

## Hotmelt lamination

Coating and laminating of web shaped layers with hotmelt adhesives traces back to 1990. CAVITEC is the forerunner in this technology, with over 80 machines sold and successfully in operation in many parts of the world. CAVITEC is clearly the market leader in this technology, with over 3 decades of experience.

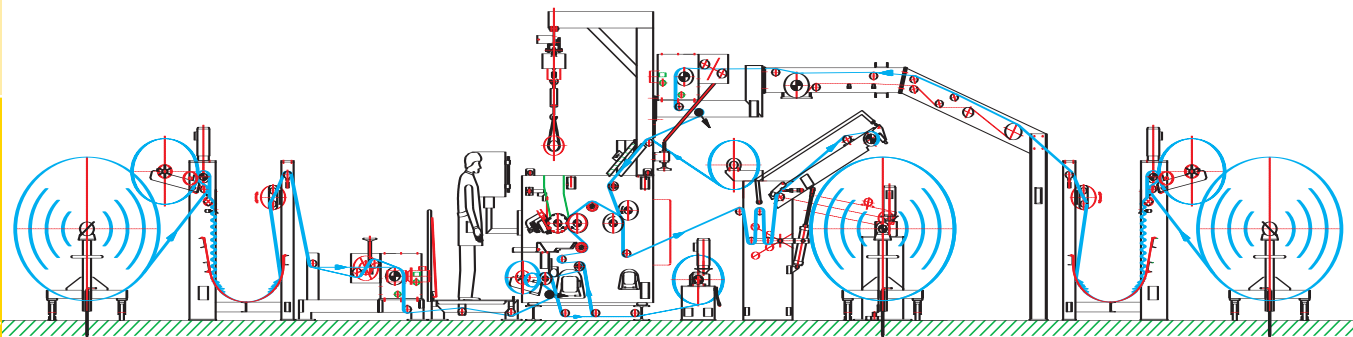
Hotmelt lamination is cheaper than powder scatter lamination, as the polymers are cheaper than thermoplastic powders, and the production speed is significantly higher.

There are no solvents and no water used in hotmelt lamination:

- no drying needed
- lower energy consumption
- ecological, no exhaust air cleaning required
- no significant heat energy on the material

Hotmelt lamination is better than flame lamination:

- thinner PU foams can be used
- better fogging values, no odor emissions in the car interior
- better color uniformity of the textile
- ecological, no exhaust air cleaning required



Typical layout of a coating and laminating plant with extensive flexibility

## Fields of application

Web laminates made on CAVITEC machines are applied in various industrial sectors:

- active wear (outdoor)
- functional and protective clothing
- automotive interiors
- home textiles, upholstery, mattress ticking
- hygiene and medical products
- fusible interlinings
- technical composites
- etc.

Hotmelt dot coatings are also used for fusible interlinings.

In the automotive interior, examples of items manufactured of laminates are:

- headliners and trim
- column cladding
- seats fabric with foam
- trunk and parcel shelf
- door panels

Any type of textile and non-textile webs can be laminated together, such as:

- woven fabrics
- knitted fabrics
- nonwovens
- membranes, films
- foams

Typical articles under active wear and protective or functional clothing, mainly laminates containing breathable membranes, are:

- outdoor and sports jackets and pants
- military camouflage suits
- clothing for police and fire fighters
- clothing for medical personnel
- materials for shoes
- etc.



Hotmelt adhesives used for coating and laminating are thermoplastic polymers and thermoset polymers.

## Thermoplastic hotmelt adhesives

They are coPA, coPES, PSA, EVA, with:

- typical working temperatures 150-230 °C
- viscosity range 3'000-150'000 cps

Thermoplastic hotmelt adhesives are in plasticized form whenever they are heated, and solid when cooled. The process is therefore fully repeatable and reversible. Under higher temperatures, the bonding strength will be

decreased. However, there are thermoplastic hotmelt adhesives that can withstand temperatures above 200 °C, and they are well accepted even in the automotive industry.

## Thermoset (duroplastic) hotmelt adhesives

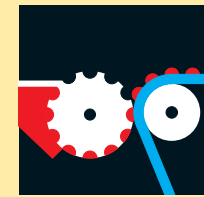
They are one-component, moisture curing / crosslinking reactive polyurethanes, with:

- typical working temperatures 90-130 °C
- viscosity range 3'000-35'000 cps

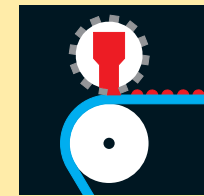


## Coating methods

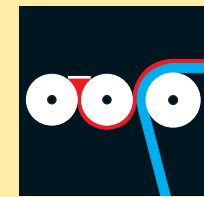
There are different methods of applying the adhesive onto the various webs:



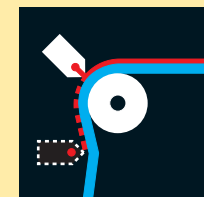
rotogravure



rotary screen



multi-roll

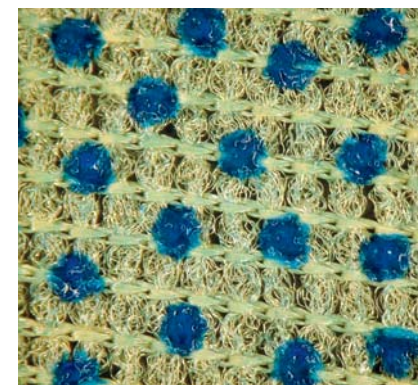


slot die

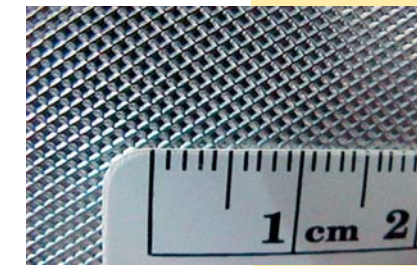
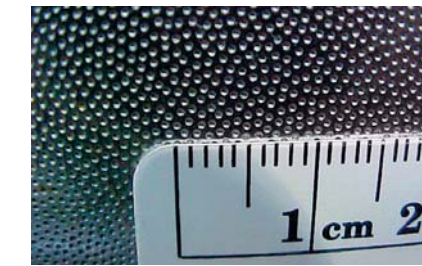
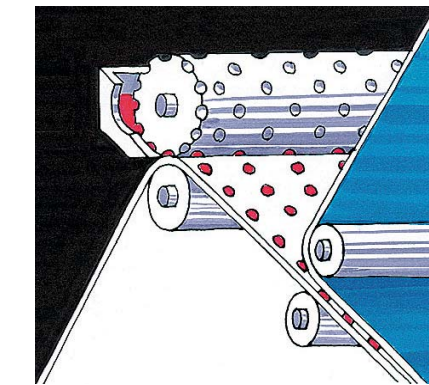
## CAVIMELT rotogravure system

The rotogravure system CAVIMELT is the most commonly applied method for lamination. It is a printing system with an engraved roller, in which little cavities are engraved for transfer of the adhesive to the web substrate.

There are different patterns available, depending on the laminated product. The patterns can be regular or random round dots, pyramidal, nets, lines, etc.



The adhesive is fed in plasticized form (molten) to a coating head. From the coating head, the adhesive is taken over by the engraved roller, the blank parts cleaned off with a special doctor blade. The adhesive is then transferred onto the substrate passing by on the pressure counter roller.



Examples of gravure patterns

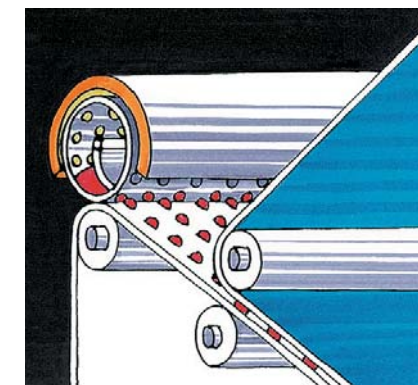
## CAVISCREEN screen system

In the CAVISCREEN system, the hotmelt adhesives are transferred onto the substrates through a rotary screen, similar to the common textile printing method.

The hotmelts are fed from the tank melter or drum melter through a heated and insulated hose to the inside of the rotary screen, just behind the doctor blade. The adhesive is distributed over the width of the fabric. The adhesive is by the doctor blade pressed through the screen onto the substrate (membrane, fabric, foam,

nonwoven, etc.). Different screen patterns allow different coating. However, other than with the rotogravure method, continuous patterns like a net structure are not possible, of course.

This method is recommended only for reactive polyurethane hotmelts (duroplastic polymers), and for thermoplastic hotmelts with lower melting points, but not for coPES and coPA.



For polymers with high plasticizing temperatures, the screens are difficult to clean and critical to handle, and therefore we recommend the rotogravure system for such polymers in case a patterned coating is desired.

The screen environment is heated with infrared heaters, closely covered against heat losses and disturbances. The doctor blade and hotmelt feeding system inside the screen is heated separately.

## CAVIROLL multi-roll system

A good and well proven method for full coating is the multi-roll system, where the molten hotmelt is transferred to the substrate by means of a coating roll with a flat surface. The coating roll is rotating together with the substrate in the same direction. It is not in reverse roll mode.

The hotmelt is fed from the melter or the extruder into the gusset between the coating roll and the dosing roll. Depending on the gap between the dosing roll and the coating roll, a specified quantity of hotmelt is transferred onto the substrate. The dosing roll may be stationary or in reverse rotation mode to further adjust the coating weight.

The rotation speed of the coating roll can be synchronous with the rotating speed of the counter roll, i.e. with the speed of

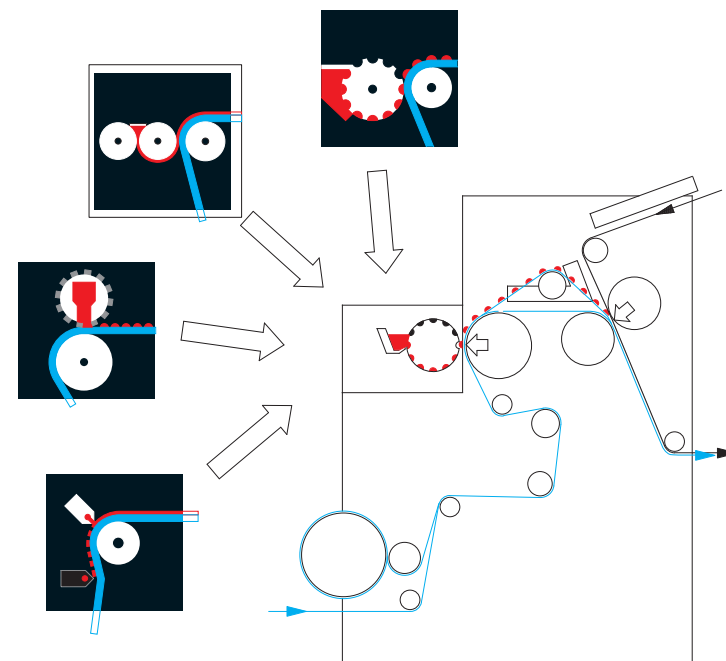
the substrate, or it can be adjusted faster or slower than the substrate. Therewith, the coating weight and also the coating pattern can be influenced.

With a speed of the coating roll slower relative to the substrate, an irregular open coating can be achieved. This can go to the extent of achieving irregular dot coatings. However, such dots cannot be controlled as with the rotogravure or screen methods.

**CAVISLOT slot die system**

The hotmelt is pumped from the melter or the extruder to the slot die mounted across the web substrate. CAVITEC utilizes slot dies from reputable sub-suppliers with extensive experience in hotmelt technology. A number of melt pumps distributed across the width guarantee an equal feeding of the hotmelt and therewith an even coating distribution.

Basically there are 2 application methods, with and without contact of the slot die with the substrate. For a regular closed film, the contactless method is used, positioning a film of the polymer onto the substrate on the counter roll. For open films with irregular open areas, the slot die touches the substrate in front of the counter roll, where the substrate is free.



**CAVIFLEX modular system**

Besides individual machines for specified coating methods, CAVITEC offers a modular system, available with 4 different modules:

- engraved roll (CAVIMELT)
- rotary screen (CAVISCREEN)
- multi-roll (CAVIROLL)
- slot die (CAVISLOT)

At the time of the investment decision, a laminator is in rare cases certain whether his lamination requirements will for a long time remain the same, allowing to decide for one coating method once and for all.

Without this flexibility the CAVIFLEX offers, a laminator has to decide at the time of the initial investment for one coating method, and has then to work with this method. Such a plant cannot easily be converted to another coating method without substantial modifications of the line, probably only by exchanging the entire coating machine. And after the conversion only the substitute new method can be used.

One or more modules can be decided during the purchase process, but later on additional modules can be added easily.

With CAVIFLEX there is full flexibility, as the modules can be exchanged within shortest time.



**Web transport and guidance**

CAVITEC's plants are equipped with low tension web transport drives. The tensions are measured with load cells and dancers, and controlled by the control system according to the setpoints.

In the plants are several web guiding systems to ensure a proper alignment of the web layers for coating and lamination.

Accumulators ensure an operation where the coating and laminating process does not need to be stopped during batch changes. Available are scray (J-box), roll and belt accumulators.

**HOTMELT**

**Coating and Laminating with Hotmelt Adhesives**

**Auxiliary equipment**

Additional to the coating and laminating plant, additional auxiliary equipment is required.

The polymers need to be molten. This happens for thermoplastic adhesives in an extruder, or for lower melting polymers in a tank melter. For reactive PU the melting takes place in a drum melter or tank melter.

Further auxiliary equipment are oil heaters and water coolers, for heating and cooling of rollers.

Cleaning of the engraved rollers takes place by chemicals in a special cleaning unit (optional).

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