Even bonding on edge bands

Hello, Mr. Shim!

I am a faithful reader of "Panels & Furniture Asia" and have recently taken charge of production in a furniture plant in the south of China. My company has two manual edge banding machines and use AS 223, hot-melt glue from Henkel, for our curved edge bonding. Recently, we have been having poor bonding issues. The PVC edge band that my company uses has a thickness of 1.0mm and a width of 20.0mm. De-bonding commonly occurs in curved areas. The bottom edge of the edge banding panels are often well bonded, however, edge banding gaps are found on the upper edge. On the straight edge banding machine, we often find that the glue lines are too thick and gaps (Figure 2) are also present. Some hot-melt glue even comes with the issue of stringing. How do we solve these problems? What advice do you have for operators?

Many thanks for your advice and best regards!

Mr. Lin from China

Hello, Mr. Lin!

Thank you for your letter. Based on the information you provided, as well as my observations on the site, I'd like to make the following analysis:

I. Analysis and solutions to problems in poor edge banding of curved edges when using a manual edge banding machine with 1.0mm PVC edge band

1. Poor quality of the substrate:

A low-density particleboard, inappropriate bonding strength, as well as stress in curved areas may all lead to poor bonding.

2. Precision of substrate processing:

Substrate processing quality directly affects the strength of edge bonding. When processing substrate, make sure the surface is smooth and that the processing edge is at right angle to the working table. If there are critical defects such as rough cutter marks, skipping marks, notches and non-right angles, the problem of poor bonding will emerge after edge banding.

3. Poor quality of PVC edge band:

The bonding surface of the band needs to go through chemical treatment. If treatment is poorly done, bonding surfaces may vary in quality, and may eventually lead to poor bonding. If it happens, you should inform your supplier and have them send a technician for the quality inspection of the PVC edge band.

4. Unstable temperature of hot-melt glue:

When the machine is manually fed at a rate of 6m - 8m per minute, it is best to use hot-melt glue at a low softening point. Glues of softening point between 72 degrees Celsius to 80 degrees Celsius should be used, and the temperature of coating roller should be between 145 degrees Celsius to 160 degrees Celsius. If the glue is overheated, it will prolong cool down and solidify. Hence, the glue film might not be fully solidified after edge banding. As a result, there might be stress in the curved areas, leading to partial rebounding and poor bonding in those

Figure 1: De-bonding on curved areas with the use of 1.00mm PVC edge band

areas. Glue films are usually kept at 50 degrees Celsius after edge banding. This ensures sufficient bonding strength in the glue film after solidification.

In the case of straight edge banding, the feeding rate is usually 15m to 20m per minute, and the glue has to be solidified within just two or three seconds. Therefore, it is best to use hot-melt glue with a high softening point. There are many types of EVA hot-melt glues. The softening point of ordinary hot-melt glue stands between 80 degrees Celsius to 100 degrees Celsius, while the coating roller is kept at a temperature between 160 degrees Celsius to 200 degrees Celsius. The heating temperature of hot-melt glue must be set according to its instructions.

5. Operations of manual edge banding machine:

a. The coating roller and press wheel must be kept at a right angle to the worktable. During large-scale curved edge banding, rubber rollers may get damaged easily. Worn-out rollers may lead to uneven pressure on the surface, which result in partial de-bonding (Figure 3).

b. The temperature of the glue tank and coating roller of the machine might have been unstable. If the temperature is beyond the upper limit of the hot-melt glue, smoke and a peculiar smell might be detected, or the glue might simply become charred. In both cases, bonding strength will be affected. Charred glue must be cleaned away before the glue tank is refilled with fresh glue. To avoid the overflow of glue, do not add in too much glue. However, also note that too little glue in the glue tank may affect the flow of glue pump and cause uneven coating or charred glue. Lastly, different types of glues should not be mixed for use.

c. The operator should be skillful in feeding the panel, taking care to check that the coating amount is adequate and that coating is even. Feeding rate and pressure should be kept constant to prevent pre-curing of the glue, which may result in variations in the pressure required for bonding. For curved edge bonding of large pieces, it is better to change operators every 2 hours. This ensures that operators have enough energy and strength to keep the pressure stable and proper.

d. Ensure that sufficient glue is coated in an even way.

II. Causes of the stringing issue of hot-melt glue and solutions

1. Stringing between the edge band and coating roller:

- The glue temperature might be lower than its application temperature. In this case, glue viscosity becomes too high and leads to stringing (Figure 4).

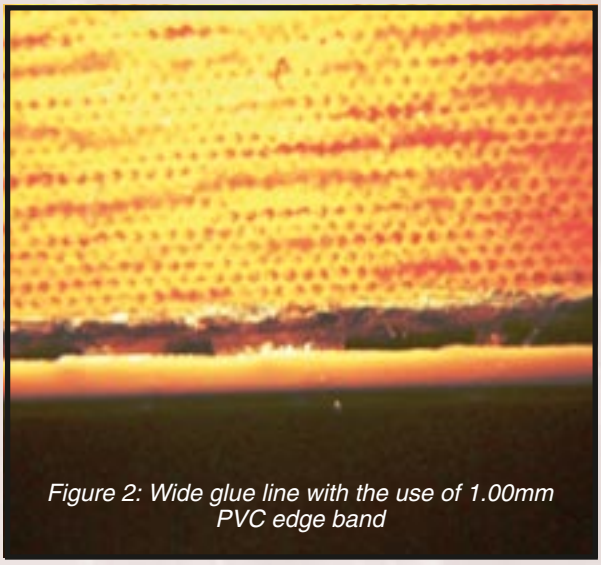

Figure 2: Wide glue line with the use of 1.00mm PVC edge band

- Check the heater of the hot-melt glue tank.
- Gradually increase the heating temperature and the stringing will disappear as the temperature rises.
- In winter, when the edge band or substrate is too cold, the temperature of the edge band or substrate, or the room temperature should be raised. Ideal temperatures would be above 15 degrees Celsius.
- The feeding rate of the edge banding machine may also lead to stringing. It should be adjusted it to a proper rate.

2. Stringing at the end of substrate after glue coating:

- Poor precision on the straight line edge banding machine:
  After operating for a long time, mechanical parts of the machine will gradually lose their precision. As a result, the substrate and coating roller may not run at the same rate. When the substrate runs slower than the coating roller, it may cause too much glue to accumulate at the end of substrate, which then leads to stringing. The machine should be checked often; parts related to the edge banding process

Figure 3: Worn-out rubber roller of a manual edge bonding machine leads to uneven pressure and partial de-bonding

Figure 4: Hot-melt glue when the glue tank temperature is too low, resulting in stringing between the edge band and the coating roller.

should be maintained and repaired accordingly, to ensure that they all have a proper level of precision.

- Too much pressure inserted by coating roller:
  If the coating roller exerts too much pressure, and coating amount is too much, the excess glue will be squeezed out from the edge, resulting in stringing. You should adjust the coating amount and the pressure of the coating roller to a proper level.
- The coating roller might not have been at a right angle to the worktable:
  If the coating roller is not at a right angle to the worktable, it may lead to too much glue on one side and resulting in stringing. Coating roller must be checked and repaired regularly to ensure that it is working normally.
- Three-layer laminate substrate may be inconsistent in the fineness of its material. Upper and lower fiberboards at the end of substrate may be a centimeter longer than the core board, which may also lead to slight stringing.
- Selection of hot-melt glue:
  Henkel offers many types of EVA hot-melt glues. Please contact a Henkel salesman or agent to acquire suitable glues for edge banding.

III. Causes of wide glue line and solutions

- Insufficient pressure:
  In the straight line edge bander, upper pressure and side pressure might be insufficient. Ensure that the coating roller is of good precision and that the side pressure is increased properly.
- Quality of substrate processing:
  Make sure the standard of substrate processing is high.
- The feeding rate of edge banding is too low:
  The glue will be exposed to air for too long. Before side pressing, it has already started to solidify. This makes the film too thick. You can increase the feeding rate or use hot-melt glue with long open time.
- Poor substrate quality:
  Substrate material (particleboard) of insufficient density will be more porous, leading to thicker glue lines. You should use better quality particleboard for edge banding. Or use hot-melt glue (Double coating) as fillings to fill and repair the rough and porous edge of particleboards before edge banding. This reduces such defect of edge banding on rough boards.
- Inconsistent colors between hot-melt glue and edge band:
  Edge band and hot-melt glue are inconsistent in color, which makes the glue line quite visible after edge banding. You should try to use hot-melt glue with a similar color to that of edge band.

Hope that the above analysis was useful in improving the quality of your edge banding. Best Regards! **PFA**

About our Wood Clinic "Doctor"

Looking for an expert in the woodworking and panel industry to clear your doubts on bonding issues? Look no further than **Mr Shim Yee Shin (left),** Henkel Asia Pacific's Woodworking Technical Services Director.

Mr Shim graduated from Taiwan's National Chun-Hsing University majoring in Forestry. With his career deeply entrenched in the solid wood and panel manufacturing industry, his extensive expertise was acquired from years with the Taiwan Forestry Department and with various woodworking factories in Indonesia, Malaysia and Singapore. Mr Shim was born in Sarawak, Malaysia and is currently based in Singapore.

Get answers from the Wood Clinic!

Send your questions to: **Panels & Furniture Asia**
Blk 16, Kallang Place, #07-01, Singapore 339156
Fax: (+65) 6396 7177 • Attention: Mr Shim Yee Shin
E-mail: yee-shin.shim@sg.henkel.com