

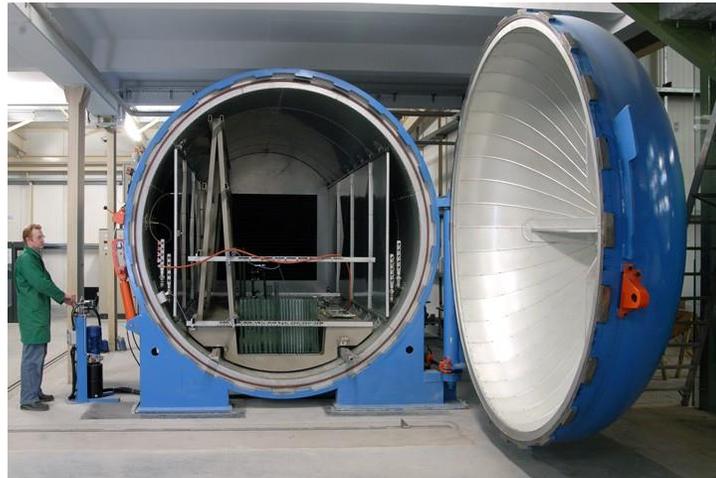


IS THE LAMIPRESS TECHNOLOGICALLY ADVANCED COMPARED TO OTHERS?

4.1 Conventional technologies on the market

4.2 Requirements for a laminator

4.3 Comparison overview



4.1 CONVENTIONAL TECHNOLOGIES

The Autoclave: The Autoclave is a pressure chamber. The room inside the machine is heated up to 140°C per convection heat and the glass is laminated by pressure

The Autoclave-Free: The glass packages are placed horizontally inside the oven on metal sheets and then covered by a silicon matt. Unlike the autoclave there is no pressure added. Underneath the silicon matt, vacuum is drawn to get the air out of the package. This step replaces the rolls to push the air out that the autoclave uses. Then the laminate is convectionally heated up to 140°C to finish the procedure

The Autoclave-Vacuumbag: The vacuumbag replaces the part where the air is rolled/pressed out, similar to the autoclave-free technology (Drawing out air by utilizing vacuum). The vacuumbag with the glass packages inside is then placed inside the autoclave and the regular lamination process takes place. The autoclave-vacuumbag can be viewed as an upgrade to the known autoclave systems

4.2 REQUIREMENTS FOR A LAMINATOR

Ventilation

Heat Transfer

Products

Cycle Times/Output

Quality/Reliable Process

Costs/Energy Efficiency

4.5 COMPARISON OVERVIEW

| | Autoclave | Autoclave-free | Autoklav-Vacuumbag | LAMIPRESS® |
|-------------------|--|---|--|---|
| Products | <ul style="list-style-type: none"> Mainly limited to PVB based products | <ul style="list-style-type: none"> Mainly limited to EVA foil based products Under certain circumstances, PVB foil is possible as well | <ul style="list-style-type: none"> Can laminate either PVB or EVA foils | <ul style="list-style-type: none"> PVB and EVA foils can both be laminated More extraordinary foils such as SentryGlas® are predestined for the laminator It is easily possible to laminate multiple, different foils in the same cycle |
| Production | <ul style="list-style-type: none"> Incomparable when it comes to efficiency in mass jumbo sized production Lack in economical production for extraordinary or smaller sizes Long Cycletimes Unreliable availability with insufficient flexibility | <ul style="list-style-type: none"> High breakage and quality deficits with non-EVA foil based laminations Low Output Unreliable availability with insufficient flexibility | <ul style="list-style-type: none"> Quality issues such as edgepitching, delamination or movement Vacuumbag can only be used once in most cases Inefficient placement inside the autoclave, a lot of unused capacity (horizontal) Unreliable availability with insufficient flexibility | <ul style="list-style-type: none"> Cycle times of under 45 minutes due to contact heat (with optimized process) Breakage under 1% (reliable process) Highest quality, no delamination No further needed consumable supplies |
| Costs | <ul style="list-style-type: none"> High running and acquisition costs (especially due to the inefficient use of convection heat) | <ul style="list-style-type: none"> Evidently low acquisition costs High secondary costs due to the need of climate and clean rooms High running costs (especially for the use of convection heat) | <ul style="list-style-type: none"> High running and acquisition costs Same energetic expenditures while producing less output | <ul style="list-style-type: none"> Fair Acquisition costs (No further secondary costs) Low running costs (most efficient technology) |