finish room I have a compressor locker at one end. It is a closet-like structure that houses various compressors and was ideal for also housing the Apollo four stage turbine unit. Once in there, the noise was no longer an issue.

If you plan to work at a site with these turbine units where other people might be around, I would recommend looking strongly at the Accuspray four stage turbine, the Fuji Quiet turbine, or one of the other sound shielded units for their superior sound suppression features.

Now, for all this talk about the turbine, lets look at the Apollo gun itself and why it scored so highly in these subjective ratings both in my rankings and in those of the focus group.

First, it is a beautifully designed, cast and machined item. The aluminum alloy castings are smooth and the obvious result of quality molds and pressure molding proc-

esses. All of the fittings are machined brass inserts that fit well, feel silky smooth, and perform exceptionally well.

The lack of a full fan control seemed at first to be a drawback. In use, it did not matter. Remember that the Apollo gun changes from either a conical fan to a flat fan by turning the air cap. There is no in between, but I did not encounter any occasion where I wanted or needed more fan shape control than I could get with this gun. The fan size control is really good - nice and linear, and the fan itself seemed to be exceptionally smooth and even all the way across. Additionally, it seems to be a soft fan that transfers most of the material to the work piece.

The finish result is first rate, well ahead of all the others in my testing except perhaps the Asturo HTE gun with which I would rate it a tie or maybe just a bit behind. All of the materials flowed out evenly and well coming off of this gun. If this were a gravity feed gun I would be hard pressed to call a favorite relative to the Asturo HTE.

But, it is a pressure pot gun and clean up, while simple, is not as fast and easy as with the gravity feed guns. The small and flexible air hose supplied with the Apollo gun makes it easy to maneuver and handle. I like it better than the larger, bulkier hose used by Accuspray.

## **Asturo Gravity Feed HTE Gun**

Pictured on the next page, this proved to be my favorite. While it appears to leave noticeably more over spray in the air than the other guns, strangely it also seems to use less material. I can't explain this in any way other than the fact that the rounder, softer, very even fan created by



have made it more difficult to maneuver than the Apollo turbine gun with its equal finish quality, but that just didn't seem to be the case.

This gun is not technically an HVLP gun in that it uses more than 10 psi at the air cap to work its magic. So, if you are in a situation where you must have HVLP for regulatory or other reasons then reach for the Apollo or the Asturo gravity feed HVLP gun.

***If you don't have to have true HVLP and already have a compressor, reach for Asturo HTE gun. No compressor or need portability? Go with the turbine units.***

this gun may well do a better job of atomizing the finish material in the first place. As soft as it is, it just may hit the surface of the work piece with less thrust but lose a bit more of the very fine atomized particles in the air along the way.

Like the other Asturo guns this one is a piece of art in your hands. It is light, responsive, easy to adjust, easy to maneuver, and just simply easy to like. Add to these visceral issues the fact that it tied for the best finish and is the easiest to clean and it becomes the winner in this comparison, at least for me. However, you need to keep in mind that the focus group ranked this gun much lower than I did.

During these test sequences I built and finished several pieces of furniture for clients. I most often found myself reaching for the Asturo HTE gun to do so. I have it hooked to a large air hose which should

## ***Performance of the Finish Materials Themselves***

In this manual we have only looked at certain Target Coatings finish materials. We covered the characteristics of the 1000 series ultima spray lacquers, the 3000 series shellac sealer, the EmTech 8000 series conversion varnish, and the 9000 and 9300 series urethanes in an earlier chapter.

There are several materials which we did not cover such as the 7500 series brushing varnishes or the 7000 series hybrid varnishes or the EM6000 series production lacquers as I think most small furniture makers would find the ones we did cover more suitable for their use.

In the finish room there were no surprises. No matter which material you select, prep the work piece as described earlier, use the spray system and gun you like the best, and you will get an outstanding finish result, likely better than any finish you have obtained in the past.

When I started these tests I expected this chapter to be one of the longest in this manual because I expected interaction effects, that is, I thought some finishes would lay down better with some guns than others. That proved not to be the case.

I already had enough experience with water based materials to know that there are not great differences in appearance, one material over another, so that was not a surprise. What differences there are I will cover in a moment.

But, back to the lack of gun/material interaction effects. It did not seem to matter either to me, or to the collective opin-

ions of the focus group participants, which material was used with which gun.

With proper technique and fresh material, right off of the gun the surfaces are smooth and clear. The only blemishes are from dust that might have settled on the still wet surface. Those come off easily with a light sanding with the Abralon material we will cover in the next chapter, or with the use of soft (white) scrubbing pads like those sold by 3M and others.

No matter which of these HVLP or HTE guns you select, you will not be disappointed in the finish with any of these materials. Choose the materials based on what you are trying to achieve and enjoy all the many benefits from water based finish materials.

In terms of appearance, in general the conversion varnish produces the softest looking finish to my eye. It flows out really well and bridges a bit better than the others. This is a handsome finish for most applications. It does not burn in between coats the way the Oxford Ultima lacquer will so you do need to be careful not to sand through the previous coat, especially along the edges.

The varnish is half again as expensive as the lacquer so I like to combine the two as was discussed earlier.

The lacquer is the all-around finish of first choice for me for most applications. It is the least expensive of the materials we covered and it gives first rate results in nearly every application. It has a very clear presence on the wood and is very forgiving to use. In low glosses it looks a bit like non-build oil and wax style finishes. yet in higher glosses it can be buffed and polished to great effect.

The Ultraseal-WB Shellac Sealer and Barrier Coating is the problem solver. It brings out the grain in darker woods and prevents blotching in really soft woods. It is the universal barrier coat to separate whatever you need to separate from the other water based finishes. In the blonde color it doesn't amber lighter colored woods as much as alcohol based shellacs tend to do, and it is 100% wax free.

The two urethanes are best on surfaces where you want the ultimate buffed and polished look (think grand piano or high end guitar). We talked earlier about how they are very abrasion resistant and also stick tenaciously to well prepared surfaces that might be exposed to shrinking and swelling. From an appearance standpoint they look much like the other finishes in the flatter sheens but can take on a more artificial or plastic look unpolished in the higher glosses, at least to my eye. Polish them after they cure and the results will knock your sox off.

***My usage recommendations are:***

***1) use the shellac for a barrier coat, not a final finish.***

***2) use the sanding sealer to raise the grain and prep the wood for your build and top coats on most every project.***

***3) use the lacquer for your every day finish work for its coat-to-coat burn in characteristics. It works especially well for vertical and inside surfaces for most interior projects, and on horizontal surfaces that are not expected to be sub-***

***jected to water, household chemicals or heavy abrasion.***

***4) use the conversion varnish for most horizontal surface applications and for anything that will be exposed to UV, water, or chemicals, and for all your exterior projects.***

***5) use the urethanes for high wear surfaces or where you want to buff and polish to an extremely high gloss.***

***6) no matter which material you select, use gloss only as a build coat where you intend to top coat with satin or flat, or where you intend to buff and polish the surface to a high shine.***

This is a personal bias as I just do not like the gloss look by itself for fine furniture. It somehow looks artificial to me. Buff and polish it and it becomes one of my favorite finishes no matter which material you use. More on that in the last chapter.

## ***Finish Problems and What To Do About Them***

There are only a few finish problems that you are likely to encounter. These will be fisheyes or craters in the surface, or peeling of the surface especially along an edge, or a milkiness or blushing on darker woods, or a dry grainy look to the surface.

If you do encounter finish problems, suspect either contamination of the wood surface, out of date material, or something really wrong with your technique - or that you foolishly tried to overly "thin" these materials with water.

If you see ***craters or fish eyes*** then one of three things likely happened:

1) The finish material you used was nearing the end of its shelf life. These materials all have a definite shelf life. Target Coatings can tell you the expected shelf life for each. I recommend you date a can when you buy it and date it again when you first open it.

I'm not sure technically what happens at the end of shelf life, but it seems to me that most of these materials eventually begin to form coagulant particles that spit out the gun, land on the surface a bit like fine grit and then force the liquid material to flow around them leaving craters or fisheyes. If you are nearing the end of the shelf life with a can of material, spray a test panel and examine the results before you spray your just completed piece of furniture. If the test panel shows craters or fish eyes, toss the material as it has likely exceeded its shelf life.

If you insist on shooting it anyway (we all are overly frugal, right?), then plan on lots

of post-shoot sanding, buffing, and polishing work to get rid of them.

2) The work piece was contaminated with oil or stearates from use of the wrong sand paper. Oil and water just don't normally mix well.

There are ways of producing oil dispersed in a water based material the way Target does with its line of Ultima-WR Stains, what they call "a water-reducible linseed oil stain system." But, other than that, if you have oil on your work piece, neither the EM 8800 Universal Sealer nor any of the other top coat products will adhere very well to those oily spots. If the oil is dry you may be able to top coat it with the water based shellac sealer and barrier coat, but always run tests first to see if it will seal well enough to allow the top coats to adhere properly.

Sometimes you can let the coat dry for an hour or more and then wipe the surface with a clean cloth wetted with lacquer thinner or acetone. Don't let these stand on the surface for very long, just use them to try to remove the contaminants. Sometimes this works and sometimes it doesn't, but it is worth a try.

The best bet is to get rid of these contaminants before you lay down the water based finish in the first place.

3) You sprayed the material on too thick or recoated too quickly. All of the water based materials need time to fully flow out.

The surface tension in these materials seems to me to be greater than for oil based finishes. As a result, the water based materials will tend to flow around grain pores and other surface imperfections rather than bridging over them the

way their volatile organic based cousins do.

If you spray on too thick a coat, especially with the early coats where the material flows around the cell openings in the wood surface, it can leave a build up on the perimeter which looks a bit like a crater. Sanding between coats can minimize this effect.

The more damaging issue from too wet a coat is that the material may dry unevenly top to bottom resulting in wrinkles or ridges. These are harder to sand out.

My experience is you are better off to put on too little per coat than too much. As your skill increases you will learn when and by how much to increase the thickness of each coat. In the beginning “less is more” is a good mantra.

If the finish **peels up or flakes off** then one of three things likely happened:

- 1) The surface was contaminated with oil or stearates from use of the wrong sand paper. Just as we discussed above you either need to clear the contaminate or seal it with the shellac barrier coat if you can.

- 2) You recoated too quickly. If the previous coat is not dry enough, especially on very resinous woods, re-coating too soon can cause adhesion problems.

- 3) You really did not thin out this stuff with a bunch of water, did you? Water will work as a viable “thinner” for some, but not all, of these materials. Some water can be added if it is pure and not contaminated with a bunch of other stuff, but too much is really “too much”. Ask before you over thin!

Knowing what happened is easier than figuring out what to do about it when it comes to adhesion problems. Seldom can you just clean up one bad area and re-shoot that spot with success. In most cases you will need to sand the whole panel down to bare wood and start the finish process all over again. If you used the lacquer, you have a chance of doing a spot repair since it will burn in. If you used one of the urethanes or the conversion varnish, you almost never can do a successful spot repair.

If the finish looks **milky or blushed** don't worry, that condition will most always go away within a few hours to a few days. This usually occurs when the coats were a bit too wet or recoated a bit too soon, or both. It occurs mostly on darker woods. A barrier coat of the water based shellac does wonders for bringing out the grain and minimizing this effect on dark colored woods.

If the finish looks **grainy or leathery** rather than really smooth, it is most likely because you held the gun too far away from the surface of the work piece. If you are too far away, the water based materials will tend to dry a bit before they are deposited on the surface. This prevents the material from flowing out the way it should and can leave the surface looking grainy or with a rough leather like surface.

I noticed this with all the focus group participants and other “first timers.” They all start out holding the gun either too high or at an angle which means one side of the fan pattern must travel longer to hit the work surface than the other. Either one of these technique problems can cause the grainy or rough surface. Sand it flat and reshoot. It is that simple to correct.

## ***The Final Finishing Steps***

Most of the time the finish you obtain with these Target Coatings water based finishes right off of the gun will be outstanding for most parts of your piece. The very visible horizontal surfaces like table or chest tops usually warrant additional attention, however, as those are surfaces most often admired by your customers or friends.

With any water based finish be careful not to try to flatten the final surface too much or you will begin to bring out a gloss you may not want. This surface gloss occurs as a result of the light reflecting off of the smooth surface rather than being refracted by the flattening agents mixed into the material to produce the semi-gloss, satin or flat sheens.

The more the light is refracted, the lower the gloss appears to be. The more it is reflected off of the surface, the higher the gloss appears to be.

One good way to take off any dust or other minor surface irregularities is through the judicious use of a mesh material into which have been imbedded silicon carbide and other man made abrasives. These mesh like materials often are adhered to a foam backing material to allow them to massage the surface without gouging.

One of the well know brands is a Mirka product called "Abralon". I use them from 500 up to 4000 grit. Most often I use them in 6" (150 mm) round pads that stick to the hook and loop backing on my random orbit and dual mode sanders.

Use a light touch, slow down the speed if your sander has variable speed, and

keep the sander moving. You are not trying to remove material from your finish, only to take off and dust or other spots that leave it less than perfect.

Start with the finest (highest number) Abralon pad you have and see if it removes these dust spots. If not, move to the next courser pad and see if it removes them. Once you find a grit that takes these dust spots off, then progress to the next finer grit. Be mindful of the gloss you are building up. You can quickly take a satin or flat finish to a higher gloss than you may want.

If you do get too much gloss for the look you are after, you can soften it by using the next courser Abralon pad, or by rubbing it with fine steel wool, or by applying a wax like Briwax. While the wax imparts a shine, it is a soft shine that most associate with a desirable patina so they don't think of the surface as "shiny" only "silky."

Never use steel wool between coats with water based finishes. Microscopic particles of steel left behind will rust under the surface creating marks that cannot be removed. On darker woods they are harder to spot, but on light colored woods they will raise havoc with an otherwise perfect finish. It is OK to use the steel wool after the final coat has cured and, in the right hands, steel wool can impart a beautifully soft flat surface. Just be mindful that the steel wool is adding very fine scratches that cause light to refract rather than reflect off of the surface rendering the flatter look. If you over do it the surface simply looks scratched.

Another "trick" with the Abralon pads is to burnish raw wood. Sand up through the finest grit you have in sand paper and then progress up through the finest grit

you have in Abralon. If the wood has much natural resin, you will be amazed at the deep patina you can achieve. Of course, this burnished raw wood has no protection so that patina will be short lived if it is touched, but the effect is stunning. If you do want to protect it a bit, just use wax. Use three coats of a quality wax like Briwax and the patina will remain so long as the piece is not handled much.

Remember those loft kitchen counters we saw earlier? Well, here is a picture of the hood vent over the commercial range in that same kitchen getting its treatment of just Abralon and Briwax applied to the raw wood.

In this case I was trying to impart an old look to the South African Bloodwood that faced the vent hood all the way up to a 14' high ceiling as a foil for the very modern look and design of the cherry and blood wood kitchen cabinets and counter tops.

You can see the "old world" patina and sheen that was developed with just Abralon pads and Briwax.

On the other hand, if what you want is that incredible deep mirror like gloss of a grand piano or high end guitar, it is far easier to do than you might imagine.

These water based finishes are perfect surfaces to buff and polish. These products are similar in many respects to the clear coat on a modern automobile so the same buffing and polishing compounds



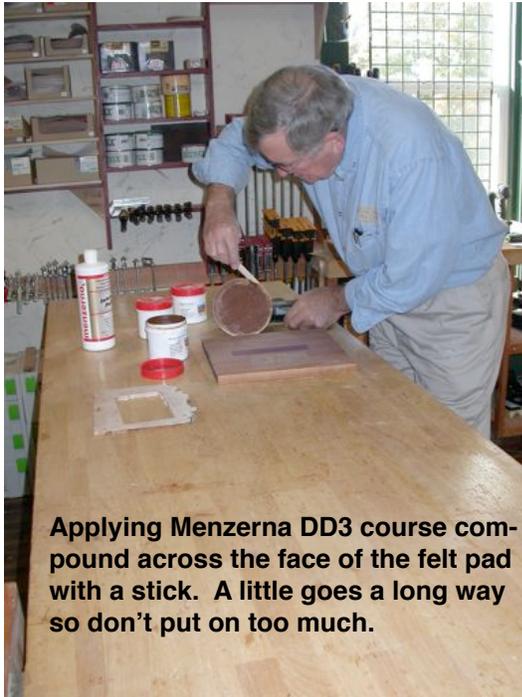
used on the car finish work just as well here also.

You can use any brand but the one I particularly like is made by a family owned German company called, "Menzerna." It is the largest supplier of polishes and compounds to Germany's automakers and is considered by many to be a world leader in abrasive and polishing technology.

Start by letting your finish cure for several days - a couple of weeks is even better, especially with the urethanes. Then, sand the finish perfectly flat with 400 grit paper. You do not want to sand through the finish, only to take out all of the surface irregularities. You want an even dull

look to the surface much like one seeks while “color sanding” or “block sanding” a car finish.

Once the surface is nice and flat and evenly dull, you can start the buffing and polishing process.



**Applying Menzerna DD3 course compound across the face of the felt pad with a stick. A little goes a long way so don't put on too much.**

I use my Festool RO150 dual mode sander with the rotary mode selected. It is really a rotary mode with a simultaneously rotating pivot point so the pad moves in a complex pattern a bit like the child's toy called a “spiograph” from years ago. I replace the backing pad with one specially designed for felt pads and sheepskin bonnets.

You can use any rotary buffer you wish as long as you can slow down the speed so as not to burn the finish with the rubbing compounds.

For this example I made up a test panel of Brazilian Cherry with inlays of both Maple Burl and Blood wood. We saw this

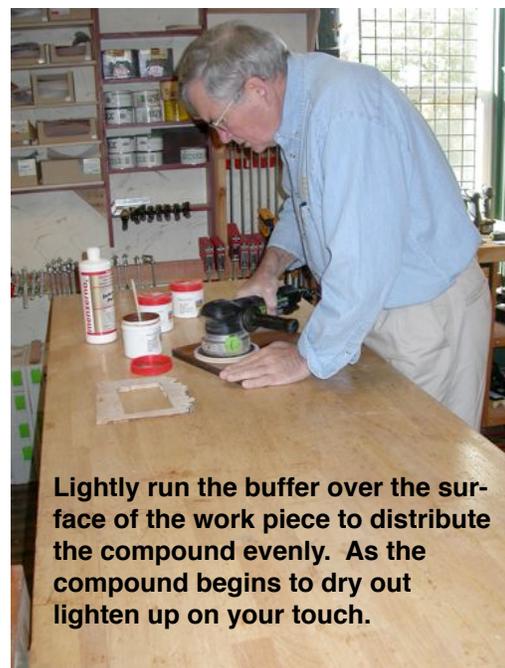
piece in one of the earlier photographs. In this sequence we will see it go from raw finish to a “jaw dropper” even though it is just a test panel.

In the photographs you can see the burl piece from which the burl inlay was cut. I put a clean felt pad on the buffer, then used a stick to evenly spread the first of three rubbing compounds we will use (photo left). All three and the final finish polish are shown on the table.

This one is the Menzerna DD3 Course Compound. It is very aggressive so you want to use a light touch and a slow speed. A little bit of compound evenly spread on your pad will go a long way.

The compound does all of its work just as the compound begins to dry out so initially all you are doing is spreading the compound evenly across the surface of the work piece.

As the compound begins to dry out the gloss will build very quickly. Lighten up



**Lightly run the buffer over the surface of the work piece to distribute the compound evenly. As the compound begins to dry out lighten up on your touch.**

even more and don't try to over work the surface. You have two more compounds to go to get the really deep gloss. Just use this one to take the even dullness left from your sanding to an even shine.

If you over work the piece at this point you risk burning the surface of the finish. You won't believe how fast you can build up heat with a compound like this. If you do burn the finish there is not much room for recovery. So, easy does it. Let the materials do the work for you.

Use a rag to wipe off any remaining compound.

Now, remove that felt pad and set it aside. Mount a new or clean felt pad to receive the next grit in the sequence. This one is called Menzerna 2L Paste.



Do the same thing as before - use a stick to spread it evenly over the surface of the felt pad. Then, with the buffer still set to a slow speed, evenly spread this grit over the work piece.

Again, use a light touch and let the grit begin to just dry out. At this point a really bright shine (photo above) will develop on the surface. Lift up on the buffer so you

are just lightly touching the surface and let this grit bring up the deep gloss.

The photo below left shows the gloss from just the first two grits. Notice that the gloss is even across both woods and the burl.

In this case the sample piece was finished with one coat of EM 8800 sealer and sanded up to 400. Then 2 coats of 1028 gloss lacquer were applied and the piece sanded again with 220 followed by 400. Then two top coats of 1028 gloss lacquer were applied and left to dry over night. The next day the piece was sanded flat with 400 and then again with 800 before the buffing you see here began.

It is now time for the final buffing compound, this one called Menzerna 16



Paste. Add a new or clean pad and spread the 16 paste lightly over the pad surface.

Work the buffer just as before with a light touch evenly disbursing the material across the surface, then wait for the compound to just begin to dry out. Lift weight off of the pad so the drying compound can work it's magic. Sit back and admire the final result - a beautiful deep glass like shine across all three woods.

The whole buffing process took less than ten minutes and I never did use the fourth step, what is called the "Menzerna Intensive Polish. It is a very white color and sometimes a bit of residual white can become imbedded in the grain imperfections when I elect not to do a complete fill or "tight" finish as on this piece.

If the finish calls for a complete fill, meaning none of the grain shows in the gloss at all, then I use the Intensive Polish to bring out the last bit of deep gloss.

## Conclusion

In this manual our objective was to explore ways you can improve the quality of your woodworking finishes without subjecting yourself or the environment to the assault from the volatile organic compounds present in most conventional finish products. Once you learn to use water based finish materials and apply them with High Volume Low Pressure spray equipment I doubt if you ever go back to those smelly volatile organics or messy wipe on stuff.

More importantly, I think you will not only wind up with a superior finish on your work, you will actually look forward to the finish process with anticipation instead of

thinking of it as a chore to be avoided. It will become the culmination of the creative process that drew you into woodworking in the first place.

Enjoy!



**Jerry Work designs and hand crafts fine furniture in the 1907 Masonic Temple building in historic Kerby, OR**