

Pointers on setting up lamination lines

By Frank Lu

U.S. fabricators add lamination lines to their plants as demand grows, spurred in part by enforcement of hurricane codes as well as architects' interest in advanced glazing techniques. What does it take to add a basic line to a company that produces only tempered and annealed products?

For typical polyvinyl butyral from DuPont, Sekisui or Solutia, or DuPont's SentryGlas Plus interlayer materials on flat-glass laminating lines, consider investing in layup and laminating line equipment, a clean room and autoclave. Don't forget upfront costs of expanding the workforce and training. It takes roughly two to four workers to operate a basic line, depending on the production rate and glass sizes to be run.

The graphic below shows a typical complete flat-glass laminating line with an autoclave and peripheral equipment. A basic system may include at least one preheating oven with press or laminator, and one tacking oven with press. Officials at some companies can save money by using existing conveyors and washers.


Clean rooms are used for assembly of the laminate and may include storage rooms for interlayer materials. The manufacturers of interlayer materials will provide recommended temperature, humidity and other conditions for storage of the materials and assembly.

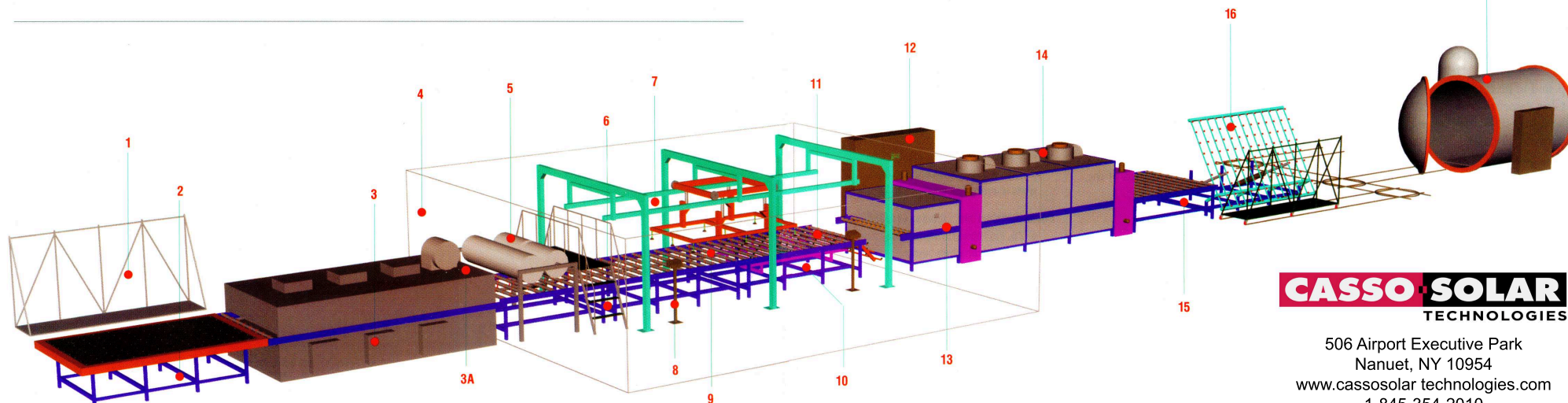
Autoclaves include the pressure vessels, heating and cooling systems, compressors, loading and unloading tracks and carts for the glass.

A few details

1. Glass can be loaded onto the lami line manually or automatically.
2. Loading table can be a free-fall table, tilt tables or an automatic loader.
3. Lamination requires a proper glass-washing machine designed to meet requirements such as production-line speed and glass types including coated glass.
- 3A. The glass enters the clean room here.
4. Plant managers can buy or construct clean rooms, also called layup rooms, where the temperature and humidity of the air can be controlled. The clean room should provide adequate space for assembly of the product and necessary PVB handling equipment, such as a sheeter to cut the PVB to the glass sizes. Sometimes, an additional room will be needed to store PVB rolls. Consult with PVB suppliers for recommendations on the temperature and humidity for the clean and storage rooms.

5. Note the overhead PVB dispensing system. The PVB storage and unwind units can be off-line or in-line, such as with an overhead system, depending on line configuration and the plant's production requirements. An overhead PVB-dispensing system could save labor and increase production efficiency for long runs of same-size products.
6. An optional bridge or drop-down conveyor for crossing over the line can be installed at Nos. 6 or 11. This saves the room required by an overhead stairway.
7. An overhead vacuum device lifts heavy and large sheets of glass, helping the layup process.
8. The local operator station provides a place for computer control for layup conveyors, pop-up tables and other equipment. The main control for the entire production line, such as operator interface and touch screen for programmable logic controllers, is commonly located inside the clean room.
9. Layup conveyor with pop-up table and registration lugs for registration of glass help the operator align the layers of glass in the laminates.
10. The trim conveyor with pop-up table helps the operator trim the excess PVB.
11. Alternate site for bridge or drop-down conveyor.

12. The control panel houses control components for the system and the system PLC. The control-system process controls the motions of loading and unloading systems, the speeds of conveyors, set points for preheating and tacking ovens, and gaps and pressures of press rolls. The PLC control system can be recipe driven for easy switching between different products.
13. An infrared preheat oven and pre-press effectively and efficiently heats the interlayer and glass laminate. In conjunction with the presses, the ovens relax the interlayer material while removing air from the assembly.
14. The IR tacking oven with optional convection heating for low-emissivity coated products helps maintain productivity.
15. An acceleration conveyor creates gaps between products to allow enough time for the tilt-unload system to unload products.
16. The unload system can feature caster tables, roll conveyors or tilt tables and other aids. Laminated glass is loaded onto racks to be transported to the autoclave.
17. An autoclave completes the bond between the interlayer material and the glass. Laminated glass normally needs to be heated to 275-to-300 degrees Fahrenheit at 180-to-190 pounds per square inch pressure in an autoclave. Cycle time will depend on the load, thickness of the glass and design of the autoclave system. 



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