

Building blocks for membrane pressing



by Bob Kory

Over the last 17 years of membrane pressing we have witnessed many changes in the market, and the process. However, even though many changes have taken place, the basics have not changed and I would like to share our experience by pointing out some of the important building blocks we have identified to achieve our goal of producing quality products.

Technology is progressive where it maintains and improves quality. With CNC technology, the auto tool change made repetitive changes for different profiles fast, once the initial set up

was done. This made more machine time available by reducing set up, still maintained quality, while improving delivery. Trimming and cleaning technology also speed up production, maintained quality and improved delivery times.

Another recent change is the automated pin system for presses and does away with the labour intensive need for pedestals. However, there are some compromises, only one predetermined pin height is available for all applications and the complimentary heat previously available from the bottom heater is restricted by the insulating effect of the layer of plastic pins, and finally overhead pressure may need to be reduced in the chamber to avoid pin damage or rupture.

The established manual pedestal on the other hand has the benefit of variable height to fine tune the variations in elasticity of heated foils for optimum draw. The problem here is that if the foil is drawn when too hot, has a higher tendency for shrink back due to the memory effect. Also

the manual pedestal can be individually matched to work piece dimensions avoiding rupture, particularly at high chamber pressure and is not hindered by a one for all grid system created by the rigid pin layout.

Heating the top surfaces of a part with a membrane is the easy part, however, the edges, where the stretching of the foil takes place needs extra heat and the bottom heated aluminium plate from the original press design is very effective to send the extra heat up directly in between the parts laid out on the press table, because it combines with the heat, which comes down with the membrane, meeting at the edges.

To achieve the same heating effect with a pin system may require compensating with higher overhead temperatures to send down to the edge. However, overheating the foil should be avoided because it may be responsible for sweating of the substrate chemical components, effect optimum elasticity and draw and ultimately service life, chamber pressures may also be compromised.

Unfortunately like any other endeavour where basics are ignored or corners are cut and a lack of experience or understanding is used as a management tool, a minefield can be created, the buyer should beware.

Like the representative of our first hot melt edgebander said prior to its installation "don't set up the machine near a doorway"? At the time it was puzzling, but the machine applies hot melt adhesive on a small surface area at around 180° C, and it can be detrimentally

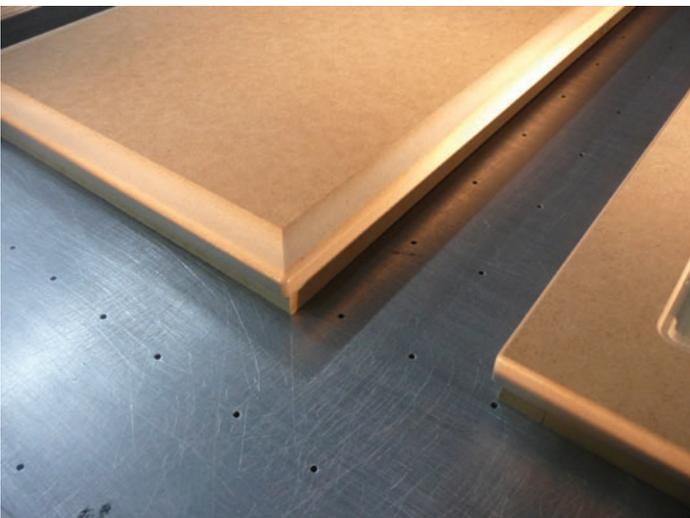
affected by drafts. Not only that, if the parts are too cold to start with, the chilling effect can also result in failure of the joint.

So you can imagine the vulnerability of the thermo laminating process, which requires a temperature that is tight, because the membrane press is challenged with the job of transferring heat evenly, across a large surface area into a relatively thin sheet of plastic so it can be thermo formed over many parts equally.

The process starts in the chamber, the membrane first accumulates heat, then a sequence of events takes place, which begins by transferring heat to the foil, after which it can be thermo formed by applying vacuum under the foil at around minus 1 Bar, to intimately conform to the shape of the work piece, which has been pre coated with adhesive. The parts now under the foil must have the correct amount of adhesive in the right condition, to be heated precisely across all edges, faces and profiles to initiate the bond.

This raises a dilemma, when finished product, from two different manufacturers is judged from the surface only there is no clue as to the quality of the product, because of all the possible variables it may have been exposed to. Worse still if a manufacturer's process is flawed and test procedures inadequate or not in place, potentially a kitchen lot or many parts can be released over time before detection.

Fortunately the local industry has finally matured and membrane pressing now has guidelines for minimum standards in Australia. A



Parts laid out on the "hot" aluminium table with the gap in between.



A programmable extra step is now available in the recipe called "One Touch" shown with heater lowered creating a flat membrane. When in cycle with a closed chamber, the foil is also held against the flat surface with vacuum until making contact with the work surface.

standard was introduced a number of years ago by some kitchen associations in Europe where the thermo laminating process was first established and recently in Australia by **ATLA** who represent some of the local industry.

There is still no "Australian Standard" that covers all the thermo laminating industry here. Conformance to the current ATLA guidelines is still voluntary and a work in progress for the moment. Promoting the industry into the future still remains the responsibility of reputable manufacturers in Australia who are quality driven.

For perfect application you need perfect temperature. Fluctuations of temperatures in some parts of Australia are worse than others, as can be seen daily in weather reports. Room temperature is easy to overlook, around 20° C is ideal. The process is intricate so maintaining a regular temperature from the start of the day to the end of the day or from one season to another is vital. We found it necessary to invest in an insulated, heated and cooled press room that contains everything, the parts, the

press and the application of adhesive. The result is the press settings hold for the task at hand. No running changes are made to the settings that interfere with the optimum settings, ensuring reliable long term results for customers.

A controlled environment is essential, then all the focus of the settings and cycle on the press are there to coordinate the warming of the chosen foil, (foils will vary in type and thickness) in preparation for thermo forming and thermo laminating to the substrate, all at the precise moment the adhesive is receptive. In the United States my colleagues referred to this as "nailing the foil". Finding the optimum point in the cycle is a matter of trial and error carried out in a test period that is set aside from operations. Otherwise you will end up with crisis management.

Regarding equipment, there are many types of presses on the market, but because set point temperature is such a critical issue in this intricate process along with overhead pressure for holding down the foil as tight as possible against the glue line during reactivation,

our preferred method is direct contact heating with a membrane in a pressure chamber capable of going up to 7 BAR. In the cycle the foil is inflated until it is up against the ceiling of the chamber against the membrane and heater, that narrows down the choice quite considerably.

Membrane presses have the huge advantage of offering 750% more heat accumulation (with a 3mm membrane) this maybe more expensive to run, because the membrane is a consumable, but it is invaluable to reactivate the glue line and form the bond which is after all our primary purpose. The membrane further reduces the risk of poor application, when compared against a membrane- less process.

The frustration caused by creases from the step in the cycle where the heated foil is dropped loosely on the top of the work pieces, encouraged the creation and installation of "**One Touch**". This patented world first technology allows us to lower the tensioned foil and membrane in our press while still against the rigid heating plate with the press sealed, conserving heat until it makes

contact with the work surface, avoiding creases, and has an ironing effect which further improves the finish. This also has the benefit of allowing us to press matching flat pressed full 8x4 sheets using the same adhesive and same foils with lower temperature and high pressure. Even veneers with wet or dry glue lines can be processed in the same press.

Chosen suppliers must have quality systems in place that compliment product reliability and warranty, this area covers heavy metal free, fade and stain resistance foil to name a few. The thickness of rigid thermo laminating vinyl offered out in the market may vary; thicker foils are obviously more expensive. Thermo foil when stretched over an object will thin, more so at the vulnerable corners and edges from the original thickness, so we have stuck with using nominal 0.4mm standard foils, show through is reduced, and durability is improved when compared against thinner foils.

Quality Gloss foil is 0.7mm thick because it achieves a better surface finish than thinner foils. However, it raises the



Brush sanding edges with Flex Trim in preparation for adhesive application.

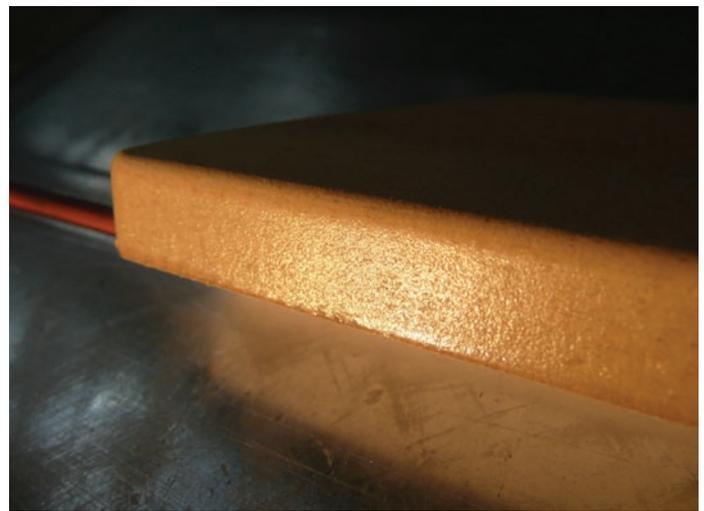
problem of the straightness of a cabinet door, out in the field. Basically one grade of substrate is available for all applications, but we have found it necessary to help develop and use different grades of board for different applications to maintain straightness in our process. Our quality system has been developed over many years in close liaison with our supplier. Our standard grade substrate is used for the 0.4mm foils and is single paper backed, but the dearer double paper backed substrate is used to counter act the shrinkage of the thicker gloss finishes after pressing and results in a balanced door.

Preparation sanding and cleaning is an essential step to create the ideal foundation for any coating. To further improve our quality we installed "state-of-the-art" brush sanding equipment and it is the most effective way to significantly reduce "grain raise" particularly on edges and profiles for preparation. This technology produces consistent results from the start of the day to the end of the day or week, improving quality in a fraction of the time, in an

otherwise labour intensive area. The improvement in surface smoothness can be felt and certainly is visible, resulting in a more even distribution of adhesive on the surfaces, greater surface contact with the foil, further enhancing the security of the end product.

Regarding the adhesive, we also have our preferred type based on tests and results since we first started. Storage is very important to ensure it remains in good condition during its shelf life. Pre-catalysed types have a critical window for activation, but adding the cross linker yourself is the more forgiving type regarding reactivation temperatures, however mixing must be thorough and once mixed must be used as soon as possible, timing is very important.

The absorbent substrate is also the ideal surface as an anchor for the wet adhesive. Manual spray application has the benefit of allowing extra coating where it is needed on the more porous areas like edges and various profiles, enhancing adhesion. In comparison pre coated foils will have thinner coatings for example where stretching has taken place and that are



An edge sealed with sprayed adhesive checked with reflective light.

the more porous areas like edges and profiles.

The best method is two separate coats with a flash off period in between, ensuring correct weight has been achieved without wicking which simply feeds adhesive deep into the core unnecessarily. When application is complete a check is as simple as looking at the reflection against a light source. Inadequate adhesive under the foil will cause failure of the joint. Timing is a critical element once the adhesive has been mixed or applied.

As with any process, rigorous maintenance and calibration is essential to make sure that the performance of the equipment is within the set tolerance. Some instruments are also essential to carry out the monitoring, like a non contact thermometer. A laboratory test oven in-house is also an invaluable asset, used during tests to separate the good results from the bad, so improvements can be made and verified. Regular batch testing to monitor results is also made possible with this equipment.

To achieve "Best Practice" don't let the path of least resistance take hold, it is

natural and applies here to the human element, and it can affect anyone, that's why it needs quality supervision. Documentation of each step of the process is invaluable for training, reflecting the best results. These system procedures are also invaluable for future training. Adequate time must be allocated to ensure training is thorough to ensure quality assurance is covered at each step.

A final building block is preventative maintenance, schedules are very important to maintain equipment performance, and should be based on usage to ensure the ongoing performance of equipment is within tolerance so the product is made within tolerance.

Reaching our 25th year at **Kory Dubay** in 2007 is one milestone, but we also have thermo laminated product in service originally membrane pressed 15 years ago, testament that where best practice for the intricate thermo laminating process is employed, membrane pressing finishes can stand the test of time. Our customers know they can rely on us to do our very best and a quality product is still the best marketing tool anyone could have. -S-



Brush sanding faces and profiles through the unique N, S, E & W sanding action of the Unisander.