CNCGLASS
CNC Ucolin Interlayer Technology Co., Ltd.
SHENZHEN, GD, CHINA
Peter Lin · cnc@cncglass.com · WhatsApp / Mobile +86 15013829504
WeChat wecan365 · www.cncglass.com

Why Bubbles Remain in SGP Laminated Glass After Vacuum Bagging

A large, dual-ply plate that still bubbled

The construction in this process case was 10 mm glass, a 1.14 mm ionoplast ply, a 0.89 mm ionoplast ply, and 10 mm glass, at 2704 mm by 3515 mm, or about 9.5 square meters on each lite. The difficulties were the area and the unequal stacked films. A vacuum bag was used from the start as a pre-treatment. After the autoclave, the plates still showed a wide field of bubbles, local haze, and poor clarity. The bag had not been enough.

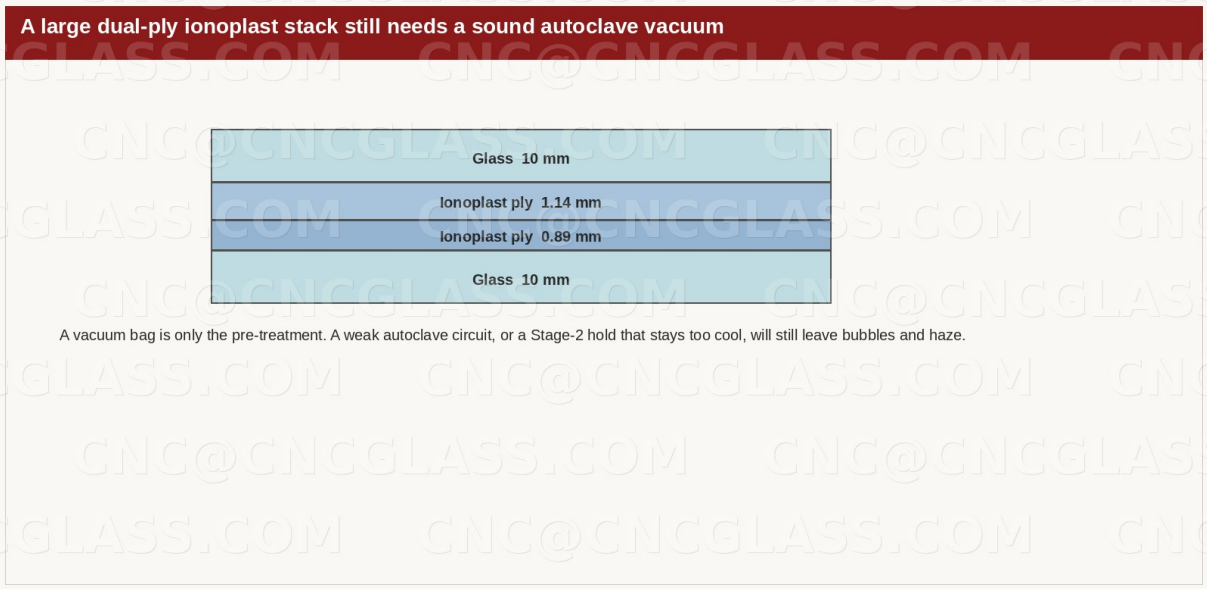


Figure 1. A representative oversized stack: 10 mm glass, a 1.14 mm ionoplast ply, a 0.89 mm ionoplast ply, and 10 mm glass, with a long path to the edge.

The circuit that is easy to overlook, and a hold that was too cool

When bubbles appear, many shops look only at the bag. The autoclave has its own vacuum circuit, and that circuit is easier to forget. In this case, one set of vacuum hardware in the autoclave had lost a serious amount of power, so the chamber could not finish evacuating the interfaces and the edges of the stacked films.

The written cycle had a first stage at 80 degrees Celsius for 20 minutes at 0.6 to 0.8 MPa, which can be an acceptable pre-heat and initial press if vacuum is sound. The second stage was held at 125 degrees Celsius for 90 minutes at 1.1 MPa. That second temperature is too low for ionoplast flow and wetting. A vacuum bag plus a first stage will still leave voids if the second hold never reaches the window this polymer family needs.

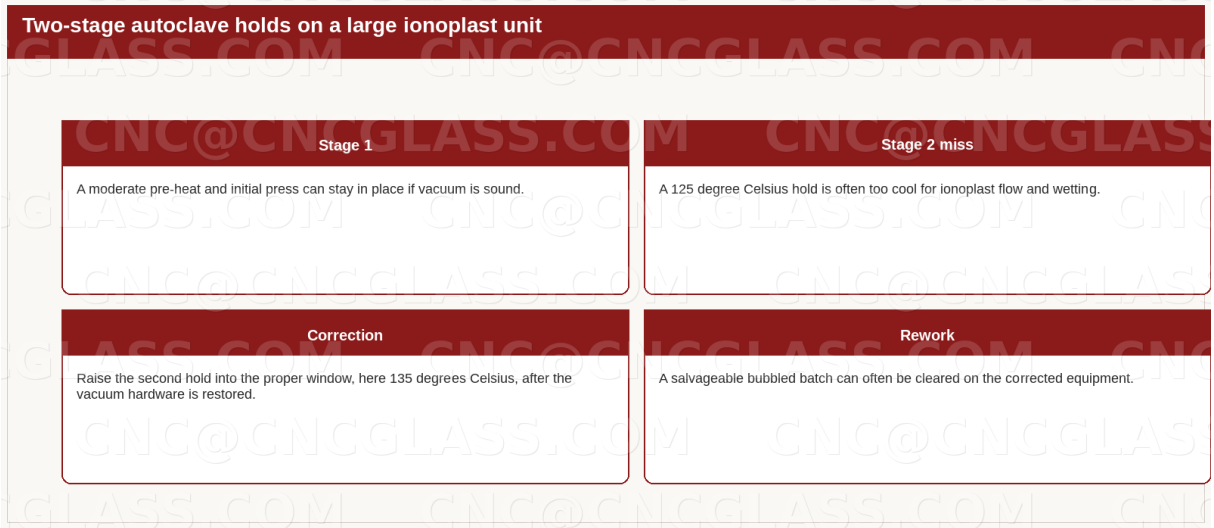


Figure 2. Stage 1 can often stay; Stage 2 is the usual miss. After the autoclave vacuum hardware is restored, raising the second hold from 125 to 135 degrees Celsius is a typical correction.

Repair, retune, and a controlled rework

The vacuum assemblies were serviced and the weakened parts replaced so that suction returned to the rated level. The first-stage temperature, hold, and pressure were left as they were. The second-stage hold was raised from 125 to 135 degrees Celsius. The already bubbled and hazy plates were then put back on the repaired autoclave vacuum system and run again at the corrected 135 degree Celsius recipe. After that rework, the internal bubbles were gone, the local haze had cleared, and overall clarity met the delivery standard.

A correct written route does not, by itself, guarantee a clear ionoplast laminate. The numbers on the card and the condition of pumps, valves, and hoses are part of the same process. Hidden power loss or a small leak in the autoclave vacuum circuit is easy to miss in daily work and expensive when it finally appears on a large plate.

A vacuum bag is necessary insurance on a large, dual-ply SGP laminate; it is not a complete explanation of bubbles after the autoclave. Restore the chamber vacuum circuit, and do not leave Stage 2 at 125 degrees Celsius if the film needs a 135 degree Celsius ionoplast hold. A salvageable batch can often be cleared once both corrections are in place.

Contact Us

Brand: CNCGLASS

Company: CNC Ucolin Interlayer Technology Co., Ltd.
Address: SHENZHEN, GD, CHINA
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WeChat: wecan365
Website: www.cncglass.com

We welcome enquiries on ionoplast autoclave windows, vacuum-circuit checks, and controlled rework of large bubbled or hazy plates.