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TECHNICAL NOTE · CASE STUDY

Why Oversized Ionoplast Laminated Glass Still Bubbles After Vacuum-Bag Pretreatment — Autoclave Vacuum and Temperature Case Study

By Peter Lin

CNCGLASS · Job snapshot

CNCGLASS (CNC Ucolin Interlayer Technology Co., Ltd., Shenzhen) reconstructed this plant troubleshooting case for fabricators who already vacuum-bag ionoplast laminates—and still open the autoclave to find widespread bubbles, local haze, and weak clarity on oversized panels.

Item	Project condition
Glass build-up	Matched thick plies with a dual-gauge ionoplast (SGP-type) stack between them
Interlayer arrangement	Two ionoplast sheets of different thickness in one cavity (asymmetric dual stack)
Typical panel size	About 2.7 m × 3.5 m class; roughly 9–10 m² view area per sheet
Pretreatment	Vacuum bag used from the first layup to improve de-airing
Defect after first autoclave	Widespread interlayer bubbles, localized haze, insufficient transparency

Large area plus a dual-thickness ionoplast stack raises the air-path and bonding demands. A vacuum bag alone does not guarantee a clear structural laminate if the autoclave cannot hold true vacuum on the bag ports—or if the bonding stage never reaches a temperature window that softens and consolidates stiff ionoplast film.

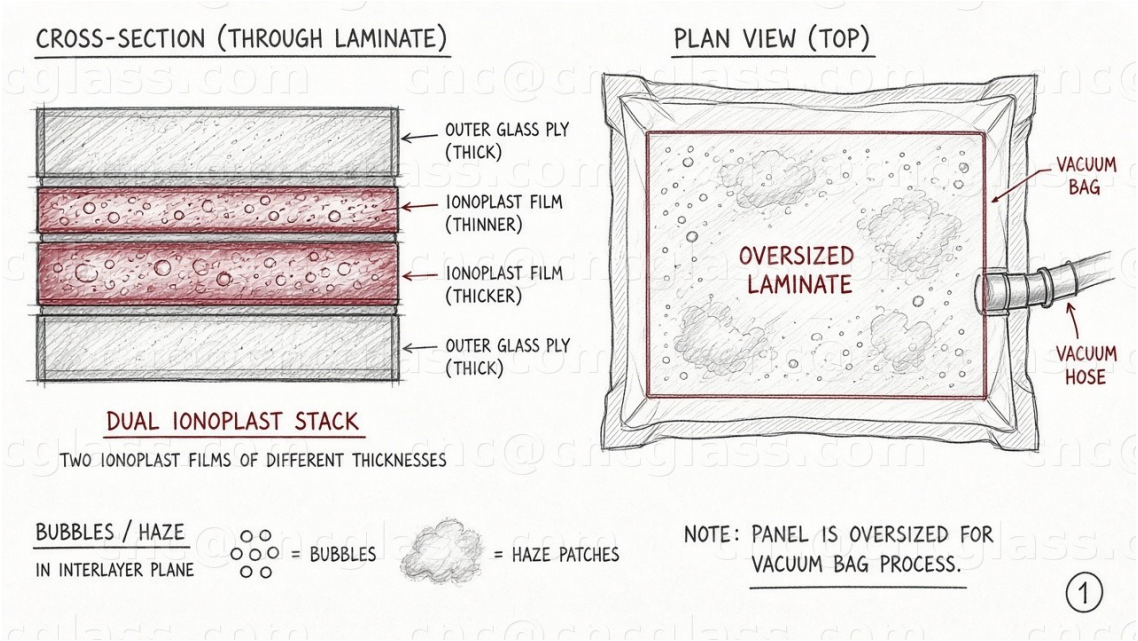


Figure 1 — Oversized dual-gauge ionoplast laminate: vacuum-bagged stack can still show interlayer bubbles and haze when autoclave vacuum or bonding temperature is wrong.

CNCGLASS · Why this build is hard to de-air

Oversized footprint

Air travel distance from the center of a ~9–10 m² panel to the bag edge is long. Any weak suction, slow pump-down, or mid-cycle vacuum loss leaves residual pockets that later read as bubbles or milkiness after pressure and heat.

Dual-gauge ionoplast stack

Two ionoplast sheets of unequal thickness create extra interfaces and a thicker polymer cavity than a single-gauge layup. Residual air can lodge between the two films and along edges. Process windows that “usually work” on thin single-film structural laminates may under-bond or under-evacuate this recipe.

- Long center-to-edge evacuation paths on jumbo architectural sheets.
- Extra film–film interface in a dual-gauge ionoplast cavity.
- High modulus ionoplast that needs enough Stage-2 temperature to flow and wet glass under pressure.
- Operators who trust the bag seal and overlook autoclave vacuum hardware health.

CNCGLASS · What people usually blame—and what they miss

Shop-floor instinct after bubbles is almost always “the bag leaked” or “the seal tape failed.” Those failures are real and must be checked. On this job, bag practice was already in place from the first cycle. The decisive faults sat elsewhere: inside the autoclave vacuum circuit, and in a Stage-2 temperature that sat too low for stiff ionoplast bonding.

Hidden degradation of autoclave vacuum assemblies—pumps, internal lines, valves, fittings, or one weak vacuum group among several—can look normal on a casual glance. Gauges may still move. Bags may still “pull down.” Yet holding vacuum during the long hot stage can be insufficient to keep residual air out of a dual-film oversized stack.

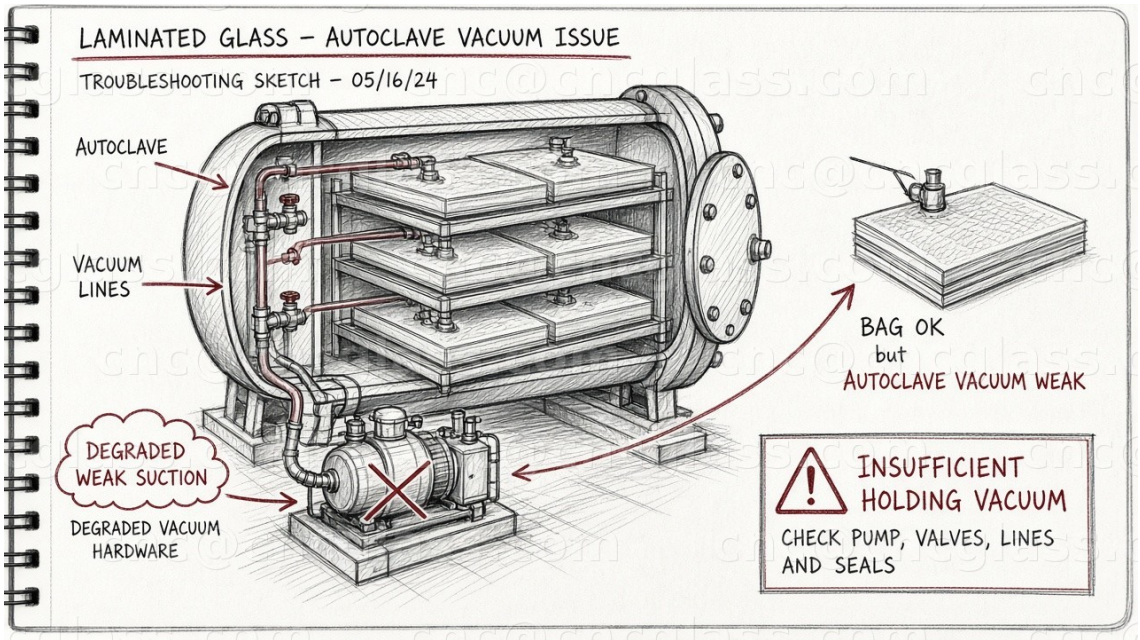


Figure 2 — Bag seals can look fine while autoclave vacuum hardware (pumps, lines, valves) has degraded suction—an easy-to-miss root cause of widespread bubbles.

CNCGLASS · Parameter review on the first failed cycle

A practical two-stage autoclave outline for this class of ionoplast work was reviewed against what the plant had actually run. Stage 1 was acceptable. Stage 2 temperature was not.

Stage	Plant settings on failed batch	CNCGLASS reading
Stage 1	About 80 °C · ~20 min hold · ~0.6–0.8 MPa	Reasonable preheat / initial press for many ionoplast autoclave recipes
Stage 2	About 125 °C · ~90 min hold · ~1.1 MPa	Temperature too low for reliable stiff ionoplast consolidation; raise toward ~135 °C class windows after validating with your film supplier and autoclave limits

Numbers above are case-study language for diagnosis—not a universal recipe for every autoclave, glass thickness, or ionoplast grade. Always confirm allowable pressure, temperature, and vacuum limits with equipment manuals and CNCGLASS process guidance for the exact film you run. The teaching point is directional: ~125 °C can leave dual-gauge ionoplast under-bonded and optically soft; ~135 °C is a typical target band many plants validate for structural ionoplast once vacuum integrity is restored.

CNCGLASS · Corrective actions that cleared the batch

1. Restore autoclave vacuum hardware

Maintenance opened the vacuum circuit that had lost capacity. Worn or under-performing vacuum components were replaced or rebuilt until measured suction returned to the autoclave's rated performance. Bag ports, hoses, and valves were verified under load—not only at ambient idle.

2. Raise Stage 2 bonding temperature

Stage 1 time, temperature, and pressure stayed as run. Stage 2 temperature was lifted from about 125 °C to about 135 °C while hold time and pressure remained in the same order of magnitude. That change gave the dual ionoplast stack enough thermal drive to wet, consolidate, and clear optical defects once vacuum was real again.

3. Re-autoclave salvageable panels

Bubbled and hazed sheets from the first cycle were reconnected to the repaired vacuum system and re-run with the corrected Stage-2 window. The oversized laminates finished clear: interlayer bubbles gone, local haze dissipated, and transparency meeting delivery inspection. Material cost of the first batch was largely recovered instead of scrapped.

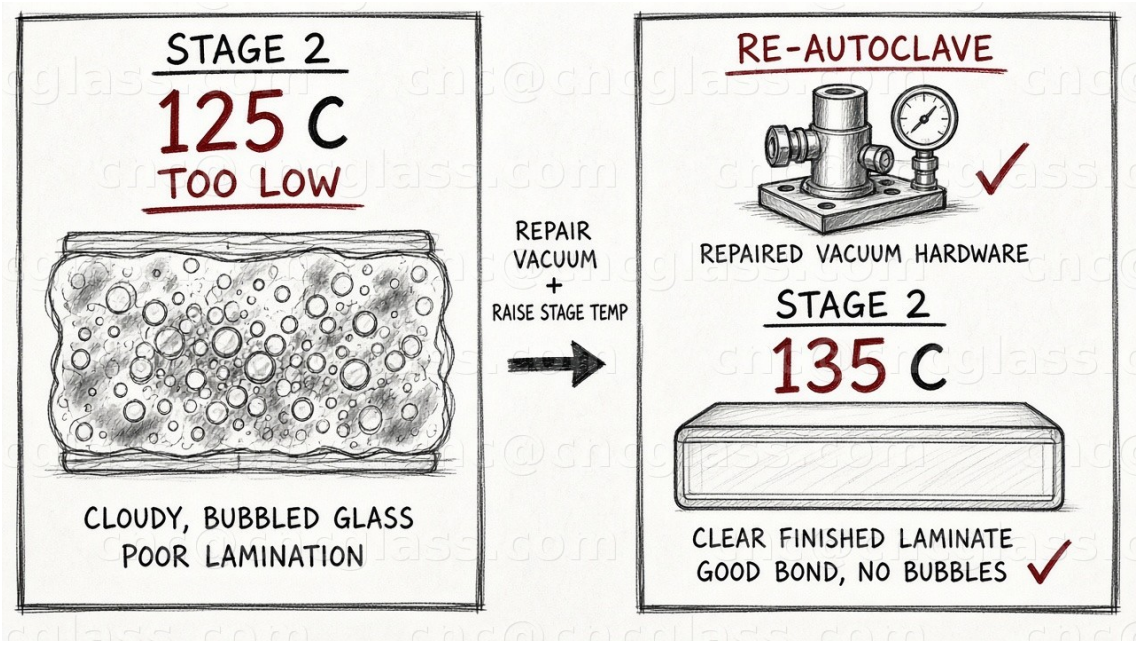


Figure 3 — Corrective path: restore autoclave vacuum capacity, raise Stage 2 ionoplast bonding temperature from about 125 °C toward about 135 °C, then re-autoclave salvageable panels.

CNCGLASS · Results after rework

- Internal bubble field eliminated on re-autoclaved oversized panels.
- Localized haze cleared; optical clarity restored to inspection standard.
- Dual-gauge ionoplast stack between thick matched plies accepted for shipment after QA.
- Root causes documented: weak autoclave vacuum group + Stage-2 temperature too low—not a missing vacuum bag.

CNCGLASS · Plant takeaways for ionoplast fabricators

Vacuum bag ≠ autoclave vacuum health

Bagging and sealing are necessary. They do not replace routine checks of autoclave vacuum pumps, internal piping, valves, and per-station suction under hot pressurized conditions. Degraded hardware is an invisible killer on jumbo structural laminates.

Respect ionoplast temperature windows

Stiff ionoplast films need a hot bonding stage that matches the chemistry and thickness stack. Running a Stage-2 set-point that works for softer films—or that sits a few tens of degrees too cool—can leave dual-gauge stacks cloudy and bubbled even when pressure looks correct.

Oversized dual stacks deserve extra QA

Jumbo area plus two ionoplast gauges multiplies residual-air risk. Log vacuum curves per load, verify every vacuum group on multi-station autoclaves, and pilot a coupon or first-article before committing a full rack of ~9–10 m² sheets.

Rework can save money—if root causes are fixed first

Re-autoclaving bubbled ionoplast panels only pays when vacuum capacity and temperature are corrected. Repeating the same weak vacuum and cool Stage-2 cycle usually wastes energy without fixing optics.

Check before blaming the bag	Pass signal	Investigate if...
Autoclave vacuum group capacity	Rated suction at bag ports under process conditions	One station or pump group pulls weak vs others
Hot-stage vacuum hold	Stable vacuum through Stage 2	Vacuum drifts or collapses mid-cycle
Stage-2 temperature	Validated ionoplast window (often ~135 °C class after confirmation)	Set-point sits near ~125 °C with dual-gauge stacks still hazy
Bag and tape integrity	No leaks on pull-down or dye/soap checks	Local edge bubbles track a seal path
Film dryness / layup	Sealed storage, clean glass, correct dual-gauge order	Haze looks moisture-like even with strong vacuum

CNCGLASS · How CNCGLASS supports structural ionoplast plants

CNCGLASS supplies ionoplast and EVA interlayer materials plus process coaching for B2B laminators. For oversized structural work, share glass schedules, dual-gauge intent, autoclave make/model, vacuum-station count, and the temperature/pressure/vacuum logs from a failed load. The team can then discuss film selection, Stage windows, and maintenance checks—not a one-line “use a bag” answer.

- Ionoplast direction for façades, canopies, fins, and other structural laminated glass.
- Talk-through of autoclave vacuum diagnostics versus bag-only troubleshooting.
- Guidance on Stage-2 temperature bands for dual-gauge stacks after plant validation.
- Coordination with EVA options when the process route favors EVA instead of ionoplast.

CNCGLASS · Conclusion

Vacuum-bag pretreatment is smart practice on oversized ionoplast laminates—but it is not a cure for degraded autoclave vacuum hardware or a Stage-2 temperature that never reaches a true ionoplast bonding window. In this dual-gauge, ~9–10 m² class case, restoring autoclave suction and lifting Stage 2 from about 125 °C toward about 135 °C, then re-autoclaving, cleared bubbles and haze and rescued the batch. Treat equipment maintenance and parameter discipline as equal partners to bag technique. Contact Peter Lin at CNCGLASS in Shenzhen to align ionoplast film and process checks with your jumbo structural laminate line.

CNCGLASS · FAQ

Q1: Can ionoplast laminated glass still bubble if a vacuum bag was used?

A: Yes. A sealed bag helps de-air, but weak autoclave vacuum holding, leaks inside the autoclave circuit, or an under-temperature bonding stage can still leave residual air and haze—especially on oversized dual-gauge stacks.

Q2: Why is a dual-thickness ionoplast stack harder than a single film?

A: Two unequal gauges add a film–film interface and a thicker polymer cavity. Air and incomplete wetting have more places to hide, so vacuum integrity and Stage-2 temperature matter more.

Q3: What Stage-2 temperature band is often discussed for stiff ionoplast?

A: Many plants validate hot bonding near about 135 ℃ after confirming autoclave and film limits. Running near about 125 ℃ can be too cool for dual-gauge structural stacks. Always validate locally—do not copy numbers blindly.

Q4: Should every bubbled panel be scrapped?

A: Not always. If glass is intact and root causes (vacuum capacity and temperature) are fixed, a controlled re-autoclave can clear optics and recover cost. Repeating a broken process will not.

Q5: What autoclave vacuum checks should maintenance run?

A: Compare suction at each bag port under load, inspect pumps/valves/lines for degradation, verify hot-stage vacuum hold, and log curves per cycle. Do not rely only on a cold idle pull-down.

Q6: When should a plant call CNCGLASS on ionoplast bubbles?

A: When oversized structural laminates show systemic bubbles or haze despite bag practice, or when dual-gauge recipes fail first-article optics. Send stack details and cycle logs so process advice can be specific.

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