Build a Frame Press

An Affordable Vacuum Bag Alternative

There is an interesting and often over-looked convenience that comes from using a frame press for vacuum veneering and this idea has left me wanting to build one for years. It took a dozen drawings and nearly as many prototypes to finally come up with something that could be created in any woodworker's shop. The hours spent designing, building, and testing those prototypes has led to this frame press article. I hope it inspires you to build one and see how much easier vacuum pressing is with one in your shop.

For most of the projects in my frame press, I prefer to use breather mesh on top and my work bench as the bottom platen. The breather mesh on the project shown above is larger than the substrate so the sharp edges are protected from puncturing the polyurethane membrane. It's always a good idea to protect the polyurethane by using breather mesh or a rounded-edge top caul. A piece of 1/4" plywood can be used in place of breather mesh. Be sure to cut several shallow air channels across the top side of the plywood caul.

Benefits of a Frame Press

- Large projects can be pressed without assistance from a helper.
- Multiple small projects can be pressed at the same time (provided you prepare the projects quickly).
- With a frame press, there is little worry of shifting the veneer on the work piece which is a common nuisance using a traditional vacuum bag.
- This DIY frame press is easy and affordable to build.

Typical Uses

- Production wood veneering where efficiency of loading a project into a press is critical
- Photo mounting and graphic arts applications
- Forming musical instruments
- Veneering copper and other metals to various substrates

What You Need to Know Before Building

- In general, the larger you build your frame press, the greater the chance of perimeter leaks. Leaks are easily resolved but the bottom line is that a small frame press is much easier to seal than a large one.
- I highly recommend building a small "test" frame press before you build a large workhorse frame. This will give you a chance to use the frame press and see if it is suitable for the amount and type of veneering you do most often.
- This is one project that must be built within reasonable tolerances for flatness. Warped or unstable wood used for building this project will undoubtedly result in poor performance.
- There are several commercial frame presses on the market which use a dimensional shape membrane which allows the pressing of dimensional projects such as curved drawer fronts, curved doors, etc. The polyurethane used in this project will expand 4 times its width and length to accommodate some mildly curved projects without the need for an expensive dimensional membrane.

Materials List

This materials list is based on the reference frame size of 52" x 36" which is the size I used for the frame press in my shop. Keep in mind that even smaller projects will work inside a large frame press.

1. Table surface (melamine, or glossy laminate)
2. Maple lumber (preferably quartersawn)
3. Dry wall screws (1 ¼", coarse thread)
4. Silicone sealant
5. Yellow glue
6. Polyurethane sheeting (36" x 54")
7. Pipe Tap (1/8" NPT)
8. Brass tank adapter (1/8" NPT)
9. Vacuum gasket tape (82' roll) 1 roll is enough to make a 4'x6' frame press
10. Breather Mesh

Sizing Up the Frame Press and Building the Table
If you are considering this project, I'll assume you are capable of building a table with adequate support in the legs, frame, and table top surface. Before you begin building the table, you'll need to determine the size of your frame press. This project can be built to any size so plan to build yours according to the largest size project you can reasonably imagine building but not forgetting the amount of shop space that the frame press will consume.

Don't forget, even small projects will work inside a large frame press.

Use My Measurements as a Starting Point
In this project, I built a frame press which is 52" long and 36" wide. This is the outside measurement of the frame and is the size required for the table top surface. The inside measurement is 47" x 31" and this allows me to press a flat panel as large as 46" x 30" which is the ideal size for most of the veneered projects I build. Additionally, this allowed me to build a frame press by using only 1 yard of polyurethane sheeting/film.

Design your table to accommodate an appropriately sized frame. Be sure to add 6 inches to the length and width of the proposed project size to allow room for the frame part of the press. See the table below for an example.

Steps	**My Example**
Plan out the size of your largest flat panel project:	46" x 30"
Add 6" to this length and width:	+6 +6
This is the size of the table top surface:	52" x 36"

Build the Table
I have an out-feed table on my table saw that has a large top covered with a plastic laminate. Since this top surface is smooth, non-porous, flat, and free of voids, it was perfect for use as the table part of my frame press. I understand that many woodworkers may not have an out-feed table like mine and this no problem.

1. Build the legs and frame of the table and add additional center supports if necessary to prevent any table top sagging. Consider building shelves under the frame so you have a place to store veneering supplies and your vacuum press. Several woodworkers have also suggested building the table on hinges so that it can be mounted to a wall and folded down when needed (to save floor space).

2. Build the table top from 2 pieces ¾" thick sheet material. It is critical that the table top surface is smooth, non-porous, and perfectly flat. If any of these requirements are not met, the project will not be a success. Melamine board is acceptable for this purpose but a better choice is MDF which after construction, is covered with a glossy plastic laminate.

Build the Frame
The frame is best made from hard maple lumber because it is relatively non-porous (it won't leak vacuum pressure through the pores) and it is dimensionally stable (it's less likely to warp).

1. Obtain 4/4 rough sawn maple and plane it down to ¾" in thickness.

2. Clean up one edge of the board on a jointer and then use a table saw to rip lengths of lumber that are 2 ½" wide.

3. There are numerous ways to join the boards together to make the frame. I opted for pocket holes but you could also use biscuits, tenons, or dowels to make the joint strong. Be certain that each board is flush with the next at the corners.

Keep This In Mind
When I prepared to assemble the boards for my frame, I found they had warped just a bit. So I assembled the frame with each of the 4 maple parts so that the bow was facing down. When finished, none of the corners were touching my workbench top. To remedy this, I simply use a clamp at each corner of the frame to force the frame to seal against the table when in use.

4. Once the joints are dry, sand the frame smooth on both sides.

5. Next use a router with a ¼" round-over bit to ease the inside edge of the frame. This will dramatically increase of the life of the polyurethane sheeting.

6. The maple lumber is mostly non-porous but under vacuum pressure, the microscopic pores that are present can allow leakage. To remedy this issue, mix 3 parts of yellow glue with 1 part water and apply this mixture with a paint brush to all sides of the frame (inside edge, outside edge, top, bottom, ends). When the glue "sealant" dries, lightly sand the frame with very fine sand paper and apply one additional coat of sealant.

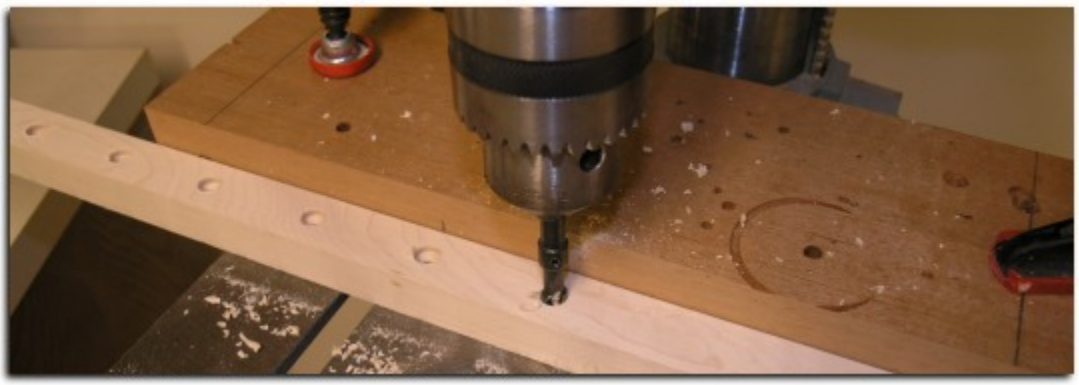
   It has been suggested that shellac may have similar sealing capabilities but I have not tested this.

7. Set the frame on your workbench so that the top side of the frame is visible. Use a pencil to mark a straight line across each of the 4 frame pieces that is 1/2" from the inside edge of the frame.

8. Apply vacuum gasket tape along the pencil line from the previous step. The tape should be applied as straight as possible. Note that the tape is applied on the side of the line closest to the outside edge of the frame. The purpose of this tape is two-fold. It creates an air-tight seal between the frame and the polyurethane film. Additionally, it softens the contact point between the polyurethane and the cleat to maximize the life of the polyurethane. Note that the vacuum gasket tape used in this step is comprised of four pieces (one for each side of the frame).

9. At this point, you'll need to make wooden "cleats" which will hold the polyurethane sheeting in place over the frame. Using ¾" thick lumber, cut 4 strips of wood that are 1" wide. They should be long enough to go around the frame using only 4 pieces. In the example above there would be two each of approximately 52" and 36".

10. Now drill pilot holes (preferably with a countersinking bit) with a 9/64" drill bit every 2" along the center of all four cleats.Remember to drill into the face that is 1" wide (not ¾" thick).



11. Set each cleat on the frame so that half of the vacuum gasket tape is covered by the cleat and cut the cleats so that they fit the frame accordingly.

12. Drill pilot holes into the frame using the hole in the cleats as a guide. Be very careful that you do not drill the pilot holes completely through the frame. It may be beneficial at this point to write an indexing number on the frame sides and each cleat so the holes line up perfect when you are ready to assemble this part.

13. The next step is to drill a hole in the frame for the vacuum to flow through. We will call this the "vacuum port". Select an area of the frame that works best for you to attach the lock-on connector from your vacuum press.

    Do not drill the vacuum port directly under any of the pilot holes from the previous step.

    Using an 11/32" bit, drill in from the outside edge of the frame and stop when the bit is approximately ¾" deep. Now use a 3/16" drill bit to complete the hole so that there is a straight path for the air to flow from the outside of the frame to the inside.

14. Use a pipe tap (1/8" NPT) to create threads in the maple. Go slowly and exercise caution during this step to avoid over-cutting the threads. Turn the tap into the hole until about half of the tap is showing. Remove the tap and test the tank adapter fitting. If it is too snug, re-chase the threads by turning the tap in a little further.

15. Use a brush or pipe cleaner to get the glue sealant down into the vacuum port hole. When it dries, apply a second coat so that the entire inside surface of the port has been sealed from the outside edge to the inside edge.

16. With a chisel, cut a channel approximately 1/8" deep from the inside frame vacuum port hole down to the bottom edge of the frame. This will allow a path of vacuum flow if the polyurethane sheeting pulls up against the inside edge of the frame.

17. Next, cut a single piece of polyurethane film that is as large as the frame.

18. Lay the polyurethane film over the frame loosely and attach one of the cleats to the frame with drywall screws. It's preferable to start with one of the long sides (if one exists). Attach the cleat to the frame with drywall screws by starting at one end and working your way towards the opposite side.

19. The next cleat that is attached should be the one that is on the opposite side of the frame. At this time you may need a helper who can hold the polyurethane snug but not tight while you attach the second cleat. Even a light amount of slack is acceptable. Again, use drywall screws to completely attach the cleat to the frame.

20. Select one of the remaining sides and attach the cleat. For the final side of the frame ask your helper again to hold the polyurethane film snug while you attach the last cleat.

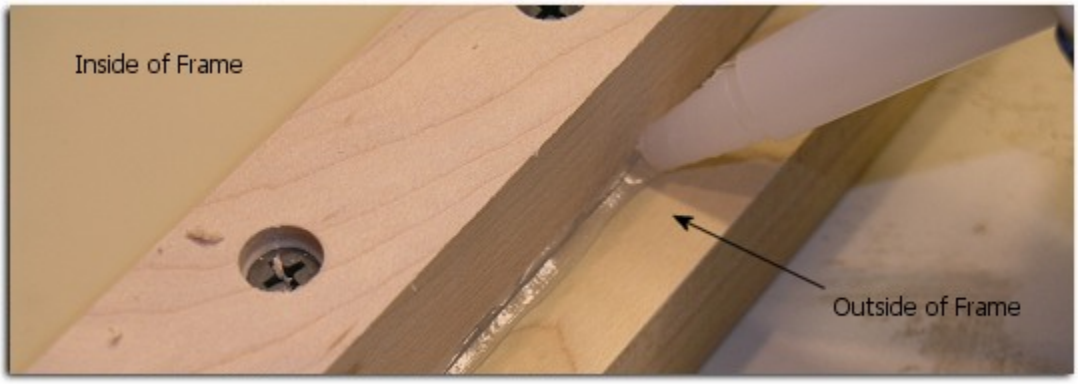
21. With a sharp razor knife, cut off any extra polyurethane that is on the outside of the cleat. It is very important to trim the excess as close to the cleat as possible.

22. Flip the frame over and you can now apply the vacuum gasket tape to the sealing side (bottom side) of the frame. Simply apply one “track" of sealing tape around the frame close to the inside as shown in the picture. Try to do this in one piece. The tape is very flexible when the paper backing is removed and it will easily go around corners. On the straight parts of the track, do not stretch the gasket tape. It is easy to avoid stretching the tape if you leave the paper backing attached until you get to the corners.

    The vacuum gasket tape offered at VeneerSupplies.com is a bit different than ordinary weather-stripping found at most hardware stores. The most important difference is that the vacuum gasket tape will return its original thickness after pressure is removed from the system. Weather-stripping generally will not return to its original thickness.

23. A second track of gasket tape can now be applied to the outer edge of the frame bottom. Follow the instructions from the previous step to apply the tape keeping in mind the comments above about the corners and stretching the tape.

24. Return the frame to its normal use position (with the top face of the frame upward). Apply a bead of silicone caulk to the outer edge of the 4 cleats and smooth it down with your finger or a smoothing tool. The bead of silicone is the secondary defense against leaks.



25. Apply a small amount of silicon to the threads on the brass tank fitting and attach it to the frame. It should be tight but be cautious that it is not so tight that it strips out the wood threads on the
frame.

26. Allow the silicone to cure overnight. When the silicone has cured, you can use the frame press.

Getting Started with the Frame Press
To use the frame press, prepare your substrate with glue and apply the veneer. Set the panel in the center of the table and lay a piece of breather mesh over the project so that the entire project is covered. The polyurethane film is self-sealing against the frame press table surface so you'll need to make certain that at least some part of the breather mesh extends out to within a half inch of the inside of the frame. If not, the vacuum will pull down and seal the polyurethane against the table surface and leave a bubble of lower pressure on the veneer panel.

If your frame lays perfectly flat on your table top, it should pull down against the table and seal shut. For some, this may not happen and 4 or more clamps will be need to force the frame to seal off. By designing the frame with the bowed ends up (when applicable), you'll only need a clamp at each corner of the frame. Larger frames may require a clamp or two between each corner.

When the frame is ready for vacuum, attach the lock-on connector from your vacuum press to the brass fitting on the frame press. Turn the vacuum press on and watch the gauge needle. In a moment, the needle should begin moving as vacuum pressure is created inside the press.

Storage
When not in use, store the frame part of the press carefully so as to avoid warping. If you built a dedicated table for your frame, simply store the frame on top of the table (without any clamps attached). Otherwise, consider storing the frame by hanging it on a wall. Do not lean the frame against the wall or it will surely warp.

Be sure to keep the gasket tape on the bottom face of the frame clean. The table top surface should also be kept clear of debris.