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TECHNICAL NOTE / CASE STUDY

Case Study: Consistent-Shape Fogging in Ionoplast (SGP-Type) Laminated Glass — Autoclave Diagnosis and Rework

By Peter Lin

CNCGLASS · What the batch looked like

A fabricator opened a lot of ionoplast (SGP-type) laminated panels and saw something that did not behave like ordinary haze. Every lite carried a soft, fog-like cloud in nearly the same place on the sheet, and the outline of that cloud repeated from panel to panel with almost the same shape. Random fingerprints, wipe marks, or packing dust do not line up that way.

Before blaming the interlayer roll, the plant wiped and even polished the outer glass faces. The fog stayed. That single check moved the problem from “dirty surface” to “defect locked inside the laminate”—inside or at the glass–ionoplast interfaces where heat, pressure, hold time, and cooling decide whether residual optical scatter appears after autoclave.

CNCGLASS (CNC Ucolin Interlayer Technology Co., Ltd., Shenzhen) writes this case study for laminators who need a practical diagnosis path when identical fog maps appear across a rack—especially when delivery dates leave little room for blind rework.

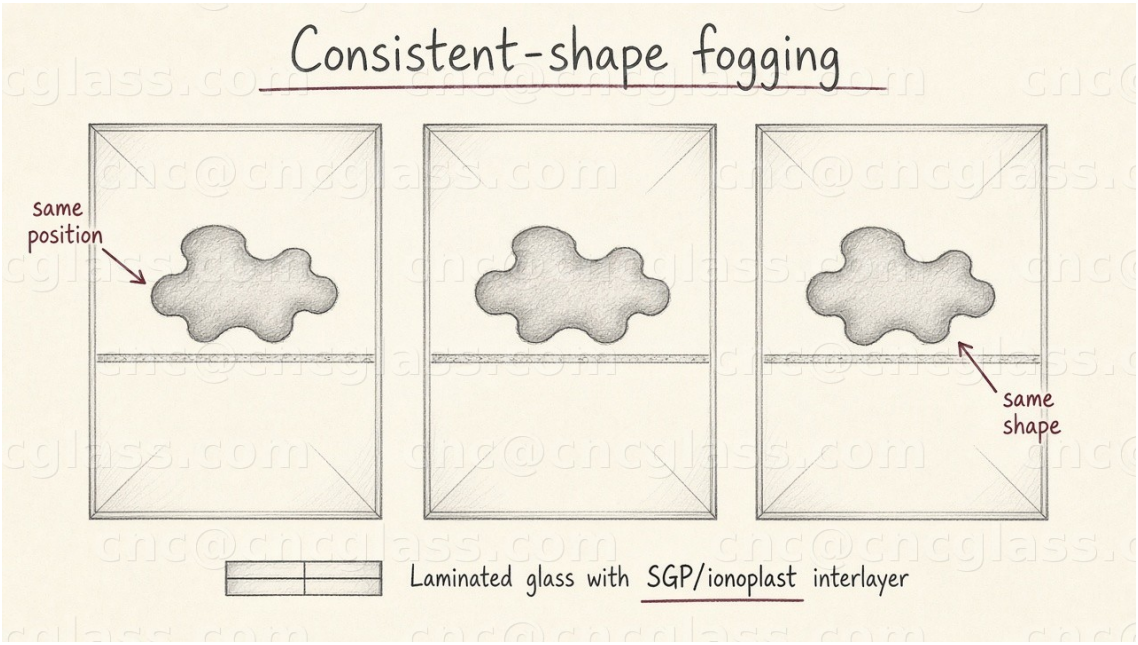


Figure 1 — Consistent-shape fogging: the same cloudy zone appears in the same relative position on every lite in the batch, pointing to process geometry rather than random surface dirt.

CNCGLASS · Why identical position and shape matter

When defects share geometry across many sheets, treat them as a process map, not as bad luck. Shared position often tracks how glass sat in the autoclave: rail contact, baffle shadows, rack pitch, stacked density, and the path of circulating air. Shared outline often tracks a thermal or pressure gradient that froze into the interlayer at the same relative zone on every lite of that load recipe.

- Surface wipe fails → look inside the sandwich, not at warehouse dust.
- Same zone on every lite → suspect load geometry and airflow, not a random film scratch.

- Same outline family → suspect a repeatable heat / cool / hold imbalance rather than one dirty roll edge.
- Tight delivery → tune parameters and reprocess; do not melt the same cycle twice and hope.

CNCGLASS · Process levers that drive internal fogging

For ionoplast laminated glass cured in autoclave, five levers repeatedly show up when fog sits inside the stack rather than on the face:

1. Peak temperature

Ionoplast needs enough heat for flow, wetting, and bond development without overshooting into optical scatter or edge squeeze-out. Undershoot leaves incomplete consolidation; overshoot plus uneven cooling can leave cloudy zones that look like fog after the cycle.

2. Hold (soak) time at temperature

Hold lets temperature equalize through thick glass and across the interlayer. Short holds on heavy makeups leave cool cores and warm edges; long holds on overloaded racks can still fail if air never reaches the mid-pack. Match hold to glass thickness, interlayer build, and actual load density—not to a single memorized minute count.

3. Cooling rate

Cooling is where many “mystery fog” lots fail. If the chamber cools too slowly in dense packs, local gradients linger and optical haze can lock in. CNCGLASS process coaching for this failure mode targets a cooling rate of no less than about 3.3 °C per minute, verified on the control chart for the actual load—not assumed from an empty-chamber recipe.

4. Loading capacity

Filling every slot maximizes throughput and often destroys uniformity. Overloading reduces free volume for hot air, slows heat-up and cool-down of mid-rack lites, and turns one “good” recipe into fog for the sheets that never saw the intended thermal path.

5. Loading method and spacing

How glass sits on the rack matters as much as how many pieces you load. Parallel sheets with no intentional gap behave like a solid block. Leave deliberate gaps so circulating air can travel between faces. Align tall stacks so they do not create dead zones behind solid walls of glass.

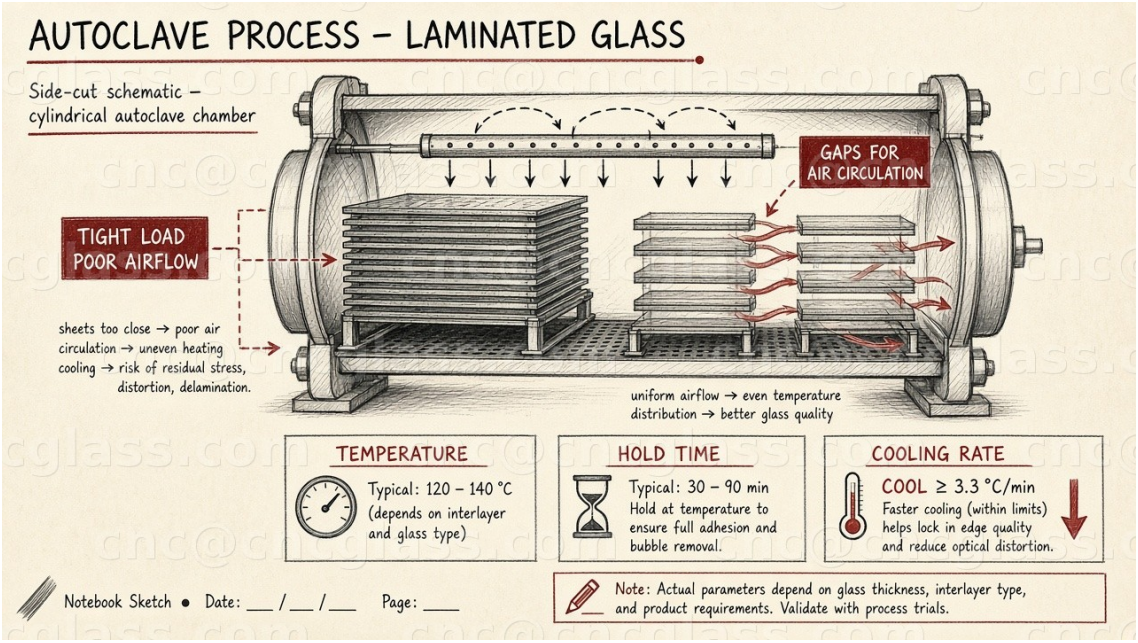


Figure 2 — Autoclave loading sketch: tight packs starve airflow; leaving gaps supports even heat and controlled cooling during ionoplast (SGP-type) lamination.

CNCGLASS · Field response — diagnose, then retune

With delivery pressure high, the wrong move is a second pass of the same autoclave program. The right move is a short, documented diagnosis followed by a controlled reprocess of the defective lot.

Step	Action	Pass criteria
1. Confirm location	Wipe / polish outer faces; photograph fog under raking light	Fog remains → internal to laminate
2. Map the batch	Mark fog position on several lites; overlay rack positions	Same relative zone → process geometry suspect
3. Pull charts	Review temp, hold, cool rate, pressure, load weight / count	Cool < ~3.3 °C/min or dense pack → retune
4. Rebuild load	Reduce count if needed; leave airflow gaps; avoid solid walls	Visible gaps between faces; free air path
5. Reprocess	Apply tuned temp / hold / cool; record new chart	Clear optics, no repeat fog map after QC

In the case that motivated this note, the plant did not scrap the glass on sight. After confirming the fog was internal and correlating it with autoclave temperature, hold, cooling, load size, and loading style, the team adjusted those parameters and reprocessed the panels. The reworked lot met optical and bond expectations and shipped on the revised schedule.

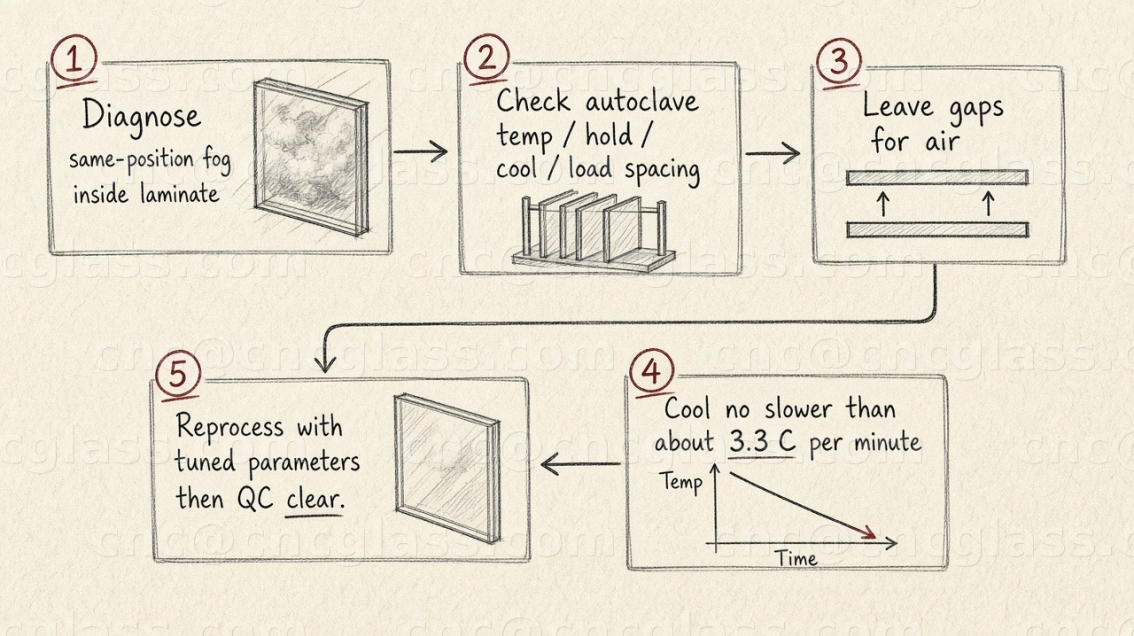


Figure 3 — Rework path: diagnose internal fog, review temperature / hold / cool / spacing, leave air gaps, cool at least about 3.3 °C per minute, then reprocess and inspect.

CNCGLASS · Two shop-floor rules that prevent this fog family

CNCGLASS recommends locking the following into work instructions for ionoplast autoclave lines that have seen consistent-shape internal fogging:

Rule A — Leave gaps for air

When loading glass, leave sufficient gaps between lites and between stacks so air can circulate through the autoclave. Treat “no gap” packing as a quality risk, not as free capacity. If a rack looks solid from the door, it is already too tight for uniform heat and cool.

Rule B — Cool at least about 3.3 °C per minute

Strictly control the cooling rate so it is no less than about 3.3 °C per minute for the validated recipe that cleared this fog mode. Measure on the running load. If the chart shows a long plateau or a crawl below that floor while glass is still hot, stop treating the cycle as “done” and adjust fan, load density, or cool program before the next batch.

- Document gap rules on the rack drawing (minimum spacing, max pieces per bay).
- Train operators to refuse overloaded carts even when the schedule is loud.
- Archive temperature and cool-rate charts with lot numbers for fog complaints.
- Qualify any makeup change (thicker glass, multi-interlayer, coatings) with a pilot load before full volume.

CNCGLASS · What this is not

Consistent-shape internal fogging is not the same as edge bubbles from poor vacuum, decorative-insert haze, scratched glass, or outdoor weathering milky edges. Those failures have different fingerprints. Do not apply this cool-rate and spacing fix as a universal bubble cure. Match the defect map to the process map first.

Observation	Likely focus	Not the first lever
Same fog shape / same place on every lite	Autoclave temp, hold, cool, load spacing	Random surface cleaning only
Edge-only bubbles after bag vacuum	Vacuum integrity, edge seal, bag leaks	Cool-rate alone
Scattered pin bubbles mid-panel	Layup dirt, moisture, vacuum time	Assuming identical rack geometry
Fog after outdoor exposure months later	Edge seal, sealant, interlayer grade, water path	One autoclave cool tweak in isolation

CNCGLASS · How CNCGLASS supports ionoplast laminators

CNCGLASS supplies interlayer materials and process dialogue for fabricators running EVA and ionoplast (SGP-type) architectural laminates. When a plant hits a repeatable fog map, share glass makeup, interlayer build, autoclave charts, rack photos, and QC images. The goal is a tuned reprocess window—not a slogan about “perfect film.”

- Ionoplast and EVA interlayer selection for structural and architectural stacks.
- Autoclave and vacuum-lamination process coaching for fog, bubble, and adhesion cases.
- Sample rolls and pilot-lot support before full production changes.
- Export packing and B2B logistics for international laminators.

CNCGLASS · Conclusion

When ionoplast laminated glass shows fog with the same outline in the same place on lite after lite, stop polishing the surface and start reading the autoclave. Peak temperature, hold time, cooling rate, how many sheets you load, and how you space them decide whether optical scatter freezes into the sandwich. Leave gaps for air. Keep cooling no slower than about 3.3 °C per minute for the recipe that cleared this mode. Retune, reprocess, and verify—then write the spacing and cool-rate rules into the work instruction so the next rush order does not recreate the same cloud. For interlayer and process support, contact Peter Lin and the CNCGLASS team in Shenzhen.

CNCGLASS · FAQ

Q1: Why does fog appear in the same place on every laminated panel?

A: Shared position usually mirrors how glass sat in the autoclave—rack geometry, airflow shadows, and thermal gradients. When the outline also matches across the lot, treat it as a process pattern, not random dirt.

Q2: How do I know the fog is inside the laminate?

A: Clean or polish the outer glass. If the cloudy zone remains under raking light, the defect is internal to the glass–interlayer stack.

Q3: What cooling rate should we target for this fog mode?

A: CNCGLASS recommends controlling cooling so it is no less than about 3.3 °C per minute for the validated load that cleared consistent-shape internal fogging. Always confirm on the chart for your glass thickness and rack density.

Q4: Can we just run the same autoclave cycle again?

A: Blind rework often reprints the same fog. Adjust temperature, hold, cooling, load count, and spacing first, then reprocess with a recorded new chart.

Q5: Does leaving gaps really matter?

A: Yes. Gaps let hot and cool air reach each face. Solid walls of glass create dead zones that heat and cool late—exactly the kind of pattern that can imprint identical fog maps.

Q6: Is this only an ionoplast (SGP-type) issue?

A: This case focuses on ionoplast autoclave laminates, but any autoclave interlayer can suffer optical defects from bad thermal uniformity. Match diagnosis to the chemistry and plant you run.

Q7: Who can help tune our recipe?

A: Contact CNCGLASS (CNC Ucolin Interlayer Technology Co., Ltd., Shenzhen) with makeup details, rack photos, and autoclave charts. Peter Lin can discuss interlayer choice and process windows for your line.

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